Subjek : Minyak Atsiri
Tahun 2004-2008 (478 judul)

Alvaro Cortes Cabrera, Jose M. Prieto, Application of artificial neural networks to the prediction of the antioxidant activity of essential oils in two experimental in vitro models, Food Chemistry, Volume 118, Issue 1, 1 January 2010, Pages 141-146, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.04.070.
(http://www.sciencedirect.com/science/article/B6T6R-4W6XYK9-1/2/708e866c3d7f370d81917ed145af525a)
Abstract: Introduction
The antioxidant properties of essential oils (EOs) have been on the centre of intensive research for their potential use as preservatives or nutraceuticals by the food industry. The enormous amount of information already generated on this subject provides a rich field for data-miners as it is conceivable, with suitable computational techniques, to predict the antioxidant capacity of any essential oil just by knowing its particular chemical composition. To accomplish this task we here report on the design, training and validation of an Artificial Neural Network (ANN) able to predict the antioxidant activity of EOs of known chemical composition.Methods
A multilayer ANN with 30 input neurons, 42 in hidden layers (20 --> 15 --> 7) and one neuron in the output layer was developed and run using Fast Artificial Neural Network software. The chemical composition of 32 EOs and their antioxidant activity in the DPPH and linoleic acid models were extracted from the scientific literature and used as input values. From the initial set of around 80 compounds present in these EOs, only 30 compounds with relevant antioxidant capacity were selected to avoid excessive complexity of the neural network and minimise the associated structural problems.Results and discussion
The ANN could predict the antioxidant capacities of essential oils of known chemical composition in both the DPPH and linoleic acid assays with an average error of only 3.16% and 1.46%, respectively. We also discuss on the contribution of different compounds to these chemical activities.Conclusions
These results confirm that artificial neural networks are reliable, fast and cheap tools for predicting antioxidant activity of essential oils from some of its components and can be used to model biochemical properties of complex natural products including the prediction of parameters associated with nutraceutical properties of food ingredients.
Keywords: Artificial neural networks; Essential oils; Antioxidant activity; DPPH; Linoleic acid; Chemometrics

Alejandro Lucia, Susana Licastro, Eduardo Zerba, Paola Gonzalez Audino, Hector Masuh, Sensitivity of Aedes aegypti adults (Diptera: Culicidae) to the vapors of Eucalyptus essential oils, Bioresource Technology, Volume 100, Issue 23, December 2009, Pages 6083-6087, ISSN 0960-8524, DOI: 10.1016/j.biortech.2009.02.075.
(http://www.sciencedirect.com/science/article/B6V24-4WR0CV1-2/2/1af6ccf32f5ca466d375bf8ca59e6a7d)
Abstract:
Vapors of essential oils extracted from various species of Eucalyptus (E. gunnii, E. tereticornis, E. grandis, E. camaldulensis, E. dunnii, E. cinerea, E. saligna, E. sideroxylon, E. globulus ssp. globulus, E. globulus ssp. maidenii, E. viminalis and the hybrids E. grandis x E. tereticornis and E. grandis x E. camaldulensis) and their major components were found to be toxic to Aedes aegypti adults, the yellow fever mosquito.
An aliquot of each oil was placed in a cylindrical test chamber and the number of knocked-down mosquitoes was recorded as function of time. Knockdown time 50% was then calculated. Results

showed that E. viminalis had the fastest knockdown time at of 4.2 min, on the same order as dichlorvos, a standard knockdown agent. A correlation was observed between the content of 1,8-cineole in the Eucalyptus essential oils and the corresponding toxic effect.
The correlation between KT50 values and calculated vapor pressures of the essential oil components showed that the fumigant activity of simple organic compounds in insects is correlated with their volatility.
Keywords: Mosquito; Fumigant activity; Knockdown; 1,8-Cineole; Vapor pressure

Melanie Turgis, Jaejoon Han, Stephane Caillet, Monique Lacroix, Antimicrobial activity of mustard essential oil against Escherichia coli O157:H7 and Salmonella typhi, Food Control, Volume 20, Issue 12, December 2009, Pages 1073-1079, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2009.02.001.
(http://www.sciencedirect.com/science/article/B6T6S-4VJM2SM-1/2/0d19241094af02de14ae9cb1f41362af)
Abstract:
The aim of this study was to investigate how mustard essential oil (EO) affected the cell membrane of Escherichia coli O157:H7 and Salmonella typhi. Intracellular pH and ATP concentration and the release of cell constituents were measured when mustard EO was in contact with E. coli and S. typhi at its minimal inhibitory concentration (MIC) and maximal tolerated concentration (MTC). The treatment with mustard EO affected the membrane integrity of bacteria and induced a decrease of the intracellular ATP concentration. Also, the extracellular ATP concentration increased and a reduction of the intracellular pH was observed in both bacteria. A significantly (P [less-than-or-equals, slant] 0.05) higher release of cell constituent was observed when both bacteria cells were treated with mustard EO. Electronic microscopy observations showed that the cell membranes of both bacteria were apparently damaged by mustard EO. In conclusion, mustard EO affects the concentration of intracellular component, such as ATP in both bacteria and affects the pH suggesting that cytoplasmic membrane is involved in the antimicrobial action of mustard EO. Mustard EO can be used as an effective antimicrobial agent. We have demonstrated that mustard EO affected the cell membrane integrity, resulting in a loss of cell homeostasis.
Keywords: Mustard essential oil; Escherichia coli O157:H7; Salmonella typhi; Intracellular pH; Cell ATP concentration; Release of cell constituents; Electronic microscopy

Jianchun Xie, Baoguo Sun, Shuaibin Wang, Yoichiro Ito, Isolation and purification of nootkatone from the essential oil of fruits of Alpinia oxyphylla Miquel by high-speed counter-current chromatography, Food Chemistry, Volume 117, Issue 2, 15 November 2009, Pages 375-380, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.04.011.
(http://www.sciencedirect.com/science/article/B6T6R-4W26GFM-1/2/c34dd3656580680d1ebc23fe7194bcad)
Abstract:
HSCCC technique in a semi-preparative scale was successfully applied in isolation and purification of nootkatone from the essential oil of fruits of Alpinia oxyphylla Miquel. Twelve kinds of two-phase solvent systems, consisting of seven non-aqueous and five organic-aqueous solvent systems, were selected with not only suitable partition coefficients of nootkatone but also suitable separation factors between nootkatone and valencene, the dominant impurity in the essential oil. Further on HSCCC, n-hexane-chloroform-acetonitrile (10:1:10, v/v) amongst the non-aqueous solvent systems and n-hexane-methanol-water (5:4:1, v/v) amongst the organic-aqueous solvent systems were separately screened out. However, n-hexane-methanol-water (5:4:1, v/v) was thought optimal due to quite shorter elution time and better HSCCC peak form. By eluting the lower phase of this solvent system in head-tail mode, 3.1 mg of nootkatone was obtained at a

purity of 92.30% by GC-MS from 80 mg of crude essential oil in one step operation in less than 4 h. The chemical structure of nootkatone fraction was confirmed by EI-MS and 1H NMR.
Keywords: Counter-current chromatography; Alpinia oxyphylla Miquel; Sesquiterpenoid; Nootkatone; Flavor; Bioactive component

Monica R. Loizzo, Federica Menichini, Filomena Conforti, Rosa Tundis, Marco Bonesi, Antoine M. Saab, Giancarlo A. Statti, Bruno de Cindio, Peter J Houghton, Francesco Menichini, Natale Giuseppe Frega, Chemical analysis, antioxidant, antiinflammatory and anticholinesterase activities of Origanum ehrenbergii Boiss and Origanum syriacum L. essential oils, Food Chemistry, Volume 117, Issue 1, 1 November 2009, Pages 174-180, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.03.095.
(http://www.sciencedirect.com/science/article/B6T6R-4VYP9BS-1/2/b7b61692cd6982d04caf5acd4d3df0f8)
Abstract:
The essential oils of Origanum ehrenbergii and O. syriacum collected in Lebanon were analysed by GC and GC-MS and evaluated for their anticholinesterase, NO production inhibitory activities, and antioxidant properties. O. ehrenbergi essential oil was characterised by the presence of 37 components, representing 94.9% of the total oil of which thymol (19%) and p-cymene (16.1%) were the main abundant compounds. Thirty-six compounds characterised the O. syriacum essential oil, representing 90.6% of the total oil. The most abundant components were thymol (24.7%) and carvacrol (17.6%). O. ehrenbergii demonstrated interesting scavenging effects on DPPH with an IC50 value of 0.99 [mu]g/ml. In addition, both O. ehrenbergii and O. syriacum oils inhibited oxidation of linoleic acid after 30 min of incubation, as well as after 60 min of incubation with IC50 values of 42.1 and 33.6 [mu]g/ml, and 46.9 and 58.9 [mu]g/ml, respectively. Interestingly, O. ehrenbergii oil inhibited NO production in the murine monocytic macrophage cell line RAW 264.7 with an IC50 value of 66.4 [mu]g/ml. Acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) inhibition was assessed by modifications of the Ellman's method. O. ehrenbergii exhibited a strong activity against both cholinesterases with IC50 values of 0.3 [mu]g/ml. The data suggest that O. ehrenbergii and O. syriacum oils could be used as a valuable new flavour with functional properties for food or nutriceutical products with particular relevance to supplements for the elderly.
Keywords: Origanum ehrenbergii; O. syriacum; Lamiaceae; Essential oil; GC-MS; Antioxidant; Inhibition of NO production; Acetylcholinesterase and butyrilcholinesterase inhibition

Mehdi Razzaghi-Abyaneh, Masoomeh Shams-Ghahfarokhi, Mohammad-Bagher Rezaee, Kamkar Jaimand, Soheil Alinezhad, Reza Saberi, Tomoya Yoshinari, Chemical composition and antiaflatoxigenic activity of Carum carvi L., Thymus vulgaris and Citrus aurantifolia essential oils, Food Control, Volume 20, Issue 11, November 2009, Pages 1018-1024, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.12.007.
(http://www.sciencedirect.com/science/article/B6T6S-4V7MSFW-1/2/5a8d8a6bc6e9a1e2b05e73eb0b4d0468)
Abstract:
In order to find out plants useful to controlling aflatoxins (AFs) production, the essential oils (EOs) from 12 medicinal plants prepared by hydrodistillation were studied with special reference to the inhibition of Aspergillus parasiticus growth and AFs production. The toxigenic fungus was cultured in presence of various oils in 6-well microplates using a microbioassay technique. The mycelial mass was estimated as an index of fungal growth, while the aflatoxins B1 (AFB1) and G1 (AFG1) were measured by high performance liquid chromatography (HPLC). Among plants tested, Thymus vulgari and Citrus aurantifolia were found to inhibit both A. parasiticus and AF production. The EOs from Mentha spicata L., Foeniculum miller, Azadirachta indica A. Juss, Conium maculatum and Artemisia dracunculus were only inhibited fungal growth, while Carum carvi L.

effectively inhibited AF production without any obvious effect on fungal growth. The other plants including Ferula gummosa, Citrus sinensis, Mentha longifolia and Eucalyptus camaldulensis had no effect on A. parasiticus growth and AF production at all concentrations used. The IC50 values of T. vulgaris, C. aurantifolia and C. carvi for AF inhibition were reported as 93.5, 285.6, and 621.9 [mu]g/ml for AFB1, while they were calculated as 11.7, 50.1, and 56.0 [mu]g/ml for AFG1. These results indicate that the EOs of some medicinal plants may be considered as potential candidates to protect foods and feeds from toxigenic fungus growth and subsequent AF contamination.
Keywords: Aspergillus parasiticus; Aflatoxin; Essential oil; Medicinal plants; Carum carvi; Thymus vulgaris; Citrus aurantifolia

Filomena Conforti, Federica Menichini, Carmen Formisano, Daniela Rigano, Felice Senatore, Nelly Apostolides Arnold, Franco Piozzi, Comparative chemical composition, free radical-scavenging and cytotoxic properties of essential oils of six Stachys species from different regions of the Mediterranean Area, Food Chemistry, Volume 116, Issue 4, 15 October 2009, Pages 898-905, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.03.044.
(http://www.sciencedirect.com/science/article/B6T6R-4VVXT0N-5/2/55040f03d10c2b38ff140323b30a1154)
Abstract:
The chemical composition of essential oils of six Stachys species, S. cretica L. ssp. vacillans Rech. fil., S. germanica L., S. hydrophila Boiss., S. nivea Labill., S. palustris L. and S. spinosa L., obtained by hydrodistillation, was studied by GC and GC-MS. All the oils have in common a great percentage of fatty acids and esters (24.2-58.5%) and a high amount of sesquiterpenes (16-35.9%), with the exception of the oil from S. palustris, which consisted mainly of carbonylic compounds (25.4%). The antioxidant activity by DPPH test and the antiproliferative activity on a series of human cancer cell lines (C32, amelanotic melanoma and ACHN, renal cell adenocarcinoma) were investigated for all the oils. S. palustris, S. cretica and S. hydrophila showed the highest antiradical effect, with IC50 values of 0.482, 0.652 and 0.664 mg/ml, respectively. The most antiproliferative essential oil against C32 cell line was the oil of S. germanica with a 77% of inhibition at a concentration of 100 [mu]g/ml. S. germanica, S. palustris and S. spinosa showed the most antiproliferative activity on ACHN cell line, at a concentration of 100 [mu]g/ml,with 81%, 77% and 73% inhibition, respectively.
Keywords: Stachys cretica ssp. vacillans; S. germanica; S. hydrophila; S. nivea; S. palustris; S. spinosa; Essential oil; Antioxidant activity; Cytotoxic activity

P. Goni, P. Lopez, C. Sanchez, R. Gomez-Lus, R. Becerril, C. Nerin, Antimicrobial activity in the vapour phase of a combination of cinnamon and clove essential oils, Food Chemistry, Volume 116, Issue 4, 15 October 2009, Pages 982-989, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.03.058.
(http://www.sciencedirect.com/science/article/B6T6R-4VWB1DY-C/2/17a1036387192c1b0c55ee5fb9b8df49)
Abstract:
The antimicrobial activity of the vapour generated by a combination of cinnamon and clove essential oils against the growth of four Gram-negative (Escherichia coli, Yersinia enterocolitica, Pseudomonas aeruginosa and Salmonella choleraesuis) and four Gram-positive bacteria (Staphylococcus aureus, Listeria monocytogenes, Bacillus cereus and Enterococcus faecalis) was assessed by means of the fractional inhibitory concentration index (FIC) of the mixture. The presence of synergism or antagonism effects depended on the reference parameter used to estimate such an index. If the minimal inhibitory concentrations were applied, the vapours of the combination of essential oils exerted an antagonistic effect on the growth of E. coli, while they wielded a synergistic effect for the inhibition of L. monocytogenes, B. cereus and Y. enterocolitica

when the concentrations of maximal inhibition were used. This fact revealed a clear concentration-dependent interaction.
The headspace of the cinnamon and clove essential oils and their combination was sampled by solid-phase microextraction (SPME) and the constituents identified and quantified by gas chromatography-ion trap mass spectrometry (GC/ITMS). Eugenol was the most abundant compound for the three antibacterial atmospheres. The differences in behaviour could be attributed to minor compounds. The combined headspace contained slightly larger amounts of 1,8-cineole and camphor, which are believed to enhance the eugenol activity. The mechanisms responsible for the antagonism are, however, less known and much further investigation is required.
To the best of our knowledge this is the first time a combination of essential oils in the vapour phase has been tested as a preservative method to prevent microorganism proliferation.
Keywords: Essential oils; Cinnamon; Clove; Fractional inhibitory concentration index; Synergy; Vapour phase; Antimicrobial activity

Atiqur Rahman, Sun Chul Kang, In vitro control of food-borne and food spoilage bacteria by essential oil and ethanol extracts of Lonicera japonica Thunb., Food Chemistry, Volume 116, Issue 3, 1 October 2009, Pages 670-675, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.03.014.
(http://www.sciencedirect.com/science/article/B6T6R-4VT14M6-B/2/faf1852e20d41828b4d7ef38952b0e81)
Abstract:
The antibacterial potential of essential oil from flowers and ethanolic leaf extracts of Lonicera japonica Thunb. was evaluated for controlling the growth of a range of food-borne pathogens. Thirty-nine compounds representing 92.34% of the total oil were identified, of which trans-nerolidol (16.31%), caryophyllene oxide (11.15%), linalool (8.61%), p-cymene (7.43%), hexadecanoic acid (6.39%), eugenol (6.13%), geraniol (5.01%), trans-linalool oxide (3.75%), globulol (2.34%), pentadecanoic acid (2.25%), veridiflorol (1.83%), benzyl alcohol (1.63%) and phenylethyl alcohol (1.25%) were the major compounds. The oil and extracts revealed a remarkable antibacterial effect against Listeria monocytogenes ATCC 19116, Bacillus subtilis ATCC 6633, B. cereus SCK 11, Staphylococcus aureus (ATCC 6538 and KCTC 1916), Salmonella enteritidis KCTC 12021, S. typhimurium KCTC 2515, Enterobacter aerogenes KCTC 2190 and Escherichia coli ATCC 8739. However, no effect was observed for Pseudomonas aeruginosa KCTC 2004 and E. coli O157:H7 ATCC 43888. Our findings demonstrate that the oil and extracts derived from L. japonica might be a potential source of preservatives for use in the food or pharmaceutical industries.
Keywords: Lonicera japonica Thunb.; Essential oil; trans-Nerolidol; Antibacterial activity; Food-borne pathogenic and spoiling bacteria

S.F. Mexis, E. Chouliara, M.G. Kontominas, Combined effect of an O2 absorber and oregano essential oil on shelf-life extension of Greek cod roe paste (tarama salad) stored at 4 [degree sign]C, Innovative Food Science & Emerging Technologies, Volume 10, Issue 4, October 2009, Pages 572-579, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.04.005.
(http://www.sciencedirect.com/science/article/B6W6D-4W3HX7X-1/2/e06270ba07a93f9e90b2a50bf1652559)
Abstract:
In the present study the combined effect of an O2 absorber and oregano essential oil (0.1% v/w) on shelf life extension of Greek cod roe paste (tarama salad) stored under refrigeration (4 [degree sign]C) was investigated. The study was based on microbiological [Total viable count (TVC), Lactic Acid Bacteria (LAB), Enterobacteriaceae, H2S-producing, yeast and molds and Clostridium spp.), physicochemical (pH, fatty acid composition, thiobarbituric acid (TBA), and color) and sensory (color, odor, and taste) changes occurring in the product as a function of treatment and storage time. Aerobically packaged tarama salad stored at 4 [degree sign]C was taken as the control

sample. Results showed that TVC exceeded 7 log cfu/g on day 12-13 of storage for control samples and day 31-32 for samples containing oregano oil. Samples containing either the O2 absorber or the O2 absorber plus oregano oil never reached 7 log cfu/g during the 60 day storage period. LAB were only partially inhibited by the oregano oil and/or the O2 absorber. Yeasts and molds were totally inhibited by the O2 absorber. Enterobacteriaceae populations were below the method detection limit (2 log cfu/g) H2S-producing bacteria were the dominant spoilage microorganisms. Clostridum spp. was absent in 25 g sample. pH decreased from an initial value of 4.36 to 3.03 depending on specific treatment. Color parameters L* and b* increased and a* decreased in control samples as well as in samples containing oregano oil. Color parameters remained unaffected in samples containing the O2 absorber. TBA expressed as malondialdehyde (MDA) values increased from 1.5 mg/kg to 3.4, 3.2 and 2.9 mg/kg for samples containing oregano oil, the O2 absorber and O2 absorber plus oregano oil at the point of sensory rejection, respectively. Saturated fatty acids (SFA) increased during storage with a respective decrease in monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) both in control samples and samples containing oregano oil. Fatty acid composition remained unaffected in all samples containing the O2 absorber. Sensory shelf life was 24 days for the control samples, 32 days for samples containing oregano oil, 60 days for samples containing the O2 absorber and at least 60 days for samples containing the O2 absorber plus oregano oil.Industrial relevance
Oxygen absorbers as well as plant essential oils are considered natural means of preservation and may substantially extend the shelf life of foodstuffs while maintaining desirable sensory attributes (taste, odor and color).
Keywords: Greek cod roe paste (tarama salad); Shelf-life extension; O2 absorber; Oregano essential oil

M. Viuda-Martos, Y. Ruiz-Navajas, J. Fernandez-Lopez, J.A. Perez-Alvarez, Effect of adding citrus waste water, thyme and oregano essential oil on the chemical, physical and sensory characteristics of a bologna sausage, Innovative Food Science & Emerging Technologies, Volume 10, Issue 4, October 2009, Pages 655-660, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.06.001.
(http://www.sciencedirect.com/science/article/B6W6D-4WKK1N2-1/2/0ec4743238dba88ec72e2dd95e551302)
Abstract:
The industrial transformation of citrus fruits generates large quantities of co-products rich in bioactive compounds that may well be suitable for other purposes. One such co-product is the water used in the process of obtaining fibre from orange. It was found that the addition of citrus waste water (5-10%) obtained as co-product during the extraction of dietary fibre and oregano or thyme essential oils (0.02%) to the bologna samples reduced the residual nitrite levels and the degree of lipid oxidation. The flavonoids hesperidin and narirutin were detected in all the samples, while those prepared with 5% of citrus waste water and 0.02% of either essential oil were the most highly valued from a sensory point of view.Industrial relevance
The object of the present work was to study the effect of adding different concentrations (5-10%) of orange juice waste water obtained as co-product during the extraction of dietary fibre, and oregano or thyme essential oils (0.02%), on the chemical, physicochemical and sensory characteristics of a bologna-type sausage, to extend its shelf life. Addition of orange juice waste water and spices essential oil had a significant effect on shelf-life extension because of a reduction of the lipid oxidation degree.
Keywords: Bologna sausage; Thyme; Oregano; Orange; Co-products; TBA; Antioxidant

Ibrahim Kivrak, Mehmet Emin Duru, Mehmet Ozturk, Nazime Mercan, Mansur Harmandar, Gulacti Topcu, Antioxidant, anticholinesterase and antimicrobial constituents from the essential oil and ethanol extract of Salvia potentillifolia, Food Chemistry, Volume 116, Issue 2, 15 September 2009, Pages 470-479, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.02.069.

(http://www.sciencedirect.com/science/article/B6T6R-4VR24C0-3/2/1816fdf239d7d074683b109f405fd432)
Abstract:
The essential oil of Salvia potentillifolia was analysed by GC and GC-MS. Totally, 123 components were detected in both hydrodistilled and steam-distilled oils, [alpha]- and [beta]-pinenes being major compounds. The antioxidant activities were determined by using complementary tests, namely, DPPH radical-scavenging, [beta]-carotene-linoleic acid and reducing power assays. The ethanol extract also showed better activity (IC50 = 69.4 +/- 0.99 [mu]g/ml) than that of BHT in the DPPH system, and showed great lipid peroxidation inhibition in the [beta]-carotene-linoleic acid system (IC50 = 30.4 +/- 0.50 [mu]g/ml). The essential oil showed meaningful butyrylcholinesterase activity (65.7 +/- 0.21%), and [alpha]-pinene showed high acetylcholinesterase inhibitory activity (IC50 = 86.2 +/- 0.96 [mu]M) while [beta]-pinene was inactive. Antimicrobial activity was also investigated on several microorganisms, and the essential oil showed high activity against Bacillus subtilis and B. cereus. It also exhibited remarkable anticandidal activity against Candida albicans and C. tropicalis with MIC values of 18.5 and 15.5 [mu]g/ml, respectively, while [alpha]- and [beta]-pinenes showed moderate activity.
Keywords: Lamiaceae; Salvia potentillifolia; Antioxidant activity; Antimicrobial activity; Anticholinesterase activity; Essential oil; GC-MS

Mario R. Marostica Junior, Thomaz A.A. Rocha e Silva, Gilberto C. Franchi, Alexandre Nowill, Glaucia M. Pastore, Stephen Hyslop, Antioxidant potential of aroma compounds obtained by limonene biotransformation of orange essential oil, Food Chemistry, Volume 116, Issue 1, 1 September 2009, Pages 8-12, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.01.084.
(http://www.sciencedirect.com/science/article/B6T6R-4VJ4WX1-3/2/6d24ca04f90b8a71c4beda4af1f66459)
Abstract:
The antioxidant activities of a limonene biotransformation extract and of some standard monoterpenes present in the extract were assessed using four antioxidant assays: total antioxidant capacity, based on the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging assay, lipid peroxidation by the thiobarbituric acid (TBA) assay, superoxide anion release by cultured leukemic cells and glutathione S-transferase (GSTs) activity. The limonene biotransformation extract had free radical-scavenging activity (EC50 = 2.09%, v/v) and inhibited lipid peroxidation (IC50 = 0.13%, v/v). The extract, perillyl alcohol and [alpha]-terpineol inhibited lipid peroxidation by ~80% at a concentration of 0.02% (v/v). Perillyl alcohol and [alpha]-terpineol also reduced the release of superoxide anions by cultured leukemic cells, by 3- and 10-fold, respectively, at concentrations of <0.02% (v/v). The biotransformation extract inhibited the conversion of nitrophenyl acetate to p-nitrophenol in the glutathione assay by ~50%. These results indicate that, in addition to monoterpenes, other non-volatile compounds may contribute to the antioxidant activity of the biotransformation extract.
Keywords: Antioxidant activity; 2,2-diphenyl-1-picrylhydrazyl; Glutathione S-transferase; Monoterepenes; Superoxide release; Thiobarbituric acid

S.F. Mexis, E. Chouliara, M.G. Kontominas, Combined effect of an oxygen absorber and oregano essential oil on shelf life extension of rainbow trout fillets stored at 4 [degree sign]C, Food Microbiology, Volume 26, Issue 6, September 2009, Pages 598-605, ISSN 0740-0020, DOI: 10.1016/j.fm.2009.04.002.
(http://www.sciencedirect.com/science/article/B6WFP-4W3PT5M-2/2/77b74e7bd0e4dfa1d19d5279fd67361a)
Abstract:
In the present study the combined effect of an O2 absorber and oregano essential oil (0.4% v/w) on shelf life extension of rainbow trout fillets (Onchorynchus mykiss) stored under refrigeration (4

[degree sign]C) was investigated. The study was based on microbiological [TVC, Pseudomonas spp., Lactic Acid Bacteria, H2S-producing bacteria including Shewanella putrefaciens, Enterobacteriaceae and Clostridium spp.), physicochemical (pH, PV, TBA, TVBN and Drip loss) and sensory (odor, taste) changes occurring in the product as a function of treatment and storage time. Aerobically-packaged rainbow trout fillets stored at 4 [degree sign]C were taken as control samples. Results showed that TVC exceeded 7 log cfu/g on day 4 of storage for control samples, day 7-8 for samples containing oregano oil, day 9 for samples containing the O2 absorber and day 12-13 for samples containing the O2 absorber and oregano oil. Pseudomonas spp., Enterobacteriaceae and LAB were only partially inhibited by the O2 absorber and/or the oregano oil. In all cases the inhibition effect was more pronounced when the combination of O2 absorber with oregano essential oil was used. pH decreased from an initial value of 6.65-6.09 and subsequently increased to 6.86 due to formation of protein decomposition products. % Drip loss ranged between 7% and 11-12% at the end of the product shelf life. PV values ranged between 11.4 and 27.0 meq O2/kg oil while malondialdehyde (MDA) ranged between 9.6 and 24.5 mg/kg. TVBN ranged between 10.6 and 54.6 mg/kg at the time of sensory rejection. Sensory shelf life was 4 days for the control samples, 7-8 days for samples containing oregano oil, 13-14 days for samples containing the O2 absorber and 17 days for samples containing the O2 absorber plus oregano oil.
Keywords: Rainbow trout; Shelf life extension; O2 absorber; Oregano essential oil

Cobo Molinos Antonio, Hikmate Abriouel, Rosario Lucas Lopez, Nabil Ben Omar, Eva Valdivia, Antonio Galvez, Enhanced bactericidal activity of enterocin AS-48 in combination with essential oils, natural bioactive compounds and chemical preservatives against Listeria monocytogenes in ready-to-eat salad, Food and Chemical Toxicology, Volume 47, Issue 9, September 2009, Pages 2216-2223, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.06.012.
(http://www.sciencedirect.com/science/article/B6T6P-4WGMB9Y-5/2/51ee955c337307d65e13743eefab1777)
Abstract:
Enterocin AS-48 (30-60 [mu]g/g) significantly reduced viable counts of Listeria monocytogenes in Russian-type salad during one week storage at 10 [degree sign]C. Antilisterial activity of AS-48 (30 [mu]g/g) in salad was strongly enhanced by essential oils (thyme verbena, thyme red, Spanish oregano, ajowan, tea tree, clove, and sage oils tested at 1%, as well as with 2% rosemary oil). Antilisterial activity also increased in combination with bioactive components from essential oils and plant extracts, with other related antimicrobials of natural origin or derived from chemical synthesis (carvacrol, eugenol, thymol, terpineol, tyrosol, hydroxytyrosol, caffeic, ferulic and vanillic acid, luteolin, geranyl butyrate, geranyl phenylacetate, pyrocatechol, hydrocinnamic acid, tert butylhydroquinone, phenylphosphate, isopropyl methyl phenol, coumaric acid, and 2-nitropropanol), and with food preservatives (citric and lactic acid, sucrose palmitate, sucrose stearate, p-hydroxybenzoic methylester acid - PHBME, and Nisaplin). AS-48 acted synergistically with citric, lactic acid, and PHBME. A mixed population of two L. monocytogenes strains was markedly reduced for one week in salads treated with AS-48 (30 [mu]g/g) in combination with lactic acid, PHBME or Nisaplin. The increased bactericidal activity of these combinations is interesting to improve protection against L. monocytogenes during salad storage.
Keywords: Bacteriocin; Antimicrobials; Food preservation; Listeria; Salads

Sharif M. Al-Reza, Vivek K. Bajpai, Sun Chul Kang, Antioxidant and antilisterial effect of seed essential oil and organic extracts from Zizyphus jujuba, Food and Chemical Toxicology, Volume 47, Issue 9, September 2009, Pages 2374-2380, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.06.033.
(http://www.sciencedirect.com/science/article/B6T6P-4WMDHPV-1/2/cac0fac8139246109b436ebd88f1ba63)

Abstract:
Hydrodistilled volatile oil from the seeds of Zizyphus jujuba was analyzed by GC-MS. Twenty three compounds representing 91.59% of the total oil was identified. The oil and organic extracts revealed a great potential of antilisterial effect against all five strains of Listeria monocytogenes ATCC 19111, 19116, 19118, 19166 and 15313. Also the oil had strong detrimental effect on the viable count of the tested bacteria. The samples were also subjected to screening for the antioxidant activity by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and superoxide radicals scavenging activities assay. In the first case, the IC50 value of the Z. jujuba essential oil was determined to be 5.21 +/- 0.01 [mu]g/ml. Among the extracts, the strongest activity was exhibited by the methanol extract with an IC50 value of 20.44 +/- 0.18 [mu]g/ml. In the superoxide radicals scavenging activities assay, methanol extract was superior to all other extracts (IC50 = 18.60 +/- 0.3 [mu]g/ml). Furthermore, the amount of total phenolic compounds was determined. The results indicate that the essential oil and extracts of Z. jujuba could serve as natural antimicrobial and antioxidant agents for the food industry.
Keywords: Antioxidant activity; Antilisterial activity; Zizyphus jujuba; Essential oil

V.F. Peres, D.J. Moura, A.R.M. Sperotto, F.C. Damasceno, E.B. Caramao, C.A. Zini, J. Saffi, Chemical composition and cytotoxic, mutagenic and genotoxic activities of the essential oil from Piper gaudichaudianum Kunth leaves, Food and Chemical Toxicology, Volume 47, Issue 9, September 2009, Pages 2389-2395, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.06.035.
(http://www.sciencedirect.com/science/article/B6T6P-4WMDHPV-5/2/7e3b752b919788b967d59d6bc870b14a)
Abstract:
We have investigated the chemical composition of Piper gaudichaudianum essential oil, as well as its cytotoxic, mutagenic and genotoxic effects in V79 cells. The chemical analyses showed that the major compounds are (E)-nerolidol (22.4%), [alpha]-humulene (16.5%), (E)-caryophyllene (8.9%) and bicyclogermacrene (7.4%). Dose-dependent cytotoxic effects were observed in V79 cells treated with essential oil by using clonal survival, 3-(4,5-dimethylthiazole-2-yl)-2,5-biphenyl tetrazolium bromide reduction assay (MTT) and trypan blue exclusion assay (TB), and a significant decrease in survival was observed at concentrations of 0.5 [mu]g/mL and higher. The P. gaudichaudianum essential oil treatment caused DNA strand breaks in V79 cells at concentrations up to 2 [mu]g/mL, as detected by the alkaline comet assay, but did not induce double-strand breaks, as verified by neutral comet assay. It induced a significant increase in the frequency of micronucleated cells at 4, 6 and 10 [mu]g/mL. Moreover, P. gaudichaudianum essential oil significantly increased lipid peroxidation at doses of 0.5 [mu]g/mL and higher, suggesting that the observed oxidant potential can be responsible, at least in part, for its cytotoxic and genotoxic effects.
Keywords: Piper gaudichaudianum; Essential oil; Cytotoxicity; Genotoxicity; Mutagenicity; Lipid peroxidation

Martin Zabka, Roman Pavela, Ludmila Slezakova, Antifungal effect of Pimenta dioica essential oil against dangerous pathogenic and toxinogenic fungi, Industrial Crops and Products, Volume 30, Issue 2, September 2009, Pages 250-253, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.04.002.
(http://www.sciencedirect.com/science/article/B6T77-4WM04Y3-1/2/04578b0a775f1de2f9d00e984f7817bf)
Abstract:
Essential oils from 25 species of medicinal plants were tested as mycelial growth inhibitors against six important pathogenic and toxinogenic fungal species. An agar dilution method was used for determination of the inhibitory effect namely on Fusarium oxysporum, Fusarium verticillioides, Penicillium expansum, Penicillium brevicompactum, Aspergillus flavus and Aspergillus fumigatus. All essential oils used in our experiment evidently affected growth of these fungi. Minimum

inhibitory concentration (MIC) was evaluated in the case of five essential oils showing the most significant antifungal activity. The superior antifungal activity was finally proved on the base of MIC values in the case of Pimenta dioica. The chemical composition of P. dioica essential oil was determined by means of GC-MS analysis.
Keywords: Essencial oils; Pimenta dioica; Antifungal activity; Pathogenic fungi; Toxinogenic fungi

P. Di Leo Lira, D. Retta, E. Tkacik, J. Ringuelet, J.D. Coussio, C. van Baren, A.L. Bandoni, Essential oil and by-products of distillation of bay leaves (Laurus nobilis L.) from Argentina, Industrial Crops and Products, Volume 30, Issue 2, September 2009, Pages 259-264, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.04.005.
(http://www.sciencedirect.com/science/article/B6T77-4WGJKK9-1/2/1bb6c0d0576dfc96626bab7b5767907c)
Abstract:
Preliminary chemical studies were undertaken during one year on plant materials collected in a 40 ha field located in Henderson, Province of Buenos Aires, in order to determine the technical viability of the industrial production of essential oil from bay leaves (Laurus nobilis L., Lauraceae) growing in Argentina. The oils were extracted at a pilot scale plant and analyzed by GC-FID-MS. The apparent density of the plant material used for the distillation ranged from 90 g L-1 to 170 g L-1, depending on the type of material. The quality of the volatile oils obtained complied with market requirements and were in agreement with values reported from other countries. No considerable variations were observed in the chemical composition of the oils throughout the year. Taking in account the composition of the sub-fractions obtained during the distillation process, the quality of the final essential oil can be adjusted by fractional distillation. The occurrence of alcohol terpenes and phenols in the condensed waters (hydrolate) makes them a possible alternative to be used in industry. Moreover, and due to the good energetic and digestibility values obtained, our results showed that the exhausted plant material obtained after distillation could be a putative fibrous feed for ruminants. Both, hydrolate and exhausted plant materials are resources that can enhance added values in new endeavours. This is the first report on bay leaves essential oil production at industrial scale in Argentina.
Keywords: Laurus nobilis L. (Lauraceae); Bay leaf; Essential oil; Argentina; Hydrolate; Nutritional value for ruminants

Archana J. Gawde, Charles L. Cantrell, Valtcho D. Zheljazkov, Dual extraction of essential oil and podophyllotoxin from Juniperus virginiana, Industrial Crops and Products, Volume 30, Issue 2, September 2009, Pages 276-280, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.05.005.
(http://www.sciencedirect.com/science/article/B6T77-4WMD2HP-1/2/6d204c3a71d5ebc0463fe66ca6769be2)
Abstract:
The leaves (needles) of eastern red cedar (Juniperus virginiana L.) contain two important natural products: essential oil and podophyllotoxin. The hypothesis of this study was that it may be possible to extract both essential oil and podophyllotoxin from the leaves of the tree, by using a dual extraction method. Podophyllotoxin was obtained from the leaves following steam distillation of the leaves to produce the essential oil, indicating that steam distillation did not degrade podophyllotoxin. Furthermore, a product with 6% purity podophyllotoxin was obtained from the steam-distilled plant material, demonstrating the possibility for the establishment of an industrially economic protocol for dual extraction of these two natural products. Our study demonstrated that J. virginiana leaves, currently a waste-product from the timber industry, could be sequentially extracted for essential oil and podophyllotoxin and utilized as a by-product instead. We also found that the J. virginiana heartwood (a traditional source for cedarwood essential oil) does not contain podophyllotoxin. This is the first study to report both podophyllotoxin and essential oil in J.

virginiana, and the first report on the dual extraction of these two natural products from the same biomass samples.
Keywords: Podophyllotoxin; Essential oil; Dual extraction; Juniperus virginiana; Cupressaceae

Roman Pavela, Larvicidal property of essential oils against Culex quinquefasciatus Say (Diptera: Culicidae), Industrial Crops and Products, Volume 30, Issue 2, September 2009, Pages 311-315, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.06.005.
(http://www.sciencedirect.com/science/article/B6T77-4WRKF73-1/2/9d7edaa7fd180b1ba0959aeae43384f7)
Abstract:
Essential oils from 22 aromatic plant species were tested for mortality of the mosquito larvae Culex quinquefasciatus. Lethal concentrations were determined for individual essential oils. Essential oils obtained from Thymus vulgaris, Satureja hortensis and Thymus satureioides plants showed the highest effect, with LC50 found lower than 50 [mu]g/ml (33, 36 and 44 [mu]g/ml, respectively). Analyses showed that majority substances for T. vulgaris were thymol and p-cymene (60.3 and 10.1%, respectively); carvacrol and [gamma]-terpinene for S. hortensis (48.1 and 36.7%, respectively), and borneol and thymol for T. satureioides (30.3 and 32.5%, respectively).
The selected essential oils also showed very good effectiveness with respect to mortality and percentage of adult emergence upon short-term exposure in water contaminated with lethal doses of individual oils. While there was 77% adult emergence from the larvae in the control, in T. vulgaris, T. satureoides and S. hortensis there was only 12.3, 15.3 and 16.0% adult emergence, respectively. High antioviposition effectiveness was found in all selected oils. Almost 100% deterrence of female oviposition was determined for all oils in concentrations of 0.02%. Significant differences were seen with tested concentrations of 0.01 and 0.005%, where the oil of T. vulgaris proved most effective (repellency about 99.8 and 62.3%, respectively).
Keywords: Thymus; Satureja; Essential oils; Larvicidal; Mosquito; Botanical insecticides

Wilma du Plooy, Thierry Regnier, Sandra Combrinck, Essential oil amended coatings as alternatives to synthetic fungicides in citrus postharvest management, Postharvest Biology and Technology, Volume 53, Issue 3, September 2009, Pages 117-122, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2009.04.005.
(http://www.sciencedirect.com/science/article/B6TBJ-4WNGD87-1/2/bc7a51869fba48c6bae6273a3c76e85e)
Abstract:
A new approach to the control of postharvest pathogens, while maintaining fruit quality, has been implemented by the application of essential oil amended coatings to citrus. This approach eliminates the need for synthetic fungicides, thereby complying with consumer preferences, organic requirements and reducing environmental pollution. In vitro studies indicated that the essential oils and some of the terpenoid components tested were active against Penicillium digitatum. In a series of subsequent semi-commercial and commercial trials, Mentha spicata and Lippia scaberrima essential oils, as well as pure (d)-limonene and R-(-)-carvone were incorporated into a variety of commercial citrus coatings. These amended coatings were applied postharvest to `Tomango' oranges in the absence of the standard fungicide dip. Excellent disease control was achieved with the amended coatings, while measured quality parameters indicated that overall fruit quality was maintained. Moreover, moisture loss was decreased significantly in fruit treated with essential oil enriched coatings. The efficacy of amended coatings as a viable alternative or supplement to existing fruit protection strategies was demonstrated in a commercial trial.
Keywords: Citrus; Penicillium; Lippia; Spearmint; Postharvest

Mousa Solgi, Mohsen Kafi, Toktam Sadat Taghavi, Roohangiz Naderi, Essential oils and silver nanoparticles (SNP) as novel agents to extend vase-life of gerbera (Gerbera jamesonii cv. `Dune')

flowers, Postharvest Biology and Technology, Volume 53, Issue 3, September 2009, Pages 155-158, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2009.04.003.
(http://www.sciencedirect.com/science/article/B6TBJ-4WMD2HK-1/2/8f38a5b5f47deec62c4b3b23c6ed71af)
Abstract:
The aim of this study was to evaluate the efficacy of silver nanoparticles (SNP) and essential oils as novel antimicrobial agents in extending the vase-life of gerbera (Gerbera jamesonii cv. `Dune') flowers. The vase-life of flowers held in a solution containing 5 mg L-1 SNP plus 6% sucrose was found to be significantly higher than with 8-HQC (8-hydroxyquinoline citrate) or control treatments. However, the vase-life was not different to that of flowers held in similar concentrations of silver nitrate. All gerbera flowers held in SNP solutions showed significantly higher relative fresh weight than the control. Vase-life of gerbera flowers was extended by addition of either 50 or 100 mg L-1 carvacrol and either 1 or 2 mg L-1 SNP from 8.3 to 16 d. In addition, the relative fresh weight and solution uptake of gerbera flowers were increased by addition of 100 mg L-1 essential oils and 1 or 2 mg L-1 SNP as compared to that of control flowers. Our results suggest the potential application of essential oils or SNP as novel alternatives to common chemicals used in preservative solutions for gerbera flowers.
Keywords: Antimicrobial; Carvacrol; Preservative solution; Silver nanoparticles; Thymol; Water uptake

Kamel Msaada, Mouna Ben Taarit, Karim Hosni, Mohamed Hammami, Brahim Marzouk, Regional and maturational effects on essential oils yields and composition of coriander (Coriandrum sativum L.) fruits, Scientia Horticulturae, Volume 122, Issue 1, 1 September 2009, Pages 116-124, ISSN 0304-4238, DOI: 10.1016/j.scienta.2009.04.008.
(http://www.sciencedirect.com/science/article/B6TC3-4WBR6MG-1/2/7efbc9ae92c31fc4988ceb23fb7fada5)
Abstract:
The composition of volatile components of the essential oils extracted from fruits of coriander (Coriandrum sativum L.) growing in two different Tunisian regions in both Menzel Temime and Borj El Ifaa was studied by GC and GC-MS. The highest oil yields were observed at final stages of maturity: 0.324 +/- 0.09% and 0.327 +/- 0.08%, in Menzel Temime and Borj El Ifaa, respectively. Essential oil yields were highly ($P < 0.001$) affected by the growing region, stages of maturity and their interaction. Essential oil composition changed significantly ($P < 0.05$) among the different stages of maturity and growing region. Linalool and geranyl acetate were the main compounds at full fruit maturity in the two studied regions. Growing region, stages of maturity and their interaction had a strong effect ($P < 0.001$) on 35 compounds. [alpha]-Pinene, sabinene, limonene, [gamma]-terpinene, cis-dihydrocarvone and geranial were insensible to the regional factor.
Keywords: Coriander (Coriandrum sativum L.); Umbelliferae; Fruits; Essential oil composition; Linalool; Regional and maturational effects

M. Spanghero, P.H. Robinson, C. Zanfi, E. Fabbro, Effect of increasing doses of a microencapsulated blend of essential oils on performance of lactating primiparous dairy cows, Animal Feed Science and Technology, Volume 153, Issues 1-2, 26 August 2009, Pages 153-157, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2009.06.004.
(http://www.sciencedirect.com/science/article/B6T42-4WP4BGN-2/2/b8ca00957871a03a435ad63f22a75317)
Abstract:
This study determined impacts of a commercial blend of microencapsulated essential oils (EO), fed at increasing dose levels to high yielding primiparous dairy cows, on milk yield and composition. Eight pregnant Holstein heifers, selected to have their parturition within a period of 30 d, were kept in tie stalls equipped for individual feeding, and with free access to water, from the 7th

month of gestation. At an average of 40 d postpartum, cows were assigned to one of four dietary EO levels in a replicated 4 x 4 Latin square design. The experimental diets (i.e., corn silage, fescue hay and a compound feed, 6.5, 4.4 and 8.7 kg DM/d respectively) differed only in the addition level of a microencapsulated EO supplement (RumaXol Feed) mixed at different levels into the compound feed (fed at 1 kg/cow day) in order to provide 0, 0.32, 0.64 and 0.96 g/d of the EO mixture. The experiment had four experimental periods of 21 d, with the last 5 d used for collection of faeces and urine, for milk yield and composition recording and measurement of cow biometric data. The dietary EO supplementation had no effect on dry matter (DM) intake, water consumptions or faecal DM, while urine density was (P=0.01) lower at the intermediate EO dosages. Digestibility and biometric measures of cows were not modified by EO feeding. The protein content of milk tended (P=0.06) to be higher at the intermediate EO dosages, as did (P=0.05) the milk energy concentration. However milk and milk component yields were not affected by EO feeding level.
Keywords: Essential oils; Milk yield; Rumen fermentation

Eva Arrebola, Dharini Sivakumar, Romina Bacigalupo, Lise Korsten, Combined application of antagonist Bacillus amyloliquefaciens and essential oils for the control of peach postharvest diseases, Crop Protection, In Press, Corrected Proof, Available online 21 August 2009, ISSN 0261-2194, DOI: 10.1016/j.cropro.2009.08.001.
(http://www.sciencedirect.com/science/article/B6T5T-4X24BVX-2/2/c9dd6468e641c96e2d45d1ed8a7b6a3c)
Abstract:
Bacillus amyloliquefaciens PPCB004 was selected as a potential antagonist to control Botrytis cinerea, Penicillium expansum and Rhizopus stolonifer on peach fruit. The HPLC data of PPCB004 indicated the lipopeptides iturin A, fengycin and surfactin as secondary metabolites. The GC/MS analysis of PPCB004 showed 3-hydroxy-2-butanone as the dominant compound (97.52% of relative peak area). Thyme (TO) and lemongrass (LO) oils showed over 50% and 25% inhibition of radial mycelial growth respectively with 8 [mu]l oil per plate for all pathogens. Combination treatment with both oils failed to increase the percentage inhibition of radial mycelial growth of the pathogens. Combined application of PPCB004 with TO or LO was tested to assess the effectiveness in the control of these pathogens during postharvest storage. The biofilm formation of PPCB004 was significantly higher in LO than TO. LO (6 [mu]l plate-1) and PPCB004 completely inhibited the mycelial growth of the pathogens. Fruit inoculation trials with PPCB004 + LO in NatureFlex(TM) modified atmosphere packaging (MAP), showed lower disease incidence and severity at 25 [degree sign]C for 5 d than treatments with PPCB004 + MAP, PPCB004 + TO + MAP, LO + MAP, TO + MAP or stand-alone MAP. On naturally infected fruit, PPCB004 + LO + MAP and LO + MAP treatments retained the total soluble solids/titratable acidity ratio and flesh firmness but failed to stimulate the levels of total phenolic content, phenylalanine ammonia-lyase, [beta]-1,3-glucanase and chitinase activities. Combination of PPCB004 (spray treatment) + LO (in pad delivery system) in NatureFlex(TM) MAP showed absence of disease and off-flavour development, retained the overall appearance and increased the overall acceptance at market shelf conditions (20 [degree sign]C for 2 d) after cold storage at 4 [degree sign]C for 14 d.
Keywords: Prunus persica (L.) Batsch; Fungal pathogens; Biocontrol agent; Essential oil

M. Tauseef Sultan, Masood Sadiq Butt, Faqir Muhammad Anjum, Safety assessment of black cumin fixed and essential oil in normal Sprague Dawley rats: serological and hematological indices, Food and Chemical Toxicology, In Press, Accepted Manuscript, Available online 21 August 2009, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.08.011.
(http://www.sciencedirect.com/science/article/B6T6P-4X24VSJ-1/2/81c700b61e6ee3d23c186e903287f72f)
Abstract:

Black cumin (Nigella sativa L.) is unique in its nutritional profile and it's fixed and essential oils are phytochemicals rich fractions. However, safety assessment is required before recommending their use. This study was designed to evaluate the safety of black cumin fixed oil (BCFO) and black cumin essential oil (BCEO) through animal modeling using Sprague dawley rats as test animals. The results indicated that BCFO @ 4.0% and BCEO @ 0.30% are safe as serological indices like liver & kidney functioning tests, serum protein profile, level of cardiac enzymes, electrolytes balance were remained in the normal ranges even after 56 days of study. Similarly, indices of red and white blood cells remained within the defined limits. Moreover, diets were insignificant in their impression regarding organs to body weight ratio. However, group of rats fed on BCFO gained less weight as compared to control that shows slight anorexic effect of BCFO which can be useful in obesity related disorders. In the nutshell, presence of phytochemicals in black cumin fixed and essential oils as well as their safe status can positively be used against lifestyle disorders.
Keywords: Black cumin; safety assessment; phytochemicals; fixed and essential oils; antioxidant potential

Maira Maciel Mattos de Oliveira, Danilo Florisvaldo Brugnera, Maria das Gracas Cardoso, Eduardo Alves, Roberta Hilsdorf Piccoli, Disinfectant action of Cymbopogon sp. essential oils in different phases of biofilm formation by Listeria monocytogenes on stainless steel surface, Food Control, In Press, Accepted Manuscript, Available online 20 August 2009, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2009.08.003.
(http://www.sciencedirect.com/science/article/B6T6S-4X1YCCX-1/2/cefd69eec0f9fcc70868c4d9ac397070)
Abstract:
Disinfectant solutions based on the essential oils of Cymbopogon citratus (D.C.) Stapf. and Cymbopogon nardus (L.) Rendle, applied alone or in combination, and a control disinfectant solution were tested in two phases (3 and 240 hours) of biofilm formation by Listeria monocytogenes ATCC 19117 on AISI 304 (#4) stainless steel surface. Disinfectant solutions based on essential oils have effectively reduced the number of surface-adhered cells, especially after 60 minutes of contact. The disinfectant solutions based on a combination of essential oils were capable of reducing 100% (5.64 Log CFU.cm-2) the number of surface-adhered cells after 60 minutes of contact, at 240 hours of biofilm formation. Essential oils of C. citratus and C. nardus, alone or in combination, are new alternatives for disinfection of industrial stainless steel surfaces contaminated by L. monocytogenes.
Keywords: Natural disinfectants; Cymbopogon citratus; Cymbopogon nardus

Jason Q.D. Goodger, Ian E. Woodrow, The influence of ontogeny on essential oil traits when micropropagating Eucalyptus polybractea, Forest Ecology and Management, Volume 258, Issue 5, 20 August 2009, Pages 650-656, ISSN 0378-1127, DOI: 10.1016/j.foreco.2009.04.033.
(http://www.sciencedirect.com/science/article/B6T6X-4WD6XVD-4/2/aec91cb2f87c48222901f0213d1e836c)
Abstract:
Eucalyptus polybractea (blue mallee) is the key species used in the commercial production of pharmaceutical-grade (>70% 1,8-cineole) eucalyptus oil in Australia. The establishment of plantations based on clones of selected, elite oil-producing plants has been recognized as the best means by which to increase oil and cineole yields. Blue mallee can be micropropagated using axillary bud proliferation of explants collected from the coppicing lignotubers of decapitated plants. To date, this has been successful for ortets from three different ontogenetic stages: 8-month-old `seedlings', 4-year-old `saplings' and `mature', biannually harvested plants of indeterminate age. The issue of ontogenetic control of oil quality and quantity is an important consideration when selecting ortets for cloning and also when examining the success of a cloning programme. Our aim is to examine if clones derived from ortets of the three different ages reflect their respective ortets,

in terms of oil quantity and quality (cineole proportion), and to appraise at what age the clones best reflect the ortets for these traits. Our results suggest that the age of ortets prior to explant collection does not influence micropropagation success or clonal consistency, and that clones generally exhibit the leaf oil traits of their respective ortets. Leaf oil quantity accumulation in ramets followed the ontogenetic trajectory of a relatively rapid increase to a maximum between 3 and 9 months, followed by a period of relative constancy for at least 12 months before beginning to gradually decrease after 21 months. Although oil quality of ramets reflected their corresponding ortets relatively well after 9 months, apparent ontogenetic constraints to cineole accumulation suggest that harvesting at a time between 9 and 21 months may better reflect the ortets for both traits. It appears likely that the proliferation of selected blue mallee genotypes using micropropagation will result in selection gains for key oil traits, thus potentially increasing cineole yields in future plantations.
Keywords: Cineole; Clone; Eucalypt; Eucalyptus oil; Micropropagation; Short-rotation forestry

Edoardo M. Napoli, Giusy Curcuruto, Giuseppe Ruberto, Screening the essential oil composition of wild Sicilian oregano, Biochemical Systematics and Ecology, In Press, Corrected Proof, Available online 18 August 2009, ISSN 0305-1978, DOI: 10.1016/j.bse.2009.07.008.
(http://www.sciencedirect.com/science/article/B6T4R-4X1GG3J-1/2/0ed4fcc1daedd331b819a00de8efe7c6)
Abstract:
The qualitative and quantitative composition of the essential oils obtained from wild Sicilian oregano plants has been investigated. Samples were collected from three areas of Sicily namely Val Mazara (M), Val di Noto (N) and Val Demona (D). These areas are based on historical territorial subdivision. The essential oils were obtained by hydrodistillation and analyzed by GC-FID-MS. Seventy eight compounds were identified representing more than 98% of the compounds in the oils. All samples are thymol-chemotype with variable percentage of [gamma]-terpinene, p-cymene, trans-sabinene hydrate, terpinen-4-ol and carvacrol. Statistical analyses were performed in order to evaluate the variability of the essential oils. Six groups were formed reflecting the compositional differences of the essential oil profiles of the wild Sicilian oregano samples.
Keywords: Origanum spp; Essential oil; Thymol; GC-MS; Cluster analysis; Sicily

Javad Safaei-Ghomi, Abdolrasoul H. Ebrahimabadi, Zahra Djafari-Bidgoli, Hossein Batooli, GC/MS analysis and in vitro antioxidant activity of essential oil and methanol extracts of Thymus caramanicus Jalas and its main constituent carvacrol, Food Chemistry, Volume 115, Issue 4, 15 August 2009, Pages 1524-1528, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.01.051.
(http://www.sciencedirect.com/science/article/B6T6R-4VFK82H-G/2/0e22c639d444a11c89026f1948626b75)
Abstract:
Chemical composition of the essential oil, antioxidant activity (DPPH and [beta]-carotene/linoleic acid assays), and total phenolic content (Folin-Ciocalteu assay) of aerial parts of Thymus caramanicus were determined. The highest radical-scavenging activity (DPPH test) was shown by the polar subfraction of the methanol extract (IC50 = 43.0 [mu]g/ml) which was also higher than that of butylated hydroxytoluene (BHT, IC50 = 19.7 [mu]g/ml). However, it was the nonpolar subfraction of the methanol extract that showed the highest inhibition (84.4%), as assessed by the [beta]-carotene/linoleic acid assay, which was only slightly lower than that shown by BHT (93.3%). The antioxidant activities of the essential oil main component (carvacrol) were also evaluated for comparison. Total phenolic content of the polar subfraction, as gallic acid equivalents, was 124.3 [mu]g/mg. Essential oil extracted from the aerial parts by hydrodistillation was analysed by GC and GC/MS. Fifteen constituents, representing 99.3% of the oil, were identified, of which the major ones, carvacrol (85.9%), thymol (3.3%), p-cymene (3.2%), [gamma]-terpinene (1.8%) and borneol (1.3%), accounted for 95.6% of the oil.

Keywords: Thymus caramanicus; Essential oil; Antioxidant activity; Total phenolics; Carvacrol

I.M. Hulley, A.M. Viljoen, P.M. Tilney, S.F. Van Vuuren, G.P.P. Kamatou, B.-E. Van Wyk, Ethnobotany, leaf anatomy, essential oil composition and antibacterial activity of Pteronia onobromoides (Asteraceae), South African Journal of Botany, In Press, Corrected Proof, Available online 15 August 2009, ISSN 0254-6299, DOI: 10.1016/j.sajb.2009.06.012.
(http://www.sciencedirect.com/science/article/B7XN9-4X0Y8G5-1/2/4682f2e166165c2106e7b0749a88fea6)
Abstract:
Available ethnobotanical information on Pteronia onobromoides (first recorded in 1685) indicates that the plant was once of considerable cultural and commercial importance and that it was powdered, mixed with fat, and applied to the skin for cosmetic and/or medicinal purposes. Sab, as well as Son or San, are considered to be the original Nama names for this aromatic bush and also the origin of various names for San people, such as Sonqua and Bushman. A study of the leaf anatomy showed that essential oil is produced in globose oil glands situated below some of the vascular bundles in the spongy parenchyma, adjacent to the palisade parenchyma. The oil is relatively complex but contains a combination of myrcene, limonene, 1,8-cineole and p-cymene as main compounds, with smaller amounts of sabinene, trans-linalooloxide, linalool, terpinen-4-ol, [alpha]-terpineol, eugenol, thymol and [alpha]-phellandrene. Dichloromethane extracts exhibited antibacterial activity (especially against Staphylococcus epidermidis) with MIC values as low as 0.83 mg/ml. Other solvent extracts and the essential oil itself were less active. The results show that the traditional method of mixing powdered leaves with fat and applying it to the skin may have had deodorant, disinfectant and medicinal benefits.
Keywords: Asteraceae; Buchu; Essential oil; Ethnobotany; Leaf anatomy; MIC values; Pteronia onobromoides

Jose S. Dambolena, Maria P. Zunino, Abel G Lopez, Hector R. Rubinstein, Julio A. Zygadlo, Julius W. Mwangi, Grace N. Thoithi, Isaac O. Kibwage, Josphat M. Mwalukumbi, Samuel T. Kariuki, Essential oils composition of Ocimum basilicum L. and Ocimum gratissimum L. from Kenya and their inhibitory effects on growth and fumonisin production by Fusarium verticillioides, Innovative Food Science & Emerging Technologies, In Press, Accepted Manuscript, Available online 13 August 2009, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.08.005.
(http://www.sciencedirect.com/science/article/B6W6D-4X0F3WF-2/2/5a066a1206cbd17e1b383beef91cd2d6)
Abstract:
This work investigated the constituents and the efficacy against Fusarium verticillioides infection and fumonisin production of essential oils of Ocimum basilicum L. and Ocimum gratissimum L. from different locations in Kenya.
The oil of leaves and flowering tops of O. basilicum from Sagana contained mainly linalool (95%). The flowering tops and leaves from Yatta contained mainly camphor (32.6 and 31.0%, respectively) and linalool (28.2 and 29.3, respectively). Eugenol was the main constituent in the oil of O. gratissimum leaves from both Sagana (95.5%) and Yatta (70.1%). The oil of the flowering tops had significantly less eugenol. The main component of the oil of flowering tops from Yatta was Z-[beta]-ocimene (34.1%). Oil from both species had some antifungal activity. The oils of O. basilicum and O. gratissimum from different locations showed chemical variation, antifungal activity, free radical scavenging capacity and antimycotoxicogenic property. These properties are attributed to the phenolic compound eugenol.
Keywords: Ocimum basilicum; Ocimum gratissimum; Lamiaceae; Basil; Composition; Eugenol; Antifungal; Antiradical; Antimycotoxicogenic activity

Mohamed Bouaziz, Thabet Yangui, Sami Sayadi, Abdelhafid Dhouib, Disinfectant properties of essential oils from Salvia officinalis L. cultivated in Tunisia, Food and Chemical Toxicology, In Press, Uncorrected Proof, Available online 12 August 2009, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.08.005.
(http://www.sciencedirect.com/science/article/B6T6P-4X087KN-4/2/660246a474e58b7d87891c77edef247f)
Abstract:
The essential oils were obtained by hydro-distillation of the aerial part of Salvia officinalis L. cultivated in Sfax gardens, Tunisia. The obtained oils were analyzed by gas chromatography-mass spectrometry (GC-MS) and 44 compounds were identified. Strong bactericidal and fungicidal effects were shown using the NCCLS broth dilution, EN 1275 and EN 1276 standard methods. The minimal cidal concentrations (MCCs) values ranged from 0.031 to 0.25 [mu]L mL-1. The essential oils concentrations of 0.5% and 1% (v/v) resulted in a reduction in viability higher than 5 and 4 log units per mL for the standard bacteria and fungi, respectively, within a contact time of 5 min. Using an air sampler and an aroma dispenser, vaporisation of 0.25 mL m-3 of S. officinalis essential oils resulted in (72%, 73% and 70%) and (54%, 55% and 55%) reduction of the total microbial count and the total count of yeasts and moulds, after a residence time of 1 h, 6 h and 24 h in a selected testing room, respectively. S. officinalis essential oils showed a potent vapour activity against a panel of bacteria, yeasts and fungi. This supported their use as a natural eco-friendly disinfectant to manage airborne microbes.
Keywords: Airborne microbes; Antimicrobial; Antioxidant; Disinfectant; Essential oils; Salvia officinalis; Vapour activity

Bochra Laribi, Iness Bettaieb, Karima Kouki, Ali Sahli, Abdelaziz Mougou, Brahim Marzouk, Water deficit effects on caraway (Carum carvi L.) growth, essential oil and fatty acid composition, Industrial Crops and Products, In Press, Corrected Proof, Available online 11 August 2009, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.07.005.
(http://www.sciencedirect.com/science/article/B6T77-4X00P6F-1/2/29edffa00fa7b03aba7d4298e7d9f149)
Abstract:
The Mediterranean region suffers of drought which affects plant behaviour regarding biochemical responses. Accordingly, the effects of water deficit on growth, essential oil and fatty acid composition of caraway (Carum carvi L.) seeds were investigated. Plants were treated with different levels of water deficit: control, moderate water deficit and severe water deficit. Plant growth (height, fresh and dry matter weight) was significantly reduced by severe water deficit. This last caused also important reductions of the seed yield and yield components. Drought decreased significantly seed total fatty acid contents and particularly the petroselinic ones whose proportions decreased significantly by 12.17 and 18.47%, in comparison with the control, under moderate water deficit and severe water deficit, respectively. Besides, moderate water deficit increased the essential oil yield (expressed as g/100 g on the basis of dry matter weight). The main essential oil constituents were carvone and limonene which showed an increasing of their contents under water deficit levels. Thus, water deficit induced a significant reduction in growth parameters and fatty acid content, and an increase in the essential oil compounds. These bioactive compounds have been required in many industrial products.
Keywords: Water deficit; Carum carvi L.; Growth; Seed yield; Fatty acids; Essential oil; Petroselinic acid; Carvone; Limonene

Ibtissem Hamrouni Sellami, Emna Maamouri, Thouraya Chahed, Wissem Aidi Wannes, Mohamed Elyes Kchouk, Brahim Marzouk, Effect of growth stage on the content and composition of the essential oil and phenolic fraction of sweet marjoram (Origanum majorana L.), Industrial Crops and

Products, In Press, Corrected Proof, Available online 11 August 2009, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.07.010.
(http://www.sciencedirect.com/science/article/B6T77-4X00P6F-3/2/030cca38201f353359a22f30aa0ec98f)
Abstract:
The variation in the content and composition of Origanum majorana L. essential oil has been studied. Plant material has been harvested at four phenological stages (early vegetative, late vegetative, budding and full-flowering). Essential oil yield varied from 0.04 to 0.09% reached during the full-flowering stage. Analysis of the essential oils by GC and GC/MS revealed the presence of 38 components represented mainly by oxygenated monoterpenes (64.01-71.4%), monoterpene hydrocarbons (21.73-29.92%) and sesquiterpene hydrocarbons (1.47-4.05%). The main components were terpinen-4-ol (29.13-32.57%), cis-sabinene hydrate (19.9-29.27%), trans-sabinene hydrate (3.5-11.61%), [gamma]-terpinene (2.11-8.20%), bornyl acetate (1.52-2.94%) and linalool (1.05-1.39%). On the other hand, phenolic contents varied from 2.706 to 6.834 mg/g of dry weight obtained during the later vegetative stage. RP-HPLC analysis of the methanolic extract of O. majorana L. dried aerial parts showed the predominance of phenolic acids during the early vegetative stage whereas flavonoids predominate during the other stages of growth. The main phenolic acids identified were trans-2-hydroxycinnamic, rosmarinic, vanillic, chlorogenic, gallic and cinnamic whereas the main flavonoids were amentoflavone, apigenin, quercetin, luteolin, coumarin and rutin. Results obtained showed that later vegetative stage is characterized by the highest contents of bioactive compounds and therefore it could be considered as the best stage for harvesting marjoram plants.
Keywords: Origanum majorana L.; Growth stages; Essential oil; Phenolic acids; Flavonoids

Ravindra Shukla, Ashok Kumar, Priyanka Singh, Nawal Kishore Dubey, Efficacy of Lippia alba (Mill.) N.E. Brown essential oil and its monoterpene aldehyde constituents against fungi isolated from some edible legume seeds and aflatoxin B1 production, International Journal of Food Microbiology, In Press, Accepted Manuscript, Available online 11 August 2009, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2009.08.002.
(http://www.sciencedirect.com/science/article/B6T7K-4X01P5Y-3/2/d6842f2d324155a13c33fcb13bec7ed4)
Abstract:
The present study deals with evaluation of antifungal properties of Lippia alba essential oil (EO) and two of its monoterpene aldehyde constituents against legume-contaminating fungi. Seventeen different fungal species were isolated from 11 varieties of legumes, and aflatoxigenic isolates of Aspergillus flavus were identified. Hydrodistillation method was used to extract the EO from fresh leaves. The GC and GC-MS analysis of EO revealed the monoterpene aldehydes viz. geranial (22.2%) and neral (14.2%) as the major components. The antifungal activity of EO, geranial and neral was evaluated by contact assay on Czapek's-dox agar. The EO (0.25-1 [mu]L/mL) and its two constituents (1 [mu]L/mL) showed remarkable antifungal effects against all the fungal isolates (growth inhibition range 32.1-100%). Their minimal inhibitory (MIC) and fungicidal (MFC) concentrations for A. flavus were lower than those of the systemic fungicide Bavistin. Aflatoxin B1 (AFB1) production by three isolates of A. flavus was strongly inhibited even at lower the fungistatic concentration of EO and its constituents. There was no adverse effect of treatments on seed germination, and rather, there was enhanced seedling growth in the EO-treated seeds. It is concluded that L. alba EO and two of its constituents could be safely used as effective preservative for food legumes against fungal infections and mycotoxins.
Keywords: Lippia alba; essential oil; geranial; neral; antifungal activity

Clara Grosso, Generosa Teixeira, Isildo Gomes, Eurico S. Martins, Jose G. Barroso, Luis G. Pedro, A. Cristina Figueiredo, Assessment of the essential oil composition of Tornabenea annua,

Tornabenea insularis and Tornabenea tenuissima fruits from Cape Verde Islands, Biochemical Systematics and Ecology, In Press, Corrected Proof, Available online 8 August 2009, ISSN 0305-1978, DOI: 10.1016/j.bse.2009.07.002.
(http://www.sciencedirect.com/science/article/B6T4R-4WYCT8H-1/2/a2545b55140bb3368c9a69db54c2ff68)
Abstract:
The essential oils of Tornabenea annua, Tornabenea insularis and Tornabenea tenuissima herbarium or in vivo fruits, collected in Fogo, Santiago, Santo Antao, Sao Nicolau and Sao Vicente Islands, from Cape Verde archipelago, or from plants grown in Lisbon, Portugal, were isolated by hydrodistillation and analysed by GC and GC-MS. The yellowish oils were obtained in variable average yields, lower in herbarium samples [0.05% (v/w)] and higher from in vivo samples [1.3% (v/w)]. Whereas T. annua fruits' oils were all dominated by myristicin (92-100%), most of the T. insularis fruit samples' oils were elemicin rich (82-90%). No clear information could be obtained for T. tenuissima fruits' oils as each of the samples gave different chemical composition. Cluster analysis of the essential oil composition from the fruits' samples studied, confirmed these chemical differences.
Keywords: Tornabenea annua; Tornabenea insularis; Tornabenea tenuissima; Apiaceae; Umbelliferae; Fruits; Essential oil; GC; GC-MS

Sharif M. Al-Reza, Atiqur Rahman, Jonghwi Lee, Sun Chul Kang, Potential roles of essential oil and organic extracts of Zizyphus jujuba in inhibiting food-borne pathogens, Food Chemistry, In Press, Corrected Proof, Available online 5 August 2009, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.07.059.
(http://www.sciencedirect.com/science/article/B6T6R-4WXSK54-5/2/7701b5f2b912d90f090d3050fe4574a7)
Abstract:
This study was undertaken to examine the chemical compositions of essential oil and tested the efficacy of oil and organic extracts from seeds of Zizyphus jujuba against food-borne pathogens. The chemical compositions of the oil was analysed by Null. Twenty three compounds representing 91.59% of the total oil were identified. The oil (5 [mu]l of 1:5 (v/v) dilution of oil with methanol) and extracts of hexane, chloroform, ethyl acetate and methanol (300 [mu]g/disc) of Z. jujuba displayed a remarkable antibacterial activity against Staphylococcus aureus (ATCC 6538 and KCTC 1916), Listeria monocytogenes ATCC 19166, Bacillus subtilis ATCC 6633, Pseudomonas aeruginosa KCTC 2004, Salmonella typhimurium KCTC 2515 and Escherichia coli ATCC 8739. The scanning electron microscopic studies also demonstrated the effect of essential oil on the morphology of Staph. aureus ATCC 6538 at the MIC value, along with the potential effect on cell viabilities of the tested bacteria.
Keywords: Antibacterial activity; Zizyphus jujuba; Essential oil; Food-borne pathogens

Mouna Ben Taarit, Kamel Msaada, Karim Hosni, Brahim Marzouk, Changes in fatty acid and essential oil composition of sage (Salvia officinalis L.) leaves under NaCl stress, Food Chemistry, In Press, Corrected Proof, Available online 4 August 2009, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.07.055.
(http://www.sciencedirect.com/science/article/B6T6R-4WXHBYY-2/2/9f304a8d732355f124ca071dd32b3b18)
Abstract:
Fatty acids and essential oils from hydroponically cultivated Salvia officinalis leaves were analyzed by GC and GC-MS. Four different levels of NaCl (25, 50, 75 and 100 mM) were applied. The first results showed that salt treatment reduced significantly the plant growth by 61% and the total fatty acids (TFA) content by 32% at 100 mM NaCl. Alpha-linolenic, gadoleic, palmitic and oleic acids were the major fatty acids. Moreover, the polyunsaturated fatty acids decreased, while the

monounsaturated ones increased with respect to increasing salinity. Regarding the essential oil composition, the main compounds were [alpha]-and [beta]-thujone, 1,8-cineole, camphor, [alpha]-humulene, viridiflorol and manool at all salt treatments. The yield had a maximum increase at 75 mM NaCl. Hence, sage can be considered as moderately salt sensitive.
Keywords: Salvia officinalis; Salinity; Fatty acids composition; [alpha]-Linolenic acid; Essential oil composition; [alpha]-Thujone

Li Cao, Jian Yong Si, Yan Liu, Hong Sun, Wen Jin, Zhan Li, Xiao Hong Zhao, Rui Le Pan, Essential oil composition, antimicrobial and antioxidant properties of Mosla chinensis Maxim, Food Chemistry, Volume 115, Issue 3, 1 August 2009, Pages 801-805, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.12.064.
(http://www.sciencedirect.com/science/article/B6T6R-4V88FTP-P/2/5b2f060e0124030fff9dabb5b515834d)
Abstract:
The essential oil of Mosla chinensis Maxim was analysed by gas chromatography/mass spectrometry, and its main components are carvacrol (57.08%), p-cymene (13.61%), thymol acetate (12.68%), thymol (6.67%), and [gamma]-terpinene (2.46%). The essential oil exhibited great potential antimicrobial activity against all eight bacterial and nine fungal strains. Antioxidant activity was also tested, the essential oil showing significantly higher antioxidant activity than that of the methanol extract. In addition, the amounts of total phenol components in the plant methanol extract (47.3 +/- 0.4 [mu]g/mg) and the oil (80.7 +/- 0.5 [mu]g/mg) were determined. The results presented here indicate that the essential oil of M. chinensis has antimicrobial and antioxidant properties, and is therefore a potential source of antimicrobial and antioxidant agents for the food and pharmaceutical industries.
Keywords: Mosla chinensis; GC/MS analysis; Antimicrobial activity; Antioxidant activity

X.-M. Li, S.-L. Tian, Z.-C. Pang, J.-Y. Shi, Z.-S. Feng, Y.-M. Zhang, Extraction of Cuminum cyminum essential oil by combination technology of organic solvent with low boiling point and steam distillation, Food Chemistry, Volume 115, Issue 3, 1 August 2009, Pages 1114-1119, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.12.091.
(http://www.sciencedirect.com/science/article/B6T6R-4VBT27F-C/2/f8eb8bb89eeff2595333d1baef52c6bd)
Abstract:
Extraction of essential oil from Cuminum cyminum seeds using a combination of organic solvent with low boiling point and steam distillation was explored. The effect of different parameters, such as particle size (40, 60, 80 mesh), temperature ([degree sign]C) 10, 15, 20 and extraction time (3, 5, 8 h), on the extraction yield was investigated using three-level orthogonal array design. The experimental results showed that the temperature had the largest effect on the yield of the extract (oleoresin), followed by extraction time and particle size. The optimum parameters, such as temperature, particle size, and extraction time were in turn 20 [degree sign]C, 80 mesh, and 8 h. Essential oil of C. cyminum seeds obtained by supercritical fluid extraction (SFE), hydrodistillation (HD), combination technology of organic solvent with low boiling point and steam distillation (OS-SD) were further analysed by gas chromatographic/mass spectrometric detection to compare the extraction methods. Forty-five compounds in the C. cyminum essential oil were identified, showing that the composition of the extraction by different methods was mostly similar, whereas relative concentration of the identified compounds was apparently different. General characteristics of the C. cyminum essential oil obtained by different methods were further compared, and OS-SD was considered as the optimum process among the three processes to obtain C. cyminum essential oil for high quality, simple technology and low cost.
Keywords: Cuminum cyminum; Oleoresin; Essential oil; Solvent extraction; Optimisation test

Maria Kostaki, Vasiliki Giatrakou, Ioannis N. Savvaidis, Michael G. Kontominas, Combined effect of MAP and thyme essential oil on the microbiological, chemical and sensory attributes of organically aquacultured sea bass (Dicentrarchus labrax) fillets, Food Microbiology, Volume 26, Issue 5, August 2009, Pages 475-482, ISSN 0740-0020, DOI: 10.1016/j.fm.2009.02.008.
(http://www.sciencedirect.com/science/article/B6WFP-4VS4060-2/2/58fcab8495442524a1149b5b655a9858)
Abstract:
The present study evaluated the combined effect of Modified Atmosphere Packaging (MAP) using two different gas mixtures (40% CO2/50% N2/10% O2; treatment M1, 60% CO2/30% N2/10% O2, treatment M2), and thyme oil (0.2% v/w, T) used as a natural preservative, on the quality and shelf life extension of fresh filleted sea bass, product of organic aquaculture, during refrigerated storage (4+/- 0.5 [degree sign]C), for a period of 21 days. Aerobically packaged sea bass fillets (A) were used as control samples. The dominant bacteria in the microflora of sea bass fillets, irrespective of treatment, were the pseudomonads and the H2S-producing bacteria while lactic acid bacteria were also part of the dominant microflora. Total viable counts for fresh sea bass fillets stored aerobically exceeded 7 log CFU/g after 7 days, while treatments A+T, M1, M2 and M2+T reached the same value on days 9, 10, 12 and 19, respectively. Among the chemical indices determined, TBA values were within the good quality limits (2-4 mg MDA/kg), during the sensory shelf lives of sea bass samples, irrespective of treatment. TVB-N proved to be a suitable index for the spoilage of sea bass fillets stored at 4 [degree sign]C. Samples A and A+T, M1, M2, M2+T exceeded the proposed upper TVB-N acceptability limit (10 mg N/100 g) on days 6, 8, 9, 13 and 17 of storage respectively. TMA-N values of the samples A, A+T and M1, M2, M2+T exceeded the proposed limit (4 mg N/100 g) on days 6, 9, 9-10, 13 and 19 of storage, respectively, and correlated well with the microbiological data, indicating that along with TVB-N, TMA-N may serve as a useful index for sea bass fillets spoilage. As regards sensory evaluation, the presence of thyme oil proved to improve the sensory quality of sea bass fillets when used in combination with MAP2, providing a shelf life of 17 days as compared to 6 days of the control samples.
Keywords: Modified atmosphere packaging; Thyme oil; Sea bass; Preservation

Vivek K. Bajpai, Sharif M. Al-Reza, Ung Kyu Choi, Jong Hwi Lee, Sun Chul Kang, Chemical composition, antibacterial and antioxidant activities of leaf essential oil and extracts of Metasequioa glyptostroboides Miki ex Hu, Food and Chemical Toxicology, Volume 47, Issue 8, August 2009, Pages 1876-1883, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.04.043.
(http://www.sciencedirect.com/science/article/B6T6P-4W7B0K5-2/2/2f2544999fdf147c9f830192e9ec8a65)
Abstract:
The aims of this study were to analyze the chemical composition of leaf essential oil of Metasequioa glyptostroboides Miki, and to test the efficacy of oil and extracts (hexane, chloroform, ethyl acetate and methanol) against food spoilage and food-borne pathogenic bacteria and their antioxidant activity. The GC-MS analysis revealed 49 compounds representing 94.62% of the total oil containing 2-butaneone (30.6%), cyclopentane (15.1%), [beta]-myrcene (13.29%), cyclobutane (7.67%), furan (3%), valeramide (2.81%), borneol (1.2%), [beta]-farnesene (1.67%), thymol (1.44%) and [alpha]-pinene (1.46%) as major components. The oil (1000 [mu]g/disc), and extracts (1500 [mu]g/disc) exhibited promising antibacterial effect as a diameter of zones of inhibition (10-18 and 7-13 mm), respectively. MIC values of oil and the extracts were ranged 125-2000 and 250 to <2000 [mu]g/ml, respectively. Also the oil had strong antibacterial effect on the viable counts. Scanning electron microscopic study demonstrated potential detrimental effect of the oil on the morphology of S. aureus KCTC1916. The free radical scavenging activities of the oil and ethyl acetate extract were found to be 11.32 and 19.12 [mu]g/ml, respectively. Also the ethyl acetate extract revealed the highest phenolic contents (85.17 mg/g of dry wt) as compared to the other extracts.

Keywords: Metasequioa glyptostroboides; Leaf essential oil; Food spoilage and food-borne pathogens; Antibacterial activity; Antioxidant activity; Phenolic content

Zeineb Ghrabi-Gammar, David R. George, Amina Daoud-Bouattour, Imtinene Ben Haj Jilani, Samia Ben Saad-Limam, Olivier A.E. Sparagano, Screening of essential oils from wild-growing plants in Tunisia for their yield and toxicity to the poultry red mite, Dermanyssus gallinae, Industrial Crops and Products, In Press, Corrected Proof, Available online 31 July 2009, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.07.001.
(http://www.sciencedirect.com/science/article/B6T77-4WWPB04-1/2/384230b496efd72ad5f35a3251c3d95a)
Abstract:
A laboratory experiment was conducted with the poultry red mite Dermanysuss gallinae (De Geer) to assess the toxicity of a range of essential oils obtained from wild-growing plants in Tunisia to this pest. Details of the percentage essential oil yield from these plants were also recorded. For comparison, commercially sourced essential oil from Thymus vulgaris (L.) was also tested against D. gallinae after work elsewhere found this product to be acaricidal. Recently fed adult female D. gallinae were exposed to the essential oils at 0.1 mg oil/cm2 in Petri-dishes at 22 [degree sign]C over a period of 24 h.
Results showed that the yield of essential oil varied considerably depending upon the source plant. Whilst maximum yields of 0.5% were achieved, three of the seven wild plants selected provided yields of less than 0.1%. Similar variability was recorded with respect to the toxicity of the essential oils to D. gallinae. Three of the essential oils tested did not cause significant D. gallinae mortality (in comparison to the control). However, all other selected oils provided mortality levels statistically similar to the 90% mortality achieved with commercial T. vulgaris essential oil, with the oil from Pelargonium graveolens (L'Her.) killing 100% of D. gallinae exposed to it. Essential oil from P. graveolens in particular may be suitable for further development as a D. gallinae acaricide alongside or in place of commercial thyme essential oil.
Keywords: Dermanyssus gallinae; Acaricide; Essential oil; Toxicity

Najoua Karray-Bouraoui, Mokded Rabhi, Manel Neffati, Barbara Baldan, Annamaria Ranieri, Brahim Marzouk, Mokhtar Lachaal, Abderrazak Smaoui, Salt effect on yield and composition of shoot essential oil and trichome morphology and density on leaves of Mentha pulegium, Industrial Crops and Products, In Press, Corrected Proof, Available online 28 July 2009, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.06.003.
(http://www.sciencedirect.com/science/article/B6T77-4WW16S2-1/2/56208b6b5f79cbc57295c58104b7ffea)
Abstract:
The aim of the present work was to study salt effect on the yield and composition of shoot essential oil (EO) and the structures responsible for its biosynthesis in Mentha pulegium L. Shoot EO was extracted by hydrodistillation and composition was determined by GC-MS method. Apical and basal leaves were taken for microscopy analyses; small fresh samples were observed directly without fixation or metallisation with environmental scanning electron microscope (ESEM) and stereomicroscope (SM). Fresh separate epidermis was used for light microscopy (LM). Salt stress enhanced EO yield by about 2.75 times and affected the percentage of menthone, which is the major compound (~51%), increasing that of pulegone. Menthone, pulegone, and neomenthol constituting the monoterpene class were found to be the principal components. The anatomical study showed three types of trichomes: (i) non-glandular, multicellular, simple hairs; (ii) small, capitate glandular trichomes; (iii) and peltate glandular trichomes. In control plants, the density and size of trichomes varied with leaf side (abaxial or adaxial) and developmental stage. Salt stress results in significant modifications affecting trichome distribution and size on both sides.
Keywords: Essential oil; Mentha pulegium; Salinity; Trichomes

Vivek K. Bajpai, Jung In Yoon, Sun Chul Kang, Antioxidant and antidermatophytic activities of essential oil and extracts of Magnolia liliflora Desr., Food and Chemical Toxicology, In Press, Corrected Proof, Available online 25 July 2009, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.07.025.
(http://www.sciencedirect.com/science/article/B6T6P-4WVF6TB-2/2/03c7779b1f127fae6a8e91f5fd7f6cc4)
Abstract:
This study was carried out to assess the antioxidant and antidermatophytic activities of the essential oil and extracts of Magnolia liliflora Desr. Antioxidant activity was evaluated by using 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay. The free radical scavenging activities of the oil and ethyl acetate extract were found to be superior (IC50 values = 10.11 and 16.17 [mu]g/ml, respectively) as compared to butylatedhydreoxyanisole (BHA), (IC50 value = 18.27 [mu]g/ml). Also the ethyl acetate extract revealed the highest phenolic contents (96.13 mg/g of dry wt) as compared to the other extracts. Further, the oil (1000 [mu]g/disc) and extracts (1500 [mu]g/disc) revealed 42.36-63.12% and 19.07-54.14% antidermatophytic effect, respectively along with their respective MIC values ranging from 62.5 to 500 and 250 to 2000 [mu]g/ml against the members of Trichophyton and Microsporum spp. Also the oil had strong detrimental effect on spore germination of tested fungal pathogens as well as concentration and time dependent kinetic inhibition of Microsporum canis KCTC 6348. The results of this study justify a potential role of M. liliflora to serve as a natural antioxidant and antidermatophytic agent.
Keywords: Magnolia liliflora; Antidermatophytic activity; Antioxidant activity; Essential oil; Phenolic contents

Mouna Ben Taarit, Kamel Msaada, Karim Hosni, Mohamed Hammami, Mohamed Elyes Kchouk, Brahim Marzouk, Plant growth, essential oil yield and composition of sage (Salvia officinalis L.) fruits cultivated under salt stress conditions, Industrial Crops and Products, In Press, Corrected Proof, Available online 18 July 2009, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.06.001.
(http://www.sciencedirect.com/science/article/B6T77-4WSWYG8-1/2/3ff1c0698ce838b61f91eb5afe7d88d3)
Abstract:
A glasshouse experiment was conducted to assess the effect of different NaCl concentrations (25, 50, 75 and 100 mM) on plant growth, essential oil production and composition of Salvia officinalis fruits. The first results showed that increasing NaCl levels to 100 mM reduced significantly the plant growth by 65%. While, the essential oil yield increased significantly from control to 75 mM and decreased only at 100 mM NaCl. Salt stress affect also the essential oil compounds mainly the major ones. Hence, viridiflorol was the main essential oil compound at control and 25 mM NaCl, 1,8-cineole became the predominant compound at 50 and 75 mM and manool prevailed at 100 mM. The oxygenated monoterpenes were the main class at all the treatments except at severe one when the diterpenes were the main ones.
Keywords: Salvia officinalis; Fruits; Salinity; Essential oil composition; Manool

Z.L. Zheng, Justin Y.W. Tan, H.Y. Liu, X.H. Zhou, X. Xiang, K.Y. Wang, Evaluation of oregano essential oil (Origanum heracleoticum L.) on growth, antioxidant effect and resistance against Aeromonas hydrophila in channel catfish (Ictalurus punctatus), Aquaculture, Volume 292, Issues 3-4, 15 July 2009, Pages 214-218, ISSN 0044-8486, DOI: 10.1016/j.aquaculture.2009.04.025.
(http://www.sciencedirect.com/science/article/B6T4D-4W6Y5FK-3/2/66748814b6cc4196e88994903afc2813)
Abstract:
Carvacrol and thymol are the two main active components of oregano essential oil (OEO). In this study, the effect of carvacrol and thymol was evaluated separately, in combination and in their natural composition as natural OEO. A total of five treatments, i.e., negative control group,

carvacrol, thymol, a combination of carvacrol and thymol and Orego-Stim(R) (OS, commercial product containing natural OEO from Origanum heracleoticum L.) were added to the diets of channel catfish (Ictalurus punctatus) to investigate the effects of the respective treatments on the growth performance and antioxidant activity. After eight weeks of feeding, fishes were infected with Aeromonas hydrophila and mortality was recorded. Results of this study showed that channel catfish fed with natural OEO (OS), containing a combination of carvacrol, thymol and other minor constituents, significantly enhanced growth performance, which was the highest amongst all treatments ($P < 0.05$). The addition of OS also effectively enhanced hepatosomatic index (HSI), viscerosomatic index (VSI) and condition factor compared to the control diet ($P < 0.05$) and distinctly promoted the sedimentation of muscle protein. OS also remarkably enhanced the antioxidant activity of channel catfish. Both the combination of carvacrol and thymol and OS reduced fish mortality following A. hydrophila infection, but the lowest mortality was observed in the group fed with OS. It can be concluded that OS, which contains natural OEO extracted from O. heracleoticum L., can act as a growth promoter, increase antioxidant activity, enhance muscle protein sedimentation and also improve disease resistance to pathogens when added to channel catfish feed.
Keywords: Channel catfish (Ictalurus punctatus); Origanum heracleoticum L. extract; Growth performance; Antioxidant activity; Disease resistance

Martin Gilles, Jian Zhao, Min An, Samson Agboola, Chemical composition and antimicrobial properties of essential oils of three Australian Eucalyptus species, Food Chemistry, In Press, Corrected Proof, Available online 15 July 2009, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.07.021.
(http://www.sciencedirect.com/science/article/B6T6R-4WS9BWN-4/2/a6689b4d1017570923cad040d90382d9)
Abstract:
The chemical composition and antimicrobial properties of the essential oils of three common Australian Eucalyptus species, namely E. olida, E. staigeriana and E. dives were determined by gas chromatography/mass spectrometry and the agar disc diffusion method, respectively. A total of 24 compounds were identified from the essential oil of E. dives, with the dominant compounds being piperitone (40.5%), [alpha]-phellandrene (17.4%), p-cymene (8.5%) and terpin-4-ol (4.7%). For E. staigeriana, 29 compounds were identified with 1,8-cineole (34.8%), neral (10.8%), geranial (10.8%), [alpha]-phellandrene (8.8%) and methyl geranate (5.2%) being the dominant ones. In contrast, a single compound, (E)-methyl cinnamate, accounted for 99.4% of the essential oils of E. oilda, although 20 compounds were identified. The essential oils displayed a variable degree of antimicrobial activity with E. staigeriana oil showing the highest activity. In general, Gram-positive bacteria were found to be more sensitive to the essential oils than Gram-negative bacteria. Staphylococcus aureus was the most sensitive strain while Pseudomonas aeruginosa was the most resistant.
Keywords: Eucalyptus; Essential oil; Chemical composition; Antimicrobial properties

Federica Menichini, Filomena Conforti, Daniela Rigano, Carmen Formisano, Franco Piozzi, Felice Senatore, Phytochemical composition, anti-inflammatory and antitumour activities of four Teucrium essential oils from Greece, Food Chemistry, Volume 115, Issue 2, 15 July 2009, Pages 679-686, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.12.067.
(http://www.sciencedirect.com/science/article/B6T6R-4V88FTP-K/2/fd26a362a692c66e0f3b2a6a06683dcc)
Abstract:
The essential oils of four Teucrium species were studied and 150 components, in all, were identified. All oils were rich in sesquiterpenes (50.1-55.8%). Spathulenol and [delta]-cadinene were the main compounds of Teucrium brevifolium oil; caryophyllene and 4-vinyl guaiacol predominated

in Teucrium flavum. Carvacrol and caryophyllene oxide predominated in Teucrium montbretii ssp. heliotropiifolium, while carvacrol and caryophyllene were the most abundant components in Teucrium polium ssp. capitatum. The oil which most effectively inhibited LPS-induced NO production in macrophage cell line RAW 264.7 was that from T. brevifolium (IC50 = 7.1 [mu]g/ml), followed by T. montbretii ssp. heliotropiifolium and T. polium ssp. capitatum (IC50 = 16.5 and 29.4 [mu]g/ml, respectively). The in vitro cytotoxic assay on three human cancer cell lines showed that the most antiproliferative oils were those from T. polium ssp. capitatum and T. montbretii ssp. heliotropiifolium on CACO-2 cell lines (IC50 = 52.7 and 92.2 [mu]g/ml, respectively). The T. brevifolium oil showed a selective cytotoxicity on COR-L23 while significant activity was exerted by T. polium oil on C32.
Keywords: Teucrium brevifolium; Teucrium flavum; Teucrium montbretii ssp. heliotropiifolium; Teucrium polium ssp. capitatum; Lamiaceae; Essential oil; Sesquiterpene; Anti-inflammatory activity; Cytotoxicity

Ill-Min Chung, Su-Hyun Seo, Eun-Young Kang, Sun-Dong Park, Won-Hwan Park, Hyung-In Moon, Chemical composition and larvicidal effects of essential oil of Dendropanax morbifera against Aedes aegypti L., Biochemical Systematics and Ecology, In Press, Corrected Proof, Available online 11 July 2009, ISSN 0305-1978, DOI: 10.1016/j.bse.2009.06.004.
(http://www.sciencedirect.com/science/article/B6T4R-4WRD6C5-2/2/2d44cc416245cd71dce6f83c8b45c3a2)
Abstract:
Essential oils obtained from the flowers of Dendropanax morbifera were extracted and the chemical composition and larvicidal effects were studied. The analyses were conducted by gas chromatography and mass spectroscopy (GC-MS) revealed that the essential oil of D. morbifera contained 27 compounds. The major chemical components identified were [gamma]-elemene (18.59%), tetramethyltricyclohydrocarbon (10.82%), [beta]-selinene (10.41%), [alpha]-zingibirene (10.52%), 2-isopropyl-5-methylbicylodecen (4.2%), [beta]-cubebene (4.19), and 2,6-bis(1,1-Dimethylethyl)-4-phenol (4.01%). The essential oil had a significant toxic effect against early fourth-stage larvae of Aedes aegypti L. with an LC50 value of 62.32 ppm and an LC90 value of 131.21 ppm. The results could be useful in search for newer, safer, and more effective natural larvicidal agents against A. aegypti.
Keywords: Aedes aegypti; Dendropanax morbifera; Essential oils; Larvicidal effects

Mercedes Verdeguer, M. Amparo Blazquez, Herminio Boira, Phytotoxic effects of Lantana camara, Eucalyptus camaldulensis and Eriocephalus africanus essential oils in weeds of Mediterranean summer crops, Biochemical Systematics and Ecology, In Press, Corrected Proof, Available online 10 July 2009, ISSN 0305-1978, DOI: 10.1016/j.bse.2009.06.003.
(http://www.sciencedirect.com/science/article/B6T4R-4WR5NTN-2/2/cc4e79c619a33434a03d4497380b0eb5)
Abstract:
The essential oil composition of Lantana camara, Eucalyptus camaldulensis and Eriocephalus africanus was analyzed by means of GC and GC-MS and bioassayed in order to determine their activity against Amaranthus hybridus and Portulaca oleracea. E. camaldulensis essential oil, with spathulenol as the main compound, was the most effective, completely inhibiting germination and seedling growth on both weeds. The essential oil of E. africanus, rich in artemisia ketone, showed activity similar to that of E. camaldulensis on A. hybridus, but it was not so effective against P. oleracea, and L. camara essential oil, with high percentages in sesquiterpene hydrocarbons, also showed higher phytotoxic activity against A. hybridus, inhibiting its germination and seedling length; however, it showed no effect against P. oleracea germination, whereas was effective in significantly reducing its seedling growth at all concentrations assayed. The results suggest the possible use of these essential oils as natural herbicides.

Keywords: Essential oil; Germination; Seedling growth; Allelopathy; Amaranthus hybridus; Portulaca oleracea; GC; GC/MS

Cengiz Sarikurkcu, Kadir Arisoy, Bektas Tepe, Ahmet Cakir, Gulsah Abali, Ebru Mete, Studies on the antioxidant activity of essential oil and different solvent extracts of Vitex agnus castus L. fruits from Turkey, Food and Chemical Toxicology, In Press, Corrected Proof, Available online 10 July 2009, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.07.005.
(http://www.sciencedirect.com/science/article/B6T6P-4WR66KD-1/2/6dfec0f99764e1ce6b1269fa9773e278)
Abstract:
This study is designed to examine the chemical composition and antioxidant activity of the essential oil and different solvent extracts of Vitex agnus castus. GC and GC-MS analysis was resulted in the detection of 27 components, representing 94.5% of the oil. Major components of the oil were 1,8-cineole (24.98%), sabinene (13.45%), [alpha]-pinene (10.60%), [alpha]-terpinyl acetate (6.66%), and (Z)-[beta]-farnesene (5.40%). Antioxidant activities of the samples were determined by three different test systems, DPPH, [beta]-carotene/linoleic acid and reducing power assays. In all systems, water extract exhibited excellent activity potential than those of other extracts (hexane, dichloromethane, ethyl acetate and methanol) and the oil. As expected, amount of total phenolics was very high in this extract (112.46 +/- 1.22 [mu]g GAEs/mg extract). Dichloromethane extract has been found to be rich in flavonoids. A positive correlation was observed between the antioxidant activity potential and total phenolic and flavonoid levels of the extracts.
Keywords: Vitex agnus castus; Antioxidant activity; DPPH; [beta]-Carotene; Essential oil

M. Viuda-Martos, Y. Ruiz-Navajas, J. Fernandez-Lopez, J.A. Perez-Alvarez, Effect of orange dietary fibre, oregano essential oil and packaging conditions on shelf-life of bologna sausages, Food Control, In Press, Corrected Proof, Available online 9 July 2009, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2009.07.004.
(http://www.sciencedirect.com/science/article/B6T6S-4WR1B0S-3/2/8912816605b6d75de835389aac0cd9a2)
Abstract:
The objective of this work was to study the effect of orange dietary fibre (1%) (ODF), oregano essential oil (0.02%) (OEO) and the storage conditions (vacuum, air and modified atmosphere) on the shelf-life of bologna sausage. Samples with ODF + OEO stored in vacuum packaging showed the lowest TBA values. ODF + OEO samples stored in vacuum packaging showed the lowest aerobic and lactic acid bacteria counts. The sensory evaluation scores were similar for samples with ODF + OEO and stored either in air or vacuum packaging. Orange dietary fibre and oregano essential oil could find a use in the food industry to improve the shelf-life of meat products.
Keywords: Meat product; Orange fibre; Oregano

J.H. Linde, S. Combrinck, T.J.C. Regnier, S. Virijevic, Chemical composition and antifungal activity of the essential oils of Lippia rehmannii from South Africa, South African Journal of Botany, In Press, Corrected Proof, Available online 9 July 2009, ISSN 0254-6299, DOI: 10.1016/j.sajb.2009.06.011.
(http://www.sciencedirect.com/science/article/B7XN9-4WR0D46-1/2/5f205c85c0273a1a7b25a3965744b32c)
Abstract:
Lippia rehmannii H.Pearson (Verbenaceae) is an aromatic bush, indigenous to the northern parts of South Africa. As far as could be ascertained, the essential oil composition has not been previously reported and forms the subject of this investigation. Aerial parts of the shrub were collected from two localities in Gauteng, South Africa, and the isolated essential oils were

analysed by gas chromatography. Citral, a mixture of the E- and Z-isomers, was found to be the main constituent of the oils, while borneol, camphor, neryl acetate, isocaryophyllene, p-cymene, [beta]-caryophyllene and [beta]-caryophyllene oxide were other major compounds present. Oil compositions, within and between the two localities, did not differ significantly. The in vitro antifungal activity of L. rehmannii essential oil was compared to that of Cympopogon citratus (lemongrass) and pure citral, against a number of pre- and postharvest fungal food pathogens. At a concentration of 3000 [micro sign]L/L, lemongrass oil and pure citral caused complete growth inhibition of all the pathogens tested. Lippia rehmannii, containing less citral than lemongrass oil, was effective at this concentration against the majority of pathogens, but only partially restricted the growth of Lasiodiplodia theobromae and Botrytis cinerea. This finding suggests that citral may be largely responsible for the observed antifungal activities. Essential oil from L. rehmannii appears to be a good candidate for the in vitro control of Fusarium oxysporum and Rhizoctonia solani and application of these oils in the field should be investigated.
Keywords: Antifungal; Citral; Essential oils; Fruit pathogens; Lemongrass; Lippia rehmannii

Lidia R. Scrivanti, Ana M. Anton, Julio A. Zygadlo, Essential oil composition of Bothriochloa Kuntze (Poaceae) from South America and their chemotaxonomy, Biochemical Systematics and Ecology, Volume 37, Issue 3, July 2009, Pages 206-213, ISSN 0305-1978, DOI: 10.1016/j.bse.2009.03.009.
(http://www.sciencedirect.com/science/article/B6T4R-4W55T5P-1/2/367c0985219b044ace77b1842bfb50ac)
Abstract:
The essential oils compositions of the 13 taxa (twelve species and two varities) of Bothriochloa have been studied. Two entities are endemics: Bothriochloa eurylemma and Bothriochloa meridionalis. The other nine taxa have disjunt distribution between North and South America and are representatives of two complexes: the Bothriochloa barbinodis complex and the Bothriochloa saccharoides complex. Multivariated statistical analysis (Principal Component Analysis, Hierarchical Cluster Analysis) applied to GC-MS data seems to have systematic significance for the delimitation of the species, independently of their morphological characteristics. However, some affinities with chromosome complement and mode of reproduction (amphimixis or sexuality) can be recognized.
Keywords: Poaceae; Andropogoneae; Bothriochloa; Aromatic grasses; Essential oils; South America; Chemotaxonomy; Multivariated statistical analysis

S. Kykkidou, V. Giatrakou, A. Papavergou, M.G. Kontominas, I.N. Savvaidis, Effect of thyme essential oil and packaging treatments on fresh Mediterranean swordfish fillets during storage at 4 [degree sign]C, Food Chemistry, Volume 115, Issue 1, 1 July 2009, Pages 169-175, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.11.083.
(http://www.sciencedirect.com/science/article/B6T6R-4V34DDC-2/2/b390ef9ba8a7e7ed59f1ab2426298d0e)
Abstract:
The present study evaluated the effect of thyme essential oil and packaging on fresh Mediterranean swordfish fillets during storage at 4 [degree sign]C. Treatments in the present study included the following: air (A), modified atmosphere packaging (M), air with thyme oil (AT) and MAP with thyme oil (MT). Of the physicochemical parameters examined, TBA values for A and M swordfish samples were variable, indicative of no specific oxidative rancidity trend, whereas MT treatment inhibited lipid oxidation in swordfish samples during storage. On the basis of microbiological and sensory data, TMA-N and TVB-N limit values of acceptability for Mediterranean swordfish, of ca. 3.72 and 24.5 mg N/100 g, for the initiation of fresh Mediterranean swordfish spoilage, may be proposed. Of the treatments used in the present study, MT and M were the most effective for the inhibition of pseudomonads and H2S-producing bacteria in

swordfish. Lactic acid bacteria and Enterobacteriaceae (to a lesser extent) were also found to be part of the natural microbial flora of swordfish, irrespective of packaging treatment. Based primarily on sensory data, the shelf-lives of fresh refrigerated Mediterranean swordfish were 8 and 13 days under aerobic and MAP conditions, respectively. Addition of 0.1% thyme essential oil extended the product's shelf-life under aerobic conditions by 5 days, whereas the combination of MAP and thyme oil resulted in a significant shelf-life extension of the swordfish fillets, i.e. by approximately 71/2 days, according to sensory data, as compared to the control sample.
Keywords: Swordfish; Packaging; Thyme oil, essential oils, natural antimicrobials; Shelf-life

A. Nincevic Grassino, Z. Grabaric, A. Pezzani, G. Fasanaro, A. Lo Voi, Influence of essential onion oil on tin and chromium dissolution from tinplate, Food and Chemical Toxicology, Volume 47, Issue 7, July 2009, Pages 1556-1561, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.04.003.
(http://www.sciencedirect.com/science/article/B6T6P-4W1JW46-1/2/a2bf22d0a9cf9ffd49fb9f43a49d8d8d)
Abstract:
During food and beverage packaging in tinplate cans the dissolution of tin and chromium into food content may occur. To protect metallic surface different corrosion inhibitors are recommended, nowadays particularly a new group of natural products is of interest. In this work the influence of essential onion oil (EOO) on metals dissolution (tin and chromium) from tinplate sheets before food canning was investigated. The analyses were performed by galvanostatic method and atomic absorption spectroscopy. The values of tin obtained for the internal surface of tinplate covered with EOO (7.31-9.76 g m-2) are lower than the values when dioctyl sebacate oil (DOS), as a protective tinplate surface layer for food caning, was used (9.24-11.03 g m-2). Obviously, the presence of EOO diminished more efficiently then DOS oil the dissolution of tin in electrolyte during galvanostatic analyses. The efficiency of EOO as corrosion inhibitor was even more pronounced in the case of chromium where the dissolution from 1.8-2.5 mg m-2 (DOS oil) was lowered to 1.0-1.3 mg m-2 (EOO). Correlation of results obtained with two different physico-chemical methods was satisfying.
Keywords: Essential onion oil; Dioctyl sebacate oil; Tinplate; Tin; Chromium

Isa Telci, Ibrahim Demirtas, Ayse Sahin, Variation in plant properties and essential oil composition of sweet fennel (Foeniculum vulgare Mill.) fruits during stages of maturity, Industrial Crops and Products, Volume 30, Issue 1, July 2009, Pages 126-130, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2009.02.010.
(http://www.sciencedirect.com/science/article/B6T77-4VYMP1F-1/2/c4a492c9a11b0801b2ea304f4235b3e5)
Abstract:
Sweet fennel (Foeniculum vulgare Mill. var. dulce Mil) is a major aromatic plant belonging to the Apiaceae. The study was conducted to determine variations of plant properties (fruit yield per plant, 1000-fruit weight), essential oil content and composition during four different maturation stages (immature, premature, mature and full mature) in sweet fennel fruit. Essential oil obtained by hydro-distillation was characterized by gas chromatography (GC) and gas chromatography/mass spectrometry (GC-MS). Fruit yield per plant and 1000-fruit weight regularly increased from immature to mature periods, while essential oil content declined with fruit maturity. The content of trans-anethole, the main component, varied between 81.63% and 87.85%, and the variation was statistically insignificant during maturation stages. Some components, particularly monoterpenes, [alpha]-pinene, [beta]-myrcene, limonene, and [alpha]-terpinene, varied significantly ($p < 0.05$) during maturation stages.
Keywords: Foeniculum vulgare; Apiaceae; Fruit; Maturation; Essential oil; trans-Anethole

Luz S. Nerio, Jesus Olivero-Verbel, Elena E. Stashenko, Repellent activity of essential oils from seven aromatic plants grown in Colombia against Sitophilus zeamais Motschulsky (Coleoptera), Journal of Stored Products Research, Volume 45, Issue 3, July 2009, Pages 212-214, ISSN 0022-474X, DOI: 10.1016/j.jspr.2009.01.002.
(http://www.sciencedirect.com/science/article/B6T8Y-4W1BFP4-1/2/73db41a12b1c09f74b1ff9ce2907ad70)
Abstract:
Essential oils isolated from seven aromatic plants grown in Colombia were analyzed by gas chromatography-mass spectrometry (GC-MS) and evaluated for repellent activity against Sitophilus zeamais (Coleoptera: Curculionidae) using the area preference method. Most oil components were oxygenated monoterpenoids or phenolic compounds. Six oils were repellent, with Lippia origanoides the most active. Eucalyptus citriodora and Tagetes lucida were also repellant at doses between 0.063 and 0.503 [mu]L/cm2.
Keywords: Essential oils; Repellency; Sitophilus zeamais; Colombia

Jefferson Carneiro de Barros, Maria Lucia da Conceicao, Nelson Justino Gomes Neto, Ana Caroliny Vieira da Costa, Jose Pinto Siqueira Junior, Irinaldo Diniz Basilio Junior, Evandro Leite de Souza, Interference of Origanum vulgare L. essential oil on the growth and some physiological characteristics of Staphylococcus aureus strains isolated from foods, LWT - Food Science and Technology, Volume 42, Issue 6, July 2009, Pages 1139-1143, ISSN 0023-6438, DOI: 10.1016/j.lwt.2009.01.010.
(http://www.sciencedirect.com/science/article/B6WMV-4VGPWST-1/2/326b9b4af9f9726cba1080d1bd239ab0)
Abstract:
The aim of this study was to investigate the chemical composition of Origanum vulgare L. essential oil, the inhibitory effect of the oil on the cell viability of Staphylococcus aureus strains isolated from foods, and the influence of sub-inhibitory concentrations of the oil on some physiological attributes of these strains. GC-MS analysis showed that carvacrol (57.71%) was the most prevalent compound in the oil, followed by p-cymene (10.91%), [gamma]-terpinene (7.18%), terpinen-4-ol (6.68%) and thymol (3.83%). The results showed that O. vulgare essential oil at 0.03, 0.6 and 0.12 [mu]L mL-1 inhibited the cell viability of Staph. aureus. At 0.12 [mu]L mL-1 the oil caused cidal effect with decrease >=3 log cycles of the initial inoculum after 15 min of exposure. Sub-inhibitory concentrations (0.03 and 0.015 [mu]L mL-1) of the oil suppressed some physiological attributes of the Staph. aureus strains such as coagulase, lipase and salt tolerance. The oil interfered on the microbial metabolic activity in a dose-dependent manner. O. vulgare essential oil could be a novel antimicrobial with capability to suppress some physiological characteristics, in addition to inhibit the growth and survival of pathogen bacteria in foods, particularly Staph. aureus.
Keywords: Staphylococcus aureus; Origanum vulgare L.; Essential oil; Anti-staphylococcal activity

Gulcan Ozkan, Osman Sagdic, R. Suleyman Gokturk, Orhan Unal, Sevil Albayrak, Study on chemical composition and biological activities of essential oil and extract from Salvia pisidica, LWT - Food Science and Technology, In Press, Corrected Proof, Available online 27 June 2009, ISSN 0023-6438, DOI: 10.1016/j.lwt.2009.06.014.
(http://www.sciencedirect.com/science/article/B6WMV-4WMDHTJ-2/2/8c48c8caa487f87a4fc13acd9ee542d6)
Abstract:
In this study, total contents of phenolic, flavanol and flavonol, antioxidant activities and antimicrobial activities of the Turkish endemic Salvia pisidica Boiss. & Heldr. ex Bentham (Lamiaceae) extract and essential oil were assessed in vitro. Total phenolic, flavanol and flavonol contents in the extract were 54.57 mg gallic acid equivalents (GAE)/g, 16.70 mg catechine equivalents (CE)/g and 18.19 mg rutin equivalents (RE)/g, respectively. Antioxidant activities (IC50

value) of the extract and essential oil were determined as 4.88 and 6.41 mg/mL by DPPH assay, respectively. 31 compounds were determined in the essential oil using GC-MS and the major compounds (%) were camphor (23.76), sabinol (19.2), [alpha]-thujone (14.2) and eucalyptol (1.8-cineole) (5.8).
The antimicrobial activity of the methanolic extract and the essential oil against 13 bacterial and two yeast strains was determined. The extract (concentration 5 g/100 ml or 10 g/100 ml) was effective against most of the strains tested, yet not against Bacillus cereus, Staphylococcus aureus, Aeromonas hydrophila and the two yeast strains tested. The essential oil (2 g/100 ml) showed an antimicrobial effect against all the gram (+) bacteria tested, against Saccharomyces cerevisiae, but was not effective against all gram (-) bacteria and Candida albicans. These results show that S.piscidica essential oil and extract could be considered as a natural alternative to traditional food preservatives and be used to enhance food safety and shelf life.
Keywords: Salvia pisidica; Essential oil; Extract; Chemical composition; Biological activities

Abdolrasoul H. Ebrahimabadi, Ebrahim H. Ebrahimabadi, Zahra Djafari-Bidgoli, Fereshteh Jookar Kashi, Asma Mazoochi, Hossein Batooli, Composition and antioxidant and antimicrobial activity of the essential oil and extracts of Stachys inflata Benth from Iran, Food Chemistry, In Press, Corrected Proof, Available online 23 June 2009, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.06.037.
(http://www.sciencedirect.com/science/article/B6T6R-4WKK1S9-3/2/2215e85f71029fa4a01580333e4e5e6e)
Abstract:
Composition and antioxidant and antimicrobial activities of essential oil and methanol extract polar and nonpolar subfractions of Stachys inflata were determined. GC and GC/MS analyse of the essential oil showed 45 constituents representing 95.46% of the oil, the major components linalool (28.55%), [alpha]-terpineol (9.45%), spathulenol (8.37%) and (2E)-hexenal (4.62%) constituted 50.99% of it. Essential oil and extracts were also tested for their antioxidant activities using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene/linoleic acid assays. In the DPPH test, IC50 value for the polar subfraction was 89.50 [mu]g/ml, indicating an antioxidant potency of about 22% of that of butylated hydroxytoluene (IC50 = 19.72 [mu]g/ml) for this extract. In [beta]-carotene/linoleic acid assay, the best inhibition belonged to the nonpolar subfraction (77.08%). Total phenolic content of the polar and nonpolar extract subfractions was 5.4 and 2.8% (w/w), respectively. The plant also showed a week antimicrobial activity against three strains of tested microorganisms. Linalool and [alpha]-terpineol were also tested as major components of the oil and showed no antioxidant but considerable antimicrobial activities.
Keywords: Stachys inflata; Essential oil; Extract; Antioxidant activity; Antimicrobial activity; Linalool; [alpha]-Terpineol; Total phenolic

D. Runyoro, O. Ngassapa, K. Vagionas, N. Aligiannis, K. Graikou, I. Chinou, Chemical composition and antimicrobial activity of the essential oils of four Ocimum species growing in Tanzania, Food Chemistry, In Press, Corrected Proof, Available online 21 June 2009, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.06.028.
(http://www.sciencedirect.com/science/article/B6T6R-4WK48F2-5/2/eec1e568eb230a6dd831011c11b71f05)
Abstract:
As part of ongoing research on Tanzanian plants used as edibles or spices, six samples of essential oils from four Ocimum species (O. basilicum, O. kilimandscharicum, O. lamiifolium, O. suave) were analyzed by GC and GC-MS. Eighty-one compounds, corresponding to 81.1-98.2% of the chemical components of the oils, were identified. Major compounds were either phenyl propane derivatives or terpenoids, including methyl eugenol, 1,8-cineole, camphor, bornyl acetate, germacrene-D, E-myroxide, germacrene-B, caryophylene oxide and p-cymene. The oils were also

evaluated for antimicrobial activity against eight bacterial strains and three fungi. The oil of O. suave (B) showed the strongest antibacterial activity; O. suave (A), O. kilimandscharicum and, O. lamiifolium were moderately active, while O. basilicum oil was weakly active. However, none of the oils was active against the fungi species. The study has shown that, Ocimum oils could potentially be used as anti-infective agents.
Keywords: Ocimum basilicum; O. kilimandscharicum; O. lamiifolium; O. suave; Antimicrobial activity; Essential oils

Hanem F. Khater, Mohamed Y. Ramadan, Reham S. El-Madawy, Lousicidal, ovicidal and repellent efficacy of some essential oils against lice and flies infesting water buffaloes in Egypt, Veterinary Parasitology, In Press, Corrected Proof, Available online 18 June 2009, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2009.06.011.
(http://www.sciencedirect.com/science/article/B6TD7-4WJHBCG-2/2/9f0a2e51e4f1c878296ada2f18a4710b)
Abstract:
The lousicidal and repellent effects of five essential oils were investigated for the first time against the buffalo louse, Haematopinus tuberculatus, and flies infesting water buffaloes in Qalyubia Governorate, Egypt.
For the in vitro studies, filter paper contact bioassays were used to test the oils and their lethal activities were compared with that of d-phenothrin. Four minutes post-treatment, the median lethal concentration, LC50, values were 2.74, 7.28, 12.35, 18.67 and 22.79% for camphor (Cinnamomum camphora), onion (Allium cepa), peppermint (Mentha piperita), chamomile (Matricaria chamomilla) and rosemary oils (Rosmarinus officinalis), respectively, whereas for d-phenothrin, it was 1.17%.
The lethal time (50) (LT50) values were 0.89, 2.75, 15.39, 21.32, 11.60 and 1.94 min after treatment with 7.5% camphor, onion, peppermint, chamomile, rosemary and d-phenothrin, respectively. All the materials used except rosemary, which was not applied, were ovicidal to the eggs of H. tuberculatus.
Despite the results of the in vitro assays, the in vivo treatments revealed that the pediculicidal activity was more pronounced with oils. All treated lice were killed after 0.5-2 min, whereas with d-phenothrin, 100% mortality was reached only after 120 min.
The number of lice infesting buffaloes was significantly reduced 3, 6, 4, 6 and 9 days after treatment with camphor, peppermint, chamomile, onion, and d-phenothrin, respectively. Moreover, the oils and d-phenothrin significantly repelled flies, Musca domestica, Stomoxys calcitrans, Haematobia irritans and Hippobosca equina, for 6 and 3 days post-treatment, respectively. No adverse effects were noted on either animals or pour-on operators after exposure to the applied materials.
Consequently, some Egyptian essential oils show potential for the development of new, speedy and safe lousicides and insect repellents for controlling lice and flies which infest water buffaloes.
Keywords: Haematopinus tuberculatus; Buffalo; Lice; Essential oils; Pediculicide; Ovicidal; Fly repellent

F. Maggi, D. Lucarini, B. Tirillini, G. Sagratini, F. Papa, S. Vittori, Chemical analysis of the essential oil of Ferula glauca L. (Apiaceae) growing in Marche (central Italy), Biochemical Systematics and Ecology, In Press, Corrected Proof, Available online 17 June 2009, ISSN 0305-1978, DOI: 10.1016/j.bse.2009.05.011.
(http://www.sciencedirect.com/science/article/B6T4R-4WJ91K4-1/2/52a980c5d1792659066c0c06addd7103)
Abstract:
Ferula glauca L. (Apiaceae), formerly believed a subspecies of Ferula communis L., but at the present considered a distinguishable species, was studied for the first time for volatiles from

leaves, flowers, fruits and roots. The chemical analysis of the essential oil obtained from different populations growing in Marche (central Italy) was performed by GC-FID and GC-MS. The differences in composition detected between F. glauca and F. communis made the volatile fraction a reliable marker to distinguish between them, and confirmed the botanical data at the base of their discrimination. In particular, the oils obtained from leaves and roots, contained as major compounds (E)-caryophyllene, caryophyllene oxide, myristicin and elemicin, that can be useful as marker components. Finally, the oils contained some daucane derivatives, that were detected also in F. communis and responsible for important biological properties.
Keywords: Ferula glauca L.; Ferula communis L.; Apiaceae; Essential oil; GC; GC-MS

Klaudija Carovic-Stanko, Sandi Orlic, Olivera Politeo, Frane Strikic, Ivan Kolak, Mladen Milos, Zlatko Satovic, Composition and antibacterial activities of essential oils of seven Ocimum taxa, Food Chemistry, In Press, Corrected Proof, Available online 12 June 2009, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.06.010.
(http://www.sciencedirect.com/science/article/B6T6R-4WH8CD4-7/2/d4cd8cb73c807b8d27e6c381ec439719)
Abstract:
GC/MS was used to identify compounds of essential oils from seven Ocimum taxa (O. americanum L., O. basilicum L., O. campechianum Mill., O. x citriodorum Vis., O. kilimandscharicum Baker ex Gurke and three botanical varieties and cultivars of Ocimum basilicum L.: `Genovese', var. difforme and var. purpurascens). Preliminary screening of their antibacterial activity was done against a number of common pathogens (Enterococcus faecalis, Enterococus faecium, Escherichia coli 0157:H7, Listeria monocytogenes, Listeria ivanovii, Proteus vulgaris, Staphylococcus aureus, Staphylococcus epidermis) using the filter paper disc agar diffusion technique, while further analyses were done by modification of the disc diffusion method. A broad variation in the antibacterial properties of investigated essential oils was observed. E. coli 0157:H7 was inhibited by O. basilicum `Genovese' essential oil, while Ocimum americanum and Ocimum x citriodorum essential oils were the most effective against Enterococcus faecalis, Enterococcus faecium, P. vulgaris, S. aureus and S. epidermis.
Keywords: Antibacterial activity; Basil; Chemical composition; Disc agar diffusion method; GC-MS; Pathogenic bacteria; Volatiles compounds

Khodadad Pirali-Kheirabadi, Mehdi Razzaghi-Abyaneh, Ali Halajian, Acaricidal effect of Pelargonium roseum and Eucalyptus globulus essential oils against adult stage of Rhipicephalus (Boophilus) annulatus in vitro, Veterinary Parasitology, Volume 162, Issues 3-4, 10 June 2009, Pages 346-349, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2009.03.015.
(http://www.sciencedirect.com/science/article/B6TD7-4VVR20P-4/2/1ca38eb1e535c1b5c419196a83ab3165)
Abstract:
In a laboratory trial, in west-central Iran, the acaricidal effects of the essential oils (EOs) prepared from two medicinal plants, i.e. Pelargonium roseum and Eucalyptus globulus on the adult stage of Rhipicephalus (Boophilus) annulatus were evaluated. For this purpose, the engorged females of R. (B) annulatus were exposed to two-fold serial dilutions of oils (0.31-5.0%) using a 'dipping method' in vitro. The engorged ticks were immersed in different plant dilutions (eight per dilution) for 1 min then each replicate was incubated in separate petri dishes at 26 [degree sign]C and 80% relative humidity. The mortality rate for adult ticks exposed to different dilutions of P. roseum and E. globulus EO's showed a dose-dependent decrease. It was however significant only for the 2.5% and 5.0% dilutions of P. roseum EO, when compared to the non-treated control ($P < 0.05$). The mass of produced eggs in adult female ticks exposed to both P. roseum and E. globulus EOs had decreased dose-dependently. It was significant for only 2.5% and 5.0% dilutions of P. roseum EO, comparing the non-treated control ($P < 0.05$). The highest decrease in egg laying was reported for

ticks treated with 5% dilutions of P. roseum (87.5%) and E. globosus (25%) ($P < 0.05$). This is the first report that details the acaricidal activity of EO's obtained from P. roseum and E. globosus against R. (B) annulatus. The results show that both plants, particularly P. Roseum can be considered as potential candidates for biocontrol of R. (B) annulatus in the field.
Keywords: Rhipicephalus (Boophilus) annulatus; Pelargonium roseum; Eucalyptus globulus; Biological control; Cattle; Essential oil

Guo-bin DENG, Han-bo ZHANG, Hong-fen XUE, Shan-na CHEN, Xiao-lan CHEN, Chemical Composition and Biological Activities of Essential Oil from the Rhizomes of Iris bulleyana, Agricultural Sciences in China, Volume 8, Issue 6, June 2009, Pages 691-696, ISSN 1671-2927, DOI: 10.1016/S1671-2927(08)60266-7.
(http://www.sciencedirect.com/science/article/B82XG-4WKTN1K-9/2/f994bddc9475421e8ef4101e8971c994)
Abstract:
Iris bulleyana has long been used as a remedy for detoxication and detumescence. Hydrodistillation was used to extract the essential oil from its rhizomes, and 0.23% oil yield was obtained. Using gas chromatography-mass spectrometry (GC-MS) analysis, 31 chemicals including aristolone, cuparene, b-gurjunene, d-amorphene, a-muurolene, a-cadinol, camphor, g-elemene, and t-cadinol were identified. The essential oil exhibited antibacterial activity against Acetobacter calcoacetica, Bacillus subtillis, Clostridium sporogenes, Clostridium perfringens, Escherichia coli, Salmonella typhii, Staphylococcus aureus, and Yersinia enterocolitica. Its antifungal and antioxidant activities were also tested.
Keywords: Iris bulleyana; essential oil; antibacterial; antifungal; antioxidant; GC-MS; chemical components

B.K. Eiasu, J.M. Steyn, P. Soundy, Rose-scented geranium (Pelargonium capitatum x P. radens) growth and essential oil yield response to different soil water depletion regimes, Agricultural Water Management, Volume 96, Issue 6, June 2009, Pages 991-1000, ISSN 0378-3774, DOI: 10.1016/j.agwat.2009.01.012.
(http://www.sciencedirect.com/science/article/B6T3X-4VP1CMW-2/2/2cf915583b582435b37383a5555bc5c8)
Abstract:
Effective irrigation management in arid and semi-arid regions, like South Africa, could increase crop yield and thereby improve productivity of scarce fresh water resources. Experiments were conducted at the Hatfield Experimental Farm of the University of Pretoria, South Africa, from 2004 to 2006, to investigate the effect of soil water depletion regimes on rose-scented geranium (Pelargonium capitatum x P. radens cv. Rose) essential oil yield, essential oil composition and water-use efficiency in an open field and a rain shelter. Four maximum allowable soil water depletion levels (MAD), 20, 40, 60 and 80% of the plant available soil water (ASW) in the top 0.8 m root zone, were applied as treatments. Plant roots extracted most soil water from the top 0.4 m soil layer. Increasing the soil water depletion level to 60% and higher resulted in a significant reduction in herbage mass and essential oil yield. Water stress apparently increased the essential oil concentration (percentage oil on fresh herbage mass basis), but its contribution to total essential oil yield (kg/ha oil) was limited. Irrigation treatments did not affect essential oil composition. An increase in maximum allowable depletion level generally resulted in a decrease in leaf area and an increase in leaf to stem fresh mass ratio. Up to 28% of irrigation water could be saved by increasing maximum allowable depletion level of ASW from 20 to 40%, without a significant reduction in essential oil yield.
Keywords: Citronellol; Citronellyl formate; Essential oil composition; Fresh herbage mass; Geraniol; Maximum allowable depletion level; Plant available soil water; Water stress

Vivek K. Bajpai, Jung In Yoon, Sun Chul Kang, Antioxidant and antidermatophytic activities of essential oil and extracts of Metasequoia glyptostroboides Miki ex Hu, Food and Chemical Toxicology, Volume 47, Issue 6, June 2009, Pages 1355-1361, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.03.011.
(http://www.sciencedirect.com/science/article/B6T6P-4VVXSYW-1/2/c90d3d315ccd77899a78f42a0284a205)
Abstract:
This study was undertaken to assess the antioxidant and antidermatophytic potential of the essential oil and extracts (hexane, chloroform, ethyl acetate and methanol) of Metasequoia glyptostroboides Miki ex Hu. Antioxidant activity was evaluated by using 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay. The free radical scavenging activities of the oil and ethyl acetate extract were found to be superior (IC50 = 9.1 and 14.24 [mu]g/ml, respectively) as compared to butylatedhydroxyanisole (BHA), (IC50 = 18.27 [mu]g/ml). Also the ethyl acetate extract revealed the highest phenolic contents (93.26 mg/g of dry wt) as compared to the other extracts. Further, oil (1250 [mu]g/disc) and extracts (1750 [mu]g/disc) revealed 35.33-67.66 and 18.0-53.3% antidermatophytic effect, respectively, along with their respective MIC values (62.5-500 and 250-4000 [mu]g/ml) against Trichophyton rubrum KCTC 6345, T. rubrum KCTC 6375, T. rubrum KCTC 6352, T. mentagrophytes KCTC 6085, T. mentagrophytes KCTC 6077, T. mentagrophytes KCTC 6316, Microsporum canis KCTC 6591, M. canis KCTC 6348 and M. canis KCTC 6349. The oil also had a strong detrimental effect on spore germination as well as concentration and time-dependent kinetic inhibition of M. canis KCTC 6591.
Keywords: Metasequoia glyptostroboides; Antidermatophytic activity; Antioxidant activity; Essential oil; Phenolic contents

Karina Araus, Edgar Uquiche, Jose M. del Valle, Matrix effects in supercritical CO2 extraction of essential oils from plant material, Journal of Food Engineering, Volume 92, Issue 4, June 2009, Pages 438-447, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.12.016.
(http://www.sciencedirect.com/science/article/B6T8J-4V88FJ1-3/2/edd568b6b6ec88532ca365208534b4f0)
Abstract:
In this work, we reviewed the effect of the solid matrix in the supercritical CO2 (SC-CO2) extraction of essentials oils from plant material. A diffusional model was adopted that assumed the substrate is as an homogeneous solid and the partition of essential oils between the solid substrate and the SC-CO2 phases is constant. The model was fitted to literature data from several plant materials (relevant solute identified between parenthesis): chamomile flowers ([alpha]-bisabolol), lavender flowers (camphor), oregano bracts (thymol), pennyroyal leaves and flowers (menthol), and sage leaves (1,8-cineole). Based on values of binary diffusion coefficient of the solute in the solvent (D12) from a literature correlation, and the best-fit values of effective diffusivity of the solute in the solid matrix (De) we estimated the value of the so-called microstructural factor (MF), which is defined as the ratio between D12 and De which ranged from 420 for pennyroyal to 25,000 for oregano. MF encompasses several factors, mainly related with to the microstructure of the substrate, that affect the extraction rate of a solid substrate with a solvent.
Keywords: Extraction; Essential oils; Mathematical modeling; Solid matrix; Supercritical CO2

Jason Q.D. Goodger, Benjamin Cao, Inneke Jayadi, Spencer J. Williams, Ian E. Woodrow, Non-volatile components of the essential oil secretory cavities of Eucalyptus leaves: Discovery of two glucose monoterpene esters, cuniloside B and froggattiside A, Phytochemistry, Volume 70, Issue 9, June 2009, Pages 1187-1194, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2009.06.004.
(http://www.sciencedirect.com/science/article/B6TH7-4WS0HHJ-2/2/83ff3832c0c3cb2f7fb841f25a38ff21)

Abstract:
The essential oils extracted from the embedded foliar secretory cavities of many Eucalyptus species are of economic value as pharmaceuticals and fragrance additives. Recent studies have indicated that Eucalyptus secretory cavities may not be exclusively involved in the biosynthesis and storage of essential oils. Therefore, we selected three species upon which to perform an examination of the contents of foliar secretory cavities: Eucalyptus froggattii, E. polybractea and E. globulus. This paper describes the isolation and structural characterization of two non-volatile glucose monoterpene esters, which we have named cuniloside B and froggattiside A, from within the secretory cavities of these species, and shows the presence of these compounds in solvent extracts of the leaves from two other species of Eucalyptus. Both compounds were found in high proportions relative to the essential oils extracted from the leaves. We propose that many other carbohydrate monoterpene esters previously isolated from bulk leaf extracts of various Eucalyptus species may also be localized within the non-volatile fraction of foliar secretory cavities.
Keywords: Eucalyptus froggattii; Eucalyptus polybractea; Myrtaceae; Kamarooka mallee; Blue mallee; Gland; Metabolomics; Monoterpene ester; Oleuropeic acid; Terpene

J. Nguefack, J.B. Lekagne Dongmo, C.D. Dakole, V. Leth, H.F. Vismer, J. Torp, E.F.N. Guemdjom, M. Mbeffo, O. Tamgue, D. Fotio, P.H. Amvam Zollo, A.E. Nkengfack, Food preservative potential of essential oils and fractions from Cymbopogon citratus, Ocimum gratissimum and Thymus vulgaris against mycotoxigenic fungi, International Journal of Food Microbiology, Volume 131, Issues 2-3, 31 May 2009, Pages 151-156, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2009.02.009.
(http://www.sciencedirect.com/science/article/B6T7K-4VMGTY1-1/2/93e80ca1bf5197c34abd6443c0f1de88)
Abstract:
The food preservative potential of essential oils from three aromatic plants Cymbopogon citratus, Ocimum gratissimum and Thymus vulgaris and their fractions was investigated against two mycotoxigenic strains each of Aspergillus ochraceus, Penicillium expansum and P. verrucosum. The fungicidal activity was determined and expressed as a Number of Decimal Reduction of the colony forming units per ml (NDR cfu). The influence of pH variation on this activity was studied. The NDR cfu varied with the essential oils and its concentration, the pH of the medium and the strain tested. The essential oils from O. gratissimum exhibited the highest activity against the six fungal strains under the three pH tested. T. vulgaris and C. citratus essential oils were less active against the Penicillium species tested and A. ochraceus, respectively. Potassium sorbate did not present any activity at pH 6 and 9. At pH 3, its NDR cfu was the lowest against the six fungal strains. At the same pH and at 4000 ppm, the three essential oils presented a NRD cfu >= 6 against strains of A. ochraceus and P. expansum. The same result was obtained with T. vulgaris and C. citratus at 8000 ppm against both strains of P. verrucosum. The highest activity of the three essential oils was recorded at pH 3 against A. ochraceus strains and at pH 9 against both species of Penicillium. From the fractionation, three active fractions were obtained each from C. citratus and O. gratissimum, and two active fractions from T. vulgaris. These active fractions exhibited a NDR cfu, two to seven folds higher than that of the complete essential oils.
Keywords: Plant food preservative; Essential oils; Cymbopogon citratus; Poaceae; Ocimum gratissimum; Thymus vulgaris; Lamiaceae; Aspergillus; Penicillium

Sergio Rosselli, Maurizio Bruno, Antonella Maggio, Rosa Angela Raccuglia, Svetlana Bancheva, Felice Senatore, Carmen Formisano, Essential oils from the aerial parts of Centaurea cuneifolia Sibth. & Sm. and C. euxina Velen., two species growing wild in Bulgaria, Biochemical Systematics and Ecology, In Press, Corrected Proof, Available online 29 May 2009, ISSN 0305-1978, DOI: 10.1016/j.bse.2009.05.001.

(http://www.sciencedirect.com/science/article/B6T4R-4WD6Y0Y-3/2/eb888bd9dbd5cffe306f805ad46ed48f)
Abstract:
The volatile constituents of the aerial parts of Centaurea cuneifolia Sibth. & Sm. and Centaurea euxina Velen. from Bulgaria were extracted by hydrodistillation and were analyzed. The main components in C. cuneifolia were [beta]-eudesmol (26.5%) and hexadecanoic acid (17.6%). The main components in C. euxina were hexadecanoic acid (20.3%), spathulenol (10.8%) and caryophyllene oxide (6.2%). The chemotaxonomic significances with respect to other previously studied species of the same sections (Achrolopus and Phalolepis, respectively) are discussed.
Keywords: Centaurea cuneifolia; Centaurea euxina; Asteraceae; Essential oil; [beta]-Eudesmol; Hexadecanoic acid; Spathulenol; Chemotaxonomic significance

Hassan Gandomi, Ali Misaghi, Afshin Akhondzadeh Basti, Saeed Bokaei, Alireza Khosravi, Arash Abbasifar, Ashkan Jebelli Javan, Effect of Zataria multiflora Boiss. essential oil on growth and aflatoxin formation by Aspergillus flavus in culture media and cheese, Food and Chemical Toxicology, In Press, Corrected Proof, Available online 27 May 2009, ISSN 0278-6915, DOI: 10.1016/j.fct.2009.05.024.
(http://www.sciencedirect.com/science/article/B6T6P-4WCSRD7-5/2/2a70d35d19a51e32a2c14b49ddb0ecb1)
Abstract:
The effect of Zataria multiflora Boiss. essential oil (EO) against growth, spore production and aflatoxin formation by Aspergillus flavus ATCC 15546 was investigated in synthetic media as well as Iranian ultra-filtered white cheese in brine. EO effectively inhibited radial growth and spore production on potato dextrose agar (PDA) in a dose-dependent manner. At 200 ppm, the radial growth and sporulation reduced by 79.4% and 92.5%, respectively. The growth was completely prevented at EO [greater-or-equal, slanted] 400 ppm on PDA, and minimum fungicidal concentration (MFC) of the oil was estimated at 1000 ppm. The oil also significantly suppressed mycelial growth and aflatoxin synthesis in broth medium at all concentrations tested ($P < 0.05$). At 150 ppm of EO, the mycelial growth and aflatoxin accumulation reduced by 90% and 99.4%, respectively. The EO at all concentrations tested, had an inhibitory effect against radial fungal growth and aflatoxin production by A. flavus in cheese. However, no concentration of EO examined was able to completely inhibit the growth and aflatoxin production in cheese. The results suggested the potential substitution of the antifungal chemicals by this EO as a natural inhibitor to control the growth of molds in foods such as cheese.
Keywords: Zataria multiflora Boiss. essential oil; Aspergillus flavus; Antifungal effect; Aflatoxin; Cheese

D.R. George, O.A.E. Sparagano, G. Port, E. Okello, R.S. Shiel, J.H. Guy, Repellence of plant essential oils to Dermanyssus gallinae and toxicity to the non-target invertebrate Tenebrio molitor, Veterinary Parasitology, Volume 162, Issues 1-2, 26 May 2009, Pages 129-134, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2009.02.009.
(http://www.sciencedirect.com/science/article/B6TD7-4VKP44S-2/2/374041847c415eec91f9e9530b063fd7)
Abstract:
With changes in legislation and consumer demand, alternatives to synthetic acaricides to manage the poultry red mite Dermanyssus gallinae (De Geer) in laying hen flocks are increasingly needed. These mites may cause losses in egg production, anaemia and even death of hens. It may be possible to use plant-derived products as D. gallinae repellents, especially if such products have a minimal impact on non-target organisms. An experiment was conducted with D. gallinae to assess the repellence of a range of plant essential oils, previously found to be of varying toxicity (relatively highly toxic to non-toxic) to this pest. Experiments were also undertaken to assess the toxicity of

these products to mealworm beetles (Tenebrio molitor L.), a non-target invertebrate typical of poultry production systems. Results showed that all seven essential oils tested (manuka, thyme, palmarosa, caraway, spearmint, black pepper and juniper leaf) were repellent to D. gallinae at 0.14 mg oil/cm3 (initial concentration) during the first 2 days of study. Thyme essential oil appeared to be the most effective, where repellence lasted until the end of the study period (13 days). At the same concentration toxicity to T. molitor differed, with essential oils of palmarosa and manuka being no more toxic to adult beetles than the control. There was neither a significant association between the rank toxicity and repellence of oils to D. gallinae, nor the toxicity of oils to D. gallinae (as previously determined) and T. molitor.
Keywords: Essential oil; Repellent; Dermanyssus gallinae; Toxicity; Non-target; Tenebrio molitor

Laura Sanchez-Gonzalez, Maria Vargas, Chelo Gonzalez-Martinez, Amparo Chiralt, Maite Chafer, Characterization of edible films based on hydroxypropylmethylcellulose and tea tree essential oil, Food Hydrocolloids, In Press, Corrected Proof, Available online 20 May 2009, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2009.05.006.
(http://www.sciencedirect.com/science/article/B6VP9-4WBC1WD-2/2/9fe6af4a2d1c6dcb95a71aecf50b986f)
Abstract:
Edible films based on hydroxypropylmethylcellulose (HPMC) and different concentrations of tea tree essential oil (TTO) were prepared. Film-forming dispersions (FFD) were characterized in terms of rheological properties, particle size distribution and [zeta]-potential. In order to study the impact of the incorporation of TTO into the HPMC matrix, the water sorption isotherms, water vapour permeability (WVP), mechanical and optical properties of the dry films were evaluated. Results showed that the increase in TTO content promoted significant changes in the size and surface charge of the FFD particles. With regards to the film properties, the higher the TTO content, the lower the WVP and the moisture sorption capacity. In general, the addition of TTO into the HPMC matrix leads to a significant decrease in gloss and transparency and a decrease in the tensile strength and elastic modulus of the composite films. The properties of the films were related with their microstructure, which was observed by SEM.
Keywords: Water vapour permeability; Transparency; Mechanical properties; Microstructure; Particle size distribution; [zeta]-Potential

Manohar Shirugumbi Hanamanthagouda, Siddappa Bhimashya Kakkalameli, Poornananda Madhava Naik, Praveen Nagella, Harisha Reddy Seetharamareddy, Hosakatte Niranjana Murthy, Essential oils of Lavandula bipinnata and their antimicrobial activities, Food Chemistry, In Press, Corrected Proof, Available online 18 May 2009, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.05.032.
(http://www.sciencedirect.com/science/article/B6T6R-4W9XBHT-3/2/040ebb52fb3f189515a354e16ce8e60b)
Abstract:
The essential oils from dried leaves of Lavandula bipinnata (Roth) Kuntze (Lamiaceae), obtained by soxhlet extraction was analysed by gas chromatography-mass spectrometry (GC-MS) and was evaluated for in vitro antimicrobial activity. The most common components usually found in lavender essential oils were present in the oil samples analysed, out of 43 peaks, 29 components, which constitute 72.38%, were identified in the essential oil. The major constituents were transcarveol (18.93%), pulegone (8.45%), camphor (7.09%) and menthol (5.89%). Other constituents present in fairly good amounts are pipertone (4.65%), caryophyllene oxide (3.68%), linalyl acetate (3.37%) and bicyclogermacrene (3.09%). The essential oil was screened for antimicrobial activity by disc diffusion assay and minimum inhibitory concentration (MIC) against bacteria and fungus. Results reveal that L. bipinnata essential oils are inhibitory against the tested bacteria and fungal strains.

Keywords: Lavandula bipinnata; Lamiaceae; Essential oils; Antimicrobial activity

Andre Sao Pedro, Elaine Cabral-Albuquerque, Domingos Ferreira, Bruno Sarmento, Chitosan: An option for development of essential oil delivery systems for oral cavity care?, Carbohydrate Polymers, Volume 76, Issue 4, 16 May 2009, Pages 501-508, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.12.016.
(http://www.sciencedirect.com/science/article/B6TFD-4V74VDB-4/2/7ba4bd9b236826188c222c0bc2528043)
Abstract:
Microencapsulation of bioactive compounds has received increased attention in the last decade. Among the polymers used for developing microparticulated systems, chitosan has been widely cited. Obtained by deacetylation of chitin, chitosan is a natural, biodegradable, biocompatible and mucoadhesive polymer with permeability enhancement properties. These data justify its use for overcoming the reduced efficacy of conventional treatments of oral diseases. Various tests simulating the buccal environment have described controlled drug release profile and significant activity against buccal pathogens by chitosan microparticles entrapping antimicrobial agents. Considering the increasing microbial resistance to conventional antibiotics, essential oils have shown to be an important option against these pathogens. For sustained stability and prolonged release of essential oils from pharmaceutical formulations, some authors have studied the association of chitosan to them. This review disserts about the application of chitosan and essential oils on oral cavity care pointing out their association may be an interesting option.
Keywords: Buccal drug delivery systems; Chitosan; Essential oils; Microencapsulation

Abdul Azis Ariffin, Jamilah Bakar, Chin Ping Tan, Russly Abdul Rahman, Roselina Karim, Chia Chun Loi, Essential fatty acids of pitaya (dragon fruit) seed oil, Food Chemistry, Volume 114, Issue 2, 15 May 2009, Pages 561-564, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.09.108.
(http://www.sciencedirect.com/science/article/B6T6R-4TPF4NG-1/2/1609d8a98cb9d4bc25773d39ff1a0c2a)
Abstract:
Hylocereus undatus and Hylocereus polyrhizus are two varieties of the commonly called pitaya fruits. The seeds were separated and the oil was extracted and analysed. Essential fatty acids, namely, linoleic acid and linolenic acid form a significant percentage of the unsaturated fatty acids of the seed oil extract. Both pitaya varieties exhibit two oleic acid isomers. Essential fatty acids are important acids that are necessary substrates in animal metabolism and cannot be synthesised in vivo. Both pitaya varieties contain about 50% essential fatty acids (C18:2 (48%) and C18:3 (1.5%)). This paper details the process of recovering the pitaya seeds and determining the composition of the oil extracted from the seeds.
Keywords: Pitaya; Seed oil; Essential fatty acids; Linoleic; Linolenic

Harminder Pal Singh, Sunil Mittal, Shalinder Kaur, Daizy R. Batish, Ravinder K. Kohli, Chemical composition and antioxidant activity of essential oil from residues of Artemisia scoparia, Food Chemistry, Volume 114, Issue 2, 15 May 2009, Pages 642-645, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.09.101.
(http://www.sciencedirect.com/science/article/B6T6R-4TMBPY1-D/2/2bd66547921ea03c983899adac2e0b11)
Abstract:
The chemical composition of hydrodistilled oil (yield ~0.17%, w/v), from the residues of Artemisia scoparia Waldst. & Kit. (sagebrush or wormweed), was analysed for the first time by GC/GC-MS. Of the 49 compounds present in the oil, 48, accounting for 99.28% of the oil, were identified. The volatile oil contained 24 monoterpenoids (56.7%), 19 sesquiterpenoids (28.7%), 2 ketones (0.25%), 1 ester (1.87%), 1 chromene (precocene II, 0.65%) and a hydrocarbon compound.

Citronellal (15.2%) followed by [beta]-citronellol (11%) were the major monoterpene constituents of the oil. The residue essential oils (25-200 [mu]g/ml) exhibited a strong antioxidant and radical scavenging activity against hydroxyl ion (OH) and hydrogen peroxide (H2O2). This study concludes that residues of A. scoparia could serve as an important bioresource for extraction of monoterpenoid-rich oil exhibiting antioxidant activity, and thus hold a good potential for use in the food and pharmaceutical industry.
Keywords: Artemisia scoparia Waldst. & Kit.; Plant residues; Essential oil; GC-MS analyses; Monoterpenoids; Antioxidant activity; Radical scavenging activity

A. Dvaranauskaite, P.R. Venskutonis, C. Raynaud, T. Talou, P. Viskelis, A. Sasnauskas, Variations in the essential oil composition in buds of six blackcurrant (Ribes nigrum L.) cultivars at various development phases, Food Chemistry, Volume 114, Issue 2, 15 May 2009, Pages 671-679, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.10.005.
(http://www.sciencedirect.com/science/article/B6T6R-4TN82N9-1/2/3e596aca63e51f332e4185d795b5c1ec)
Abstract:
The variations in the content and the composition of dormant bud essential oil in six blackcurrant (Ribes nigrum L.) cultivars collected at various vegetation phases (from December 15, 2004 until April 19, 2005) were studied. Essential oil yield varied from 0.6% to 1.8%, except for the buds harvested in April, when the yield was considerably lower, 0.19-0.27%. Fifty volatile compounds were identified in the bud oils, hydrocarbon (38-55%) and oxygenated (on average 30%) terpenes being the major chemical constituents. Sabinene, [delta]-3-carene, terpinolene were dominant components, while cis- and trans-[beta]-ocimene, [alpha]-thujene, [alpha]- and [beta]-pinene, myrcene, [alpha]- and [beta]-phellandrene, [alpha]- and [gamma]-terpinene, p-cymene, cis- and trans-sabinene hydrate, terpinen-4-ol, [alpha]-terpineol, trans-piperitol, bornyl acetate, terpinyl acetate, citronellyl acetate, germacrenes D, [beta]-caryophyllene, [alpha]-humulene, [alpha]-selinene, [delta]-cadinene and [alpha]-cadinol were found in reasonable amounts. Almiai may be considered as a superior cultivar, as possessing the most even content of oils ant the main constituents at all harvesting periods, except for April; however some other cultivars (Gagatai, Joniniai) accumulated higher amounts of oil at particular vegetation phases. January may be considered as a preferable harvesting time of buds; the amount of major terpenes at this phase was the highest in the all cultivars except for Joniniai. The concentration of the main oil compounds in buds harvested in April was 2-50 times lower than at other periods in the all six cultivars.
Keywords: Blackcurrant buds; Ribes nigrum; Essential oil; Harvesting period

Roger Randrianarivelo, Samira Sarter, Eric Odoux, Pierre Brat, Marc Lebrun, Bernard Romestand, Chantal Menut, Hanitriniaina Sahondra Andrianoelisoa, Marson Raherimandimby, Pascal Danthu, Composition and antimicrobial activity of essential oils of Cinnamosma fragrans, Food Chemistry, Volume 114, Issue 2, 15 May 2009, Pages 680-684, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.10.007.
(http://www.sciencedirect.com/science/article/B6T6R-4TNWH3K-3/2/1af63a45ed68e7b66ba1cf2735811509)
Abstract:
Essential oil samples of Cinnamosma fragrans from two regions in Madagascar, Tsaramandroso (38 samples) and Mariarano (30 samples), were analysed by GC/MS. Fifty-seven components were identified, accounting from 88.3% to 99.4% of the oils' composition. The major components were linalool (72.5 +/- 23.3%) in Tsaramandroso and 1,8-cineole (47.3 +/- 10.2%) in Mariarano.
Samples B8 (95.8% linalool) from Tsaramandroso and B143 (71.6% 1,8-cineole) from Mariarano containing the highest proportions of the two main components identified, were selected to determine antimicrobial activities against 10 microbial strains. Bacillus subtilis and Staphylococcus

aureus were the most sensitive strains to both oils. Minimum inhibitory concentration (MIC) values were lower for B143 against all tested Gram-negative strains than pure 1,8-cineole. B8 showed higher MIC values than pure linalool against Salmonella typhimurium and Vibrio alginolyticus, and similar MIC values to linalool towards the other Gram-negative strains. Both essential oils exhibited higher MIC values towards Fusarium oxysporum than their respective pure major component. These results suggested the occurrence of synergism or antagonism effects between the different oil constituents.
Keywords: Cinnamosma fragrans; Essential oil; Antimicrobial activity; Linalool; 1,8-Cineole; Madagascar

J. Michiels, J.A.M. Missotten, D. Fremaut, S. De Smet, N.A. Dierick, In vitro characterisation of the antimicrobial activity of selected essential oil components and binary combinations against the pig gut flora, Animal Feed Science and Technology, Volume 151, Issues 1-2, 12 May 2009, Pages 111-127, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2009.01.004.
(http://www.sciencedirect.com/science/article/B6T42-4VRWNJJ-1/2/0cc2786f849222acc448e4819b75b19d)
Abstract:
The antimicrobial activity of selected essential oil (EO) components against the major culturable components of the pig gut flora has been characterised by means of an in vitro incubation model simulating the fermentation in different sections of the pig gastrointestinal tract (GIT). In a first study 7 components were screened for their antimicrobial properties. Dose-response equations were established for the 4 components with the highest potential in a second study. Binary combinations were tested as well, and the interaction effects were evaluated following the isobole method. The results of both studies indicated that carvacrol, thymol, eugenol and trans-cinnamaldehyde give opportunities to modulate the flora and fermentation pattern of the GIT of pigs. Eucalyptol, terpinen-4-ol and trans-anethole were found not to have interesting effects on the growth of the pig gut flora. The minimum concentration for carvacrol, thymol, eugenol and trans-cinnamaldehyde in jejunal simulations to reduce the number of total anaerobic bacteria compared to control with a probability of 99.7% was 255, 258, 223 and 56 mg/L respectively. This strong activity of trans-cinnamaldehyde was due to its progressively increasing effect against coliform bacteria; a dose of 104 mg/L gave a reduction of 1 log10 CFU/mL vs. 371, 400 and 565 mg/L for carvacrol, thymol and eugenol respectively. However, trans-cinnamaldehyde showed clearly less inhibitory activity towards lactobacilli than carvacrol and thymol. Therefore, the use of trans-cinnamaldehyde (for example 100 mg/L) and to a lesser extent eugenol could result in a shift in the microbial ecology in favour of lactic acid producing bacteria and reducing the number of coliform bacteria. Carvacrol and thymol showed very similar and non-selective antimicrobial properties. Their effect was more pronounced in acidic media and demonstrated a rapidly increasing bactericidal effect from a certain concentration on (400-500 mg/L in jejunal simulations). The inhibition of the production of total short chain fatty acids (SCFA) in jejunal simulations by these 4 candidates was related to their effect against coliform bacteria, however they did not alter the lactic acid and ammonia concentrations. Few combinations demonstrated synergism; most mixtures showed zero interaction or antagonism. Carvacrol + thymol (ratio >=1) was synergistic against total anaerobic bacteria in jejunal simulations, however this effect was rather small. In caecal simulations, carvacrol, thymol and trans-cinnamaldehyde were equally effective while eugenol had an effect only on coliforms. These data on the in vitro antimicrobial activities of EO components give support for a better control of the gastrointestinal bacterial community and the design of alternative growth promoters. Their in vivo potential is also discussed.
Keywords: In vitro antimicrobial activity; Carvacrol; Thymol; Eugenol; Trans-cinnamaldehyde; Pig gut flora; Lactobacilli; Coliforms

D.R. George, T.J. Smith, R.S. Shiel, O.A.E. Sparagano, J.H. Guy, Mode of action and variability in efficacy of plant essential oils showing toxicity against the poultry red mite, Dermanyssus gallinae, Veterinary Parasitology, Volume 161, Issues 3-4, 12 May 2009, Pages 276-282, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2009.01.010.
(http://www.sciencedirect.com/science/article/B6TD7-4VFC833-4/2/b8bf3d80465575bd4a46bc326f4c52e6)
Abstract:
This paper describes a series of experiments to examine the mode of action and toxicity of three plant essential oils (thyme, manuka and pennyroyal) to the poultry red mite, Dermanyssus gallinae (De Geer), a serious ectoparasitic pest of laying hens. All three oils were found to be toxic to D. gallinae in laboratory tests with LC50, LC90 and LC99 values below 0.05, 0.20 and 0.30 mg/cm3, respectively, suggesting that these products may make for effective acaricides against this pest. Further experiments demonstrated that when mites were exposed to only the vapour phase of the essential oil without contact with the oil itself, mortality was consistently higher in closed arenas than in arenas open to the surrounding environment, or in control arenas. This suggests that all three essential oils were toxic to D. gallinae by fumigant action. In addition, in an experiment where mites were allowed contact with the essential oil in either open or closed arenas, mortality was always reduced in the open arenas where this was comparable to control mortality for thyme and pennyroyal essential oil treatments. This supports the findings of the previous experiment and also suggests that, with the possible exception of manuka, the selected essential oils were not toxic to D. gallinae on contact.
Statistical comparisons were made between the toxicity of the selected essential oils to D. gallinae in the current work and in a previous study conducted in the same laboratory. The results demonstrated considerable variation in LC50, LC90 and LC99 values. Since both the essential oils and the mites were obtained from identical sources in the two studies, it is hypothesized that this variation resulted from the use of different `batches' of essential oil, which could have varied in chemistry and hence acaricidal activity.
Keywords: Dermanyssus gallinae; Poultry red mite; Essential oil; Fumigant toxicity; Acaricide

N.L. Tatsadjieu, A. Yaouba, E.N. Nukenine, M.B. Ngassoum, C.M.F. Mbofung, Comparative study of the simultaneous action of three essential oils on Aspergillus flavus and Sitophilus zeamais Motsch, Food Control, In Press, Corrected Proof, Available online 10 May 2009, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2009.05.004.
(http://www.sciencedirect.com/science/article/B6T6S-4W85MBV-2/2/4ee698378897cfa51631e47fb2f94fa6)
Abstract:
Maize is among the most important produced and consumed crops in Cameroon. However, the availability of this cereal is limited by post-harvest losses, especially in the course of storage. Therefore, there is an urgent need to overcome this phenomenon through the use of efficient, cheap methods. To this effect, the simultaneous action of three essential oils, obtained by hydrodistillation from leaves of Ocimum gratissimum and Lippia rugosa and fruits of Xylopia aethiopica, on Aspergillus flavus and Sitophilus zeamais was investigated using a 24 factorial design. The three essential oils and the storage time were considered as factors. The results revealed that low volume (60 [mu]l/200 g grain) for O. gratissimum and high volume for L. rugosa (310 [mu]l/200 g grain) and X. aethiopica (250 [mu]l/200 g grain) showed the most important efficiencies against A. flavus and S. zeamais in a 2 weeks storage. Hence, the rate of mortality for S. zeamais was 92% and 89%, respectively, in samples of maize infested by S. zeamais and samples of maize infested by S. zeamais and A. flavus. Ninety five percent of A. flavus conidia were inhibited in samples of maize infested by A. flavus and samples of maize infested by S. zeamais and A. flavus.
Keywords: Experimental design; Essential oil; Aspergillus flavus; Sitophilus zeamais

Li-mei Wang, Mao-teng Li, Wen-wen Jin, Shuo Li, Shuai-qi Zhang, Long-jiang Yu, Variations in the components of Osmanthus fragrans Lour. essential oil at different stages of flowering, Food Chemistry, Volume 114, Issue 1, 1 May 2009, Pages 233-236, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.09.044.
(http://www.sciencedirect.com/science/article/B6T6R-4THC1HM-5/2/b1ffd5f3e348b7451c864765655ac4d8)
Abstract:
A headspace solid-phase microextraction (HS-SPME) method was used to extract the essential oil of Osmanthus fragrans Lour., which was then analysed by gas chromatography-mass spectrometry (GC-MS) at four different stages of flowering. The primary chemical components of the essential oil extracted from O. fragrans were linalool and its oxide, [alpha]-ionone, [beta]-ionone, nerol, [gamma]-decalactone, 9,12,15-octadecatrienoic acid, and hexadecanoic acid, most of which were at their highest concentrations in extracts obtained from flowers at the initial flowering stage. HS-SPME using a PDMS/DVB fibre is a simple, rapid, and solvent-free method for the extraction of volatile compounds emitted from living O. fragrans. HS-SPME with GC-MS can be used to determine the aromatic maturity in O. fragrans, to decide the optimal harvest date. The initial flowering stage was the best time to harvest O. fragrans.
Keywords: Osmanthus fragrans Lour.; Headspace solid-phase microextraction; Gas chromatography-mass spectrometry; Chemical components

Mehmet Musa Ozcan, Olga Tzakou, Maria Couladis, Essential oil composition of the turpentine tree (Pistacia terebinthus L.) fruits growing wild in Turkey, Food Chemistry, Volume 114, Issue 1, 1 May 2009, Pages 282-285, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.08.094.
(http://www.sciencedirect.com/science/article/B6T6R-4TD4J0W-2/2/cd6ced6dd7fad2bc683077807bc0a432)
Abstract:
Constituents of essential oils from fruit samples of the turpentine tree (Pistacia terebinthus L.) collected from fifteen different localities of Turkey on August 2001 were identified by GC-MS. Twenty-eight compounds representing 92.3-100.0% of turpentine fruit oils were identified. The oil yields varied between 0.06% and 0.16%. The highest yield of oil was obtained from fruits of Antalya origin (Akbas-Serik) (0.16%). [alpha]-Pinene (51.3%), limonene (39.0%), p-cymen-8-ol (40.0%) and caryophyllene oxide (51.0%) were found as major components for different localities in Turkey. The predominant constituents in most samples were [alpha]-pinene (9.5-51.3%), limonene (tr-39.0%) and caryophyllene oxide (tr-51.5). Except for one collection (Manavgat-Antalya), which contained spathulenol (20.7%) and p-cymen-8-ol (40.0%), all the other samples yielded oils rich in [alpha]-pinene and limonene. [beta]-Caryophyllene oxide is the most abundant compound in Hisaronu (Izmir), Alanya (Antalya) and Yayladag (Hatay) oils. Results confirm the effect of locality on the oil content and composition.
Keywords: Turpentine; Pistacia terebinthus; Essential oils; Locations; [alpha]-Pinene; limonene

Nabil Bousbia, Maryline Abert Vian, Mohamed A. Ferhat, Emmanuel Petitcolas, Brahim Y. Meklati, Farid Chemat, Comparison of two isolation methods for essential oil from rosemary leaves: Hydrodistillation and microwave hydrodiffusion and gravity, Food Chemistry, Volume 114, Issue 1, 1 May 2009, Pages 355-362, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.09.106.
(http://www.sciencedirect.com/science/article/B6T6R-4TN0M1B-4/2/e5d1d404e6f172ee5bcfcea3e580e357)
Abstract:
Traditional hydrodistillation (HD) and innovative Microwave Hydrodiffusion and Gravity (MHG) methods have been compared and evaluated for their effectiveness in the isolation of essential oil from fresh Rosmarinus officinalis leaves. The microwave method offers important advantages over

traditional alternatives, namely: shorter isolation times (15 min against 3 h for hydrodistillation), environmental impact (energy cost is fairly higher to perform HD than that required for rapid MHG isolation), cleaner features (as no residue generation and no water or solvent used), increases antimicrobial activities, increases antioxidant activity and provides a more valuable essential oil (with high amount of oxygenated compounds). It offers also the possibility for a better reproduction of natural aroma of the essential oil from rosemary leaves than the HD essential oil. Moreover, microwave procedure yielded essential oils that could be analysed or used directly without any clean-up, solvent exchange or centrifugation steps. Scanning electron microscopy shows important structural changes for MHG extraction in contrast to those obtained by HD. Electron micrographs show clearly that the cells are broken and damaged during microwave treatment. Finally, the mechanism of Microwave Hydrodiffusion and Gravity is proposed and discussed.
Keywords: Microwave; Hydrodiffusion; Antioxidant; Essential oil; Rosemary

Feyza Oke, Belma Aslim, Sahlan Ozturk, Senol Altundag, Corrigendum to 'Essential oil composition, antimicrobial and antioxidant activities of Satureja cuneifolia Ten.' by F. Oke, B. Aslim, S.Ozturk and S. Altundag Food Chemistry 112(4) (2009) 874-879, Food Chemistry, Volume 113, Issue 4, 15 April 2009, Page 1174, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.09.015.
(http://www.sciencedirect.com/science/article/B6T6R-4TDK6YJ-3/2/d9fb576593ba6831649f5be93569d2ab)

I. Bettaieb, N. Zakhama, W. Aidi Wannes, M.E. Kchouk, B. Marzouk, Water deficit effects on Salvia officinalis fatty acids and essential oils composition, Scientia Horticulturae, Volume 120, Issue 2, 2 April 2009, Pages 271-275, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.10.016.
(http://www.sciencedirect.com/science/article/B6TC3-4V5XP73-1/2/a4471927c557fa41bd0e2993bd2b64cb)
Abstract:
The effects of water deficit on vegetative growth, fatty acids and essential oil yield and composition of Salvia officinalis aerial parts were investigated. Plants were treated with different levels of water deficit (C, MWD and SWD). Results showed important reductions of the different growth parameters. Drought decreased significantly the foliar fatty acid content and the double bond index (DBI) degree. This later was provoked mainly by a strong reduction of linolenic acid proportion and the disappearance of palmitoleic acid. Besides, moderate deficit increased the essential oil yield (expressed as g/100 g on the basis of dry weight) and the main essential oil constituents were camphor, [alpha]-thujone and 1.8-cineole which showed an increasing under moderate water deficit.
Keywords: Water deficit; Salvia officinalis; Aerial part; Growth; Fatty acid; Essential oil

E.S. Autran, I.A. Neves, C.S.B. da Silva, G.K.N. Santos, C.A.G. da Camara, D.M.A.F. Navarro, Chemical composition, oviposition deterrent and larvicidal activities against Aedes aegypti of essential oils from Piper marginatum Jacq. (Piperaceae), Bioresource Technology, Volume 100, Issue 7, April 2009, Pages 2284-2288, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.10.055.
(http://www.sciencedirect.com/science/article/B6V24-4V4KC6M-6/2/aaee214ea551c6fb79ed8d9c53059a47)
Abstract:
The essential oils of leaves, stems and inflorescences of Piper marginatum, harvested in the Atlantic forest in the State of Pernambuco, Brazil, were obtained by hydrodistillation. GC and GC-MS analyses revealed the presence of 40 components accounting, respectively, for 99.6%, 99.7% and 99.1% of the leaf, stem and inflorescence oil, the most abundant being (Z)- or (E)-asarone and patchouli alcohol. The essential oil of the inflorescences exhibited potent activity against the 4th instar of Aedes aegypti with LC10 and LC50 values of 13.8 and 20.0 ppm, respectively. Furthermore, the inflorescence oil did not interfere in the oviposition of A. aegypti females when

assayed at 50 ppm. These properties suggest that P. marginatum oil is a potential source of valuable larvicidal compounds for direct use or in conjunction with baits in traps constructed to capture eggs and larvae.
Keywords: Piper; Aedes; GC-MS analysis; Larvicide; Oviposition deterrent

J. Gutierrez, C. Barry-Ryan, P. Bourke, Antimicrobial activity of plant essential oils using food model media: Efficacy, synergistic potential and interactions with food components, Food Microbiology, Volume 26, Issue 2, April 2009, Pages 142-150, ISSN 0740-0020, DOI: 10.1016/j.fm.2008.10.008.
(http://www.sciencedirect.com/science/article/B6WFP-4TTMNBB-1/2/690d6333ce58f505de9b337a084d0334)
Abstract:
The aim of this study was to optimise the antimicrobial efficacy of plant essential oils (EOs) for control of Listeria spp. and spoilage bacteria using food model media based on lettuce, meat and milk. The EOs evaluated were lemon balm, marjoram, oregano and thyme and their minimum inhibitory concentrations (MIC) were determined against Enterobacter spp., Listeria spp., Lactobacillus spp., and Pseudomonas spp. using the agar dilution method and/or the absorbance based microplate assay. MICs were significantly lower in lettuce and beef media than in TSB. Listeria strains were more sensitive than spoilage bacteria, and oregano and thyme were the most active EOs. EO combinations were investigated using the checkerboard method and Oregano combined with thyme had additive effects against spoilage organisms. Combining lemon balm with thyme yielded additive activity against Listeria strains. The effect of simple sugars and pH on antimicrobial efficacy of oregano and thyme was assessed in a beef extract and tomato serum model media. EOs retained greater efficacy at pH 5 and 2.32% sugar, but sugar concentrations above 5% did not negatively impact EO efficacy. In addition to proven antimicrobial efficacy, careful selection and investigation of EOs appropriate to the sensory profile of foods and composition of the food system is required. This work shows that EOs might be more effective against food-borne pathogens and spoilage bacteria when applied to foods containing a high protein level at acidic pH, as well as moderate levels of simple sugars.
Keywords: Essential oils; Antimicrobial; Synergy; Food model; Food composition

I. Atrea, A. Papavergou, I. Amvrosiadis, I.N. Savvaidis, Combined effect of vacuum-packaging and oregano essential oil on the shelf-life of Mediterranean octopus (Octopus vulgaris) from the Aegean Sea stored at 4 [degree sign]C, Food Microbiology, Volume 26, Issue 2, April 2009, Pages 166-172, ISSN 0740-0020, DOI: 10.1016/j.fm.2008.10.005.
(http://www.sciencedirect.com/science/article/B6WFP-4TTMNBB-3/2/91d6c1806d0b5d70f03d07cc767f73a1)
Abstract:
The present study evaluated the use of vacuum packaging (alone) or with addition of oregano essential oil (EO), as an antimicrobial treatment for shelf-life extension of fresh Mediterranean octopus stored under refrigeration for a period of 23 days. Four different treatments were tested: A, control sample; under aerobic storage in the absence of oregano essential oil; VP, under vacuum packaging in the absence of oregano essential oil; and VO1, VO2, treated samples with oregano essential oil 0.2 and 0.4% (v/w), respectively, under VP. Of all the microorganisms enumerated, Pseudomonas spp., H2S-producing bacteria and lactic acid bacteria (LAB) were the groups that prevailed in octopus samples, irrespective of antimicrobial treatment. With regard to the chemical freshness indices determined, thiobarbituric acid (TBA) values were low in all octopus samples, as could have been expected from the low fat content of the product. Both trimethylamine nitrogen (TMA-N) and total volatile basic nitrogen (TVB-N) values of oregano treated under VP octopus samples were significantly lower compared to control samples during the entire refrigerated storage period. Based primarily on sensory evaluation (odor), the use of VP,

VO1 and VO2 extended the shelf-life of fresh Mediterranean octopus by ca. 3, 11 and 20 days, respectively.
Keywords: Cephalopods; Essential oils; Octopus; Oregano; Shelf-life; Vacuum packaging

Jorge Gutierrez, Paula Bourke, Julien Lonchamp, Catherine Barry-Ryan, Impact of plant essential oils on microbiological, organoleptic and quality markers of minimally processed vegetables, Innovative Food Science & Emerging Technologies, Volume 10, Issue 2, April 2009, Pages 195-202, ISSN 1466-8564, DOI: 10.1016/j.ifset.2008.10.005.
(http://www.sciencedirect.com/science/article/B6W6D-4TTHWD5-1/2/8fe1ffa9fdcda71a005448243edc7b3a)
Abstract:
The objectives of this study were to evaluate the efficacy of plant essential oils (EOs) for control of the natural spoilage microflora on ready-to-eat (RTE) lettuce and carrots whilst also considering their impact on organoleptic properties. Initial decontamination effects achieved using EOs were comparable to that observed with chlorine and solution containing oregano recorded a significantly lower initial TVC level than the water treatment on carrots ($p < 0.05$). No significant differences were found between the EO treatments and chlorine considering gas composition, color, texture and water activity of samples. The sensory panel found EO treatments acceptable for carrots throughout storage, while lettuce washed with the EO solutions were rejected for overall appreciation by Day 7. Correlating microbial and sensory changes with volatile emissions identified 12 volatile quality markers. Oregano might be a suitable decontamination alternative to chlorine for RTE carrots, while the identification of volatile quality markers is a useful complement to sensory and microbiological assessments in the monitoring of organoleptic property changes and shelf-life of fresh vegetables.Industrial relevance
There is industrial demand for natural alternatives to chlorine, which is commonly used for decontamination of fresh produce but which has limitations with respect to antimicrobial efficacy and possible formation of carcinogenic compounds in water. Plant essential oils have proven antimicrobial and other bioactive properties, however their usefulness in foods can be mitigated by their high sensory impact. This study examined the application of EOs for fresh produce decontamination addressing control of spoilage microflora and improving shelf-life characteristics whilst also considering the impact on organoleptic properties. The effectiveness of oregano as a decontamination treatment was comparable with that of chlorine. Carrot discs treated with the EO regimes were acceptable in terms of sensory quality and appreciation, therefore oregano could offer a natural alternative for the washing and preservation of fresh produce. Combining EOs with other natural preservatives might minimize doses and reduce the impact on organoleptic properties of fresh vegetables.
Keywords: Essential oils; Spoilage; Sensory; Volatiles; Lettuce; Carrot; Ready-to-eat

Rui Wang, Ruijiang Wang, Bao Yang, Extraction of essential oils from five cinnamon leaves and identification of their volatile compound compositions, Innovative Food Science & Emerging Technologies, Volume 10, Issue 2, April 2009, Pages 289-292, ISSN 1466-8564, DOI: 10.1016/j.ifset.2008.12.002.
(http://www.sciencedirect.com/science/article/B6W6D-4V70RB6-2/2/7cf632b49768cd9ad844947a21359e68)
Abstract:
Five cinnamon species, viz. Cinnamomum cassia, Cinnamomum zeylanicum, Cinnamomum tamala, Cinnamomum burmannii, Cinnamomum pauciflorum, were chosen to prepare essential oils by hydrodistillation and to identify and quantify their volatile compound compositions. C. cassia was determined to have the highest yield (1.54%) of essential oil, followed by C. zeylanicum, C. pauciflorum, C. burmannii and C. tamala. Gas chromatography/mass spectrometry (GC/MS) was used to identify and quantify the volatile compound composition. The results indicated the

apparent difference in the volatile compound compositions of essential oils between species. The total numbers of volatile compounds identified from C. cassia, C. zeylanicum, C. tamala, C. burmannii and C. pauciflorum leaves were 22, 22, 13, 6 and 21, respectively. trans-Cinnamaldehyde was found in the essential oil of each species, which was also the major volatile component of C. cassia and C. burmannii leaves. Besides trans-cinnamaldehyde, 3-methoxy-1,2-propanediol was the main volatile compound of C. cassia leaf, while eugenol of C. zeylanicumand, C. pauciflorum and C. burmannii leaves, and 5-(2-propenyl)-1,3-benzodioxole of C. tamala leaf were also the main substances.Industrial relevance
The essential oil of cinnamon is an important bioactive substance which has many disease prevention effects. In this work, five species of cinnamon leaves were chosen as materials to prepare the essential oils. The yield of essential oil was determined. The volatile compounds of essential oil were identified by GC/MS analysis. The results showed the significant difference of volatile compound composition between species. trans-Cinnamaldehyde was detected to exist in all the species tested as an important volatile component. This work is helpful for extensive development of this medicinal herb.
Keywords: Cinnamon; Hydrodistillation; GC/MS; Volatile compound; Essential oil

Georgia Rocha Vilela, Gustavo Steffen de Almeida, Marisa Aparecida Bismara Regitano D'Arce, Maria Heloisa Duarte Moraes, Jose Otavio Brito, Maria Fatima das G.F. da Silva, Sebastiao Cruz Silva, Sonia Maria de Stefano Piedade, Maria Antonia Calori-Domingues, Eduardo Micotti da Gloria, Activity of essential oil and its major compound, 1,8-cineole, from Eucalyptus globulus Labill., against the storage fungi Aspergillus flavus Link and Aspergillus parasiticus Speare, Journal of Stored Products Research, Volume 45, Issue 2, April 2009, Pages 108-111, ISSN 0022-474X, DOI: 10.1016/j.jspr.2008.10.006.
(http://www.sciencedirect.com/science/article/B6T8Y-4VKVBXX-1/2/c947ec68a3520407e9de5a87cdad70fc)
Abstract:
The essential oil from leaves of Eucalyptus globulus obtained by hydrodistillation, as well as its major compound 1,8-cineole, identified by gas chromatography coupled with a mass selective detector, were evaluated for their effectiveness against the storage fungi Aspergillus flavus and Aspergillus parasiticus. The evaluation was performed by compound dissolution in yeast extract sucrose (YES) medium and exposure to headspace volatiles. Complete fungal growth inhibition of both species was achieved with the essential oil by contact and volatile assays. Volatile exposure showed total inhibition at the lower level tested of 500 [mu]L. The 1,8-cineole tested alone showed partial inhibition only at the highest level of 1.3492 [mu]L. Aflatoxin B1 production was reduced in headspace volatile assays and partial inhibition was observed at the 200 [mu]L dose of the essential oil.
Keywords: Eucalyptus globulus; Essential oil; 1,8-Cineole; Storage fungi; Aflatoxin production

S. Cosimi, E. Rossi, P.L. Cioni, A. Canale, Bioactivity and qualitative analysis of some essential oils from Mediterranean plants against stored-product pests: Evaluation of repellency against Sitophilus zeamais Motschulsky, Cryptolestes ferrugineus (Stephens) and Tenebrio molitor (L.), Journal of Stored Products Research, Volume 45, Issue 2, April 2009, Pages 125-132, ISSN 0022-474X, DOI: 10.1016/j.jspr.2008.10.002.
(http://www.sciencedirect.com/science/article/B6T8Y-4VKMW7H-4/2/bc77a1f7a66aa3109d19962bbf33ae3f)
Abstract:
Essential oils extracted from bay laurel (Laurus nobilis), bergamot (Citrus bergamia), fennel (Foeniculum vulgare) and lavandin (Lavandula hybrida) were tested for repellency against Sitophilus zeamais and Cryptolestes ferrugineus adults and Tenebrio molitor larvae. Composition of L. nobilis essential oil included large amounts of monoterpenes, mainly oxygenated derivatives,

while in C. bergamia essential oil limonene was the main compound followed by linalyl acetate and [gamma]-terpinene and linalool. In lavandin oil there was a prevalence of linalool and linalyl acetate, while phenyl propanoids were the main compounds detected in fennel essential oil. Two kinds of bioassays were performed: filter paper tests, carried out in Petri dishes on all three coleopteran species and tests on treated kernels carried out only on S. zeamais adults. In filter paper bioassays, essential oils showed different activity: on S. zeamais, fennel after 3 h of exposure and bergamot after 24 h exerted the highest repellency, similar results were obtained for C. ferrugineus, but lavandin also showed good repellent activity, while for T. molitor larvae bay laurel was the most effective repellent. Repellency tests on kernels against S. zeamais adults suggested that bergamot and lavandin were the most efficient oils. Even if laboratory bioassays are only the first step towards use of essential oils in practical applications, these substances do represent a possible alternative to chemical insecticides in some market niches.
Keywords: Stored-food insects; Repellent activity; Plant essential oils; Bioassays

M. Chutia, P. Deka Bhuyan, M.G. Pathak, T.C. Sarma, P. Boruah, Antifungal activity and chemical composition of Citrus reticulata Blanco essential oil against phytopathogens from North East India, LWT - Food Science and Technology, Volume 42, Issue 3, April 2009, Pages 777-780, ISSN 0023-6438, DOI: 10.1016/j.lwt.2008.09.015.
(http://www.sciencedirect.com/science/article/B6WMV-4TK47K0-1/2/524d25ff8803738233f88b72e6387b3e)
Abstract:
The essential oil (EO) isolated by hydro-distillation from the peel of fully matured ripen fruits of Citrus reticulata Blanco were analyzed by GC and GC-MS. Thirty seven different components were identified constituting approximately >=99% of the oil. The major components were limonene (46.7%), geranial (19.0%), neral (14.5%), geranyl acetate (3.9%), geraniol (3.5%), [beta]-caryophyllene (2.6%), nerol (2.3%), neryl acetate (1.1%) etc. The antifungal activity of the oil was tested by poisoned food (PF) technique and the volatile activity (VA) assay against five plant pathogenic fungi viz Alternaria alternata (Aa), Rhizoctonia solani (Rs), Curvularia lunata (Cl), Fusarium oxysporum (Fo) and Helminthosporium oryzae (Ho). The oil showed better activity in VA assay. The Minimum inhibitory concentration (MIC) for Aa, Rs and Cl was 0.2 ml/100 ml whereas >0.2 ml/100 ml for Fo and Ho in PF technique. Fungal sporulation was also completely inhibited at 2 ml/100 ml of the oil except for Cl and Ho, which was only 0.5% (+/-0.5) and 0.25% (+/-0.25) respectively as compared to control.
Keywords: Antifungal; Chemical compositions; Citrus reticulata; Essential oil; Phytopathogens

S. Combrinck, T. Regnier, W.G. du Plooy, Use of Lippia scaberrima essential oil in postharvest management of subtropical fruits, South African Journal of Botany, Volume 75, Issue 2, April 2009, Page 396, ISSN 0254-6299, DOI: 10.1016/j.sajb.2009.02.036.
(http://www.sciencedirect.com/science/article/B7XN9-4W0WFVR-10/2/aca79c64b46f9ef25b0718cf9cc94028)

K.M. Swanepoel, W. Alberts, Good agriculture practices for production of essential oil crops, South African Journal of Botany, Volume 75, Issue 2, April 2009, Pages 421-422, ISSN 0254-6299, DOI: 10.1016/j.sajb.2009.02.109.
(http://www.sciencedirect.com/science/article/B7XN9-4W0WFVR-3K/2/cd16ae00d13f942a67ac79d1cce53401)

Huseyin Cetin, James E. Cilek, Levent Aydin, Atila Yanikoglu, Acaricidal effects of the essential oil of Origanum minutiflorum (Lamiaceae) against Rhipicephalus turanicus (Acari: Ixodidae), Veterinary Parasitology, Volume 160, Issues 3-4, 23 March 2009, Pages 359-361, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2008.11.009.

(http://www.sciencedirect.com/science/article/B6TD7-4TX7996-7/2/1b03d380bcb81f6b0573220b2a4de863)
Abstract:
The acaricidal effects of the volatile essential oil Origanum minutiflorum O. Schwarz & P.H. Davis (Lamiaceae) against adult Rhipicephalus turanicus was evaluated at a variety of concentrations and exposure times. Generally tick mortality increased with concentration and exposure. Ticks exposed to vapors from cotton wicks containing at least 10 [mu]l/L resulted in complete (100%) mortality at 120 min. The major constituent of essential oil obtained from the plant material of O. minutiflorum was carvacrol.
Keywords: Origanum minutiflorum; Rhipicephalus turanicus; Tick control; Essential oil

J.C. Matasyoh, Z.C. Maiyo, R.M. Ngure, R. Chepkorir, Chemical composition and antimicrobial activity of the essential oil of Coriandrum sativum, Food Chemistry, Volume 113, Issue 2, 15 March 2009, Pages 526-529, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.07.097.
(http://www.sciencedirect.com/science/article/B6T6R-4T542JT-3/2/684729b28d89fcfb1b292c4d5a08f173)
Abstract:
The essential oil from leaves of Coriandrum sativum L. (Apiaceae), obtained by hydro-distillation was analysed by gas chromatography-mass spectrometry (GC-MS) and also evaluated for in vitro antimicrobial activity. Out of 27 peaks, 24 components, which constitute 92.7%, were identified in the oil. The oil was dominated by aldehydes and alcohols which accounted for 56.1% and 46.3% of the oil, respectively. The major constituents were 2E-decenal (15.9%), decanal (14.3%), 2E-decen-1-ol (14.2%) and n-decanol (13.6%). Other constituents present in fairly good amounts are 2E-tridecen-1-al (6.75%), 2E-dodecenal (6.23%), dodecanal (4.36%), undecanol (3.37%), and undecanal (3.23%). The oil was screened for antimicrobial activity against both Gram positive (Staphylococcus aureus, Bacillus spp.) and Gram negative (Escherichia coli, Salmonella typhi, Klebsiella pneumonia, Proteus mirabilis, Pseudomonas aeruginosae) bacteria and a pathogenic fungus, Candida albicans. The oil showed pronounced antibacterial and antifungal activity against all of the microbes tested, except for P. aeruginosae, which showed resistance.
Keywords: Coriandrum sativum; Apiaceae; Antimicrobial activity; Essential oils; Aldehydes

Halijah Ibrahim, Ahmad Nazif Aziz, Devi Rosmy Syamsir, Nor Azah Mohamad Ali, Mastura Mohtar, Rasadah Mat Ali, Khalijah Awang, Essential oils of Alpinia conchigera Griff. and their antimicrobial activities, Food Chemistry, Volume 113, Issue 2, 15 March 2009, Pages 575-577, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.08.033.
(http://www.sciencedirect.com/science/article/B6T6R-4T7F5N7-1/2/9788c616aa4d87236a46939de601470b)
Abstract:
The essential oils from the dried leaves, pseudostems and rhizomes of Alpinia conchigera Griff. (KL 5049), collected from Jeli province of Kelantan, east coast of Peninsular Malaysia, were isolated by hydrodistillation. The collected oils were analyzed by capillary GC and GC-MS. Forty one compounds were identified, among which 13 have not been detected previously. The leaf, pseudostem and rhizome oils afforded 40, 33 and 39 constituents, respectively. The most abundant components in the leaf oil included [beta]-bisabolene (15.3%), [beta]-pinene (8.2%), [beta]-sesquiphellandrene (7.6%), chavicol (7.5%) and [beta]-elemene (6.0%), while [beta]-bisabolene (19.9%), [beta]-sesquiphellandrene (11.3%), [beta]-caryophyllene (8.8%) and [beta]-elemene (4.7%) were the main components in the pseudostem. In the rhizome, 1,8-cineole (17.9%), [beta]-bisabolene (13.9%), [beta]-sesquiphellandrene (6.8%) and [beta]-elemene (4.0%) were the major components. The essential oils were also subjected to antifungal and antibacterial tests, using the minimum inhibitory concentration (MIC) method. Results revealed weak inhibitions against the microorganisms tested.

Keywords: Alpinia conchigera; Zingiberaceae; Essential oils; Antimicrobial activity; Antifungal activity

Qian Liang, Zong-Suo Liang, Jun-Ru Wang, Wen-Hui Xu, Essential oil composition of Salvia miltiorrhiza flower, Food Chemistry, Volume 113, Issue 2, 15 March 2009, Pages 592-594, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.08.035.
(http://www.sciencedirect.com/science/article/B6T6R-4T7XGWK-2/2/9b6426da1eff38ffca2e960954f590ea)
Abstract:
Hydrodistillation of the flower of seven populations of Salvia miltiorrhiza Bge. collected in different locations in China afforded a pale yellowish oil in a yield of approximately 0.2%. A total of 82 compounds were identified across all the samples, accounting for 98-100% of the total compositions of each sample. Components were mainly monoterpenes, sesquiterpenes, fatty acids and alkanes. GC and GC-MS analysis indicated that the predominant components of the essential oils are [beta]-caryophyllene (12.2-31.7%), [beta]-caryophyllene oxide (1.4-11.6%), [alpha]-caryophyllene (4.8-10.6%), cadinadiene (7.4-29.3%), and hexadecanoic acid (3.9-18.8%).
Keywords: Salvia miltiorrhiza flower; Essential oil; GC; GC-MS; [beta]-Caryophyllene

Asghar Safaralie, Shohreh Fatemi, Alireza Salimi, Experimental design on supercritical extraction of essential oil from valerian roots and study of optimal conditions, Food and Bioproducts Processing, In Press, Corrected Proof, Available online 13 March 2009, ISSN 0960-3085, DOI: 10.1016/j.fbp.2009.02.002.
(http://www.sciencedirect.com/science/article/B8JGD-4VTVJYT-1/2/96f4cf65c3aaf914bfb838c853090557)
Abstract:
Supercritical CO2 extraction from valerian (Valeriana officinalis L.) roots was studied. The objective of this study was to optimize the independent process parameters (temperature, pressure, dynamic time and modifier volume) in order to attain the highest yield of the essential oil and valerenic acids as the desired compounds. The process optimization was based on a simplex centroid design (mixture design), coupled with the statistical and graphical analysis of the results. Due to the features of mixture method and to the proper ratios of four independent variables, the optimal points were in the range of temperature (37 [degree sign]C), pressure (24.3-25.0 MPa), dynamic time (19-24 min) and modifier volume (100-200 [mu]l).
Keywords: Valerian; Supercritical fluid extraction; Valerenic acid; Essential oil; Simplex centroid design

Mehdi Rahimmalek, Badraldin Ebrahim Sayed Tabatabaei, Nematolah Etemadi, Sayed Amir Hossein Goli, Ahmad Arzani, Hossein Zeinali, Essential oil variation among and within six Achillea species transferred from different ecological regions in Iran to the field conditions, Industrial Crops and Products, Volume 29, Issues 2-3, March 2009, Pages 348-355, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.07.001.
(http://www.sciencedirect.com/science/article/B6T77-4T8332G-1/2/94188cde24eed4fb5aa1ce8a2c8b2dab)
Abstract:
The compositions of essential oils of 19 accessions belonging to six different Achillea species, transferred from the natural habitats in 10 provinces of Iran to the field conditions, were assessed. The relationship between the leaf areas of selected accessions with their essential oil content was also investigated. Essential oil yield of dried plants obtained by hydro-distillation ranged from 0.1 to 2.7% in leaves. Results indicated a significant variation in oil composition among and within species. Total of 94 compounds were identified in 19 accessions belonging to the six species of A. millefolium, A. filipendulina, A. tenuifolia, A. santolina, A. biebersteinii and A. eriophora. The major

constituents of the leaves in the tested genotypes were determined as germacrene-D, bicyclogermacrene, camphor, borneol, 1,8-cineole, spathulenol and bornyl acetate. According to the major compounds, four chemotypes were defined as: (I) spathulenol (1.64-34.31%) + camphor (0.2-15.61%) (7 accessions); (II1) germacrene-D (18.78-23.93%) + borneol (7.93-8.26%) + bornyl acetate (11.56-14.66%) (5 accessions); (II2) germacrene-D (13.28-36.28%) + bicyclogermacrene (5.93-8.4%) + 1,8-cineole (15.26-19.41%) + camphor (14.95-23.32%) (2 accessions); (III) borneol + camphor (52.04-63.27) (2 accessions); (IV) germacrene-D (45.86-69.64%) (3 accessions). The relationships of chemotypes with soil type and climatic conditions of collected regions were assessed, as probable reasons of high variations in essential oil components, and discussed.
Keywords: Achillea species; Essential oil; Leaves; Leaf area; Monoterpenes; Sesquiterpenes

R. Perrini, I. Morone-Fortunato, E. Lorusso, P. Avato, Glands, essential oils and in vitro establishment of Helichrysum italicum (Roth) G. Don ssp. microphyllum (Willd.) Nyman, Industrial Crops and Products, Volume 29, Issues 2-3, March 2009, Pages 395-403, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.07.010.
(http://www.sciencedirect.com/science/article/B6T77-4TM9NCY-1/2/1c5b073cd35262f1b7daca8487b39151)
Abstract:
In this work, two Helichrysum italicum (Roth) G. Don ssp. microphyllum (Willd.) Nym. genotypes (genotype 1 and genotype 12) collected from different areas of Corsica were used. After the taxonomic identification based on several specific morphological characters, the two genotypes were subjected to microscopic studies. The precise structure of the glandular trichomes, secreting essential oils, on the flower heads and leaves of H. italicum (Roth) G. Don ssp. microphyllum (Willd.) Nym. are described here for the first time. Volatile constituents from both field-grown genotypes 1 and 12 were analyzed and their composition compared: monoterpenes were the most abundant class of compounds with nerol and its esters as the main metabolites. Genotype 12 was used to establish an efficient micropropagation protocol. For proliferation, different concentrations of 6-benzylaminopurine (BAP) alone or in combination with indole-3-butyric acid (IBA) were tested adding sucrose (20% or 30%). To define the optimal conditions for in vitro rooting, the shoots obtained were divided and transferred to the culture medium without growth regulators or enriched by different auxins in combination with sucrose (20% or 30%). Acclimatization, carried out in different conditions was easy, registering high survival percentages. The results achieved in this study allowed to obtain selected and standardized plants suitable for the exploitation in industrial sectors of this interesting species.
Keywords: Helichrysum italicum; H. italicum ssp. microphyllum; Everlasting; Micropropagation; Glands; Essential oils

Ali Azizi, Feng Yan, Bernd Honermeier, Herbage yield, essential oil content and composition of three oregano (Origanum vulgare L.) populations as affected by soil moisture regimes and nitrogen supply, Industrial Crops and Products, Volume 29, Issues 2-3, March 2009, Pages 554-561, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.11.001.
(http://www.sciencedirect.com/science/article/B6T77-4V5GCT7-1/2/1639337ddbf9955df43d1ef93546d29f)
Abstract:
To compare the response of oregano (Origanum vulgare L.) populations to soil moisture regimes and nitrogen fertilization, a greenhouse experiment with three populations of oregano cultivated in Germany (O. vulgare var. creticum, O. vulgare ssp. hirtum, O. vulgare var. samothrake) was conducted during 2006-2007 at the research station Rauischholzhausen of Justus Liebig University in Germany. A completely randomized experimental design with three soil moisture regimes (optimal, consistent water deficiency and water deficiency from the beginning of flowering) and two nitrogen fertilization levels with six replications was realized. Dry matter production of

population O. vulgare var. samothrake was stable for two experiment years, whereas those of the populations O. vulgare var. creticum and O. vulgaressp. hirtum were higher in 2007 than in 2006. Among tested populations O. vulgare var. samothrake showed the highest essential oil content in both experiment years. Consistent water deficiency caused reduction of dry matter, but not essential oil content. Water deficiency in flowering stage reduced also dry matter production, but increased essential oil content, resulting in the highest essential oil yield in 2006 and a comparable essential oil yield as control in 2007. Higher nitrogen levels caused an increase in dry matter production of oregano for both experiment years and a decrease in essential oil content in 2007, which can be explained in terms of dilution effect. Totally, 42 compounds were identified in essential oils of three populations by means of GC-MS. Carvacrol was the dominant compound (70.0-77.4%) for all essential oil samples, followed by [gamma]-terpinene (8.1-9.5%) and p-cymene (4.5-5.3%). The composition of essential oil of oregano populations was independent of cultivation conditions. In conclusion, the population of O. vulgare var. samothrake showed a stable dry matter yield with higher essential oil content than the populations of O. vulgare var. creticum and O. vulgare ssp. hirtum. Water deficiency after beginning of blooming (folded flowers) can induce an increase in essential oil content and thus result in higher quality of oregano herbage and higher water use efficiency of oregano plants.
Keywords: Origanum vulgare; Essential oil; Nitrogen application; Soil moisture regime; Carvacrol

Saban Kordali, Ahmet Cakir, Tulay Aytas Akcin, Ebru Mete, Adnan Akcin, Tuba Aydin, Hamdullah Kilic, Antifungal and herbicidal properties of essential oils and n-hexane extracts of Achillea gypsicola Hub-Mor. and Achillea biebersteinii Afan. (Asteraceae), Industrial Crops and Products, Volume 29, Issues 2-3, March 2009, Pages 562-570, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.11.002.
(http://www.sciencedirect.com/science/article/B6T77-4V6YSY1-1/2/416278054e312ec4a65ea0f519768f83)
Abstract:
The chemical composition of essential oils isolated by hydrodistillation from the aerial parts of Achillea gypsicola Hub-Mor., Achillea biebersteinii Afan. and n-hexane extracts obtained from the flowers of A. gypsicola and A. biebersteinii Afan. was analyzed by GC and GC-MS. Camphor (40.17-23.56%, respectively), 1,8-cineole (22.01-38.09%, respectively), piperitone (11.29-0.37%, respectively), borneol (9.50-5.88%, respectively) and [alpha]-terpineol (1.56-5.15%, respectively) were found to be the main constituents in A. gypsicola and A. biebersteinii essential oils. Furthermore, hexane extracts of A. gypsicola and A. biebersteinii consist of mainly camphor (37.78-27.88%, respectively), 1,8-cineole (13.43-24.78%, respectively), piperitone (15.57%-tr, respectively), n-eicosane (1.61-9.68%, respectively), n-heneicosane (2.56-9.55%, respectively), n-tricosane (3.46-10.04%, respectively), linoleic acid (6.19-3.17%, respectively) and borneol (5.66-5.58%, respectively). Although the oils and extracts were characterized relatively by high content of oxygenated monoterpenes, hexane extracts of the plant samples relatively rich in n-alkanes, fatty acids and fatty acid esters as compared with the oil. The oils and hexane extracts were also tested against 12 phytopathogenic fungi and the oils found to be more toxic as compared with hexane extracts of the plant samples. A. gypsicola oil only did not inhibit the growth of Fusarium graminearum. The extracts also strongly increased the growth of Fusarium equiseti and F. graminearum. Therefore, the antifungal activity of the oils can be attributed to their relatively high content of oxygenated monoterpenes. The results of herbicidal assays of the essential oils and hexane extracts of the plant samples against five important weeds in cultivated areas, Amaranthus retroflexus L., Chenopodium album L., Cirsium arvense L. (Scop.), Lactuca serriola L. and Rumex crispus L. showed that, in particular, the oils had inhibitory effects on the seed germination and seedling growth of A. retroflexus, C. arvense and L. serriola. The hexane extracts also showed lower herbicidal effect against the weeds in comparison to that of the oils. The findings of the

present study suggest that the essential oils have a potential to be used as herbicide as well as fungicide.
Keywords: Achillea gypsicola; Achillea biebersteinii; Camphor; 1,8-Cineole; Piperitone; Antifungal activity; Herbicidal effect

Christos Dordas, Foliar application of calcium and magnesium improves growth, yield, and essential oil yield of oregano (Origanum vulgare ssp. hirtum), Industrial Crops and Products, Volume 29, Issues 2-3, March 2009, Pages 599-608, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.11.004.
(http://www.sciencedirect.com/science/article/B6T77-4VBM4BN-1/2/095b68814829482265f9a39c6c26da76)
Abstract:
Oregano is one of the most important spices, is used all over the world, and includes many species. One of the most important commercially grown species is Origanum vulgare ssp. hirtum (Link) Ietsw (syn.: O. heracleoticum.), which is endemic to the Mediterranean area. O. vulgare ssp. hirtum is a crop species which is well adapted to both dry land conditions and calcareous soils. The objectives of this study were to determine the effects of foliar Ca2+ and Mg2+ applications on growth, yield, essential oil content, and essential oil yield of oregano. Five treatments (0, 0.5% Ca, 1% Ca, 1% Mg, and 2% Mg) were used, and the experiment was repeated at two locations over two growth periods (2005 and 2006) in northern Greece in a sandy loam and sandy clay soil. Foliar applications with Ca2+ and Mg2+ increased the Ca2+ and Mg2+ concentration of the leaves. Ca2+ and Mg2+ applications affected plant height as the plants were shorter in the control treatment and increased with Ca2+ and Mg2+ applications by an average of 10% during the 2-year period and at the both locations compared with the control. Also, Ca2+ and Mg2+ applications increased the number of stems per plant by an average of 23% in both years and at both locations. Chlorophyll concentration was affected by Ca2+ and Mg2+ applications and subsequently increased an average of 23% with Ca2+ and 38% with Mg2+ compared with the control. Applications of Ca2+ and Mg2+ decreased the number of days required for oregano plants to flower by an average of 3-4 days compared with the control. Dry matter yield also increased 22% with Ca2+ and Mg2+ during the 2-year study and at both locations compared with the control treatment. In addition, the Ca2+ and Mg2+ applications affected the essential oil yield, but they did not affect the essential oil content. These results show that Ca2+ and Mg2+ applications can affect the growth and yield of oregano, especially when the plant is grown in acid soils. However, the physiological basis of this effect remains unknown.
Keywords: Oregano; Origanum vulgare ssp. hirtum; Calcium; Magnesium; Foliar; Essential oils; Quality

R.S. Chauhan, M.K. Kaul, A.K. Shahi, Arun Kumar, G. Ram, Aldo Tawa, Chemical composition of essential oils in Mentha spicata L. accession [IIIM(J)26] from North-West Himalayan region, India, Industrial Crops and Products, Volume 29, Issues 2-3, March 2009, Pages 654-656, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.12.003.
(http://www.sciencedirect.com/science/article/B6T77-4VFBY7D-1/2/148d3c3b9be21e1402a02c547186beaa)
Abstract:
Mentha spicata L. (spearmint) was collected from different sub-tropical and temperate zones of North-West Himalayan region of India. Plants were collected during the flowering stage and essential oil was extracted using Clevenger-type apparatus for 2.5 h and analyzed. GC-MS analysis reveals that carvone was major part which varied between 49.62%-76.65%, second major component was limonene that varied between 9.57%-22.31%. 1,8-cineole varied between 1.32%-2.62%, whereas trans-carveol varied between 0.3%-1.52%. Out of 26 collections, one accession

was found rich in carvone (76.65%) along with low limonene content (9.57%). Chemical composition of this accession is described in detail.
Keywords: Chemical composition; Essential oil; GC-MS; Volatile oil

Manel Neffati, Brahim Marzouk, Erratum to 'Changes in essential oil and fatty acid composition in coriander (Coriandrum sativum L.) leaves under saline conditions' [Ind. Crops Prod. 28 (2) (2008) 137-142], Industrial Crops and Products, Volume 29, Issues 2-3, March 2009, Page 657, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.08.004.
(http://www.sciencedirect.com/science/article/B6T77-4TJ5YN8-1/2/c3f8a9630984c3acc19a9c12eeb6e4f4)

N. Soultos, Z. Tzikas, E. Christaki, K. Papageorgiou, V. Steris, The effect of dietary oregano essential oil on microbial growth of rabbit carcasses during refrigerated storage, Meat Science, Volume 81, Issue 3, March 2009, Pages 474-478, ISSN 0309-1740, DOI: 10.1016/j.meatsci.2008.10.001.
(http://www.sciencedirect.com/science/article/B6T9G-4TMBPY4-2/2/674ce146f7de27be4789d0ce6f35d006)
Abstract:
The effect of dietary supplementation with oregano essential oil on microbial growth of rabbit carcasses during refrigerated storage was investigated. A total of 45 weaned rabbits were separated into three equal groups with three subgroups each. One group was given the basal diet and served as control and the other two groups were administered diets supplemented with oregano essential oil at levels of 100 and 200 mg/kg diet, respectively (OR100 and OR200 groups). Total viable counts, Pseudomonas spp., lactic acid bacteria, Brochothrix thermosphacta, Enterobacteriaceae and yeast and mould counts, as well as off-odours and appearance of slime were all assessed on rabbit carcasses stored at 3 +/- 1 [degree sign]C for 12 days. The results showed that performance parameters were not affected ($p > 0.05$) whereas the dietary supplementation with oregano essential oil resulted in lower ($p < 0.05$) average microbial counts on the carcasses, compared to controls, throughout storage. Dietary supplementation with oregano essential oil at 200 mg/kg was more effective in inhibiting microbial growth compared with 100 mg/kg. Sensory evaluation scores indicated that the carcasses obtained from OR100 and OR200 groups gave a noticeable putrid odour after days 8 and 10, respectively, whereas the control carcasses developed off-odours after the 6th day of storage. Slime formation in the controls was observed after day 6, while the OR100 and OR200 groups were just beginning to show slime after days 8 and 10, respectively.
Keywords: Oregano essential oil; Rabbit carcasses; Refrigerated storage; Microbial growth

Yeon-Suk Lee, Junheon Kim, Sang-Gil Lee, Eunsung Oh, Sang-Chul Shin, Il-Kwon Park, Effects of plant essential oils and components from Oriental sweetgum (Liquidambar orientalis) on growth and morphogenesis of three phytopathogenic fungi, Pesticide Biochemistry and Physiology, Volume 93, Issue 3, March 2009, Pages 138-143, ISSN 0048-3575, DOI: 10.1016/j.pestbp.2009.02.002.
(http://www.sciencedirect.com/science/article/B6WP8-4VKXBYF-1/2/5ea0b4d7544187efb05eb84d425d4691)
Abstract:
Commercial plant essential oils obtained from 40 plant species were tested for their antifungal activity against Phytophthora cactorum, Cryphonectria parasitica, and Fusarium circinatum. Strong antifungal activity against Phytophthora cactorum was achieved with the essential oil derived from Oriental sweetgum, Liquidambar orientalis at 28 x 10-3 mg/mL air concentration. In a test with C. parasitica, inhibition rate of patchouli was 51.0%, whereas the other essential oils showed weak activity. Essential oils of manuka (Leptospermum scoparium) and patchouli (Pagostemon

patchouli) showed moderate activity against F. circinatum. Analysis by gas chromatography-mass spectrometry led to identification of 11 compounds in the oil of L. orientalis. The antifungal activity of identified compounds was tested singularly by using standard or synthesized compounds. Inhibition rates of cinnamyl aldehyde and benzaldehyde were 100% against P. cactorum at 28 x 10-3 mg/mL air concentration. There was a significant morphological alternation in three phytopathogenic fungi after oil or compound treatment.
Keywords: Plant essential oils; Antifungal activity; Oriental sweetgum; Cinnamyl aldehyde; SEM

Feyza Oke, Belma Aslim, Sahlan Ozturk, Senol Altundag, Essential oil composition, antimicrobial and antioxidant activities of Satureja cuneifolia Ten., Food Chemistry, Volume 112, Issue 4, 15 February 2009, Pages 874-879, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.06.061.
(http://www.sciencedirect.com/science/article/B6T6R-4SX3P3G-6/2/29760f125ba44f2d6863333962c161dc)
Abstract:
Satureja cuneifolia Ten. is a well-known aromatic plant which is frequently used as a spice and herbal tea in Anatolia. S. cuneifolia oil was analyzed by gas chromatography/mass spectrometry (GC/MS). The major components of S. cuneifolia oil were carvacrol (44.99%) and p-cymene (21.61%). The essential oil of S. cuneifolia exhibited antimicrobial activity against all of the tested foodborne and spoilage bacteria. The minimum inhibitory concentration (MIC) values for test bacteria which were sensitive to the essential oil of S. cuneifolia were in the range of 600-1400 [mu]g/ml. Antioxidant activities of the essential oil and the methanolic extract from S. cuneifolia were evaluated by using DPPH radical scavenging, [beta]-carotene-linoleic acid bleaching and metal chelating activity assays. In addition, the amounts of total phenol components in the plant methanolic extract (222.5 +/- 0.5 [mu]g/mg) and the oil (185.5 +/- 0.5 [mu]g/mg) were determined.
Keywords: Satureja cuneifolia; Antimicrobial activity; GC/MS analysis; Antioxidant activity

Wissem Aidi Wannes, Baya Mhamdi, Brahim Marzouk, Variations in essential oil and fatty acid composition during Myrtus communis var. italica fruit maturation, Food Chemistry, Volume 112, Issue 3, 1 February 2009, Pages 621-626, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.06.018.
(http://www.sciencedirect.com/science/article/B6T6R-4SSY910-6/2/4fa37962e1372de049df251c8483c8e7)
Abstract:
The essential oil and fatty acid composition of Myrtus communis var. italica fruit during its ripening was determined. The effect of the harvesting time on some physical properties of Myrtus fruits, fruit weight and moisture content, were significant. The increase of fruit weight (from 2.54 to 8.79 g% fruits) during ripeness was correlated positively with that of moisture content (from 28% to 72%). Fruit essential oil yields varied from 0.003% to 0.01% and showed a remarkable increase at 60 days after flowering to reach a maximum of 0.11%. Forty-seven volatile compounds were identified in fruit essential oils; 1,8-cineole (7.31-40.99%), geranyl acetate (1.83-20.54%), linalool (0.74-18.92%) and [alpha]-pinene (1.24-12.64%) were the main monoterpene compounds. Total fatty acid contents varied from 0.81% to 3.10% during fruit maturation and the predominant fatty acids were linoleic (12.21-71.34%), palmitic (13.58-37.07%) and oleic (6.49-21.89%) acids. The linoleic acid proportions correlated inversely with palmitic and oleic acids during all the stages of ripening.
Keywords: Myrtus communis var. italica; Myrtaceae; Fruit; Essential oil; Fatty acids; Maturation

Lenka Nedorostova, Pavel Kloucek, Ladislav Kokoska, Miluse Stolcova, Josef Pulkrabek, Antimicrobial properties of selected essential oils in vapour phase against foodborne bacteria, Food Control, Volume 20, Issue 2, February 2009, Pages 157-160, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.03.007.

(http://www.sciencedirect.com/science/article/B6T6S-4S6P1Y9-4/2/5e48f6bc4e9d16f73b4c4117bc2daa8f)
Abstract:
The aim of this study was to identify antimicrobial properties of essential oils in vapour phase. In vitro antibacterial activity against five foodborne bacteria (Escherichia coli, Listeria monocytogenes, Pseudomonas aeruginosa, Salmonella enteritidis, Staphylococcus aureus) was evaluated by disc volatilization method. The results were expressed as minimum inhibitory concentrations (MIC) in [mu]l/cm3 of air. Thirteen of the 27 essential oils were active at least against one bacterial strain in the range of tested concentrations (0.0083-0.53 [mu]l/cm3). The best results were shown by Armoracia rusticana (MIC 0.0083 [mu]l/cm3) against all of the strains, followed by Allium sativum > Origanum vulgare > Thymus vulgaris > Satureja montana, Thymus pulegioides > Thymus serpyllum > Origanum majorana > Caryopteris x clandonensis, Hyssopus officinalis, Mentha villosa, Nepeta x faassenii, Ocimum basilicum var. grant verte. In conclusion, certain essential oils are highly effective in vapour phase and could be used in control of foodborne bacterial pathogens.
Keywords: Essential oils; Foodborne bacteria; Vapour phase

N.L. Tatsadjieu, P.M. Jazet Dongmo, M.B. Ngassoum, F-X. Etoa, C.M.F. Mbofung, Investigations on the essential oil of Lippia rugosa from Cameroon for its potential use as antifungal agent against Aspergillus flavus Link ex. Fries, Food Control, Volume 20, Issue 2, February 2009, Pages 161-166, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.03.008.
(http://www.sciencedirect.com/science/article/B6T6S-4S6P1Y9-2/2/f8b86af200e113874351b7f527b714ca)
Abstract:
Lippia rugosa essential oil was tested for its effectiveness against Aspergillus flavus on artificial growth media. The chemical composition of the oil was determined by gas chromatography-mass spectrometry (GC-MS). Geraniol (51.5%), nerol (18.6%) and geranial (10.4%) were the main components of Lippia oil. After 8 days of incubation on essential oil supplemented medium, mycelium growth of A. flavus was totally inhibited by 1000 mg l-1 of L. rugosa essential oil. The effect of essential oil on aflatoxin B1 synthesis was evaluated in SMKY broth. The medium supplemented with different essential oil concentrations, was inoculated with A. flavus mycelium and incubated at 25 [degree sign]C. After 2, 4, 6 and 8 days, aflatoxin B1 (AFB1) was quantified in the supernatant using Enzyme Linked Immuno-Sorbent Assay (ELISA). Results showed that aflatoxin B1 synthesis was inhibited by 1000 mg l-1 of L. rugosa essential oil after 8 days of incubation. The effect of the EO on the H+-ATPase pumping membrane was also evaluated in the presence of several concentrations of oil (200-2000 mg l-1) by monitoring glucose-induced acidification of the external medium. L. rugosa essential oil at the concentration of 2000 mg l-1 completely inhibited the activity of this enzyme. These data suggest that the essential oil of L. rugosa is a fungicidal for A. flavus and its possible cellular target include the H+-ATPase.
Results obtained in the present study indicate the possibility of exploiting Lippia rugosa essential oil in the fight against strains of A. flavus responsible for biodeterioration of stored foods products.
Keywords: Natural fungicide; Essential oil; Aspergillus flavus; Lippia rugosa; Geranial; Geraniol; Nerol

Nguyen Thi Dung, Vivek K. Bajpai, Jung In Yoon, Sun Chul Kang, Anti-inflammatory effects of essential oil isolated from the buds of Cleistocalyx operculatus (Roxb.) Merr and Perry, Food and Chemical Toxicology, Volume 47, Issue 2, February 2009, Pages 449-453, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.11.033.
(http://www.sciencedirect.com/science/article/B6T6P-4V34DCJ-3/2/8fb090adea6e440ece810b094188aba1)
Abstract:

Cleistocalyx operculatus (Roxb.) Merr and Perry buds (Myrtaceae) are widely used in folk medicine for the treatment of gastric ailments as well as an antiseptic agent in China, Vietnam and some other tropical countries. However, to be clinically useful, more scientific data are needed. In the present study, we investigated the in vitro and in vivo anti-inflammatory activities of the essential oil of the C. operculatus buds (EO-CO). In the applied tests, EO-CO significantly inhibited lipopolysaccharide (LPS)-induced secretion of pro-inflammatory cytokines, including tumor necrosis factor-[alpha] (TNF-[alpha]) and interleukin-1[beta] (IL-1[beta]), in RAW 264.7 cells, a mouse macrophage-like cell line. Also the mRNA expression of TNF-[alpha] and IL-1[beta] was suppressed by treatment with EO-CO in LPS-stimulated RAW 264.7 cells. Moreover, reporter gene analysis revealed that the EO-CO significantly blocked LPS-induced transcriptional activation of NF-[kappa]B in RAW 264.7 cells. Nuclear translocation of p65 subunit was also suppressed by EO-CO treatment. In addition, EO-CO inhibited phorbol ester-induced increase in ear swelling and skin water content in BALB/c mice. These results suggest that EO-CO might exert an anti-inflammatory effect by suppressing the expression of pro-inflammatory cytokines which is mediated, at least in part, by blocking NF-[kappa]B activation.
Keywords: Cleistocalyx operculatus; Essential oil; Anti-inflammatory effects; TNF-[alpha]; IL-1[beta]; NF-[kappa]B

Nabil Bousbia, Maryline Abert Vian, Mohamed A. Ferhat, Brahim Y. Meklati, Farid Chemat, A new process for extraction of essential oil from Citrus peels: Microwave hydrodiffusion and gravity, Journal of Food Engineering, Volume 90, Issue 3, February 2009, Pages 409-413, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.06.034.
(http://www.sciencedirect.com/science/article/B6T8J-4SWWSY7-1/2/07aa7f6b9070fc0969e49a2d4042e330)
Abstract:
Attention is drawn to the development of a new and green alternative technique for the extraction of essential oil from citrus peels. The process uses the hydro-diffusion phenomenon generated by microwaves to extract essential oil from the inside to the outside of the biological material and gravity to collect and separate them. The present apparatus permits fast and efficient extraction, reduces waste, avoids water and solvent consumption, and allows substantial energy savings.
Keywords: Microwave; Extraction; Hydro-diffusion; Essential oil; Citrus

Jaroslav Havlik, Milos Budesinsky, Pavel Kloucek, Ladislav Kokoska, Irena Valterova, Sona Vasickova, Vaclav Zeleny, Norsesquiterpene hydrocarbon, chemical composition and antimicrobial activity of Rhaponticum carthamoides root essential oil, Phytochemistry, Volume 70, Issue 3, February 2009, Pages 414-418, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2008.12.018.
(http://www.sciencedirect.com/science/article/B6TH7-4VHWB0F-2/2/2600c162fb8e79ee1a7362fd2a0fc2b9)
Abstract:
A detailed analysis of Rhaponticum carthamoides (Willd.) Iljin root essential oil was carried out by GC, GC-MS and GC-FTIR techniques. In total, 30 components were identified, accounting for 98.0% of total volatiles. A norsesquiterpene 13-norcypera-1(5),11(12)-diene (22.6%), followed by aplotaxene (21.2%) and cyperene (17.9%), were isolated and their structures confirmed by 1D and 2D-NMR spectra (COSY, ROESY, HSQC, HMBC and INADEQUATE). Selinene type sesquiterpenes and aliphatic hydrocarbons were among minor constituents of the essential oil. The oil exhibited antimicrobial activity against 5 of 9 strains of bacteria and yeast, when tested using broth micro-dilution method. Minimum inhibitory concentrations ranged between 32 and 256 [mu]g/ml.
Keywords: Rhaponticum carthamoides; Essential oil; 13-Norcypera-1(5),11(12)-diene; Aplotaxene; Cyperene; Antimicrobial activity

Mostafa Khajeh, Yadollah Yamini, Shahab Shariati, Comparison of essential oils compositions of Nepeta persica obtained by supercritical carbon dioxide extraction and steam distillation methods, Food and Bioproducts Processing, In Press, Corrected Proof, Available online 10 January 2009, ISSN 0960-3085, DOI: 10.1016/j.fbp.2008.11.003.
(http://www.sciencedirect.com/science/article/B8JGD-4VBM4K9-1/2/43df230290cf4b7cabdd0e78f62bbd2f)
Abstract:
Essential oil of Nepeta persica cultivated in Iran was obtained by steam distillation and supercritical (carbon dioxide) extraction methods. The oils were analysed by capillary gas chromatography using flame ionization and mass spectrometric detections. The compounds were identified according to their retention indices and mass spectra (EI, 70 eV). The effects of different parameters such as pressure, temperature, modifier volume and extraction times (dynamic and static) on the supercritical fluid extraction (SFE) of N. persica oil were investigated. The results showed that under the pressure of 20.3 MPa, temperature of 45 [degree sign]C, methanol of 1.5% v/v), dynamic extraction time of 50 min and static extraction time of 25 min extraction was more selective for the 4[alpha][beta],7[alpha],7a[alpha]-nepetalactone. Twelve compounds were identified in the steam-distilled oil. The major components of N. persica were 4[alpha][beta],7[alpha],7a[alpha]-nepetalactone (26.5%), cis-[beta]-farnesene (4.4%) and 3,4[alpha]-dihydro-4a[alpha],7[alpha],7a[alpha]-nepetalactone (3.5%). However, by using supercritical carbon dioxide under optimum conditions, only two components have more than 90.0% of the oil. The extraction yield based on steam distillation was 0.08% (v/w). On the other hand, using SFE extraction yield in the range of 0.22-8.90% (w/w) were obtained at different conditions. The results show that, in Iranian N. persica oil, 4[alpha][beta],7[alpha],7a[alpha]-nepetalactone is a major component.
Keywords: Nepeta persica; Supercritical carbon dioxide; Steam distillation; Essential oil; 4[alpha][beta],7[alpha],7a[alpha]-Nepetalactone

Sen-Sung Cheng, Chin-Gi Huang, Ying-Ju Chen, Jane-Jane Yu, Wei-June Chen, Shang-Tzen Chang, Chemical compositions and larvicidal activities of leaf essential oils from two eucalyptus species, Bioresource Technology, Volume 100, Issue 1, January 2009, Pages 452-456, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.02.038.
(http://www.sciencedirect.com/science/article/B6V24-4S7HS93-1/2/2070ae40915059fbb100ed060ba60c93)
Abstract:
In the current study, the mosquito larvicidal activity of leaf essential oils and their constituents from two eucalyptus species (Eucalyptus camaldulensis and Eucalyptus urophylla) against two mosquito species, Aedes aegypti and Aedes albopictus, was investigated. In addition, the chemical compositions of the leaf essential oils were analyzed using gas chromatography-mass spectrometry. Results from the larvicidal tests revealed that essential oil from the leaves of E. camaldulensis had an excellent inhibitory effect against both A. aegypti and A. albopictus larvae. The 12 pure constituents extracted from the two eucalyptus leaf essential oils were also tested individually against two mosquito larvae. Among the six effective constituents, [alpha]-terpinene exhibits the best larvicidal effect against both A. aegypti and A. albopictus larvae. Results of this study show that the leaf essential oil of E. camaldulensis and its effective constituents might be considered as a potent source for the production of fine natural larvicides.
Keywords: Eucalyptus camaldulensis; Eucalyptus urophylla; Essential oils; Aedes aegypti; Aedes albopictus

Sen-Sung Cheng, Ju-Yun Liu, Chin-Gi Huang, Yen-Ray Hsui, Wei-June Chen, Shang-Tzen Chang, Insecticidal activities of leaf essential oils from Cinnamomum osmophloeum against three

mosquito species, Bioresource Technology, Volume 100, Issue 1, January 2009, Pages 457-464, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.02.030.
(http://www.sciencedirect.com/science/article/B6V24-4S9RDDH-3/2/6ad88fc4f572754886ed5af8e4670a67)
Abstract:
The larvicidal activities of leaf essential oils and their constituents from six chemotypes of indigenous cinnamon (Cinnamomum osmophloeum Kaneh.) trees were evaluated against three mosquito species. Results of larvicidal tests demonstrated that the leaf essential oils of cinnamaldehyde type and cinnamaldehyde/cinnamyl acetate type had an excellent inhibitory effect against Aedes albopictus larvae, and their LC50 values in 24 h were 40.8 [mu]g/ml (LC90 = 81.7 [mu]g/ml) and 46.5 [mu]g/ml (LC90 = 83.3 [mu]g/ml), respectively. Results of the 24-h mosquito larvicidal assays also showed that the effective constituents in leaf essential oils were trans-cinnamaldehyde and benzaldehyde and that the LC50 values of these constituents against A. albopictus larvae were below 50 [mu]g/ml. In addition, cinnamaldehyde type leaf essential oil and trans-cinnamaldehyde have also exhibited great larvicidal performance against Culex quinquefasciatus and Armigeres subalbatus larvae. Comparisons of mosquito larvicidal activity of trans-cinnamaldehyde congeners revealed that [alpha]-methyl cinnamaldehyde, benzaldehyde, and trans-cinnamaldehyde exhibited strong mosquito larvicidal activity.
Keywords: Cinnamomum osmophloeum; Essential oils; Aedes albopictus; Culex quinquefasciatus; Armigeres subalbatus

Sen-Sung Cheng, Meng-Thong Chua, Ed-Haun Chang, Chin-Gi Huang, Wei-June Chen, Shang-Tzen Chang, Variations in insecticidal activity and chemical compositions of leaf essential oils from Cryptomeria japonica at different ages, Bioresource Technology, Volume 100, Issue 1, January 2009, Pages 465-470, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.11.060.
(http://www.sciencedirect.com/science/article/B6V24-4RH8SDH-5/2/a640d78c54a5cdf77fad7bccdfcc4107)
Abstract:
The larvicidal effects of the essential oils extracted from the leaves of Cryptomeria japonica at different ages (58, 42, and 26 years old) against 2 mosquito species, Aedes aegypti and Aedes albopictus, were studied. The analysis of major constituents of these essential oils was also investigated. Results obtained from the larvicidal tests, using essential oil from the leaves of 58-year-old C. japonica was found to be most effective against both A. aegypti and A. albopictus larvae, indicating tree age has significant influence on mosquito larvicidal activity. In addition, the eleven pure constituents from C. japonica leaf essential oil were also tested individually against the two mosquito larvae. Among them, [alpha]-terpinene, [gamma]-terpinene, p-cymene, 3-carene, terpinolene, and [beta]-myrcene shows strong larvicidal effect against the two mosquito larvae. Among these pure constituents, 3-carene exhibits the best larvicidal effect against A. aegypti and terpinolene shows an excellent inhibitory action against A. albopictus larvae. The results of this study show that the leaf essential oil and its effective constituents might be considered as a potent source for the production of fine natural larvicides.
Keywords: Cryptomeria japonica; Aedes aegypti; Aedes albopictus; Essential oils; Mosquito larvicidal activity

Emanuela Vurro, Renato Bruni, Alberto Bianchi, Luigi Sanita di Toppi, Elevated atmospheric CO2 decreases oxidative stress and increases essential oil yield in leaves of Thymus vulgaris grown in a mini-FACE system, Environmental and Experimental Botany, Volume 65, Issue 1, January 2009, Pages 99-106, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2008.09.001.
(http://www.sciencedirect.com/science/article/B6T66-4TDK6VF-1/2/bff16d51d2a807cb471009e3c975bbc7)
Abstract:

Potted one-year-old plants of Thymus vulgaris L. (thyme, Lamiaceae, C3 metabolism), were grown for three months (10 June-10 September, 2004) in a 'mini-free-air-CO2-enrichment' ('mini-FACE') system, under 500 [mu]mol mol-1 and ambient concentrations of atmospheric carbon dioxide (CO2). Compared to ambient CO2, elevated CO2 stimulated leaf superoxide dismutase (SOD, EC 1.15.1.1) activity only at the first sampling-time (July), followed by no variation or even a trend of decreased activity on the other two sampling-times (August and September). Under high CO2, guaiacol peroxidase (GPX, EC 1.11.1.7) and catalase (CAT, EC 1.11.1.6) leaf activities showed no variation or drop throughout the duration of the experiment. By contrast, under elevated CO2, leaf glutathione reductase (GR, EC 1.6.4.2) activity increased on all the sampling-times, and also a duration-dependent upward trend of glutathione (GSH) content was recorded, with this increase becoming significant - compared with ambient CO2 - at the third sampling-time (September). Simultaneously, leaves from plants grown under high CO2 showed a marked increase in essential oil yield, with slight increments in phenolic component and decrements in mono- and sesquiterpene components. Also, a drop in thiobarbituric acid reactive substances (TBARS) content under elevated CO2 was displayed. Thus, in general, the results reported here point to a downregulation of leaf antioxidant enzymes under elevated CO2, supporting the notion of reduced reactive oxygen species (ROS) formation under these circumstances. Relying instead on antioxidant-regenerating enzymes, namely GR, fairly high GSH content and essential oils, might be a `low cost' life strategy for growth under elevated CO2, not requiring synthesis/activation of energy-intensive and expensive metabolic processes.
Keywords: Antioxidants; CO2-enrichment; FACE; Lamiaceae; Phytochemicals; Thyme

C.C. Liolios, O. Gortzi, S. Lalas, J. Tsaknis, I. Chinou, Liposomal incorporation of carvacrol and thymol isolated from the essential oil of Origanum dictamnus L. and in vitro antimicrobial activity, Food Chemistry, Volume 112, Issue 1, 1 January 2009, Pages 77-83, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.05.060.
(http://www.sciencedirect.com/science/article/B6T6R-4SMF046-2/2/0b193b8e1a535538376fc380cd3762fa)
Abstract:
The chemical composition of the essential oils from Origanum dictamnus L. (wild and organic cultivated plant) was analysed by GC-MS. Carvacrol, thymol, p-cymene, and [gamma]-terpinene were identified as major constituents and isolated from both samples. The above components were successfully encapsulated in phosphatidyl choline-based liposomes and the possible improvement of their antioxidant and antimicrobial activities was tested against selected microbia. The antimicrobial properties of the oils were tested by a diffusion technique against four Gram positive and four Gram negative bacteria and three human pathogenic fungi, as well as the food-borne pathogen, Listeria monocytogenes. The percentage of the encapsulated carvacrol, the major component of the oil, was determined by GC-FID. In order to investigate any possible synergistic or antagonistic effect between carvacrol/thymol and carvacrol/[gamma]-terpinene, the antimicrobial activities of the mixtures, were also determined before and after encapsulation in liposomes. All tested compounds presented enhanced antimicrobial activities after the encapsulation. Finally, in all cases, their antioxidant activity using differential scanning calorimetry was studied, in order to gain knowledge about their oxidation stability.
Keywords: Carvacrol; Thymol; Origanum dictamnus L.; Essential oil; Liposomal incorporation; In vitro antimicrobial activity; Antioxidant activity

George A. Burdock, Ioana G. Carabin, Safety assessment of coriander (Coriandrum sativum L.) essential oil as a food ingredient, Food and Chemical Toxicology, Volume 47, Issue 1, January 2009, Pages 22-34, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.11.006.
(http://www.sciencedirect.com/science/article/B6T6P-4TX33T5-2/2/31780656409e2846002d72a2120d4562)

Abstract:
Coriander essential oil is used as a flavor ingredient, but it also has a long history as a traditional medicine. It is obtained by steam distillation of the dried fully ripe fruits (seeds) of Coriandrum sativum L. The oil is a colorless or pale yellow liquid with a characteristic odor and mild, sweet, warm and aromatic flavor; linalool is the major constituent (~70%). Based on the results of a 28 day oral gavage study in rats, a NOEL for coriander oil is approximately 160 mg/kg/day. In a developmental toxicity study, the maternal NOAEL of coriander oil was 250 mg/kg/day and the developmental NOAEL was 500 mg/kg/day. Coriander oil is not clastogenic, but results of mutagenicity studies for the spice and some extracts are mixed; linalool is non-mutagenic. Coriander oil has broad-spectrum, antimicrobial activity. Coriander oil is irritating to rabbits, but not humans; it is not a sensitizer, although the whole spice may be. Based on the history of consumption of coriander oil without reported adverse effects, lack of its toxicity in limited studies and lack of toxicity of its major constituent, linalool, the use of coriander oil as an added food ingredient is considered safe at present levels of use.
Keywords: Coriander; Toxicity; Spice; Essential oil; GRAS

Maria J. Jordan, Rosa M. Martinez, C. Martinez, I. Monino, Jose A. Sotomayor, Polyphenolic extract and essential oil quality of Thymus zygis ssp. gracilis shrubs cultivated under different watering levels, Industrial Crops and Products, Volume 29, Issue 1, January 2009, Pages 145-153, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.04.021.
(http://www.sciencedirect.com/science/article/B6T77-4SRDF7F-1/2/d682ac39c4dfddaaa0c73bdc46f75d17)
Abstract:
Thymus zygis ssp. gracilis shrubs were cultivated as an experimental crop under different watering level, in order to achieve 81, 63, 44 and 30% of the local potential evapotranspiration (ETo). After 4 years of cultivation, thyme leaves were analyzed on the basis of their essential oil (yield and quality), total phenolic content, free radical-scavenging activity and polyphenolic profile.
Essential oil yield values ranged between (2.3 +/- 0.7) and (3.6 +/- 0.7)% for 81 and 30% ETo equivalent, respectively. The comparison of essential oil production at the 2nd and 4th years of cultivation showed that using watering levels higher than 30% ETo equivalents reduced significantly ($P < 0.05$) the essential oil yielded by these shrubs with time.
Analysis of total phenolic content, polyphenolic profile, and radical scavenging activity were performed using post-distillation dry leaves. Total phenolic content values ranged from (122.2 +/- 19.3) to (108.5 +/- 19.2) mg of gallic acid equivalents (GAEs)/g of dry plant for the highest and lowest watering level treatment, respectively. Regarding the polyphenolic profile, rosmarinic acid, followed by apigenin, ferulic, carnosic and caffeic acids, was the phenolic component quantified at the highest concentrations. Radical-scavenging activities (IC50) concentrations varied from (3.7 +/- 1.6) mg/mL for 81% ETo to (7.4 +/- 2.3) mg/mL 30% ETo.
In spite of the intra-specific variability detected, the individual analysis of shrubs has allowed the selection of plants which are characterised by having adequate levels of essential oil and polyphenolic extract (yield and quality), almost all of them being cultivated under a 60% ETo watering level. These selected shrubs will allow us to make further vegetative propagations in order to obtain homogeneous field crops with plants of contrasted quality cultivated under a 60% ETo watering level.
Keywords: Thyme; Thymus zygis ssp. gracilis; Water supply; Essential oil; Antiradical activity; Polyphenolic content

E. Cassel, R.M.F. Vargas, N. Martinez, D. Lorenzo, E. Dellacassa, Steam distillation modeling for essential oil extraction process, Industrial Crops and Products, Volume 29, Issue 1, January 2009, Pages 171-176, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.04.017.

(http://www.sciencedirect.com/science/article/B6T77-4T1X2FG-1/2/6ab95def835d04517c02f0698b26fac9)
Abstract:
A mathematical model was evaluated to predict the essential oil recovery by steam distillation of rosemary (Rosmarinus officinalis L.), basil (Ocimum basilicum L.), and lavender (Lavandula dentata L.). The aim of the work was to obtain yield experimental data to compare with a mathematical model used in the simulation of essential oils extraction by steam distillation. The extraction model is based on single plate particle description on mass transfer. This model requires only one adjustable parameter, effective diffusion coefficient (D), to predict the essential oil yield experimental curves.
Keywords: Labiatae; Rosemary; Basil; Lavender; Distillation; Mathematical model

O.D. Dhingra, G.N. Jham, F.A. Rodrigues, G.J. Silva Jr., M.L.N. Costa, Fumigation with essential oil of mustard retards fungal growth and accumulation of ergosterol and free fatty acid in stored shelled groundnuts, Journal of Stored Products Research, Volume 45, Issue 1, 2009, Pages 24-31, ISSN 0022-474X, DOI: 10.1016/j.jspr.2008.06.007.
(http://www.sciencedirect.com/science/article/B6T8Y-4TN8BVR-1/2/e72350978ba8b11f74563e9f437a6d01)
Abstract:
Shelled groundnut (Arachis hypogaea) samples with moisture contents (m.c.) between 7.5 and 10.5% and inoculated with conidia of Aspergillus glaucus and A. parasiticus were stored for 15-90 days at 25 +/- 2 [degree sign]C, and fumigated with synthetic food grade essential oil of mustard (100 [mu]l/l space). Deterioration of the samples was assessed by estimating the percentage of kernels colonized by fungi, the number of colony forming units (CFUs)/kernel, and the accumulation of ergosterol and free fatty acids (FFA). The values of these variables increased with the m.c. and storage period, independent of the fumigation treatment; however, the rate of increase was significantly lower in fumigated samples. After 90 days storage, the proportion of kernels yielding A. glaucus was similar in all samples, but the number of CFUs was 300x, ergosterol content 3.6x and FFA 4x higher in non-fumigated than in fumigated samples. In fumigated samples, no molded kernels were visible, while many were seen in non-fumigated samples after 30 or 60 days storage at 10.5 or 9.3% m.c., respectively. The deterioration retardation featured a reduced inoculum on kernel surfaces. Aspergillus parasiticus did not colonize kernels independently of m.c. and fumigation treatments. There was a strong positive correlation between CFUs and ergosterol or FFA content when the data of fumigated and non-fumigated samples were analyzed separately. However, this relationship was absent when data were pooled to disregard the fumigation effect. The correlation between ergosterol and FFA content remained high regardless of the fumigation treatment (r = 0.99). The ergosterol or FFA content of stored groundnuts can be used interchangeably, as a sensitive indicator, to assess deterioration caused by xeric storage fungi. However, the latter was preferable because it was simpler to assess and provided a direct indication of economic losses due to reduced oil yield.
Keywords: Oilseed; Deterioration; Storage; Ergosterol; Free fatty acid; Fat acidity value; Peanuts; Storage fungi

M. Munoz, L. Guevara, A. Palop, J. Tabera, P.S. Fernandez, Determination of the effect of plant essential oils obtained by supercritical fluid extraction on the growth and viability of Listeria monocytogenes in broth and food systems using flow cytometry, LWT - Food Science and Technology, Volume 42, Issue 1, 2009, Pages 220-227, ISSN 0023-6438, DOI: 10.1016/j.lwt.2008.06.007.
(http://www.sciencedirect.com/science/article/B6WMV-4STYV5N-1/2/3f8adfa1ffae1ddbc08a643f54213943)
Abstract:

The antimicrobial properties of oregano, rosemary and laurel extracts obtained by supercritical fluid extraction were investigated by examining their influence on the growth and viability of Listeria monocytogenes in laboratory medium and broccoli juice at 30 and 8 [degree sign]C. Important decreases in the L. monocytogenes population were shown in presence of all the extracts obtained from rosemary and one oregano extract. The counts were reduced below the level of detection after 4 h of exposure at 30 [degree sign]C in laboratory medium. A bactericidal effect was observed also when L. monocytogenes was exposed to rosemary at 30 [degree sign]C and 8 [degree sign]C in broccoli juice. Significant reductions in growth rate and an increase in lag phase of L. monocytogenes were observed in presence of some of the laurel and oregano extracts at both temperatures.
Flow cytometry was used as a rapid method to determine the antibacterial effect of supercritical extracts and the physiological state of L. monocytogenes. Bacterial viability performed by dual staining of L. monocytogenes with SYTO 9 and propidium iodide revealed three different cell populations, specifically, living, dead and compromised cells. Live cell percentage decreased with the time of exposure, whereas the percentage of compromised cells remained constant and the dead cells increased in the same period.
Keywords: SFE; Broccoli; Essential oils; Flow cytometry; Listeria monocytogenes

Daizy R. Batish, Harminder Pal Singh, Ravinder Kumar Kohli, Shalinder Kaur, Eucalyptus essential oil as a natural pesticide, Forest Ecology and Management, Volume 256, Issue 12, 10 December 2008, Pages 2166-2174, ISSN 0378-1127, DOI: 10.1016/j.foreco.2008.08.008.
(http://www.sciencedirect.com/science/article/B6T6X-4THJ6D9-3/2/503115bebdf7c1dcb9e0c2b756e48993)
Abstract:
Eucalyptus (family Myrtaceae), an Australian native, represented by around 700 species is a genus of tall, evergreen and magnificent trees cultivated world over for its oil, gum, pulp, timber, medicine and aesthetic value. Among the various wood and non-wood products, essential oil found in its foliage is the most important one and finds extensive use in food, perfumery and pharmaceutical industry. In addition, the oil possesses a wide spectrum of biological activity including anti-microbial, fungicidal, insecticidal/insect repellent, herbicidal, acaricidal and nematicidal. The present paper discusses this environmentally benign pest control using eucalyptus oils against bacteria, fungi, insects, nematodes, weeds and mites. The use of eucalyptus oil as a natural pesticide is of immense significance in view of the environmental and toxicological implications of the indiscriminate use of synthetic pesticides and overcoming/reducing the problem of increasing pest resistance.
Keywords: Antimicrobial activity; Eucalyptus species; Essential oils; Environment friendly pest control; Herbicidal activity; Insecticidal/insect-repellent activity

Daiana Retta, Martha Gattuso, Susana Gattuso, Paola Di Leo Lira, Catalina van Baren, Graciela Ferraro, Arnaldo Bandoni, Essential oil composition of Achyrocline flaccida (Weinm.) DC. (Asteraceae) from different locations of Argentina, Biochemical Systematics and Ecology, Volume 36, Issue 12, December 2008, Pages 877-881, ISSN 0305-1978, DOI: 10.1016/j.bse.2008.11.001.
(http://www.sciencedirect.com/science/article/B6T4R-4V2X6V0-1/2/26ef1a199fc0c50862094614c68800e6)
Abstract:
The qualitative and quantitative composition of the essential oils obtained from the inflorescences of Achyrocline flaccida (Asteraceae) has been investigated for the first time. Plant material was collected from eleven locations in Argentina. The essential oils were obtained by hydrodistillation (0.1-0.8% v/w, dried material) and analyzed by GC-FID-MS. Eighty-three compounds were identified representing more than the 90% of the oils. The major components were [alpha]-pinene and [beta]-caryophyllene. Statistical analysis was performed in order to evaluate the variability of

the essential oils analyzed. Two groups were formed reflecting only quantitative differences in the content of major compounds. The chemical pattern of essential oils observed for A. flaccida is similar to other Achyrocline species studied, except Achyrocline hyperchlora.
Keywords: Achyrocline flaccida; Asteraceae; 'Marcela'; Essential oils; Argentina

Chien-Tsong Lin, Chi-Jung Chen, Ting-Yu Lin, Judia Chen Tung, Sheng-Yang Wang, Anti-inflammation activity of fruit essential oil from Cinnamomum insularimontanum Hayata, Bioresource Technology, Volume 99, Issue 18, December 2008, Pages 8783-8787, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.04.041.
(http://www.sciencedirect.com/science/article/B6V24-4SMF29N-6/2/c661f5f5128946808eff602b99288d5a)
Abstract:
In this study, the fruit essential oil of Cinnamomum insularimontanum was prepared by using water distillation. Followed by GC-MS analysis, the composition of fruit essential oil was characterized. The main constituents of essential oil were [alpha]-pinene (9.45%), camphene (1.70%), [beta]-pinene (4.30%), limonene (1.76%), citronellal (24.64%), citronellol (16.78%), and citral (35.89%). According to the results obtained from nitric oxide (NO) inhibitory activity assay, crude essential oil and its dominant compound (citral) presented the significant NO production inhibitory activity, IC50 of crude essential oil and citral were 18.68 and 13.18 [mu]g/mL, respectively. Moreover, based on the results obtained from the protein expression assay, the expression of IKK, iNOS, and nuclear NF-[kappa]B was decreased and I[kappa]B[alpha] was increased in dose-dependent manners, it proved that the anti-inflammatory mechanism of citral was blocked via the NF-[kappa]B pathway, but it could not efficiently suppress the activity on COX-2. In addition, citral exhibited a potent anti-inflammatory activity in the assay of croton oil-induced mice ear edema, when the dosage was 0.1 and 0.3 mg per ear, the inflammation would reduce to 22% and 83%, respectively. The results presented that the fruit essential oil of C. insularimontanum and/or citral may have a great potential to develop the anti-inflammatory medicine in the future.
Keywords: Cinnamomum insularimontanum; Essential oil; Anti-inflammation; Citral

Saban Kordali, Ahmet Cakir, Hakan Ozer, Ramazan Cakmakci, Memis Kesdek, Ebru Mete, Antifungal, phytotoxic and insecticidal properties of essential oil isolated from Turkish Origanum acutidens and its three components, carvacrol, thymol and p-cymene, Bioresource Technology, Volume 99, Issue 18, December 2008, Pages 8788-8795, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.04.048.
(http://www.sciencedirect.com/science/article/B6V24-4SMF29N-7/2/bfc435091cbdeed7615a179414a9fa16)
Abstract:
The chemical composition of essential oil isolated by hydrodistillation from the aerial parts of Origanum acutidens was analyzed by GC-MS. Carvacrol (87.0%), p-cymene (2.0%), linalool acetate (1.7%), borneol (1.6%) and [beta]-caryophyllene (1.3%) were found to be as main constituents. Antifungal, phytotoxic and insecticidal activities of the oil and its aromatic monoterpene constituents, carvacrol, p-cymene and thymol were also determined. The antifungal assays showed that O. acutidens oil, carvacrol and thymol completely inhibited mycelial growth of 17 phytopathogenic fungi and their antifungal effects were higher than commercial fungicide, benomyl. However, p-cymene possessed lower antifungal activity. The oil, carvacrol and thymol completely inhibited the seed germination and seedling growth of Amaranthus retroflexus, Chenopodium album and Rumex crispus and also showed a potent phytotoxic effect against these plants. However, p-cymene did not show any phytotoxic effect. Furthermore, O. acutidens oil showed 68.3% and 36.7% mortality against Sitophilus granarius and Tribolium confusum adults, respectively. The findings of the present study suggest that antifungal and herbicidal properties of

the oil can be attributed to its major component, carvacrol, and these agents have a potential to be used as fungicide, herbicide as well as insecticide.
Keywords: Origanum acutidens; Carvacrol; Thymol; Antifungal activity; Phytotoxicity

Vivek K. Bajpai, Savita Shukla, Sun Chul Kang, Chemical composition and antifungal activity of essential oil and various extract of Silene armeria L., Bioresource Technology, Volume 99, Issue 18, December 2008, Pages 8903-8908, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.04.060.
(http://www.sciencedirect.com/science/article/B6V24-4SNXT4B-2/2/d85494100630b64675da54562a19faea)
Abstract:
The aims of this study were to examine the chemical composition of the essential oil isolated from the floral parts of Silene armeria L. by hydrodistillation, and to test the efficacy of essential oil and various leaf extracts (n-hexane, chloroform, ethyl acetate and methanol) as an antifungal potential. The GC-MS analysis determined that 28 compounds, which represented 89.03% of total oil, were present in the oil containing mainly 1-butene, methylcyclopropane, 2-butene and caryophyllene oxide. The oil (1000 ppm/disc) and the leaf extracts (1500 ppm/disc) revealed remarkable antifungal effect against Fusarium oxysporum, Fusarium solani, Phytophthora capsici, Colletotrichum capsici, Sclerotinia sclerotiorum, Botrytis cinerea and Rhizoctonia solani, in the growth inhibition range of 39.6-67.6% and 9.3-61.3%, respectively, along with their respective MIC values ranging from 62.5 to 1000 [mu]g/ml and 125 to 2000 [mu]g/ml. The essential oil had also a strong detrimental effect on spore germination of all the tested plant pathogens along with concentration as well as time-dependent kinetic inhibition of B. cinerea. Thus, the results obtained in this study demonstrate that S. armeria essential oil and various organic extracts possess a wide range spectrum of fungicidal activity and could become an alternative to synthetic fungicides for controlling certain important plant fungal diseases.
Keywords: Silene armeria; Antifungal activity; Essential oil; Caryophyllene oxide; Phytopathogens

Sanja Cavar, Milka Maksimovic, Marija Edita Solic, Anesa Jerkovic-Mujkic, Renata Besta, Chemical composition and antioxidant and antimicrobial activity of two Satureja essential oils, Food Chemistry, Volume 111, Issue 3, 1 December 2008, Pages 648-653, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.04.033.
(http://www.sciencedirect.com/science/article/B6T6R-4S9G98P-3/2/794959ff054ef71191f7e7e79ada8015)
Abstract:
Hydro-distilled volatile oils from the aerial parts of Satureja montana L., and Satureja subspicata Bartl. ex Vis., growing wild in Bosnia and Herzegovina, were analyzed by GC/MS. More than one hundred compounds were identified in both plant oils, representing 92.4-98.1% of the total oil. The major constituents of essential oils obtained from the plant material of S. montana, collected from two different localities, were thymol (31.7%), and geraniol (22.3%), respectively. The most abundant compounds in essential oils of S. subspicata, collected at two different stages of development, were thymol (28.6%), and spathulenol (37.6%), respectively. The screening of antimicrobial activity of essential oil samples was individually evaluated against Staphylococcus aureus, Staphylococcus epidermidis, Escherichia coli, Pseudomonas aeruginosa and Bacillus subtilis using a paper disc diffusion method. All tested microorganisms were inhibited by essential oil samples. Antioxidant activity was tested using the DPPH radical-scavenging method. All samples showed activity comparable to thymol, which was used as a positive probe.
Keywords: Satureja montana L.; Satureja subspicata Bartl. ex Vis.; Essential oil; GC/MS; Thymol; Antioxidant activity; DPPH; Antimicrobial activity

El Akrem Hayouni, Marielle Bouix, Manaf Abedrabba, Jean-Yves Leveau, Moktar Hamdi, Mechanism of action of Melaleuca armillaris (Sol. Ex Gaertu) Sm. essential oil on six LAB strains

as assessed by multiparametric flow cytometry and automated microtiter-based assay, Food Chemistry, Volume 111, Issue 3, 1 December 2008, Pages 707-718, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.04.044.
(http://www.sciencedirect.com/science/article/B6T6R-4SC78WK-1/2/bee1292a7f81a2e49c3b0b645a263a36)
Abstract:
Little is known concerning the effects of essential oils (EOs) against lactic acid bacteria (LAB), either of the human gastrointestinal microflora or those involved in industrial processes. GC and GC/MS analysis of Melaleuca armillaris EO resulted in the identification of 68 compounds comprising 99.6% of the oil. Eucalyptol (1,8-cineole) was the major compound (68.9%) and the composition was largely dominated by the oxygenated monoterpenes fraction (77.3%). The anti-LAB activities of the EO were first checked by the disc diffusion assay. In a second phase, time-survival kinetics of each strain incubated with increasing concentrations of the EO (0.25, 2.5, 5 and 25 [mu]g/ml) were established using an automated microtiter assay (Bioscreen C). Bacteriostatic or bactericidal effects were noticed depending on the studied strain and on the applied concentration of the EO. The mathematical modelling of the kinetics showed that in presence of increasing concentrations of M. armillaris EO, the lag phases of growth were extended (0.69%-97.5%) and both the growth rate and final cell density were reduced. Variations depending on the strain were noticed.
Live/dead assays of the multiparametric flow cytometry technique (combining carboxyfluorescein diacetate (cFDA) and propidium iodide (PI) fluorescent probes) were performed by dual staining of each sample culture to differentiate viable, dead and stressed cells. The behaviour of each strain, in presence of increasing concentrations of M. armillaris EO, was evaluated by quantifying the relative percentages of each subpopulation throughout 3 days of culture. Results displayed disparate patterns of subpopulations which revealed dynamic changes in cell behaviour. This is probably due to disparate influences of the EO components on cellular physiological properties throughout the incubation period. This study proved that multiparametric flow cytometry was a convenient and rapid tool to evaluate the viability of LAB, and was well correlated with plate count results. Such study could be useful to understand how to fully take advantage of LAB as probiotics or as potential candidates to improve food hygiene and to assure food quality; namely when they are associated with natural preservatives such as EOs.
Keywords: Melaleuca armillaris; Essential oil; LAB; Antibacterial; Automated microtiter assay; Multiparametric flow cytometry; cFDA; PI

M. Viuda-Martos, Y. Ruiz-Navajas, J. Fernandez-Lopez, J. Perez-Alvarez, Antifungal activity of lemon (Citrus lemon L.), mandarin (Citrus reticulata L.), grapefruit (Citrus paradisi L.) and orange (Citrus sinensis L.) essential oils, Food Control, Volume 19, Issue 12, December 2008, Pages 1130-1138, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.12.003.
(http://www.sciencedirect.com/science/article/B6T6S-4RPVJ14-1/2/73e56e7093e29becf9c9ce6faee3f916)
Abstract:
The objective of this work was to study the effect of the essential oils of lemon (Citrus lemon L.), mandarin (Citrus reticulata L.), grapefruit (Citrus paradisi L.) and orange (Citrus sinensis L.) on the growth of moulds commonly associated with food spoilage: Aspergillus niger, Aspergillus flavus, Penicillium chrysogenum and Penicillium verrucosum, using the agar dilution method. All the oils showed antifungal activity against all the moulds. Orange essential oil was the most effective against A. niger, mandarin essential oil was most effective at reducing the growth of Aspergillus flavus while grapefruit was the best inhibitor of the moulds P. chrysogenum and P. verrucosum. Citrus essential oils could be considered suitable alternatives to chemical additives for use in the food industry.
Keywords: Essential oils; Citrics; Moulds

F. Demirci, K. Guven, B. Demirci, M.Y. Dadandi, K.H.C. Baser, Antibacterial activity of two Phlomis essential oils against food pathogens, Food Control, Volume 19, Issue 12, December 2008, Pages 1159-1164, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.01.001.
(http://www.sciencedirect.com/science/article/B6T6S-4RJYV46-1/2/f9e31b8e03fe4d1af9609d5d20dcd8b6)
Abstract:
Phlomis species from the Lamiaceae family are widely distributed in Turkey. In this study, the essential oils of Phlomis russeliana (Sims.) Bentham and Phlomis grandiflora H.S. Thompson var. grandiflora collected from North and Southern parts of Turkey, were obtained by hydrodistillation of the aerial parts. The essential oils were subsequently analysed by gas chromatography (GC) and gas chromatography-mass spectrometry (GC/MS). The major constituents of P. russeliana essential oil were identified as sesquiterpenes [beta]-caryophyllene (23%), germacrene-D (15%), and caryophyllene oxide (8%). Analysis of P. grandiflora var. grandiflora oil also showed oxygenated sesquiterpenes such as [beta]-eudesmol (42%) and [alpha]-eudesmol (16%) as major constituents.
Furthermore, essential oils were tested in vitro against common food borne bacteria such as Aeromonas hydrophila, Bacillus cereus, Escherichia coli O157:H7, Listeria monocytogenes, Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella typhimurium, Yersinia enterocolitica, and the anaerobic pathogen Clostridium perfringens using the micro-broth dilution assay. When compared with antimicrobial standards weak to moderate (125 to >1000 [mu]g/ml) minimum inhibitory concentrations (MIC) were observed. The results show that Phlomis essential oils might be an alternative to conventional antimicrobials in various foods.
Keywords: Phlomis sp.; Essential oil; Antibacterial activity

Antonello Paparella, Lorenzo Taccogna, Irene Aguzzi, Clemencia Chaves-Lopez, Annalisa Serio, Fulvio Marsilio, Giovanna Suzzi, Flow cytometric assessment of the antimicrobial activity of essential oils against Listeria monocytogenes, Food Control, Volume 19, Issue 12, December 2008, Pages 1174-1182, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.01.002.
(http://www.sciencedirect.com/science/article/B6T6S-4RJYV46-2/2/8ea3c386ee4d02a28a4ca7cb4736590e)
Abstract:
Flow cytometry was applied to assess the antimicrobial activity of oregano, thyme and cinnamon essential oils against Listeria monocytogenes ATCC19114, using combined staining with propidium iodide (PI) for membrane damage evaluation and carboxyfluorescein diacetate (cFDA) for esterase activity detection. The antimicrobial activity of the essential oils was also tested at different NaCl concentrations.
Significant differences were observed between plate count results and flow cytometric data, which suggested the presence of a sublethally stressed subpopulation, not able to form colonies on agar plates.
Following treatments, flow cytometric assessment clearly discriminated three different subpopulations: viable, dead and injured cells. Cinnamon essential oil exerted a different impact on the cellular subpopulations, with a lower overall activity and a large percentage of cells having minimally damaged membranes. On the contrary, membrane disintegration seemed to be the primary inactivation mechanism of oregano and thyme essential oils.
The antimicrobial activity of the essential oils increased with NaCl concentration increase, but higher NaCl concentrations were necessary following treatments with cinnamon essential oil.
Our findings suggest differences in the mode of action of cinnamon essential oil against L. monocytogenes, in comparison with thyme and oregano essential oils.
Keywords: Flow cytometry; Listeria monocytogenes; Essential oils

Mir-Hassan Moosavy, Afshin Akhondzadeh Basti, Ali Misaghi, Taghi Zahraei Salehi, Reza Abbasifar, Hossein Ali Ebrahimzadeh Mousavi, Majid Alipour, Nader Emami Razavi, Hassan Gandomi, Negin Noori, Effect of Zataria multiflora Boiss. essential oil and nisin on Salmonella typhimurium and Staphylococcus aureus in a food model system and on the bacterial cell membranes, Food Research International, Volume 41, Issue 10, December 2008, Pages 1050-1057, ISSN 0963-9969, DOI: 10.1016/j.foodres.2008.07.018.
(http://www.sciencedirect.com/science/article/B6T6V-4T542BN-2/2/c0ea9fa516a3d9199c25052f1595c863)
Abstract:
The effects of different concentrations of Zataria multiflora Boiss. essential oil (EO: 0, 5, 15 and 30 [mu]l 100 ml-1) and nisin (N: 0, 0.25 and 0.5 [mu]g ml-1), temperatures (T: 25 and 8 [degree sign]C), and storage times (up to 21 days) on growth of Salmonella typhimurium and Staphylococcus aureus in a commercial barley soup were evaluated in a factorial design study. The growth of S. typhimurium was significantly ($P < 0.05$) decreased by EO concentrations and their combinations with N concentrations at 8 [degree sign]C. For S. aureus, the viable count was significantly ($P < 0.05$) inhibited by EO and N concentrations and their combinations, incubated at both storage temperatures. The mechanism of the antimicrobial action of EO, N, and their combinations against cell membranes of the tested organisms were also studied by measurement of the release of cell constituents and by the electronic microscopy observations of the cells. The significant increase of the cell constituents' release of both organisms was observed as a result of treatments with EO and EO in combination with N. Electronic microscopy observations revealed that the cell membranes of S. typhimurium treated by EO and EO in combination with N were significantly damaged, while cells treated with only N looked similar to untreated cells. The electron micrographs of treated cells of S. aureus with EO, N, and their combination also showed important morphological damages and disrupted membranes.
Keywords: Zataria multiflora Boiss. essential oil; Nisin; Salmonella typhimurium; Staphylococcus aureus

Nguyen Thi Dung, Jung Min Kim, Sun Chul Kang, Chemical composition, antimicrobial and antioxidant activities of the essential oil and the ethanol extract of Cleistocalyx operculatus (Roxb.) Merr and Perry buds, Food and Chemical Toxicology, Volume 46, Issue 12, December 2008, Pages 3632-3639, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.09.013.
(http://www.sciencedirect.com/science/article/B6T6P-4TG9HYT-3/2/6264e0dcfa8c4cb3abd4abadc38382e5)
Abstract:
In the present study, the essential oil isolated from the buds of Cleistocalyx operculatus by hydrodistillation was analyzed by GC and GC/MS. A total of 55 compounds representing 93.71% of the oil were identified. The oil significantly inhibited the growth of food spoilage (FS), food-borne (FB), skin pathogens (SP), methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant Enterococci (VRE) and multiantibiotic-resistant bacteria (MARB). The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the oil against the tested microorganisms were found in the range of 1-20 [mu]L/mL. Whereas the ethanol extract exhibited potential antibacterial activity against the entire tested Gram positive bacteria and one food spoilage Gram negative bacterium P. aeruginosa. The MIC and MBC values of ethanol extract against the tested bacteria were found in the range of 0.25-32 mg/mL. The scanning electron microscopic (SEM) studies demonstrated potential detrimental effect of the essential oil on the morphology of MRSA-P249 and VRE-B2332 at the used MIC values, along with the potential effect on cell viabilities of the tested bacteria. Moreover, the total antioxidant capacity and the scavenging effect on 2,2-diphenyl-1-picrylhydrazyl (DPPH) radicals of the essential oil and the ethanol extract were also evaluated.

Keywords: Cleistocalyx operculatus; Essential oil; Antimicrobial activity; MRSA; VRE; Antioxidant assay

Bibi Zahra Sahaf, Saeid Moharramipour, Mohammad Hadi Meshkatalsadat, Fumigant toxicity of essential oil from Vitex pseudo-negundo against Tribolium castaneum (Herbst) and Sitophilus oryzae (L.), Journal of Asia-Pacific Entomology, Volume 11, Issue 4, December 2008, Pages 175-179, ISSN 1226-8615, DOI: 10.1016/j.aspen.2008.09.001.
(http://www.sciencedirect.com/science/article/B8JJN-4THJGT1-1/2/8b688e6b804c31979d64f8d27b782b76)
Abstract:
The objective of the current study was to determine the chemical constituents and fumigant toxicity of an essential oil that was isolated via hydrodistillation from dry leaves of Vitex pseudo-negundo (Hausskn.) Hand.-Mzz. The chemical composition of the essential oil was assessed via GC and GC-MS. 1, 8-Cineol (18.23%), [alpha]-Pinene (16.20%) and Sabinene (5.67%) were determined to be the major constituents of the oil. The fumigant toxicity of the essential oil was tested against 1-7 day-old adults of Tribolium castaneum (Herbst) and Sitophilus oryzae (L.) at 27 +/- 1 [degree sign]C and 60 +/- 5% r.h. in darkness. The mortality of adults was tested at different concentrations ranging from 37.0 to 925.9 [mu]L/L air and different exposure times (1-30 h). The results demonstrated that the mortality increased with increases in concentration and exposure time. At concentrations higher than 185.2 [mu]L/L air, the mortality was recorded at more than 50% after 10 h, and reached 100% after 12-16 h. Data probit analysis demonstrated that S. oryzae (LC50 = 31.96 [mu]L/L air) was more susceptible than T. castaneum (LC50 = 47.27 [mu]L/L air). These results showed that the essential oil from V. pseudo-negundo could be applicable to the management of populations of stored-product insects.
Keywords: Botanical insecticides; Monoterpenoids; Stored-product beetles; Red flour beetle; Rice weevil

D.R. George, K. Callaghan, J.H. Guy, O.A.E. Sparagano, Lack of prolonged activity of lavender essential oils as acaricides against the poultry red mite (Dermanyssus gallinae) under laboratory conditions, Research in Veterinary Science, Volume 85, Issue 3, December 2008, Pages 540-542, ISSN 0034-5288, DOI: 10.1016/j.rvsc.2008.02.001.
(http://www.sciencedirect.com/science/article/B6WWR-4S2VRJP-1/2/b9482e1dc9a324f4fd5cef53648b79e9)
Abstract:
Managing the poultry red mite, Dermanyssus gallinae (De Geer) by conventional means (i.e., synthetic acaricides) has become increasingly problematic. As a possible alternative, research has identified several plant essential oils that are toxic to D. gallinae. However, essential oils are highly volatile and any acaricidal effect they exert could be short-lived in practice.
This study investigated the short-lived toxicity of six lavender essential oils to D. gallinae. In sealed Petri-dishes, mites were exposed to filter papers impregnated with essential oil at a concentration of 0.14 mg/cm3. When filter papers were used immediately after impregnation, 66-90% D. gallinae mortality was observed after 24 h, depending upon the essential oil used. If impregnated filter papers were left in a fume cupboard for 24 h prior to use, mortality rates of D.gallinae fell to 11% or less.
Keywords: Dermayssus gallinae; Novel control; Essential oil

Anne Gauvin-Bialecki, Claude Marodon, Essential oil of Ayapana triplinervis from Reunion Island: A good natural source of thymohydroquinone dimethyl ether, Biochemical Systematics and Ecology, Volume 36, Issue 11, November 2008, Pages 853-858, ISSN 0305-1978, DOI: 10.1016/j.bse.2008.09.006.

(http://www.sciencedirect.com/science/article/B6T4R-4TXDXNX-3/2/70ced1539a15791fe7e6dcee39541155)
Abstract:
Three specimens of Ayapana triplinervis (Vahl) R.M. King & H. Rob from Reunion Island (Indian Ocean) collected at two distant locations (North of the island; samples 1 and 2, South of the island; sample 3), in different growth phases (flowering; samples 1 and 3, vegetative; sample 2) were investigated for their leaf essential oil composition. This study reports the chemical character of this species on the island and investigates the relationship between essential oil composition, developmental stage and geographic location. Analysis by GC-FID and GC-MS enabled us to identify and quantify a total of 39 constituents accounting for 97.1-98.0% of the oils. The three essential oil samples, all obtained by hydrodistillation, showed a high percentage of the aromatic compound thymohydroquinone dimethyl ether (89.9-92.8%). All other minor components remained more or less unchanged both qualitatively and quantitatively with respect to the stage of growth. On the contrary, variations were observed with geographic distribution. The geographical variation of the chemical composition of the volatile oil of A. triplinervis from several sites in the world is also briefly discussed.
Keywords: Ayapana triplinervis; Asteraceae; Essential oil composition; Thymohydroquinone dimethyl ether; Chemical variability

E. Hnawia, C. Menut, A. Agrebi, P. Cabalion, Wood essential oils of two endemic trees from New Caledonia: Callitris sulcata (Parl.) Schltr. and Callitris neocaledonica Dummer, Biochemical Systematics and Ecology, Volume 36, Issue 11, November 2008, Pages 859-866, ISSN 0305-1978, DOI: 10.1016/j.bse.2008.08.007.
(http://www.sciencedirect.com/science/article/B6T4R-4V09BY1-1/2/ddd75faef0649b92d0eeda6a8d538bf5)
Abstract:
The essential oils obtained by hydrodistillation of pieces of dead trunks of Callitris sulcata (Parlatore) Schlechter and Callitris neocaledonica Dummer were investigated by gas chromatography, mass spectrometry and NMR spectroscopy. Analyses evidenced the presence of rare natural compounds: both essential oils are exclusively sesquiterpenic with nevertheless remarkable difference: C. sulcata essential oil was dominated by [beta]-barbatene and thujopsene while C. neocaledonica was characterized by high levels of guaiane- and eudesmane-type structures (eudesmols, guaiol and related components). The biochemical correlations between the major components of each species are discussed and the relationship between the two species is commented.
Keywords: Callitris sulcata (Parlatore) Schlechter; Callitris neocaledonica Dummer; Cupressaceae; Essential oil; [beta]-Barbatene; Thujopsene; Guaiol; Eudesmols

M. Sandasi, C.M. Leonard, A.M. Viljoen, The effect of five common essential oil components on Listeria monocytogenes biofilms, Food Control, Volume 19, Issue 11, November 2008, Pages 1070-1075, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.11.006.
(http://www.sciencedirect.com/science/article/B6T6S-4R644HD-2/2/5f656c7142db68f3f81a38e1dbd800c3)
Abstract:
The effect of five essential oil components (EOC's) on biofilms were investigated on two pathogenic Listeria monocytogenes isolates. Growth of the biofilm was assessed using the crystal violet (CV) staining assay and the XTT reduction assay. Scanning electron microscopy (SEM) was used to assess the architectural changes of the biofilm. Treatment of a 6 h preformed biofilm with each of the EOC's at a concentration of 1 mg/ml enhanced growth of the biofilm which was confirmed by SEM. Conversely, the presence of the essential oil components caused a reduction in the metabolic activity of the biofilm as shown by the XTT reduction assay.

Keywords: Essential oil; Listeria; Biofilm

S. Nejad Ebrahimi, J. Hadian, M.H. Mirjalili, A. Sonboli, M. Yousefzadi, Essential oil composition and antibacterial activity of Thymus caramanicus at different phenological stages, Food Chemistry, Volume 110, Issue 4, 15 October 2008, Pages 927-931, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.02.083.
(http://www.sciencedirect.com/science/article/B6T6R-4S03RKK-B/2/1c3045307724342c1313d8baa02cd50c)
Abstract:
Thymus species are well known as medicinal plants because of their biological and pharmacological properties. Thymus caramanicus is an endemic species grown in Iran. Variation in the quantity and quality of the essential oil of wild population of T. caramanicus at different phenological stages including vegetative, floral budding, flowering and seed set are reported. The oils of air-dried samples were obtained by hydrodistillation. The yields of oils (w/w%) at different stages were in the order of: flowering (2.5%), floral budding (2.1%), seed set (2.0%) and vegetative (1.9%). The oils were analyzed by GC and GC-MS. In total 37, 37, 29 and 35 components were identified and quantified in vegetative, floral budding, full flowering and seed set, representing 99.3, 98.6, 99.2 and 97.8% of the oil, respectively. Carvacrol was the major compound in all samples. The ranges of major constituents were as follow: carvacrol (58.9-68.9%), p-cymene (3.0-8.9%), [gamma]-terpinene (4.3-8.0%), thymol (2.4-6.0%) and borneol (2.3-4.0%). Antibacterial activity of the oils and their main compounds were tested against seven Gram-positive and Gram-negative bacteria by disc diffusion method and determining their minimum inhibitory concentration (MIC) values. The inhibition zones (IZ) and MIC values for bacterial strains, which were sensitive to the essential oil of T. caramanicus, were in the range of 15-36 mm and 0.5-15.0 mg/ml, respectively. The oils of various phenological stages showed high activity against all tested bacteria, of which Bacillus subtilis and Pseudomonas aeruginosa were the most sensitive and resistant strains, respectively. Thus, they represent an inexpensive source of natural antibacterial substances that exhibited potential for use in pathogenic systems.
Keywords: Thymus caramanicus; Essential oil; Phenological variation; Antibacterial activity

Erika Banchio, Pablo C. Bogino, Julio Zygadlo, Walter Giordano, Plant growth promoting rhizobacteria improve growth and essential oil yield in Origanum majorana L., Biochemical Systematics and Ecology, Volume 36, Issue 10, October 2008, Pages 766-771, ISSN 0305-1978, DOI: 10.1016/j.bse.2008.08.006.
(http://www.sciencedirect.com/science/article/B6T4R-4TJ05JT-2/2/9d4386c1a976c5a39dfa0edccd5ee491)
Abstract:
Effects of root colonization by plant growth promoting rhizobacteria (PGPR) on biomass, and qualitative and quantitative composition of essential oils, were determined in the aromatic crop Origanum majorana L. (sweet marjoram). PGPR strains evaluated were Pseudomonas fluorescens, Bacillus subtilis, Sinorhizobium meliloti, and Bradyrhizobium sp. Only P. fluorescens and Bradyrhizobium sp. showed significant increases in shoot length, shoot weight, number of leaf, number of node, and root dry weight, in comparison to control plants or plants treated with other PGPR. Essential oil yield was also significantly increased relative to non-inoculated plants, without alteration of oil composition. P. fluorescens has clear commercial potential for economic cultivation of O. majorana.
Keywords: Plant growth promoting rhizobacteria; PGPR; Aromatic plants; Origanum majorana; Sweet marjoram; Essential oil

Ariel Ceferino Toloza, Alejandro Lucia, Eduardo Zerba, Hector Masuh, Maria Ines Picollo, Interspecific hybridization of Eucalyptus as a potential tool to improve the bioactivity of essential

oils against permethrin-resistant head lice from Argentina, Bioresource Technology, Volume 99, Issue 15, October 2008, Pages 7341-7347, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.12.067.
(http://www.sciencedirect.com/science/article/B6V24-4RSHR2H-1/2/eccc4fbc9db5f74d0ca8cff7ec9e43fc)
Abstract:
The essential oils extracted from Eucalyptus grandis, Eucalyptus camaldulensis, Eucalyptus tereticornis, and the hybrids E. grandis x E. camaldulensis, and E. grandis x E. tereticornis were analyzed by GC-MS, and evaluated for their fumigant and repellent effects on permethrin-resistant head lice. Fumigant activity of both hybrids was higher than that for pure species. E. grandis x E. tereticornis and E. grandis x E. camaldulensis showed KT50 values of 12.99 and 13.63 min, respectively. E. grandis, E. camaldulensis, and E. tereticornis showed KT50 values of 25.57, 35.01, and 31.31, respectively. A simple regression analysis revealed a significant correlation between KT50 data and % of 1,8-cineole in these essential oils. Repellency varied from 47.80 +/- 16% to 80.69 +/- 6% for the five Eucalyptus essential oils tested. Interspecific hybridization improves the pediculicidal activity of Eucalyptus essential oils.
Keywords: Head lice; Eucalyptus; Interspecific hybridization; Repellents; Fumigants

Gurdip Singh, I.P.S. Kapoor, Pratibha Singh, Carola S. de Heluani, Marina P. de Lampasona, Cesar A.N. Catalan, Chemistry, antioxidant and antimicrobial investigations on essential oil and oleoresins of Zingiber officinale, Food and Chemical Toxicology, Volume 46, Issue 10, October 2008, Pages 3295-3302, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.07.017.
(http://www.sciencedirect.com/science/article/B6T6P-4T3DD0F-3/2/b0b8afdeb0f7c05f5d3a1aa5aa42c2fa)
Abstract:
The essential oil and oleoresins (ethanol, methanol, CCl4 and isooctane) of Zingiber officinale were extracted respectively by hydrodistillation and Soxhlet methods and subjected to GC-MS analysis. Geranial (25.9%) was the major component in essential oil; eugenol (49.8%) in ethanol oleoresin, while in the other three oleoresins, zingerone was the major component (33.6%, 33.3% and 30.5% for, methanol, CCl4 and isooctane oleoresins, respectively). The antioxidant activity of essential oil and oleoresins were evaluated against mustard oil by peroxide, anisidine, thiobarbituric acid (TBA), ferric thiocyanate (FTC) and 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging methods. They were found to be better antioxidants than butylated hydroxyanisole (BHA). The antimicrobial properties were also studied using various food-borne pathogenic fungal and bacterial species. The essential oil and CCl4 oleoresin showed 100% zone inhibition against Fusarium moniliforme. For other tested fungi and bacteriae, the essential oil and all oleoresins showed good to moderate inhibitory effects. Though, both essential oil and oleoresins were found to be effective, essential oil was found to be better than the oleoresins.
Keywords: Zingiber officinale; Essential oil; Oleoresins; GC-MS; Antioxidant; Antimicrobial

Ashok Kumar, Ravindra Shukla, Priyanka Singh, Chandra Shekhar Prasad, Nawal Kishore Dubey, Assessment of Thymus vulgaris L. essential oil as a safe botanical preservative against post harvest fungal infestation of food commodities, Innovative Food Science & Emerging Technologies, Volume 9, Issue 4, October 2008, Pages 575-580, ISSN 1466-8564, DOI: 10.1016/j.ifset.2007.12.005.
(http://www.sciencedirect.com/science/article/B6W6D-4RJ3WFC-1/2/5148219faec92fa5b806b1702988bf0e)
Abstract:
A total of 14 odoriferous angiospermic essential oils were tested against the toxigenic strain of Aspergillus flavus. The essential oil of Thymus vulgaris L. showed highest antifungal efficacy. The thyme oil absolutely inhibited the mycelial growth of A. flavus at 0.7 [mu]l ml- 1 and exhibited a

broad fungitoxic spectrum against eight different food contaminating fungi viz. Fusarium oxysporum, Cladosporium herbarum, Curvularia lunata, Aspergillus terreus, Aspergillus niger, Aspergillus fumigatus, Alternaria alternata and Botryodiploidia theobromae. The oil also showed significant antiaflatoxigenic efficacy as it completely arrested the aflatoxin B1 production at 0.6 [mu]l ml- 1. Thyme oil as fungitoxicant was also found superior over most of the prevalent synthetic fungicides. The LC50 of thyme oil against mice was recorded as 7142.85 [mu]l kg- 1 body weight indicating its non-mammalian toxicity and strengthening its safe exploitation as preservative for stored food commodities. The findings recommend the thyme oil as potential botanical preservative in eco-friendly control of biodeterioration of food commodities during storage.Industrial relevance
The thyme essential oil may be recommended for large scale application as a plant based preservative for stored food items because of its strong antifungal as well as antiaflatoxigenic efficacy. Because of broad antimicrobial spectrum, more efficacy over prevalent synthetic preservatives as well as non-mammalian toxicity, the thyme essential oil may be formulated as a safe and economical plant based preservative against post harvest fungal infestation and aflatoxin contamination of food commodities.
Keywords: Aflatoxin; Botanical preservative; Essential oil; Fungitoxicity; Safety limit; Thymus vulgaris

Beste Bayramoglu, Serpil Sahin, Gulum Sumnu, Solvent-free microwave extraction of essential oil from oregano, Journal of Food Engineering, Volume 88, Issue 4, October 2008, Pages 535-540, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.03.015.
(http://www.sciencedirect.com/science/article/B6T8J-4S32NFK-3/2/be73c2dd5145c6bc936034b59569c31f)
Abstract:
Applicability of solvent-free microwave extraction (SFME) in the extraction of essential oil from Origanum vulgare L. was examined and the effects of microwave power and extraction time on the yield and composition of the product were investigated. Specific gravity and refractive index of the essential oil and its solubility in alcohol were also examined. Hydrodistillation was performed as control. GC-MS/FID was used for the determination and quantification of aroma compounds in the essential oils. SFME offered significantly higher essential oil yields (0.054 mL/g) as compared to hydrodistillation (0.048 mL/g). When 622 W microwave power was used in SFME, conventional process time was reduced by 80%. The main aroma compound of oregano essential oil was found to be thymol (650-750 mg/mL). No significant differences were obtained in the compositions and physical properties of oregano essential oils obtained by SFME and hydrodistillation.
Keywords: Solvent-free microwave extraction (SFME); Origanum vulgare L.; Essential oil; Aroma compounds

N. Solomakos, A. Govaris, P. Koidis, N. Botsoglou, The antimicrobial effect of thyme essential oil, nisin and their combination against Escherichia coli O157:H7 in minced beef during refrigerated storage, Meat Science, Volume 80, Issue 2, October 2008, Pages 159-166, ISSN 0309-1740, DOI: 10.1016/j.meatsci.2007.11.014.
(http://www.sciencedirect.com/science/article/B6T9G-4R7J66V-1/2/9a691a069439eddbf4d1302676d41f0c)
Abstract:
The antimicrobial effect of thyme essential oil (EO) at supplementation levels of 0.3%, 0.6% or 0.9%, nisin at 500 or 1000 IU/g, and their combination, on Escherichia coli O157:H7 was examined in both tryptic soy broth (TSB) and minced beef meat. EO at 0.3% possessed a weak antibacterial activity against the pathogen in TSB, whereas at 0.9% showed unacceptable organoleptic properties in minced meat. Thus, only the level of 0.6% of EO was further examined against the pathogens in minced meat. Treatment of minced beef meat with EO at 0.6% showed

an inhibitory activity against E. coli O157:H7 during storage at 10 [degree sign]C, but not at 4 [degree sign]C. Treatment of minced beef meat or TSB with nisin at 500 or 1000 IU/g did not show any antibacterial activity against E. coli O157:H7. The combination of EO at 0.6% and nisin at 500 or 1000 IU/g showed an additive effect against the pathogen, which was higher during storage at 10 [degree sign]C than at 4 [degree sign]C.
Keywords: Thyme; Essential oil; Nisin; Escherichia coli O157:H7; Minced beef

Jean-Claude Chalchat, Mehmet Musa Ozcan, Comparative essential oil composition of flowers, leavesand stems of basil (Ocimum basilicum L.) used as herb, Food Chemistry, Volume 110, Issue 2, 15 September 2008, Pages 501-503, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.02.018.
(http://www.sciencedirect.com/science/article/B6T6R-4RVG3S9-2/2/f905c1526cd019de9e969974246d3f1c)
Abstract:
The chemical composition of flower, leaves and stems from basil (Ocimum basilicum L.) have been examined by GC and GC-MS. The identified components constituting 99.03%, 95.04% and 97.66% of the flower, leaves and stem oils, respectively. The main constituents of the essential oil of flower, leaves and stem oils, respectively, were estragole (58.26%, 52.60% and 15.91%) and limonene (19.41%, 13.64% and 2.40%) and p-cymene (0.38%, 2.32% and 2.40%). Dill apiole (50.07%) was identified as the highest main constituent for stem. Estragole (15.91%), apiole (9.48) and exo-fenchyle acetate (6.14%) followed in order to decreasing them. Minor qualitative and major quantitative variations for some compounds of essential oils were determined with respect to different parts of O. basilicum. It was reported that the chemical composition of different parts oils of basil are very variable. It is known that specific estragole chemotypes are also known.
Keywords: Basil; O. basilicum; Lamiaceae; Essential oil; Estragol; Dillapiole

Vidhi Chaudhary, Rupam Kapoor, A.K. Bhatnagar, Effectiveness of two arbuscular mycorrhizal fungi on concentrations of essential oil and artemisinin in three accessions of Artemisia annua L., Applied Soil Ecology, Volume 40, Issue 1, September 2008, Pages 174-181, ISSN 0929-1393, DOI: 10.1016/j.apsoil.2008.04.003.
(http://www.sciencedirect.com/science/article/B6T4B-4SK59C4-1/2/c6e0af1d511757ea45d1765cb000b379)
Abstract:
A field experiment was conducted to study and compare the effectiveness of two arbuscular mycorrhizal fungi (AMF), Glomus macrocarpum (GM) and Glomus fasciculatum (GF) on three accessions of Artemisia annua. The AM inoculation significantly increased the production of herbage, dry weight of shoot, nutrient status (P, Zn and Fe) of shoot, concentration of essential oil and artemisinin in leaves as compared to non-inoculated plants. The extent of growth, nutrient concentration and production of secondary plant metabolites varied with the fungus-plant accession combination. The mycorrhizal dependency of the three accessions was related to the shoot: root ratio. Comparing the two fungal inoculants in regard to increase in essential oil concentration in shoot, the effectiveness of GF was more than that of GM. While in two accessions, GM was more effective in enhancing artemisinin concentration than GF. Increase in concentration of essential oil was found to be positively correlated to P-status of the plant. Conversely, no correlation was found between shoot-P and artemisinin concentration.
Keywords: Glomus macrocarpum; Glomus fasciculatum; Artemisia annua; AMF; Essential oil; Artemisinin; Shoot-P

Joao Henrique G. Lago, Paulete Romoff, Oriana A. Favero, Fatima O. Souza, Marisi G. Soares, Patricia T. Baraldi, Arlene G. Correa, Chemical composition of male and female Baccharis trimera

(Less.) DC. (Asteraceae) essential oils, Biochemical Systematics and Ecology, Volume 36, Issue 9, September 2008, Pages 737-740, ISSN 0305-1978, DOI: 10.1016/j.bse.2008.05.009.
(http://www.sciencedirect.com/science/article/B6T4R-4T1SFRR-1/2/eb44abe51ff4e63a53b33f0a5693e20b)
Keywords: Baccharis trimera; Asteraceae; Essential oil composition; Dioecious species

Hui-Ting Chang, Ying-Hung Cheng, Chi-Lin Wu, Shang-Tzen Chang, Tun-Tschu Chang, Yu-Chang Su, Antifungal activity of essential oil and its constituents from Calocedrus macrolepis var. formosana Florin leaf against plant pathogenic fungi, Bioresource Technology, Volume 99, Issue 14, September 2008, Pages 6266-6270, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.12.005.
(http://www.sciencedirect.com/science/article/B6V24-4RWK054-3/2/b188604b15e948aff097740878ad7ca8)
Abstract:
Resistance to conventional fungicides causes the poor disease control of agriculture. Natural products from plants have great potential as novel fungicide sources for controlling pathogenic fungi. In this study antipathogenic activity of the leaf essential oil and its constituents from Calocedrus macrolepis var. formosana Florin were evaluated in vitro against six plant pathogenic fungi. Chemical analysis of leaf oil by GC/MS allowed identification of [alpha]-pinene (44.2%), limonene (21.6%), [beta]-myrcene (8.9%), [beta]-caryophyllene (8.2%), caryophyllene oxide (2.4%), [alpha]-cadinol (1.6%), [beta]-pinene (1.2%), and T-muurolol (1.1%) as main components. Sesquiterpenoid components of the oil were more effective than monoterpenoid components of the oil. In particular, T-muurolol and [alpha]-cadinol strongly inhibited the growth of Rhizoctonia solani and Fusarium oxysporum, with the IC50 values < 50 [mu]g ml-1. These compounds also efficiently inhibited the mycelial growths of Colletotrichum gloeosporioides, P. funerea, Ganoderma australe and F. solani. These results showed that T-muurolol and [alpha]-cadinol possess antifungal activities against a broad spectrum of tested plant pathogenic fungi and could be used as potential antifungal agents for the control of fungal diseases in plants.
Keywords: Calocedrus macrolepis var. formosana Florin; Plant pathogenic fungi; Antifungal activity; T-Muurolol; [alpha]-Cadinol

Samir A.M. Abdelgaleil, Moustafa A. Abbassy, Abdel-Salam H. Belal, Mona A.A. Abdel Rasoul, Bioactivity of two major constituents isolated from the essential oil of Artemisia judaica L., Bioresource Technology, Volume 99, Issue 13, September 2008, Pages 5947-5950, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.10.043.
(http://www.sciencedirect.com/science/article/B6V24-4R8M99H-3/2/f36df48def3686dc82128f76aa558e75)
Abstract:
The essential oil of Artemisia judaica L., grown on Sinai Peninsula of Egypt, was extracted via hydrodistillation. Chromatographic separation on repeated silica gel columns led to isolate two compounds namely piperitone and trans-ethyl cinnamate. Insecticidal, antifeedant and antifungal properties of the isolated compounds were examined. Both compounds showed pronounced insecticidal and antifeedant activity against the third instar larvae of Spodoptera littoralis (Boisd). trans-Ethyl cinnamate (LD50 = 0.37 [mu]g/larva) was more toxic than piperitone (LD50 = 0.68 [mu]g/larva). The two isolated compounds revealed antifeedant activity in a concentration dependent manner, with complete feeding inhibition at a concentration of 1000 [mu]g/ml. When tested for antifungal activity against four plant pathogenic fungi, the isolated compounds exhibited a moderate to high activity.
Keywords: Artemisia judaica; Piperitone; trans-Ethyl cinnamate; Insecticidal activity; Antifeedant activity

Naciye Erkan, Guler Ayranci, Erol Ayranci, Antioxidant activities of rosemary (Rosmarinus Officinalis L.) extract, blackseed (Nigella sativa L.) essential oil, carnosic acid, rosmarinic acid and sesamol, Food Chemistry, Volume 110, Issue 1, 1 September 2008, Pages 76-82, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.01.058.
(http://www.sciencedirect.com/science/article/B6T6R-4RSBYFW-4/2/05215e12cfe35055fbdc46031b338222)
Abstract:
Antioxidant activities of three pure compounds: carnosic acid, rosmarinic acid and sesamol, as well as two plant extracts: rosemary extract and blackseed essential oil, were examined by applying DPPH and ABTS+ radical-scavenging assays and the ferric thiocyanate test. All three test methods proved that rosemary extract had a higher antioxidant activity than blackseed essential oil. The order of antioxidant activity of pure compounds showed variations in different tests. This was attributed to structural factors of individual compounds. Phenolic contents of blackseed essential oil and rosemary extract were also determined. Rosemary extract was found to have a higher phenolic content than blackseed essential oil. This fact was utilised in explaining the higher antioxidant activity of rosemary extract.
Keywords: Antioxidant activity; Rosemary extract; Blackseed essential oil; Carnosic acid; Rosmarinic acid; Sesamol

Manel Neffati, Brahim Marzouk, Changes in essential oil and fatty acid composition in coriander (Coriandrum sativum L.) leaves under saline conditions, Industrial Crops and Products, Volume 28, Issue 2, September 2008, Pages 137-142, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2008.02.005.
(http://www.sciencedirect.com/science/article/B6T77-4S69S67-1/2/b8e65e05aaffc310d2a64f5512184197)
Abstract:
The influence of salinity on essential oil and fatty acid composition of Tunisian coriander (Coriandrum sativum L.) leaves grown in hydroponic culture was investigated. Volatile constituents and fatty acid of leaves were analyzed. The essential oil yield increased significantly up to 18 and 43% with 25 and 50 mM NaCl, respectively and decreased significantly under high salinity. The major volatile compound in leaves was (E)-2-decenal with 52% of total essential oil constituents, followed by decanal, dodecanal, (E)-2-tridecenal and (E)-2-dodecenal. Further, the content of these compounds was affected differently by the treatment level.
Salinity decreased significantly the total fatty acid content of the upper and basal leaves. [alpha]-Linolenic (C18:3n3) was the main compound of both organs, followed by linoleic (C18:2n6), heptadecenoic (C17:1n7) and palmitic (C16:0) acids. Raising NaCl concentrations lead to an important decrease in the unsaturated to saturated fatty acid ratio stimulating the formation of more rigid membrane.
Keywords: Coriander; Salinity; Essential oil; (E)-2-Decenal; [alpha]-Linolenic acid; Heptadecenoic acid

A.V. Chaves, K. Stanford, M.E.R. Dugan, L.L. Gibson, T.A. McAllister, F. Van Herk, C. Benchaar, Effects of cinnamaldehyde, garlic and juniper berry essential oils on rumen fermentation, blood metabolites, growth performance, and carcass characteristics of growing lambs, Livestock Science, Volume 117, Issues 2-3, September 2008, Pages 215-224, ISSN 1871-1413, DOI: 10.1016/j.livsci.2007.12.013.
(http://www.sciencedirect.com/science/article/B7XNX-4RWK0CS-2/2/6e5792f79029163a8f7cb8cb5d9fbca5)
Abstract:
The objective of this study was to examine the effects of cinnamaldehyde (CDH), garlic (GAR) and juniper berry (JUN) essential oils (200 mg/kg of DM) on performance and carcass characteristics

of lambs fed a barley-based concentrate diet ad libitum. For this purpose, 40 ewes' lambs (23.5 +/- 1.11 kg initial live weight, LW) were used in a random block design over a 13-week period. Feeding CDH, GAR or JUN did not affect dry matter intake (DMI) but the average daily gain (ADG) of lambs supplemented with CDH and JUN was higher (P = 0.002) as compared to lambs fed GAR or the control diet. Feed conversion (DMI/ADG) was numerically improved when lambs were fed CDH (4.8) and JUN (4.7) compared to those fed GAR (5.2) or the control diet (5.3). There were no effects of feed additives on ruminal pH and concentrations of ammonia and total VFA. Serum concentrations of glycerol and total glycerides were lower and higher (P <= 0.03) in lambs fed CDH or JUN respectively, as compared to lambs fed GAR or the control diet. Hot dressed carcass weight was similar among treatments (23.7 +/- 0.75 kg; P = 0.18) whereas saleable meat tended (P = 0.13) to increase (+ 9%) in lambs fed CDH and JUN compared to those fed GAR or the control diet. Feeding CDH, GAR or JUN had little effect on the overall fatty acid composition of back fat and liver and only minor effects on meat flavour characteristics.
Keywords: Essential oil; Lamb; Ruminal fermentation; Growth performance; Carcass quality

Maria Serrano, Domingo Martinez-Romero, Fabian Guillen, Juan Miguel Valverde, Pedro Javier Zapata, Salvador Castillo, Daniel Valero, The addition of essential oils to MAP as a tool to maintain the overall quality of fruits, Trends in Food Science & Technology, Volume 19, Issue 9, September 2008, Pages 464-471, ISSN 0924-2244, DOI: 10.1016/j.tifs.2008.01.013.
(http://www.sciencedirect.com/science/article/B6VHY-4RSBY22-1/2/72e2e305b92d32d5e58965936e5e4fb4)
Abstract:
This paper covers the recent literature on fruit ripening and problems related to quality loss during postharvest storage, as well as the use of essential oils as antioxidants and antimicrobials. This review sets the principles for the creation of innovative technological developments by using an active packaging based on the combination of modified atmosphere packaging (MAP) with natural antimicrobial compounds. The use of this active packaging on the delay of fruit ripening and the extension of shelf-life based on safety and the preservation of sensory attributes and bioactive compounds with functional properties will be provided.

D.R. George, T.J. Smith, O.A.E. Sparagano, J.H. Guy, The influence of `time since last blood meal' on the toxicity of essential oils to the poultry red mite (Dermanyssus gallinae), Veterinary Parasitology, Volume 155, Issues 3-4, 17 August 2008, Pages 333-335, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2008.05.005.
(http://www.sciencedirect.com/science/article/B6TD7-4SGD4X0-9/2/218bfd5a3267dc1310d6f4ee3c7060ae)
Abstract:
The poultry red mite, Dermanyssus gallinae (De Geer) is a serious ectoparasitic pest of layer hens that can survive for long periods in the poultry house sub-structure without taking a blood meal from its host. The research undertaken in this study found that `time since last blood meal' had a notable effect on how toxic a selection of plant essential oils were to D. gallinae under laboratory conditions.
In general, the essential oils had a greater toxic effect on D. gallinae if mites had been starved of a blood meal for around 3 weeks, than if they had been more recently fed 3-13 days prior to tests. This result was consistent across the four essential oils used (thyme, palmarosa, caraway and juniper leaf). This suggests that plant essential oils may be of use in management schemes for D. gallinae, particularly if used to sanitise houses between flocks, when mites will have been starved.
Keywords: Dermanyssus gallinae; Essential oil; Toxicity; Diet

Mohammad-Taghi Golmakani, Karamatollah Rezaei, Comparison of microwave-assisted hydrodistillation withthe traditional hydrodistillation method in the extractionof essential oils from

Thymus vulgaris L., Food Chemistry, Volume 109, Issue 4, 15 August 2008, Pages 925-930, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.12.084.
(http://www.sciencedirect.com/science/article/B6T6R-4RP0MTK-1/2/5b5cf364eff4d966f4b910d030e27d93)
Abstract:
Microwave-assisted hydrodistillation (MAHD) is an advanced hydrodistillation (HD) technique utilizing a microwave oven in the extraction process. MAHD of essential oils from the aerial parts (tops) of Thymus vulgaris L. (common thyme) was studied and the results were compared with those of the conventional HD in terms of extraction time, extraction yield/efficiency, chemical composition, quality of the essential oils and cost of the operation. MAHD was superior in terms of saving energy and extraction time (75 min, compared to 4 h in HD). Scanning electron microscopy (SEM) of thyme leaves undergone HD and MAHD provided evidences as to a sudden rupture of essential oil glands with MAHD. Gas chromatography-mass spectrometry analysis of the extracted essential oils indicated that the use of microwave irradiation did not adversely influence the composition of the essential oils. MAHD was found to be a green technology.
Keywords: Essential oil composition; Microwave assisted hydrodistillation; Scanning electron microscopy; Thymus vulgaris L.

C. Benchaar, S. Calsamiglia, A.V. Chaves, G.R. Fraser, D. Colombatto, T.A. McAllister, K.A. Beauchemin, A review of plant-derived essential oils in ruminant nutrition and production, Animal Feed Science and Technology, Volume 145, Issues 1-4, Enzymes, Direct Fed Microbials and Plant Extracts in Ruminant Nutrition, 14 August 2008, Pages 209-228, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2007.04.014.
(http://www.sciencedirect.com/science/article/B6T42-4PG2KV2-2/2/11f50e1b042652aa0e8c9b2823a4f259)
Abstract:
Public concern over use of antibiotics in livestock production has increased in recent years because of their possible contribution to emergence of antibiotic resistant bacteria, and their transmission from livestock to humans. Accordingly, ruminant microbiologists and nutritionists have been exploring alternative methods of favorably altering ruminal metabolism to improve feed efficiency and animal productivity. Plant extracts contain secondary metabolites, such as essential oils (EO), that have antimicrobial properties that make them potential alternatives to antibiotics to manipulate microbial activity in the rumen. Essential oils are naturally occurring volatile components responsible for giving plants and spices their characteristic essence and color. Over the last few years, a number of studies have examined effects of EO, and their active components, on rumen microbial fermentation. However, many of these studies are laboratory based (i.e., in vitro) and of a short-term nature. Nevertheless, results from in vitro batch culture studies provide evidence that EO and their components have the potential to improve N and/or energy utilization in ruminants. Effects of EO on ruminal N metabolism is more likely mediated by their impact on hyper-ammonia producing (HAP) bacteria resulting in reduced deamination of amino acids (AA) and production of ammonia N. However, these responses are only observed with high doses of EO, which also can inhibit the process of ruminal fermentation as reflected by a decline in total volatile fatty acid production. Effects on methane production are inconsistent, but evidence to date indicates that there is potential to select EO, or active components, that selectively inhibit ruminal methanogenesis. Results from in vitro continuous culture studies suggest that rumen microbial populations may adapt to EO, which may explain the lack of an effect of EO on ruminal metabolism and animal performance in long-term in vivo studies. Several studies have examined the activity of a number of EO against a wide variety of food-borne pathogens. Data available show a strong bactericidal activity against pathogenic bacteria such as Escherichia coli O157:H7 and Salmonella spp. Essential oils hold promise as feed additives in ruminant nutrition to improve feed efficiency and control the spread of pathogens in livestock. However identification of EO, or

their active components, that favorably alter fermentation without resulting in broad overall inhibition of rumen fermentation, continues to be a major challenge for researchers.
Keywords: Essential oil; Ruminant; Metabolism; Production; Control of pathogens

L. Castillejos, S. Calsamiglia, J. Martin-Tereso, H. Ter Wijlen, In vitro evaluation of effects of ten essential oils at three doses on ruminal fermentation of high concentrate feedlot-type diets, Animal Feed Science and Technology, Volume 145, Issues 1-4, Enzymes, Direct Fed Microbials and Plant Extracts in Ruminant Nutrition, 14 August 2008, Pages 259-270, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2007.05.037.
(http://www.sciencedirect.com/science/article/B6T42-4PFFD14-1/2/c3fa5adbc9ad5798344b2e1722f00906)
Abstract:
Use of antibiotics as growth promoters in animal feeds has been banned in the European Union due to increasing concerns about the appearance of residues in meat and milk and antibiotic resistant strains of bacteria. Some essential oils (EO) modify rumen microbial activity and appear to be a `natural' alternative to modify rumen microbial fermentation. Effects of 10 EO (i.e., clove leave, hyssop, lavandin, lavender, thyme, oregano, rosemary, sage, savory, tea tree) were evaluated in in vitro 24 h batch culture of diluted rumen fluid [Tilley, J.M.A., Terry, R.A., 1963. A two stage technique for the in vitro digestion of forage crops. J. Brit. Grassland Soc. 18, 104-111] at pH 6.50. A 10:90 forage:concentrate diet (161 g/kg CP; 320 g/kg NDF; 380 g/kg starch on a dry matter basis) typically fed to beef cattle in a barley grain based beef system was used as substrate. Treatments were: negative control (CTR), positive control (10 mg/l of monensin), and three doses of each EO (5, 50, 500 mg/l). After 24 h, pH was determined in the culture fluid and samples were analyzed for ammonia N and volatile fatty acid (VFA) concentrations. Monensin increased VFA concentration, and propionate and valerate proportions, and decreased acetate and butyrate proportions, the acetate to propionate ratio and ammonia N concentration. Lavender oil did not modify rumen microbial fermentation and lavandin and oregano (500 mg/l) inhibited rumen microbial fermentation thereby decreasing VFA concentration, which suggests that these EO may not be beneficial in beef cattle nutrition. However, the lower doses of oregano oil increased VFA concentration by 39-56%. Thyme and savory oils increased VFA concentration, and decreased ammonia N concentration and final pH. The 500 mg/l doses of rosemary, hyssop, sage, tea tree and clove leaf oils acted similar to monensin by increasing propionate and valerate proportion, and reducing acetate and butyrate proportions and the acetate to propionate ratio without reducing VFA concentration. Clove leaf oil at 500 mg/l increased total VFA and was the only EO that increased final pH. Most of these EO modified rumen microbial fermentation and may allow manipulation of rumen fermentation to improve animal performance.
Keywords: Essential oil; Rumen fermentation

D. Macheboeuf, D.P. Morgavi, Y. Papon, J.-L. Mousset, M. Arturo-Schaan, Dose-response effects of essential oils on in vitro fermentation activity of the rumen microbial population, Animal Feed Science and Technology, Volume 145, Issues 1-4, Enzymes, Direct Fed Microbials and Plant Extracts in Ruminant Nutrition, 14 August 2008, Pages 335-350, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2007.05.044.
(http://www.sciencedirect.com/science/article/B6T42-4PJ6BN4-3/2/f2b0531a35219f88ca1908f2ee1a8a28)
Abstract:
Numerous bioactive compounds in plant-derived products are secondary toxic metabolites produced by plants as a mechanism of defence against herbivores and invading microbes. Among them, essential oils (EO), which are known for their antimicrobial effects have been proposed as modulators of rumen fermentation. However, there is little information on their dose-response effects on the rumen ecosystem. Using five natural EO from Thymus vulgaris, Origanum vulgare,

thymol chemo-type of O. vulgare, Cinnamomum verum, and Anethum graveolens, and three pure constituents thymol, carvacrol, and cinnamaldehyde, we examined the in vitro response of the rumen microbial ecosystem evaluated through production curves of volatile fatty acids (VFA), ammonia, and gas. Three types of EO molecules were discriminated, being carvone (a terpene), thymol, and carvacrol (phenolic EO originated from the terpene pathway), and cinnamaldehyde (a phenolic EO originating from the phenyl-propane pathway). The carvone-based EO produced a linear non-threshold profile that negatively affected end-products of fermentation. A threshold profile, characterized by a virtual stop of fermentation when doses were higher than the threshold level, occurred for thymol/carvacrol-based EO. The effect of cinnamaldehyde-based EO was a negative sigmoid profile characterized by a reduction of protein degradation at low additive concentration, without changes in VFA production, and a negative effect on all fermentation variables at higher concentrations. Loss of the methanogenesis was a feature of the transition point in this profile. Results show that EO induces at least three types of dose-response in the rumen ecosystem. Knowing the type of response, as well as the effective dose, could help determine which compound would be most appropriate for a particular production objective, such as decreasing protein degradation. Results also highlight the toxic nature of EO upon rumen microbes, and that there is a narrow dose window for the successful adoption of this technology.
Keywords: Rumen fermentation; Ammonia production; Essential oils; Cinnamaldehyde; Thymol; Carvacrol; Antimicrobial activity

M. Spanghero, C. Zanfi, E. Fabbro, N. Scicutella, C. Camellini, Effects of a blend of essential oils on some end products of in vitro rumen fermentation, Animal Feed Science and Technology, Volume 145, Issues 1-4, Enzymes, Direct Fed Microbials and Plant Extracts in Ruminant Nutrition, 14 August 2008, Pages 364-374, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2007.05.048.
(http://www.sciencedirect.com/science/article/B6T42-4PG2KV2-3/2/200f4f56f92e0d548f28b9ce40216323)
Abstract:
This study was designed to evaluate effects of increasing doses of a blend of essential oils (EO; oregano, cinnamon, thyme, orange peel) on in vitro rumen fermentation in rumen liquor from dairy cows and fattening bulls, as influenced by acidity at the start of the fermentation. Two in vitro fermentation experiments, which differed only in the origin of rumen liquor (i.e., dairy cows [DC] or fattening bulls [FB]), were conducted in duplicate runs in 100 ml glass tubes containing 50 ml of diluted rumen fluid and 500 mg of a mixed ration substrate. The pH of the diluted rumen liquor at the beginning of each fermentation was adjusted to 7.0 with 5N NaOH or 5.5 with 3N HCl. The EO blend was added to each fermentation tube at doses of 8, 16, 24 and 32 [mu]l/tube, equivalent to 160, 320, 480 and 640 [mu]l/l, using 3 tubes for each dosage level plus 3 tubes without EO as controls (i.e., 30 tubes in total/run). After 24 h of incubation, fermentation liquor was collected and analyzed for volatile fatty acids (VFA), ammonia N and pH. In both experiments, pH and ammonia N concentration of the fermentation liquor were lower ($P<0.01$) at the initial pH of 5.5. The reduction of initial pH from 7.0 to 5.5 depressed VFA yield (138 mM versus 120 mM and 132 mM versus 111 mM, $P<0.01$, respectively, for DC and FB rumen liquors), and modified end products of fermentation by lowering the acetate:propionate ratio (4.3 versus 3.6 and 3.2 versus 2.5, $P<0.01$, respectively, for DC and FB rumen liquors). Butyrate concentration was higher at the lower pH in the DC rumen liquor fermentation (22.4 mM/100 mM versus 16.2 mM/100 mM, $P<0.01$), but not in the FB fermentation. In both experiments, addition of the EO blend did not depress total VFA concentrations, except at the highest dose in the experiment with rumen fluid from DC (122 mM versus 128 mM, $P<0.01$). In both experiments, there was an interaction ($P<0.01$) between EO addition and initial pH on acetate proportion; at the initial pH of 5.5, EO addition decreased acetate from 65.0 to 63.9 and from 62.6 to 61.8 mM/100 mM, respectively, for DC and FB rumen liquors, while there were no effects of EO at the initial pH of 7.0. In the experiment with DC rumen liquid, EO addition tended ($P<0.08$) to increase propionate proportion (from 16.1 to 16.6 mM/100 mM),

while there was no effect in FB rumen liquid. In the FB experiment, EO decreased (P<0.05) the acetate:propionate ratio, while in the DC experiment it decreased only at low pH (interaction `EO additionxinitial pH': P<0.01). A moderate shift in end products of fermentation occurred with both types of rumen liquor, but mainly at low ruminal pH (i.e., 5.5), suggesting a selective toxicity of these EO against rumen bacterial strains that grow at low rumen pH.
Keywords: Essential oil; Rumen fermentation; Volatile fatty acid; Ammonia

Ayda Khadri, M.L.M. Serralheiro, J.M.F. Nogueira, Mohamed Neffati, Samira Smiti, M.E.M. Araujo, Antioxidant and antiacetylcholinesterase activities of essential oils from Cymbopogon schoenanthus L. Spreng. Determination of chemical composition by GC-mass spectrometry and 13C NMR, Food Chemistry, Volume 109, Issue 3, 1 August 2008, Pages 630-637, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.12.070.
(http://www.sciencedirect.com/science/article/B6T6R-4RJYVBV-4/2/3ef32be398184510213f45f85063933e)
Abstract:
Cymbopogon schoenanthus L. Spreng, is an aromatic herb consumed in salads and used to prepare traditional meat recipes in Tunisia. The chemical composition, antioxidant activities and acetylcholinesterase inhibitory properties of the essential oils from fresh leaves, dried leaves and roots collected from three different locations in southern Tunisia, were evaluated. Essential oils were analysed by GC-mass spectrometry and 13C NMR. The major components were limonene (10.5-27.3%), [beta]-phellandrene (8.2-16.3%), [delta]-terpinene (4.3-21.2%) and [alpha]-terpineol (6.8-11.0%). Antioxidant activity was measured by DPPH assay. The results ranged from 36.0% to 73.8% (2 [mu]l of essential oil per mL of test solution).
The antioxidant activity was also assayed using [beta]-carotene-linoleic acid bleaching method. The best results (IC50 = 0.47 +/- 0.04 mg mL-1) were obtained with the fresh leaves of plants collect in the desert region.
The greatest acetylcholinesterase inhibitory activity (IC50 = 0.26 +/- 0.03 mg mL-1) was exhibited by the essential oil of the fresh leaves from the mountain region.
Keywords: Cymbopogon schoenanthus; Essential oils; 13C NMR; GC-MS; Antioxidant activity; Acetylcholinesterase activity

El Akrem Hayouni, Imed Chraief, Manaf Abedrabba, Marielle Bouix, Jean-Yves Leveau, Hammami Mohammed, Moktar Hamdi, Tunisian Salvia officinalis L. and Schinus molle L. essential oils: Their chemical compositions and their preservative effects against Salmonella inoculated in minced beef meat, International Journal of Food Microbiology, Volume 125, Issue 3, 31 July 2008, Pages 242-251, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.04.005.
(http://www.sciencedirect.com/science/article/B6T7K-4SB7TR7-1/2/9ea44699b23f21adf78b82bd9d0092d5)
Abstract:
The essential oils (EOs) extracted from the aerial parts of cultivated Salvia officinalis L. and the berries of Schinus molle L. were analysed by gas chromatography-mass spectrometry (GC-MS) and 68 and 67 constituents were identified, respectively. The major constituents were 1,8-cineole (33.27%), [beta]-thujone (18.40%), [alpha]-thujone (13.45%), borneol (7.39%) in S. officinalis oil and [alpha]-phellandrene (35.86%), [beta]-phellandrene (29.3%), [beta]-pinene (15.68%), p-cymene (5.43%) and [alpha]-pinene (5.22%) in S. molle oil.
In its second part, the present study was conducted to evaluate the in vitro antimicrobial activity of both studied EOs. For this purpose, paper disc-diffusion method and broth microdilution test were used. The disc-diffusion method showed significant zone of lysis against all the pathogens studied (gram-negative and gram-positive bacteria, yeast). These activities remained stable after six months, and decreased approximately by 20% after one year of storage of the EOs at 4 to 7 [degree sign]C. On comparing the efficiency of both EOs, S. officinalis EO exhibited higher

antibacterial activity against the majority of strains and especially against Candida albicans (two fold more active according to the inhibition zones values). The minimal inhibitory concentrations (MICs) were reported between 4.5 mg/ml and 72 mg/ml on nutrient broth. The particular chemotype of each EO may be involved in its specific antimicrobial behaviour.
Furthermore, the inhibitory effect of these EOs were evaluated against two foodborne pathogens belonging to Salmonella genus, experimentally inoculated (103 CFU/g) in minced beef meat, which was mixed with different concentrations of the EO and stored at 4 to 7 [degree sign]C for 15 days. Although the antibacterial activities of both EOs in minced beef meat were clearly evident, their addition had notable effects on the flavour and taste of the meat at concentrations more than 2% for S. molle and 1.5% for S. officinalis. One solution to the above-mentioned problem may be the use of combinations of different food preservation systems. In this context, each of the EOs has been used along with low water activity (addition of NaCl) in addition to low refrigeration temperatures. Results on the Salmonella growth showed that some combinations could be recommended to eliminate germs from minced raw beef. By using this method, a stable and, from a microbiological point of view, safe meat can be produced without substantial loss in sensory quality.
Results obtained herein, may suggest that the EOs of S. officinalis and S. molle possess antimicrobial activity, and therefore, they can be used in biotechnological fields as natural preservative ingredients in food and/or pharmaceutical industry.
Keywords: Essential oils; Salvia officinalis L.; Schinus molle L.; Antimicrobial activity; GC-MS; Minced beef meat; Salmonella; Sodium chloride

Vivek K. Bajpai, Atiqur Rahman, Sun Chul Kang, Chemical composition and inhibitory parameters of essential oil and extracts of Nandina domestica Thunb. to control food-borne pathogenic and spoilage bacteria, International Journal of Food Microbiology, Volume 125, Issue 2, 15 July 2008, Pages 117-122, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.03.011.
(http://www.sciencedirect.com/science/article/B6T7K-4S5KX76-1/2/ba701d5d4f32d9e53d4de938cf09844f)
Abstract:
The aim of this study was to examine the chemical composition of the essential oil isolated from the floral parts of Nandina domestica Thunb. by hydrodistillation, and to test the efficacy of essential oil and various organic extracts against a panel of food-borne pathogenic and spoilage bacteria such as Bacillus subtilis ATCC6633, Listeria monocytogenes ATCC19166, Staphylococcus aureus KCTC1916, S. aureus ATCC6538, Pseudomonas aeruginosa KCTC2004, Salmonella typhimurium KCTC2515, Salmonella enteridis KCCM12021, Escherichia coli 0157-Human, E. coli ATCC8739, E. coli 057:H7 ATCC43888 and Enterobacter aerognes KCTC2190. The chemical composition of essential oil was analysed by GC-MS. It was determined that 79 compounds, which represented 87.06% of total oil, were present in the oil. The oil contained mainly 1-indolizino carbazole (19.65%), 2-pentanone (16.4%), mono phenol (12.1%), aziridine (9.01%), methylcarbinol (4.6%), ethanone (3.3%), furfural (2.96%), 3,5-dimethylpyrazole (1.29%) and 2(5H)-furanone (1.32%). The oil (1000 ppm/disc), and various organic extracts of hexane, chloroform, ethyl acetate and methanol (1500 ppm/disc) exhibited promising antibacterial effect as a diameter of zones of inhibition (9-18 and 7-13 mm) and MIC values (62.5 to 1000 and 250 to 2000 [mu]g/ml), respectively against the tested bacteria. Also the oil had strong detrimental effect on the viable count of the tested bacteria. These results indicate the potential efficacy of plant-based natural products such as essential oil and organic extracts of N. domestica to control food-borne pathogenic and spoilage bacteria.
Keywords: Nandina domestica Thunb.; Essential oil; Mono phenol; 3,5-dimethylpyrazole; Food-borne and spoiling bacteria; Antibacterial activity

Mustafa Kelen, Bektas Tepe, Chemical composition, antioxidant and antimicrobial properties of the essential oils of three Salvia species from Turkish flora, Bioresource Technology, Volume 99, Issue 10, July 2008, Pages 4096-4104, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.09.002.
(http://www.sciencedirect.com/science/article/B6V24-4PYRK9N-5/2/db12afbf34b6931bd764da7140b24e76)
Abstract:
Essential oils of three different Salvia species [Salvia aucheri var. aucheri (endemic), Salvia aramiensis and Salvia pilifera (endemic)] were screened for their possible antioxidant and antimicrobial properties as well as their chemical compositions. According to the gas chromatography (GC)/EIMS (gas chromatography/electron impact mass spectrum) analysis results; 41 (97.2%), 51 (98.5%) and 83 compounds (98.2%) were identified, respectively. While 1,8-cineole (30.5%), camphor (21.3%) and borneol (8.50%) are the major compounds for S. aucheri var. aucheri oil, [beta]-pinene (10.3%), was the main constituent for S. aramienesis together with 1,8-cineole (46.0%) and camphor (8.7%). In the case of S. pilifera oil, [alpha]-thujene (36.1%) and [alpha]-pinene (13.8%) determined as the major compounds. Antioxidant activity was employed by two complementary test systems namely 2,2'-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging and [beta]-carotene/linoleic acid systems. Antioxidant activity of S. aramiensis was found to be higher than those of the others for the both systems (12.26 +/- 1.09 and 92.46% +/- 1.64 [mu]g mg-1, respectively). Additionally, antioxidant activities of BHT, curcumin, ascorbic acid and [alpha]-tocopherol were determined in parallel experiments. In the case of antimicrobial activity, similar activity pattern was obtained (both in disc diffusion and MIC tests). Antimicrobial activity of S. aramiensis was followed by S. aucheri var. aucheri and S. pilifera, respectively. In these experiments, the most sensitive microorganism Acinetobacter lwoffii was followed by Candida albicans.
Keywords: Salvia aucheri var. aucheri; Salvia aramiensis; Salvia pilifera; Antimicrobial activity; Antioxidant activity; Essential oil

Cengiz Sarikurkcu, Bektas Tepe, Dimitra Daferera, Moschos Polissiou, Mansur Harmandar, Studies on the antioxidant activity of the essential oil and methanol extract of Marrubium globosum subsp. globosum (lamiaceae) by three different chemical assays, Bioresource Technology, Volume 99, Issue 10, July 2008, Pages 4239-4246, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.08.058.
(http://www.sciencedirect.com/science/article/B6V24-4R008GF-4/2/0b3562e8d02408718e140c8fd4b72db0)
Abstract:
This study is designed to examine the chemical composition and in vitro antioxidant activity of the essential oil and sub-fractions of the methanol extract of Marrubium globosum subsp. globosum. The GC and GC-MS analysis of the essential oil were resulted in the determination of 84 components representing 88.2% of the oil. The major constituents of the oil were spathulenol (15.8%), [beta]-caryophyllene (9.0%), caryophyllene oxide (7.9%), germacrene D (6.5%), and bicyclogermacrene (3.1%). Antioxidant activities of the samples were determined by three different test systems namely DPPH, [beta]-carotene/linoleic acid and reducing power assay. In DPPH system, the weakest radical scavenging activity was exhibited by the essential oil (1203.38 +/- 7.18 [mu]g ml-1). Antioxidant activity of the polar sub-fraction of methanol extract was superior to the all samples tested with an EC50 value of 157.26 +/- 1.12 [mu]g ml-1. In the second case, the inhibition capacity (%) of the polar sub-fraction of methanol extract (97.39% +/- 0.84) was found the strongest one, which is almost equal to the inhibition capacity of positive control BHT (97.44% +/- 0.74). In the case of reducing power assay, a similar activity pattern was observed as given in the first two systems. Polar sub-fraction was the strongest radical reducer when compared with the non-polar one, with an EC50 value of 625.63 +/- 1.02 [mu]g ml-1. The amount of the total phenolics was highest in polar sub-fraction (25.60 +/- 0.74 [mu]g/mg). A positive correlation was

observed between the antioxidant activity potential and total phenolic level of the extracts. On the other hand, total flavonoid content was found equal for the both sub-fractions.
Keywords: Marrubium globosum subsp. globosum; Antioxidant activity; DPPH; [beta]-carotene; Reducing power

M.K. Fasseas, K.C. Mountzouris, P.A. Tarantilis, M. Polissiou, G. Zervas, Erratum to 'Antioxidant activity in meat treated with oregano and sage essential oils' [Food Chem. 106 (3) (2008) 1188-1194], Food Chemistry, Volume 109, Issue 1, 1 July 2008, Page 173, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.11.068.
(http://www.sciencedirect.com/science/article/B6T6R-4R8MDX9-8/2/93546c92905ad59166a05f6bde3ed5d3)

Maria C. Rota, Antonio Herrera, Rosa M. Martinez, Jose A. Sotomayor, Maria J. Jordan, Antimicrobial activity and chemical composition of Thymus vulgaris, Thymus zygis and Thymus hyemalis essential oils, Food Control, Volume 19, Issue 7, July 2008, Pages 681-687, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.07.007.
(http://www.sciencedirect.com/science/article/B6T6S-4P7FSB9-1/2/b58f7be241e78d71a37e7c6dba90d127)
Abstract:
The present study describes the volatile profile and antimicrobial activity of Thymus vulgaris (thymol chemotype), Thymus zygis subsp. gracilis (thymol and two linalool chemotypes) and Thymus hyemalis Lange (thymol, thymol/linalool and carvacrol chemotypes) essential oils extracted from seven plants cultivated in Murcia (Spain). Antimicrobial activities of the oils were evaluated for control of growth and survival of 10 pathogenic microorganisms.
Gas chromatography-mass spectrometry analysis allowed for the identification of between 42 and 51 compounds as main volatile constituents of each essential oil analyzed. Results presented here may suggest that the essential oils from T. hyemalis (thymol) followed by T. hyemalis (carvacrol), T. zygis (thymol) and T. vulgaris possesses antimicrobial properties, and are a potential source of antimicrobial ingredients for the food industry.
Keywords: Essential oils; Antimicrobial activity; Foodborne pathogens; Aromatic plants

P. Fandohan, B. Gnonlonfin, A. Laleye, J.D. Gbenou, R. Darboux, M. Moudachirou, Toxicity and gastric tolerance of essential oils from Cymbopogon citratus, Ocimum gratissimum and Ocimum basilicum in Wistar rats, Food and Chemical Toxicology, Volume 46, Issue 7, July 2008, Pages 2493-2497, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.04.006.
(http://www.sciencedirect.com/science/article/B6T6P-4S8K9H7-3/2/95fc3fbcddf2b6e4abf5c32a95239451)
Abstract:
Oils of Cymbopogon citratus, Ocimum gratissimum and Ocimum basilicum are widely used for their medicinal properties, and as food flavours and perfumes. Recently in a study in West Africa, these oils have been recommended to combat Fusarium verticillioides and subsequent fumonisin contamination in stored maize, but their toxicological profile was not investigated. The current study was undertaken to provide data on acute and subacute toxicity as well as on gastric tolerance of these oils in rat. For this purpose, the oils were given by gavage to Wistar rats for 14 consecutive days. The animals were observed daily for their general behaviour and survival, and their visceral organs such as stomach and liver were taken after sacrifice for histological analyses. A dose-dependent effect of the tested oils was observed during the study. Applied at doses generally higher than 1500 mg/kg body weight, the oils caused significant functional damages to stomach and liver of rat. Unlike the other oils, administration of O. gratissimum oil did not result in adverse effects in rat liver at the tested doses. The no observed adverse effect level (NOAEL) of

the tested oils has been established. The three tested oils can be considered as safe to human when applied on stored maize at recommended concentrations.
Keywords: Toxicity; Essential oils; Ocimum graticimum; Ocimum basilicum; Cymbopogon citratus; Rat

A.N. Hristov, J.K. Ropp, S. Zaman, A. Melgar, Effects of essential oils on in vitro ruminal fermentation and ammonia release, Animal Feed Science and Technology, Volume 144, Issues 1-2, 23 June 2008, Pages 55-64, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2007.09.034.
(http://www.sciencedirect.com/science/article/B6T42-4R2GX1V-1/2/3c9fc1e2e60c35ffbbb2c362f59db64d)
Abstract:
Ruminal inoculum enriched with particle-associated microorganisms was collected from two lactating dairy cows fed an alfalfa hay/cereal silage/concentrate diet 1 h before feeding and used to evaluate effects of essential oils (EO) on ruminal fermentation in short-term in vitro incubations. Ruminal ammonia N was labeled with 15N and native and hydrolyzed casein were provided as sources of amino acids. Forty EO were tested at 10 and 100 mg/l final medium concentration. Monensin-Na, and sodium laurate were also incubated at 5 and 2000 mg/l, respectively. Compared with blanks (i.e., no addition of EO), sodium laurate increased medium pH and a number of EO reduced medium pH. Both sodium laurate and monensin reduced ammonia concentrations compared to the blank. Only one of the tested EO (i.e., Caraway) slightly reduced ammonia concentration, by 8%, compared with the blank. Monensin and sodium laurate resulted in higher (i.e., 9-34%, monensin, and 29-47%, sodium laurate) 15N enrichment of ammonia N, an indication of reduced deamination of amino acids in these treatments versus the blank. Several EO (i.e., FrankMyrrh, Gardenia, Hibiscus, Eucaliptus, and Peppermint) had similar effects, but of a smaller magnitude (i.e., 5-12%). Some EO increased medium total VFA concentration, primarily through an increase in acetate concentration. Overall, effects of EO on fermentation were subtle, and it is unlikely that these moderate in vitro effects would correspond to any substantive impact on ruminal fermentation in vivo.
Keywords: Essential oil; Rumen fermentation; Ammonia

A.L.F. Camurca-Vasconcelos, C.M.L. Bevilaqua, S.M. Morais, M.V. Maciel, C.T.C. Costa, I.T.F. Macedo, L.M.B. Oliveira, R.R. Braga, R.A. Silva, L.S. Vieira, A.M.C. Navarro, Anthelmintic activity of Lippia sidoides essential oil on sheep gastrointestinal nematodes, Veterinary Parasitology, Volume 154, Issues 1-2, 14 June 2008, Pages 167-170, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2008.02.023.
(http://www.sciencedirect.com/science/article/B6TD7-4RY6WX8-3/2/a386ad5d6b7d1ec37df04c95ccd83b3c)
Abstract:
Medicinal plants have been investigated for their anthelmintic properties and shown to be effective against eggs and larvae of gastrointestinal nematodes. The aim of this study was to evaluate the efficacy of the Lippia sidoides essential oil (LsEO) on sheep gastrointestinal nematodes. Initially, 44 naturally infected sheep were divided and treated with 200 [mu]g kg-1 ivermectin and 230 and 283 mg kg-1 LsEO, respectively, plus the control. Fecal samples were collected from each animal to determine epg at 7, 14 and 21 days after treatment. In another test, 21 sheep were distributed and treated with 200 [mu]g kg-1 ivermectin, 283 mg kg-1 LsEO and the control, respectively. Seven days after treatment, they were euthanized and necropsied to count and identify the nematodes from the abomasum, small and large intestines. In the first test, the efficacy of 230 and 283 mg kg-1 LsEO and ivermectin was 38%, 45.9% and 40.2%, respectively, 7 days after treatment, and 30%, 54% and 39.6%, respectively, 14 days after treatment. In the second experiment, the respective efficacy of 283 mg kg-1 LsEO and ivermectin was 56.9% and 34.4% against Haemonchus spp., and 39.3% and 63.6% against Trichostrongylus spp.

Keywords: Phytotherapy; Sheep; Gastrointestinal nematodes; In vivo tests

Yu-Tang Tung, Meng-Thong Chua, Sheng-Yang Wang, Shang-Tzen Chang, Anti-inflammation activities of essential oil and its constituents from indigenous cinnamon (Cinnamomum osmophloeum) twigs, Bioresource Technology, Volume 99, Issue 9, June 2008, Pages 3908-3913, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.07.050.
(http://www.sciencedirect.com/science/article/B6V24-4PMJ9T7-B/2/6d5ae19a9ab74d7b30448e0da365a6b5)
Abstract:
In this study, chemical compositions of hydrodistilled essential oil and anti-inflammatory activities from the twigs of Cinnamomum osmophloeum Kaneh. were investigated for the first time. The chemical constituents of the twig essential oil were further analyzed by GC-MS and they were found to be l-bornyl acetate (15.89%), caryophyllene oxide (12.98%), [gamma]-eudesmol (8.03%), [beta]-caryophyllene (6.60%), T-cadinol (5.49%), [delta]-cadinene (4.79%), trans-[beta]-elemenone (4.25%), cadalene (4.19%), and trans-cinnamaldehyde (4.07%). The effects of essential oil on nitric oxide (NO) and prostaglandin E2 (PGE2) production in lipopolysaccharide (LPS)-activated RAW 264.7 macrophages were also examined. Results of nitric oxide tests indicated that twig essential oil and its major constituents such as trans-cinnamaldehyde, caryophyllene oxide, l-borneol, l-bornyl acetate, eugenol, [beta]-caryophyllene, E-nerolidol, and cinnamyl acetate have excellent activities. These findings demonstrated that essential oil of C. osmophloeum twigs have excellent anti-inflammatory activities and thus have great potential to be used as a source for natural health products.
Keywords: Cinnamomum osmophloeum; Twigs; Essential oil; trans-Cinnamaldehyde; Anti-inflammation

Abdullah Ijaz Hussain, Farooq Anwar, Syed Tufail Hussain Sherazi, Roman Przybylski, Chemical composition, antioxidant and antimicrobial activities of basil (Ocimum basilicum) essential oils depends on seasonal variations, Food Chemistry, Volume 108, Issue 3, 1 June 2008, Pages 986-995, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.12.010.
(http://www.sciencedirect.com/science/article/B6T6R-4RBYG2H-8/2/eec2c00374745986a21383b4c2f933d2)
Abstract:
Chemical composition, antioxidant and antimicrobial activities of the essential oils from aerial parts of basil (Ocimum basilicum L.) as affected by four seasonal, namely summer, autumn, winter and spring growing variation were investigated. The hydro-distilled essential oils content ranged from 0.5% to 0.8%, the maximum amounts were observed in winter while minimum in summer. The essential oils consisted of linalool as the most abundant component (56.7-60.6%), followed by epi-[alpha]-cadinol (8.6-11.4%), [alpha]-bergamotene (7.4-9.2%) and [gamma]-cadinene (3.2-5.4%). Samples collected in winter were found to be richer in oxygenated monoterpenes (68.9%), while those of summer were higher in sesquiterpene hydrocarbons (24.3%). The contents of most of the chemical constituents varied significantly ($p < 0.05$) with different seasons. The essential oils investigated, exhibited good antioxidant activity as measurements by DPPH free radical-scavenging ability, bleaching [beta]-carotene in linoleic acid system and inhibition of linoleic acid oxidation. Evaluation of antimicrobial activity of the essential oils and linalool, the most abundant component, against bacterial strains: Staphylococcus aureus, Escherichia coli, Bacillus subtilis, Pasteurella multocida and pathogenic fungi Aspergillus niger, Mucor mucedo, Fusarium solani, Botryodiplodia theobromae, Rhizopus solani was assessed by disc diffusion method and measurement of determination of minimum inhibitory concentration. The results of antimicrobial assays indicated that all the tested microorganisms were affected. Both the antioxidant and antimicrobial activities of the oils varied significantly ($p < 0.05$), as seasons changed.

Keywords: Seasonal variation; GC-MS; Linalool; IC50; Antimicrobial; Staphylococcus aureus; Aspergillus niger

W. Wang, N. Wu, Y.G. Zu, Y.J. Fu, Antioxidative activity of Rosmarinus officinalis L. essential oil compared to its main components, Food Chemistry, Volume 108, Issue 3, 1 June 2008, Pages 1019-1022, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.11.046.
(http://www.sciencedirect.com/science/article/B6T6R-4R7J66T-1/2/7f34e9a20a84f9c04cb3b2949b1474c3)
Abstract:
This study was designed to examine the in vitro antioxidant activities of Rosmarinus officinalis L. essential oil compared to three of its main components (1,8-cineole, [alpha]-pinene, [beta]-pinene). GC-MS analysis of the essential oil resulted in the identification of 19 compounds, representing 97.97% of the oil, the major constituents of the oil were described as 1,8-cineole (27.23%), [alpha]-pinene (19.43%), camphor (14.26%), camphene (11.52%) and [beta]-pinene (6.71%). The oil and the components were subjected to screening for their possible antioxidant activity by means of 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay and [beta]-carotene bleaching test. In the DPPH test system, free radical-scavenging activity of R. officinalis L. essential oil, 1,8-cineole, [alpha]-pinene and [beta]-pinene were determined to be 62.45% +/- 3.42%, 42.7% +/- 2.5%, 45.61% +/- 4.23% and 46.21% +/- 2.24% (v/v), respectively. In the [beta]-carotene bleaching test system, we tested series concentration of samples to show the antioxidant activities of the oil and its main components, whereas the concentrations providing 50% inhibition (IC50) values of R. officinalis L. essential oil, 1,8-cineole, [alpha]-pinene and [beta]-pinene were 2.04% +/- 0.42%, 4.05% +/- 0.65%, 2.28% +/- 0.23% and 2.56% +/- 0.16% (v/v), respectively. In general, R. officinalis L. essential oil showed greater activity than its components in both systems, and the antioxidant activities of all the tested samples were mostly related to their concentrations. Antioxidant activities of the synthetic antioxidant, ascorbic acid and BHT, were also determined in parallel experiments as positive control.
Keywords: Rosmarinus officinalis L.; 1,8-Cineole; [alpha]-Pinene; [beta]-Pinene; Antioxidant activities; GC-MS

Emmanoel V. Costa, Sirlei D. Teixeira, Francisco A. Marques, Marta C.T. Duarte, Camila Delarmelina, Maria Lucia B. Pinheiro, Jose R. Trigo, Beatriz Helena L.N. Sales Maia, Chemical composition and antimicrobial activity of the essential oils of the Amazon Guatteriopsis species, Phytochemistry, Volume 69, Issue 9, June 2008, Pages 1895-1899, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2008.03.005.
(http://www.sciencedirect.com/science/article/B6TH7-4SJF1K1-1/2/468b324f097000f2ff67403a3dc628b5)
Abstract:
The essential oils of Guatteriopsis blepharophylla, Guatteriopsis friesiana and Guatteriopsis hispida were obtained by hydrodistillation and analysed by GC and GC/MS. The main compound found in the leaf oil of G. blepharophylla was caryophyllene oxide (1) (69.25%). The leaf oil of G. friesiana contained predominantly [beta]-eudesmol (2) (51.60%), [gamma]-eudesmol (3) (23.70%), and [alpha]-eudesmol (4) (14.56%). The major constituents identified in the leaf of G. hispida were [beta]-pinene (38.18%), [alpha]-pinene (30.77%) and (E)-caryophyllene (20.59%). The antimicrobial activity of the essential oils was evaluated against 11 species of microorganisms. The oil of G. friesiana exhibited significant antimicrobial activity for all microorganisms tested, whereas that of G. hispida and G. blepharophyla had potent activity against Rhodococcus equi with MIC of 50 [mu]g mL-1. The major constituents of each oil were also tested separately, and showed lower activity compared to the oils. Moreover, mixtures of the main constituents, in the same proportions found in G. friesiana and G. hispida oils, did not show the same activity as the original oils.

Keywords: Guatteriopsis blepharophylla; Guatteriopsis friesiana; Guatteriopsis hispida; Annonaceae; Antimicrobial activity; Essential oil

Neslihan Dikbas, Recep Kotan, Fatih Dadasoglu, Fikrettin Sahin, Control of Aspergillus flavus with essential oil and methanol extract of Satureja hortensis, International Journal of Food Microbiology, Volume 124, Issue 2, 31 May 2008, Pages 179-182, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.03.034.
(http://www.sciencedirect.com/science/article/B6T7K-4S6G8W1-1/2/6c391f65028652257fc33b4b9bbd5ca5)
Abstract:
The essential oil and methanol extract of Satureja hortensis were tested for antifungal activity against Aspergillus flavus in vitro on Petri plates and liquid culture, and under storage conditions. The oil showed strong antifungal activity based on the inhibition zone and minimal inhibitory concentration values against the pathogen on Petri plates assays. The very low concentrations of them also reduced wet and dry mycelium weight of pathogen fungus in liquid culture. When the oils at 25, 12.5 and 6.25 [micro sign]l/mL concentrations were applied to lemon fruits before seven days of pathogen inoculation on storage conditions, the decay on fruits caused by the pathogen could be prevent completely. The results in this study showed that the essential oil of S. hortensis had strong antifungal activity against pathogen fungi tested. So, the essential oil of S. hortensis could be used for management of this pathogen as a potential source of sustainable eco-friendly botanical fungicides.
Keywords: Antifungal; Aspergillus flavus; Plant extract; Essential oil; Satureja hortensis

Jason Q.D. Goodger, Ian E. Woodrow, Selection gains for essential oil traits using micropropagation of Eucalyptus polybractea, Forest Ecology and Management, Volume 255, Issue 10, 30 May 2008, Pages 3652-3658, ISSN 0378-1127, DOI: 10.1016/j.foreco.2008.03.006.
(http://www.sciencedirect.com/science/article/B6T6X-4S86269-3/2/913b9ca140765a7ce329a8050d29fc4c)
Abstract:
The value of eucalyptus oil for medicinal purposes is based largely on its cineole content, and the prime commercial species for pharmaceutical grade eucalyptus oil is Eucalyptus polybractea (blue mallee). This study applies a recently developed micropropagation protocol to selected elite oil yielding blue mallee seedlings and investigates the potential of a trial plantation based on micropropagated clones to increase cineole yields. The study aims to assess two micropropagated clones of blue mallee for growth and key essential oil traits in comparison to two related half-sibling families, and to assess consistency for oil traits within clones. After 23 months growth in a plantation, all ramets from the micropropagated clones appeared healthy and showed similar growth forms to the half-sibling saplings at the time of harvest. Total above ground biomass was significantly greater in the half-sibling families compared to their relative clones. Nevertheless, the foliar essential oil concentration and the proportion of the total oil as cineole was greatest in the clones compared to their related half-sibling families, reflecting the oil traits of the ortets. The oil composition profiles were very consistent within clones. This was particularly evident for cineole which had the remarkably narrow ranges of 90-92% in one clone and 92-94% in the other, suggesting strong genetic control of essential oil composition. Overall, the results suggest that micropropagation has great potential for the establishment of blue mallee plantations using genotypes selected for key oil traits. The application of the micropropagation protocol to older plants of blue mallee (for which both key oil and biomass traits are known) is likely to produce greater selection gains for cineole yield.
Keywords: Eucalyptus oil; Cineole; Clone; Mallee; Micropropagation; Short-rotation forestry

J. Gutierrez, C. Barry-Ryan, P. Bourke, The antimicrobial efficacy of plant essential oil combinations and interactions with food ingredients, International Journal of Food Microbiology, Volume 124, Issue 1, 10 May 2008, Pages 91-97, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.02.028.
(http://www.sciencedirect.com/science/article/B6T7K-4S0201P-1/2/ab36b727900f4488224370e8d587cdc3)
Abstract:
The objective of this study was to evaluate the efficacy of plant essential oils (EOs) in combination and to investigate the effect of food ingredients on their efficacy. The EOs assessed in combination included basil, lemon balm, marjoram, oregano, rosemary, sage and thyme. Combinations of EOs were initially screened against Bacillus cereus, Escherichia coli, Listeria monocytogenes and Pseudomonas aeruginosa using the spot-on-agar test. The influence of varying concentrations of EO combinations on efficacy was also monitored using E. coli. These preliminary studies showed promising results for oregano in combination with basil, thyme or marjoram. The checkerboard method was then used to quantify the efficacy of oregano, marjoram or thyme in combination with the remainder of selected EOs. Fractional inhibitory concentrations (FIC) were calculated and interpreted as synergy, addition, indifference or antagonism. All the oregano combinations showed additive efficacy against B. cereus, and oregano combined with marjoram, thyme or basil also had an additive effect against E. coli and P. aeruginosa. The mixtures of marjoram or thyme also displayed additive effects in combination with basil, rosemary or sage against L. monocytogenes. The effect of food ingredients and pH on the antimicrobial efficacy of oregano and thyme was assessed by monitoring the lag phase and the maximum specific growth rate of L. monocytogenes grown in model media. The model media included potato starch (0, 1, 5 or 10%), beef extract (1.5, 3, 6 or 12%), sunflower oil (0, 1, 5 or 10%) and TSB at pH levels of 4, 5, 6 or 7. The antimicrobial efficacy of EOs was found to be a function of ingredient manipulation. Starch and oils concentrations of 5% and 10% had a negative impact on the EO efficacy. On the contrary, the EOs were more effective at high concentrations of protein, and at pH 5, by comparison with pH 6 or 7. This study suggests that combinations of EOs could minimize application concentrations and consequently reduce any adverse sensory impact in food. However, their application for microbial control might be affected by food composition, therefore, careful selection of EOs appropriate to the sensory and compositional status of the food system is required. This work shows that EOs might be more effective against food-borne pathogens and spoilage bacteria when applied to ready to use foods containing a high protein level at acidic pH, as well as lower levels of fats or carbohydrates.
Keywords: Essential oils; Antimicrobial; Synergy; Food ingredients; Food application

Recep Kotan, Saban Kordali, Ahmet Cakir, Memis Kesdek, Yusuf Kaya, Hamdullah Kilic, Antimicrobial and insecticidal activities of essential oil isolated from Turkish Salvia hydrangea DC. ex Benth., Biochemical Systematics and Ecology, Volume 36, Issues 5-6, May-June 2008, Pages 360-368, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.12.003.
(http://www.sciencedirect.com/science/article/B6T4R-4RR86VP-1/2/0be735c81744b74eb3bd3c9a673e6507)
Abstract:
The hydrodistillated essential oil of Salvia hydrangea was analyzed by GC-MS. Fifty-four different components representing 95.9% of the compounds in the oil were identified. Camphor (54.2%), [alpha]-humulene (4.0%), cis-sesquisabinene hydrate (2.8%), myrtenol (2.6%), [beta]-bisabolol (2.2%) and 1,8-cineole (2.1%) were found to be predominant components. The oil was also characterized by relatively high amount of oxygenated monoterpenes (69.6%). The oil was tested for fungitoxic effects against 33 agricultural pathogenic fungi using in vitro microbial growth inhibition assays. The oil exhibited considerable antifungal activity against a broad spectrum of tested fungi. Antibacterial activity of the oil was determined against 30 bacterial strains using the

disc diffusion method. The oil had a very wide spectrum of antibacterial activity. However, it was not as active as penicillin. The oil showed 68.3-75.0% mortality against adults of Sitophilus granarius and Tribolium confusum, the major pests of wheat and wheat products, respectively. It can be concluded that the oil of S. hydrangea has a potential against agricultural pathogenic fungi and two stored pests, S. granarius and T. confusum.
Keywords: Lamiaceae; Salvia hydrangea; Essential oil; Camphor; Antifungal; Antibacterial; Insecticidal; Sitophilus granarius; Tribolium confusum

Carmen Formisano, Daniela Rigano, Felice Senatore, Monique S.J. Simmonds, Angela Bisio, Maurizio Bruno, Sergio Rosselli, Essential oil composition and antifeedant properties of Bellardia trixago (L.) All. (sin. Bartsia trixago L.) (Scrophulariaceae), Biochemical Systematics and Ecology, Volume 36, Issues 5-6, May-June 2008, Pages 454-457, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.11.003.
(http://www.sciencedirect.com/science/article/B6T4R-4RFD3T1-1/2/29bdcb0e549a487359a4ea2ccaba3cb6)
Keywords: Bellardia trixago; Bartsia trixago; Essential oil; Antifeedant; Oviposition

Y.G. Gillij, R.M. Gleiser, J.A. Zygadlo, Mosquito repellent activity of essential oils of aromatic plants growing in Argentina, Bioresource Technology, Volume 99, Issue 7, May 2008, Pages 2507-2515, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.04.066.
(http://www.sciencedirect.com/science/article/B6V24-4P1275R-1/2/b411defbabbd0924036ff3a5aed87175)
Abstract:
Mosquitoes are important vectors of diseases and nuisance pests. Repellents minimize contact with mosquitoes. Repellents based on essential oils (EO) are being developed as an alternative to DEET (N,N-diethyl-m-methylbenzamide), an effective compound that has disadvantages including toxic reactions, and damage to plastic and synthetic fabric. This work evaluated the repellency against Aedes aegypti of EO from aromatic plants that grow in Argentina: Acantholippia seriphioides, Achyrocline satureioides, Aloysia citriodora, Anemia tomentosa, Baccharis spartioides, Chenopodium ambrosioides, Eucalyptus saligna, Hyptis mutabilis, Minthostachys mollis, Rosmarinus officinalis, Tagetes minuta and Tagetes pusilla. Most EO were effective. Variations depending on geographic origin of the plant were detected. At a 90% EO concentration, A. satureoides and T. pusilla were the least repellent. At concentrations of 12.5% B. spartioides, R. officinalis and A. citriodora showed the longest repellency times. Comparisons of the principal components of each EO suggest that limonene and camphor were the main components responsible for the repellent effects.
Keywords: Essential oils; Mosquito; Culicidae; Aedes aegypti; Repellent

W.J. Silva, G.A.A. Doria, R.T. Maia, R.S. Nunes, G.A. Carvalho, A.F. Blank, P.B. Alves, R.M. Marcal, S.C.H. Cavalcanti, Effects of essential oils on Aedes aegypti larvae: Alternatives to environmentally safe insecticides, Bioresource Technology, Volume 99, Issue 8, May 2008, Pages 3251-3255, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.05.064.
(http://www.sciencedirect.com/science/article/B6V24-4P8R7F6-5/2/31ade69214a73b5ca0b593cee520919e)
Abstract:
The essential oils from leaves of Hyptis fruticosa (Lamiaceae) Salzm., H. pectinata (Lamiaceae) Poit., and Lippia gracilis (Verbenaceae) HBK were investigated for their larvicidal activity against Aedes aegypti and analyzed by GC/MS. Fifty-nine compounds, representing 91.28-98.39% of the essential oils, have been identified. A standard solution was used to make 20 mL solutions ranging from 30 to 2000 ppm. Twenty larvae between third and fourth stages were added to the essential oil solution. A mortality count was conducted 24 h after treatment. Essential oils LC50 and their

confidence limits at 95% probability were calculated by the methods of Reed-Muench and Pizzi, respectively. The essential oil of Lippia gracilis showed potent insecticidal effect against Aedes aegypti larvae, the vector of dengue fever. Carvacrol and caryophyllene oxide were the main responsible for the activity of L. gracilis and H. pectinata. Minor compounds are probably acting synergistically to achieve H. fruticosa activity.
Keywords: Hyptis fruticosa; Lippia gracilis; Hyptis pectinata; Larvicidal; Carvacrol

Yadollah Yamini, Mostafa Khajeh, Ensieh Ghasemi, Mehdi Mirza, Katayon Javidnia, Comparison of essential oil compositions of Salvia mirzayanii obtained by supercritical carbon dioxide extraction and hydrodistillation methods, Food Chemistry, Volume 108, Issue 1, 1 May 2008, Pages 341-346, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.10.036.
(http://www.sciencedirect.com/science/article/B6T6R-4PXDM83-1/2/1f3fc71259316570349a5f14a1fa1362)
Abstract:
Essential oil of Salvia mirzayanii cultivated in Iran was obtained by hydrodistillation and supercritical (carbon dioxide) extraction methods. The oil was analysed by capillary gas chromatography using flame ionization and mass spectrometric detections. The compounds were identified according to their retention indices and mass spectra (EI, 70 eV). The effects of different parameters such as pressure, temperature, modifier volume and extraction times (dynamic and static) on the supercritical fluid extraction (SFE) of S. mirzayanii oil were investigated. The results showed that, under a pressure of 35.5 MPa, temperature of 35 [degree sign]C, 6% methanol, dynamic extraction time of 50 min and static extraction time of 30 min, extraction was more selective for the linalyl acetate. Thirty four compounds were identified in the hydrodistilled oil. The major components of S. mirzayanii were linalyl acetate (7.6%), 1,8-cineole (8.0%), linalool (9.0%) and 8-acetoxy linalool (11.0%). However, by using supercritical carbon dioxide in optimum conditions, only three components contain more than 63% of the oil. The yield of the obtained oil based on hydrodistillation was 2.20% (v/w). Extraction yield based on the SFE varied in the range of 1.50-9.67% (w/w) under different conditions. The results revealed that, in Iranian S. mirzayanii oil, linalyl acetate is a major component.
Keywords: Salvia mirzayanii; Supercritical carbon dioxide; Hydrodistillation; Essential oil; Linalyl acetate

Karim Hosni, Kamel Msaada, Mouna Ben Taarit, Olfa Ouchikh, Monem Kallel, Brahim Marzouk, Essential oil composition of Hypericum perfoliatum L. and Hypericum tomentosum L. growing wild in Tunisia, Industrial Crops and Products, Volume 27, Issue 3, May 2008, Pages 308-314, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2007.11.004.
(http://www.sciencedirect.com/science/article/B6T77-4RKMCMW-1/2/6b994f2edd920b75722f9eb31f2d433a)
Abstract:
The essential oils obtained by hydrodistillation from the aerial parts of Tunisian native Hypericum perfoliatum L. (sect. Drosocarpium Spach.) and Hypericum tomentosum (sect. Adenosepalum Spach.) were analyzed by GC and GC-MS. Thirty-two compounds were identified in the essential oils of H. perfoliatum with [alpha]-pinene (13.1%), allo-aromadendrene (11.4%), germacrene-D (10.6%), n-octane (7.3%), [alpha]-selinene (6.5%) and [beta]-selinene (5.5%) as main constituents. Sixty-seven components were identified in the oil of H. tomentosum with menthone (17.0%), n-octane (9.9%), [beta]-caryophyllene (5.3%), [alpha]-pinene (5.2%), lauric acid (4.1%) and [beta]-pinene (3.7%) as the most abundant components. Both oils were characterized by the presence of many components which could have numerous applications in food, pharmaceutical and perfume industries.
Keywords: Hypericum parfoliatum L.; Hypericum tomentosum L.; Hypericaceae; Essential oil composition; [alpha]-pinene; Menthone

M. Amzad Hossain, Zhari Ismail, Atiqur Rahman, Sun Chul Kang, Chemical composition and anti-fungal properties of the essential oils and crude extracts of Orthosiphon stamineus Benth, Industrial Crops and Products, Volume 27, Issue 3, May 2008, Pages 328-334, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2007.11.008.
(http://www.sciencedirect.com/science/article/B6T77-4RKVCY2-1/2/f2a92e15ab4ee73e68f6ee160e54fd02)
Abstract:
The hydrodistilled essential leaves and stems oils of Orthosiphon stamineus Benth were analysed by GC-MS/MS. Sixty nine compounds representing 97.6 and 97.4% of the total leaves and stems oils, respectively were identified, of which [beta]-caryophyllene (24.0 and 35.1%), [alpha]-humulene (14.2 and 18.4%), [beta]-elemene (11.1 and 8.5%), 1-octen-3-ol (8.2 and 7.0%), [beta]-bourbonene (3.4 and 3.0%), [beta]-pinene (2.1 and 1.7%), caryophyllene oxide (1.6 and 2.2%), camphene (1.6 and 1.3%) and limonene (1.2 and 1.1%) were the major compounds. Thus, the monoterpenes and sesquiterpenes were the predominant portions of the oils. Essential oils and methanol extract of O. stamineus and the derived fractions of hexane, chloroform, and ethyl acetate were tested for anti-fungal activity, which was determined by disc diffusion and minimum inhibitory concentration (MIC) determination methods. The oils, methanol extract and derived fractions of methanol extract displayed great potential of anti-fungal activity as a mycelial growth inhibitor against the tested phytopathogenic fungi such as Botrytis cinerea, Rhizoctonia solani, Fusarium solani, Colletotricum capsici and Phytophthora capsici, in the range of 49.3-70.3% and minimum inhibitory concentration ranging from 500 to 1000 [mu]g/ml.
Keywords: Orthosiphon stamineus; Essential oil composition; [beta]-Caryophyllene; [alpha]-Humulene; [beta]-Elemene; 1-Octen-3-ol; Caryophyllene oxide; MIC; Anti-fungal activity

K. Ramesh, Virendra Singh, Effect of planting date on growth, development, aerial biomass partitioning and essential oil productivity of wild marigold (Tagetes minuta) in mid hills of Indian western Himalaya, Industrial Crops and Products, Volume 27, Issue 3, May 2008, Pages 380-384, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2007.08.004.
(http://www.sciencedirect.com/science/article/B6T77-4R8KT38-1/2/b8a78138a3a5a808670de0831f1c0df1)
Abstract:
A field investigation was conducted at the Institute of Himalayan Bioresource Technology, Palampur during the year 2005 to study the effect of planting dates on duration of growth and development in wild marigold (Tagetes minuta). Duration of growth phases (vegetative phase to budding phase and budding phase to 50% flowering phase), aerial biomass partitioning and essential oil production were analysed. Plantings were done in seven consequent meteorological standard weeks (MSWs) starting from the 30th MSW (30 July-5 August). Planting time coincided with distinct changes in weather parameters and consequently significant variation in the performance of the crop. The results indicated that the crop planted in the 30th and 31st MSW had the longest duration of growth and highest aerial biomass. But it partitioned more biomass towards the stem, whereas the crop planted in the 35th MSW produced significantly less biomass than the former and partitioned more towards leaf and flower and had maximum essential oil content and production. The crop planted at the 36th MSW had the minimum field duration of growth of 50 days, but the partitioning towards leaf and flower were higher than the longest field duration of growth (30th MSW). The study clearly indicated that planting dates had profound influence on growth and development of T. minuta as reflected from the significant variation on growth phase duration, aerial biomass partitioning, herb and essential oil yield.
Keywords: Biomass partitioning; Tagetes minuta; Meteorological standard week

Daise Lopes-Lutz, Daniela S. Alviano, Celuta S. Alviano, Paul P. Kolodziejczyk, Screening of chemical composition, antimicrobial and antioxidant activities of Artemisia essential oils, Phytochemistry, Volume 69, Issue 8, May 2008, Pages 1732-1738, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2008.02.014.
(http://www.sciencedirect.com/science/article/B6TH7-4S92RSF-2/2/07e13f1cbf1ad500b9b59dfc9d0af167)
Abstract:
The chemical composition of essential oils isolated from aerial parts of seven wild sages from Western Canada - Artemisia absinthium L., Artemisia biennis Willd., Artemisia cana Pursh, Artemisia dracunculus L., Artemisia frigida Willd., Artemisia longifolia Nutt. and Artemisia ludoviciana Nutt., was investigated by GC-MS. A total of 110 components were identified accounting for 71.0-98.8% of the oil composition. High contents of 1,8-cineole (21.5-27.6%) and camphor (15.9-37.3%) were found in Artemisia cana, A. frigida, A. longifolia and A. ludoviciana oils. The oil of A. ludoviciana was also characterized by a high content of oxygenated sesquiterpenes with a 5-ethenyltetrahydro-5-methyl-2-furanyl moiety, of which davanone (11.5%) was the main component identified. A. absinthium oil was characterized by high amounts of myrcene (10.8%), trans-thujone (10.1%) and trans-sabinyl acetate (26.4%). A. biennis yielded an oil rich in (Z)-beta-ocimene (34.7%), (E)-beta-farnesene (40.0%) and the acetylenes (11.0%) (Z)- and (E)-en-yn-dicycloethers. A. dracunculus oil contained predominantly phenylpropanoids such as methyl chavicol (16.2%) and methyl eugenol (35.8%). Artemisia oils had inhibitory effects on the growth of bacteria (Escherichia coli, Staphylococcus aureus, and Staphylococcus epidermidis), yeasts (Candida albicans, Cryptococcus neoformans), dermatophytes (Trichophyton rubrum, Microsporum canis, and Microsporum gypseum), Fonsecaea pedrosoi and Aspergillus niger. A. biennis oil was the most active against dermatophytes, Cryptococcus neoformans, Fonsecaea pedrosoi and Aspergillus niger, and A. absinthium oil the most active against Staphylococcus strains. In addition, antioxidant (beta-carotene/linoleate model) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activities were determined, and weak activities were found for these oils.
Keywords: Artemisia absinthium L.; Artemisia biennis Willd.; Artemisia cana Pursh; Artemisia dracunculus L.; Artemisia frigida Willd.; Artemisia longifolia Nuttall; Artemisia ludoviciana Nutt.; Essential oil composition; Antimicrobial activity; Antioxidant activity

Thierry Regnier, Wilma du Plooy, Sandra Combrinck, Ben Botha, Fungitoxicity of Lippia scaberrima essential oil and selected terpenoid components on two mango postharvest spoilage pathogens, Postharvest Biology and Technology, Volume 48, Issue 2, May 2008, Pages 254-258, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.10.011.
(http://www.sciencedirect.com/science/article/B6TBJ-4S044HX-1/2/90607ddd465fd45e19cf603a4a96be94)
Abstract:
Lippia scaberrima, an aromatic shrub with medicinal properties, is indigenous to southern Africa. Essential oil obtained from aerial plant parts was assessed in vitro and in vivo for antifungal activity against Botryosphaeria parva and Colletotrichum gloeosporioides isolated from mango fruit. Exposure to oil vapour for 2 and 4 days caused inhibition of mycelial growth of both isolates. Three major terpenoids identified in the oil, limonene, R-(-)-carvone, and 1,8-cineole, as well as S-(+)-carvone, were individually evaluated in vitro. The two enantiomers of carvone, along with L. scaberrima oil, were found to have the highest fungistatic activity. Oil and carvone enantiomer fungicidal activities were less pronounced. The use of commercial wax coatings enriched with essential oils led to reduced fungal infection by both pathogens. Results of the in vitro and preliminary in vivo studies suggest that employing L. scaberrima oil to control postharvest pathogens is worthy of further investigation.
Keywords: Anthracnose; Mango; Lippia; Botryosphaeria; Colletotrichum

Mehdi Razzaghi-Abyaneh, Masoomeh Shams-Ghahfarokhi, Tomoya Yoshinari, Mohammad-Bagher Rezaee, Kamkar Jaimand, Hiromichi Nagasawa, Shohei Sakuda, Inhibitory effects of Satureja hortensis L. essential oil on growth and aflatoxin production by Aspergillus parasiticus, International Journal of Food Microbiology, Volume 123, Issue 3, 30 April 2008, Pages 228-233, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.02.003.
(http://www.sciencedirect.com/science/article/B6T7K-4RV7Y69-1/2/73870557114b9732ef25f0ae6bcc4080)
Abstract:
In an effort to screen the essential oils of some Iranian medicinal plants for novel aflatoxin (AF) inhibitors, Satureja hortensis L. was found as a potent inhibitor of aflatoxins B1 (AFB1) and G1(AFG1) production by Aspergillus parasiticus NRRL 2999. Fungal growth was also inhibited in a dose-dependent manner. Separation of the plant inhibitory substance(s) was achieved using initial fractionation of its effective part (leaf essential oil; LEO) by silica gel column chromatography and further separation by reverse phase-high performance liquid chromatography (RP-HPLC). These substances were finally identified as carvacrol and thymol, based on the interpretation of 1H and 13C NMR spectra. Microbioassay (MBA) on cell culture microplates contained potato-dextrose broth (PDB) medium (4 days at 28 [degree sign]C) and subsequent analysis of cultures with HPLC technique revealed that both carvacrol and thymol were able to effectively inhibit fungal growth, AFB1 and AFG1 production in a dose-dependent manner at all two-fold concentrations from 0.041 to 1.32 mM. The IC50 values for growth inhibition were calculated as 0.79 and 0.86 mM for carvacrol and thymol, while for AFB1 and AFG1, it was reported as 0.50 and 0.06 mM for carvacrol and 0.69 and 0.55 mM for thymol. The results obtained in this study clearly show a new biological activity for S. hortensis L. as strong inhibition of aflatoxin production by A. parasiticus. Carvacrol and thymol, the effective constituents of S. hortensis L., may be useful to control aflatoxin contamination of susceptible crops in the field.
Keywords: Satureja hortensis L.; Aflatoxin; Aspergillus parasiticus; NMR spectra; Chromatography; Growth inhibition

Fatma Tosun, Cigdem Akyuz Kizilay, Kevser Erol, Fatma Sultan Kilic, Mine Kurkcuoglu, Kemal Husnu Can Baser, Anticonvulsant activity of furanocoumarins and the essential oil obtained from the fruits of Heracleum crenatifolium, Food Chemistry, Volume 107, Issue 3, 1 April 2008, Pages 990-993, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.08.085.
(http://www.sciencedirect.com/science/article/B6T6R-4PKXBWB-5/2/fee6edf25e1f21489adbead139b6cbe8)
Abstract:
The anticonvulsant activity of furanocoumarins, coumarin mixture and the essential oil obtained from the fruits of Heracleum crenatifolium was examined against maximal electroshock (MES)-induced seizures in mice. Bergapten showed significant anticonvulsant activity. The furanocoumarins isolated from the fruits of the plant were identified using thin-layer chromatography, melting points and spectroscopic methods (IR, MS, 1H NMR) as isobergapten (1), pimpinellin (2), bergapten (3), isopimpinellin (4), sphondin (5) and byak-angelicol (6). The essential oil content of the fruits were found as 5.5%. Twenty-two compounds representing 99.3% of the essential oil obtained from the fruits of H. crenatifolium were determined and the major components were identified as octanol and octyl acetate (3.1% and 88.4% respectively) by GC and GC-MS.
Keywords: Heracleum crenatifolium; Furanocoumarin; Essential oil; Anticonvulsant; MES

Chryssavgi Gardeli, Papageorgiou Vassiliki, Mallouchos Athanasios, Theodosis Kibouris, Michael Komaitis, Essential oil composition of Pistacia lentiscus L. and Myrtus communis L.: Evaluation of

antioxidant capacity of methanolic extracts, Food Chemistry, Volume 107, Issue 3, 1 April 2008, Pages 1120-1130, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.09.036.
(http://www.sciencedirect.com/science/article/B6T6R-4PRRBT7-3/2/07d7d1f6ac6eef61165c8b74106ffbbe)
Abstract:
The seasonal variation of the essential oil composition, the antioxidant activity (DPPH, FRAP assays) and the total phenolic content (Folin-Ciocalteu assay) of two aromatic wild plants, Pistacia lentiscus L. (Anacardiaceae) and Myrtus communis L. (Myrtaceae), grown in Zakynthos, a Greek island, was investigated. The essential oil was obtained by hydrodistillation and subsequently analysed by GC-MS.
The essential oil composition of P. lentiscus L. was characterised by a high monoterpene hydrocarbon fraction (45.0-68.3%), which was found in greater amounts during the flowering stage (May). At the same stage, the extracts showed the highest free radical-scavenging activity (IC50 = 5.09 mg/l) and antioxidant capacity (131 mmol/l), as well as the highest phenolic content (588 mg gallic acid/g plant material). The strongest antioxidant activity and the highest phenolic content for M. communis L. were obtained during full flowering stage (August). Its essential oil composition was characterised by a high oxygenated monoterpene fraction (70.1-73.2%), the highest accumulation of which was also observed during the same flowering stage.
Keywords: Seasonal variation; Essential oils analysis; Antioxidant activity; Phenolics; Pistacia lentiscus L.; Myrtus communis L.

Jiachuan Lei, Jianqing Yu, Huaidong Yu, Zhixiong Liao, Composition, cytotoxicity and antimicrobial activity of essential oil from Dictamnus dasycarpus, Food Chemistry, Volume 107, Issue 3, 1 April 2008, Pages 1205-1209, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.09.050.
(http://www.sciencedirect.com/science/article/B6T6R-4PRYG84-G/2/be1e898b89efa8ca707970049e50309d)
Abstract:
The composition of the essential oil from Dictamnus dasycarpus was analysed by GC-MS; 47 constituents (88.9% of the total oil) were identified. The main compounds were syn-7-hydroxy-7-anisylnorbornene (29.4%), pregeijerene (15.5%) and geijerene (11.4%). The antimicrobial activity of the essential oil was evaluated against nine microorganisms using disc diffusion and broth microdilution methods. The oil showed the strongest bactericidal activity against Staphylococcus aureus ATCC 25923 and methicillin-resistant S. aureus. The in vitro cytotoxicity of the oil on six human cancer cell lines was also examined. The cytotoxicity of the oil on three human breast cancer cell lines was significantly stronger than on other cell lines.
Keywords: Dictamnus dasycarpus; Essential oil; Cytotoxicity; Antimicrobial

Farah Deba, Tran Dang Xuan, Masaaki Yasuda, Shinkichi Tawata, Chemical composition and antioxidant, antibacterial and antifungal activities of the essential oils from Bidens pilosa Linn. var. Radiata, Food Control, Volume 19, Issue 4, April 2008, Pages 346-352, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.04.011.
(http://www.sciencedirect.com/science/article/B6T6S-4NMC87F-1/2/d8895668ed2ac778ff002beeb767ff89)
Abstract:
The present study describes the chemical composition, antibacterial and antifungal activities of essential oils from Bidens pilosa, a traditional medicinal plant widely distributed in the subtropics and tropics. The essential oils from the fresh leaves and flowers of B. pilosa were analyzed by GC-MS. Forty-four components were identified, of which [beta]-caryophyllene (10.9% and 5.1%) and [tau]-cadinene (7.82% and 6.13%) were the main compounds in leaves and flowers, respectively. The oils and aqueous extracts of leaves and flowers were subjected to screening for their possible antioxidant activities by using 2,2'-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene bleaching

methods. In the former case, the essential oils from leaves and flowers were found to be superior to all aqueous extracts tested with an IC50 value of 47.5 and 49.7 [mu]g/ml, respectively, whereas all extracts and essential oils seemed to inhibit the oxidation of linoleic acid in the latter case. The oils from B. pilosa exerted significant antibacterial and antifungal activities against six bacteria and three fungal strains. The inhibitory activity of the flower essential oils in Gram-negative bacteria was significantly higher than in Gram-positive. Our findings demonstrate that the essential oils and aqueous extracts of B. pilosa possess antioxidant and antimicrobial activities that might be a natural potential source of preservative used in food and other allied industries.
Keywords: Essential oils; Antifungal activity; Bidens pilosa; Antibacterial activity

Hongxia Du, Hongjun Li, Antioxidant effect of Cassia essential oil on deep-fried beef during the frying process, Meat Science, Volume 78, Issue 4, April 2008, Pages 461-468, ISSN 0309-1740, DOI: 10.1016/j.meatsci.2007.07.015.
(http://www.sciencedirect.com/science/article/B6T9G-4P7789J-1/2/1752cab540f1b4eb3a872d98076dd3ba)
Abstract:
The object of the research was to determine the antioxidant effect of cassia essential oil on deep-fried beef during the frying process. The rules and optimum processing conditions of deep-fried beef with addition of cassia essential oil were discussed through an orthogonal experiment and some single factor experiments (frying time, frying temperature, oil types and concentration of essential oil). The antioxidant effect was evaluated by peroxide and TBA value. Results showed that the antioxidant effect of cassia oil during the frying process was optimum under the conditions of 30 [mu]L cassia oil/250 mL palm oil, 1.5 min at 150 [degree sign]C. The main compositions of cassia oil were analysed by GC-MS method.
Keywords: Cassia essential oil; Antioxidant effect; Deep-fried beef; TBA; PV

S. Eyob, M. Appelgren, J. Rohloff, A. Tsegaye, G. Messele, Traditional medicinal uses and essential oil composition of leaves and rhizomes of korarima (Aframomum corrorima (Braun) P.C.M. Jansen) from southern Ethiopia, South African Journal of Botany, Volume 74, Issue 2, April 2008, Pages 181-185, ISSN 0254-6299, DOI: 10.1016/j.sajb.2007.10.007.
(http://www.sciencedirect.com/science/article/B7XN9-4R5G6ST-1/2/3ec30501e5779b288945957486dbf884)
Abstract:
Ethnobotanical surveys were conducted in Gamo Gofa, Debub Omo and Kaffa; which are the three major korarima (Aframomum corrorima (Braun) P.C.M. Jansen) growing regions of southern Ethiopia. Plant parts used as a medicine for different aliments were documented. Eighty-three percent of key informants replied that seeds were mostly used as traditional medicine followed by leaves (75%) and rhizomes (72%). The remedies were prepared from freshly collected plant materials and were mostly taken orally. The values of preference ranking on the main use categories of korarima indicated that the cash value obtained from sale of korarima was the 1st use category for the majority of interviewed key informants.
Essential oils of korarima were obtained by hydrodistillation. The oil refractive indices were recorded for leaf (1.494) and rhizome (1.445). When analyzed by GC and GC/MS, 38 (leaf) and 52 (rhizome) compounds were identified from the essential oils. The major component of the oil of the leaf was [beta]-caryophyllene (60.7%). The rhizome oil was dominated by [gamma]-terpinene (21.8%) and [beta]-pinene (17.6%).
Keywords: [beta]-caryophyllene; Aframomum corrorima; Korarima; Traditional use; [beta]-pinene; [gamma]-terpinene

G.P.P. Kamatou, R.L. Van Zyl, S.F. Van Vuuren, A.C. Figueiredo, J.G. Barroso, L.G. Pedro, A.M. Viljoen, Seasonal variation in essential oil composition, oil toxicity and the biological activity of

solvent extracts of three South African Salvia species, South African Journal of Botany, Volume 74, Issue 2, April 2008, Pages 230-237, ISSN 0254-6299, DOI: 10.1016/j.sajb.2007.08.002.
(http://www.sciencedirect.com/science/article/B7XN9-4PMYXY0-1/2/452e40c9e3f150665e578c7e9fbd2f04)
Abstract:
Aromatic plants contain both volatile and non-volatile fractions and the chemical composition of these two fractions may be influenced by seasonal changes. The essential oil and solvent extracts of S. africana-caerulea, S. africana-lutea and S. lanceolata, collected at the same locality throughout the 2005 growing season, were compared in terms of essential oil composition, yields and biological activities. Mostly quantitative, rather than qualitative variation was observed in the oil composition of each species. Major fluctuations in the composition of S. africana-caerulea oil included limonene (2-33%) and viridiflorol (2-24%). Levels of [alpha]-pinene (1-12%), myrcene (2-12%) and [alpha]-eusdesmol (trace-13%) fluctuated seasonally in the S. africana-lutea oil. In S. lanceolata, considerable changes were noted for [beta]-caryophyllene (1-19%), [beta]-caryophyllene oxide (1-21%) and ledol (3-12%). The extract prepared from S. lanceolata harvested in winter was more active against Gram-positive bacteria. The S. africana-caerulea extract exhibited the most favourable anti-plasmodial activity when harvested in winter (IC50 value: 12 [mu]g ml- 1), which contrasts with the lowest anti-plasmodial activity of S. lanceolata obtained at the same period (IC50 value: 43 [mu]g ml- 1). The anti-oxidant activity of the solvent extracts also displayed variation over seasons with the winter collection of S. africana-lutea yielding the most favourable anti-oxidant activity (IC50 value: 10 [mu]g ml- 1). All the solvent extracts prepared from the winter collection exhibited the lowest toxicity (20 < IC50 values < 60 [mu]g ml- 1), while the three essential oils obtained from autumn collection were more toxic (0.03 < IC50 values < 0.4 [mu]g ml- 1).
Keywords: Essential oil composition; Salvia africana-caerulea; S. africana-lutea; S. lanceolata; Biological activities; Seasonal variation

K.M. Swanepoel, Essential oil from Pelargonium sp. as alternative crops, South African Journal of Botany, Volume 74, Issue 2, April 2008, Page 379, ISSN 0254-6299, DOI: 10.1016/j.sajb.2008.01.110.
(http://www.sciencedirect.com/science/article/B7XN9-4S807WN-3H/2/2f2633117be02c140f2c7a02aa88a809)

Belma Aslim, Nihal Yucel, In vitro antimicrobial activity of essential oil from endemic Origanum minutiflorum on ciprofloxacin-resistant Campylobacter spp., Food Chemistry, Volume 107, Issue 2, 15 March 2008, Pages 602-606, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.08.048.
(http://www.sciencedirect.com/science/article/B6T6R-4PGY504-1/2/9218065737d9e1fd36e9be77b9a884f0)
Abstract:
This study evaluated the antimicrobial activities of an essential oil of Origanum minutiflorum (O. Schwarz and P.H. Davis) against ciprofloxacin-resistant Campylobacter spp., by broth microdilution and agar well-diffusion methods. Moreover, O. minutiflorum oil was analyzed by gas chromatography/mass spectrometry (GC/MS). Twenty-nine components were identified, representing 98.7 of the oil. The oil yield from the plants was 4.0-4.4% v/w. The major components of O. minutiflorum oil were carvacrol (73.9%) and p-cymene (7.20%). The oil has lower contents of carvacrol methyl ether (0.05%), heptadecanol (0.06%) and carvacryl acetate (0.06%). Twenty-one Campylobacter spp. (12 C. jejuni, 5 C. lari and 4 C. coli) strains using in this study were selected among 300 isolates according to their resistance to ciprofloxacin. The minimum inhibitory concentration (MIC) values for bacterial strains, which were sensitive to the essential oil of O. minutiflorum, were in the range of 7.8-800 [mu]g/ml. The essential oil obtained showed strong antimicrobial activity against all of the tested ciprofloxacin-resistance Campylobacter spp. These

results suggest that the essential of O. minutiflorum may be used as a natural preservative in food against food-born disease, such as Campylobacteriosis.
Keywords: Antimicrobial activity; Origanum minutiflorum; Campylobacter spp.; GC/MS analysis

Guido Flamini, Marianna Tebano, Pier Luigi Cioni, Composition of the essential oils from leafy parts of the shoots, flowers and fruits of Eryngium amethystinum from Amiata Mount (Tuscany, Italy), Food Chemistry, Volume 107, Issue 2, 15 March 2008, Pages 671-674, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.08.064.
(http://www.sciencedirect.com/science/article/B6T6R-4PJCYJM-5/2/74a2b5e44785f3f24190c627895df819)
Abstract:
The essential oils obtained from the leafy parts of the shoots, inflorescences and fruits of Eryngium amethystinum (Apiaceae) from Italy have been studied. The essential oil from the inflorescences was characterised by methyl-derivatives of benzaldehyde (26.4%) and by some phenylpropanoids (3.0%) such as eugenol and (E)-methyl isoeugenol. The essential oil of leafy parts of the shoots showed a higher percentage of sesquiterpenes (31.3%) than monoterpenes (20.2%). The main differences between the two essential oils can be referred to [alpha]-pinene and germacrene D: the essential oil of the inflorescences contained much more [alpha]-pinene than the other one (25.6% vs. 11.8%), while the contrary is true for germacrene D (14.5% vs. 31.3%).
Keywords: Eryngium amethystinum L.; Apiaceae; Essential oil; Flowering aerial parts; Benzaldehyde methyl-derivatives; [alpha]-Pinene; Germacrene D

Jesus M. Rodilla, Maria Teresa Tinoco, Julio Cruz Morais, Cristina Gimenez, Raimundo Cabrera, Dario Martin-Benito, Lucia Castillo, Azucena Gonzalez-Coloma, Laurus novocanariensis essential oil: Seasonal variation and valorization, Biochemical Systematics and Ecology, Volume 36, Issue 3, March 2008, Pages 167-176, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.09.001.
(http://www.sciencedirect.com/science/article/B6T4R-4R1731V-1/2/c29f430c8001e847478bcb733b8c0e43)
Abstract:
We investigated the qualitative and quantitative seasonal variation of the leaf and fruit oils of the Macaronesian endemism Laurus novocanariensis and their plant defensive potential. The monoterpene fraction dominated the leaf (74%) and berry essential oils (73-44%, ripe-unripe). The insect antifeedant effects of these oils were species- and season-dependent against the aphids (Myzus persicae and Rhopalosiphum padi). Overall, the biological effects of these oils correlated with the oxygenated terpene fraction. Among the pure components tested, [beta]-caryophyllene and its oxide were strong antifeedants to Leptinotarsa decemlineata and Spodoptera littoralis. The aphids responded to [beta]-ocimene, [beta]-pinene, 1,8-cineole, linalool (antifeedants) and linalool oxide (attractive to M. persicae). The antifungal effects of the leaf oils on Fusarium spp. were season-dependent. [beta]-Caryophyllene oxide proved to be a strong antifungal. L. novocanariensis oils inhibited Lactuca sativa germination and radicle elongation, the leaves being more effective. Linalool also inhibited seed germination.
Keywords: Laurus novocanariensis; Essential oils; Season; Antifeedant; Phytotoxic

Robert P. Adams, Sanko Nguyen, Dennis A. Johnston, Sunghun Park, Tony L. Provin, Mitiku Habte, Comparison of vetiver root essential oils from cleansed (bacteria- and fungus-free) vs. non-cleansed (normal) vetiver plants, Biochemical Systematics and Ecology, Volume 36, Issue 3, March 2008, Pages 177-182, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.10.004.
(http://www.sciencedirect.com/science/article/B6T4R-4R71DW8-1/2/d222284251b4d72b0f971b05a41c6112)
Abstract:

`Karnataka' and `Malaysia' cultivars of vetiver (Vetiveria zizanioides (L.) Nash, =Chrysopogon zizanioides (L.) Roberty) were subjected to meristem tissue culture in order to produce plants that were bacteria- and fungi-free. Tissue cultured ('cleansed' or phytosanitary) vetiver was grown for five months in sterilized soil contained in pots, and the oil content of plants grown on the medium was compared to that of non-cleansed (normal) vetiver plants grown in unsterilized soil under the same conditions. Statistical analysis of 49 of the major oil components revealed numerous significant differences between tissue culture derived and natural plants for both genotypes.
Although oil yields differed, this may reflect the larger size of the initial plantlets obtained from natural sources. Tissue cultured vs. natural plantlets grown in sterilized soil resulted in the largest number of differences in compounds. The least number of differences of compounds were between tissue cultured vs. natural plantlets grown in non-sterile soil. The thesis that many of the compounds found in vetiver roots originate from endogenous fungi was not supported.
Keywords: Vetiver; Vetiveria zizanioides; Chrysopogon zizanioides; Poaceae; Essential oils; Mycorrhiza; Bacteria; Biotransformation

K.M. Knio, J. Usta, S. Dagher, H. Zournajian, S. Kreydiyyeh, Larvicidal activity of essential oils extracted from commonly used herbs in Lebanon against the seaside mosquito, Ochlerotatus caspius, Bioresource Technology, Volume 99, Issue 4, March 2008, Pages 763-768, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.01.026.
(http://www.sciencedirect.com/science/article/B6V24-4NBY8MG-6/2/e49732e5db71d252b91ef8ec13417879)
Abstract:
This study investigates the potential of essential oils from commonly used medical and culinary herbs in Lebanon as an environmentally safe measure to control the seaside mosquito, Ochlerotatus caspius. The composition of essential oils extracted from parsley seeds and leaves, alpine thyme inflorescences, anis seeds, and coriander fruits were analyzed by GC-MS, and the major components of these oils were found to be thymol, sabinene, carvacrol, anethole, and linalool, respectively. Mosquito larvicidal assays were conducted to evaluate the LC50 and LC90 after 24 and 48 h of the essential oils and their major constituents. All of the tested oils proved to have strong larvicidal activity (LC50: 15-156 ppm) against Oc. caspius fourth instars, with the most potent oil being thyme inflorescence extract, followed by parsley seed oil, aniseed oil, and then coriander fruit oil. Toxicity of each oil major constituent was also estimated and compared to a reported larvicidal compound, eugenol.
Keywords: Essential oil; Larvicidal; Ochlerotatus caspius; Herbs

Sen-Sung Cheng, Ju-Yun Liu, Chun-Ya Lin, Yen-Ray Hsui, Mei-Chun Lu, Wen-Jer Wu, Shang-Tzen Chang, Terminating red imported fire ants using Cinnamomum osmophloeum leaf essential oil, Bioresource Technology, Volume 99, Issue 4, March 2008, Pages 889-893, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.01.039.
(http://www.sciencedirect.com/science/article/B6V24-4N9MYHD-3/2/ee37af8b5c6321a743c7f0cdc3719d96)
Abstract:
Eleven compounds from indigenous cinnamon (Cinnamomum osmophloeum) leaf essential oil were identified by GC-MS and the dominant constituent was trans-cinnamaldehyde (79.85%). The toxicity of leaf essential oil and trans-cinnamaldehyde were then determined to study their effectiveness in controlling the red imported fire ant, Solenopsis invicta Buren. The results of the toxicity tests indicated that both the indigenous cinnamon leaf essential oil and trans-cinnamaldehyde had an excellent inhibitory effect in controlling the red imported fire ant. The LT50 values for both 2% leaf essential oil and 2% trans-cinnamaldehyde after open exposure were 105.0 min and 32.2 min; after close exposure were 18.5 min and 21.2 min, respectively.

Keywords: Solenopsis invicta; Cinnamomum osmophloeum; Essential oil; Leaf; trans-Cinnamaldehyde

Katie Fisher, Carol Phillips, Potential antimicrobial uses of essential oils in food: is citrus the answer?, Trends in Food Science & Technology, Volume 19, Issue 3, March 2008, Pages 156-164, ISSN 0924-2244, DOI: 10.1016/j.tifs.2007.11.006.
(http://www.sciencedirect.com/science/article/B6VHY-4R6B2HT-2/2/cb473bd7eb79e4ab9965ce2265f1f3d4)
Abstract:
The antimicrobial properties of essential oils (EOs) have been recognised for centuries and, with growing demand from changes in legislation, consumer trends and increasing isolation of antibiotic resistant pathogens, alternatives to chemical-based bactericides need to be found. Citrus oils not only lend themselves to use in food but also are generally recognised as safe (GRAS) and have been found to be inhibitory both in direct oil and vapour form against a range of both Gram-positive and Gram-negative bacteria. This group of oils may provide the natural antimicrobials that the food industry requires to fulfil both its requirements and those of the consumer.

Iraj Rasooli, Mohammad Hadi Fakoor, Davod Yadegarinia, Latif Gachkar, Abdolamir Allameh, Mohammad Bagher Rezaei, Antimycotoxigenic characteristics of Rosmarinus officinalis and Trachyspermum copticum L. essential oils, International Journal of Food Microbiology, Volume 122, Issues 1-2, 29 February 2008, Pages 135-139, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.11.048.
(http://www.sciencedirect.com/science/article/B6T7K-4R7NPVT-2/2/eb20eb218b78022c89fa64740c8a1e65)
Abstract:
Aflatoxin B1 (AFB1) is a highly toxic and carcinogenic metabolite produced by Aspergillus species on food and agricultural commodities. Natural products may regulate the cellular effects of aflatoxins and evidence suggests that aromatic organic compounds of spices can control the production of aflatoxins. With a view to controlling aflatoxin production, the essential oils from Rosmarinus officinalis and Trachyspermum copticum L. were obtained by hydrodistillation. Antifungal activities of the oils were studied with special reference to the inhibition of Aspergillus parasiticus growth and aflatoxin production. Minimal inhibitory (MIC) and minimal fungicidal (MFC) concentrations of the oils were determined. T. copticum L. oil showed a stronger inhibitory effect than R. officinalis on the growth of A. parasiticus. Aflatoxin production was inhibited at 450 ppm of both oils with that of R. officinalis being stronger inhibitor. The oils were analyzed by GC and GC/MS. The major components of R. officinalis and T. copticum L. oils were Piperitone (23.65%), [alpha]-pinene (14.94%), Limonene (14.89%), 1,8-Cineole (7.43%) and Thymol (37.2%), P-Cymene (32.3%), [gamma]-Terpinene (27.3%) respectively. It is concluded that the essential oils could be safely used as preservative materials on some kinds of foods to protect them from toxigenic fungal infections.
Keywords: Rosmarinus officinalis; Trachyspermum copticum L.; Essential oil; Antifungal; Aflatoxin

S.A. Petropoulos, Dimitra Daferera, M.G. Polissiou, H.C. Passam, The effect of water deficit stress on the growth, yield and composition of essential oils of parsley, Scientia Horticulturae, Volume 115, Issue 4, 21 February 2008, Pages 393-397, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.10.008.
(http://www.sciencedirect.com/science/article/B6TC3-4R5G3JK-1/2/efe1713bcaedb991e6b57feac7f28ce8)
Abstract:
Three parsley cultivars (plain-leafed, curly-leafed and turnip-rooted) were grown under conditions of 35-40% and 45-60% water deficit in order to evaluate the effect of this form of stress on plant

growth, essential oil yield and composition. Plant growth (foliage and root weight, leaf number) was significantly reduced by water stress, even at 30-45% deficit. Water stress increased the yield of essential oil (on a fresh weight basis) from the leaves of plain-leafed and curly-leafed, but not turnip-rooted, parsley. However, on a m2 basis foliage oil yield increased significantly only in curly-leafed parsley. Water stress also caused changes in the relative contribution of certain aroma constituents of the essential oils (principally 1,3,8-p-menthatriene, myristicin, terpinolene + p-cymenene), but these changes varied between cultivars. The oil yield of roots was low and water deficit stress had relatively little effect on the root oil composition. It is concluded that because the biomass of plants subjected to water deficit is reduced, it is possible to increase the plant density of plain-leafed or curly-leafed parsley, thereby further increasing the yield of oil per m2. However, the application of water deficit stress to parsley essential oil production must also take into account likely changes in oil composition, which in turn relate to the cultivar.
Keywords: Plain-leafed; Curly-leafed; Turnip-rooted parsley; Drought

M.K. Fasseas, K.C. Mountzouris, P.A. Tarantilis, M. Polissiou, G. Zervas, Antioxidant activity in meat treated with oregano and sage essential oils, Food Chemistry, Volume 106, Issue 3, 1 February 2008, Pages 1188-1194, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.07.060.
(http://www.sciencedirect.com/science/article/B6T6R-4P96263-2/2/36efb775de80789b1ae19578991f0ff9)
Abstract:
The antioxidant activity of meat treated (homogenized) with oregano and sage essential oils, during meat storage, was determined using the following assays: a thiobarbituric acid (TBA) assay, a diphenylpicrylhydrazyl (DPPH) assay and a crocin assay. Porcine and bovine ground meat samples were divided into three experimental treatments, namely: control (no antioxidant), oregano (oregano essential oil 3% w/w) and sage (sage essential oil 3% w/w). Subsequently, the samples from each treatment were stored at 4 [degree sign]C, in the raw and cooked (at 85 [degree sign]C for 30 min) state, and the antioxidant activity was determined after 1, 4, 8 and 12 days of storage. The results showed that the essential oil treatments significantly reduced the oxidation, while the heat treatment and storage time significantly affected the antioxidant activity of the meat. The role of antioxidants appeared to be much more important in cooked meat than raw and the meat proteins greatly affected the antioxidant activity.
Keywords: Antioxidant; Oregano; Sage; Essential oil; TBA; DPPH; Crocin

Romina V. Bluma, Miriam G. Etcheverry, Application of essential oils in maize grain: Impact on Aspergillus section Flavi growth parameters and aflatoxin accumulation, Food Microbiology, Volume 25, Issue 2, February 2008, Pages 324-334, ISSN 0740-0020, DOI: 10.1016/j.fm.2007.10.004.
(http://www.sciencedirect.com/science/article/B6WFP-4PV2RX7-1/2/9cbf6e5865c9ecd0c95a102cadbecbe3)
Abstract:
The antifungal activity of Pimpinella anisum L. (anise), Peumus boldus Mol (boldus), Hedeoma multiflora Benth (mountain thyme), Syzygium aromaticum L. (clove), and Lippia turbinate var. integrifolia (griseb) (poleo) essential oils (EOs) against Aspergillus section Flavi was evaluated in sterile maize grain under different water activity (aw) condition (0.982, 0.955, and 0.90). The effect of EOs added to maize grains on growth rate, lag phase, and aflatoxin B1 (AFB1) accumulation of Aspergillus section Flavi were evaluated at different water activity conditions. The five EOs analyzed have been shown to influence lag phase and growth rate. Their efficacy depended mainly on the essential oil concentrations and substrate water activity conditions. All EOs showed significant impact on AFB1 accumulation. This effect was closely dependent on the water activity, concentration, and incubation periods. Important reduction of AFB1 accumulation was observed in the majority of EO treatments at 11 days of incubation. Boldus, poleo, and mountain thyme EO

completely inhibited AFB1at 2000 and 3000 [mu]g g-1. Inhibition of AFB1 accumulation was also observed when aflatoxigenic isolates grew with different concentration of EOs during 35 days.
Keywords: Aspergillus section Flavi; Aflatoxin B1; Maize grain; Essential oils

N. Solomakos, A. Govaris, P. Koidis, N. Botsoglou, The antimicrobial effect of thyme essential oil, nisin, and their combination against Listeria monocytogenes in minced beef during refrigerated storage, Food Microbiology, Volume 25, Issue 1, February 2008, Pages 120-127, ISSN 0740-0020, DOI: 10.1016/j.fm.2007.07.002.
(http://www.sciencedirect.com/science/article/B6WFP-4P8GWWV-2/2/1fc3997335c72739a2006a676dc5c928)
Abstract:
The antimicrobial effect of thyme essential oil (EO) at 0.3%, 0.6%, or 0.9%, nisin at 500 or 1000 IU/g, and their combination against Listeria monocytogenes was examined in both tryptic soy broth (TSB) and minced beef meat. Thyme EO at 0.3% possessed a weak antibacterial activity against the pathogen in TSB, whereas at 0.9% showed unacceptable organoleptic properties in minced meat. Thus, only the level of 0.6% of EO was further examined against the pathogen in minced meat. Treatment of minced beef meat with nisin at 500 or 1000 IU/g showed antibacterial activity against L. monocytogenes, which was dependent on the concentration level of nisin and the strains used. Treatment of minced beef meat with EO at 0.6% showed stronger inhibitory activity against L. monocytogenes than treatment with nisin at 500 or 1000 IU/g. All treatments showed stronger inhibitory activity against the pathogens at 10 [degree sign]C than at 4 [degree sign]C. The combined addition of EO at 0.6% and nisin at 500 or 1000 IU/g showed a synergistic activity against the pathogen. Most efficient among treatments was the combination of EO at 0.6% with nisin at 1000 IU/g, which decreased the population of L. monocytogenes below the official limit of the European Union recently set at 2 log cfu/g, during storage at 4 [degree sign]C.
Keywords: Thyme essential oil; Nisin; Listeria monocytogenes; Minced beef

C. Busatta, R.S. Vidal, A.S. Popiolski, A.J. Mossi, C. Dariva, M.R.A. Rodrigues, F.C. Corazza, M.L. Corazza, J. Vladimir Oliveira, R.L. Cansian, Application of Origanum majorana L. essential oil as an antimicrobial agent in sausage, Food Microbiology, Volume 25, Issue 1, February 2008, Pages 207-211, ISSN 0740-0020, DOI: 10.1016/j.fm.2007.07.003.
(http://www.sciencedirect.com/science/article/B6WFP-4P9621F-1/2/7acb40db28c1d3534259b753b5b1c0b8)
Abstract:
This work reports on the antimicrobial activity in fresh sausage of marjoram (Origanum majorana L.) essential oil against several species of bacteria. The in vitro minimum inhibitory concentration (MIC) was determined for 10 selected aerobic heterotrophic bacterial species. The antimicrobial activity of distinct concentrations of the essential oil based on the highest MIC value was tested in a food system comprising fresh sausage. Batch food samples were also inoculated with a fixed concentration of Escherichia coli and the time course of the product was evaluated with respect to the action of the different concentrations of essential oil. Results showed that addition of marjoram essential oil to fresh sausage exerted a bacteriostatic effect at oil concentrations lower than the MIC, while a bactericidal effect was observed at higher oil concentrations which also caused alterations in the taste of the product.
Keywords: Antimicrobial properties; Food system; Fresh sausage; Marjoram (Origanum majorana L.)

F. Bakkali, S. Averbeck, D. Averbeck, M. Idaomar, Biological effects of essential oils - A review, Food and Chemical Toxicology, Volume 46, Issue 2, February 2008, Pages 446-475, ISSN 0278-6915, DOI: 10.1016/j.fct.2007.09.106.

(http://www.sciencedirect.com/science/article/B6T6P-4PSK90K-3/2/62dcd64718e83e54364ee2ef5311ebbc)
Abstract:
Since the middle ages, essential oils have been widely used for bactericidal, virucidal, fungicidal, antiparasitical, insecticidal, medicinal and cosmetic applications, especially nowadays in pharmaceutical, sanitary, cosmetic, agricultural and food industries. Because of the mode of extraction, mostly by distillation from aromatic plants, they contain a variety of volatile molecules such as terpenes and terpenoids, phenol-derived aromatic components and aliphatic components. In vitro physicochemical assays characterise most of them as antioxidants. However, recent work shows that in eukaryotic cells, essential oils can act as prooxidants affecting inner cell membranes and organelles such as mitochondria. Depending on type and concentration, they exhibit cytotoxic effects on living cells but are usually non-genotoxic. In some cases, changes in intracellular redox potential and mitochondrial dysfunction induced by essential oils can be associated with their capacity to exert antigenotoxic effects. These findings suggest that, at least in part, the encountered beneficial effects of essential oils are due to prooxidant effects on the cellular level.
Keywords: Essential oil; Cytotoxicity; Genotoxicity; Antigenotoxicity; Prooxidant activity

Andrea L. Medina-Holguin, F. Omar Holguin, Sandra Micheletto, Sondra Goehle, Julian A. Simon, Mary A. O'Connell, Chemotypic variation of essential oils in the medicinal plant, Anemopsis californica, Phytochemistry, Volume 69, Issue 4, February 2008, Pages 919-927, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2007.11.006.
(http://www.sciencedirect.com/science/article/B6TH7-4RH8SJB-2/2/527028d6c98a62f177c6ba21e6622a72)
Abstract:
Anemopsis californica (Saururaceae) commonly called yerba mansa, is an important medicinal plant in many deserts in the southwestern region of North America. Populations of A. californica, collected throughout New Mexico, were examined for chemical variability in roots and rhizomes for select monocyclic (cymene, limonene, piperitone and thymol) and bicyclic ([alpha]-pinene, 1,8-cineole and myrtenol) monoterpenoid and phenylpropanoid (methyleugenol, isoeugenol and elemicin) derived essential oil components. Three distinct chemotypes were detected using a hierarchical clustering analysis on the concentration of 10 different analytes in three individuals from each of 17 populations. One chemotype was characterized by high elemicin concentrations, a second chemotype by high methyleugenol concentrations and the third by high piperitone and thymol concentrations. Steam distilled oil was used to screen for anticancer bioactivity. A. californica root oils demonstrated anti-proliferative activity against AN3CA and HeLa cells in vitro but no activity against lung, breast, prostate or colon cancer cells. The IC50 values for the root oil were 0.056% and 0.052% (v/v) for the AN3CA and HeLa cells, respectively.
Keywords: Anemopsis californica; Sauraceae; Yerba mansa; Essential oil; Chemotypes; Supercritical fluid extraction; SFE; Uterine cancer; Cervical cancer

Neeta Sharma, Abhishek Tripathi, Integrated management of postharvest Fusarium rot of gladiolus corms using hot water, UV-C and Hyptis suaveolens (L.) Poit. essential oil, Postharvest Biology and Technology, Volume 47, Issue 2, February 2008, Pages 246-254, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.07.001.
(http://www.sciencedirect.com/science/article/B6TBJ-4PMT5JM-1/2/9edcf81105183b4c9d0c1878630d2254)
Abstract:
Gladiolus corms artificially inoculated with the pathogen Fusarium oxysporum f. sp. gladioli were treated with hot water, UV-C or essential oil of Hyptis suaveolens (L.) Poit., alone and in combinations, to control the population growth of the pathogen after storage of 4 and 12 weeks. In vitro efficacy of hot water, UV-C or essential oil was tested and it was observed that a hot water

treatment at 55 [degree sign]C for 25 min or a UV-C treatment with a dose of 3.63 kJ m-2 were sufficient to inhibit germination of conidia. In vitro fungitoxic efficacy of the essential oil also clearly showed that 0.6 [mu]L cm-3 of oil was sufficient to completely inhibit the fungal growth and 0.4 [mu]L cm-3 oil completely inhibited conidial germination. In vivo efficacy of hot water, UV-C or essential oil was determined by calculating the log10 transformation of CFU g-1 corm after storage periods of 4 and 12 weeks. Hot water alone at 55 [degree sign]C for 30 min significantly reduced the CFU as compared with the control. UV-C treatment (dose 4.98 kJ m-2) was sufficient to reduce the population of the fungus. An essential oil treatment of 0.8 [mu]L cm-3 for 2 weeks was significantly effective in reducing the pathogen population during storage. Integrated treatments of hot water (55 [degree sign]C for 30 min), UV-C (dose 4.98 kJ m-2) and essential oil (0.8 [mu]L cm-3) for 2 weeks were more promising than their treatments alone, after storage for 4 and 12 weeks. GC-MS analysis of the H. suaveolens essential oil, showed that 24 compounds were present, the main ones being1,8-cineole (44.4%), [beta]-pinene (11.7%), [beta]-caryophyllene (10.0%), camphene (5.7%) and [beta]-myrcene (5.3%).
Keywords: Fusarium rot; Gladiolus corms; Hyptis suaveolens; Hot water treatment; UV-C; Integrated management

Lidia R. Scrivanti, Gabriel Bernardello, Ana M. Anton, The foveola of Bothriochloa alta (Poaceae: Andropogoneae): Extrafloral nectary or secretory gland of essential oils?, Flora - Morphology, Distribution, Functional Ecology of Plants, Volume 203, Issue 1, 15 January 2008, Pages 55-59, ISSN 0367-2530, DOI: 10.1016/j.flora.2006.12.005.
(http://www.sciencedirect.com/science/article/B7GX0-4RN488D-3/2/6903b625eabb5eae98ba2af4b98184b9)
Abstract:
In some Bothriochloa species, the foveola or pit - a depression located in the lower glume of the sessile spikelet - has been interpreted as being an extrafloral nectary, although neither the structure has been studied nor the secretion was chemically characterized. On this basis, we analyzed the characteristics and structure of the foveola and the chemical composition of the secretion in Bothriochloa alta (Hitchc.) Herter, a grass with disjunt distribution from North and South America. In parallel, inflorescence visitors were identified during three summers (2003-2005) in populations from the Province of Cordoba (Argentina). The results show that the foveola functions as a secretory cavity producing essential oils instead of being an extrafloral nectary as previously suggested. The main compounds identified as components of the oils included methyl linoleate ester (34%), and two oxygenated sesquiterpenes: tau-cadinol (23.3%) and 6-methyl-alpha (E)-ionone (9.8%). Several species of Coleoptera, Hemiptera, and Diptera are inflorescence visitors.
Keywords: Essential oil; Secretory gland; Sesquiterpenes; Visitors

Teresa Nogueira, M.J. Marcelo-Curto, A. Cristina Figueiredo, Jose G. Barroso, Luis G. Pedro, Patrizia Rubiolo, Carlo Bicchi, Chemotaxonomy of Hypericum genus from Portugal: Geographical distribution and essential oils composition of Hypericum perfoliatum, Hypericum humifusum, Hypericum linarifolium and Hypericum pulchrum, Biochemical Systematics and Ecology, Volume 36, Issue 1, January 2008, Pages 40-50, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.07.004.
(http://www.sciencedirect.com/science/article/B6T4R-4PRJY2G-1/2/4aa7299f3124938014aca86f0ab873c7)
Abstract:
The geographical distribution and analysis of the essential oils of species from three sections of Hypericum L. (Guttiferae/Clusiaceae/Hypericaceae) from Portugal are presented. Hypericum perfoliatum (section Drosocarpium) grows wild in the centre and south of Portugal; Hypericum humifusum and Hypericum linarifolium are both from section Oligostema, the former occurring throughout the country, while the second is distributed mainly in the north and centre; Hypericum

pulchrum (section Taeniocarpium) is confined to the littoral north of Portugal. The essential oils were obtained by distillation-extraction, hydrodistillation and distillation in a modified Marcusson apparatus from the dried aerial parts of the different populations and were analysed by GC and GC-MS. Monoterpene hydrocarbons constituted the main fraction in all oils (43-69%, 53-85%, 28-45% and 48-65% for H. perfoliatum, H. humifusum, H. linarifolium and H. pulchrum, respectively). Sesquiterpene hydrocarbons (2-13%, 6-18%, 21-27% and 16-18%, respectively) and a third fraction of non-terpenic compounds (20-29%, 3-16%, 2-14% and 5-11%, respectively) from the four species attained relatively high amounts in all oils. Within each species, no major differences were detected in the essential oil composition, despite the fact that different locations, phenological phases and extraction methodologies were used. Notwithstanding the dominance of [alpha]-pinene in all four species' oils, cluster and principal components analysis on the identified components showed that the range of [alpha]-pinene, [beta]-pinene and n-nonane supported a separation of the four species. The essential oil composition of the four species showed some qualitative resemblances, which correlate well with the taxonomical classification based on morphological characters.
Keywords: Section Drosocarpium; Section Oligostema; Section Taeniocarpium; Essential oils; [alpha]-Pinene; n-Nonane; Chemotaxonomy

M. Bendahou, A. Muselli, M. Grignon-Dubois, M. Benyoucef, Jean-Marie Desjobert, Antoine-Francois Bernardini, Jean Costa, Antimicrobial activity and chemical composition of Origanum glandulosum Desf. essential oil and extract obtained by microwave extraction: Comparison with hydrodistillation, Food Chemistry, Volume 106, Issue 1, 1 January 2008, Pages 132-139, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.05.050.
(http://www.sciencedirect.com/science/article/B6T6R-4NVH81D-8/2/5b3cb52d2efc3f01ee213da238bdf01d)
Abstract:
Origanum glandulosum Desf. essential oils obtained by hydrodistillation (HD), solvent-free microwave extraction (SFME) and the extract obtained by microwave-assisted extraction (MAE) were investigated by capillary gas chromatography and gas chromatography/mass spectrometry. The main components of both oils obtained by HD and SFME were thymol (41.6-81.1%) followed by [gamma]-terpinene (27.0-3.1%), p-cymene (17.1-4.0%) and carvacrol (2.2-4.4%), respectively. In the same way, thymol (65.4%), [gamma]-terpinene (13.1%), p-cymene (7.2%) and carvacrol (3.5%) were the main components of the extract obtained by hexane microwave extraction. The SFME method was most selective for the extraction of thymol. The examination of the antimicrobial activity of both essential oils against 10 bacteria, two yeasts and four moulds revealed that O. glandulosum oil is more antifungal than antibacterial. To our knowledge, the antifungal activity of the O. glandulosum oil obtained by HD and both antimicrobial and antifungal activities of O. glandulosum SFME oil were not yet reported. Our study suggests that O. glandulosum essential oil has the potential to be used as a food preservative and to prevent the growth of nosocomial bacteria.
Keywords: Origanum glandulosum Desf.; Lamiaceae; Essential oil composition; Extract composition; Microwave extraction; Thymol; [gamma]-Terpinene; p-Cymene; Carvacrol; Antimicrobial activities

Gauri Saxena, Laiq-ur-Rahman, Praveen Chandra Verma, Suchitra Banerjee, Sushil Kumar, Field performance of somaclones of rose scented geranium (Pelargonium graveolens L'Her Ex Ait.) for evaluation of their essential oil yield and composition, Industrial Crops and Products, Volume 27, Issue 1, January 2008, Pages 86-90, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2007.08.001.
(http://www.sciencedirect.com/science/article/B6T77-4PPFT76-1/2/82ba860aa87ad93991413a0700f3dd56)
Abstract:

Several randomly selected glasshouse grown somaclones of rose scented geranium, Pelargonium graveolens L'Her Ex Ait. cv. Hemanti were successfully transferred to the field in Northern India for evaluation. Two distinct morphotypes were described on the basis of leaf dentation-one resembling the parental cultivar in having highly dentated leaves (HDL) and the other with less dentated leaves (LDL). After repeated field-testing for 3 consecutive years, the HDL clones closely resembled the parental cultivar with respect to the different quantity and quality determining traits, while the LDL group was clearly different. The field established LDL somaclones possessed higher herb yield, number of branches and other oil yield attributing traits as compared to the HDL clones and the parent cultivar. The chemical investigations of the essential oil revealed significant differences between the LDL clones, the HDL clones and the control. Selection of such somaclones, which are superior to the parental in most of the quantitative and qualitative traits and show better adaptability to different areas of cultivation, will help towards commercialization of geranium in India.
Keywords: Essential oil; Field evaluation; Morphotypes; Pelargonium; Rose scented geranium; Somaclones

David Aldred, Victoria Cairns-Fuller, Naresh Magan, Environmental factors affect efficacy of some essential oils and resveratrol to control growth and ochratoxin A production by Penicillium verrucosum and Aspergillus westerdijkiae on wheat grain, Journal of Stored Products Research, Volume 44, Issue 4, 2008, Pages 341-346, ISSN 0022-474X, DOI: 10.1016/j.jspr.2008.03.004.
(http://www.sciencedirect.com/science/article/B6T8Y-4SSGCMG-2/2/31be28e00dd9d581d4a3f189573462d0)
Abstract:
This study determined the efficacy of three essential oils (bay, clove and cinnamon oil) and the antioxidant resveratrol (0-500 [mu]g g-1) on the control of growth and ochratoxin A (OTA) production by Penicillium verrucosum and Aspergillus westerdijkiae (=A. ochraceus) under different water activity (aw, 0.90, 0.95, 0.995), and temperature (15, 25 [degree sign]C) conditions on irradiated wheat grain. The most effective treatment (resveratrol) was then tested on natural grain. The ED50 values for growth inhibition by the oils were 200-300 [mu]g g-1 at the aw and the temperatures tested. For resveratrol, this varied from <50 [mu]g g-1 at 0.90-0.95 aw to >350 at 0.995aw at both temperatures. The ED50 values for the control of OTA were slightly lower than for control of growth, with approx. 200 [mu]g g-1 required for the oils and 50-100 [mu]g g-1 of the antioxidant, at 0.90/0.95aw and both temperatures. In wet grain (0.995aw), higher concentrations were required. For growth there were statistically significant effects of single-, two- and three-way interactions between treatments except for concentrationxtemperature and concentrationxtemperaturexessential oil/antioxidant treatment. For OTA control, statistically significant treatments were aw, temperaturexaw, concentrationxtemperature, treatmentxconcentration, and three-way interaction of concentrationxawxtreatment for P. verrucosum and A. westerdijkiae. Subsequent studies were done with the best treatment (resveratrol, 200 [mu]g g-1) on natural wheat grain with either P. verrucosum or A. westerdijkiae at 0.85-0.995aw and 15/25 [degree sign]C over 28 days storage. This showed that the populations of the mycotoxigenic species and OTA contamination could be reduced by >60% by this treatment at the end of the storage period.
Keywords: Essential oils; Antioxidants; Water activity; Temperature; Ochratoxin; Fungal growth; Wheat grain; Environment

Maria D. Lopez, Maria J. Jordan, Maria J. Pascual-Villalobos, Toxic compounds in essential oils of coriander, caraway and basil active against stored rice pests, Journal of Stored Products Research, Volume 44, Issue 3, 2008, Pages 273-278, ISSN 0022-474X, DOI: 10.1016/j.jspr.2008.02.005.

(http://www.sciencedirect.com/science/article/B6T8Y-4SB9DXN-1/2/01fac6bec9a10dece3cd53cfd64ba69a)
Abstract:
Essential oils, distilled from seeds of Coriander sativum and Carum carvii and from leaves of five different varieties of Ocimum basilicum, were fractionated by column chromatography and tested in the laboratory for volatile toxicity against three stored rice pests (Sitophilus oryzae, Rhyzopertha dominica and Cryptolestes pusillus). The active fractions were analyzed by GC-MS. Coriander contained linalool (1617 ppm of the oil) as the main product active against the three pests. Camphor-rich fractions (over 400 ppm) were very toxic to R. dominica and C. pusillus. The caraway profile included carvone and limonene as expected but (E)-anethole, generally regarded as a minor product in the essential oil of this species, was also a major component, being present at 365 ppm. Carvone was the most effective (972 ppm) monoterpenoid against S. oryzae. In addition, (E)-anethole at 880 ppm was toxic to R. dominica while vapors of limonene (1416 ppm) and fenchone-rich (554 ppm) fractions killed adults of C. pusillus only. Three major essential oil profiles were present in the five varieties of O. basilicum analyzed: methyl eugenol/estragole, estragole and estragole/linalool chemotypes. The abundance of components had a strong influence on the outcome of the bioassays. Fractions, where combinations of products occurred with or without other minor compounds, were often more toxic than any one compound alone.
Keywords: Coriandrum sativum; Carum carvii; Ocimum basilicum; Sitophilus oryzae; Rhyzopertha dominica; Cryptolestes pusillus; Linalool; Carvone; Anethole; Estragole; Methyl eugenol

Maria B. Mielnik, Signe Sem, Bjorg Egelandsdal, Grete Skrede, By-products from herbs essential oil production as ingredient in marinade for turkey thighs, LWT - Food Science and Technology, Volume 41, Issue 1, January 2008, Pages 93-100, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.01.014.
(http://www.sciencedirect.com/science/article/B6WMV-4N146FN-1/2/aa4171fc74dbc6e50899041767d5c394)
Abstract:
Herb decoctions--the aqueous extract of rosemary, sage and thyme, left as by-product after steam distillation of essential oils, were investigated as a source of antioxidants in marinades for turkey thigh meat. Lipid oxidation after marinating, cooking and chill storage (warmed over flavour, WOF) was assessed by thiobarbituric acid-reactive substances (TBARS), GC-MS and sensory judgement on marinated and untreated meat. Results showed that marinating with herb decoctions, which exerted antioxidant activity (free radical scavenging), was an effective means of retarding lipid oxidation in raw and cooked meat. Meat from the rosemary marinade had the lowest TBARS values and volatile levels, while the control samples showed the highest values throughout the marinating, cooking and storage period. Oxidative changes in meat marinated with thyme and sage were significantly more advanced than in meat marinated with rosemary decoction. The partial least squares regression (PLS-R) showed that control samples were strongly related to the oxidation variables (volatiles, TBARS, rancidity) while the marinated meat had high scores for spicy and acidic odour and flavour. Results indicated that antioxidants contained in herb decoction, could be exploited in marinades to prevent rancidity in stored, heat-treated turkey meat products.
Keywords: Turkey meat; Antioxidants; Decoction; Marinating; Rancidity; Volatile compounds

P. Kotzekidou, P. Giannakidis, A. Boulamatsis, Antimicrobial activity of some plant extracts and essential oils against foodborne pathogens in vitro and on the fate of inoculated pathogens in chocolate, LWT - Food Science and Technology, Volume 41, Issue 1, January 2008, Pages 119-127, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.01.016.
(http://www.sciencedirect.com/science/article/B6WMV-4N25W0J-2/2/ae2576d28c5d6dd502781db9176d99d0)
Abstract:

The efficacy of commercially available plant extracts and essential oils used extensively as flavour ingredients in confectionery products were used as antimicrobials in laboratory media against the following microorganisms: Escherichia coli O157:H7, Salmonella Enteritidis, Salmonella Typhimurium, Staphylococcus aureus, Listeria monocytogenes, and Bacillus cereus. Using the disc diffusion method, inhibition zones in diameter >20 mm were observed by adding 10 [mu]l of each antimicrobial substance on the following microorganisms: lemon flavour applied on E. coli O157:H7, lemongrass essences against S. aureus, plum using a B. cereus strain and strawberry flavour using a L. monocytogenes strain. E. coli O157:H7 strains were the most susceptible microorganisms inhibited by 18 extracts, followed by S. Typhimurium and S. aureus which were inhibited by 17 extracts. Lemon flavour, lemongrass essences, pineapple and strawberry flavour inhibited the foodborne pathogens at the lowest concentration (5 ml/100 ml). Plant extracts and essential oils with potent antimicrobial activities were tested in chocolate held at different temperatures (7 and 20 [degree sign]C) in dry or humidified environment, which resulted in different aw values of the product (i.e. 0.340, 0.450, and 0.822), in order to determine their efficacy on the fate of the inoculated pathogens. The most inhibitory action was observed by lemon flavour applied on chocolate inoculated with E. coli cocktail culture after storage at 20 [degree sign]C for 9 days. Plant extracts tested on chocolate show an enhanced inhibitory effect during storage at 20 [degree sign]C indicating that their application may provide protection in case of storage at the above temperature or even higher.
Keywords: Antimicrobials; Chocolate; Essential oils; Foodborne pathogens; Plant extracts

Carla S. Francisco, Gisele B. Messiano, Lucia M.X. Lopes, Aristeu G. Tininis, Jose E. de Oliveira, Lindolpho Capellari Jr., Classification of Aristolochia species based on GC-MS and chemometric analyses of essential oils, Phytochemistry, Volume 69, Issue 1, January 2008, Pages 168-175, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2007.07.007.
(http://www.sciencedirect.com/science/article/B6TH7-4PG2S09-1/2/f6250710ac3c5a47efb386c806c2e29b)
Abstract:
Essential oils were obtained from roots of 10 Aristolochia species by hydrodistillation and analysed by GC-MS. A total of 75 compounds were identified in the analysed oils. Multivariate analyses of the chemical constituents of the roots enabled classification of the species into four morphological groups. These forms of analysis represent an aid in identification of further specimens belonging to these species.
Keywords: Aristolochia; Aristolochiaceae; Essential oils; Multivariate analysis; Principal component analysis; Morphology; Monoterpene; Sesquiterpene

I. Cheraif, H. Ben Jannet, M. Hammami, M.L. Khouja, Z. Mighri, Chemical composition and antimicrobial activity of essential oils of Cupressus arizonica Greene, Biochemical Systematics and Ecology, Volume 35, Issue 12, December 2007, Pages 813-820, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.05.009.
(http://www.sciencedirect.com/science/article/B6T4R-4PPNMN4-1/2/779f07e88f1529dbaf5f39d0c0b4a2fa)
Abstract:
The chemical composition of the essential oils obtained by hydrodistillation from leaves, branches and female cones of Cupressus arizonica Greene cultivated in Tunisia was determined by GC and GC/MS analysis. Significant differences were found between the constituent percentages of the different oils. Among the 87 identified components [alpha]-pinene (60.5% in female cones), umbellulone (18.4% in leaves), [delta]-3-carene (15.6% in branches) and cis-muurola-4(14),5-diene (9.4% in leaves) were found to be the major ones.
Composition of essential oils extracted from different organs of C. arizonica Greene growing in Tunisia showed remarkable differences from the same species cultivated in Algeria, Argentina,

Iran, Italy, France and Texas based on a comparison with published results. The in vitro antibacterial activity of the essential oils samples was evaluated against some Gram positive and negative bacteria.
Keywords: Cupressus arizonica Greene; Essential oil; Tunisia; [alpha]-Pinene; Antibacterial activity

Catherine Argyropoulou, Dimitra Daferera, Petros A. Tarantilis, Costas Fasseas, Moschos Polissiou, Chemical composition of the essential oil from leaves of Lippia citriodora H.B.K. (Verbenaceae) at two developmental stages, Biochemical Systematics and Ecology, Volume 35, Issue 12, December 2007, Pages 831-837, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.07.001.
(http://www.sciencedirect.com/science/article/B6T4R-4PGXFFJ-1/2/edf46e4c3b3bfb403b26c91c274ea3a0)
Abstract:
The chemical composition of the essential oil extracted from fresh leaves of Lippia citriodora (Verbenaceae) was analyzed by GC-FID and GC-MS in May, when growth rates are maximal, and in September, in full bloom. In both samples the main constituents were geranial, neral and limonene constituting 66.3% of the total essential oil yield in May and increasing to 69% in September. Their individual percentage values, however, changed considerably for geranial and neral decreasing from 38.7 to 26.8% and from 24.5 to 21.8%, respectively, and for limonene increasing from 5.8 to 17.7%. All other components remained more or less unchanged both qualitatively and quantitatively. FT-IR spectrometry was also applied for the qualitative determination of the main components.
Keywords: Lippia citriodora; Verbenaceae; Essential oil; Leaf; Growth stage; GC-FID; GC-MS; FT-IR

Ramona A. Cole, William A. Haber, William N. Setzer, Chemical composition of essential oils of seven species of Eugenia from Monteverde, Costa Rica, Biochemical Systematics and Ecology, Volume 35, Issue 12, December 2007, Pages 877-886, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.06.013.
(http://www.sciencedirect.com/science/article/B6T4R-4PGH4JK-1/2/3acffdceab610fa9900f373ccb086144)
Abstract:
The leaf essential oils of seven species of Eugenia from Monteverde, Costa Rica (Eugenia austin-smithii, Eugenia cartagensis, Eugenia haberi, Eugenia monteverdensis, Eugenia zuchowskiae, Eugenia sp. A aff. haberi, and Eugenia sp. B aff. oerstediana) have been obtained by hydrodistillation and analyzed by GC-MS. The seven species were compared to determine the similarities and differences among their volatile chemical compositions. The major component in each of the seven species was as follows: E. austin-smithii and E. cartagensis was trans-2-hexenal, E. haberi and E. zuchowskiae was [alpha]-pinene, E. monteverdensis was linalool, Eugenia sp. A was zingiberene, and Eugenia sp. B was 1,8-cineole. The following six components were present in all seven species: [alpha]-copaene, [beta]-caryophyllene, [alpha]-humulene, [delta]-cadinene, trans-nerolidol, and torreyol. The complex array and differing abundances of these compounds among the Eugenia species studied suggest that they may provide useful characters in understanding the phylogenetic relationships among closely related species.
Keywords: Eugenia austin-smithii; Eugenia cartagensis; Eugenia haberi; Eugenia monteverdensis; Eugenia zuchowskiae; Eugenia sp. A aff. haberi; Eugenia sp. B aff. oerstediana; Myrtaceae; Essential oil composition

Maryam Omidbeygi, Mohsen Barzegar, Zohreh Hamidi, Hassanali Naghdibadi, Antifungal activity of thyme, summer savory and clove essential oils against Aspergillus flavus in liquid medium and

tomato paste, Food Control, Volume 18, Issue 12, December 2007, Pages 1518-1523, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2006.12.003.
(http://www.sciencedirect.com/science/article/B6T6S-4MMWHGK-1/2/d04a86d69c89c31c9e83c61c999253fb)
Abstract:
Antifungal activity of essential oils of thyme, summer savory and clove were evaluated in culture medium and tomato paste. Aspergillus flavus were inoculated in Sabouraud Dextrose Broth and tomato paste and then 0, 50, 200, 350 and 500 ppm of essential oils were added to each sample and then kept at 25 +/- 0.5 [degree sign]C for 2 months. Results showed that all essential oils could inhibit the growth of A. flavus and the thyme oil and summer savory, showed the strongest inhibition at 350 ppm and 500 ppm, respectively. Taste panel evaluations were carried out in a tomato ketchup base, and the percent of inhibition of each essential oil in tomato paste was lower than culture medium. Taste panel was carried out and sample with 500 ppm thyme oil was accepted by panelists.
Keywords: Natural antifungal; Essential oil; Aspergillus flavus

S.S. Shekarforoush, A.H.K. Nazer, R. Firouzi, M. Rostami, Effects of storage temperatures and essential oils of oregano and nutmeg on the growth and survival of Escherichia coli O157:H7 in barbecued chicken used in Iran, Food Control, Volume 18, Issue 11, November 2007, Pages 1428-1433, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2006.10.006.
(http://www.sciencedirect.com/science/article/B6T6S-4MJJC2S-1/2/1afbe6fcc7e32da6aa95887b1fec6582)
Abstract:
Traditional Iranian barbecued chicken (TIBC) consists of cubed chicken breast, lemon juice, onion, saffron, salt, red pepper, vegetable oil and various spices such as oregano and nutmeg with pH value about 5.5. As this product is sometimes consumed under-cooked, there is growing concern that it may pose health hazards to consumers related to pathogenic bacteria such as Escherichia coli O157:H7. We studied the influence of storage temperature and essential oils (EOs) of oregano and nutmeg on the growth and survival of E. coli O157:H7 in ready-to-cook TIBC. Ready-to-cook TIBC was prepared according to the traditional practice using different concentrations of oregano and nutmeg EOs. The TIBC and control samples (TIBC without the EOs) were spiked with E. coli O157:H7 to a final concentration of 6-7 log10 CFU g-1 and stored at 3, 8 and 20 [degree sign]C. E. coli O157:H7 was counted after 0, 24, 48 and 72 h storage using MacConkey sorbitol agar supplemented with cefixime and tellurite. The EOs of oregano and nutmeg had a bactericidal effect on E. coli O157:H7 in broth culture with 0.6 and 10 [mu]l ml-1 concentration, respectively. The log10 CFU g-1 of E. coli O157:H7 count in the spiked samples, containing 1, 2 and 3 [mu]l g-1 of EOs of oregano and nutmeg that were stored at different temperatures for up to 72 h relative to the control samples did not change. Increasing the storage temperatures from 3 [degree sign]C to 20 [degree sign]C up to 72 h significantly increased the log10 CFU g-1 of E. coli O157:H7 in both experimental and control samples. The results showed that the E. coli O157:H7 had the ability to survive in ready-to-cook TIBC at refrigeration condition (3 [degree sign]C) and multiplied significantly at the higher temperature, e.g. 8 [degree sign]C and the ambient temperature of 20 [degree sign]C. The results from our study showed that contrary to the inhibitory effect of EOs of oregano and nutmeg against E. coli O157:H7 in broth system, they had no any inhibitory effect against E. coli O157:H7 in ready-to-cook TIBC.
Keywords: E. coli O157:H7; Oregano; Nutmeg; Chicken; Essential oil

Selene Maia de Morais, Valdir Alves Facundo, Luciana Medeiros Bertini, Eveline Solon Barreira Cavalcanti, Joao Francisco dos Anjos Junior, Silane Aparecida Ferreira, Edy Sousa de Brito, Manoel Alves de Souza Neto, Chemical composition and larvicidal activity of essential oils from

Piper species, Biochemical Systematics and Ecology, Volume 35, Issue 10, October 2007, Pages 670-675, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.05.002.
(http://www.sciencedirect.com/science/article/B6T4R-4P3M8CH-2/2/7e00f6d040bbc1fe29c515ed6ea9adaf)
Abstract:
The larvicidal activity of essential oils of four species of Piper from the Amazon Forest was tested using third-instar larvae of Aedes aegypti. The oils were extracted by steam distillation and analyzed by GC and GC-MS. The main components isolated from each Piper species were as follows: viridiflorol (27.50%), aromadendrene (15.55%) and [beta]-selinene (10.50%) from Piper gaudichaudianum; [beta]-selinene (15.77%) and caryophyllene oxide (16.63%) from Piper humaytanum; dillapiol (54.70%) and myristicin (25.61%) from Piper permucronatum; and asaricin (27.37%) and myristicin (20.26%) from Piper hostmanianum. Amongst all essential oils tested, the most active against larvae of A. aegypti was the oil extracted from P. permucronatum, with a LC50 = 36 [mu]g/ml (LC90 = 47 [mu]g/ml), followed by the essential oil of P. hostmanianum, with a LC50 = 54 [mu]g/ml (LC90 = 72 [mu]g/ml). The oils with higher content of arylpropanoids were more active against larvae of A. aegypti.
Keywords: Larvicidal activity; Essential oil; Piperaceae; Aedes aegypti; Dillapiol

Soha Basiri, Hadi Esmaily, Sanaz Vosough-Ghanbari, Azadeh Mohammadirad, Nargues Yasa, Mohammad Abdollahi, Improvement by Satureja khuzestanica essential oil of malathion-induced red blood cells acetylcholinesterase inhibition and altered hepatic mitochondrial glycogen phosphorylase and phosphoenolpyruvate carboxykinase activities, Pesticide Biochemistry and Physiology, Volume 89, Issue 2, October 2007, Pages 124-129, ISSN 0048-3575, DOI: 10.1016/j.pestbp.2007.04.006.
(http://www.sciencedirect.com/science/article/B6WP8-4NNWCF1-1/2/65e578bc856c9899121bab7e351d0888)
Abstract:
The aim of this study was to examine whether Satureja khuzestanica (Lamiaceae) essential oil (SKEO) might have protective effects on toxicity of malathion, a commonly used organophosphorus (OP), by measuring the activities of hepatic cells mitochondrial glycogen phosphorylase (GP) and phosphoenolpyruvate carboxykinase (PEPCK) activities and blood levels of glucose and acetylcholinesterase (AChE) in rats. Malathion (20 mg/kg/day) and SKEO (225 mg/kg/day) were administered alone or in combination by intragastric intubation for 28 days. Treatment by malathion increased blood glucose as measured at days 18 and 28 of treatment. Malathion inhibited erythrocyte AChE and increased hepatic cells GP and PEPCK activities. Coadministration SKEO resulted in restoration of malathion-induced changes in hepatic cells GP and PEPCK activities and levels of blood AChE and glucose. It is concluded that SKEO interferes with malathion-induced stimulation of hepatic cells glycogenolysis and gluconeogenesis through its antioxidant potential and increasing AChE activity.
Keywords: Malathion; Oxidative stress; Hyperglycemia; Acetylcholinesterase; Satureja; Cell; Mitochondria; Hepatic

A.L.F. Camurca-Vasconcelos, C.M.L. Bevilaqua, S.M. Morais, M.V. Maciel, C.T.C. Costa, I.T.F. Macedo, L.M.B. Oliveira, R.R. Braga, R.A. Silva, L.S. Vieira, Anthelmintic activity of Croton zehntneri and Lippia sidoides essential oils, Veterinary Parasitology, Volume 148, Issues 3-4, 30 September 2007, Pages 288-294, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2007.06.012.
(http://www.sciencedirect.com/science/article/B6TD7-4P6MC34-1/2/29c0817496df8d3a3184d1b8d2d0bc43)
Abstract:
Because of the development of anthelmintic resistant populations, the search for new drugs is essential to maintain the productivity of small ruminants. The aim of this study was to evaluate the

anthelmintic activity of Croton zehntneri and Lippia sidoides essential oils and their major constituents, anethole and thymol. The effects of these oils and their constituents were determined by in vitro assays with the eggs and larvae of the sheep gastrointestinal nematode Haemonchus contortus. The two essential oils were evaluated on intestinal nematodes of mice at 800 mg kg-1 dose. In the last experiment, the mice were treated with larger doses of L. sidoides, 1200 and 1600 mg kg-1. The essential oils and their constituents prevented more than 98% of the H. contortus eggs from hatching at a concentration of 1.25 mg ml-1 and inhibited more than 90% of H. contortus larval development at a concentration of 10 mg ml-1. At a concentration of 800 mg kg-1, the two essential oils were 46.3% and 11.64% effective against Syphacia obvelata and Aspiculuris tetraptera. At 1200 and 1600 mg kg-1, L. sidoides essential oil's efficacy on the mouse worm burden was 57.6% and 68.9%, respectively. The fact that L. sidoides essential oil was almost 70% effective against mouse intestinal nematodes indicates it should be evaluated against gastrointestinal nematodes of sheep and goats.
Keywords: Haemonchus contortus; In vitro; In vivo; Mice; Syphacia obvelata; Aspiculuris tetraptera

Emine Salamci, Saban Kordali, Recep Kotan, Ahmet Cakir, Yusuf Kaya, Chemical compositions, antimicrobial and herbicidal effects of essential oils isolated from Turkish Tanacetum aucheranum and Tanacetum chiliophyllum var. chiliophyllum, Biochemical Systematics and Ecology, Volume 35, Issue 9, September 2007, Pages 569-581, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.03.012.
(http://www.sciencedirect.com/science/article/B6T4R-4NM5XXC-1/2/685ee4f8e999f1c3978f8516f5344250)
Abstract:
The chemical composition of essential oils isolated from the aerial parts by hydrodistillation of Turkish Tanacetum aucheranum and Tanacetum chiliophyllum var. chiliophyllum were analyzed by GC-MS. The oils contain similar major components. The major components of T. aucheranum oil were 1,8-cineole (23.8%), camphor (11.6%), terpinen-4-ol (7.2%), [alpha]-terpineol (6.5%), borneol (3.8%), (E)-thujone (3.2%), epi-[alpha]-cadinol (3.1%), and artemisia ketone (3.0%). Camphor (17.9%), 1,8-cineole (16.6%) and borneol (15.4%) were found to be predominant constituents in the oil of T. chiliophyllum. It is interesting to find that ester derivatives of dihydro-[alpha]-cyclogeranic acid (2,2,6-trimethylcyclohexylcarboxylate), dihydro-[alpha]-cyclogeranyl hexanoate (10.1%), dihydro-[alpha]-cyclogeranyl pentanoate (3.0%), dihydro-[alpha]-cyclogeranyl butanoate (2.1%) and dihydro-[alpha]-cyclogeranyl propionate (1.2%) are firstly found as chemotaxonomically important components in T. chiliophyllum oil. From these, dihydro-[alpha]-cyclogeranyl hexanoate was isolated on silica gel column chromatography and its structure was confirmed by spectroscopic methods. This is the first report on the occurrence of ester derivatives of dihydro-[alpha]-cyclogeranic acid in essential oils of Tanacetum species. The oils were also characterized to have relatively high amounts of oxygenated monoterpenes. Results of the antifungal testing by microbial growth inhibition assays showed that the oils completely inhibit the growth of 30 phytopathogenic fungi. However, their growth inhibition effects were lower than commercial benomyl. The oils tested for antibacterial activity against 33 bacterial strains showed a considerable antibacterial activity over a wide spectrum. Herbicidal effects of the oils on seed germination of Amaranthus retroflexus, Chenopodium album and Rumex crispus were also determined and the oils completely inhibited the seed germination and seedling growth of the plants.
Keywords: Tanacetum; Tanacetum aucheranum; Tanacetum chiliophyllum; Antimicrobial activity; Herbicidal effect; Dihydro-[alpha]-cyclogeranic acid esters

Ali Misaghi, Afshin Akhondzadeh Basti, Effects of Zataria multiflora Boiss. essential oil and nisin on Bacillus cereus ATCC 11778, Food Control, Volume 18, Issue 9, September 2007, Pages 1043-1049, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2006.06.010.

(http://www.sciencedirect.com/science/article/B6T6S-4KPP45Y-1/2/1c132477f75d8eab18740024d68a180a)
Abstract:
The effects of different concentrations of Zataria multiflora Boiss. essential oil (EO, 0.0%, 0.005%, 0.015%, 0.03% and 0.045%) and nisin (N, 0.0, 0.25, 0.5, 1.5 and 2.5 [mu]g ml-1), pH values (7.4, 6.5 and 6.0), temperatures (Ts, 10, 20 and 30 [degree sign]C) and storage times (Ds, up to 43 days) on log10 probability percentage of growth initiation (log P%) of one vegetative cell of Bacillus cereus in brain heart infusion broth were evaluated in a factorial design study. The log P% of the organism was significantly affected ($P < 0.01$) by the values of EO, N, pH, T and D.
The combinations of T [greater-or-equal, slanted] 20 [degree sign]C, EO [less-than-or-equals, slant] 0.03% and pH values (7.4, 6.5 and 6.0) could not obviously affect the growth of the organism in this study. Whereas, the strong inhibitory action was observed by increasing EO concentration to 0.045 at T [greater-or-equal, slanted] 20 [degree sign]C and selected pH values (7.4, 6.5 and 6.0) and by decreasing temperature to 10 [degree sign]C at EO [greater-or-equal, slanted] 0.015% and pH values used in this study. The inhibitory effect of N also was enhanced by decreasing storage temperature to 10 [degree sign]C at the selected pH values (7.4, 6.5 and 6.0) in this study.
The growth of the organisms was strongly affected by increasing EO concentration to 0.03% in combination with N concentrations used at the selected temperatures in this study. The growth of the organism was completely inhibited at combinations EO [greater-or-equal, slanted] 0.015%, N [greater-or-equal, slanted] 1.5 [mu]g ml-1, T [less-than-or-equals, slant] 30 [degree sign]C and pH [less-than-or-equals, slant] 7.4 during 43 days of storage in this study. This synergistic effect of EO and N was enhanced in lower pH values (6.5 and 6.0) in the present study. The growth of organism was completely inhibited at combinations of EO [greater-or-equal, slanted] 0.005 and N [greater-or-equal, slanted] 1.5 [mu]g ml-1 at pH = 6.0, and EO [greater-or-equal, slanted] 0.03 and N [greater-or-equal, slanted] 0.5 [mu]g ml-1 at pH [less-than-or-equals, slant] 6.5 during the study at the selected Ts (30, 20 and 10 [degree sign]C).
Keywords: Zataria multiflora Boiss. essential oil; Nisin; Bacillus cereus

Wu Feng, Xiaodong Zheng, Essential oils to control Alternaria alternata in vitro and in vivo, Food Control, Volume 18, Issue 9, September 2007, Pages 1126-1130, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2006.05.017.
(http://www.sciencedirect.com/science/article/B6T6S-4KW5WB6-2/2/e65a394caafa22170ff1055e128e5307)
Abstract:
The inhibitory effects of five essential oils (thyme, sage, nutmeg, eucaptus and cassia) against Alternaria alternata were tested at different concentrations (100-500 ppm) in vitro. The cassia oil and thyme oil both exhibited antifungal activity against A. alternata. The cassia oil inhibited completely the growth of A. alternata at 300-500 ppm. The thyme oil exhibited a lower degree of inhibition 62.0% at 500 ppm. Spore germination and germ tube elongation of the pathogens in potato dextrose broth was strongly inhibited in the presence of 500 ppm cassia oil. Irreversible inhibition of fungal growth could be caused by exposure to 300 ppm and 400 ppm cassia oil for 6 days and 500 ppm cassia oil for 3 days. Cassia oil at 500 ppm reduced the percentage of decayed tomatoes. The experiments on reducing natural decay development of tomatoes gave similar results. Therefore, essential oils could be an alternative to chemicals for control of postharvest phytopathogenic fungi on fruits or vegetables.
Keywords: Essential oil; Antifungal; Cherry tomato

E. Chouliara, A. Karatapanis, I.N. Savvaidis, M.G. Kontominas, Combined effect of oregano essential oil and modified atmosphere packaging on shelf-life extension of fresh chicken breast

meat, stored at 4 [degree sign]C, Food Microbiology, Volume 24, Issue 6, September 2007, Pages 607-617, ISSN 0740-0020, DOI: 10.1016/j.fm.2006.12.005.
(http://www.sciencedirect.com/science/article/B6WFP-4MT5JYY-1/2/1cb6f16c77d3b4e6af750e6c25937a70)
Abstract:
The combined effect of oregano essential oil (0.1% and 1% w/w) and modified atmosphere packaging (MAP) (30% CO2/70% N2 and 70% CO2/30% N2) on shelf-life extension of fresh chicken meat stored at 4 [degree sign]C was investigated. The parameters that were monitored were: microbiological (TVC, Pseudomonas spp., lactic acid bacteria (LAB), yeasts, Brochothrix thermosphacta and Enterobacteriaceae), physico-chemical (pH, TBA, color) and sensory (odor and taste) attributes. Microbial populations were reduced by 1-5 log cfu/g for a given sampling day, with the more pronounced effect being achieved by the combination of MAP and oregano essential oil. TBA values for all treatments remained lower than 1 mg malondialdehyde (MDA) kg-1 throughout the 25-day storage period. pH values varied between 6.4 (day 0) and 5.9 (day 25). The values of the color parameters L*, a* and b* were not considerably affected by oregano oil or by MAP. Finally, sensory analysis showed that oregano oil at a concentration of 1% imparted a very strong taste to the product for which reason these lots of samples were not scored. On the basis of sensory evaluation a shelf-life extension of breast chicken meat by ca. 3-4 days for samples containing 0.1% oregano oil, 2-3 days for samples under MAP and 5-6 days for samples under MAP containing 0.1% of oregano oil was attained. Thus oregano oil and MAP exhibited an additive preservation effect.
Keywords: Chicken meat; Shelf-life extension; Oregano oil; Modified atmosphere packaging

Milka Maksimovic, Danijela Vidic, Mladen Milos, Marija Edita Solic, Sabaheta Abadzic, Sonja Siljak-Yakovlev, Effect of the environmental conditions on essential oil profile in two Dinaric Salvia species: S. brachyodon Vandas and S. officinalis L., Biochemical Systematics and Ecology, Volume 35, Issue 8, August 2007, Pages 473-478, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.02.005.
(http://www.sciencedirect.com/science/article/B6T4R-4NF2NNV-2/2/938c57a171ee2096facec810dee88b41)
Abstract:
Two species belonging to the genus Salvia (Salvia brachyodon Vandas and Salvia officinalis L.) from Dalmatian region were studied for their essential oil composition, genome size and base composition. These species showed the same chromosome number (2n = 14), similar genome size (0.95 and 0.97 pg/2C) and base composition (38.52 and 38.55 GC%), respectively. This is the first estimation of DNA content and base composition for both species.
The chemical composition of S. officinalis essential oil was characterized by high content of oxygenated monoterpenes with cis- and trans-thujone as the major constituents (57.0% and 15.0%, respectively). In contrast, the main component of S. brachyodon essential oil was oxygenated sesquiterpene humulene epoxide II (22.9%).
S. brachyodon is an endemic Dinaric species with narrow geographical distribution limited to only two localities, one in Croatia and another at the border of Herzegovina and Montenegro. The Croatian population has been studied here for the first time.
Keywords: Genome size; Base composition; Inter-specific and inter-population differentiation; Essential oil composition; cis-Thujone; trans-Thujone; Humulene epoxide II

Jesus Munoz-Bertomeu, Isabel Arrillaga, Juan Segura, Essential oil variation within and among natural populations of Lavandula latifolia and its relation to their ecological areas, Biochemical Systematics and Ecology, Volume 35, Issue 8, August 2007, Pages 479-488, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.03.006.

(http://www.sciencedirect.com/science/article/B6T4R-4NJP3Y4-2/2/3f2698333ee7cf269681f04a29018698)
Abstract:
Essential oil yield and composition in seven natural populations of Lavandula latifolia from the eastern Iberian Peninsula were determined by GC/MS. Twenty-eight constituents were identified, accounting for 92.0-95.4% of the total oils. These oils were dominated by the monoterpene fraction and three of them (linalool, cineole and camphor) constituted 79.5-86.9% of the oil from flowers. Essential oil yield in leaves and flowers varied among and within populations, but hierarchic analyses of variance showed that the proportion of variation attributable to individuals was significantly higher than that attributable to population differences. Principal component and cluster analyses allowed three groups of flower essential oils to be distinguished according to their high, intermediate and low proportion of linalool. These essential oil types are respectively correlated to the Supra-, Meso- and Thermo-Mediterranean bioclimatic belts where the populations are located. A genetic analysis based on those terpenes that showed a trimodal distribution roughly corroborated the relationships between the seven populations obtained from the ordination analyses and emphasizes the distinctiveness of some of the populations.
Keywords: Lavandula latifolia; Lamiaceae; Spike lavender; Essential oil yield; Bioclimatic belts; PCA; AHC; Genetic analysis

Sayaka Takaku, William A. Haber, William N. Setzer, Leaf essential oil composition of 10 species of Ocotea (Lauraceae) from Monteverde, Costa Rica, Biochemical Systematics and Ecology, Volume 35, Issue 8, August 2007, Pages 525-532, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.02.003.
(http://www.sciencedirect.com/science/article/B6T4R-4NCKK4T-2/2/baeb7e7be6b3e9c344dc2da71cecd6a9)
Abstract:
The leaf essential oils of 10 species of Ocotea (Lauraceae) from Monteverde, Costa Rica (Ocotea floribunda, Ocotea holdridgeana, Ocotea meziana, Ocotea sinuata, Ocotea tonduzii, Ocotea valeriana, Ocotea veraguensis, Ocotea whitei, and two undescribed species, Ocotea new species 'los llanos', and Ocotea new species 'small leaf') have been obtained by hydrodistillation and analyzed by GC-MS in order to discern the differences and similarities between the volatile chemical compositions of these species. The principal common constituents of the 10 species of Ocotea were [alpha]-pinene, [beta]-pinene, [beta]-caryophyllene, and germacrene-D.
Keywords: Ocotea floribunda; Ocotea holdridgeana; Ocotea meziana; Ocotea sinuata; Ocotea tonduzii; Ocotea valeriana; Ocotea veraguensis; Ocotea whitei; Ocotea new species 'los llanos'; Ocotea new species 'small leaf'; Lauraceae; Essential oil composition; [alpha]-Pinene; [beta]-Pinene; [beta]-Caryophyllene; Germacrene-D; trans-[beta]-Ocimene; Bulnesol; Kaurene

A.C. Seydim, G. Sarikus, Corrigendum to 'Antimicrobial activity of whey protein based edible films incorporated with oregano, rosemary and garlic essential oils' [Food Res. Int. 39 (2006) 639-644], Food Research International, Volume 40, Issue 7, August 2007, Page 949, ISSN 0963-9969, DOI: 10.1016/j.foodres.2007.04.002.
(http://www.sciencedirect.com/science/article/B6T6V-4NJ7W7S-1/2/47fe705d4f39a2ead0fcc50bad8bf278)

Mi Ja Chung, Ah-Young Kang, Sung-Ok Park, Kuen-Woo Park, Hee-Jin Jun, Sung-Joon Lee, The effect of essential oils of dietary wormwood (Artemisia princeps), with and without added vitamin E, on oxidative stress and some genes involved in cholesterol metabolism, Food and Chemical Toxicology, Volume 45, Issue 8, August 2007, Pages 1400-1409, ISSN 0278-6915, DOI: 10.1016/j.fct.2007.01.021.

(http://www.sciencedirect.com/science/article/B6T6P-4N0PPXJ-1/2/b9618219655e86cf42ed573a6bfd1ad3)
Abstract:
Wormwood (Artemisia princeps) due to the abundance of antioxidant in its essential oils (EO), has been used as a traditional drug and health food in Korea. Oxidative stress plays an important role in the etiology of atherosclerosis thus antioxidative chemicals improves hepatic lipid metabolism partly by reducing oxysterol formation. The antioxidant activity was assessed using two methods, human low-density lipoprotein (LDL) oxidation and the anti-DPPH free radical assays. It was found that the antioxidant activity of EO with vitamin E higher than EO alone. To study mechanisms accounting for the antiatherosclerotic properties of this wormwood EO, we examined the expression of key genes in cholesterol metabolism such as the LDL receptor, the 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase and sterol regulatory element binding proteins. The induction was increased up to twofold at 0.05 mg/mL of EO treatment in HepG2 cells for 24 h. When EO (0.2 mg/mL) was co-incubated with vitamin E, interestingly, the LDL receptor was dramatically induced by 5-6-folds. HMG-CoA reductase did not change. However, treatment with the higher concentration resulted in cytotoxicity. Our data suggest that wormwood EO with vitamin E may be anti-atherogenic due to their inhibition of LDL oxidation and upregulation of the LDL receptor.
Keywords: Antioxidant; Vitamin E; Cholesterol; Oxidative stress; Toxicity

Eugenia Pinto, Ligia Ribeiro Salgueiro, Carlos Cavaleiro, Ana Palmeira, Maria Jose Goncalves, In vitro susceptibility of some species of yeasts and filamentous fungi to essential oils of Salvia officinalis, Industrial Crops and Products, Volume 26, Issue 2, August 2007, Pages 135-141, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2007.02.004.
(http://www.sciencedirect.com/science/article/B6T77-4NGBB3R-1/2/14318ab5b61ba2cb8ff243dea7a4799e)
Abstract:
Composition and antifungal activity of Salvia officinalis essential oil were studied. Three samples of essential oils obtained by hydrodistillation from aerial parts of plants grown in Portugal and one commercial sample were analysed by gas chromatography (GC) and by gas chromatography-mass spectrometry (GC-MS). Quantitative differences were observed in the compositions, particularly in the amounts of cis-thujone (8.8-37.1%) and camphor (11.6-23.4%). Antifungal activity of the oils was evaluated by minimal inhibitory concentrations (MIC) and minimal lethal concentrations (MLC) determinations against Candida (four clinical isolates and four ATCC type strains), dermatophytes (five clinical strains) and other filamentous fungi (Penicillium, Aspergillus, Cladosporium and Fusarium). The oils exhibited a broad antifungal spectrum, with higher activity against dermatophyte strains. The oil with 10.4% of cis-thujone and 20.5% of camphor was the most active and showed fungicidal activity, with MIC and MLC values of 0.63 [mu]l/ml, against dermatophyte strains. Sage products, with low content of thujones, may be an alternative as antifungal agents in different areas.
Keywords: Salvia officinalis; Sage; Essential oils; Antifungal activity

Maria A. Rojas-Grau, Roberto J. Avena-Bustillos, Carl Olsen, Mendel Friedman, Philip R. Henika, Olga Martin-Belloso, Zhongli Pan, Tara H. McHugh, Effects of plant essential oils and oil compounds on mechanical, barrier and antimicrobial properties of alginate-apple puree edible films, Journal of Food Engineering, Volume 81, Issue 3, August 2007, Pages 634-641, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.01.007.
(http://www.sciencedirect.com/science/article/B6T8J-4MX569N-3/2/63916a79a5b90b26cbeba75c067110b1)
Abstract:

Mechanical, barrier and antimicrobial properties of 0.1-0.5% suspensions of the following essential oils (EOs)/oil compounds (OCs) were evaluated against the foodborne pathogen Escherichia coli O157:H7 in alginate-apple puree edible film (AAPEF): oregano oil/carvacrol; cinnamon oil/cinnamaldehyde; and lemongrass oil/citral. The presence of plant essential oils did not significantly affect water vapor and oxygen permeabilities of the films, but did significantly modify tensile properties. Antimicrobial activities of solutions used to prepare edible films (AAPFFS) were also determined. The results obtained demonstrate that carvacrol exhibited the strongest antimicrobial activity against E. coli O157:H7. The data show that the antimicrobial activities were in the following order: carvacrol > oregano oil > citral > lemongrass oil > cinnamaldehyde > cinnamon oil. This study showed that plant-derived essential oils and their constituents could be used to prepare apple-based antimicrobial edible films for food applications.
Keywords: Alginate film; Apple puree; Plant essential oils; Mechanical properties; Barrier properties; Antimicrobial activity; Escherichia coli O157:H7

Afshin Akhondzadeh Basti, Ali Misaghi, Daryusch Khaschabi, Growth response and modelling of the effects of Zataria multiflora Boiss. essential oil, pH and temperature on Salmonella Typhimurium and Staphylococcus aureus, LWT - Food Science and Technology, Volume 40, Issue 6, August 2007, Pages 973-981, ISSN 0023-6438, DOI: 10.1016/j.lwt.2006.07.007.
(http://www.sciencedirect.com/science/article/B6WMV-4KPPCPC-2/2/7bbefc12e85b61926518b3d9a8e1d1f9)
Abstract:
The effects of different concentrations of Zataria multiflora Boiss. essential oil (EO: 0.0, 0.015, 0.03 and 0.06%), pH values (7.3 and 6.0) and storage temperatures (T: 15, 25 and 35 [degree sign]C) on some growth kinetics, time-to-detection (TTD, time to the nearest visible detection) and log10 probability percentage (log P%) of growth initiation of Salmonella Typhimurium and Staphylococcus aureus in Brain Heart Infusion broth were evaluated in a factorial design study. For the log P%, the effects of another variable, storage time (D, up to 43 days) was also assessed as an additional factor. The TTD and log P% of both organisms were significantly affected ($P<0.01$) by the values of EO, pH, T and D (just for log P%). The combinations of pH=7.3, and EO[less-than-or-equals, slant]0.015 could not obviously affect the growth kinetics of the organisms in this study. Whereas, strong inhibitory action was observed by increasing of EO concentration to 0.06% at the considered pH (7.3) and T ([less-than-or-equals, slant]35 [degree sign]C). The growth of both organisms was completely inhibited at the combinations of EO=0.06%, pH=6.0 and up to 43 days of storage. Regression equations were derived relating TTDs to EO, pH and T and log P% of both organisms to EO, pH, T and D. From these models the values of predicted TTD and log P% of S. Typhimurium and St. aureus can be calculated by any combinations of EO, pH, T and D (for log P%) within the limits studied. However, between the two TTD and log P% models obtained for both organisms in this study, the TTD models of S. Typhimurium and St. aureus showed better prediction ($R2=0.951$ and 0.978, respectively) than the log P% models of them ($R2=0.852$ and 0.804, respectively).
Keywords: Growth modelling; Zataria multiflora Boiss. essential oil; pH; Temperature; Salmonella Typhimurium; Staphylococcus aureus

F. Sharififar, M.H. Moshafi, S.H. Mansouri, M. Khodashenas, M. Khoshnoodi, In vitro evaluation of antibacterial and antioxidant activities of the essential oil and methanol extract of endemic Zataria multiflora Boiss, Food Control, Volume 18, Issue 7, Breakdowns in Food Safety, July 2007, Pages 800-805, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2006.04.002.
(http://www.sciencedirect.com/science/article/B6T6S-4JTPM7B-1/2/8d745a6ba9a2888477f970b0eab72248)
Abstract:

The present study was conducted to evaluate in vitro antibacterial and antioxidant properties of essential oil and methanol extracts from a unique and endemic plant, Zataria multiflora Boiss. The antibacterial test results showed that the essential oil of the plant strongly inhibited the growth of all of the microorganisms studied especially the Gram-negative strains. The polar fraction of methanol extract has been effective against Gram-positive strains, while the non-polar fraction has shown activity similar to essential oil. The antioxidant potential of the samples was evaluated using two separate methods, inhibition of free radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) and ammonium thiocyanate systems. Sub fractions of the methanol extract were able to reduce the stable free radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) with an IC50 of 11.7 +/- 1.58 and 16.2 +/- 1.61 [mu]g/ml, respectively for non-polar and polar ones, which the activity of the latter almost is equal to synthetic antioxidant BHA (18.2 +/- 1.94 [mu]g/ml). Inhibition values of linoleic oxidation were calculated to be 82.4% and 80.3% for the polar and non-polar fractions, respectively. The essential oil to be showed more inhibition (89.7 +/- 2.5), similar to the synthetic antioxidants BHA (97.8 +/- 2.94) and ascorbic acid (93.2 +/- 2.1). The chemical composition of hydrodistilled essential oils of Z. multiflora was analyzed by GC/MS. A total of 25 compounds representing 99.78% of the oil were identified: thymol (37.59%), carvacrol (33.65%); para-cymene (7.72%), [gamma]-terpinene (3.88%) and [beta]-caryophyllene (2.06%) were the main components comprising 84.9% of the oil. Results here show that the essential oil and methanol extract of Z. multiflora possess antioxidant and antibacterial activity, and therefore it could be used as a natural preservative ingredient in food and/or pharmaceutical industries.
Keywords: Zataria multiflora; Antibacterial activity; Antioxidant activity

Wendy Marcason, Can Cutaneous Application of Vegetable Oil Prevent an Essential Fatty Acid Deficiency?, Journal of the American Dietetic Association, Volume 107, Issue 7, July 2007, Page 1262, ISSN 0002-8223, DOI: 10.1016/j.jada.2007.05.028.
(http://www.sciencedirect.com/science/article/B758G-4P2M748-1D/2/f1f53338a3c4e13cb3fe8cfc2f03aa40)

S.F. Van Vuuren, A.M. Viljoen, T. Ozek, B. Demirci, K.H.C. Baser, Seasonal and geographical variation of Heteropyxis natalensis essential oil and the effect thereof on the antimicrobial activity, South African Journal of Botany, Volume 73, Issue 3, July 2007, Pages 441-448, ISSN 0254-6299, DOI: 10.1016/j.sajb.2007.03.010.
(http://www.sciencedirect.com/science/article/B7XN9-4NP9KP3-1/2/8ff9c5d003620b3eef153d91415562e5)
Abstract:
Heteropyxis natalensis (Heteropyxidaceae) is traditionally used to treat respiratory disorders, and as a decongestant and antimicrobial agent. The seasonal variation of the hydrodistilled essential oil was investigated. Three trees in the Johannesburg Botanical Garden (Gauteng) indicated similar chemical profiles with fluctuation in the levels of the two major constituents (1,8-cineole and limonene). Little variation between the antimicrobial activity of seasonally collected samples was documented, with standard deviations of +/- 0.3 to +/- 3.3 depending on the pathogen studied. Moderate antimicrobial activity (3.0-16.0 mg/ml) was noted for most pathogens tested with Cryptococcus neoformans exhibiting the highest sensitivity (2.0-3.0 mg/ml). The chemogeographical variation of the oil composition from five of the seven distinct localities studied all contains 1,8-cineole and limonene as major constituents. The antimicrobial study of these samples indicated little variability between localities (standard deviation of +/- 0.5 to +/- 3.8). As observed in the seasonal variation study, C. neoformans displayed the highest sensitivity (0.5-2.0 mg/ml). One oil sample (Lagalametse), was distinctly different both chemically and microbiologically.
Keywords: Antimicrobial activity; Essential oil; Heteropyxis natalensis; Limonene; 1,8-Cineole; Geographical variation; Seasonal variation

Vivek K. Bajpai, Atiqur Rahman, Sun Chul Kang, Chemical composition and anti-fungal properties of the essential oil and crude extracts of Metasequoia glyptostroboides Miki ex Hu, Industrial Crops and Products, Volume 26, Issue 1, June 2007, Pages 28-35, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2006.12.012.
(http://www.sciencedirect.com/science/article/B6T77-4N3P55V-2/2/36d4763e5a35df2b56e4812c8c4272c4)
Abstract:
The chemical composition of essential oil isolated from the floral cone of Metasequoia glyptostroboides Miki ex Hu by hydrodistillation was analysed by GC-MS. It was determined that 59 compounds, which represented 97.06% of total oil, were present in the oil. The oil contains mainly [alpha]-pinene (29.54%), caryophyllene oxide (4.49%), [alpha]-thujene (8.63%), bornylene (8.63%), totarol (5.28%), [beta]-caryophyllene (4.40%), [delta]-3-carene (3.19%), 2-[beta]-pinene (2.25%) and [alpha]-humulene (1.18%). Thus, the oil was found mainly contained oxygenated mono- and sesquiterpenes and their respective hydrocarbons. Essential oil and methanol extract of M. glyptostroboides and the derived fractions of hexane, chloroform and ethyl acetate were tested for anti-fungal activity, which was determined by disc diffusion and minimum inhibitory concentration (MIC) determination methods. The oil and the methanol extract and the derived fractions of methanol showed great potential of anti-fungal activity as a mycelial growth inhibition against the tested phytopathogenic fungi such as Fusarium oxysporum, Fusarium solani, Sclerotonia sclerotiorum, Rhizoctonia solani, Colletotricum capsici, Botrytis cinerea, and Phytophthora capsici, in the inhibition range of 49-70% and minimum inhibitory concentration ranging from 500 to 1000 [mu]g/ml.
Keywords: Metasequoia glyptostroboide; Essential oil composition; [alpha]-Pinene; [alpha]-Thujene; [beta]-Caryophyllene; 2-[beta]-Pinene; MIC; Anti-fungal activity

Nikos G. Tzortzakis, Costas D. Economakis, Antifungal activity of lemongrass (Cympopogon citratus L.) essential oil against key postharvest pathogens, Innovative Food Science & Emerging Technologies, Volume 8, Issue 2, June 2007, Pages 253-258, ISSN 1466-8564, DOI: 10.1016/j.ifset.2007.01.002.
(http://www.sciencedirect.com/science/article/B6W6D-4MV0MB5-1/2/5ccb53964dfa31f531b590fc51f24459)
Abstract:
Lemongrass (Cympopogon citratus L.) oil (ranging between 25 and 500 ppm) was tested for antifungal activity against Colletotrichum coccodes, Botrytis cinerea, Cladosporium herbarum, Rhizopus stolonifer and Aspergillus niger in vitro. Oil-enrichment resulted in significant ($P < 0.05$) reduction on subsequent colony development for the examined pathogens. Fungal spore production inhibited up to 70% at 25 ppm of lemongrass oil concentration when compared with equivalent plates stored in ambient air. In the highest oil concentration (500 ppm) employed, fungal sporulation was completely retarded. Lemongrass oil reduced spore germination and germ tube length in C. coccodes, B. cinerea, C. herbarum and R. stolonifer with the effects dependent on oil concentration. However, lemongrass oil (up to 100 ppm) accelerated spore germination for A. niger. Work is currently focussing on the mechanisms underlying the impacts of essential oil volatiles on disease development with a major contribution to limiting the spread of the pathogen by lowering the spore load in the storage/transit atmospheres as well as the use of essential oil as an alternative food preservative.Industrial relevance
The present study suggests that the use of pure lemongrass essential oil is an innovative and useful tool as alternative to the use of synthetic fungicides or other sanitation techniques in storage/packaging. Oil enrichment may reduce disease development with a major contribution to limiting the spread of the pathogen by lowering the spore load (spore production) in the storage/transit atmospheres as well as the use of essential oil as an alternative food preservative.

The effectiveness (oil concentration) of the oil depends on the target pathogen. The effects of natural compounds on individual microorganisms (fungi and bacteria), both responsible for spoilage and food-borne pathogens, as well as the minimum concentration to gain effectiveness without affecting fresh produce quality and storage deserve further research.
Keywords: Antifungal activity; Essential oils; Fungal growth; Lemongrass

Chang-Geun Yi, Min Kwon, Tran Trung Hieu, Young-Su Jang, Young-Joon Ahn, Fumigant Toxicity of Plant Essential Oils to Plutella xylostella (Lepidoptera: Yponomeutidae) and Cotesia glomerata (Hymenoptera: Braconidae), Journal of Asia-Pacific Entomology, Volume 10, Issue 2, June 2007, Pages 157-163, ISSN 1226-8615, DOI: 10.1016/S1226-8615(08)60347-7.
(http://www.sciencedirect.com/science/article/B8JJN-4V6TFF2-C/2/887f7f0eccd4ac6adfccca26f8e0fbb7)
Abstract:
The fumigant toxicity of 66 plant essential oils to Plutella xylostella (L.) larvae and Cotesia glomerata (L.) adults was examined using a vapor-phase toxicity bioassay and compared with that of dichlorvos. Responses varied according to oil and insect species used. Based on 24 h LD50 values, pennyroyal oil [10.77 mg/filter paper (4.25 cm diameter)] was the most toxic fumigant, followed by rosemary and sage (Dalmatin) oils (15.15 mg/paper). Potent fumigant toxicity was also produced from armoise, buchu leaf, cedarleaf, coriander, eucalyptus, howood, lavender, myrtle, niaouli, peppermint, and rosewood oils (LD50, 21.29-27.31 mg/paper). All essential oils were less effective than dichlorvos (LD50, 0.52 mg/paper). Against adult C. glomerata, dichlorvos (LD50, 0.03 mg/paper) was the most toxic fumigant, whereas the LD50 values of the 14 essential oils ranged from 1.59 to 8.51 mg/paper. Based on selective toxicity ratio (STR, P. xylostella LD50/C. glomerata LD50), the 14 essential oils (STR, 2.5-14.5) are more selective than dichlorvos (STR, 17.3). The essential oils tested merit further study as potential fumigants for the control of P. xylostella in greenhouses because of their selective toxicity to adult C. glomerata and their much greater activity as a fumigant.
Keywords: Botanical insecticide; Natural fumigant; Essential oil; Plutella xylostella; Cotesia glomerata

Kai Liu, Paul-Georges Rossi, Bernard Ferrari, Liliane Berti, Joseph Casanova, Felix Tomi, Composition, irregular terpenoids, chemical variability and antibacterial activity of the essential oil from Santolina corsica Jordan et Fourr, Phytochemistry, Volume 68, Issue 12, June 2007, Pages 1698-1705, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2007.04.027.
(http://www.sciencedirect.com/science/article/B6TH7-4NWN39T-5/2/de91bda6bbbd6779f075f8936ac89db2)
Abstract:
A detailed analysis of Santolina corsica essential oil was carried out by combination of GC (RI), GC-MS and 13C NMR spectroscopy. After fractionation by column chromatography, 50 components were identified, accounting for 88.2% of the total amount of the oil. The chemical composition was dominated by monoterpene hydrocarbons, myrcene (34.6%), santolina triene (13.5%) and [beta]-phellandrene (11.7%). Beside the main compounds, we noted the occurrence of irregular mono and sesquiterpenes belonging to five families: santolinane, artemisane, chrysanthemane, lavandulane and sesquilavandulane. Three compounds, lyratyl butyrate, isolyratone and epi-isolyratol were isolated and their structure elucidated by 2D NMR. Antibacterial activity was tested against six bacteria strains. The essential oil was effective against Staphylococcus aureus and C. jejuni. Lyratol was identified as main responsive of the antibacterial activity. The content of lyratol was measured in 33 oil samples isolated from individual plants.
Keywords: Santolina corsica; Essential oil composition; Irregular monoterpenes; Santolina triene; Lyratol; Lyratyl butyrate; epi-Isolyratol; Isolyratone; Antibacterial activity

E.L. Souza, T.L.M. Stamford, E.O. Lima, V.N. Trajano, Effectiveness of Origanum vulgare L. essential oil to inhibit the growth of food spoiling yeasts, Food Control, Volume 18, Issue 5, May 2007, Pages 409-413, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2005.11.008.
(http://www.sciencedirect.com/science/article/B6T6S-4J9X2T4-1/2/ad25f3c5f33cc4a6ad14446e17b5316e)
Abstract:
Origanum vulgare L. has been known as having many therapeutic properties and its antimicrobial activity has currently received a renewed interest. This study aimed to verify the effectiveness of O. vulgare L. essential oil to inhibit the growth/survival of various food spoiling yeasts. Anti-yeast activity was studied by determining the MIC by solid medium diffusion and microplate bioassay, as well as observing the effect of the essential oil MIC on the yeast cell viability. O. vulgare essential oil showed effectiveness to inhibit the growth of all assayed yeasts with MIC values for the most ones of 20 and 0.6 [mu]L/mL when determined, respectively, by solid medium diffusion and microplate bioassay. Solid medium diffusion MIC presented statistically significant inhibitory effects ($P < 0.05$) on yeast cell viability, mainly when interacting with Candida albicans and Candida krusei. On the other hand, the microplate MIC just provided statistically significant inhibitory effects on the cell viability when interacting with C. krusei. These data show the anti-yeast property of O. vulgare essential oil.
Keywords: Origanum vulgare L.; Essential oil; Yeasts; Foods

Mounia Oussalah, Stephane Caillet, Linda Saucier, Monique Lacroix, Inhibitory effects of selected plant essential oils on the growth of four pathogenic bacteria: E. coli O157:H7, Salmonella Typhimurium, Staphylococcus aureus and Listeria monocytogenes, Food Control, Volume 18, Issue 5, May 2007, Pages 414-420, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2005.11.009.
(http://www.sciencedirect.com/science/article/B6T6S-4J4B963-4/2/985d381f3e8c22a882b14e12be82deb3)
Abstract:
Twenty eight essential oils were evaluated for their antibacterial properties, against four pathogenic bacteria (Escherichia coli O157:H7, Listeria monocytogenes 2812 1/2a, Salmonella Typhimurium SL 1344 and Staphylococcus aureus). Essential oils were introduced into Brain Heart Infusion agar (BHI) (15 ml) at a concentration of 0.003%, 0.006%, 0.013%, 0.025%, 0.05%, 0.1%, 0.2%, 0.4% and 0.8% (vol/vol) to determine the minimum inhibitory concentration (MIC) and the maximal tolerated concentration (MTC) for each pathogen evaluated. Results showed that the most active essential oils against bacteria tested were Corydothymus capitatus, Cinnamomum cassia, Origanum heracleoticum, Satureja montana, and Cinnamomum verum (bark). These showed a MIC [less-than-or-equals, slant] 0.05% (vol/vol) for all bacteria tested. For the MTC, with the exception of S. Typhimurium and L. monocytogenes where a MTC of 0.025% (vol/vol) was observed in presence of Cinnamomum verum and Cinnamomum cassia, respectively, a MTC [less-than-or-equals, slant] 0.013% (vol/vol) was observed for all other bacteria and the three other most active essential oils. Three oils (Satureja hortensis, Thymus vulgaris carvacroliferum, Origanum compactum) showed a MIC [less-than-or-equals, slant] 0.1% (vol/vol) for all bacteria tested. Seven oils (Thymus vulgaris thymoliferum, Thymus serpyllum, Thymus satureioides, Cymbopogon martinii, Pimenta dioica, Cinnamomum verum (leaf), Eugenia caryophyllus) showed a lower antimicrobial activity showing a MIC [less-than-or-equals, slant] 0.4% (vol/vol) against the four bacteria tested. Finally, 13 essential oils were less active showing a MIC value [greater-or-equal, slanted] 0.8% (vol/vol) against at least one bacterium.
Keywords: Essential oils; Foodborne pathogens; Minimum inhibitory concentration

O.O. Atanda, I. Akpan, F. Oluwafemi, The potential of some spice essential oils in the control of A. parasiticus CFR 223 and aflatoxin production, Food Control, Volume 18, Issue 5, May 2007, Pages 601-607, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2006.02.007.

(http://www.sciencedirect.com/science/article/B6T6S-4KGX855-1/2/9b50df7179bcb5ac5d9e79c4ad31b307)
Abstract:
Essential oils of sweet basil (Ocimum basilicum), cassia (Cinnamomum cassia), coriander (Coriandrum sativum) and bay leaf (Laurus nobilis) at 1-5% (v/v) concentration in palm kernel broth inoculated with spore suspension (106/ml) of Aspergillus parasiticus CFR 223 were evaluated for their potential in the control of aflatoxigenic fungus A. parasiticus CFR 223 and aflatoxin production. Healthy sorghum grains (120/treatment) immersed in the oils and distributed in three petri dishes with wet cotton wool were also inoculated with spore suspension (106/ml) of A. parasiticus CFR 223 and assayed for grain protection. Sweet basil oil at optimal protective dosage of 5% (v/v) was fungistatic on A. parasiticus CFR 223 and aflatoxins produced in vitro and on fungal development on sorghum grains (P [less-than-or-equals, slant] 0.05) with a residual effect that lasted for 32 days. In contrast, oils of cassia and bay leaf stimulated the mycelia growth of the fungus in vitro but reduced the aflatoxin concentration (B1 + G1) of the fungus by 97.92% and 55.21% respectively, while coriander oil did not have any effect on both the mycelia growth and aflatoxin content of the fungus. The combination of cassia and sweet basil oils at half their optimal protective dosages (2.5% v/v) completely inhibited the growth of the fungus. The feasibility of implementing the results of this study to control aflatoxins was examined by the addition of whole and ground dry basil leaves at 5% and 10% (w/w), respectively, to 10 g sorghum, groundnut, maize and melon seed after 35 days storage period. It was found that the addition of whole and ground basil leaves markedly reduced aflatoxin contamination; however, 10% (w/w) of whole leaves was more effective as the reduction in aflatoxin was between 89.05% and 91%.
The findings showed that aflatoxins can be controlled by co-storing whole sweet basil leaves with aflatoxin infected foods. The economic value of the study lies in the simplified technique for control of aflatoxin contamination in agricultural products and the benefits derivable from the use of local resources.
Keywords: Aflatoxigenic fungus; Essential oils; Protection assay and sorghum grains

Mohammad H. Eikani, Fereshteh Golmohammad, Soosan Rowshanzamir, Subcritical water extraction of essential oils from coriander seeds (Coriandrum sativum L.), Journal of Food Engineering, Volume 80, Issue 2, May 2007, Pages 735-740, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2006.05.015.
(http://www.sciencedirect.com/science/article/B6T8J-4MD45XY-1/2/6c7b00e3141237f791e15aa0ee76933e)
Abstract:
Subcritical water extraction (SCWE), hydrodistillation and Soxhlet extraction were compared for the extraction of essential oil from coriander seeds (Coriandrum sativum L.). The extraction efficiencies of different temperatures (100, 125, 150 and 175 [degree sign]C), mean particle sizes (0.25, 0.50 and 1 mm), and water flow rates (1, 2 and 4 ml/min) were investigated. Separation and identification of the components were carried out by GC-FID and GC-MS. The results showed that the optimum temperature, mean particle size, and flow rate were 125 [degree sign]C, 0.5 mm, and 2 ml/min. The SCWE was compared with both conventional methods in terms of the efficiency and the essential oil composition. Hydrodistillation and Soxhlet extraction showed higher extraction efficiencies, but the SCWE resulted to the essential oils more concentrated in valuable oxygenated components.
Keywords: Subcritical water extraction; Coriandrum sativum L.; Coriander seeds; Essential oil

I.S. Jang, Y.H. Ko, S.Y. Kang, C.Y. Lee, Effect of a commercial essential oil on growth performance, digestive enzyme activity and intestinal microflora population in broiler chickens, Animal Feed Science and Technology, Volume 134, Issues 3-4, 2 April 2007, Pages 304-315, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2006.06.009.

(http://www.sciencedirect.com/science/article/B6T42-4KGPPDB-2/2/ecdaa62ddb8cce24d78d59ee70418015)
Abstract:
The present study was designed to evaluate whether a blend of essential oils (EO) extracted from herbs could affect growth performance, digestive enzymes and antimicrobial activity of the gut in growing broiler chickens. A total of one hundred and twenty, 3-day-old male broiler chickens were assigned to the basal diet (CON) and the basal diet supplemented with 10 mg antibiotics/kg diet (ANTI), 25 mg EO/kg diet (EO I) and 50 mg EO/kg diet (EO II) until 35 days of age. Throughout the entire feeding period (3-35 days), there were no differences in body weight, feed intake, total gain and feed:gain ratio among the birds fed the basal diet and the diet supplemented with antibiotics, either low (EO I) or high level of EO (EO II). Weights of digestive organs including the liver, pancreas, intestine and mucosal tissues were not affected by the dietary treatments. Total and specific activities of pancreatic trypsin significantly ($P<0.05$) increased in birds fed EO II diet compared with those fed CON and ANTI diets. It was also observed that the total activities of pancreatic [alpha]-amylase and intestinal maltase significantly ($P<0.05$) elevated in birds fed EO II diet compared with those fed CON diet. The colony forming units (CFU) of Escherichia coli in the digesta of ileo-cecum in the ANTI group showed a significantly lower number compared with that in the CON group. However, there was no difference in the CFU of E. coli between the ANTI and EO groups. The CFU of lactobacilli was unaffected by dietary supplementation of either EO or antibiotics. In summary, dietary addition of EO showed a decreased E. coli population in ileo-cecal digesta. Furthermore, a high dose of EO resulted in a significant increase in certain digestive enzyme activities of the pancreas and intestine in growing broiler chickens.
Keywords: Essential oils; Antibiotics; Trypsin; [alpha]-Amylase; Maltase; E. coli; Lactobacilli; Broiler chickens

Matias Garcia, Azucena Gonzalez-Coloma, Osvaldo J. Donadel, Carlos E. Ardanaz, Carlos E. Tonn, Marta E. Sosa, Insecticidal effects of Flourensia oolepis Blake (Asteraceae) essential oil, Biochemical Systematics and Ecology, Volume 35, Issue 4, April 2007, Pages 181-187, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.10.009.
(http://www.sciencedirect.com/science/article/B6T4R-4MGVJDJ-1/2/9218887e3f202abbe82687ae24eaab1a)
Abstract:
Flourensia oolepis Blake (Asteraceae) essential oil had a complex chemical composition with [tau]-muurolene (6.14%), santolinetriene (6.22%), 2-methylene-4,8,8-trimethyl-4-vinyl-bicyclo[5.2.0]nonane (10.15%), [delta]-cadinene (10.27%) and [gamma]-gurjunene (20.69%) comprising more than 50% of the oil. This oil had repellent and toxic effects on Tribolium castaneum Herbst (Coleoptera: Tenebrionidae) adults, acting as a contact toxin. Myzus persicae (Sulzer) (Homoptera: Aphididae) and Leptinotarsa decemlineata Say (Coleoptera: Chrysomelidae) adults showed behavioral sensibility to this oil.
Keywords: Flourensia oolepis; Essential oil; Tribolium castaneum; Toxicity; Repellency; Myzus persicae

Niko Radulovic, Jelena Lazarevic, Novica Ristic, Radosav Palic, Chemotaxonomic significance of the volatiles in the genus Stachys (Lamiaceae): Essential oil composition of four Balkan Stachys species, Biochemical Systematics and Ecology, Volume 35, Issue 4, April 2007, Pages 196-208, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.10.010.
(http://www.sciencedirect.com/science/article/B6T4R-4MGVJDJ-2/2/b7aa23aeeae8f948527cb0ce6da46bbf)
Abstract:
Gas chromatography (GC) and GC/MS analysis of the essential oil composition of Stachys germanica ssp. heldreichii (Boiss) Hayek, Stachys iva Griseb., Stachys plumosa Griseb. and

Stachys scardica Griseb., Balkan Peninsula endemics, has been carried out. Eighty-three compounds, which accounted for 96.3-99.6% of the total composition of the oils, have been identified. This is the first report on the composition of S. iva volatiles and on the occurrence in the family Lamiaceae of (Z)-nuciferyl isobutyrate (and other nuciferyl esters, higher that acetates), which was found as one of the major components of oils from S. germanica ssp. heldreichii and S. iva. The chemotaxonomic relationships within the genus Stachys and with those of related Lamioideae have been discussed in detail. Nuciferyl esters and volatile diterpenoids were used as marker compounds. The high degree of variation in the main constituents, especially of germacrene D and its congeners, was correlated with possible rearrangements under hydro-distillation conditions. Thus, due to the possible artefactual origin of these compounds they seem to be unreliable as chemotaxonomic markers.
Keywords: Stachys; Lamiaceae; Essential oil composition; Nuciferyl esters; Diterpenes; Germacrene D rearrangement

Marcelo Telascrea, Carla C. de Araujo, Marcia O.M. Marques, Roselaine Facanali, Pedro L.R. de Moraes, Alberto J. Cavalheiro, Essential oil from leaves of Cryptocarya mandioccana Meisner (Lauraceae): Composition and intraspecific chemical variability, Biochemical Systematics and Ecology, Volume 35, Issue 4, April 2007, Pages 222-232, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.09.015.
(http://www.sciencedirect.com/science/article/B6T4R-4MJBTVW-1/2/9e6b6df844ea4c65b88ce41076c28ea8)
Abstract:
The composition of the essential oil from leaves of Cryptocarya mandioccana has been determined by chromatographic fractionation and GC-FID, GC-MS and 13C NMR analyses, yielding the identification of 64 compounds with predominance of isomeric sesquiterpenes with molecular weights of 204. The main components of the oil obtained by hydrodistillation were [beta]-caryophyllene, spathulenol, caryophyllene oxide, [delta]-cadinene, germacrene D, benzaldehyde and bicyclogermacrene. However, the oil obtained by steam distillation contained higher levels of sesquiterpene hydrocarbons, with predominance of [beta]-caryophyllene (C), germacrene D (G) and bicyclogermacrene (B), and was considered to be more representative of the composition of the oil in its natural state. The intraspecific chemical variability of the essential oil obtained by steam distillation was evaluated within populations of trees growing at three separate locations in the state of Sao Paulo, Brazil. Three distinct chemical groups could be characterised due to differences in the relative percentages of the three main sesquiterpenes from essential oil: CGB [relative contents of C (14-34%), G (5-28%), B (8-15%)], BCG [B (17-34%), C (9-24%), G (12-25%)] and GCB [G (22-42%), C (4-17%), B (7-15%)]. Individuals from groups CGB and BCG were found to be more frequent at south locations while group GCB is predominant in north location.
Keywords: Cryptocarya mandioccana; Lauraceae; Essential oil; Monoterpenes; Sesquiterpenes; Retention index; Intraspecific variability

Abdelnaser A. Elzaawely, Tran D. Xuan, Shinkichi Tawata, Changes in essential oil, kava pyrones and total phenolics of Alpinia zerumbet (Pers.) B.L. Burtt. & R.M. Sm. leaves exposed to copper sulphate, Environmental and Experimental Botany, Volume 59, Issue 3, April 2007, Pages 347-353, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2006.04.007.
(http://www.sciencedirect.com/science/article/B6T66-4K5JBSD-1/2/12861fd57c30615a77af6186d8d51160)
Abstract:
Essential oils, total phenolics, dihydro-5,6-dehydrokawain (DDK) and antioxidant and antibacterial activities were investigated in Alpinia zerumbet (Pers.) B.L. Burtt. & R.M. Sm. plants, that had been sprayed with copper sulphate 24 h beforehand. Ethyl acetate extract of copper-treated plants

contained increased levels of total phenolics, had higher antioxidant activity assayed by DPPH and [beta]-carotene bleaching methods and exhibited higher antibacterial activity against Bacillus cereus than that of non-treated plants. Contents of DDK, vanillin and cinnamic acid were significantly higher in chloroform and ethyl acetate extracts of A. zerumbet plants following exposure to copper. Volatile components that increased after copper treatment include: 1,8-cineol, camphor, borneol, and terpinene-4-ol. Foliar application of copper sulphate may regulate the antioxidant compounds in A. zerumbet plants, influencing its antioxidant and antibacterial activities.
Keywords: Alpinia zerumbet; Copper; Total phenolics; Dihydro-5,6-dehydrokawain; Antioxidant activity; Antibacterial activity

Gulcan Ozkan, Bedia Simsek, Hakan Kuleasan, Antioxidant activities of Satureja cilicica essential oil in butter and in vitro, Journal of Food Engineering, Volume 79, Issue 4, April 2007, Pages 1391-1396, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2006.04.020.
(http://www.sciencedirect.com/science/article/B6T8J-4JW7FG7-D/2/9380df351e33ca9955b0bb5dd598464c)
Abstract:
Satureja (Labiatae) species are a well-known aromatic plant which is used to produce essential oil and aromatic water in the mountain regions of the Mediterranean part of Turkey. In our study, it was aimed to determine antioxidant activities of Satureja cilicica essential oil in butter and in vitro. Antioxidant activities of the oils at different concentrations were evaluated using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging and phosphomolybdenum methods. Also the essential oil with 0.5%, 1.0% and 2.0% were added in butter as antioxidants and were assayed during 60 days storage of butter at +4 and +20 [degree sign]C. For this reason, it was analyzed peroxide value, pH, titratable acidity and total lactic acid bacteria as a criterion to assess the antioxidant activity of essential oil at 20th, 40th and 60th days of storage. Antiradical activity was found as IC50 = 32.02 +/- 0.58 [mu]g/ml and in vitro antioxidant capacity was 101.16 +/- 3.32 [mu]g/ml by phosphomolybdenum methods. On the other hand, the essential oil of S. cilicica exhibited a strong antioxidant activity in butter. Antioxidant activities of oils were higher when the essential oil concentration was increased. In addition to that peroxide value pH, titratable acidity and number of viable lactic acid bacteria were compared to the control. In addition, titratable acidity and total number of lactic acid bacteria of samples stored at +20 [degree sign]C were determined higher than the other storage temperature during the storage time. According to our results, essential oil of S. cilicica could be used as both natural antioxidant and aroma agent in butter.
Keywords: Satureja cilicica; Essential oil; Butter; Starter culture

Marie E. Lucchesi, Jacqueline Smadja, Steven Bradshaw, Willem Louw, Farid Chemat, Solvent free microwave extraction of Elletaria cardamomum L.: A multivariate study of a new technique for the extraction of essential oil, Journal of Food Engineering, Volume 79, Issue 3, April 2007, Pages 1079-1086, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2006.03.029.
(http://www.sciencedirect.com/science/article/B6T8J-4JRVR40-2/2/23724d61e345a15499e771409f991dc3)
Abstract:
The solvent-free microwave extraction (SFME) of cardamom essential oil (Elletaria cardamomum L.) was studied. A multivariate study based on a central composite design (CCD) was used to evaluate the influence of three major variables affecting the performance of the solvent-free microwave extraction of cardamom seed. The yield and the composition of the essential oils from the dry cardamom seeds obtained by SFME were determined, and compared with those obtained by the traditional hydro-distillation (HD). Statistical treatment of the results provided by the CCD revealed that the selected parameters: extraction time, irradiation power and moisture content of the seeds were significant. The essential oils were analysed by gas chromatography-mass

spectrometry (GC-MS). Essential oils provided by SFME are dominated by the oxygenated fraction which is the more valuable and composed of highly odoriferous aromatic compounds. Cardamom seeds treated by SFME and HD were observed by scanning electronic microscopy (SEM). Micrographs provide more evidence of the destruction of cardamom seeds treated by SFME, in contrast to conventional hydro-distillation.
Keywords: Microwave; Extraction; Cardamom; Essential oil; Multivariate study

S.F. Van Vuuren, S. Suliman, S. Dhorat, A.M. Viljoen, The pharmacological interaction of commercial essential oils in combination with conventional antimicrobials, South African Journal of Botany, Volume 73, Issue 2, April 2007, Pages 339-340, ISSN 0254-6299, DOI: 10.1016/j.sajb.2007.02.202.
(http://www.sciencedirect.com/science/article/B7XN9-4NBRG1G-6S/2/7c896fbc7a0b9aa8b1c621aea5fe1b2d)

Vasiliki Saroglou, Petar D. Marin, Ana Rancic, Milan Veljic, Helen Skaltsa, Composition and antimicrobial activity of the essential oil of six Hypericum species from Serbia, Biochemical Systematics and Ecology, Volume 35, Issue 3, March 2007, Pages 146-152, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.09.009.
(http://www.sciencedirect.com/science/article/B6T4R-4M9H8WN-1/2/ea65c6e65504bf21bbf7fdf44fc79b45)
Abstract:
The volatile composition of six Hypericum species has been studied. The essential oils were obtained by steam distillation in 500 mL H2O for 2 h in a modified Clevenger apparatus with a water-cooled oil receiver to reduce hydrodistillation over-heating artifacts, and their analyses were performed by GC and GC-MS. Identification of the substances was made by comparison of mass spectra and retention indices with literature records. A total of 100 different compounds were identified. The main constituents of the investigated populations of each taxon have been revealed as follows: Hypericum alpinum: (-)-[beta]-pinene, [gamma]-terpinene, (-)-(E)-caryophyllene; Hypericum barbatum: (-)-[alpha]-pinene, (-)-[beta]-pinene, (-)-limonene, (-)-(E)-caryophyllene, (-)-caryophyllene oxide; Hypericum rumeliacum: (-)-[alpha]-pinene, (-)-[beta]-pinene, (-)-limonene, Hypericum hirsutum: nonane, undecane, (-)-(E)-caryophyllene, (-)-caryophyllene oxide; Hypericum maculatum: spathulenol, globulol; Hypericum perforatum: (-)-[alpha]-pinene, (Z)-[beta]-farnesene, germacrene D; Monoterpene hydrocarbons were shown to be the main group of the taxa belonging to the section Drosocarpium, while the taxa of section Hypericum were more rich in sesquiterpene hydrocarbons.
Keywords: Hypericum; Hypericaceae; Volatile constituents; Monoterpene hydrocarbons; Sesquiterpene hydrocarbons; Antimicrobial activity

A. Arabhosseini, W. Huisman, A. van Boxtel, J. Muller, Long-term effects of drying conditions on the essential oil and color of tarragon leaves during storage, Journal of Food Engineering, Volume 79, Issue 2, March 2007, Pages 561-566, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2006.02.014.
(http://www.sciencedirect.com/science/article/B6T8J-4JKYTB7-2/2/6224405bf9c137bb91656203ba91721a)
Abstract:
The effect of storage on the essential oil content and color of French Tarragon (Artemisia dracunculus L.) leaves is studied. Tarragon leaves were dried at temperatures 45, 60 and 90 [degree sign]C with, respectively, the relative humidity levels 17%, 7% and 2.5%. At 60 [degree sign]C also a relative humidity level of 18% was applied. The air velocity was constant at 0.6 m/s. Oil content and color were measured for the fresh and dried leaves just after drying as well as after storage during 15, 30, 60 and 120 days. The essential oil compounds of the material were isolated by the hydro-distillation method and analyzed by GC-FID as well as GC-MS. A Chroma meter was

used to measure the color of the samples. The results showed a reduction of the oil content and changed color parameters during the storage period. The largest changes of the essential oil content (about 50% after 30 days) and color expressed by the hue value was found for the material dried at 90 [degree sign]C. Drying at 45 [degree sign]C resulted in the smallest quality changes.
Keywords: Artemisia dracunculus; Color; Drying; Essential oil content; Storage; Tarragon

Erika Banchio, Graciela Valladares, Julio Zygadlo, Pablo C. Bogino, Luciana V. Rinaudi, Walter Giordano, Changes in composition of essential oils and volatile emissions of Minthostachys mollis, induced by leaf punctures of Liriomyza huidobrensis, Biochemical Systematics and Ecology, Volume 35, Issue 2, February 2007, Pages 68-74, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.08.007.
(http://www.sciencedirect.com/science/article/B6T4R-4M340GM-1/2/2694e0e93e32bd1f16ce1961078cc658)
Abstract:
Plant defensive mechanisms against herbivores include chemical changes following damage. Effects of feeding punctures produced by Liriomyza huidobrensis (pea leafminers) adult females on the plant's dominant monoterpenes, pulegone and menthone were assessed by monitoring essential oil composition at 24, 48, and 120 h; emission of volatiles was also measured 24 and 48 h after wounding. We studied such changes in Minthostachys mollis, a Lamiaceae species native to Central Argentina with medicinal and aromatic uses. Leaf puncturing resulted in reduced menthone throughout the experiment and increased pulegone concentration in M. mollis essential oil during the first 48 h. The adjacent undamaged leaves showed similar changes, suggesting a systemic response. Composition of volatiles released from damaged leaves was also altered, most noticeably by increasing pulegone and diminishing menthone emissions. Such herbivore-induced chemical changes in aromatic plants are economically relevant, since the quality of essential oils and volatile emissions are altered.
Keywords: Phytochemical induction; Aromatic plants; Monoterpenes; Pulegone; Menthone; Minthostachys mollis; Liriomyza huidobrensis

Andrija Smelcerovic, Michael Spiteller, Axel Patrick Ligon, Zaklina Smelcerovic, Nils Raabe, Essential oil composition of Hypericum L. species from Southeastern Serbia and their chemotaxonomy, Biochemical Systematics and Ecology, Volume 35, Issue 2, February 2007, Pages 99-113, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.09.012.
(http://www.sciencedirect.com/science/article/B6T4R-4MBCJRJ-2/2/13e411dad5889e79f05bf17cbab063e2)
Abstract:
The essential oils of the aerial parts of nine species of Hypericum (Hypericum barbatum, Hypericum hirsutum, Hypericum linarioides, Hypericum maculatum, Hypericum olympicum, Hypericum perforatum, Hypericum richeri, Hypericum rumeliacum and Hypericum tetrapterum), collected from different locations in Southeast Serbia, were obtained by steam distillation and analyzed by GC and GC-MS. The essential oils investigated were characterized by a high content of non-terpene compounds and a low content of monoterpenes. The contents of non-terpenes, monoterpenes and sesquiterpenes in oils of the species H. barbatum, H. richeri and H. rumeliacum (section Drosocaprium) were similar and these oils were characterized by high contents of fatty acids. The oils of H. hirsutum and H. linarioides (section Taeniocarpium) contained a high percentage of n-nonane. There were similarities in contents of non-terpenes and sesquiterpenes in oils of species that belong to the section Hypericum (H. maculatum, H. perforatum and H. tetrapterum). The oil of H. olympicum differed from others by higher terpene content. A comparison was also carried out of the chemical composition of the essential oils from flower, leaf and stem of H. perforatum and it revealed that the highest concentration of non-

terpene compounds was found in the flower and stem oil, while a high concentration of sesquiterpenes was characteristic for leaf oil. There were significant differences in the concentrations of the same compounds in the essential oils of H. maculatum, H. olympicum and H. perforatum, collected in different years from the same location which could be explained by seasonal differences. All data were statistically processed with principal component analysis and cluster analysis. The main conclusion from the above data is that genetic and environmental factors both play a role in determining the composition of essential oils of the Hypericum species studied.
Keywords: Hypericum barbatum; Hypericum hirsutum; Hypericum linarioides; Hypericum maculatum; Hypericum olympicum; Hypericum perforatum; Hypericum richeri; Hypericum rumeliacum; Hypericum tetrapterum; Essential oil composition

J. A.M. Janz, P.C.H. Morel, B.H.P. Wilkinson, R.W. Purchas, Preliminary investigation of the effects of low-level dietary inclusion of fragrant essential oils and oleoresins on pig performance and pork quality, Meat Science, Volume 75, Issue 2, February 2007, Pages 350-355, ISSN 0309-1740, DOI: 10.1016/j.meatsci.2006.06.027.
(http://www.sciencedirect.com/science/article/B6T9G-4KPNB57-3/2/a29be901f2c36b75e66fffffbf08d84d)
Abstract:
Since the tissue characteristics of monogastric species are readily influenced by the composition of the feeds they consume, the objectives of this preliminary study were to assess the performance of finisher pigs on diets containing 0.05% of essential oils or oleoresins of rosemary, garlic, oregano, or ginger, and to determine the effect of these diets on pork quality. The pigs preferred the garlic-treated diet, and feed intake and average daily gain were significantly increased although no difference in feed efficiency was observed. Carcass and meat quality attributes were unchanged by dietary treatment, although a tendency towards reduction of lipid oxidation was noted in oregano-fed pork. Sensory panelists were unable to detect a flavour/aroma difference between treated and control pork. These results indicate that a higher level of dietary supplementation may be required in order to effect observable differences in pork characteristics.
Keywords: Pigs; Essential oils; Oleoresins; Rosemary; Oregano; Garlic; Ginger; Pork quality; Sensory evaluation

L. Castillejos, S. Calsamiglia, A. Ferret, R. Losa, Effects of dose and adaptation time of a specific blend of essential oil compounds on rumen fermentation, Animal Feed Science and Technology, Volume 132, Issues 3-4, 15 January 2007, Pages 186-201, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2006.03.023.
(http://www.sciencedirect.com/science/article/B6T42-4PNJ1MF-3/2/c52d489d84d6c1f69155e5a06686fd74)
Abstract:
Essential oils can be used as natural additives in animal feeds. The present study evaluated the effects of three different doses and different adaptation times of a specific blend of essential oils (BEO) on rumen microbial fermentation. Eight dual flow continuous culture fermenters (1320 ml) were used in two periods of 9 days each to study the effects of increasing doses of BEO. Treatments were: CTR (no BEO), D5 (5 mg/l of BEO), D50 (50 mg/l of BEO) and D500 (500 mg/l of BEO). During the last 3 days, samples were taken at 0, 2, 4 and 6 h after the morning feeding and analyzed for large peptide (LPep), small peptides plus amino acid (SPep + AA) and ammonia N concentrations, and at 2 h after feeding for volatile fatty acids (VFA) concentration and profile. The D5 increased total VFA concentration, acetate proportion and acetate to propionate ratio, and decreased propionate and valerate proportion, compared with CTR. The concentration of LPep N tended (P=0.08) to be lower for D5 compared with CTR. In the second experiment, eight sheep were used to study the effects of long-term adaptation of rumen fluid to BEO on ruminal

fermentation. Four sheep were assigned at random to the CTR treatment (no BEO) and four sheep were adapted to BEO (110 mg/day of BEO) for 4 weeks (ADBEO). After 4 weeks samples of ruminal fluid were obtained at 0 and 3 h after the morning feeding and in 2 consecutive days using an oro-ruminal probe. Samples were analyzed for LPep, SPep + AA and ammonia N concentrations, total and individual VFA, and pH. Treatment ADBEO tended ($P<0.10$) to increase acetate proportion and decrease valerate proportion, compared with CTR. Ruminal fluid collected from each of CTR and ADBEO sheep was used to study in vitro fermentation profile of soybean meal, corn meal, alfalfa hay and ryegrass hay. Treatments were: Control fluid (CTR without BEO), CTR fluid plus a single dose of BEO (11 mg/l; CTR + BEO) and ADBEO fluid plus a single dose of BEO (11 mg/l; ADBEO + BEO). Acetate proportion and acetate to propionate ratio was higher, and propionate and isovalerate proportion, and BCVFA and ammonia N concentration were lower in ADBEO + BEO fluid compared with CTR fluid. The addition of essential oils can shift the microbial fermentation in the rumen by increasing the acetate to propionate ratio and inhibiting deamination.
Keywords: Essential oil; Rumen fermentation; N metabolism

Sen-Sung Cheng, Hui-Ting Chang, Chi-Lin Wu, Shang-Tzen Chang, Anti-termitic activities of essential oils from coniferous trees against Coptotermes formosanus, Bioresource Technology, Volume 98, Issue 2, January 2007, Pages 456-459, ISSN 0960-8524, DOI: 10.1016/j.biortech.2006.01.006.
(http://www.sciencedirect.com/science/article/B6V24-4J9X2SK-3/2/4b8581d6180dda45aa678811daf10383)
Abstract:
In this study, the anti-termitic activities of 11 essential oils from three species of coniferous tree against Coptotermes formosanus Shiraki were investigated using direct contact application. Results demonstrated that at the dosage of 10 mg/g, the heartwood and sapwood essential oils of Calocedrus macrolepis var. formosana and Cryptomeria japonica and the leaf essential oil of Chamaecyparis obtusa var. formosana had 100% mortality after 5 d of test. Among the tested essential oils, the heartwood essential oil of C. macrolepis var. formosana killed all termites after 1 d of test, with an LC50 value of 2.6 mg/g, exhibiting the strongest termiticidal property. The termiticidal effect of heartwood essential oil was due to its toxicity and its repellent action.
Keywords: Calocedrus macrolepis var. formosana; Cryptomeria japonica; Chamaecyparis obtusa var. formosana; Heartwood; Essential oil; Coptotermes formosanus; Anti-termitic activity

Ping-Hsien Chuang, Chi-Wei Lee, Jia-Ying Chou, M. Murugan, Bor-Jinn Shieh, Hueih-Min Chen, Anti-fungal activity of crude extracts and essential oil of Moringa oleifera Lam, Bioresource Technology, Volume 98, Issue 1, January 2007, Pages 232-236, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.11.003.
(http://www.sciencedirect.com/science/article/B6V24-4J021KF-1/2/a7cb94a667b36dc39a1158a74a02b65d)
Abstract:
Investigations were carried out to evaluate the therapeutic properties of the seeds and leaves of Moringa oleifera Lam as herbal medicines. Ethanol extracts showed anti-fungal activities in vitro against dermatophytes such as Trichophyton rubrum, Trichophyton mentagrophytes, Epidermophyton floccosum, and Microsporum canis. GC-MS analysis of the chemical composition of the essential oil from leaves showed a total of 44 compounds. Isolated extracts could be of use for the future development of anti-skin disease agents.
Keywords: Anti-fungal activity; Crude extract; Essential oil; Moringa oleifera

Jose M. Prieto, Patrizia Iacopini, Pierluigi Cioni, Silvio Chericoni, In vitro activity of the essential oils of Origanum vulgare, Satureja montana and their main constituents in peroxynitrite-induced

oxidative processes, Food Chemistry, Volume 104, Issue 3, 2007, Pages 889-895, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.10.064.
(http://www.sciencedirect.com/science/article/B6T6R-4NMCVBY-1/2/2bc8308907539c6ccc9c4d7bb108629d)
Abstract:
The essential oil obtained from aerial parts of Satureja montana L. and Origanum vulgare L. (Labiatae) along with four of its main components, p-cymene, carvacrol, thymol and [gamma]-terpinene were tested in models of in vitro peroxynitrite-induced formation of both 3-nitrotyrosine and malondialdehyde, two biomarkers of the oxidative stress of recognised pathological and toxicological significance. The essential oils showed a significant activity, thus decreasing 3-nitrotyrosine formation (IC50 values of 43.9 [mu]g/ml for S. montana and 19.2 [mu]g/ml for O. vulgare), and also inhibited the peroxynitrite induced malondialdehyde formation (IC50 values of 27.2 [mu]g/ml and 17.0 [mu]g/ml respectively). Thymol and carvacrol inhibited 3-nitrotyrosine formation (IC50 values of 81.3 [mu]M and 106.3 [mu]M; ascorbic acid IC50 = 400 [mu]M) and reduced malondialdehyde formation (IC50 values of 43.9 [mu]M and 70.1 [mu]M respectively; trolox IC50 = 240 [mu]M). On the contrary, p-cymene and [gamma]-terpinene were completely inactive in both assays under the concentration of 300 [mu]g/ml. These results support, in particular for origanum, the nutraceutical value of these spices and the potential of thymol and carvacrol in preventing the formation of toxic products by the action of reactive nitrogen species.
Keywords: Peroxynitrite; Malondialdehyde; 3-Nitrotyrosine; Origanum vulgare; Satureja montana; Essential oils; Carvacrol; Thymol

Xie Xianfei, Cai Xiaoqiang, Zhu Shunying, Zou Guolin, Chemical composition and antimicrobial activity of essential oils of Chaenomeles speciosa from China, Food Chemistry, Volume 100, Issue 4, 2007, Pages 1312-1315, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.12.011.
(http://www.sciencedirect.com/science/article/B6T6R-4J2M0P0-7/2/b736d6e24d513719b3eb7c2b1646335b)
Abstract:
The chemical composition of essential oil obtained by hydrodistillation from the dried fruits of Chaenomeles speciosa was analyzed by GC-MS. Forty compounds, constituting about 85.13% of the total oil, were identified. The main constituents were [beta]-caryophyllene (12.52%), [alpha]-terpineol (5.41%), terpinen-4-ol (4.56%) and 1,8-cineole (4.31%). The antimicrobial activity of the oil was evaluated against 10 microorganisms using disc diffusion and broth microdilution methods. The essential oil was found to show a broad spectrum of antimicrobial activity against all the tested bacterial strains. The essential oil had more sensitivity to gram-positive than gram-negative bacteria.
Keywords: Chaenomeles speciosa; Essential oil; GC-MS; Antimicrobial activity

K. Vagionas, K. Graikou, O. Ngassapa, D. Runyoro, I. Chinou, Composition and antimicrobial activity of the essential oils of three Satureja species growing in Tanzania, Food Chemistry, Volume 103, Issue 2, 2007, Pages 319-324, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.07.051.
(http://www.sciencedirect.com/science/article/B6T6R-4M1TT63-N/2/4797fc5be60eea730e295223458a2f29)
Abstract:
Hydro-distilled volatile oils from the aerial parts of three Satureja species were investigated, mainly by a combination of GC and GC/MS. One hundred and thirteen compounds were identified, representing 82.9-92.0% of the total oil. Among the identified components, spathulenol, cis-piperitone oxide, [alpha]-bisabolol oxide-B, terpinen-4-ol, linalool, bornyl acetate, [beta]-bourbonene, isomenthone, thymol, neoisomenthol and menthone were found as the main components. Furthermore, the essential oils were investigated for their antimicrobial activity, by

the agar dilution technique. The antimicrobial test results showed that the oils had a high antimicrobial activity against two Gram-positive and four Gram-negative bacteria, two oral pathogens and three pathogenic fungi. Gram-positive bacteria were more sensitive to the investigated oils than were Gram-negative bacteria. These results could support the suggestion of Satureja species as a source of antimicrobial ingredients for the food industry.
Keywords: Satureja biflora; S. masukensis; S. pseudosimensis; Lamiaceae; Essential oil composition; Antimicrobial activity

Simonetta Maccioni, Rosa Baldini, Marianna Tebano, Pier Luigi Cioni, Guido Flamini, Essential oil of Teucrium scorodonia L. ssp. scorodonia from Italy, Food Chemistry, Volume 104, Issue 4, 2007, Pages 1393-1395, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.01.070.
(http://www.sciencedirect.com/science/article/B6T6R-4N2D30C-3/2/8ebea7839d4a9eec0a8e07c30b88c12c)
Abstract:
The essential oil of the flowering aerial parts of Teucrium scorodonia L. ssp. scorodonia growing in Italy on Verrucano, was analyzed by GC and GC-MS. All the identified compounds were sesquiterpene hydrocarbons. The main ones were germacrene B (26.2%) and [beta]-caryophyllene (25.2%).
Keywords: Teucrium scorodonia L. ssp. scorodonia; Lamiaceae; Essential oil composition; Sesquiterpenes; Germacrene B; [beta]-Caryophyllene

Bektas Tepe, Arzuhan Sihoglu-Tepe, Dimitra Daferera, Moschos Polissiou, Atalay Sokmen, Chemical composition and antioxidant activity of the essential oil of Clinopodium vulgare L., Food Chemistry, Volume 103, Issue 3, 2007, Pages 766-770, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.09.019.
(http://www.sciencedirect.com/science/article/B6T6R-4M63RWS-7/2/a06cc271cb21ff2713543e32b3f9fdfe)
Abstract:
This study was designed to examine the chemical composition and in vitro antioxidant activity of the essential oil of Clinopodium vulgare. GC-MS analysis of the oil resulted in the identification of 40 compounds, representing 99.4% of the oil; thymol (38.9%), [gamma]-terpinene (29.6%) and p-cymene (9.1%) were the main components. The samples were subjected to a screening for their possible antioxidant activity by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene-linoleic acid assays. In the first case, IC50 value of the C. vulgare essential oil was determined as 63.0 +/- 2.71 [mu]g/ml. IC50 value of thymol and [gamma]-terpinene, the major compounds of the oil, was determined as 161 +/- 1.3 [mu]g/ml and 122 +/- 2.5 [mu]g/ml, respectively, whereas p-cymene did not show antioxidant activity. In [beta]-carotene-linoleic acid system, C. vulgare essential oil exhibited 52.3 +/- 1.19% inhibition against linoleic acid oxidation. In both systems, antioxidant capacities of BHT, curcumine and ascorbic acid were also determined in parallel experiments.
Keywords: Antioxidant activity; Essential oil; Clinopodium vulgare

Nicola E. Durling, Owen J. Catchpole, John B. Grey, Rosemary F. Webby, Kevin A. Mitchell, L. Yeap Foo, Nigel B. Perry, Extraction of phenolics and essential oil from dried sage (Salvia officinalis) using ethanol-water mixtures, Food Chemistry, Volume 101, Issue 4, 2007, Pages 1417-1424, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.03.050.
(http://www.sciencedirect.com/science/article/B6T6R-4JRT34R-2/2/91dc72ecc6525b433b5bcf4a4e0e9728)
Abstract:
Effects of particle size, temperature, contact time, solvent-to-sage ratio and the ethanol-water ratio on the extraction of the active compounds rosmarinic acid, carnosic compounds and essential oil

from dried sage (Salvia officinalis) were studied. Optimal extraction conditions giving highest yield of all three active compounds were particle diameter 1 mm, extraction temperature 40 [degree sign]C, solvent-to-sage ratio of 6:1 and 55-75 wt% ethanol for up to 3 h. This gave an extract equivalent to 14.9% of dry sage, containing 6.9% rosmarinic acid (55% recovery), 10.6% carnosic compounds (75% recovery) and 7.3% essential oil (42% recovery). Scale up of the process by a factor of 100 demonstrated that the optimised laboratory scale process can be carried out without any loss of efficiency at an industrial scale.
Keywords: Sage; Salvia officinalis; Phenolics; Rosmarinic acid; Solvent extraction; Essential oil

A. Clara Grosso, Monya M. Costa, Luisa Ganco, Ana L. Pereira, Generosa Teixeira, Jose M.G. Lavado, A. Cristina Figueiredo, Jose G. Barroso, Luis G. Pedro, Essential oil composition of Pterospartum tridentatum grown in Portugal, Food Chemistry, Volume 102, Issue 4, 2007, Pages 1083-1088, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.06.049.
(http://www.sciencedirect.com/science/article/B6T6R-4M0BHRV-4/2/183bbf651221b98c767a26a53796a864)
Abstract:
The essential oils, isolated by hydrodistillation and distillation-extraction, from the aerial parts of different populations of Pterospartum tridentatum collected during the flowering phase, at different locations in Portugal, were analysed by GC and GC-MS. All the P. tridentatum populations studied afforded a yellowish oil in a yield <0.05% (v/w). cis-Theaspirane (2-14%), trans-theaspirane (2-17%) and octen-3-ol (2-37%) were, in variable amounts, the dominant components of the oils. Cluster analysis of the essential oil compositions from the nine populations studied, confirmed a major chemical variability.
Keywords: Pterospartum tridentatum L. Willk.; Leguminosae; Fabaceae; Essential oil; GC; GC-MS; Theaspiranes

Jie Hou, Tao Sun, Jun Hu, Shuangyang Chen, Xiaoqiang Cai, Guolin Zou, Chemical composition, cytotoxic and antioxidant activity of the leaf essential oil of Photinia serrulata, Food Chemistry, Volume 103, Issue 2, 2007, Pages 355-358, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.07.060.
(http://www.sciencedirect.com/science/article/B6T6R-4M1TT63-T/2/6320a1aef0131f7a5c8e73a2682f03fe)
Abstract:
The leaf essential oil of Photinia serrulata was obtained by hydrodistillation and analyzed by GC and GC-MS. Seventy-one components were identified in the essential oil and the main components of the oil were 10-epi-[gamma]-eudesmol (12.72%), pinene (6.85%), sabinene (5.93%), [alpha]-humulene (5.87%) and [alpha]-thujene (5.47%). The in vitro cytotoxicity of the oil on human cancer cell lines Hela, A-549 and Bel-7402 was examined. The oil was found to be very active against all the three human tumor cell lines tested with low IC50 of 0.0427 [mu]l/ml (Hela), 0.0219 [mu]l/ml (A-549) and 0.0301 [mu]l/ml (Bel-7402). The oil was also found to possess antioxidant activity as demonstrated by the 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical method.
Keywords: Photinia serrulata; Essential oil; Cytotoxicity; Antioxidant

O.T. Asekun, D.S. Grierson, A.J. Afolayan, Effects of drying methods on the quality and quantity of the essential oil of Mentha longifolia L. subsp. Capensis, Food Chemistry, Volume 101, Issue 3, 2007, Pages 995-998, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.02.052.
(http://www.sciencedirect.com/science/article/B6T6R-4JWFMRG-3/2/42f0bb84911ce7cdfef57bda372d0266)
Abstract:
The effects of various methods of drying on the content and chemical quality of the essential oil of Mentha longifolia was studied. The most prominent component in both the air-dried and sun-dried

leaf oils was menthone (47.9% and 38.3%, respectively), while oven-dried leaf oil had limonene as the major compound (40.8%), whereas pulegone was the major compound from the original fresh leaf oil. Menthone and pulegone were not detected in the oven-dried leaf oil. The essential oil underwent significant chemical transformation in its monoterpenoids when the leaves were dried by the three different methods. Due to the significant reduction of the potentially harmful pulegone and menthone by oven-drying, it is suggested that this herb should be oven-dried or cooked before consumption in order to reduce toxicity.
Keywords: Mentha longifolia; Essential oil; Menthone; Pulegone; Limonene; Drying methods

O. Yesil Celiktas, E.E. Hames Kocabas, E. Bedir, F. Vardar Sukan, T. Ozek, K.H.C. Baser, Antimicrobial activities of methanol extracts and essential oils of Rosmarinus officinalis, depending on location and seasonal variations, Food Chemistry, Volume 100, Issue 2, 2007, Pages 553-559, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.10.011.
(http://www.sciencedirect.com/science/article/B6T6R-4HSY556-1/2/b9014e301d79fba21179a9078c888f0a)
Abstract:
Rosmarinus officinalis is widely found in the lands of Aegean and Mediterranean regions of Turkey. The goal of this work was to test the antimicrobial activity of the essential oils and methanolic extracts of R. officinalis collected from three different regions at four different time intervals of the year against Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa, Klebsiella pneumonia, Enterococcus feacalis, Escherichia coli, Staphylococcus epidermidis, Bacillus subtilis and Candida albicans. Essential oils were obtained from the aerial parts of the plant by using a Clevenger apparatus, for 4 h. After distillation, the distillates were filtered, air-dried and then extracted by using a Soxhlet apparatus for 9 h to obtain the methanolic extracts. The antimicrobial activities of the methanolic extracts were tested by the disc diffusion technique. The antimicrobial activities of the essential oils obtained from R. officinalis were determined by minimum inhibitory concentration (MIC).The results indicated that the tested bacteria were sensitive to the essential oils and partially to the methanolic extracts. The antimicrobial activities of the essential oils against the tested bacteria differed, depending on location and seasonal variations.
Keywords: Rosmarinus officinalis; Antimicrobial activity; Essential oil; GC-MS

Kuan-Hung Lin, Shu-Yin Yeh, Min-Yi Lin, Ming-Chih Shih, Kai-Ts'ung Yang, Shih-Ying Hwang, Major chemotypes and antioxidative activity of the leaf essential oils of Cinnamomum osmophloeum Kaneh. from a clonal orchard, Food Chemistry, Volume 105, Issue 1, 2007, Pages 133-139, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.03.051.
(http://www.sciencedirect.com/science/article/B6T6R-4NCR9FK-8/2/70b74b4ccda90ce6a5e485859b3be9f3)
Abstract:
Essential oils of 92 cutting clones from a clonal orchard of Cinnamomum osmophloeum Kaneh. were obtained by hydrodistillation and characterised by gas chromatography-mass spectrometry. Our results showed that the yields of essential oils ranged between 0.09% and 2.65% (vol/fresh wt). The constituents of essential oils varied among samples. The major chemotypes classified in the individual cutting clones were cinnamaldehyde (50 plants, representing 50-95% of the total volatiles), linalool (1 plant, 73.3%), [beta]-cubebene (2 plants, 59.4% and 78.7%), and cinnamyl acetate (1 plant, 61.8%). The antioxidant activities of the four chemotypes were determined using a 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay. The antioxidant activities of the essential oil decreased in the order of cinnamyl acetate > cinnamaldehyde > [beta]-cubebene > linalool. Indigenous cinnamon oil extract showed a good free radical-scavenging capacity at all concentrations studied, except at 2 [mu]g/ml. The scavenging activity increased with increasing concentration of the extract. The capability of the four essential oil chemotypes to reduce the

stable radical, DPPH, to DPPH-H was assayed by a decrease in the IC50 values of 10.4 (cinnamyl acetate type) to 29.7 (linalool type) [mu]g/ml. These results suggest that the leaf essential oil of C. osmophloeum possesses chemical compounds with antioxidant activity which can be used as natural preservatives in food and/or by the pharmaceutical industry. Trees in this plantation which can be used for further propagation for the production of chemotypes of interest were identified.
Keywords: Antioxidant activity; Cinnamomum osmophloeum; DPPH (1,1-diphenyl-2-picrylhydrazyl); Essential oil

Kamel Msaada, Karim Hosni, Mouna Ben Taarit, Thouraya Chahed, Mohamed Elyes Kchouk, Brahim Marzouk, Changes on essential oil composition of coriander (Coriandrum sativum L.) fruits during three stages of maturity, Food Chemistry, Volume 102, Issue 4, 2007, Pages 1131-1134, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.06.046.
(http://www.sciencedirect.com/science/article/B6T6R-4KV2YF0-5/2/08653775f9947f24c85da26ce13e310c)
Abstract:
The essential oils composition of coriander (Coriandrum sativum L.) fruits obtained by hydrodistillation was studied at three stages of maturity by GC-FID and GC-MS. Essential oil yields showed marked increase during maturation process and forty one compounds were identified. Geranyl acetate (46.27%), linalool (10.96%), nerol (1.53%) and neral (1.42%) were the main compounds at the first stage of maturity (immature fruits). At the middle stage, linalool (76.33%), cis-dihydrocarvone (3.21%) and geranyl acetate (2.85%) were reported as the main constituents. Essential oils at the final stage of maturity (mature fruits) consist mainly on linalool (87.54%) and cis-dihydrocarvone (2.36%). Additionally, accumulation of monoterpene alcohols and ketones was observed during maturation process of coriander fruit.
Keywords: Coriandrum sativum L.; Umbelliferae; Fruit; Ripening; Essential oil composition

I.G. Sandri, J. Zacaria, F. Fracaro, A.P.L. Delamare, S. Echeverrigaray, Antimicrobial activity of the essential oils of Brazilian species of the genus Cunila against foodborne pathogens and spoiling bacteria, Food Chemistry, Volume 103, Issue 3, 2007, Pages 823-828, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.09.032.
(http://www.sciencedirect.com/science/article/B6T6R-4M936W0-2/2/6bdb79d4c2ea383a2cbba46f1aea7ebb)
Abstract:
The essential oils from aerial parts of six Brazilian species of the genus Cunila Mill. (Lamiaceae) currently used in beverages and food preparation, and in folk medicine, were obtained by steam distillation and analyzed by GC and GC/MS. The main components of the oils were: Cunila galioides citral (citral -77.9%), C. galioides menthene (mentha-trans-2,8-dienol -20.0%, limonene -13.6%, trans-ocimene -13.0%), C. incisa (1,8-cineole -42.9%, [alpha]-terpineol -14.0%), C. spicata (1,8-cineole -47.9%, [alpha]-terpineol -37.5%), C. menthoides (menthene -77.8%), C. angustifolia (sabinene -41.4%, [gamma]-terpinene -11.4%), and C. microcephala (menthofuran -94.90%). These oils were screened for antibacterial activity against 15 bacterial species. The oil of C. galioides citral efficiently controlled the growth of Bacillus sp., L. monocytogenes, S. aureus, A. hydrophila, and E. faecalis, showing both contact and gaseous activity. Although less efficient, the other essential oils studied were effective against Bacillus species, S. aureus, and other specific bacteria. MIC and MCC values support their popular use, and indicate that they can be an efficient alternative for the control of foodborne and spoiling bacteria.
Keywords: Cunila; Essential oils; Antimicrobial activity

S. Bounatirou, S. Smiti, M.G. Miguel, L. Faleiro, M.N. Rejeb, M. Neffati, M.M. Costa, A.C. Figueiredo, J.G. Barroso, L.G. Pedro, Chemical composition, antioxidant and antibacterial activities of the essential oils isolated from Tunisian Thymus capitatus Hoff. et Link., Food

Chemistry, Volume 105, Issue 1, 2007, Pages 146-155, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.03.059.
(http://www.sciencedirect.com/science/article/B6T6R-4NFR5H7-1/2/79bd8caff5ff49aa774623ed79b82157)
Abstract:
The chemical composition, antioxidant and antibacterial activities of essential oils isolated by hydrodistillation from the aerial parts of Tunisian Thymus capitatus Hoff. et Link. during the different phases of the plant development, and from different locations, were evaluated. The chemical composition was analyzed by gas chromatography (GC) and gas chromatography/mass spectrometry (GC/MS). The main components of the essential oils were carvacrol (62-83%), p-cymene (5-17%), [gamma]-terpinene (2-14%) and [beta]-caryophyllene (1-4%). The antioxidant activity of the oils (100-1000 mg l-1) was assessed by measurement of metal chelating activity, the reductive potential, the free radical scavenging (DPPH) and by the TBARS assay. The antioxidant activity was compared with that of synthetic antioxidants: butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT). Both the essential oils and BHA and BHT showed no metal chelating activity. Although with the other methodologies, there was a general increase in the antioxidant activity, with increasing oil concentration, maxima being obtained in the range of 500 and 1000 mg l-1 for flowering and post-flowering phase oils. Major differences were obtained according to the methodology of antioxidant capacity evaluation. Antibacterial ability of Th. capitatus essential oils was tested by disc agar diffusion against Bacillus cereus, Salmonella sp., Listeria innocua, four different strains of Staphylococus aureus (C15, ATCC25923, CFSA-2) and a multi-resistant form of S. aureus (MRSA-2). Antibacterial properties were compared to synthetic antibiotics. Higher antibacterial activity was observed with the flowering and the post-flowering phase essential oils.
Keywords: Thymus capitatus; Lamiaceae; Essential oils; Antioxidant activity; Metal chelating measurement; Reductive potential; DPPH; TBARS; Antibacterial activity; Listeria innocua; Bacillus cereus; Salmonella sp.; Staphylococus aureus

Guido Flamini, Pier Luigi Cioni, Simonetta Maccioni, Rosa Baldini, Composition of the essential oil of Daucus gingidium L. ssp. gingidium, Food Chemistry, Volume 103, Issue 4, 2007, Pages 1237-1240, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.10.028.
(http://www.sciencedirect.com/science/article/B6T6R-4MFCW9M-4/2/7115c2a8bbdd00341e042286062cb816)
Abstract:
The essential oils obtained from leaves and fruits of Daucus gingidium ssp. gingidium have been studied. The main constituents of the essential oil from the leaves were sabinene (26.8%), [alpha]-pinene (10.8%), germacrene D (6.9%) and limonene (5.7%). Sabinene (60.6%) was the main compound identified in the essential oil of the fruits, followed by [alpha]-pinene (12.2%) and 4-terpineol (5.4%). Furthermore, qualitative and quantitative considerations about differences with literature data on Daucus carota have been made in order to confirm the species status of D. gingidium.
Keywords: Daucus gingidium L. ssp. gingidium; Apiaceae; Essential oil; Leaves; Fruits; Sabinene

Vivek K. Bajpai, Atiqur Rahman, Ung Kyu Choi, Sun Joo Youn, Sun Chul Kang, Inhibitory parameters of the essential oil and various extracts of Metasequoia glyptostroboides Miki ex Hu to reduce food spoilage and food-borne pathogens, Food Chemistry, Volume 105, Issue 3, 2007, Pages 1061-1066, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.05.008.
(http://www.sciencedirect.com/science/article/B6T6R-4NRK4PR-B/2/812886414dc91908fe3361b3d9bfab97)
Abstract:

The aim of this work was to examine the chemical composition of the essential oil and various solvent extracts isolated from the floral cone of Metasequoia glyptostroboides Miki ex Hu and to test their efficacy against a diverse range of organisms comprising food spoilage and food-borne pathogenic bacteria. The chemical composition of essential oil isolated by hydrodistillation was analysed by GC-MS. It was determined that 59 compounds, which represented 97.06% of total oil, were present in the oil. The oil contains mainly [alpha]-pinene (29.54%), totarol (9.37%), [alpha]-thujene (8.63%), bornylene (8.63%), [beta]-caryophyllene (4.40%), totarol acetate (3.98%), [delta]-3-carene (3.19%) and 2-[beta]-pinene (2.25%). The oil was found containing mainly the oxygenated mono- and sesquiterpenes and their respective hydrocarbons. Antibacterial activity of essential oil, methanol extract and various organic sub-fractions of methanol extract of M. glyptostroboides was determined in vitro using agar diffusion method and MIC determination test against eleven (four Gram-positive, seven Gram-negative) bacterial strains including food spoilage and food-borne pathogens. The essential oil (5 [mu]l/ml, corresponding to 1000 ppm/disc), methanol extract and various organic sub-fractions (7.5 [mu]l/ml, corresponding to 1500 ppm/disc) of M. glyptostroboides exhibited great potential of antibacterial activity against four Gram-positive bacteria such as Bacillus subtilis (ATCC 6633), Listeria monocytogenes (ATCC 19166), Staphylococcus aureus (KCTC 1916), S. aureus (ATCC 6538) and one Gram-negative bacterium, Pseudomonas aeruginosa (KCTC 2004). The zones of inhibition of different concentrations of essential oil, methanol extract and its derived various organic sub-fractions against the tested bacteria were found in the range of 10 ~ 20 mm and the MIC values were recorded between 125 and 1000 [mu]g/ml. This study shows that M. glyptostroboides mediated essential oil and extracts can be applied in food industries as a natural preservatives or flavoring additives to control food spoilage and food-borne pathogenic bacteria causing severe destruction in food.
Keywords: Metasequoia glyptostroboides; Essential oil composition; [alpha]-Pinene; Sabinene; [alpha]-Thujene; Food spoilage and food-borne pathogens; Antibacterial activity

Barakat S.M. Mahmoud, Y. Kawai, K. Yamazaki, K. Miyashita, T. Suzuki, Effect of treatment with electrolyzed NaCl solutions and essential oil compounds on the proximate composition, amino acid and fatty acid composition of carp fillets, Food Chemistry, Volume 101, Issue 4, 2007, Pages 1492-1498, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.03.057.
(http://www.sciencedirect.com/science/article/B6T6R-4K6CPYF-1/2/5776ae226facd0d79d0be8dca2b5328e)
Abstract:
This investigation was undertaken to evaluate the effect of treatment with electrolyzed NaCl solutions and 1% essential oil (0.5% carvacrol + 0.5% thymol) on the proximate composition and nutritional components (amino acids and fatty acids) of carp fillets at room temperature (25 [degree sign]C). Carp fillet samples were treated with anodic electrolyzed NaCl solution [EW (+)], cathodic electrolyzed NaCl solution [EW (-)] followed by EW (+) [EW (-)/EW (+)], 1% essential oil (0.5% carvacrol + 0.5% thymol) [1% (Cv + Ty)], EW (+) followed by 1% (Cv + Ty) [EW (+)/1% (Cv + Ty)] and EW (-) followed by EW (+) and finally with 1% (Cv + Ty) [EW (-)/EW (+)/1% (Cv + Ty)]. Proximate composition, SDS-PAGE, amino acid composition, digestibility and fatty acid composition were used to determine the changes in carp fillet composition. Moisture, total lipid, total protein, ash and carbohydrate contents of the carp fillets were approximately 76%, 3.9%, 17.5%, 1.0% and 0.40%, respectively. The dominant amino acid was glutamic acid, and the composition ranged from 14.2 to 14.5 mol%. Protein digestibility of the carp fillets was approximately 85%. Oleic acid was the major monounsaturated acid in the carp fillets (41.0-41.9%). These results show that our method of fish preservation, using electrolyzed NaCl solutions and 1% (Cv + Ty), did not affect the quality (nutritional components) of carp fillets, and could be a good alternative to synthetic preservatives routinely used in the food industry.
Keywords: Amino acids; Anodic solution EW (+); Carvacrol (Cv); Cathodic solution EW (-); Carp protein; Digestibility; Electrolyzed NaCl solutions (EW); Fatty acids; Thymol (Ty)

Ana Paula Longaray Delamare, Ivete T. Moschen-Pistorello, Liane Artico, Luciana Atti-Serafini, Sergio Echeverrigaray, Antibacterial activity of the essential oils of Salvia officinalis L. and Salvia triloba L. cultivated in South Brazil, Food Chemistry, Volume 100, Issue 2, 2007, Pages 603-608, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.09.078.
(http://www.sciencedirect.com/science/article/B6T6R-4HR72NX-4/2/fe6df74271c61df61630831b2da23a83)
Abstract:
The essential oils of Salvia officinalis and Salvia triloba cultivated in South Brazil were analyzed by GC-MS. The major constituents of the oil of S. officinalis were [alpha]-thujone, 1,8-cineole, camphor, borneol and [beta]-pinene, whereas those of S. triloba were [alpha]-thujone, 1,8-cineole, camphor, and [beta]-caryophyllene. The essential oils of both species exhibited remarkable bacteriostatic and bactericidal activities against Bacillus cereus, Bacillus megatherium, Bacillus subtilis, Aeromonas hydrophila, Aeromonas sobria, and Klebsiella oxytoca. Moreover, the essential oil of S. triloba efficiently inhibited the growth of Staphylococcus aureus. S. aureus and A. hydrophila growth were drastically reduced even in the presence of 0.05 mg/ml of the essential oil of S. triloba.
Keywords: Salvia officinalis; Salvia fruticosa; Essential oil; Antimicrobial activity; GC-MS

B. Demirci, M. Kosar, F. Demirci, M. Dinc, K.H.C. Baser, Antimicrobial and antioxidant activities of the essential oil of Chaerophyllum libanoticum Boiss. et Kotschy, Food Chemistry, Volume 105, Issue 4, 2007, Pages 1512-1517, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.05.036.
(http://www.sciencedirect.com/science/article/B6T6R-4NSMMW2-1/2/031773ff324055f234e1f0cd7dff8ffd)
Abstract:
Chaerophyllum libanoticum Boiss. et Kotschy from Apiaceae, is collected and used as a food plant in Turkey. The essential oil obtained by hydrodistillation from the crushed fruits of C. libanoticum collected from Osmaniye, Southern Turkey, was simultaneously analysed by gas chromatography (GC) and gas chromatography-mass spectrometry (GC-MS). As a result, a total of seventy three components were characterized, representing 98.3% of the total oil with monoterpenes as the major group. The principal constituents were identified as [beta]-phellandrene (17.6%), limonene (15.9%), [beta]-pinene (8.8%), and sabinene (8.5%), respectively. The essential oil was evaluated for its antimicrobial activity using a microdilution assay resulting in the inhibition of a number of common human pathogenic bacteria including methicillin-resistant Staphylococcus aureus (MRSA) and the yeast Candida albicans. The minimum inhibitory concentrations (MIC) varied between 0.25 and 0.5 mg/ml which is within a moderate antimicrobial activity range. Furthermore, the antioxidant capacity of the essential oil was examined using an in vitro radical scavenging activity test. The C. libanoticum essential oil scavenged 1,1-diphenyl-2-picrylhydrazyl radical (DPPH), resulting in IC50 > 30 mg/ml. In addition, the effect on inhibition of lipid peroxidation of the essential oil was assayed using [beta]-carotene bleaching and haemoglobin induced linoleic acid peroxidation methods resulting in 16% antioxidative activity.
Keywords: Chaerophyllum libanoticum; Apiaceae; Essential oil composition; Monoterpenes; Antimicrobial activity; Antioxidant activity

Fatemeh Sefidkon, Khadijeh Abbasi, Ziba Jamzad, Shahla Ahmadi, The effect of distillation methods and stage of plant growth on the essential oil content and composition of Satureja rechingeri Jamzad, Food Chemistry, Volume 100, Issue 3, 2007, Pages 1054-1058, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.11.016.
(http://www.sciencedirect.com/science/article/B6T6R-4HYD9PF-5/2/5bdac01895a494b35d0da1a471338350)
Abstract:

The aerial parts of Satureja rechingeri were collected in two stages of plant growth (at the beginning of and full flowering stage) from Ilam province in the west of Iran. The essential oils were isolated by steam, hydro- and water-steam-distillation from the aerial parts at complete flowering stage. In addition, the essential oil of plant material at the beginning of flowering was obtained by the hydro-distillation. The oils were analyzed by capillary GC and GC-MS. The highest oil yield was obtained by hydro-distillation method and the lowest by steam-distillation. The highest oil yield was obtained at the beginning of flowering (4.72% w/w). The oil yields at full flowering stage were 2.46-4.24% (the highest for hydro-distillation and the lowest for steam-distillation).
Fifty-three compounds were identified in the oil of S. rechingeri at the beginning of flowering, with carvacrol (56.1%), p-cymene (14.0%) and [alpha]-thujone (4.7%) as the main components. Twenty-three constituents were characterized in the oils at the full flowering stage. The main components in all of the oils were carvacrol (84.0-89.3%).
So, S. rechingeri can be introduced as a rich carvacrol source in the complete flowering period.
Keywords: Satureja rechingeri; Essential oil; Distillation methods; Carvacrol

Abdelnaser A. Elzaawely, Tran D. Xuan, Shinkichi Tawata, Essential oils, kava pyrones and phenolic compounds from leaves and rhizomes of Alpinia zerumbet (Pers.) B.L. Burtt. & R.M. Sm. and their antioxidant activity, Food Chemistry, Volume 103, Issue 2, 2007, Pages 486-494, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.08.025.
(http://www.sciencedirect.com/science/article/B6T6R-4M3J12R-2/2/2fecbfebcb42f66c52296ae34a5818ca)
Abstract:
During essential oil production from Alpinia zerumbet, large volumes of water and solid wastes are produced and subsequently discarded. An extraction protocol to obtain essential oil, dihydro-5,6-dehydrokawain (DDK) and enriched antioxidant phenolic extracts from fresh leaves or rhizomes of A. zerumbet and their wastes was developed. The main components determined in leaf oil were 1,8-cineol, camphor and methyl cinnamate, whereas rhizome oil mainly contained DDK and methyl cinnamate. The highest DDK content was found in the hexane extract of fresh rhizomes. Ethyl acetate extracts from leaves showed higher 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activities than those from rhizomes. Ethyl acetate extract from wastewater of leaves possessed the strongest inhibition to [beta]-carotene oxidation. Ferulic and p-hydroxybenzoic acids were the major phenolics present in these extracts. The results indicate that disposed wastes produced during essential oil production from A. zerumbet leaves or rhizomes may be utilized in foodstuffs as a cheap source of natural antioxidants.
Keywords: Alpinia zerumbet; Essential oil; Antioxidant activity; Phenolics; DDK; Disposed wastes

Wenqiang Guan, Shufen Li, Ruixiang Yan, Shaokun Tang, Can Quan, Comparison of essential oils of clove buds extracted with supercritical carbon dioxide and other three traditional extraction methods, Food Chemistry, Volume 101, Issue 4, 2007, Pages 1558-1564, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.04.009.
(http://www.sciencedirect.com/science/article/B6T6R-4JT8DM8-1/2/be0bd00ed5d2550077227f0ab45e754a)
Abstract:
Supercritical fluid extraction (SFE) of essential oil from clove buds with CO2 was explored. The effect of different parameters, such as temperature (30 [degree sign]C, 40 [degree sign]C, 50 [degree sign]C), pressure(10 MPa, 20 MPa, 30 MPa) and particle size (three degree index), on the extraction yield and the content of eugenol in extracts was investigated using three-level orthogonal array design. The experimental results show that the temperature has the largest effect on the eugenol content of the extracts, and particle size has the maximum effect on the oil yield. The essential oil of 19.56% yield, in which the maximum content of eugenol in extracts is 58.77%, can be extracted from clove buds at pressure of 10 MPa and temperature of 50 [degree sign]C.

Essential oil of clove buds obtained by SFE, hydrodistillation, steam distillation and Soxhlet extraction were further analyzed by gas chromatography/mass spectrometric detection to compare the extraction methods. Twenty three compounds in the clove oils have been identified, showing that the composition of the clove oil extracted by different methods is mostly similar, whereas relative concentration of the identified compounds is apparently different. General characteristics of the clove oils obtained by different methods were further compared, and SFE is considered as the optimum process among the four processes for obtaining clove oil with high quality.
Keywords: Supercritical fluid extraction; Carbon dioxide; Essential oil; Clove bud; Steam distillation; Hydrodistillation; Soxhlet extraction

Danilo R. Oliveira, Gilda G. Leitao, Humberto R. Bizzo, Dai'se Lopes, Daniela S. Alviano, Celuta S. Alviano, Suzana G. Leitao, Chemical and antimicrobial analyses of essential oil of Lippia origanoides H.B.K, Food Chemistry, Volume 101, Issue 1, 2007, Pages 236-240, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.01.022.
(http://www.sciencedirect.com/science/article/B6T6R-4JGJGVW-3/2/30e29324d4eaed281aaed4663e9fbc19)
Abstract:
Lippia origanoides H.B.K. (Verbenaceae) is a plant known in Oriximina (Brazil) as 'Salva-de-Marajo'. Its leaves are widely used as of a spice in cooking and in traditional medicine. The chemical composition of the essential oil obtained from its leaves, analyzed by GC and GC/MS, showed a high content of oxygenated monoterpenes (66.0%), carvacrol (38.6%) and thymol (18.5%) being the major constituents. Considering that previous studies on the same plant species showed carvacrol as a trace or absent compound, we propose the existence of a new chemotype for this species. A high carvacrol content in the essential oil determines the plant's suitability for the preparation of oregano condiment. The antimicrobial activity of this essential oil was determined by the drop diffusion method, showing highly significant inhibition zones for all microorganisms tested.
Keywords: Lippia origanoides; Essential oil; Oregano; Antimicrobial activity; Thymol; Carvacrol

Antonios E. Goulas, Michael G. Kontominas, Combined effect of light salting, modified atmosphere packaging and oregano essential oil on the shelf-life of sea bream (Sparus aurata): Biochemical and sensory attributes, Food Chemistry, Volume 100, Issue 1, 2007, Pages 287-296, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.09.045.
(http://www.sciencedirect.com/science/article/B6T6R-4HM7S70-1/2/7f5ccd8e843ac63506c03876e2854aa3)
Abstract:
The combined effect of modified atmosphere packaging (MAP: 40% CO2/30% O2/30% N2) and oregano essential oil, on the shelf-life of lightly salted cultured sea bream (Sparus aurata) fillets stored under refrigeration was studied. Quality assessment was based on sensory analysis and biochemical indices determination. Total volatile basic nitrogen (TVBN) and trimethylamine nitrogen (TMAN) values were higher in sea bream fillets stored in air followed by salted fillets stored in air. For salted sea bream fillets stored under MAP the inhibition in the TVBN and TMAN values was evident in the order MAP < MAP/0.4% (v/w) oregano oil < MAP/0.8% (v/w) oregano oil indicating the preservative effect of oregano oil. Salting had a noticeable preservative effect but produced an increase in the 2-thiobarbituric acid (TBA) values while oregano oil had a strong antioxidant activity giving the lowest TBA values. All raw sea bream fillet samples received acceptable sensory scores during the first 15-16 days of storage. The salted samples remained acceptable up to ca. 20-21 days while the MAP salted samples up to ca. 27-28 days of storage. The oregano oil addition in MAP salted samples yielded a distinct but pleasant flavor and contributed to a considerable slower process of fish spoilage given that the fillets treated with 0.8%

(v/w) oregano oil were still sensory acceptable after 33 days of storage. The preservative effect was greater as the oregano oil concentration was greater.
Keywords: Modified atmosphere packaging; Oregano essential oil; Salting; Shelf-life; Sea bream; Biochemical analysis; Sensory assessment

Bektas Tepe, Dimitra Daferera, Arzuhan-Sihoglu Tepe, Moschos Polissiou, Atalay Sokmen, Antioxidant activity of the essential oil and various extracts of Nepeta flavida Hub.-Mor. from Turkey, Food Chemistry, Volume 103, Issue 4, 2007, Pages 1358-1364, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.10.049.
(http://www.sciencedirect.com/science/article/B6T6R-4MGVPK8-5/2/8b34e5b388b3f955c10df1bb648fd636)
Abstract:
This study was designed to examine the chemical composition and in vitro antioxidant activity of the essential oil and various extracts (hexane, dichloromethane and methanol sub-fractions) of Nepeta flavida. GC and GC-MS analyses of the essential oil resulted in the identification of 68 compounds, representing 96.4% of the oil; 1,8-cineole (38.9%) and linalool (25.1%) were the main components, comprising 64.0% of the total oil. The samples were subjected to a screening for their possible antioxidant activities by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene-linoleic acid assays. In the first case, the IC50 value of the N. flavida essential oil was determined to be 42.8 +/- 2.19 [mu]g/ml. Among the extracts, the strongest activity was exhibited by the polar sub-fraction of the methanol extract with an IC50 value of 63.2 +/- 1.75 [mu]g/ml. In the [beta]-carotene-linoleic acid system, N. flavida essential oil exhibited 86.3% +/- 1.69 inhibition against linoleic acid oxidation. Among the extracts prepared with various solvents, a correlation was observed between the polarity and antioxidant activity. The extracts exhibited the same activity pattern in this system the most active one is the polar sub-fraction, 79.7% +/- 0.89. On the other hand, 1,8-cineole, a major compound of the essential oil, exhibited marked antioxidant activity in both systems, whereas the other compound, linalool, did not show any activity. The amount of total phenolics was highest in the polar and non-polar sub-fractions. Particularly, a positive correlation was observed between the total phenolic content and the antioxidant activity of the extracts. As estimated from the results, amounts of phenolic compounds were less in hexane and dichloromethane extracts than in the others. In conclusion, antioxidant potentials of polar and non-polar methanol sub-fractions could be attributed to their high phenolic contents. In both systems, antioxidant capacities of BHT, ascorbic acid, curcumin and [alpha]-tocopherol were also determined in parallel experiments.
Keywords: Nepeta flavida; Antioxidant activity; Essential oil; Total phenolics; Various extracts

Guido Flamini, Pier Luigi Cioni, Ivano Morelli, Ammar Bader, Essential oils of the aerial parts of three Salvia species from Jordan: Salvia lanigera, S. spinosa and S. syriaca, Food Chemistry, Volume 100, Issue 2, 2007, Pages 732-735, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.10.032.
(http://www.sciencedirect.com/science/article/B6T6R-4HV74V1-2/2/182b161d0d651202fa0eb67d936f9f1a)
Abstract:
The compositions of the essential oils of three Jordanian Salvia species, S. lanigera and S. spinosa from a desert climate, and S. syriaca from a Mediterranean habitat, were studied. All three oils are rich in monoterpene derivatives (68-73%).
S. lanigera and S. spinosa showed a very high content of thymol, 54.9% and 68.9%, respectively. The main constituents of S. syriaca were thymol, [alpha]-pinene and isobornyl acetate (15.5%, 12.6% and 12.0%, respectively).
Keywords: Salvia lanigera; S. spinosa; S. syriaca; Lamiaceae; Essential oil; Thymol

Suzana I. Dimitrijevic, Katarina R. Mihajlovski, Dusan G. Antonovic, Mirjana R. Milanovic-Stevanovic, Dusan Z. Mijin, A study of the synergistic antilisterial effects of a sub-lethal dose of lactic acid and essential oils from Thymus vulgaris L., Rosmarinus officinalis L. and Origanum vulgare L., Food Chemistry, Volume 104, Issue 2, 2007, Pages 774-782, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.12.028.
(http://www.sciencedirect.com/science/article/B6T6R-4MP0013-5/2/eb120c57cd3f00dd4e4b4cfa1c4df08f)
Abstract:
Commercial essential oils of Thymus vulgaris L., Rosmarinus officinalis L. and Origanum vulgare L. were chemically characterized by GC, GC/MS analyses. The antilisterial activity of the oils, and the sub-lethal concentration of lactic acid were established by the agar-well diffusion method. The bactericidal kinetics of the diluted oils (50 ppm, 100 ppm, 200 ppm and 300 ppm) and their mixtures with 50 ppm of lactic acid were determined by optical density (OD600) measurements. The results suggest that a sub-lethal dose of lactic acid noticeably increased the antilisterial activity, especially of rosemary and thyme oils, but that the synergistic effects were reduced with higher concentrations of oils.
Keywords: Oregano oil; Rosemary oil; Thyme oil; Chemical composition; L. monocytogenes; Lactic acid; Synergy

Josphat C. Matasyoh, Joyce J. Kiplimo, Nicholas M. Karubiu, Tiffany P. Hailstorks, Chemical composition and antimicrobial activity of essential oil of Tarchonanthus camphoratus, Food Chemistry, Volume 101, Issue 3, 2007, Pages 1183-1187, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.03.021.
(http://www.sciencedirect.com/science/article/B6T6R-4JJ6DNM-2/2/a24f1f085c503b84853de40953894684)
Abstract:
The essential oil of Tarchonanthus camphoratus (Asteraceae), obtained by hydro-distillation, was analysed by gas chromatography-mass spectrometry (GC-MS) and also evaluated for antimicrobial activity. Out of 45 peaks representing 99.8% of the oil, 38 components which constitute 95.8% of the total oil were identified. The oil was dominated by monoterpenes, which accounted for 80.9% of the oil. This study indicates the presence of a high percentage of oxygenated monoterpenes (62.3%), of which the main constituents were fenchol (15.9%), 1,8-cineole (14.3%) and [alpha]-terpineol (13.2%). Other monoterpenes present in fairly good amounts were [alpha]-pinene (6.87%), trans-pinene hydrate (6.51%), terpinen-4-ol (4.74%) and camphene (3.76%). The oil was screened for antimicrobial activity against both Gram positive (Staphylococcus aureus, Bacillus ssp.) and Gram negative (Escherichia coli, Pseudomonas aeruginosa, Salmonella typhi, Klebsiella pneumoniae, Proteus mirabilis) bacteria and a pathogenic fungus Candida albicans. Except for P. aeruginosa, which showed resistance, the oil had pronounced antibacterial and antifungal activities.
Keywords: Tarchonanthus camphoratus; Asteraceae; Fenchol; 1,8-Cineole; [alpha]-Terpineol; Antimicrobial activity; Antifungal activity; MIC

Ozgur Eminagaoglu, Bektas Tepe, Onder Yumrutas, H. Askin Akpulat, Dimitra Daferera, Moschos Polissiou, Atalay Sokmen, The in vitro antioxidative properties of the essential oils and methanol extracts of Satureja spicigera (K. Koch.) Boiss. and Satureja cuneifolia ten, Food Chemistry, Volume 100, Issue 1, 2007, Pages 339-343, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.09.054.
(http://www.sciencedirect.com/science/article/B6T6R-4HNSGFD-2/2/35cf993e63666ff9879554078ff0386d)
Abstract:

This study was designed to examine the in vitro antioxidant activities of the essential oil and methanol extracts of Satureja spicigera and S. cuneifolia from Turkish flora. GC and GC/MS analysis of the essential oils resulted in the identification of 40 and 29 compounds, representing the 99.4% and 99.5% of the oils, respectively. Major constituents of the oils were carvacrol (42.5% and 67.1%), [gamma]-terpinene (21.5% and 15.2%) and p-cymene (20.9% and 6.7%), respectively. Methanol extracts were also obtained from the aerial parts of the plants. The samples were subjected to a screening for their possible antioxidant activities by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene-linoleic acid assays. In general, samples obtained from S. cuneifolia exerted greater antioxidant activities than did those obtained from S. spicigera. In the DPPH test system, free radical-scavenging activity of S. spicigera oil was determined to be 127 +/- 1.63 [mu]g/ml, whereas IC50 value of S. cuneifolia was 89.1 +/- 2.29 [mu]g/ml. In the [beta]-carotene-linoleic acid test system, antioxidant activities of the oil were 81.7 +/- 1.14% and 93.7 +/- 1.83%, respectively. Antioxidant activities of the synthetic antioxidant, BHT, ascorbic acid, curcumin and [alpha]-tocopherol were also determined in parallel experiments.
Keywords: Satureja spicigera, Satureja cuneifolia; Antioxidant activity; Essential oil; Methanol extract

Abdelnaser A. Elzaawely, Tran D. Xuan, Haruo Koyamaand, Shinkichi Tawata, Antioxidant activity and contents of essential oil and phenolic compounds in flowers and seeds of Alpinia zerumbet (Pers.) B.L. Burtt. & R.M. Sm, Food Chemistry, Volume 104, Issue 4, 2007, Pages 1648-1653, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.03.016.
(http://www.sciencedirect.com/science/article/B6T6R-4N8M8CP-6/2/a47f9e666e22b545f126cae405ec8f1d)
Abstract:
Alpinia zerumbet leaves and rhizomes have been extensively studied for their chemical compositions and biological activities. However, less attention has been given to its flowers and seeds. In our study, essential oil, total phenolics and antioxidant capacities assayed by 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging and [beta]-carotene bleaching methods were evaluated in flowers and seeds of A. zerumbet. In addition, their phenolic composition was determined by GC-MS and HPLC. 1,8-Cineol, camphor, methyl cinnamate and borneol were the major constituents in flower oils, whereas the main components in seeds oil were [alpha]-cadinol, T-muurolol, [alpha]-terpineol, [delta]-cadinene and terpinene-4-ol. The results showed that the hexane extract of flowers contained a significantly higher quantity of dihydro-5,6-dehydrokawain (DDK) than that of seeds. Total phenolic contents of flower and seed extracts were measured as 56.7 and 13.7 mg gallic acid equivalent per gram extract, respectively. The ethyl acetate extract of flowers and seeds possessed a high antiradical activity and prevented the bleaching of [beta]-carotene. The HPLC analysis indicated that p-hydroxybenzoic acid, ferulic acid and syringic acid were the predominant phenolics in the ethyl acetate extract of flowers, whilst p-hydroxybenzoic acid, syringic acid and vanillin were the major phenolics in seeds.
Keywords: Alpinia zerumbet; Essential oil; Total phenolics; Dihydro-5,6-dehydrokawain; Antioxidant activity; Phenolic acids

Sandra B. Glisic, Dusan R. Misic, Marko D. Stamenic, Irena T. Zizovic, Ruzica M. Asanin, Dejan U. Skala, Supercritical carbon dioxide extraction of carrot fruit essential oil: Chemical composition and antimicrobial activity, Food Chemistry, Volume 105, Issue 1, 2007, Pages 346-352, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.11.062.
(http://www.sciencedirect.com/science/article/B6T6R-4MWPVF8-2/2/68b8a7b6ebd31d6fe46a9641d91d0c8d)
Abstract:
Isolation of carrot fruit (Daucus carrota L., cultivar 'Chanteney') essential oil by supercritical carbon dioxide was investigated from the pretreatment of herbaceous matrix and extraction conditions to

the chemical composition of obtained extract and its antimicrobial activity. The qualitative and quantitative analyses of the supercritical extract, as well as of the essential oil obtained by hydrodistillation, were done by GC/FID and GC/MS methods. Antimicrobial properties of both samples were investigated against ten species of microorganisms. Experimental results showed that the particle size had no influence on the extraction process. The highest yield was obtained at 40 [degree sign]C and 10 MPa. The main component of the supercritical extract, as well as of the essential oil was carotol. The supercritical extract was characterized by the presence of heavier molecular weight compounds, while some lighter compounds, e.g. pinenes, were not detected. The supercritical extract and the essential oil were the most effective against Gram-positive bacteria.
Keywords: Carrot fruit; Carotol; Supercritical fluid extraction; Essential oil; Antimicrobial activity

N.E. Rocha-Guzman, J.A. Gallegos-Infante, R.F. Gonzalez-Laredo, M. Ramos-Gomez, M.E. Rodriguez-Munoz, R. Reynoso-Camacho, A. Rocha-Uribe, M.R. Roque-Rosales, Antioxidant effect of oregano (Lippia berlandieri v. Shauer) essential oil and mother liquors, Food Chemistry, Volume 102, Issue 1, 2007, Pages 330-335, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.05.024.
(http://www.sciencedirect.com/science/article/B6T6R-4KDBM99-3/2/40bd8e500c7fcdb0a0db5dee7d72d78e)
Abstract:
The conventional steam distillation process for oregano (Lippia berlandieri v. Shauer) essential oil extraction produces large volumes of mother liquor. This residual liquid represents a potential value because the soluble antioxidants it contains. Essential oil and ethyl acetate mother liquor extracts (MLEs) were evaluated for antioxidant activity. Total phenolic content and antioxidant activities by the 2-2'-diphenyl-1-picrylhydrazyl (DPPH) method, by the deoxyribose degradation assay, and by oxidation of low density lipoproteins (LDL) with CuSO4 were evaluated. Oil yield was 4.34%. Total phenolic content was 151 +/- 2.00 and 150.5 +/- 0.98 mg of GAE (gallic acid equivalents)/mL for the essential oil and MLEs, respectively. DPPH assay showed a low radical scavenging activity (RSA) for oregano essential oil. Meanwhile MLEs exhibited no significant RSA at low concentrations, but at higher concentrations (100 [mu]g/mL), it was superior to those exhibited by the controls ascorbic acid and butylated hydroxytoluene (BHT). Deoxy-d-ribose assay results for both essential oil and MLEs showed a good hydroxyl radical RSA at the concentrations tested. Essential oil and MLEs delayed induction time effectively. Solubility problems, chemical constituents, and their hydrophilic-lipophilic distribution are key factors that explain samples behavior for an eventual use of these natural products.
Keywords: Antioxidant; LDL oxidation; Mother liquor extracts; Oregano essential oil

Latif Gachkar, Davood Yadegari, Mohammad Bagher Rezaei, Masood Taghizadeh, Shakiba Alipoor Astaneh, Iraj Rasooli, Chemical and biological characteristics of Cuminum cyminum and Rosmarinus officinalis essential oils, Food Chemistry, Volume 102, Issue 3, 2007, Pages 898-904, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.06.035.
(http://www.sciencedirect.com/science/article/B6T6R-4KPFKVS-2/2/c92dbe2332ed8484d29e1e448cf5a824)
Abstract:
Essential oils extracted by hydrodistillation from Cuminum cyminum and Rosmarinus officinalis were characterized by means of GC and GC-MS. C. cyminum and R. officinalis contained [alpha]-pinene (29.1%, 14.9%), 1,8-cineole (17.9%, 7.43%) and linalool (10.4%, 14.9%), respectively, as the major compounds. C. cyminum oil exhibited stronger antimicrobial activity than did R. officinalis oil against E. coli, S. aureus and L. monocytogenes. Complete death time on exposure to Cuminum cyminum L. and Rosmarinus officinalis L. oils were 20 and 25 min 180 and 240 min and 90 and 120 min for E. coli, S. aureus and L. monocytogenes, respectively. Radical-scavenging

and antioxidant properties were tested by means of 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay and the [beta]-carotene bleaching test. These properties were compared to those of Thymus x-porlock essential oil, used as a reference ingredient. The radical scavenging performance of the rosemary oil was better than that of C. cyminum. Results from the antioxidant test were better than those provided by the radical-scavenging activity. C. cyminum and R. officinalis essential oils may be considered as potent agents in food preservation.
Keywords: Cuminum cyminum; Rosmarinus officinalis; Essential oil; E. coli; S. aureus; L. monocytogenes; Antioxidant; Radical scavenging; Antimicrobial

Mario Roberto Marostica Jr., Glaucia Maria Pastore, Production of R-(+)-[alpha]-terpineol by the biotransformation of limonene from orange essential oil, using cassava waste water as medium, Food Chemistry, Volume 101, Issue 1, 2007, Pages 345-350, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.12.056.
(http://www.sciencedirect.com/science/article/B6T6R-4JHMFRH-1/2/973c26e8ca3de61b540661a7c60b874f)
Abstract:
The use of two agro-residues (liquid cassava waste and orange essential oil) in the biotransformation of R-(+)-limonene was investigated. The main components of orange essential oil were determined by GC-MS and R-(+)-limonene was shown to be the predominant constituent, accounting for more than 94% of the total content. Cassava wastewater proved to be a suitable substrate for mycelial growth, leading to good, rapid growth with all the fungal strains tested, reaching 29.4 g/l (dry weight) after 3 days of growth (Penicillium sp. 2025). The best R-(+)-[alpha]-terpineol yields were achieved when the strains were grown in cassava media and the mycelia then transferred to a new flask containing mineral medium and orange essential oil as the sole C- and energy source. One of the strains tested, Fusarium oxysporum 152B, converted R-(+)-limonene to R-(+)-[alpha]-terpineol, yielding nearly 450 mg/l after 3 days of transformation. Growth in the presence of a solution of 1% orange essential oil in decane did not increase the transformation yields.
Keywords: Biotransformation; Industrial residues; R-(+)-limonene; R-(+)-[alpha]-terpineol; Fusarium oxysporum

M. Gulluce, F. Sahin, M. Sokmen, H. Ozer, D. Daferera, A. Sokmen, M. Polissiou, A. Adiguzel, H. Ozkan, Antimicrobial and antioxidant properties of the essential oils and methanol extract from Mentha longifolia L. ssp. longifolia, Food Chemistry, Volume 103, Issue 4, 2007, Pages 1449-1456, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.10.061.
(http://www.sciencedirect.com/science/article/B6T6R-4MH8BPV-5/2/0408728eea2c7170faadfa3e4cf2450a)
Abstract:
This study was designed to evaluate antimicrobial and antioxidant activities of the essential oil and methanol extract from Mentha longifolia ssp. longifolia. The essential oil showed strong antimicrobial activity against all 30 microorganisms tested whereas the methanol extract almost remained inactive. In contrast, the extract showed much better activity than the essential oil in antioxidant activity assays employed, e.g. in the inhibition of free radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene/linoleic acid systems. In the former, the extract was able to reduce the stable free radical DPPH with an IC50 of 57.4 [mu]g/ml while that of the oils was 10 700 [mu]g/ml. When compared to BHT, a synthetic antioxidant, both showed weaker antioxidative potential. Similarly, in [beta]-carotene/linoleic acid assay, these samples were not effectively able to inhibit the linoleic acid oxidation; exhibiting only 24% and 36% inhibitions at 2 mg/ml, respectively; both were far below than that of BHT. Total phenolic constituent of the extract was 4.5 g/100 g as gallic acid equivalent. GC-MS analysis of the oil resulted in the identification of

45 constituents, cis-piperitone epoxide, pulegone and piperitenone oxide being the main components.
Keywords: Antimicrobial activity; Antioxidant activity; Mentha longifolia ssp. longifolia; GC-MS-analysis

Abdolali Mohagheghzadeh, Pouya Faridi, Younes Ghasemi, Carum copticum Benth. & Hook., essential oil chemotypes, Food Chemistry, Volume 100, Issue 3, 2007, Pages 1217-1219, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.12.002.
(http://www.sciencedirect.com/science/article/B6T6R-4J2M5MF-5/2/0db4a5c0d198df86d6dc7fe75d3ed101)
Abstract:
Carum copticum Benth. & Hook is a popular spice and a traditional flavor that is used in Iran. The fruits of C. copticum have several therapeutic effects including carminative, diuretic and anti-vomiting effects. There are some reports on the chemical composition of C. copticum fruits essential oil. In our research the results of GC-MS analyses of the essential oil from C. copticum fruits and differences among various reports were described. Major constitutes of the oil were thymol (54.50%), [gamma]-terpinene (26.10%) and p-cymene (22.10%). Comparison of the result from this study with other reports indicates that C. copticum have thymol and carvacrol chemotypes.
Keywords: Carum copticum Benth. & Hook; Essential oil; Chemotype

Charng-Cherng Chyau, Shu-Yao Tsai, Joan-Hwa Yang, Chu-Chun Weng, Ching-Mei Han, Chun-Chien Shih, Jeng-Leun Mau, The essential oil of Glossogyne tenuifolia, Food Chemistry, Volume 100, Issue 2, 2007, Pages 808-812, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.10.044.
(http://www.sciencedirect.com/science/article/B6T6R-4HVF12C-7/2/32cdc217d187e807e0ea91f1cbfa1c5b)
Abstract:
Glossogyne tenuifolia (Labill) Cass. (Compositae) is a traditional anti-pyretic and hepatoprotective herb in The Pescadores Islands. The essential oil of the dried herb, from four seasons, was isolated using a simultaneous steam-distillation and solvent-extraction (SDE) apparatus. The essential oil contents were in the range of 0.48-0.77 mg g-1, with an average of 0.66 mg g-1, and declined with the seasons. Generally, the essential oils from four seasons exhibited similar volatile profiles. A total of 62 different compounds were isolated by the SDE method and, among them, 30 compounds were identified, including 13 terpenes, 16 oxygen-containing compounds (eight alcohols, five aldehydes, one ester and two ketones) and one other compound. Terpenes were predominantly present in the essential oil and accounted for 61.3-76.0% of the essential oil with an average of 69.1%. The second most abundant class was alcohols, accounting for 12.4-15.9% of the essential oil, with an average of 14.1%. Consistently for four seasons, the most abundant eight compounds were in the descending order: p-cymene > [beta]-pinene > [beta]-phellandrene > limonene > cryptone > [alpha]-pinene > 4-terpineol + [gamma]-muurolene. However, these eight compounds accounted for 71.5% of the average of the essential oil and, in combination, might give rise to the overall citrus-like aroma of the G. tenuifolia.
Keywords: Glossogyne tenuifolia (Compositae); Essential oil; GC-MS

O. Politeo, M. Jukic, M. Milos, Chemical composition and antioxidant capacity of free volatile aglycones from basil (Ocimum basilicum L.) compared with its essential oil, Food Chemistry, Volume 101, Issue 1, 2007, Pages 379-385, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2006.01.045.
(http://www.sciencedirect.com/science/article/B6T6R-4JHMSW4-5/2/93d20fed2525c383a79c1ec91c8825c1)
Abstract:

The present paper examines the chemical composition and antioxidant capacity of free volatile aglycones from basil compared to their essential oil. The comparison of chemical composition of volatile aglycones with the chemical composition of essential oil reveals four common compounds: eugenol, chavicol, linalool and [alpha]-terpineol. For the evaluation of the mentioned antioxidant capacities, two different methods were performed: the 2,2'-diphenyl-1-picrylhydrazyl radical scavenging method (DPPH) and ferric reducing/antioxidant power assay (FRAP). DPPH method shows that free volatile aglycones possess good antioxidant properties comparable with that of the essential oil and well-known antioxidant butylated hydroxytoluene (BHT), but less than pure eugenol. The results obtained by FRAP method show that these compounds are some less effective antioxidants than essential oil and BHT.
Keywords: Ocimum basilicum L.; Volatile aglycones; Essential oil; Chemical composition; GC-MS; Antioxidant capacity; DPPH; FRAP

Jens K.S. Moller, Rodrigo R. Catharino, Marcos N. Eberlin, Electrospray ionization mass spectrometry fingerprinting of essential oils: Spices from the Labiatae family, Food Chemistry, Volume 100, Issue 3, 2007, Pages 1283-1288, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.10.013.
(http://www.sciencedirect.com/science/article/B6T6R-4HPK90X-6/2/51536d149c0d7b5b0fdae512f1417358)
Abstract:
Polar components of the methanolic extracts of the essential oils of the spices Origanum dictamnus, Origanum vulgare, Origanum majorana and Rosmarinus officinalis, all four belonging to the Labiatae family, were investigated by direct infusion electrospray ionisation mass spectrometry (ESI-MS) both in the negative and positive ion modes. Characteristic ESI mass spectra with many diagnostic ions were obtained for the extracts of all four spices, serving for fast and reliable identification of these species. Tandem mass spectrometry (ESI-MS/MS), which often forms a series of fragment ions, and this additional MS dimension increases selectivity for authenticity and adulteration tests for spice essential oils. The MS technique also provides complementary information of component structures revealing the presence of important bioactive components.
Keywords: Electrospray ionisation mass spectrometry fingerprinting; Labiatae family spices; Charged components; Natural antioxidants characterisation; Structural elucidation; Proof of authenticity

Mouin Rouatbi, Albert Duquenoy, Pierre Giampaoli, Extraction of the essential oil of thyme and black pepper by superheated steam, Journal of Food Engineering, Volume 78, Issue 2, January 2007, Pages 708-714, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2005.11.010.
(http://www.sciencedirect.com/science/article/B6T8J-4HWX8J4-5/2/d8fafea077eac66ae6ffe5e97c6e2a8d)
Abstract:
Superheated heated steam was used to extract volatiles from thyme leaves and black pepper fruits. Steam and extracted volatiles are collected in a condenser and essential oils are separated from the collected mixture by solvents and analysed by GC. Results show that the yield of extraction has an asymptotical evolution with time and increase with steam temperature and flow and it is higher for ground black pepper fruits. However, the quality of the extract is lower when the steam temperature is higher than 175 [degree sign]C.
Keywords: Superheated steam distillation; Thyme; Black pepper; Quality

Maryam Negahban, Saeid Moharramipour, Fatemeh Sefidkon, Fumigant toxicity of essential oil from Artemisia sieberi Besser against three stored-product insects, Journal of Stored Products

Research, Volume 43, Issue 2, 2007, Pages 123-128, ISSN 0022-474X, DOI: 10.1016/j.jspr.2006.02.002.
(http://www.sciencedirect.com/science/article/B6T8Y-4K9C5DV-2/2/f9d61dd423c1357cd976a36e81117f12)
Abstract:
Artemisia sieberi is a widely distributed plant in Iran. Because some species of Artemisia are insecticidal, experiments were conducted to investigate fumigant toxicity of the essential oil. Dry ground leaves were subjected to hydrodistillation using a modified Clevenger-type apparatus and the resulting oil contained camphor (54.7%), camphene (11.7%), 1,8-cineol (9.9%), [beta]-thujone (5.6%) and [alpha]- pinene (2.5%).
The mortality of 7 days old adults of Callosobruchus maculatus, Sitophilus oryzae, and Tribolium castaneum increased with concentration from 37 to 926 [mu]L/L and with exposure time from 3 to 24 h. A concentration of 37 [mu]L/L and an exposure time of 24 h was sufficient to obtain 100% kill of the insects. Callosobruchus maculatus was significantly more susceptible than S. oryzae and T. castaneum; a second more detailed bioassay gave estimates for the LC50 of C. maculatus as 1.45 [mu]L/L, S. oryzae 3.86 [mu]L/L and T. castaneum 16.76 [mu]L/L. These results suggested that A. sieberi oil may have potential as a control agent against C. maculatus, S. oryzae and T. castaneum.
Keywords: Stored-product insects; Artemisia sieberi; Botanical insecticides; Fumigant toxicity

Mario Estevez, Rosario Ramirez, Sonia Ventanas, Ramon Cava, Sage and rosemary essential oils versus BHT for the inhibition of lipid oxidative reactions in liver pate, LWT - Food Science and Technology, Volume 40, Issue 1, January 2007, Pages 58-65, ISSN 0023-6438, DOI: 10.1016/j.lwt.2005.07.010.
(http://www.sciencedirect.com/science/article/B6WMV-4H10BT1-1/2/4d6b6b8c30fdba6f889c42347330f366)
Abstract:
The antioxidant effect of two plant essential oils (sage and rosemary essential oils) and one synthetic antioxidant (BHT) on refrigerated stored liver pate (4 [degree sign]C/90 days) was evaluated. Pates with no added antioxidants were used as controls. Liver pates were analysed for the amount of polyunsaturated fatty acids (PUFA), thiobarbituric acid reactive substances (TBA-RS) numbers, and lipid-derived volatiles at days 0, 30, 60 and 90 of refrigerated storage. The amount of PUFA gradually decreased during refrigerated storage of porcine liver pates with this decrease being significantly greater ($P<0.05$) in control and BHT pates than in those with added essential oils. Consistently, the increase of TBA-RS numbers during refrigerated storage of liver pates was significantly higher in control pates than in the treated counterparts. At days 60 and 90, TBA-RS numbers in treated pates were significantly smaller ($P<0.05$) than in the control counterparts. Headspace solid-phase microextraction (HS-SPME) successfully isolated recognized indicators of lipid decomposition (i.e. hexanal, nonanal, hexan-1-ol, oct-1-en-3-ol, deca-(E,Z)-2,4-dienal) from liver pates whereas some other volatiles analysed are typical contributors to the overall off-flavour of oxidized liver (i.e. hept-(Z)-4-enal, non-(E)-2-enal, nona-(E,E)-2,4-dienal). The addition of antioxidants significantly ($P<0.05$) reduced the total amount of lipid-derived volatiles isolated from liver pates HS. Plant essential oils inhibited oxidative deterioration of liver pates to a higher extent than BHT did.
Keywords: Liver pate; PUFA; TBA-RS; Lipid-derived volatiles; Natural antioxidants; BHT

A. Kaya, B. Demirci, K.H.C. Baser, Micromorphology of glandular trichomes of Nepeta congesta Fisch. & Mey. var. congesta (Lamiaceae) and chemical analysis of the essential oils, South African Journal of Botany, Volume 73, Issue 1, January 2007, Pages 29-34, ISSN 0254-6299, DOI: 10.1016/j.sajb.2006.05.004.

(http://www.sciencedirect.com/science/article/B7XN9-4MD9KMF-1/2/31985335e579472e1bd24598cc37713b)
Abstract:
The micromorphology and distribution of foliar trichomes of Nepeta congesta var. congesta (Lamiaceae), a species endemic to Turkey, were investigated in order to evaluate the usefulness of this feature for systematic purpose. The aerial parts of N. congesta var. congesta bear an indumentum of glandular and non-glandular trichomes. Two types of glandular trichomes are identified. Peltate trichomes consist of a basal cell embedded in the epidermis, a stalk cell, and a four-celled secretory head. Capitate trichomes comprise either a unicellular head and uni- or bicellular stalk, or a bicellular head and unicellular stalk. Water-distilled essential oil of the aerial parts of N. congesta var. congesta was analysed by GC and GC/MS and the main components were found to be 1.8-cineole (29.9%), germacrene-D (20.3%) and sabinene (10.3%).
Keywords: Essential oil; Glandular trichomes; Micromorphology; Nepeta congesta var. congesta; SEM

G.P.P. Kamatou, A.M. Viljoen, A.C. Figueiredo, P.M. Tilney, R.L. Van Zyl, J.G. Barroso, L.G. Pedro, S.F. Van Vuuren, Trichomes, essential oil composition and biological activities of Salvia albicaulis Benth. and S. dolomitica Codd, two species from the Cape region of South Africa, South African Journal of Botany, Volume 73, Issue 1, January 2007, Pages 102-108, ISSN 0254-6299, DOI: 10.1016/j.sajb.2006.08.001.
(http://www.sciencedirect.com/science/article/B7XN9-4M340NK-1/2/44abd6647c2458f6505639aa7a43a54c)
Abstract:
An investigation of leaf indumentum, the identification of the essential oil components and assessment of various biological activities of Salvia albicaulis and S. dolomitica essential oils were carried out. Non-glandular and both peltate and capitate glandular trichomes were identified using scanning electron microscopy. The essential oil of S. albicaulis was dominated by oxygen-containing sesquiterpenes (47%), with viridiflorol (25%), 1,8-cineole (9%) and limonene (9%) as major components. S. dolomitica oil was mainly composed of oxygen-containing monoterpenes (72%), with geraniol (20%), linalyl acetate (20%) and linalool (17%) being the major components. The in vitro pharmacological properties of the essential oils were also evaluated. Antibacterial activity was assessed against Staphylococcus aureus (ATCC 25923), Bacillus cereus (ATCC 11778), Escherichia coli (ATCC 8739) and Klebsiella pneumoniae (NCTC 9633). The oils showed poor activity against E. coli (MIC value > 32 mg ml- 1), while moderate activity was obtained against the other pathogens (MIC values between 2 and 12 mg ml- 1). The results of the antiplasmodial activity evaluated against the chloroquine-resistant FCR-3 strain showed that both S. albicaulis and S. dolomitica essential oils exhibited antiplasmodial activity with IC50 values of 6 +/- 2 and 5 +/- 1 [mu]g ml- 1, respectively. The two oils also displayed anti-inflammatory activity (IC50 value: 39 +/- 4 and 65 +/- 6 [mu]g ml- 1, respectively). Poor anti-oxidant activity was obtained against the DPPH[middle dot]and the ABTS[middle dot]+ radicals (IC50 values > 100 [mu]g ml- 1). The toxicity profile of the two oils evaluated against the human kidney epithelium cells indicated some degree of toxicity in comparison to 5'-fluoro-uracil.
Keywords: Salvia albicaulis; Salvia dolomitica; Antibacterial; Antiplasmodial; Anti-inflammatory; Anti-oxidant; Toxicity; Essential oil; Linalool; Geraniol; Linalyl acetate; Viridiflorol; Trichomes

Vjera Bilusic Vundac, Hartwig W. Pfeifhofer, Adelheid H. Brantner, Zeljan Males, Misko Plazibat, Essential oils of seven Stachys taxa from Croatia, Biochemical Systematics and Ecology, Volume 34, Issue 12, December 2006, Pages 875-881, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.04.010.
(http://www.sciencedirect.com/science/article/B6T4R-4KWTFMT-1/2/8ee144f7a7db7ec64e1cddf4f9eeb81c)
Abstract:

The essential oils of Stachys alpina L., Stachys officinalis (L.) Trevis., Stachys palustris L., Stachys recta L. subsp. recta, S. recta L. subsp. subcrenata (Vis.) Briq., Stachys salviifolia Ten., and Stachys sylvatica L. were obtained by hydrodistillation and analysed by gas chromatography (GC) and gas chromatography-mass spectrometry (GC-MS). Sesquiterpene hydrocarbons were the main group of constituents of all taxa, except S. alpina, which was rich in oxygenated sesquiterpenes. S. alpina and S. palustris had a significant aldehyde fraction and a high amount of alcohols. Some differences in the essential oil composition of two subspecies of S. recta (S. recta subsp. recta and S. recta subsp. subcrenata), growing under almost identical conditions, have been found.
Keywords: Stachys; Lamiaceae; Essential oil; GC-MS

S. Ravi Kiran, K. Bhavani, P. Sita Devi, B.R. Rajeswara Rao, K. Janardhan Reddy, Composition and larvicidal activity of leaves and stem essential oils of Chloroxylon swietenia DC against Aedes aegypti and Anopheles stephensi, Bioresource Technology, Volume 97, Issue 18, December 2006, Pages 2481-2484, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.10.003.
(http://www.sciencedirect.com/science/article/B6V24-4KCRS9F-1/2/7002c15d6bd7bd12cfe45b3706ad9f92)
Abstract:
The laboratory bioassay of the essential oil and the isolated compounds from Chloroxylon swietenia against Aedes aegypti and Anopheles stephensi was carried out to evaluate the larvicidal activity. LC50 value estimated for A. aegypti and An. stephensi were 16.5 and 14.9 [mu]g/ml and 20.2 and 19 [mu]g/ml for leaf and stem oils, respectively. The three sesquiterpenes pregeijerene, geijerene and germacrene D were isolated and their Larvicidal activity was evaluated. Pregeijerene and geijerene were observed for the first time in the volatile constituents of C. swietenia, however, leaves contained higher amount of geijerene compared to stems.
Keywords: Essential oil composition; Chloroxylon swietenia; Sesquiterpenes; Pregeijerene; Aedes aegypti; Anopheles stephensi

Valtcho D. Zheljazkov, Lyle E. Craker, Baoshan Xing, Effects of Cd, Pb, and Cu on growth and essential oil contents in dill, peppermint, and basil, Environmental and Experimental Botany, Volume 58, Issues 1-3, December 2006, Pages 9-16, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2005.06.008.
(http://www.sciencedirect.com/science/article/B6T66-4H5DYDH-2/2/561055f76849662d39f050022ef2736d)
Abstract:
The hypothesis tested in this study was that some essential oil crops could be to grown as alternatives to edible crops in heavy metal enriched soils. Experiments were conducted to evaluate the effect of Cd, Pb, and Cu on yields and essential oils of peppermint, basil, and dill. The accumulation of Cd, Pb, and Cu in plant parts, in plant material and water after distillation, and in the essential oils, was also determined. Metal treatments of peppermint and basil consisted of Cd, Pb, Cu, Cd + Pb, Cd + Cu, Pb + Cu, Cd + Pb + Cu, and unamended control. Metal treatments of dill consisted of (in mg L-1): Cd at 2, 6, and 10; Pb at 50, 100, and 500; Cu at 20, 60, and 150 and an unamended control. Peppermint and basil yields were not affected by the treatments. Copper at 60 and Cu 150 mg L-1 reduced both yields and height of dill, Cu 150 mg L-1 resulted in Cu phytotoxicity symptoms and retarded growth. High Pb and Cu reduced Cd uptake by peppermint and basil. At elevated Cd concentrations in the growth medium, Cd transport from roots to shoots of the three species was impaired. The tested treatments slightly altered chemical composition of the essential oils of basil and dill, and reduced the menthol content in the peppermint oil. Oil content in basil from the CdPbCu treatment was lower that in the control. Copper application at 150 mg L-1 reduced oil content in dill relative to the control. No detectable amount of Cd, Cu, or Pb in the oils of any of the three species was found. Peppermint, basil, and dill can be grown in

soils enriched with Cd, Pb, and Cu medium without risk for metal transfer into the oils, and without significant alteration of essential oil composition that may impair marketability. Our results support the use of aromatic plants as alternative crops for Cd, Pb, and Cu enriched soils.
Keywords: Cadmium; Copper; Lead; Aromatic plants; Phytoremediation; Dill; Peppermint; Basil; Essential oil

Maryam Negahban, Saeid Moharramipour, Fatemeh Sefidkon, Chemical Composition and Insecticidal Activity of Artemisia scoparia Essential Oil against Three Coleopteran Stored-Product Insects, Journal of Asia-Pacific Entomology, Volume 9, Issue 4, December 2006, Pages 381-388, ISSN 1226-8615, DOI: 10.1016/S1226-8615(08)60318-0.
(http://www.sciencedirect.com/science/article/B8JJN-4V6TFFV-D/2/20e933083a18f0243b7f4575fbd81b14)
Abstract:
Chemical composition of the essential oil from Artemisia scoparia Waldst et Kit, and its fumigant and repellent activity were investigated against three stored product insects, Callosobruchus maculatus (Fab.), Sitophilus oryzae (L.), and Tribolium castaneum (Herbst). Dry ground leaves were subjected to hydrodistillation using a modified clevenger-type apparatus and the chemical composition of the volatile oil was studied by GC-MS. Nineteen components (99.51% of the total composition) were identified. [beta]-Pinene (19.01%), capillin (17.45%), limonene (15.11%), myrcene (10.95) were found to be the major constituents of the oil. The mortality of 1-7 day old adults of the insect pests increased with concentration from 37 to 926 [mu]L per L air and with exposure time from 3 to 24 h. A concentration of 37 [mu]L per L air and exposure time of 24 h was sufficient to obtain 100% kill of the insects. Callosobruchus maculatus was more susceptible than S. oryzae and T. castaneum. A second more detailed bioassay gave estimates for the LC50 of C. maculatus as 1.46 [mu]L per L air, S. oryzae 1.87 [mu]L per L air and T. castaneum 2.05 [mu]L per L air. Also, the essential oil was significantly more repellent to T. castaneum and S. oryzae than C. maculatus. However, half-life time of the oil for C. maculatus was longer than S. oryzae and T. castaneum. These results show the efficacy of A. scoparia oil for use in organic food protection.
Keywords: Artemisia scoparia; stored product insects; botanical insecticides; fumigant toxicity; repellent; chemical composition

Jesus Pala-Paul, Lachlan M. Copeland, Joseph J. Brophy, Robert J. Goldsack, Essential oil composition of Eryngium rosulatum P.W. Michael ined.: A new undescribed species from eastern Australia, Biochemical Systematics and Ecology, Volume 34, Issue 11, November 2006, Pages 796-801, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.06.009.
(http://www.sciencedirect.com/science/article/B6T4R-4KKFPH4-1/2/e1380c72a22cbaa27d0ded2e1115a2ee)
Abstract:
The essential oil composition from the aerial parts of a new Eryngium species from Australia, Eryngium rosulatum P.W. Michael ined., has been analysed by GC and GC/MS. A total of 34 compounds have been identified representing around 80% of the total oil. The main constituents of the oil were found to be [beta]-elemene (16.0%) and bicyclogermacrene (12.5%). Other representative compounds were identified as [delta]-elemene (7.0%) and (E)-caryophyllene (5.9%). The sesquiterpene fraction (75.0%) was predominant in the essential oil of this species, most of these were hydrocarbons (53.8%). This paper represents the first study on this new, undescribed Australian species and its chemical composition.
Keywords: Eryngium; E. rosulatum; Essential oils; [beta]-elemene; Bicyclogermacrene

Gustavo Agostini, Fabiana Agostini, Luciana Atti-Serafini, Sergio Echeverrigaray, Essential oil variability within and among populations of Cunila incisa Benth., Biochemical Systematics and

Ecology, Volume 34, Issue 11, November 2006, Pages 802-808, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.04.007.
(http://www.sciencedirect.com/science/article/B6T4R-4KW5WP0-1/2/7b895be7128b380ab32645f95767eea6)
Abstract:
To evaluate the intra- and interpopulational variability of volatile compounds in Cunila incisa, 72 samples representing 12 populations, were collected all over the distribution area of the species in Rio Grande do Sul State. The samples were extracted by steam distillation and analyzed using GC and GC-MS. A total of 19 volatile compounds were detected and identified. In average, the main compounds were 1,8-cineole, [alpha]-terpineol, p-cymene, sabinene, terpinene-4-ol, and [gamma]-terpinene. Negative correlation was detected between the concentrations of 1,8-cineole and [alpha]-terpineol. Significant variation in the concentration of volatile compounds was detected within and among populations. Multivariate analysis of volatile oil composition identified three groups. Most populations exhibited low intra-populational variation indicating foundation effect. Relation between geographic distribution and chemical composition was observed.
Keywords: Lamiaceae; Volatile oils; Chemotaxonomy; 1,8-Cineole

M.J. Jordan, R.M. Martinez, K.L. Goodner, E.A. Baldwin, J.A. Sotomayor, Seasonal variation of Thymus hyemalis Lange and Spanish Thymus vulgaris L. essential oils composition, Industrial Crops and Products, Volume 24, Issue 3, 2005 Annual Meeting of the Association for the Advancement of Industrial Crops: The International Conference on Industrial Crops and Rural Development, November 2006, Pages 253-263, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2006.06.011.
(http://www.sciencedirect.com/science/article/B6T77-4KN5C3Y-1/2/600811653d97ac04c83f49e68919c663)
Abstract:
Thymus hyemalis L. and Spanish Thymus vulgaris L. shrubs are characterized by a large chemical intraspecific variability among the plants. This fact makes it difficult to detect real changes occurring in their essential oil composition during the vegetative cycle. Based on this, the clones of T. hyemalis and Spanish T. vulgaris were used in this present work to monitor seasonal variations in the composition of the essential oil. Shrubs were harvested at five different phenological stages during the vegetative cycle. The volatile profile of the essential oil samples was determined by capillary GC/MS analyses. This technique identified 99 and 98 components in T. hyemalis and T. vulgaris essential oils, respectively.
For the Spanish T. vulgaris essential oil, the major components quantified were 1,8-cineole, followed by terpenyl acetate, borneol, linalool, [beta]-pinene, [alpha]-terpineol, and camphor. With respect to the concentrations of some of the most abundant components, the mid-vegetative stage seems to be the most appropriate harvesting time for this species. Cineol, borneol, monoterpenic hydrocarbons, and camphor exhibited their maximum relative concentrations at this phenological stage. In contrast, terpenyl acetate, [alpha]-terpineol, and linalool, probably components that are associated with the fresh aroma in the oil, were mostly concentrated from full bloom to advanced fruit formation. Correlations were detected among the concentrations of the most abundant components in this essential oil. Thus, terpenyl acetate and cineol concentrations varied during the entire vegetative cycle. The same behaviour was observed between sabinene and linalool.
For the T. hyemalis, the thymol, which defines the chemical type and the essential oil quality, and its precursors [gamma]-terpinene and p-cymene, showed synchronized patterns of variation during the entire vegetative cycle. In this way, the maximum relative concentration of [gamma]-terpinene, a precursor of p-cymene, was achieved at the full bloom (FB) phenological stage that coincided with the minimum concentration detected for p-cymene, a precursor of thymol. However, the maximum relative concentration of thymol was detected at full bloom/at the beginning of fruit maturation (FB-FR). From these observations, we can conclude that between FB and FB-FR

stages could be the period beyond which the sequence [gamma]-terpinene --> p-cymene --> thymol begins. On the other hand, the essential oil exhibited the highest amount in alcohols, ketones, and esters at the vegetative stage.
Keywords: Thymus hyemalis; Thymus vulgaris; Thyme; Essential oil; Phenological stages

K.L. Goodner, K. Mahattanatawee, A. Plotto, J.A. Sotomayor, M.J. Jordan, Aromatic profiles of Thymus hyemalis and Spanish T. vulgaris essential oils by GC-MS/GC-O, Industrial Crops and Products, Volume 24, Issue 3, 2005 Annual Meeting of the Association for the Advancement of Industrial Crops: The International Conference on Industrial Crops and Rural Development, November 2006, Pages 264-268, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2006.06.006.
(http://www.sciencedirect.com/science/article/B6T77-4KPP473-2/2/2bdf1580a2d5b957bb2d5fc98b655740)
Abstract:
Thymus hyemalis L. and Spanish T. vulgaris subsp. vulgaris shrubs are characterized by a great chemical intraspecific variability among plants. This fact makes it difficult to detect real changes occurring in their essential oil composition during the vegetative cycle. Because of this, clones of T. hyemalis and T. vulgaris were used to monitor seasonal variations in their aromatic composition of the essential oil. Shrubs were harvested at five different phenological stages during the plant vegetative cycle. Capillary GC/MS with olfactometry analysis was used to determine the volatile profile of the essential oil samples. GC-olfactometry analysis was conducted on each phenological stage for T. hyemalis and T. vulgaris. A total of 96 (T. hyemalis) and 52 (T. vulgaris) aromas were detected with the 27 (T. hyemalis) and 26 (T. vulgaris) most important reported here. The compounds with the most aroma impact for T. hyemalis were linalool, borneol, thymol, and [beta]-damascenone. The compounds with the most aroma impact for T. vulgaris were eucalyptol, borneol, terpinyl acetate, and [beta]-damascenone. [beta]-ionone, myrtenol, and [beta]-damascenone are reported for the first time.
Keywords: Thymus hyemalis; Thymus vulgaris; Thyme; Phenological stages; Olfactometry

Marco A. Curado, Carolina B.A. Oliveira, Jose G. Jesus, Suzana C. Santos, Jose C. Seraphin, Pedro H. Ferri, Environmental factors influence on chemical polymorphism of the essential oils of Lychnophora ericoides, Phytochemistry, Volume 67, Issue 21, November 2006, Pages 2363-2369, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2006.08.002.
(http://www.sciencedirect.com/science/article/B6TH7-4KVXHRW-3/2/43f737534d9088db3b6dcee98108c89e)
Abstract:
Lychnophora ericoides is a Brazilian medicinal plant used in folk medicine as an anti-inflammatory and analgesic agent. The essential oils from leaves of two populations with and without scent, collected at 2-month intervals during an 1-year period, were analysed by GC-MS. The results were submitted to principal component and cluster analysis which allowed two groups of essential oils to be distinguished with respect to sampling site and scent: cluster I (Vianopolis site, with specimens exhibiting an aromatic scent) containing a high percentage of [alpha]-bisabolol (44.7-76.4%) and [alpha]-cadinol (10.9-23.5%), and cluster II (Cristalina site, with specimens without scent) characterised by a high content of (E)-nerolidol (31.3-47.1%) and ar-dihydro-turmerone (4.8-15.4%). The canonical discriminant analysis showed that using the data set of the seven sampling months and (E)-nerolidol and [alpha]-bisabolol as predictable variables, it was possible to distinguish between the samples harvested according to Cerrado seasons, dry winter (May-September) and humid summer (November-March). In addition, canonical correlation analysis between the soil sampling sites and the populations revealed a significant relationship between oil components and edaphic factors. Oxygenated sesquiterpenes and potential acidity, Al saturation, cationic exchange capacity, silt, and sand load as the first canonical variate were fairly strongly related to samples collected in Vianopolis site. On the other hand, monoterpenes and

sesquiterpene hydrocarbons were strongly related to chemical balance in soils (organic matter, P and base saturation), which is related to samples at the Cristalina site. The chemovariation observed appears to be environmentally determined.
Keywords: Lychnophora ericoides; Asteraceae; Essential oils; Chemical variability; Edaphic factors; Canonical correlation; Canonical discriminant analysis

C.H. Liu, A.K. Mishra, R.X. Tan, C. Tang, H. Yang, Y.F. Shen, Repellent and insecticidal activities of essential oils from Artemisia princeps and Cinnamomum camphora and their effect on seed germination of wheat and broad bean, Bioresource Technology, Volume 97, Issue 15, October 2006, Pages 1969-1973, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.09.002.
(http://www.sciencedirect.com/science/article/B6V24-4HBSGV4-1/2/72079389492bafbd894022888aa89074)
Abstract:
Repellent and insecticidal activities of essential oils extracted from leaves of Artemisia princeps Pamp and seeds of Cinnamomum camphora (L.) Presl. against storage pests Sitophillus oryzae L. and Bruchus rugimanus Bohem were investigated. Results showed that the two individual oils displayed good, but their mixture (1:1) exhibited much better repellent activities at concentrations from 250 to 1000 [mu]g g-1 and insecticidal actions at concentrations [greater-or-equal, slanted]1000 [mu]g g-1 against the test beetles S. oryzae and B. rugimanus. Oils from A. princeps and C. camphora applied individually were significantly toxic to seed germination of wheat at 500 [mu]g ml-1. However, no toxic effects were found when the two oils were mixed (1:1 w/w) at the same concentration. These observations indicated that the mixture of the two plant-derived oils had a synergic effect and could be used in the control of storage pests.
Keywords: Essential oils; Artimisia princeps; Cinnamomum camphora; Insecticidal; Phytotoxic

Hui Zhang, Feng Chen, Xi Wang, Hui-Yuan Yao, Evaluation of antioxidant activity of parsley (Petroselinum crispum) essential oil and identification of its antioxidant constituents, Food Research International, Volume 39, Issue 8, October 2006, Pages 833-839, ISSN 0963-9969, DOI: 10.1016/j.foodres.2006.03.007.
(http://www.sciencedirect.com/science/article/B6T6V-4JMM4VF-1/2/7ab2d39dea6c580475c7c328f240e142)
Abstract:
Antioxidant capacities of the essential oil extracted from parsley (Petroselinum crispum) were evaluated by three different in vitro assays: [beta]-carotene bleaching assay, DPPH free radical scavenging assay and Fe2+-metal chelating assay. Results showed that the parsley oil (PO) possessed a certain degree of antioxidant activities in terms of [beta]-carotene bleaching capacity and free radical scavenging activity, but its metal chelating capacity was negligible. The antioxidant EC50 values of the [beta]-carotene bleaching assay and DPPH free radical scavenging assay of the crude PO dissolved in methanol were measured in about 5.12 and 80.21 mg/mL, respectively. However, these values were much weaker than those of BHT in 0.01 and 0.58 mg/mL, and of [alpha]-tocopherol in 0.01 and 0.10 mg/mL. Isolation and identification of the inherent antioxidants in PO involved using various chromatographic techniques including silica gel open column chromatography, normal phase-HPLC and GC-MS. Myristicin in PO was found as a dominant compound (32.75%) that exhibited a moderate antioxidant activity. Apiol was the second dominant compound (17.54%), but it might be the major contributor to the antioxidant activity of PO. These results suggest that the PO and its two major components can be potential alternative natural antioxidants.
Keywords: Parsley; Petroselinum crispum; Essential oil; Antioxidant activity; Apiol; Myristicin

B. Vukovic-Gacic, S. Nikcevic, T. Beric-Bjedov, J. Knezevic-Vukcevic, D. Simic, Antimutagenic effect of essential oil of sage (Salvia officinalis L.) and its monoterpenes against UV-induced

mutations in Escherichia coli and Saccharomyces cerevisiae, Food and Chemical Toxicology, Volume 44, Issue 10, October 2006, Pages 1730-1738, ISSN 0278-6915, DOI: 10.1016/j.fct.2006.05.011.
(http://www.sciencedirect.com/science/article/B6T6P-4K2253K-4/2/5a1948a36033c006c2d108a50fbd7d8c)
Abstract:
Mutagenic and antimutagenic potential of essential oil (EO) of cultivated sage (S. officinalis L.) and its monoterpenes: thujone, 1,8-cineole, camphor and limonene against UVC-induced mutations was studied with Salmonella/microsome, E. coli WP2, E. coli K12 [Simic, D., Vukovic-Gacic, B., Knezevic-Vukcevic, J., 1998. Detection of natural bioantimutagens and their mechanisms of action with bacterial assay-system. Mutat. Res. 402, 51-57] and S. cerevisiae D7 reversion assays. The toxicity of EO differed, depending on the strain used. The most sensitive were permeable strains TA100, TA102, E. coli K12 IB112 and non-permeable WP2. Mutagenic potential of EO and monoterpenes was not detected, with or without S9. EO reduced the number of UV-induced revertants in a concentration-dependent manner, reaching 50-70% of inhibition at the maximum non-toxic concentrations: 3 [mu]l/plate (TA102), 5 [mu]l/plate (WP2), 7.5 [mu]l/plate (IB112), 30 [mu]l/plate (E. coli K12 SY252) and 60 [mu]l/plate (D7). The metabolic activation had no effect on antimutagenic potential of EO. Similar toxicity of monoterpenes was observed in TA100, E. coli SY252 and D7, with the exception of limonene (less toxic to D7). Reduction of UV-induced revertants by non-toxic concentrations of monoterpenes, tested with SY252 and D7, reached 40-50% at 15-20 [mu]l/plate of thujone, 10 [mu]l/plate of cineole and 1-10 [mu]g/plate of camphor. Limonene showed antimutagenic effect only in D7. Our data recommend sage monoterpenes for further chemoprevention studies.
Keywords: Sage; Monoterpenes; Antimutagens; Salmonella/microsome; E. coli; S. cerevisiae

Abbas Delazar, Fahimeh Biglari, Solmaz Esnaashari, Hossein Nazemiyeh, Amir-Hossein Talebpour, Lutfun Nahar, Satyajit D. Sarker, GC-MS analysis of the essential oils, and the isolation of phenylpropanoid derivatives from the aerial parts of Pimpinella aurea, Phytochemistry, Volume 67, Issue 19, Reports on Structure Elucidation, October 2006, Pages 2176-2181, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2006.06.012.
(http://www.sciencedirect.com/science/article/B6TH7-4KFMMDP-4/2/0ba0da8bdd0d00e4377e9c5820395073)
Abstract:
A combination of vacuum liquid chromatography (VLC) and preparative thin layer chromatography (PTLC) of the dichloromethane extract of the aerial parts of the Iranian plant Pimpinella aurea afforded two phenylpropanoids, erythro-1'-(4-methoxyphenyl)-propan-1',2'-diol (1) and erythro-1'-[4-(sec-butyl)-phenyl]-propan-1',2'-diol (2), the latter being a natural product. The structures of these compounds were determined by spectroscopic means. The antioxidant properties of these compounds were assessed by the DPPH assay. The GC-MS analysis of the essential oils of P. aurea provided a chemical profile that was significantly different from the previously published reports.
Keywords: Pimpinella aurea; Umbelliferae; Apiaceae; Phenylpropanoid; Erythro-1'-(4-methoxyphenyl)-propan-1',2'-diol; Erythro-1'-[4-(sec-butyl)-phenyl]-propan-1',2'-diol; GC-MS; DPPH; Antioxidant; Chemotaxonomy

Deborah H. Markowicz Bastos, Emilia Y. Ishimoto, Marcia Ortiz M. Marques, Adalberto Fernando Ferri, Elizabeth A.F.S. Torres, Essential oil and antioxidant activity of green mate and mate tea (Ilex paraguariensis) infusions, Journal of Food Composition and Analysis, Volume 19, Issues 6-7, Biodiversity and nutrition: a common path, September-November 2006, Pages 538-543, ISSN 0889-1575, DOI: 10.1016/j.jfca.2005.03.002.

(http://www.sciencedirect.com/science/article/B6WJH-4J72YVJ-1/2/42d754eefaf787391ba4dd392b5eee36)
Abstract:
The soluble solids content, total phenolic content (Folin-Ciocalteau method), antioxidant activity (ferric thiocyanate method) and essential oil composition of green mate and mate tea (roasted green mate) infusions were analysed. The essential oil was obtained by hydrodistillation, and the volatile compounds were separated by high resolution gas chromatography and identified by mass spectrum and Kovats index. Although the antioxidant activity of green mate and mate tea infusions were equivalent, the soluble solids content in green mate was higher (4.2%) than in mate tea infusions (3.2%). Important compounds that add flavor to plant infusions--such as linalool, present in high concentrations in the green mate essential oil--were oxidized into linalool oxides after roasting. Limonene decreased from 19.5% to 7.3%, and furfural and methylfurfural were formed.
Keywords: Mate (Ilex paraguariensis); Essential oil; Antioxidant activity

Azucena Gonzalez-Coloma, Dario Martin-Benito, Nagla Mohamed, M Concepcion Garcia-Vallejo, Ana Cristina Soria, Antifeedant effects and chemical composition of essential oils from different populations of Lavandula luisieri L., Biochemical Systematics and Ecology, Volume 34, Issue 8, August 2006, Pages 609-616, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.02.006.
(http://www.sciencedirect.com/science/article/B6T4R-4K0FJWN-4/2/ebc8df874a52ed64f125b57d8e62207d)
Abstract:
Forty-seven individual Lavandula luisieri (Rozeira) Riv.-Mart. plants were grouped into six categories according to their volatile composition using Principal Component Analysis. The essential oils from flowers and leaves from these six groups were analyzed by GC-MS and their antifeedant effects tested against the insect species Spodoptera littoralis, Leptinotarsa decemlineata and Myzus persicae; L. decemlineata and M. persicae being the most sensitive species. The antifeedant effects of these oils could not be justified by the activity of their major components considered individually thus pointing to synergistic effects among the oil components as suggested by a stepwise linear regression of compound concentrations on antifeedant effects for these groups.
Keywords: Lavandula luisieri; Volatiles; Principal Component Analysis; Antifeedant

Niko Radulovic, Emilienne Mananjarasoa, Liva Harinantenaina, Asakawa Yoshinori, Essential oil composition of four Croton species from Madagascar and their chemotaxonomy, Biochemical Systematics and Ecology, Volume 34, Issue 8, August 2006, Pages 648-653, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.02.005.
(http://www.sciencedirect.com/science/article/B6T4R-4K0FJWN-1/2/10091b97810892f1bea5b0a81701b842)
Keywords: Croton antanosiensis Leandri; Croton decaryi Leandri; Croton geayi Leandri; Croton sakamaliensis Leandri; Euphorbiaceae; Essential oil; Chemotaxonomy

Bektas Tepe, H. Askin Akpulat, Munevver Sokmen, Dimitra Daferera, Onder Yumrutas, Enes Aydin, Moschos Polissiou, Atalay Sokmen, Screening of the antioxidative and antimicrobial properties of the essential oils of Pimpinella anisetum and Pimpinella flabellifolia from Turkey, Food Chemistry, Volume 97, Issue 4, August 2006, Pages 719-724, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.05.045.
(http://www.sciencedirect.com/science/article/B6T6R-4GR8N9Y-2/2/fbff30df9c15fd97873b869ab1a89265)
Abstract:
The aerial parts of two endemic Pimpinella [Pimpinella anisetum Boiss. & Ball. and Pimpinella flabellifolia (Boiss.) Benth. ex Drude] were hydro-distilled to produce oils in the yields of 2.07%

(v/w) and 2.61% (v/w), respectively. The oils were analysed by GC and GC/MS. Twenty-one and nineteen components were identified, representing 99.5% and 99.7% of the oils, respectively. The main compounds of P. anisetum were (E)-anethole (82.8%) and methyl chavicol (14.5%), whereas limonene (47.0%), (E)-anethole (37.9%) and [alpha]-pinene (6.0%) were the major constituents of P. flabellifolia. The oils were screened for their possible antioxidant activities by two complementary test systems, namely DPPH free radical-scavenging and [beta]-carotene/linoleic acid systems. In the first case, P. anisetum oil exerted greater antioxidant activity than that of P. flabellifolia oil with an IC50 value of 5.62 +/- 1.34 [mu]g/ml. In the [beta]-carotene/linoleic acid test system, the oil of P. anisetum was superior to P. flabellifolia with 70.5% +/- 2.86 inhibition rate. Essential oils of the plants studied here were also screened for their antimicrobial activities against six bacteria and two fungi. The oils showed moderate antimicrobial activity against all microorganisms tested.
Keywords: Pimpinella anisetum; Pimpinella flabellifolia; Essential oil; Antimicrobial activity; Antioxidant activity; GC-MS

F. De Pasquale, M. Siragusa, L. Abbate, N. Tusa, C. De Pasquale, G. Alonzo, Characterization of five sour orange clones through molecular markers and leaf essential oils analysis, Scientia Horticulturae, Volume 109, Issue 1, 9 June 2006, Pages 54-59, ISSN 0304-4238, DOI: 10.1016/j.scienta.2006.03.002.
(http://www.sciencedirect.com/science/article/B6TC3-4JRVD9T-7/2/65e3fa25e066a9c7bbe6a3188abd24ae)
Abstract:
Five clones of sour orange (Citrus aurantium L.) showing significant morphological differences were selected from our germplasm collection and characterized both by genetic and leaf volatiles analysis. The genetic studies were undertaken by the use of molecular markers developed by PCR-based techniques (ISSR and RAPD), while the leaf essential oil patterns were obtained by chromatographic and mass spectrometric determination. Data obtained suggest that reasonably similar information can be achieved from the two techniques, supporting each other in characterization studies.
Keywords: Citrus aurantium; Sour orange; ISSR; RAPD; Citrus rootstock; Leaf essential oil composition; GC-MS

Isa Telci, Emine Bayram, Gungor Yilmaz, Betul Avci, Variability in essential oil composition of Turkish basils (Ocimum basilicum L.), Biochemical Systematics and Ecology, Volume 34, Issue 6, June 2006, Pages 489-497, ISSN 0305-1978, DOI: 10.1016/j.bse.2006.01.009.
(http://www.sciencedirect.com/science/article/B6T4R-4JHMFR6-1/2/6cd685d0b2ea27288705ae324728a94b)
Abstract:
Sweet basil (Ocimum basilicum L.), one of the most popular aromatic plants, shows great variation in both morphology and essential oil components. In this study, the composition of 18 Turkish basil essential oils was investigated by GC and GC-MS. Variation of essential oils in the landraces was subjected to cluster analysis, and seven different chemotypes were identified. They were (1) linalool, (2) methyl cinnamate, (3) methyl cinnamate/linalool, (4) methyl eugenol, (5) citral, (6) methyl chavicol (estragol), and (7) methyl chavicol/citral. Methyl chavicol with high citral contents (methyl chavicol/citral) can be considered as a 'new chemotype' in the Turkish basils. Because methyl eugenol and methyl chavicol have structural resemblance to carcinogenic phenylpropanoids, chemotypes having high linalool, methyl cinnamate or citral contents and a mixture of these is suitable to cultivate for use in industry.
Keywords: Basil; Ocimum basilicum; Essential oil; Chemotypes; GC-MS

Antonio Miceli, Carmine Negro, Luca Tommasi, Essential oil variability in Thymbra capitata (L.) Cav. growing wild in Southern Apulia (Italy), Biochemical Systematics and Ecology, Volume 34, Issue 6, June 2006, Pages 528-535, ISSN 0305-1978, DOI: 10.1016/j.bse.2005.12.010.
(http://www.sciencedirect.com/science/article/B6T4R-4JF97TV-1/2/569c96a484f6da272de0bd9a2f212d9b)
Abstract:
Essential oils of Thymbra capitata (Thymus capitatus) collected from Southern Apulia (Italy) were analysed using gas chromatography and gas chromatography-mass spectrometry techniques, to check for chemical variability. The study showed that among the 75 components of the oils the most recurrent ones were thymol and carvacrol, which always constituted more than 50% of the oils, as well as [gamma]-terpinene, borneol and p-cymene. Cluster analysis led to the identification of three chemotypes: thymol, carvacrol and thymol/carvacrol; this was presumably a crossbreed between the other two chemotypes. Principal component analysis showed the direct correlation among myrcene, [alpha]-terpinene and [gamma]-terpinene; anti-correlation between thymol and carvacrol, and the inverse correlation between linalool and myrcene. Moreover, lower thymol concentrations were accompanied by an increase in myrcene, [alpha]-terpinene and [gamma]-terpinene.
Keywords: Thymbra capitata; Thymus capitatus; Lamiaceae; Essential oil composition; South Apulia

A.C. Seydim, G. Sarikus, Antimicrobial activity of whey protein based edible films incorporated with oregano, rosemary and garlic essential oils, Food Research International, Volume 39, Issue 5, June 2006, Pages 639-644, ISSN 0963-9969, DOI: 10.1016/j.foodres.2006.01.013.
(http://www.sciencedirect.com/science/article/B6T6V-4JB9MSJ-2/2/05939bdcb9f7a79086baa8b0a6c77bff)
Abstract:
The use of edible films to release antimicrobial constituents in food packaging is a form of active packaging. Antimicrobial properties of spice extracts are well known, however their application to edible films is limited. In this study, antimicrobial properties of whey protein isolate (WPI) films containing 1.0-4.0% (wt/vol) ratios of oregano, rosemary and garlic essential oils were tested against Escherichia coli O157:H7 (ATCC 35218), Staphylococcus aureus (ATCC 43300), Salmonella enteritidis (ATCC 13076), Listeria monocytogenes (NCTC 2167) and Lactobacillus plantarum (DSM 20174). Ten millilitres of molten hard agar was inoculated by 200 [mu]l of bacterial cultures (colony count of 1 x 108 CFU/ml) grown overnight in appropriate medium. Circular discs of WPI films containing spice extracts, prepared by casting method, were placed on a bacterial lawn. Zones of inhibition were measured after an incubation period. The film containing oregano essential oil was the most effective against these bacteria at 2% level than those containing garlic and rosemary extracts ($P < 0.05$). The use of rosemary essential oil incorporated into WPI films did not exhibit any antimicrobial activity whereas inhibitory effect of WPI film containing garlic essential oil was observed only at 3% and 4% level ($P < 0.05$). The results of this study suggested that the antimicrobial activity of some spice extracts were expressed in a WPI based edible film.
Keywords: Whey protein isolate; Edible film; Oregano; Garlic; Rosemary; Essential oils; Antimicrobial packaging

Jung-Ok Kong, Sang-Myung Lee, Yil-Seong Moon, Sang-Gil Lee, Young-Joon Ahn, Nematicidal Activity of Plant Essential Oils against Bursaphelenchus xylophilus (Nematoda: Aphelenchoididae), Journal of Asia-Pacific Entomology, Volume 9, Issue 2, June 2006, Pages 173-178, ISSN 1226-8615, DOI: 10.1016/S1226-8615(08)60289-7.
(http://www.sciencedirect.com/science/article/B8JJN-4V6TFDY-C/2/35c33c18efc8203be8cb37f7ef0de64c)

Abstract:
The nematicidal activity and poisoning symptoms of 88 plant essential oils against Bursaphelenchus xylophilus were examined by an immersion bioassay. Results were compared with those of three trunk-injection nematicides: fenitrithion, levamisol hydrochloride, and morantel tartrate. As judged by 24 h LC50 values, cinnamon bark oil (0.12 mg/ml) was the most effective nematicide, followed by coriander herb oil (0.14 mg/ml). Potent nematicidal activity was also observed with lemongrass, oregano, thyme red, and clove bud oils (LC50, 0.57-0.88 mg/ml). Fenitrothion was ineffective (LC50, > 10 mg/ml). In typical poisoning symptoms in B. xylophilus, these essential oils exerted rapid nematicidal action and the nematodes killed usually showed an extended shape, whereas levamisole hydrochloride and morantel tartrate usually exhibited semicircular and coiling shapes, respectively. The essential oils described merit further study as botanical nematicides for the control of pine wilt disease caused by B. xylophilus.
Keywords: Bursaphelenchus xylophilus; essential oil; botanical nematicide; trunk-injection nematicide; pine wilt disease; pine wood nematode

Mounia Oussalah, Stephane Caillet, Linda Saucier, Monique Lacroix, Antimicrobial effects of selected plant essential oils on the growth of a Pseudomonas putida strain isolated from meat, Meat Science, Volume 73, Issue 2, June 2006, Pages 236-244, ISSN 0309-1740, DOI: 10.1016/j.meatsci.2005.11.019.
(http://www.sciencedirect.com/science/article/B6T9G-4J3WSMS-2/2/c0f745e6c656a78c8b665b0ec8b14bd0)
Abstract:
The inhibitory effect of 60 different essential oils was evaluated on a Pseudomonas putida strain of meat origin, associated with meat spoilage. Essential oils were tested at concentrations from 0.003 to 0.8% (wt/vol) to determine minimum inhibitory and maximal tolerated concentrations (MIC and MTC, respectively) using an agar medium culture. Of the 60 samples tested, Corydothymus capitatus essential oil was the most active showing a MIC of 0.025% and a MTC of 0.06%. Seven essential oils (Cinnamomum cassia, Origanum compactum, Origanum heracleoticum, Satureja hortensis, Satureja montana, Thymus vulgaris carvacroliferum, Thymus vulgaris thymoliferum) have shown a strong antimicrobial activity against P. putida with a MIC of 0.05% and a MTC ranging from 0.013% to 0.025%. Ten other oils (Cinnamomum verum (leaf and bark), Eugenia caryophyllus, Cymbopogon martinii var. motia, Cymbopogon nardus, Melaleuca linariifolia, Origanum majorana, Pimenta dioica, Thymus satureoides, Thymus serpyllum) showed a high antimicrobial activity showing a MIC ranging from 0.1% to 0.4%, while the remaining were less active showing a MIC [greater-or-equal, slanted] 0.8%.
Keywords: Antimicrobial activity; Essential oils; Pseudomonas putida; Minimum inhibitory concentration; Maximal tolerated concentration

Davod Yadegarinia, Latif Gachkar, Mohammad Bagher Rezaei, Massoud Taghizadeh, Shakiba Alipoor Astaneh, Iraj Rasooli, Biochemical activities of Iranian Mentha piperita L. and Myrtus communis L. essential oils, Phytochemistry, Volume 67, Issue 12, June 2006, Pages 1249-1255, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2006.04.025.
(http://www.sciencedirect.com/science/article/B6TH7-4K606NS-4/2/bb9643b8a95bfa9fcb78921190fe6a1e)
Abstract:
GC-MS analysis of essential oils of Iranian Mentha piperita and Myrtus communis extracted by hydrodistillation lead to identification of 26 and 32 compounds, respectively. The oils had good to excellent antimicrobial activities against Escherichia coli, Staphylococcus aureus and Candida albicans with the oil of M. piperita being more active. The findings suggest feasibility of application of M. piperita oil in treatment of the infections caused by C. albicans and E. coli. D-values on exposure to M. piperita and Myrtus communis oils were (2.14 and 2.8 min), (1.4 and 12.8 min) and

(4.3 and 8.6 min) for E. coli, S. aureus and C. albicans , respectively. The oils were screened for their possible antioxidant activities by two complementary test systems, namely DPPH free radical scavenging and [beta]-carotene/linoleic acid systems. M. piperirta oil exerted greater antioxidant activity than that of M. communis. Phytochemical and phytobiological characteristics of these oils may lead to extraction and production of active compounds in single or combined forms with useful applications.
Keywords: Mentha piperita; Myrtus communis; Essential oil; E. coli; S. aureus; C. albicans; Antioxidant; Radical scavenging; Antimicrobial

Maria Isabella Sifola, G. Barbieri, Growth, yield and essential oil content of three cultivars of basil grown under different levels of nitrogen in the field, Scientia Horticulturae, Volume 108, Issue 4, 25 May 2006, Pages 408-413, ISSN 0304-4238, DOI: 10.1016/j.scienta.2006.02.002.
(http://www.sciencedirect.com/science/article/B6TC3-4JFHFF0-5/2/ab3115231645794e55f2e3eca230c2c6)
Abstract:
A field experiment was conducted in Southern Italy to investigate the effect of different nitrogen (N) rates (0, 100 or 300 kg ha-1) on the number of branchings and leaves per plant, plant height, yield of above-ground fresh biomass, total leaf area, dry weight, leaf-to-stem ratio, leaf essential oil content and the essential oil quality at commercial harvest (full bloom) of the three cultivars of basil (Ocimum basilicum L.): (i) 'Mostruoso mammouth' (MM); (ii) 'Genovese profumatissimo' (GP); (iii) 'Napoletano a foglia di lattuga' (NFL). Nitrogen fertilization up to 300 kg ha-1 increased yield of above-ground and leaf fresh biomass, leaf essential oil yield, but it did not affect leaf-to-stem ratio, plant height and the number of branchings per plant. The increase in essential oil yield induced by N fertilization depended on an increase in both leaf essential oil concentration and leaf biomass. The increase in LAI with increasing N fertilization was due to an increase in leaf number per plant rather than in individual leaf expansion. The cultivar GP was different in morphology from MM and NFL, since it had greater leaf number and plant height, but lower leaf-to-stem ratio and LAI. The physiological efficiency of N use (PE) in producing above-ground biomass was not related to N application whereas PE in producing essential oil (PE-oil) tended to increase with increasing levels of N applied. With regard to the effect of the cultivar, GP was less efficient in N use for oil production than MM and NFL since PE-oil of GP was lower while leaf N and PE-biomass were higher than the other cultivars. NFL was the richest in methyl chavicol but the lowest in linalool, whereas MM and GP contained linalool and eugenol.
Keywords: Above-ground fresh biomass; Chlorophyll; Ocimum basilicum L.; Plant morphology

Elba B. de la Fuente, Adriana E. Lenardis, Susana A. Suarez, Alejandra Gil, Claudio M. Ghersa, Insect communities related to wheat and coriander cropping histories and essential oils in the Rolling Pampa, Argentina, European Journal of Agronomy, Volume 24, Issue 4, May 2006, Pages 385-395, ISSN 1161-0301, DOI: 10.1016/j.eja.2006.01.004.
(http://www.sciencedirect.com/science/article/B6T67-4JD0HCM-1/2/1e73c0f83e254377b66ad120f3b1d960)
Abstract:
Intensive land use in the Rolling Pampa of Argentina have resulted in a mosaic of fields with different cultural histories creating different soil environments, which interact with crops and cropping activities producing a wide range of habitats for insects. Species and functions in canopy structure, food quality and essential oils of the crop-weed associations may vary depending on the field's cropping history and management (i.e. crops, soil degradation, weeding and fertilization). Species composition and functional structure of insect communities may respond to these changes. We studied insect communities in wheat and coriander crops that differed in their canopy structures, essential oil production, and the cropping histories of the fields on which they grew. For this purpose we planted wheat (Triticum aestivum L.), and two coriander (Coriandrum sativum L.)

landraces in plots with two levels of weeding and fertilization. The crops were grown in two consecutive years at two locations differing in cropping history and related to this in level of soil degradation. Insects were sampled in all plots at crop full flowering, and were classified and related to agronomic variables and to essential oils using multivariate techniques. Among all the environmental factors tested in this study, year and soil degradation were the main factors explaining insect community structure; and also weed community structure in unweeded plots. The proportion of essential oil components varied with cropping history, suggesting an association among soil properties indicative of soil degradation, plant chemical signals and insect distribution. Although insect community composition varied widely, functional structure was very similar among crop-weed communities. Soil degradation appeared to have affected directly crop-weed communities and insects' assemblages, since no consistent relationship was found between plant composition and insect community structure. It can be hypothesized that soil degradation might have affected the amount of volatiles produced especially by coriander, generating a 'soil degradation scent' that determined the structure in the insect community, and/or the soil itself emitted different signals, in relation to changes in its physical, chemical and biological characteristics.
Keywords: Agroecosystem; Coriander; Insect; Soil degradation; Weeding; Wheat

Mirjana Skocibusic, Nada Bezic, Valerija Dunkic, Phytochemical composition and antimicrobial activities of the essential oils from Satureja subspicata Vis. growing in Croatia, Food Chemistry, Volume 96, Issue 1, May 2006, Pages 20-28, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.01.051.
(http://www.sciencedirect.com/science/article/B6T6R-4FY296D-1/2/81873427ed7fd9d0d86c05eed53b95fa)
Abstract:
The present study describes the phytochemical profile and antimicrobial activity of Satureja subspicata Vis. essential oils, collected in Dalmatia (Croatia). Three samples of essential oils were obtained from the aerial parts of the plant by hydrodistillation and analyzed by GC-MS. From the 24 compounds representing 97.47% of the oils, carvacrol (16.76%), [alpha]-pinene (13.58), p-cymene (10.76%), [gamma]-terpinene (9.54%) and thymol methyl ether (8.83%) appear as the main components. The oils also contained smaller percentages of myrcene, linalool, [beta]-caryophyllene, limonene, geranyl acetate, 1-Octen-3-ol, nerol, thymol and borneol. Furthermore, antimicrobial activity of the oil was evaluated using agar diffusion and broth microdilution methods. The antimicrobial test results showed that the oils had a great potential antimicrobial activity against all 13 bacteria and 9 fungal strains. Gram-positive bacteria are more sensitive to the investigated oil, with a range of 0.09 to 6.25 [mu]l/ml than Gram-negative bacteria in the range which is significantly higher from 1.56 to 25.00 [mu]l/ml. Results presented here may suggest that the essential oil of S. subspicata possesses antimicrobial properties, and is therefore a potential source of antimicrobial ingredients for the food and pharmaceutical industry.
Keywords: Satureja subspicata; Essential oil; Antimicrobial activity; GC-MS

Iraj Rasooli, Mohammad Bagher Rezaei, Abdolamir Allameh, Growth inhibition and morphological alterations of Aspergillus niger by essential oils from Thymus eriocalyx and Thymus x-porlock, Food Control, Volume 17, Issue 5, May 2006, Pages 359-364, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2004.12.002.
(http://www.sciencedirect.com/science/article/B6T6S-4FM3X10-1/2/1066b46364904aab990e556d9fbd1188)
Abstract:
The antifungal effects of essential oils from Thymus eriocalyx and Thymus x-porlock were studied with special reference to the mechanism of inhibition of Aspergillus niger growth at ultrastructural level. Minimal inhibitory (MIC), minimal fungicidal (MFC) concentrations, and fungicidal kinetics of

the oils were determined. Transmission electron microscopy (TEM) of A. niger exposed to MIC levels of the oils showed irreversible damage to cell wall, cell membrane and cellular organelles. The oils analyzed by GC and GC/MS led to identification of 18 and 19 components in T. eriocalyx and T. x-porlock oils respectively. The results are compared and discussed with the data in literature. It is concluded that the essential oils could be safely used as preservatives.
Keywords: Aspergillus niger; Ultrastructure; Essential oils; Thyme

J. Lalko, A.M. Api, Investigation of the dermal sensitization potential of various essential oils in the local lymph node assay, Food and Chemical Toxicology, Volume 44, Issue 5, May 2006, Pages 739-746, ISSN 0278-6915, DOI: 10.1016/j.fct.2005.10.006.
(http://www.sciencedirect.com/science/article/B6T6P-4HP6GFG-2/2/137c5ec4c9b1b62976bcc888d0ce35aa)
Abstract:
Essential oils are commonly used fragrance ingredients. The oils themselves are complex mixtures, which may contain naturally occurring contact sensitizers. The local lymph node assay was used to evaluate the dermal sensitization potential of basil, citronella, clove leaf, geranium, litsea cubeba, lemongrass, and palmarosa oils. Three of the major components--citral, eugenol, and geraniol--were included to investigate any difference in sensitization potential arising from their exposure in a mixture. Each fragrance material was tested at five concentration ranging from 2.5% to 50% w/v in 1:3 ethanol:diethyl phthalate. The stimulation index (SI) values were calculated for each dose level, an SI [greater-or-equal, slanted] 3 was considered a positive response. The estimated concentration (EC3) required to elicit a positive was calculated and taken as a measure of relative potency. The EC3 values and potency classification for basil, clove leaf, litsea cubeba, lemongrass and palmarosa oils were calculated to be <2.5% ([greater-or-equal, slanted]moderate), 7.1% (weak), 8.4% (weak), 6.5% (weak) and 9.6% (weak), respectively. Citronella and geranium oils were negative. The individual components citral, eugenol and geraniol resulted in EC3 values of 6.3%, 5.4% and 11.4%, respectively. In general, the potency of each essential oil did not differ significantly from that observed for its main individual component.
Keywords: Essential oils; Fragrance materials; Local lymph node assay; Potency; Skin sensitization

S.F. van Vuuren, A.M. Viljoen, R.L. van Zyl, F.R. van Heerden, K. Husnu C. Baser, The antimicrobial, antimalarial and toxicity profiles of helihumulone, leaf essential oil and extracts of Helichrysum cymosum (L.) D. Don subsp. cymosum, South African Journal of Botany, Volume 72, Issue 2, May 2006, Pages 287-290, ISSN 0254-6299, DOI: 10.1016/j.sajb.2005.07.007.
(http://www.sciencedirect.com/science/article/B7XN9-4J6181X-1/2/476cdac5267dd48fa0a01c1ba6f2963c)
Abstract:
Helichrysum cymosum, an aromatic plant used in traditional medicine to treat respiratory ailments and wound infections is widely distributed throughout Southern Africa. Using bioassay-guided fractionation, an active compound was isolated using column chromatography and identified as the known phloroglucinol derivative, helihumulone (1). The antimicrobial activity (MIC), antimalarial (tritiated hypoxanthine incorporation) and toxicity (tetrazolium-based cellular viability assay) profiles were determined for the essential oil, acetone extract and helihumulone (1). The MIC ranges for essential oil, acetone extract and helihumulone (1) were 1-8, 0.078-0.313 and 0.016-0.125 (mg/ml) respectively. While the acetone extract was at least six times more active than the essential oil in the antimicrobial investigation, the antimalarial studies indicated that the essential oil was most active against the chloroquine-resistant Plasmodium falciparum FCR-3 strain (IC50 value: 0.204 +/- 0.05 [mu]g/ml). It was however, also the most toxic (IC50 value: 17.47 +/- 3.14 [mu]g/ml). The GC/MS analysis of the essential oil is also presented.
Keywords: Essential oil; Antimicrobial; Antimalarial; Toxicity; Helihumulone; Helichrysum

Silvana A. Rodriguez, Maria S. Vela Gurovic, Maria C. Mulet, Ana P. Murray, Diplotaxis tenuifolia (L.) DC., a source of a potentially antifungal essential oil containing nitrile, Biochemical Systematics and Ecology, Volume 34, Issue 4, April 2006, Pages 353-355, ISSN 0305-1978, DOI: 10.1016/j.bse.2005.09.008.
(http://www.sciencedirect.com/science/article/B6T4R-4J91NMG-1/2/883f6feafc298cf39ea59892e3d0fab2)
Keywords: Diplotaxis tenuifolia; Brassicaceae; Antifungal activity; Hydrodistillation; Nitrile

Vasant M. Kelkar, Brian W. Geils, Dennis R. Becker, Steven T. Overby, Daniel G. Neary, How to recover more value from small pine trees: Essential oils and resins, Biomass and Bioenergy, Volume 30, Issue 4, Proceedings of the third annual workshop of Task 31 'Systainable production systems for bioenergy: Impacts on forest resources and utilization of wood for energy' October 2003, Flagstaff, Arizona, USA, April 2006, Pages 316-320, ISSN 0961-9534, DOI: 10.1016/j.biombioe.2005.07.009.
(http://www.sciencedirect.com/science/article/B6V22-4J0XV75-1/2/2e018503dabe01e4a916e8c411b7abb6)
Abstract:
In recent years, the young dense forests of northern Arizona have suffered extreme droughts, wildfires, and insect outbreaks. Improving forest health requires reducing forest density by cutting many small-diameter trees with the consequent production of large volumes of residual biomass. To offset the cost of handling this low-value timber, additional marketing options for current operations are urgently needed to recover more value as wood products, energy, and chemicals. Northern Arizona forests are predominantly composed of ponderosa pine (Pinus ponderosa) which, besides producing abundant timber, can also yield many useful chemicals such as essential oils and resins.
We describe a case study to assess the opportunities, constraints, and information required to integrate recovery of essential oils into forest and mill operations as might be used in northern Arizona. Preliminary results support the proposition there is an available, large supply of biomass with high concentrations of essential oils. The chemistry and process engineering for recovering these essential oils by distillation are well known. The potential output and uses also appear attractive given the substantial United States market for such products. However, less is known of the capability of essential oils extracted from ponderosa pine to compete with products imported from other countries. A more detailed assessment of product uses and further analysis of viable markets and environmental benefits are justified.
Keywords: Essential oils; Volatile oils; Resins; Pine oil; Pine needle oil; Resource recovery; Chemicals

Won-Sik Choi, Byeoung-Soo Park, Young-Haeng Lee, Do Youn Jang, Hey Young Yoon, Sung-Eun Lee, Fumigant toxicities of essential oils and monoterpenes against Lycoriella mali adults, Crop Protection, Volume 25, Issue 4, April 2006, Pages 398-401, ISSN 0261-2194, DOI: 10.1016/j.cropro.2005.05.009.
(http://www.sciencedirect.com/science/article/B6T5T-4GVGT83-2/2/89e2db0ded8113729891b532964972ee)
Abstract:
Toxicity of various essential oils and their volatile components against the mushroom sciarid, Lycoriella mali was determined. The most potent fumigant toxicity was found in essential oil from thyme followed by the oils of sage, eucalyptus, and clove bud. [alpha]-Pinene was the most toxic fumigant compound found in thyme essential oil (air) followed by [beta]-pinene (air) and linalool (air). The mixture of [alpha]- and [beta]-pinene exhibited stronger fumigant toxicity than [alpha]- or

[beta]-pinene itself against the mushroom fly adults. Therefore, thyme essential oil, [alpha]- and [beta]-pinene could be potent fumigants to control mushroom flies during mushroom cultivation.
Keywords: Thyme essential oil; Lycoriella mali; [alpha]-Pinene; Fumigant toxicity

Nuh Boyraz, Musa Ozcan, Inhibition of phytopathogenic fungi by essential oil, hydrosol, ground material and extract of summer savory (Satureja hortensis L.) growing wild in Turkey, International Journal of Food Microbiology, Volume 107, Issue 3, 1 April 2006, Pages 238-242, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2005.10.002.
(http://www.sciencedirect.com/science/article/B6T7K-4HR727S-1/2/0e7d03708584f1c9676a872a85d519a3)
Abstract:
The antifungal activities of the essential oil, hydrosol, ground material and extract of summer savory (Satureja hortensis L.) on mycelial growth of Alternaria mali Roberts and Botrytis cinerea Pers. were determined. All doses of extract inhibited 100% the mycelial growth of both fungi, and exhibited a fungicidal effect. The 15% level of hydrosol and the 1.0% level of ground material had a 100% effect on B. cinerea. The other doses showed weak inhibition on mycelial growth of the fungi, and antifungal activity of the essential oil varied depending on concentrations. While the levels of essential oil show fungistatic effect, the increasing doses of hydrosol and ground material showed a fungicidal effect against B. cinerea and A. mali. While the ground material had not showed any fungicidal activity against mycelial growth of A. mali, the 1% and 1.5% levels of the ground material exhibited a fungicidal effect on B. cinerea. The results obtained from this study may contribute to the development of environmentally safer alternatives to protect the spoilage of food products from pathogenic and saprophytic fungi.
Keywords: Inhibition; Pathogens; Fungi; Summer savory; Essential oil; Hydrosol; Extract

Onder Calmasur, Irfan Aslan, Fikrettin Sahin, Insecticidal and acaricidal effect of three Lamiaceae plant essential oils against Tetranychus urticae Koch and Bemisia tabaci Genn., Industrial Crops and Products, Volume 23, Issue 2, March 2006, Pages 140-146, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2005.05.003.
(http://www.sciencedirect.com/science/article/B6T77-4GJM3M1-1/2/088585509162b5e3e6a9115b06b2af82)
Abstract:
Tetranychus urticae Koch (Acari: Tetranychidae) and Bemisia tabaci Genn. (Homoptera: Aleyrodidae) are two economically important pests of greenhouse vegetables and ornamentals. The management is commonly done based on repetitive applications of chemicals, resulting in environmental pollution and resistance in pest population.
In the present study, essential oil vapours from Micromeria fruticosa L., Nepeta racemosa L. and Origanum vulgare L. (Lamiaceae) were tested for toxicities against the nymphs and/or adults of T. urticae and the adults of B. tabaci. Amounts of the essential oils applied were 2, 4, 6 and 8 [mu]l in each of the desiccators with 4 l capacity, corresponding to 0.5, 1, 1.5 and 2 [mu]l/l air. The essential oil vapours of all three plant species caused the highest mortality in 2 [mu]l/l air doses and at 120 h of exposure in both of two pests' species. In general, higher mortality was observed as the doses of essential oils and exposure period increased. T. urticae was more tolerant than B. tabaci at all doses of essential oils in all times. The data may suggest that essential oils of all three plants have potential to be used for management of T. urticae and B. tabaci pests in greenhouse conditions.
Keywords: Tetranychus urticae; Bemisia tabaci; Essential oil; Natural insecticide; Natural acaricide

Saban Kordali, Irfan Aslan, Onder Calmasur, Ahmet Cakir, Toxicity of essential oils isolated from three Artemisia species and some of their major components to granary weevil, Sitophilus

granarius (L.) (Coleoptera: Curculionidae), Industrial Crops and Products, Volume 23, Issue 2, March 2006, Pages 162-170, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2005.05.005.
(http://www.sciencedirect.com/science/article/B6T77-4GMS96X-1/2/41c84e068278748a20b923f893e77e00)
Abstract:
The essential oils of aerial parts of three Artemisia species (A. absinthium, A. santonicum and A. spicigera) were isolated by hydrodistillation method and tested for their toxicity against to granary weevil, Sitophilus granarius (L.) (Coleoptera: Curculionidae). All of the essential oils tested were found to be toxic to adults of S. granarius. The oils showed about 80-90% mortality of granary weevil, S. granarius at a dose of 9 [mu]l/l air after 48 h of exposure. The constituents of these oils isolated from Artemisia spp. were also analyzed by GC-MS method. Camphor, 1,8-cineole, chamazulene, nuciferol propionate, nuciferol butanoate, caryophyllene oxide, terpinen-4-ol, borneol and [alpha]-terpineol were the predominant components of the oils. Some pure compounds (camphor, 1,8-cineole, terpinen-4-ol, borneol, bornyl acetate and [alpha]-terpineol) identified as major component in the oils, at 0.5, 0.75 and 1 [mu]l/l air doses were also tested for their toxicity against S. granarius. While all pure compounds were found to be toxic against S. granarius, 1,8-cineole and terpinen-4-ol were more toxic among the tested pure compounds. 1,8-Cineole and terpinen-4-ol showed 100% mortality at all doses after 12 h of exposure. It can be concluded that essential oils of three Artemisia species and their major components, 1,8-cineole and terpinen-4-ol are potential control agents against S. granarius.
Keywords: Artemisia spp.; Sitophilus granarius; 1,8-Cineole; Terpinen-4-ol; Essential oil; Fumigation; Toxicity

Maiyam Negahban, Saeid Moharramipour, Fatemeh Sefidkon, Insecticidal Activity and Chemical Composition of Artemisia sieben Besser Essential Oil from Karaj, Iran, Journal of Asia-Pacific Entomology, Volume 9, Issue 1, March 2006, Pages 61-66, ISSN 1226-8615, DOI: 10.1016/S1226-8615(08)60276-9.
(http://www.sciencedirect.com/science/article/B8JJN-4V6K5MX-B/2/b6c435650b25c82e6aa893926c35d735)
Abstract:
Atremisia sieberi Besser is a widely distributed plant that grows in many areas of Iran and has strong insecticidal activity against stored product pests, so an experiment was conducted to investigate fumigant toxicity of the A. sieberi oil collected from Karaj region of Iran. The oil was applied against one to seven day old adults of three major stored product insects including: Callosobruchus maculatus (Fab.), Sitophilus oryzae (L.), and Tribollium castaneum (Herbst). The potency of fumigant toxicity of A. sieberi on C. maculatus was higher (LC50: 1.64 [mu]L per L) than S. oryzae (LC50: 4.41 [mu]L per L) and T. castaneum (LC50: 20.31 [mu].L per L). The relationships between the time exposure and oil concentration on mortality show that the mortality was increased as oil concentration and exposure time was increased. The concentration of 185 [mu]L per L and exposure time of 24h was enough to obtain 100% kill of the insects. It was also found that the regions where A. sieberi grows affect essential oil components of the plant and can play an important role in properties of fumigant toxicity.
Keywords: Artemisia sieberi; fumigant toxicity; botanical insecticides; stored product insects; chemotype

David N. Price, Michael S. Berry, Comparison of effects of octopamine and insecticidal essential oils on activity in the nerve cord, foregut, and dorsal unpaired median neurons of cockroaches, Journal of Insect Physiology, Volume 52, Issue 3, March 2006, Pages 309-319, ISSN 0022-1910, DOI: 10.1016/j.jinsphys.2005.11.010.
(http://www.sciencedirect.com/science/article/B6T3F-4J0NYD6-1/2/4e4522a3499149b7543acb03cac2a205)

Abstract:
Essential oil constituents were tested for their neurophysiological effects in Periplaneta americana and Blaberus discoidalis. Eugenol depressed spontaneous and stimulus-evoked impulses recorded extracellularly in the abdominal nerve cord, with an almost complete block of spikes at 2x10-3 M. Geraniol and citral had similar depressive effects but increased spontaneous firing at lower doses (threshold 2.5x10-4 M). Similar effects occurred in dorsal unpaired median (DUM) neurons, recorded intracellularly in the isolated terminal abdominal ganglion of P. americana. Spontaneous firing was progressively reduced by increasing concentrations of eugenol, whereas geraniol and citral produced biphasic effects (excitation at 10-4 M, depression at 2x10-3 M). All three oils decreased excitability of silent DUM neurons that were depolarised by applied current, but eugenol (at 10-3 M) also changed the firing pattern from single spikes to bursts driven by plateau potentials. All oils reduced spike undershoot. Low doses of citral and geraniol (threshold ca. 10-4 M) reversibly increased the frequency of spontaneous foregut contractions and abolished them at 2x10-3 M (together with response to electrical stimulation). Eugenol reversibly reduced spontaneous activity at 10-4 M and above.
Eugenol has been reported to exert its insecticidal properties via a low-dose activation of octopamine receptors. In our studies, however, octopamine was found to have opposing effects to eugenol on DUM neurons and foregut activity (excitatory in both). Furthermore, eugenol did not affect the response to octopamine in DUM neurons. These results suggest that reported effects of eugenol were on a different sub-type of octopamine receptor.
Keywords: Cockroach; Neurophysiology; Citral; Geraniol; Eugenol

Barakat S.M. Mahmoud, Koji Yamazaki, Kazuo Miyashita, Yuji Kawai, Il-Shik Shin, Tetsuya Suzuki, Preservative effect of combined treatment with electrolyzed NaCl solutions and essential oil compounds on carp fillets during convectional air-drying, International Journal of Food Microbiology, Volume 106, Issue 3, 15 February 2006, Pages 331-337, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2005.09.010.
(http://www.sciencedirect.com/science/article/B6T7K-4HGD715-1/2/ad434d2d33b8e606bb01580c6c0d4f6c)
Abstract:
The antimicrobial and antioxidant effects on carp fillet samples of treatments with alkaline electrolyzed NaCl solution EW (-) prior to treatment with acidic electrolyzed NaCl solution EW (+) and 1% solutions of the essential oils consisting of 0.5% carvacrol and 0.5% thymol (1% Cv + Ty) were tested. First carp fillet samples were treated with EW (-), then EW (+), followed by 1% (C + T), represented as [EW (-)/EW (+) / 1% (Cv + Ty)] for 15 min, during drying at 45 [degree sign]C. Samples were subsequently evaluated by microbiological, chemical and sensory analyses. Microbiological analyses indicated that the initial total microbial counts of samples treated with EW (-)/EW (+), 1% (Cv + Ty) or EW (-)/EW (+) / 1% (Cv + Ty) were significantly ($p <= 0.05$) reduced, compared with the control sample. Treatment with EW (-)/EW (+) / 1% (Cv + Ty) gave the strongest overall inhibition of microbial growth when compared to all of the other treatments. The volatile basic nitrogen (VBN) value of samples treated with EW (-)/EW (+) / 1% (Cv + Ty) was kept at low level (18.46 +/- 0.45) until the end of drying period (5 days), compared with control samples (40.33 +/- 0.58). Treatment with EW (-)/EW (+) / 1% (Cv + Ty) during drying significantly reduced the peroxide values (PV) and thiobarbituric acid values (TBA). Sensory evaluation indicated that there were significant differences ($p <= 0.05$) in the color, odor, taste, flavor and texture, on the end of the 5-day drying period between samples treated with EW (-)/EW (+) / 1% (Cv + Ty), as compared to all of the other treatments. We conclude that treatment with EW (-)/EW (+) / 1% (Cv + Ty) had stronger antimicrobial and antioxidant effects than all of the other treatments on carp fillets during drying, and could be a good alternative to artificial preservatives in food industry.

Keywords: Acidic electrolyzed solution [EW (+)]; Alkaline electrolyzed solution [EW (-)]; Antimicrobial; Antioxidant; Carp fillets; Carvacrol (Cv); Drying; Electrolyzed NaCl solutions (EW); Thymol (Ty)

Mario Estevez, Ramon Cava, Effectiveness of rosemary essential oil as an inhibitor of lipid and protein oxidation: Contradictory effects in different types of frankfurters, Meat Science, Volume 72, Issue 2, February 2006, Pages 348-355, ISSN 0309-1740, DOI: 10.1016/j.meatsci.2005.08.005.
(http://www.sciencedirect.com/science/article/B6T9G-4HC0R7J-1/2/503e5de2b160cd8c8495c5e530332b53)
Abstract:
The effect of increasing levels (150, 300 and 600 ppm) of rosemary essential oil on lipid and protein oxidation and the increase of non-heme iron (NHI) content during refrigeration (+4 [degree sign]C/60 days) of frankfurters produced with tissues from Iberian pigs (IF) or white pigs (WF), was studied. Frankfurters with no added essential oil were used as controls. Iberian pigs were free-range reared and fed on acorns and pasture whereas white pigs (Large-white x Landrance) were intensively reared and fed on a mixed diet. Large differences were detected between types of frankfurters (Iberian vs white) in terms of fatty acid composition and tocopherols content due to the different feeding background of the animals. The effect of the addition of rosemary essential oil on the oxidative stability of frankfurters depended on the level of added essential oil and the characteristic of the frankfurter. The rosemary essential oil successfully inhibited the development of lipid and protein oxidation in IF with that antioxidant effect being more intense at higher concentrations of essential oil. In WF, 150 ppm rosemary essential oil showed an antioxidant effect, significantly reducing the generation of lipid and protein oxidation products. At higher levels (300 and 600 ppm) the essential oil had, in general, no effect on lipid oxidation while significantly enhanced the oxidation of proteins and the release of iron from myoglobin. The presence of certain amounts of tocopherols in the frankfurters could have influenced the activity displayed by the added essential oil leading to antioxidant or prooxidants effects though the different fatty acid composition and oxidative status between frankfurters could also have had an effect.
Keywords: Protein oxidation; Lipid oxidation; Frankfurters; Non-heme iron; Rosemary; Vitamin E; Fatty acids

A.M. Viljoen, B. Demirci, K.H.C. Baser, C.J. Potgieter, T.J. Edwards, Microdistillation and essential oil chemistry--a useful tool for detecting hybridisation in Plectranthus (Lamiaceae), South African Journal of Botany, Volume 72, Issue 1, February 2006, Pages 99-104, ISSN 0254-6299, DOI: 10.1016/j.sajb.2005.05.003.
(http://www.sciencedirect.com/science/article/B7XN9-4HVW8V1-3/2/bb688c6db1d73c01543c60edeab4d019)
Abstract:
The essential oil composition is reported for Plectranthus ciliatus, Plectranthus zuluensis and their putative hybrid. The essential oil chemistry is in support of morphological data and pollination studies, which have indicated a natural hybrid between P. ciliatus and P. zuluensis. The hybrid plant contains terpenoids from both putative parents together with `hybrid compounds,' which are not present in any of the two parents. The composition of the essential oil obtained through microdistillation is virtually identical to the analysis of the hydrodistilled essential oil.
Keywords: Plectranthus; Essential oil; Chemotaxonomy; Hybridisation

M. Valero, M.J. Giner, Effects of antimicrobial components of essential oils on growth of Bacillus cereus INRA L2104 in and the sensory qualities of carrot broth, International Journal of Food Microbiology, Volume 106, Issue 1, 15 January 2006, Pages 90-94, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2005.06.011.

(http://www.sciencedirect.com/science/article/B6T7K-4H8FPHH-1/2/b4ebd562acc305d04552846e6191505d)
Abstract:
The possible use of antimicrobials from seven plant essential oils as food preservatives was studied by examining their effects on the growth kinetics of activated Bacillus cereus INRA L2104 spores inoculated into tyndallized carrot broth. The effects of various concentrations of borneol, carvacrol, cinnamaldehyde, eugenol, menthol, thymol, and vanillin were determined. Five microliters of cinnamaldehyde, 15 [mu]l of carvacrol, or 30 mg of thymol per 100 ml of inoculated carrot broth completely inhibited bacterial growth for more than 60 days at 16 [degree sign]C. Lower concentrations of the three antimicrobials prolonged the lag phase and reduced both the exponential growth rate and the final population densities of cultures. The study of the sensory characteristics of the supplemented broths suggested that low concentration of cinnamaldehyde enhanced the taste of carrot broth, and that it did not have any adverse effect on the taste and smell of carrot broth at concentrations less than 6 [mu]l 100 ml- 1.
Keywords: Bacillus cereus; Natural antimicrobial compounds; Essential oil components; Carvacrol; Cinnamaldehyde; Thymol

Miyuki Nitta, Hidetaka Kobayashi, Mayumi Ohnishi-Kameyama, Tsukasa Nagamine, Mitsuru Yoshida, Essential oil variation of cultivated and wild Perilla analyzed by GC/MS, Biochemical Systematics and Ecology, Volume 34, Issue 1, January 2006, Pages 25-37, ISSN 0305-1978, DOI: 10.1016/j.bse.2005.05.006.
(http://www.sciencedirect.com/science/article/B6T4R-4GXW95Y-4/2/8636d632d52368b71c840b7e9e3bd22d)
Abstract:
Twenty components extracted from the essential oil in the leaves of 172 samples of Perilla frutescens var. crispa (vegetable crop form), P. frutescens var. frutescens (oil crop form), the wild/weedy form of P. frutescens, and three wild Perilla species, Perilla citriodora, Perilla hirtella and Perilla setoyensis were analyzed using GC/MS. A wide range of essential oil components were found among the wild/weedy form of P. frutescens, whereas distinctive components were detected in each wild Perilla species. Egomaketone, asaron, methyleugenol and 4,6-dimethoxy- or 4,7-dimethoxy-5-(2-propenyl)-1,3-dioxaindan were detected from Perilla for the first time. Limonene derivatives, piperitone and piperitenone, were detected from P. citriodora. Discovery of the limonene derivatives in this Perilla species provides evidence of this wild species being a genome donor of P. frutescens, while limonene synthase has been considered to be a specific enzyme in cultivated P. frutescens. These results will be useful for the evaluation and utilization of Perilla genetic resources.
Keywords: Perilla; Lamiaceae; Essential oil; GC/MS; Biosynthetic pathways

Jesus Pala-Paul, Lachlan M. Copeland, Joseph J. Brophy, Robert J. Goldsack, Essential oil composition of two variants of Prostanthera lasianthos Labill. from Australia, Biochemical Systematics and Ecology, Volume 34, Issue 1, January 2006, Pages 48-55, ISSN 0305-1978, DOI: 10.1016/j.bse.2005.04.003.
(http://www.sciencedirect.com/science/article/B6T4R-4H27CC2-1/2/0314c7380b73e078cca46142b0b41e52)
Abstract:
The essential oils from the leaves of two variants of Prostanthera lasianthos Labill. have been analysed by GC and GC/MS. The different samples studied showed two chemotypes, the rheophytic variant, chemotype 1,8-cineole and [beta]-pinene and the smooth-leaved variant with the chemotype linalool, linalyl acetate and [beta]-selinene. The percentage composition of these compounds were 57.3-66.0%, 9.2-10.2%, 13.8-24.6%, 13.8-19.1% and 7.8-14.2%, respectively. One of the samples (P.l.n2) showed intermediate values so it could be a hybrid although it was

morphologically similar to smooth-leaved variant. According to our chemical results and previous morphological studies we think that both variants could be recognised as distinct taxa level (subspecies or species) although further genetic research should be done to confirm this hypothesis.
Keywords: Prostanthera lasianthos; Essential oils; Chemotypes; 1,8-Cineole; Linalool; Linalyl acetate

Sen-Sung Cheng, Ju-Yun Liu, Yen-Ray Hsui, Shang-Tzen Chang, Chemical polymorphism and antifungal activity of essential oils from leaves of different provenances of indigenous cinnamon (Cinnamomum osmophloeum), Bioresource Technology, Volume 97, Issue 2, January 2006, Pages 306-312, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.02.030.
(http://www.sciencedirect.com/science/article/B6V24-4FXWWMS-2/2/2d35a73fb07042f29bc397aa5edde7dd)
Abstract:
The essential oils isolated from nine geographical provenances of indigenous cinnamon (Cinnamomum osmophloeum Kaneh.) leaves were examined by GC-MS and their chemical constituents were compared. According to GC-MS and cluster analyses the leaf essential oils of the nine provenances and their relative contents were classified into six chemotypes--cinnamaldehyde type, cinnamaldehyde/cinnamyl acetate type, cinnamyl acetate type, linalool type, camphor type and mixed type. In addition, the antifungal activities of leaf essential oils and their constituents from six chemotypes of indigenous cinnamon were investigated in this study. Results from the antifungal tests demonstrated that the leaf essential oils of cinnamaldehyde type and cinnamaldehyde/cinnamyl acetate type had an excellent inhibitory effect against white-rot fungi, Trametes versicolor and Lenzites betulina and brown-rot fungus Laetiporus sulphureus. The antifungal indices of leaf essential oils from these two chemotypes at the level of 200 [mu]g/ml against T. versicolor, L. betulina and L. sulphureus were all 100%. Among them, the IC50 (50% of inhibitory concentrations) value of the essential oil of cinnamaldehyde type leaf against L. sulphureus was 52-59 [mu]g/ml. Cinnamaldehyde possessed the strongest antifungal activities in comparison with other constituents of the essential oils from cinnamaldehyde type leaf, at the level of 100 [mu]g/ml its antifungal indices against T. versicolor, L. betulina and L. sulphureus were 100%. The IC50 values of cinnamaldehyde against T. versicolor, L. betulina and L. sulphureus were 73, 74 and 73 [mu]g/ml, respectively.
Keywords: Cinnamomum osmophloeum; Essential oils; Leaf; Chemotypes; GC-MS; Cinnamaldehyde; Antifungal activity

Barakat S.M. Mahmoud, K. Yamazaki, K. Miyashita, Il. Shin, T. Suzuki, A new technology for fish preservation by combined treatment with electrolyzed NaCl solutions and essential oil compounds, Food Chemistry, Volume 99, Issue 4, 2006, Pages 656-662, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.08.037.
(http://www.sciencedirect.com/science/article/B6T6R-4H9GRRJ-6/2/d93ba03b0441ed4af10316a005e28c16)
Abstract:
This study was undertaken to establish a new technology, using pre-treatment with electrolyzed NaCl solutions and essential oil compounds, to extend the shelf-life of carp fillets. Samples of skinless carp fillets were treated with 100-fold (by weight) of electrolyzed NaCl solutions [cathodic solution, EW(-) and/or anodic solution, EW(+)] and 1% oil (0.5% carvacrol + 0.5% thymol) [1%(C + T)]. Then chemical [pH, volatile basic nitrogen, peroxide value, and thiobarbituric acid], microbiological (total viable count) and sensory analyses were used to evaluate the preservative effect of this new technology during storage at 5 and 25 [degree sign]C. Our results from the chemical assays indicated that EW(-), followed by EW(+) and subsequently 1%(C + T) [EW(-)/EW(+)/1%(C + T)], significantly suppressed the lipid oxidation compared with other treatments.

Data from sensory evaluation and microbiological assay showed that treatment with EW(-)/EW(+)/1%(C + T) extended the shelf-life of carp fillets to 16 and 1.3 days compared with 4 and 0.3 days for the control samples during storage at 5 and 25 [degree sign]C, respectively.
Keywords: Antioxidant; Antimicrobial; Carp fillets; Carvacrol (C); Electrolyzed NaCl solutions (EW); Shelf-life; Thymol (T)

Fatemeh Sefidkon, Khadijeh Abbasi, Gholamreza Bakhshi Khaniki, Influence of drying and extraction methods on yield and chemical composition of the essential oil of Satureja hortensis, Food Chemistry, Volume 99, Issue 1, 2006, Pages 19-23, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.07.026.
(http://www.sciencedirect.com/science/article/B6T6R-4H9YCG6-1/2/a5dd0c9ef012887fc48aefcfef5dd0d0)
Abstract:
The aerial parts of Satureja hortensis, cultivated in Iran (Research Station of Alborz, Karaj), were collected at the full-flowering stage and dried by three different drying methods (sun-drying, shade-drying and oven-drying at 45 [degree sign]C). The essential oils of every treatment were obtained by hydro-distillation of the aerial parts. In addition, the essential oil of shade-dried sample was obtained by two other distillation methods (water- and steam-distillation and direct steam-distillation). The oils were analyzed by capillary GC and GC-MS. Statistical analysis showed no significant difference between oil yield (w/w) of the oven-dried sample (1.06%) compared to shade-dried (0.94%) and sun-dried (0.87%). The oil content of the shade-dried sample, obtained by hydro-distillation, was higher (0.94%) than that of the steam-distilled (0.27%). Twenty-three components were identified in the oil of S. hortensis in the different drying methods, including carvacrol (46.0-48.1%) and [gamma]-terpinene (37.7-39.4%) as main components. Seventeen compounds were characterized in the oils of different distillation methods, including carvacrol (12.3-46%) and [gamma]-terpinene (37.7-70.4%). Although the drying methods had no significant effect on oil composition of S. hortensis, the distillation changed the percentage of main components sharply (significant at 1%). The steam-distillation method produced the lowest amount of carvacrol and highest amount of [gamma]-terpinene. The results showed that extraction by hydro-distillation gave the best results for S. hortensis, based on oil yield and carvacrol percentage.
Keywords: Satureja hortensis; Essential oil; Drying methods; Distillation methods; Carvacrol; [gamma]-terpinene

Qingbiao Wang, Yong Yang, Xiaomin Zhao, Bin Zhu, Peng Nan, Jiayuan Zhao, Li Wang, Fan Chen, Zhijun Liu, Yang Zhong, Chemical variation in the essential oil ofEphedra sinica from Northeastern China, Food Chemistry, Volume 98, Issue 1, 2006, Pages 52-58, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2005.04.033.
(http://www.sciencedirect.com/science/article/B6T6R-4GWC297-3/2/d3bd668122379ca8b5a13751c03712fe)
Abstract:
Hydro-distillated volatile oils of Ephedra sinica Stapf. from six populations of Inner Mongolia in Northeastern China were analyzed by using GC/MS. Ninety-nine compounds were identified in the oils and a relatively high variation in their contents was found. The main constituents of the essential oils were [alpha]-terpineol (19.28-52.23%), p-vinylanisole (0.59-11.64%), 3-methyl-2-buten-1-ol (0-5.44%), tetramethylpyrazine (0.63-8.99%), terpine-4-ol (1.17-4.37%), [alpha]-linalool (1.62-5.15%), phytol (1.24-15.73%), [gamma]-eudesmol (0-7.77%), and eudesm-7(11)-en-4-ol (0.41-6.13). Six populations were divided into two chemotypes based on cluster analysis and principal component analysis (PCA); one rich in [alpha]-terpineol and p-vinylanisole, and the other rich in phytol, [gamma]-eudesmol, and eudesm-7(11)-en-4-ol.
Keywords: Ephedra sinica; Essential oils; GC/MS; Chemotype; Northeastern China

J. Wang, F. Zhu, X.M. Zhou, C.Y. Niu, C.L. Lei, Repellent and fumigant activity of essential oil from Artemisia vulgaris to Tribolium castaneum (Herbst) (Coleoptera: Tenebrionidae), Journal of Stored Products Research, Volume 42, Issue 3, 2006, Pages 339-347, ISSN 0022-474X, DOI: 10.1016/j.jspr.2005.06.001.
(http://www.sciencedirect.com/science/article/B6T8Y-4H7TD0J-2/2/5868dc55bf9095afbebe3328eced272f)
Abstract:
Repellent and fumigant activity of the essential oil of mugwort, Artemisia vulgaris, against the stored-product insect pest, Tribolium castaneum was investigated. Artemisia vulgaris oil had a very strong repellent activity to adults and was significantly repellent at a 0.6 [mu]L/mL (v/v) and higher in a filter-paper arena test. The oil had high fumigant activity against adults and larvae with adults much more susceptible than larvae. At 8.0 [mu]L/mL, mortality of adults reached 100%, but with 12-, 14- and 16-day larvae, mortalities were 49%, 53% and 52%, respectively. The oil also had high-fumigant activity against eggs and toxicity progressively increased with increased exposure time and concentration. At dosages of 10, 15 and 20 [mu]L/L air and a 96 h exposure period, mortality reached 100%. Regression analysis of data on individuals fumigated in the larval stage confirmed that the percentage of larvae reaching the pupal stage and the percentage of pupae that reached the adult stage, decreased significantly with increase in dosage concentration. No larvae, pupae and adults were observed following a 60 [mu]L/L dosage.
Keywords: Artemisia vulgaris; Essential oil; Repellent; Fumigant; Tribolium castaneum

Pedro A.G. Santos, Jose G. Barroso, A. Cristina Figueiredo, Luis G. Pedro, Ligia R. Salgueiro, Susana S. Fontinha, Stanley G. Deans, Johannes J.C. Scheffer, Chemical polymorphism of populations of Thymus caespititius grown on the islands Corvo, Flores, Sao Miguel and Terceira (Azores) and on Madeira, assessed by analysis of their essential oils, Plant Science, Volume 169, Issue 6, December 2005, Pages 1112-1117, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2005.07.004.
(http://www.sciencedirect.com/science/article/B6TBH-4GTWRT7-1/2/05c8804e2fc7516eb0fa1f39d826ebb9)
Abstract:
The composition of the essential oils isolated from 24 populations of Thymus caespititius collected on Corvo, Flores, Sao Miguel and Terceira (Azores) and on Madeira were studied by GC and GC-MS. All the oil samples analysed were dominated by their monoterpene fraction (66-89%). In the Azorean populations, the proportion of the oxygenated monoterpenes (51-79%) was higher than that of the monoterpene hydrocarbons (8-27%). In contrast, the monoterpene hydrocarbons and the oxygenated monoterpenes represented 35-44 and 42-43%, respectively, of the total oils from the populations grown on Madeira. Cluster analysis of the identified components with a concentration >=1% grouped the oils into three main clusters that corresponded with their main components: carvacrol (41-65%), thymol (35-51%) and [alpha]-terpineol (33-37%). Although the populations collected on Madeira were grouped in the same cluster, the chiral analysis of sabinene, terpinen-4-ol and [alpha]-terpineol showed that there was a clear chemical polymorphism. Actually, in the oils from two populations (-)-sabinene, (-)-terpinen-4-ol and (+)-[alpha]-terpineol were the predominant enantiomers while in that from the third population an opposite ratio was found. The chemical polymorphism of the essential oils from T. caespititius may result either from the genetic variability of the populations or from the influence of edaphic factors.
Keywords: Thymus caespititius; Lamiaceae; Essential oil; Chemotypes; Azores; Madeira; Thymol; Carvacrol; [alpha]-Terpineol; Chiral analysis

Veena Prajapati, A.K. Tripathi, K.K. Aggarwal, S.P.S. Khanuja, Insecticidal, repellent and oviposition-deterrent activity of selected essential oils against Anopheles stephensi, Aedes aegypti

and Culex quinquefasciatus, Bioresource Technology, Volume 96, Issue 16, November 2005, Pages 1749-1757, ISSN 0960-8524, DOI: 10.1016/j.biortech.2005.01.007.
(http://www.sciencedirect.com/science/article/B6V24-4FJXN56-7/2/91dc68aa24f5e2944c69d1995dac9b67)
Abstract:
Essential oils extracted from 10 medicinal plants were evaluated for larvicidal, adulticidal, ovicidal, oviposition-deterrent and repellent activities towards three mosquito species; Anopheles stephensi, Aedes aegypti and Culex quinquefasciatus. The essential oils of Juniperus macropoda and Pimpinella anisum were highly effective as both larvicidal and ovicidal. The essential oil of P. anisum showed toxicity against 4th instar larvae of A. stephensi and A. aegypti with equivalent LD95 values of 115.7 [mu]g/ml, whereas it was 149.7 [mu]g/ml against C. quinquefasciatus larvae. Essential oils of Zingiber officinale and Rosmarinus officinalis were found to be ovicidal and repellent, respectively towards the three mosquito species. The essential oil of Cinnamomum zeylanicum resulted into highest repellent (RD95) values of 49.6, 53.9 and 44.2 mg/mat against A. stephensi, A. aegypti and C. quinquefasciatus, respectively apart from oviposition-deterrent potential.
Keywords: Anopheles stephensi; Aedes aegypti; Culex quinquefasciatus; Essential oils; Oviposition-deterrence; Repellent; Insecticidal

S.A. Rezzoug, C. Boutekedjiret, K. Allaf, Optimization of operating conditions of rosemary essential oil extraction by a fast controlled pressure drop process using response surface methodology, Journal of Food Engineering, Volume 71, Issue 1, November 2005, Pages 9-17, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2004.10.044.
(http://www.sciencedirect.com/science/article/B6T8J-4F1J8NW-4/2/4682cacd61c4e9b66fd2908f1928fbc8)
Abstract:
Response surface methodology (RSM) was used to evaluate the effects of processing parameters of a recent extraction process: the fast controlled pressure drop (DIC, 'Detente Instantanee Controlee') on the extraction yield of rosemary essential oil. This process involves subjecting the rosemary leaves for a short period of time to a steam absolute pressure varying from 50 to 550 kPa and then dropping the pressure instantaneously to a vacuum at 50 kPa. In this study, the tested parameters were the processing pressure, the processing time and the initial moisture content of leaves before treatment and the responses were the global extraction yield and the extraction yield of the essential oil compounds namely [alpha]-pinene, camphene, 1,8-cineole, camphor, borneol and [alpha]-terpineol. The optimum processing conditions selected for the global extraction yield of essential oil obtained from response surface analysis were as follows: pressure level: 410 kPa; moisture content: 0.40 g H2O/g of dry material; processing time: 15.8 min. Under these conditions, the experimental extraction yield of essential oil was close to the predicted values calculated from the polynomial response surface model equation. The results showed that the processing pressure and processing time were the most significant parameters both on global extraction yield and the extraction yield of the different essential oil compounds.
Keywords: Rosemary (Rosmarinus officinalis L.); Extraction; Essential oil; Vacuum; Fast pressure drop; Response surface methodology

Regina Karousou, Dimitrios N. Koureas, Stella Kokkini, Essential oil composition is related to the natural habitats: Coridothymus capitatus and Satureja thymbra in NATURA 2000 sites of Crete, Phytochemistry, Volume 66, Issue 22, November 2005, Pages 2668-2673, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2005.09.020.
(http://www.sciencedirect.com/science/article/B6TH7-4HHP3R1-3/2/d9115bf4b728e6fd1f7a96734c6d3c5c)
Abstract:

The study of essential oils obtained from Coridothymus capitatus and Satureja thymbra collected from different natural habitat types of 11 NATURA 2000 sites scattered all over Crete has shown that they are characterized either by a high amount of carvacrol (up to 75.7%) or thymol (up to 65.6%) or by a more or less equal amount of the two phenols. The results of a discriminant analysis with predefined groups the natural habitat types wherefrom the plants were collected have shown that the oils of both species collected from the dry dwarf-shrub formations of the lowland have a high carvacrol content whereas those collected from the more mesic timber or highland formations have a high thymol content. Furthermore, the results of this study introduce the use of natural habitat unit as a tool for the assessment of essential oil variation.
Keywords: Coridothymus capitatus Reichenb. fil.; Satureja thymbra L.; Labiatae; Crete; NATURA 2000; Natural habitat type; Essential oils; Carvacrol; Thymol

Panos V. Petrakis, Maria Couladis, Vassilios Roussis, A method for detecting the biosystematic significance of the essential oil composition: The case of five Hellenic Hypericum L. species, Biochemical Systematics and Ecology, Volume 33, Issue 9, September 2005, Pages 873-898, ISSN 0305-1978, DOI: 10.1016/j.bse.2005.02.002.
(http://www.sciencedirect.com/science/article/B6T4R-4G5BJVX-4/2/3847c8abbcbb1f0300ad4277c8c2aa5f)
Abstract:
We examined the importance of the constitutive terpenoids of five species of Hypericum native to the Greek mainland, Crete Island and the west Aegean. The species studied are Hypericum empetrifolium Willd. (sect. Coridium Spach), Hypericum rumeliacum Boiss. subsp. apollinis Robson & Strid, Hypericum perfoliatum L. (sect. Drosocarpium Spach), Hypericum triquetrifolium Turra and Hypericum perforatum L. (sect. Hypericum, subsect. Hypericum [Robson, N.K.B., 2001. Studies in the genus Hypericum L. (Guttiferae). 4 (1). Sections 7. Roscyna to 9. Hypericum sensu lato (part 1). Bull. Brit. Mus. (Nat. Hist.) Bot. 31, 37-88]). Canonical discriminant analysis (CDA) on 98 of the most abundant terpenoids was found to achieve a separation of species. The performed phylogenetic reconstruction supports the existing divisions of Hypericum in taxonomic sections. Other multivariate techniques were also investigated such as principal coordinate analysis and principal component analysis, but these were found inferior to CDA. These analyses transformed the data in such a way that they did not sufficiently account for the entire terpenoid variation, nor did they delineate species in accepted taxonomic sections.
Keywords: Discriminant analysis; Hypericum; Terpenoids; Maximum likelihood; Evolution

M.G. Evandri, L. Battinelli, C. Daniele, S. Mastrangelo, P. Bolle, G. Mazzanti, The antimutagenic activity of Lavandula angustifolia (lavender) essential oil in the bacterial reverse mutation assay, Food and Chemical Toxicology, Volume 43, Issue 9, September 2005, Pages 1381-1387, ISSN 0278-6915, DOI: 10.1016/j.fct.2005.03.013.
(http://www.sciencedirect.com/science/article/B6T6P-4G6J8BD-1/2/8157c40862a02f4c0bac4be21caf0170)
Abstract:
Essential oils from Melaleuca alternifolia (tea-tree oil) and Lavandula angustifolia (lavender oil) are commonly used to treat minor health problems. Tea-tree oil possesses broad-spectrum antimicrobial activity, and is increasingly used for skin problems. Lavender oil, traditionally used as an antiseptic agent, is now predominantly used as a relaxant, carminative, and sedative in aromatherapy. Despite their growing use no data are available on their mutagenic potential. In this study, after determining the chemical composition of tea-tree oil and lavender oil, by gas-chromatography and mass spectrometry, we investigated their mutagenic and antimutagenic activities by the bacterial reverse mutation assay in Salmonella typhimurium TA98 and TA100 strains and in Escherichia coli WP2 uvrA strain, with and without an extrinsic metabolic activation system. Neither essential oil had mutagenic activity on the two tested Salmonella strains or on E.

coli, with or without the metabolic activation system. Conversely, lavender oil exerted strong antimutagenic activity, reducing mutant colonies in the TA98 strain exposed to the direct mutagen 2-nitrofluorene. Antimutagenicity was concentration-dependent: the maximal concentration (0.80 mg/plate) reduced the number of histidine-independent revertant colonies by 66.4%. Lavender oil (0.80 mg/plate) also showed moderate antimutagenicity against the TA98 strain exposed to the direct mutagen 1-nitropyrene. Its antimutagenic property makes lavender oil a promising candidate for new applications in human healthcare.
Keywords: Bacterial reverse mutation assay; Antimutagenicity; Essential oils; Melaleuca alternifolia; Lavandula angustifolia

Gianni Sacchetti, Silvia Maietti, Mariavittoria Muzzoli, Martina Scaglianti, Stefano Manfredini, Matteo Radice, Renato Bruni, Comparative evaluation of 11 essential oils of different origin as functional antioxidants, antiradicals and antimicrobials in foods, Food Chemistry, Volume 91, Issue 4, August 2005, Pages 621-632, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2004.06.031.
(http://www.sciencedirect.com/science/article/B6T6R-4DDXRSS-2/2/bd4092a677684f8440adc13d52599579)
Abstract:
Eleven essential oils, namely, Cananga odorata (Annonaceae), Cupressus sempervirens (Cupressaceae), Curcuma longa (Zingiberaceae), Cymbopogon citratus (Poaceae), Eucalyptus globulus (Myrtaceae), Pinus radiata (Pinaceae), Piper crassinervium (Piperaceae), Psidium guayava (Myrtaceae), Rosmarinus officinalis (Lamiaceae), Thymus x citriodorus (Lamiaceae) and Zingiber officinale (Zingiberaceae), were characterized by means of GC and GC-MS and evaluated for their food functional ingredient related properties. These properties were compared to those of Thymus vulgaris essential oil, used as a reference ingredient. Antioxidant and radical-scavenging properties were tested by means of 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay, [beta]-carotene bleaching test and luminol-photochemiluminescence (PCL) assay. In the DPPH assay, C. odorata, C. citratus, R. officinalis and C. longa showed major effectiveness, with a radical inhibition ranging from 59.6 +/- 0.42-64.3 +/- 0.45%. In the [beta]-carotene bleaching test, C. odorata (75.5 +/- 0.53%), R. officinalis (81.1 +/- 0.57%) and C. longa (72.4 +/- 0.51%) gave the best inhibition results. Similar results were obtained for the same essential oils in the PCL assay. Antimicrobial properties were obtained on five food-spoilage yeasts: Candida albicans ATCC 48274, Rhodotorula glutinis ATCC 16740, Schizosaccharomyces pombe ATCC 60232, Saccharomyces cerevisiae ATCC 2365, Yarrowia lypolitica ATCC 16617 . C. citratus and T. x citriodorus were the most effective against the tested strains. Suggestions on relationships between chemical composition and biological activities are outlined.
Keywords: Cananga odorata; Cupressus sempervirens; Curcuma longa; Cymbopogon citratus; Eucalyptus globulus; Pinus radiata; Piper crassinervium; Psidium guayava; Rosmarinus officinalis; Thymus x citriodorus; Zingiber officinale; Thymus vulgaris; Antioxidant activity; Photochemiluminescence; Antimicrobial activity

Mostafa Khajeh, Yadollah Yamini, Naader Bahramifar, Fatemeh Sefidkon, Mohammad Reza Pirmoradei, Comparison of essential oils compositions of Ferula assa-foetida obtained by supercritical carbon dioxide extraction and hydrodistillation methods, Food Chemistry, Volume 91, Issue 4, August 2005, Pages 639-644, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2004.06.033.
(http://www.sciencedirect.com/science/article/B6T6R-4D98XB5-6/2/edfabc9d972634ab111374ee572b192e)
Abstract:
Essential oil of Ferula assa-foetida, cultivated in Iran, was obtained by hydrodistillation and supercritical (carbon dioxide) extraction methods. The oils were analysed by capillary gas chromatography using flame ionization and mass spectrometric detections. The compounds were identified according to their retention indices and mass spectra (EI, 70 eV). The effects of different

parameters, such as pressure, temperature, modifier volume and extraction time, on the supercritical fluid extraction (SFE) of Ferula assa-foetida oil were investigated. The results showed that, under a pressure of 300 atm, temperature 35 [degree sign]C, 5% methanol and dynamic extraction time of 25 min, extraction was more selective for the E-1-propyl sec-butyl disulfide. Twenty five compounds were identified in the hydrodistilled oil. The major components of Ferula assa-foetida were E-1-propenyl sec-butyl disulfide (40.0%) and germacrene B (7.8%). However, by using supercritical carbon dioxide under optimum conditions, only two components constituted more than 70% of the oil. The extraction yield, based on hydrodistillation, was 1.13% (w/w). Extraction yield, based on the SFE, varied in the range of 0.8-5.5% (w/w) under different conditions. The results show that, in Iranian Ferula assa-foetida oil, E-1-propyl sec-butyl disulfide is a major component.
Keywords: Ferula assa-foetida; Supercritical carbon dioxide; Hydrodistillation; Essential oil; E-1-propenyl sec-butyl disulfide

Richard A. Holley, Dhaval Patel, Improvement in shelf-life and safety of perishable foods by plant essential oils and smoke antimicrobials, Food Microbiology, Volume 22, Issue 4, August 2005, Pages 273-292, ISSN 0740-0020, DOI: 10.1016/j.fm.2004.08.006.
(http://www.sciencedirect.com/science/article/B6WFP-4F032B8-1/2/ce498517b99f2bb589da97d56c531c90)
Abstract:
This review examines the potency of natural antimicrobial agents from plants, outlining the ranges of microbial susceptibility and factors affecting antimicrobial action. Methods used for estimation of inhibitory activity are evaluated and currently understood mechanisms of their action are described. The potential value of these agents as secondary preservatives is considered as well as the effectiveness and use of similar aromatic and phenolic compounds in wood smoke for the safe extension of perishable food shelf-life.
Keywords: Natural antimicrobials; Food safety; Shelf-life; Essential oils; Plant phenolics; Smoke

Bektas Tepe, Munevver Sokmen, Atalay Sokmen, Dimitra Daferera, Moschos Polissiou, Antimicrobial and antioxidative activity of the essential oil and various extracts of Cyclotrichium origanifolium (Labill.) Manden. & Scheng., Journal of Food Engineering, Volume 69, Issue 3, August 2005, Pages 335-342, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2004.08.024.
(http://www.sciencedirect.com/science/article/B6T8J-4DTK86R-1/2/a4e30d1641297efb18f913e8a49aa83e)
Abstract:
This study was designed to examine the in vitro antimicrobial and antioxidant activity of the essential oil and various extracts prepared by using solvents of varying polarity from Cyclotrichium origanifolium (Labill.) Manden. & Scheng. The essential oil was particularly found to possess stronger antimicrobial activity while other non-polar extracts and subfractions showed moderate activity and polar extracts remained almost inactive. GC and GC/MS analysis of the oil resulted in the identification of 26 compounds, representing 99.6% of the oil; pulegone (49.8%), menthone (32.5%) and limonene (6.0%) were the main components. The samples were also subjected to a screening for their possible antioxidant activity by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene-linoleic acid assays. In the first case, the free radical scavenging activity of polar subfraction of deodorized methanol extract (DeMW) was superior to all other extracts. Especially polar extracts exhibited strongest activity than the non-polar extracts. In the case of linoleic acid system, oxidation of linoleic acid was effectively inhibited by non-polar (chloroformic) subfraction methanol extract (MC), where the oil was less effective. MC extract exhibits 79.2% inhibition that is close to synthetic antioxidant reagent BHT when compared to the other extracts tested.
Keywords: Cyclotrichium origanifolium; Antimicrobial activity; Antioxidant activity; Total phenolics; Essential oil composition

M.R. Moreira, A.G Ponce, C.E. del Valle, S.I. Roura, Inhibitory parameters of essential oils to reduce a foodborne pathogen, LWT - Food Science and Technology, Volume 38, Issue 5, August 2005, Pages 565-570, ISSN 0023-6438, DOI: 10.1016/j.lwt.2004.07.012.
(http://www.sciencedirect.com/science/article/B6WMV-4FR3GG6-2/2/e89e7f138eeb7a60b16d3f067d41aae8)
Abstract:
Technological application of essential oils, as natural sanitizing agents, to reduce food pathogens in the post-harvest processing of foods requires the establishment of the optimal conditions. The present work evaluated the parameters of antimicrobial activity of the essential oils of eucalyptus (Eucalyptus globules), tea tree (Melaleuca alternifolia), rosemary (Rosmarinus officinalis), mint (Mentha piperita), rosa moschata (Rosa moschata), clove (Syzygium aromaticum), lemon (Citrus limonum), oregano (Origanum vulgare), pine (Pinus silvestrys) and sweet basil (Ocimum basilicum) on survival and growth of different strains of E. coli O157:H7. The strains of E. coli exhibited similar susceptibilities to the action of the essential oils assayed. The essential oil with the lowest MIC and MBC (Minimum Inhibitory and Bactericidal Concentration, respectively) was clove (0.25 ml/100 ml and 0.3 ml/100 ml, respectively) and the results demonstrated that clove exerted a significant bactericidal and bacteriostatic action.
Keywords: Sanitizing agents; Naturals essential oils; Pathogens control; Antimicrobial activity

Anne Gauvin, Jacqueline Smadja, Essential oil composition of four Psiadia species from Reunion Island: A chemotaxonomic study, Biochemical Systematics and Ecology, Volume 33, Issue 7, July 2005, Pages 705-714, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.12.013.
(http://www.sciencedirect.com/science/article/B6T4R-4FWV2PW-1/2/9494c15a6dd9f4b753e5492cea7d2100)
Abstract:
The essential oils of four wild species of Psiadia (Psiadia anchusifolia, Psiadia argentea, Psiadia boivinii, Psiadia salaziana; Asteraceae) endemic to Reunion Island were obtained by hydrodistillation and subjected to detailed GC/MS analysis in order to determine possible similarities among them and also the differences in their chemical compositions depending on the stage of the life cycle (vegetative and flowering). A total of 57 compounds were identified including two unusual components 7,7-dimethyl-2-methylenebicyclo[3.3.1]heptan-6-ol acetate (1) and 6,6,8,9-tetramethyltricyclo[3.3.3.0]-undec-7-en-2-ol (2) which, until now, have been found only in species of the genus Psiadia. For P. anchusifolia, P. argentea and P. salaziana, the qualitative and quantitative composition of the oils appeared to be constant in the different stages of their development. In contrast, considerable differences were found to exist in the composition of essential oils of P. boivinii.
Keywords: Psiadia anchusifolia; Psiadia argentea; Psiadia boivinii; Psiadia salaziana; Asteraceae; Essential oil composition; 7,7-Dimethyl-2-methylenebicyclo[3.3.1]heptan-6-ol acetate; 6,6,8,9-Tetramethyltricyclo[3.3.3.0]-undec-7-en-2-ol; Chemotaxonomy

V.S.S. Dharmagadda, S.N. Naik, P.K. Mittal, P. Vasudevan, Larvicidal activity of Tagetes patula essential oil against three mosquito species, Bioresource Technology, Volume 96, Issue 11, July 2005, Pages 1235-1240, ISSN 0960-8524, DOI: 10.1016/j.biortech.2004.10.020.
(http://www.sciencedirect.com/science/article/B6V24-4F1JP53-2/2/e9f4e3d2f0544abab1f9e27cc5749873)
Abstract:
Larvicidal activity of Tagetes patula essential oil was tested against the fourth instar larvae of Aedes aegypti, Anopheles stephensi, and Culex quinquefaciatus. Five different concentrations of essential oil were studied and the results were compared with that of synthetic insecticide,

malathion. A. aegypti (LC50 13.57, LC90 37.91) was most susceptible followed by An. stephensi (LC50 12.08, LC90 57.62) and C. quinnquefaciatus (LC50 22.33, LC90 71.89).
Keywords: Aedes, Anopheles; Culex; Essential oil; Larvicidal; Tagetes patula

Silvina D. Zamar, Hector E. Salomone, Oscar A. Iribarren, Operation planning in the rectification of essential oils, Journal of Food Engineering, Volume 69, Issue 2, July 2005, Pages 207-215, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2004.07.019.
(http://www.sciencedirect.com/science/article/B6T8J-4DTJSJG-5/2/3f7c98545e2450fd6e2da073696205d4)
Abstract:
This paper proposes a methodology that uses a recently developed shortcut model to represent each individual separation task, for planning the operation of a batch distillation column. For a given column and recycle policy, optimization of the recoveries of two key components at each separation renders the set of optimal reflux ratios and advances in each separation.
The methodology is specially expedite for systems with a large number of components and whose performance can be upgraded by recycling intermediate cuts, as is the case in the rectification of essential oils. We illustrate the methodology by planning the rectification of crude orange oil to produce an oil essence depleted from light terpenes, which are responsible for rancidity of oils.
Keywords: Essential oils processing; Batch rectification; Operation planning

Nurettin Yayli, Ahmet Yasar, Canan Gulec, Asu Usta, Sevgi Kolayli, Kamil Coskuncelebi, Sengul Karaoglu, Composition and antimicrobial activity of essential oils from Centaurea sessilis and Centaurea armena, Phytochemistry, Volume 66, Issue 14, Structure Elucidation, Reports on Structure Elucidation, July 2005, Pages 1741-1745, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2005.04.006.
(http://www.sciencedirect.com/science/article/B6TH7-4G3YDK7-2/2/43a11303ff7da8a2d229e2e4d7158d46)
Abstract:
The essential oils of air-dried Centaurea sessilis and Centaurea armena obtained by hydrodistillation were analyzed by gas chromatography-mass spectrometry (GC-MS). Forty and twenty components were identified in the essential oils and the main component of these taxons was [beta]-eudesmol in the ratios of 12.4% and 19.3% from C. sessilis and C. armena, respectively. The antimicrobial activity of the isolated essential oil of the plants was also investigated. They showed moderate antibacterial activity against Gram-positive and Gram-negative bacteria, but no antifungal activity was observed against two yeastlike fungi.
Keywords: Centaurea sessilis; Centaurea armena; Asteraceae; Essential oil; Antimicrobial activity; GC-MS

Pinarosa Avato, Irene Morone Fortunato, Claudia Ruta, Roberta D'Elia, Glandular hairs and essential oils in micropropagated plants of Salvia officinalis L., Plant Science, Volume 169, Issue 1, July 2005, Pages 29-36, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2005.02.004.
(http://www.sciencedirect.com/science/article/B6TBH-4FM357V-3/2/d1570123ffddf97ebe040b0232f74cfd)
Abstract:
Micropropagation of Salvia officinalis L. (the common sage) plants to verify their ability to produce the typical volatile oil is described. The morphology of the glandular hairs and the chemical composition of the essential oils from in vitro shoots and micropropagated plants have been studied. For comparative purposes, volatile constituents from field grown mother plants and derived rooted cuttings have also been analyzed. Peltate glands secreting essential oils were present on the regenerated plants. Correlation between the higher amounts of camphor in the oils from the micropropagated, compared to the mother plants, and the stage of development of the

regenerated sage is discussed. Histological observations from plant material at different physiological stages clearly demonstrate the rejuvenation of the germoplasm in the in vitro regenerated plants, in agreement with the chemical data.
Keywords: Salvia officinalis; Sage; Micropropagation; Essential oils; Secretory glands; Camphor; Thujone

Sezgin Celik, R. Suleyman Gokturk, Guido Flamini, Pier Luigi Cioni, Ivano Morelli, Essential oils of Phlomis leucophracta, Phlomis chimerae and Phlomis grandiflora var. grandiflora from Turkey, Biochemical Systematics and Ecology, Volume 33, Issue 6, June 2005, Pages 617-623, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.11.010.
(http://www.sciencedirect.com/science/article/B6T4R-4FR3NS2-2/2/92eb7c4dbd2ee76dc0bd7c60fe288790)
Abstract:
The essential oils of three species of Phlomis from Turkey, Phlomis leucophracta, Phlomis chimerae and Phlomis grandiflora var. grandiflora have been studied. The main constituents of P. leucophracta essential oil were [beta]-caryophyllene (20.2%), [alpha]-pinene (19.2%) and limonene (11.0%). This species also contained three diterpene derivatives, 15-isopimaradiene, manoyl oxide and epi-13-manoyl oxide that summed 1.4%. In P. chimerae the principal compounds were [beta]-caryophyllene (31.6%), [alpha]-pinene (11.0%), germacrene D (6.1%), limonene (5.5%) and linalool (4.7%). In P. grandiflora var. grandiflora, germacrene D (45.4%), [beta]-caryophyllene (22.8%) and bicyclogermacrene (4.9%) were among the principal derivatives.
Keywords: Phlomis leucophracta; Phlomis chimerae; Phlomis grandiflora var. grandiflora; Essential oil; [beta]-Caryophyllene; [alpha]-Pinene; Germacrene D; Limonene

Carlos Alexandre Carollo, Aline Regina Hellmann, Joao Maximo de Siqueira, Sesquiterpenoids from the essential oil from leaves of Duguetia furfuracea (Annonaceae), Biochemical Systematics and Ecology, Volume 33, Issue 6, June 2005, Pages 647-649, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.09.004.
(http://www.sciencedirect.com/science/article/B6T4R-4F4H9NP-5/2/f40a50ddee425e03d9c40b7b8e213803)
Keywords: Duguetia furfuracea; Annonaceae; Ishwarane; Santalane; Sesquiterpenes; Volatile oil

F. Sefidkon, Z. Jamzad, Chemical composition of the essential oil of three Iranian Satureja species (S. mutica, S. macrantha and S. intermedia), Food Chemistry, Volume 91, Issue 1, June 2005, Pages 1-4, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2004.01.027.
(http://www.sciencedirect.com/science/article/B6T6R-4DS6VB1-1/2/df5071acce2ffe8eef2ffe54de5314ce)
Abstract:
Essential oils from aerial parts of Satureja mutica Fisch. & C. A. Mey., Satureja macrantha C. A. Mey. and Satureja intermedia C. A. Mey. were obtained by hydro-distillation. The oils were analyzed by capillary gas chromatography, using flame ionization and mass spectrometric detection. Forty five components were identified in the oil of S. mutica with carvacrol (30.9%), thymol (26.5%), [gamma]-terpinene (14.9%) and p-cymene (10.3%) as main constituents. Sixty five compounds were identified in the oil of S. macrantha, with p-cymene (25.8%), limonene (16.3%) and thymol (8.1%) as main components. Thirty eight compounds were characterized in the oil of S. intermedia with thymol (32.3%), [gamma]-terpinene (29.3%) and p-cymene (14.7%) as main constituents. The results showed different compositions of the essential oils of these Satureja species. There are some minor components in each oil that are not present in the others.
Keywords: Satureja mutica; Satureja macrantha; Satureja intermedia; Labiatae; Essential oil composition; Thymol; Carvacrol; p-cymene; [gamma]-terpinene; Limonene; Iran

Guido Flamini, Pier Luigi Cioni, Ivano Morelli, Composition of the essential oils and in vivo emission of volatiles of four Lamium species from Italy: L. purpureum, L. hybridum, L. bifidum and L. amplexicaule, Food Chemistry, Volume 91, Issue 1, June 2005, Pages 63-68, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2004.05.047.
(http://www.sciencedirect.com/science/article/B6T6R-4D0Y466-R/2/9e2f61a629dad26f463d0d57dafa4c1f)
Abstract:
The essential oils and the volatiles emitted in vivo by flowers, leaves and bracts of Lamium purpureum, L. hybridum, L. bifidum, L. amplexicaule (Lamiaceae) were analyzed by GC-MS and SPME, respectively. All the essential oils were characterized by their high contents of germacrene D. In L. purpureum (35.4%), L. hybridum (39.0%) and L. bifidum (34.9%), it was the main compound, while in L. amplexicaule (28.9%), the main constituent was trans-chrysanthenyl acetate (41.1%). The SPME analyses showed a pattern typical of volatiles for both the different species and the single plant parts analyzed.
Keywords: Lamium purpureum; L. hybridum; L. bifidum; L. amplexicaule; Lamiaceae; Essential oil composition; SPME analysis

Asta Judzentiene, Danute Mockute, The inflorescence and leaf essential oils of Tanacetum vulgare L. var. vulgare growing wild in Lithuania, Biochemical Systematics and Ecology, Volume 33, Issue 5, May 2005, Pages 487-498, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.11.003.
(http://www.sciencedirect.com/science/article/B6T4R-4FJV20C-4/2/cb9c975b778fd21ab2d76c82db9a9178)
Abstract:
Forty samples of inflorescences and leaves of wild Tanacetum vulgare L. var. vulgare were collected in 20 habitats from Lithuania. The essential oils were analyzed by GC and GC/MS. The 57 identified compounds in the oils made up 80.7-99.6%. According to the cluster analysis the volatile oils were divided into four groups with 1,8-cineole (23.6-46.3%, 11 oils), trans-thujone (35.7-78.4%, 6 samples), camphor (19.8-61.8%, 17 oils) and myrtenol (13.1-24.9%, 6 samples) as main constituents. The inflorescences and leaves of tansy plants formed the oils with the same dominating constituent in 15 of the 20 habitats investigated. The leaves in five localities produced oils of the 1,8-cineole chemotype, while the inflorescences biosynthesized oils of the camphor type in three habitats and of the myrtenol type in two habitats. Amounts of the 1,8-cineole in all leaf oils were greater than that in inflorescence oils of the plants from the same locality. An opposite correlation was determined for camphor, myrtenol, cis- and trans-thujone. The myrtenol chemotype was not noticed earlier in the essential oils of T. vulgare.
Keywords: Tanacetum vulgare; Essential oil chemotypes; 1,8-Cineole; Thujone; Chrysanthenone; Camphor; Borneol; Myrtenol; Vulgarone B

H. Askin Akpulat, Bektas Tepe, Atalay Sokmen, Dimitra Daferera, Moschos Polissiou, Composition of the essential oils of Tanacetum argyrophyllum (C. Koch) Tvzel. var. argyrophyllum and Tanacetum parthenium (L.) Schultz Bip. (Asteraceae) from Turkey, Biochemical Systematics and Ecology, Volume 33, Issue 5, May 2005, Pages 511-516, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.10.006.
(http://www.sciencedirect.com/science/article/B6T4R-4FH5KDN-2/2/c4fd7ef66e5d793d231790ebb7479c9e)
Abstract:
The aerial parts of Tanacetum argyrophyllum (C. Koch) Tvzel. var. argyrophyllum and T. parthenium (L.) Schultz Bip. were hydro-distilled to produce the oils in the yields of 0.78% (v/w) and 0.43% (v/w), respectively. The oils were analysed by GC and GC/MS. Twenty-two and twenty-three components were identified representing 94.2% and 90.1% of the oils, respectively. The main compounds of T. argyrophyllum were cis-thujone (69.9%), trans-thujone (5.6%) and 1,8-

cineole (3.2%), whereas camphor (56.9%), camphene (12.7%) and p-cymene (5.2%) were the major constituents of T. parthenium.
Keywords: Tanacetum argyrophyllum var. argyrophyllum; Tanacetum parthenium; Essential oil composition; Camphor; Thujone

K. Loziene, P.R. Venskutonis, Influence of environmental and genetic factors on the stability of essential oil composition of Thymus pulegioides, Biochemical Systematics and Ecology, Volume 33, Issue 5, May 2005, Pages 517-525, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.10.004.
(http://www.sciencedirect.com/science/article/B6T4R-4FDMYB0-1/2/ecc7463b4a1976065d0b41e65f6d8d4d)
Abstract:
Thymus pulegioides plants were collected from various natural habitats of Lithuania and transferred into a new uniform environment. The plants were cloned annually at controlled conditions and their essential oil composition was monitored by capillary GC and GC/MS. The geraniol/geranial/neral (G/G/N), thymol (T), linalool (L), carvacrol/[gamma]-terpinene/p-cymene (C/[gamma]T/pC) and thymol/carvacrol/[gamma]-terpinene/p-cymene (T/C/[gamma]T/pC) chemotypes of T. pulegioides were studied. It was found that according to the stability of essential oil composition on a sudden change of environmental conditions two types of T. pulegioides can be distinguished: (1) plants which preserve their chemical composition of the essential oils; (2) plants, which considerably change their chemical composition of the essential oils.
Keywords: Thymus pulegioides; Lamiaceae; Essential oil; Chemical polymorphism; Environmental conditions

Sheng-Yang Wang, Pin-Fun Chen, Shang-Tzen Chang, Antifungal activities of essential oils and their constituents from indigenous cinnamon (Cinnamomum osmophloeum) leaves against wood decay fungi, Bioresource Technology, Volume 96, Issue 7, May 2005, Pages 813-818, ISSN 0960-8524, DOI: 10.1016/j.biortech.2004.07.010.
(http://www.sciencedirect.com/science/article/B6V24-4DBSWHW-3/2/b509a23aa901276c0b0d7877f8cbf6d9)
Abstract:
Cinnamomum osmophloeum Kaneh is one of the hardwood species indigenous to Taiwan that possesses significant antifungal activity. To examine the antifungal activity of leaf essential oils and dominant constituents from C. osmophloeum, the essential oils of leaves from three clones (A, B, and C) collected from Haw-Lin experimental forest were extracted and their components analyzed by gas chromatography. Results from the antifungal tests demonstrated that the essential oils of both B and C leaves had strong inhibitory effects. The antifungal indices of these two leaf oils at 100 ppm against five strains of white rot fungi and four strains of brown rot fungi were all 100%. Cinnamaldehyde, the major compound in C. osmophloeum leaf essential oils, possessed the strongest antifungal activities compared with the other components. Its antifungal indices against both Coriolus versicolor and Laetiporus sulphureus were 100%. The MIC (minimum inhibitory concentration) of cinnamaldehyde against C. versicolor and L. sulphureus was 50 and 75 ppm, respectively. In addition, comparisons of the antifungal indices of cinnamaldehyde's congeners proved that cinnamaldehyde exhibited the strongest antifungal activities.
Keywords: Cinnamomum osmophloeum; Leaf; Essential oil; Cinnamaldehyde; White rot fungi; Brown rot fungi; Antifungal activity

Bektas Tepe, Dimitra Daferera, Atalay Sokmen, Munevver Sokmen, Moschos Polissiou, Antimicrobial and antioxidant activities of the essential oil and various extracts of Salvia tomentosa Miller (Lamiaceae), Food Chemistry, Volume 90, Issue 3, May 2005, Pages 333-340, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2003.09.013.

(http://www.sciencedirect.com/science/article/B6T6R-4B1SK71-D/2/4c1e5710e61fb4902d6f1abd1b81baef)
Abstract:
This study was designed to examine the in vitro antimicrobial and antioxidant activities of the essential oil and various extracts (prepared by using solvents of varying polarity) of Salvia tomentosa (Miller). The essential oil was particularly found to possess strong antimicrobial activity while other non-polar extracts and subfractions showed moderate activities while polar extracts remained almost inactive. GC and GC/MS analyses of the oil resulted in the identification of 44 compounds, representing 97.7% of the oil; [beta]-pinene (39.7%), [alpha]-pinene (10.9%) and camphor (9.7%) were the main components. The samples were also subjected to screening for their possible antioxidant activity by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene-linoleic acid assays. In the first case, the free radical scavenging activity of aqueous methanol extract (MW) was superior to all other extracts (IC50=18.7 [mu]g/ml). Polar extracts exhibited stronger activities than non-polar extracts. In the case of the linoleic acid system, oxidation of the linoleic acid was effectively inhibited by the polar subfraction of the MW extract, while the oil was less effective. The MW extract showed 90.6% inhibition, that is close to the synthetic antioxidant BHT.
Keywords: Salvia tomentosa; Essential oil; Antimicrobial activity; Antioxidant activity; GC-MS

Bahman Nickavar, Faraz Mojab, Reza Dolat-Abadi, Analysis of the essential oils of two Thymus species from Iran, Food Chemistry, Volume 90, Issue 4, May 2005, Pages 609-611, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2004.04.020.
(http://www.sciencedirect.com/science/article/B6T6R-4CS4MV2-5/2/d07c1ce7e21284ec149a7cfbb98854ed)
Abstract:
The essential oils obtained from the aerial parts of Thymus daenensis subsp. daenensis and Thymus kotschyanus were analyzed by using GC and GC/MS. Twenty six compounds representing 99.7% of T. daenensis subsp. daenensis oil were identified. The main ones were thymol (74.7%), p-cymene (6.5%), [beta]-caryophyllene (3.8%) and methyl carvacrol (3.6%). Thirty one components accounting for 98.7% of T. kotschyanus oil were identified. The major constituents were thymol (38.6%), carvacrol (33.9%), [gamma]-terpinene (8.2%) and p-cymene (7.3%). Both oils were found to be rich in monoterpene phenols, especially thymol and carvacrol.
Keywords: Thymus daenensis subsp. daenensis; Thymus kotschyanus; Essential oil; Chemical composition; Labiatae

A. Iori, D. Grazioli, E. Gentile, G. Marano, G. Salvatore, Acaricidal properties of the essential oil of Melaleuca alternifolia Cheel (tea tree oil) against nymphs of Ixodes ricinus, Veterinary Parasitology, Volume 129, Issues 1-2, 20 April 2005, Pages 173-176, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2004.11.035.
(http://www.sciencedirect.com/science/article/B6TD7-4FD13HW-1/2/8b4105db620767987d0630e7de78a620)
Abstract:
The aim of the study was to examine the acaricidal effect of essential oil of Melaleuca alternifolia (tea tree oil, TTO) at different doses (4, 6, 8 and 10 [mu]l) and for different exposure times (30, 60, 90 and 120 min) on nymphs of Ixodes ricinus. A dose of 8 [mu]l TTO was lethal for more than 70% of ticks when inhaled and this effect was enhanced when the dose was increased to 10 [mu]l (>80%). The effect was correlated with the duration of exposure of ticks to TTO, with a significant effect being observed after 90 min exposure. The findings show that TTO has acaricidal properties and could be extremely useful in controlling ticks that are efficient vectors of pathogens.
Keywords: Melaleuca alternifolia; Tea tree oil; Antitick effect; Ixodes ricinus

Anand B. Melkani, Vasu Dev, Philip S. Beauchamp, Anuradha Negi, S.P.S. Mehta, K.B. Melkani, Constituents of the essential oil of a new chemotype of Elsholtzia strobilifera Benth., Biochemical Systematics and Ecology, Volume 33, Issue 4, April 2005, Pages 419-425, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.10.009.
(http://www.sciencedirect.com/science/article/B6T4R-4FC3RPY-4/2/7690121920273adf7cfe3300b17ad375)
Abstract:
The composition of the essential oil from a new chemotype of Elsholtzia strobilifera Benth. collected from sub-alpine region of central Himalaya, India, has been investigated by Gas Chromatography and Gas Chromatography-Mass Spectrometry. The GC of the oil revealed the presence of more than 50 constituents, of which neral (18.3%) and geranial (29.9%) were found to be the major compounds and an absence of monoterpene hydrocarbons. Acylfuran derivatives, the specific chemical markers of the essential oils from the genus Elsholtzia were not detected.
Keywords: Elsholtzia strobilifera; Lamiaceae; Essential oil composition; Citral; GC-MS

Essam E. Enan, Molecular response of Drosophila melanogaster tyramine receptor cascade to plant essential oils, Insect Biochemistry and Molecular Biology, Volume 35, Issue 4, April 2005, Pages 309-321, ISSN 0965-1748, DOI: 10.1016/j.ibmb.2004.12.007.
(http://www.sciencedirect.com/science/article/B6T79-4FD0HT4-1/2/e4b53024e0d1970dda307cfbb184806c)
Abstract:
This paper reports the role of the tyramine (TA) receptor cascade in the insecticidal activity of plant essential oils. A TA receptor cDNA encoding a putative seven transmembrane domain G-protein coupled receptor was amplified from Drosophila melanogaster head cDNA phage library. The encoded protein contains 601 amino acids and has a sequence similar to other biogenic amine receptors. This protein was expressed in Drosophila S2 cells for radioligand binding studies with the ligand 3H-TA. Competitive binding studies comparing biogenic amines that could potentially function as endogenous ligands have demonstrated that this receptor had the highest affinity for TA () followed by DL-octopamine, dopamine, serotonin and histamine. TA decreased the forskolin-increased cAMP levels (IC50=5.802 [mu]M) and increased [Ca2+]i through the receptor expressed in S2 cells. The toxicity rank order of the tested plant essential oils against wild type D. melanogaster fly demonstrated a pattern similar to their effect on receptor binding activity and changes in cAMP level and [Ca2+]i. The toxicity of two of these chemicals was eliminated when tested against the TA receptor mutant (TyrRneo30) Drosophila strain. Therefore, the data indicates a correlation between cellular changes and insecticidal activity of tested plant essential oils, and suggests that the toxicity of at least two of these chemicals is mediated through the TA receptor.
Keywords: Tyramine receptor; cAMP; [Ca2+]i; Drosophila melanogaster; G-protein coupled receptor; Plant essential oils

S. Zeboudj, N. Belhaneche-Bensemra, R. Belabbes, Use of surface response methodology for the optimization of the concentration of the sweet orange essential oil of Algeria by wiped film evaporator, Journal of Food Engineering, Volume 67, Issue 4, April 2005, Pages 507-512, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2004.05.018.
(http://www.sciencedirect.com/science/article/B6T8J-4CX6Y2J-7/2/03d9e828b30ccd020ee5eaedf4286f47)
Abstract:
The evaluation of the optimum conditions for concentration of the sweet orange essential oil by wiped film evaporator required a planning of experiments. The factors of the selected centered composite plan are the rate of feed, the temperature of the heated fluid and the stirring velocity. The quadratic model obtained required complementary work by simplex method to determine the

optimum. The analysis by gas chromatography of the samples revealed a 18.2 times concentrated oxygenated compound in the residue.
Keywords: Concentration; Sweet orange essential oil; Optimization; Surface response methodology; Wiped film evaporator

Hailemichael Tesso, Wilfried A. Konig, Yoshinori Asakawa, Composition of the essential oil of the liverwort Radula perrottetii of Japanese origin, Phytochemistry, Volume 66, Issue 8, April 2005, Pages 941-949, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2005.03.003.
(http://www.sciencedirect.com/science/article/B6TH7-4FWT3VH-3/2/3e991e6e1e0eb7eb30178c9af231f83e)
Abstract:
Analysis of the essential oil of the liverwort Radula perrottetii afforded two novel viscidane diterpenes, viscida-3,9,14-triene (1), viscida-3,11(18),14-triene (2), four bisabolane sesquiterpenes, bisabola-2,6,11-triene (3), bisabola-1,3,5,7(14),11-pentaene (4), bisabola-1,3,5,7,11-pentaene (5), 6,7-epoxybisabola-2,11-diene (6), and 1-methoxy-4-(2-methylpropenyl)benzene (7) as new natural products. In addition, the known compounds bisabola-1,3,5,7(14),10-pentaene (8), ar-tenuifolene (9), [alpha]-helmiscapene (10), and [beta]-helmiscapene (11) were also isolated. Isolation was carried out by preparative gas chromatography, and the structures were established by extensive NMR analysis. This is the first finding of viscidane diterpenes in liverworts. Compounds 8, 9 and the rarely encountered eudesmane sesquiterpene hydrocarbons 10 and 11 are reported for the first time from R. perrottetii.
Keywords: Radula perrottetii; Liverwort; Essential oil; Viscidane diterpenes; Bisabolane and eudesmane sesquiterpenes; ar-Tenuifolene

Pedro A.G. Santos, A. Cristina Figueiredo, M. Margarida Oliveira, Jose G. Barroso, Luis G. Pedro, Stanley G. Deans, Johannes J.C. Scheffer, Growth and essential oil composition of hairy root cultures of Levisticum officinale W.D.J. Koch (lovage), Plant Science, Volume 168, Issue 4, April 2005, Pages 1089-1096, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2004.12.009.
(http://www.sciencedirect.com/science/article/B6TBH-4F60JYM-1/2/4097b6a8cf0f8a7004f3ddb4509698ed)
Abstract:
Transformed root cultures of Levisticum officinale (lovage) were established by inoculation of aseptically grown seedlings with Agrobacterium rhizogenes strain A4 carrying plasmid pRiA4::70GUS. Hairy roots growth in four different types of liquid culture media was determined by the dissimilation method and by measuring the fresh and dry weight of the roots. The composition of the essential oils from the hairy roots and from lovage plant roots was analysed by GC and GC-MS. The main components of the oil samples from the hairy roots were falcarinol, (Z)-ligustilide, (Z)-3-butylidenephthalide, trans-[beta]-farnesene, [beta]-phellandrene, n-octanal, [gamma]-elemene and n-heptanal, in varying amounts depending on the culture media tested. The hairy roots essential oil yields ranged from 0.006 to 0.018% (v/fr. wt.). The main components of the oil from the lovage plant roots were (Z)-ligustilide, [beta]-pinene, pentylcyclohexadiene and [alpha]-pinene. The yield of the oil from the lovage plant roots was 0.16% (v/fr. wt.).
Keywords: Levisticum officinale W.D.J. Koch; Apiaceae; Hairy root cultures; Agrobacterium rhizogenes; Essential oil; Falcarinol

E. Tedonkeng Pamo, F. Tendonkeng, J.R. Kana, V. Khan Payne, B. Boukila, J. Lemoufouet, E. Miegoue, A.S. Nanda, A study of the acaricidal properties of an essential oil extracted from the leaves of Ageratum houstonianum, Veterinary Parasitology, Volume 128, Issues 3-4, 31 March 2005, Pages 319-323, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2004.10.022.

(http://www.sciencedirect.com/science/article/B6TD7-4F8BF6F-1/2/d3452dea90d000865d4a312a7d761b29)
Abstract:
Study on acaricide property of foam soap containing essential oil of Ageratum houstonianum leaves was tested on Rhipicephalus lunulatus. Four doses of the oil (0.00, 0.02, 0.025 and 0.03 [mu]l/g) with four replications for each dose were used in vitro. Each replication consisted of 10 ticks in a Petri dish with filter paper impregnated uniformly with the foam soap on the bottom. The same four doses in three replications were used in vivo. Each replication was made up of 10 naturally ticks infested goats. Results of this study indicate that foam soap containing essential oil of A. houstonianum leaves is toxic to R. lunulatus. The in vitro mortality rate was observed to vary from 0 to 50% on day 8 after treatment with the controls as compared to 95% with the lowest dose (0.02 [mu]l/g) on day 8 and 100% with the highest dose (0.03 [mu]l/g) on day 3. Meanwhile, the in vivo mortality rate was observed to be 23.4% with the control on day 8 after treatment whereas the highest dose killed 95.1% of the ticks by this day. The LD50 of the foam soap containing essential oil of this plant was 0.0259 and 0.0173 [mu]l/g on day 2 after treatment, in the laboratory and on the farm, respectively. This indicates a potentially high efficiency of this medicated soap on this parasite.
Keywords: Rhipicephalus lunulatus; Ageratum houstonianum; Essential oil; Foam soap; Leaves; LD50

L. Castillejos, S. Calsamiglia, A. Ferret, R. Losa, Effects of a specific blend of essential oil compounds and the type of diet on rumen microbial fermentation and nutrient flow from a continuous culture system, Animal Feed Science and Technology, Volume 119, Issues 1-2, 7 March 2005, Pages 29-41, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2004.12.008.
(http://www.sciencedirect.com/science/article/B6T42-4F924FP-1/2/f829043145a292c01201378da47747e6)
Abstract:
Eight dual flow continuous culture fermenters (1320 ml) were used in two replicated periods of 8 days to study effects of a specific blend of essential oil compounds (BEO, CRINA(R) RUMINANTS) on rumen microbial fermentation and nutrient flow. Temperature (39 [degree sign]C), pH (6.4), and liquid (0.10/h) and solid (0.05/h) dilution rates were maintained constant. Treatments were arranged in a 2 x 2 factorial design. Main factors were type of diet (i.e., 100 forage and 900 concentrate versus 600 forage and 400 concentrate) and the addition of BEO (i.e., 0 mg/l versus 1.5 mg/l of BEO). Diets (95 g/d of dry matter) were fed in three equal portions during the day. Each experimental period consisted of 5 days for adaptation of the rumen fluid to in vitro conditions and 3 days for sampling. Effluent samples were collected from a composite of the three sampling days, and bacteria were isolated from fermenter flasks on the last day of each period for chemical analysis. There were no interactions between diet type and the addition of BEO, and no effects of diet type on dry matter (DM), organic matter (OM), neutral detergent fibre (NDF), acid detergent fibre (ADF) and crude protein (CP) digestion. The high concentrate diet resulted in a higher concentration of total volatile fatty acids (VFA; 128.1 mM versus 110.9 mM) and proportion of butyrate (18.5 mol/100 mol versus 13.9 mol/100 mol) compared with the high forage diet. The high forage diet had a higher proportion of acetate (61.0 mol/100 mol versus 50.3 mol/100 mol), acetate to propionate ratio (2.98 versus 1.98), ammonia N concentration (8.64 mg/100 ml versus 3.01 mg/100 ml), total N flow (3.57 g/d versus 3.26 g/d), ammonia N flow (0.27 g/d versus 0.10 g/d) and non-ammonia N flow (3.30 g/d versus 3.17 g/d) compared with the high concentrate diet. There were no effects of BEO on DM, OM, NDF, ADF and CP digestion, but BEO increased the concentration of total VFA (122.8 mM versus 116.2 mM) without affecting individual VFA proportions or N metabolism. Further research is required to determine the effect of dose of BEO, and adaptation time to the addition of BEO, on N metabolism of rumen microorganisms.
Keywords: Essential oil; Rumen microbial fermentation

Ahmet Cakir, Saban Kordali, Hamdullah Kilic, Ercan Kaya, Antifungal properties of essential oil and crude extracts of Hypericum linarioides Bosse, Biochemical Systematics and Ecology, Volume 33, Issue 3, March 2005, Pages 245-256, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.08.006.
(http://www.sciencedirect.com/science/article/B6T4R-4F4H9NP-4/2/35e174993d2a6a3b7eeb68ae85b192e7)
Abstract:
The chemical composition of the essential oil isolated from the aerial parts of Hypericum linarioides Bosse by hydrodistillation was analysed by GC-MS. It was determined that 74 compounds, which represent 84.1% of total oil, were present in the oil. The oil contains mainly [delta]-cadinene (6.9%), (Z)-[beta]-farnesene (5.2%), [gamma]-muurolene (5.5%), spathulenol (4.8%), hexahydrofarnesyl acetone (4.5%) and [alpha]-selinene (4.0%). The oil was also characterized by high content of sesquiterpenes (64.2% of total oil). The oil was tested for antifungal activity using mycelial growth inhibition assays (in vitro) against 11 agricultural pathogenic fungi, which consisted of six Fusarium species (Fusarium acuminatum, Fusarium culmorum, Fusarium equiseti, Fusarium oxysporum, Fusarium sambucinum and Fusarium solani) and three anastomosis groups of Rhizoctonia solani (AG-5, AG-9 and AG-11), Alternaria solani and Verticillium albo-atrum. The oil of H. linarioides showed antifungal activity against AG-9 and V. albo-atrum. In addition, petroleum ether, chloroform, acetone and methanol extracts of H. linarioides were tested against species of 11 fungi. The extracts showed moderate inhibition effects on the growth of A. solani, F. culmorum, F. equiseti and all anastomosis groups of R. solani.
Keywords: Hypericum linarioides; Essential oil composition; Antifungal activity; [delta]-Cadinene; (Z)-[beta]-Farnesene

Marcio J. Oliveira, Irani F.P. Campos, Carolina B.A. Oliveira, Marisa R. Santos, Paulo S. Souza, Suzana C. Santos, Jose C. Seraphin, Pedro H. Ferri, Influence of growth phase on the essential oil composition of Hyptis suaveolens, Biochemical Systematics and Ecology, Volume 33, Issue 3, March 2005, Pages 275-285, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.10.001.
(http://www.sciencedirect.com/science/article/B6T4R-4F923XW-1/2/66252bd53e56a4b261755a03b40e7999)
Abstract:
The chemical composition of the essential oils of seven populations of Hyptis suaveolens in vegetative, flowering and fruiting stages and their interpopulation variability were investigated by GC-MS. Sabinene, limonene, 1,8-cineole, (E)-caryophyllene and spathulenol were the principal constituents. The results from the chemical analysis were submitted to Principal Component and Chemometric Cluster Analysis which allowed five groups of populations to be distinguished with respect to the stage of growth and high content of bicyclogermacrene/terpin-4-ol, sabinene, 1,8-cineole/spathulenol, limonene/[gamma]-terpinene and spathulenol/(E)-caryophyllene. Pattern of geographic-variation in essential oil composition indicated that monoterpene hydrocarbons were mainly produced in plants from sampling sites located in higher latitudes and altitudes regardless of the phase of growth, while sesquiterpenes were mainly produced in fruiting samples grown at lower ones. The Canonical Correlation Analysis between the soil sampling sites with the populations revealed a significant relationship between oil components and edaphic factors. Sesquiterpenes and potential acidity, Al, and Al saturation load fairly strong onto the first canonical variate and are related to fruiting samples collected at lower latitudes. On the other hand, monoterpene hydrocarbons are strongly related to chemical balance in soils (P, Zn, Cu, Mn, base saturation, neutral pH), which is related to the vegetative/flowering sampling at higher latitudes.
Keywords: Hyptis suaveolens; Lamiaceae; Essential oil; Chemical variability; Multivariate analysis; Canonical correlation

A. Tomaino, F. Cimino, V. Zimbalatti, V. Venuti, V. Sulfaro, A. De Pasquale, A. Saija, Influence of heating on antioxidant activity and the chemical composition of some spice essential oils, Food Chemistry, Volume 89, Issue 4, March 2005, Pages 549-554, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2004.03.011.
(http://www.sciencedirect.com/science/article/B6T6R-4CCNV8B-1/2/33101fe412d2658042ac59fd156de29e)
Abstract:
Oxidation of lipids is one of the basic processes causing rancidity in food products. Since application of natural antioxidants may be one of the technically simplest ways of reducing fat oxidation, we studied the effect of heating on antioxidant effectiveness and the chemical composition of basil, cinnamon, clove, nutmeg, oregano and thyme essential oils. When maintained at room temperature, all the oils tested appeared endowed with good radical-scavenger properties in the DPPH[square root] assay (effectiveness order: clove >> cinnamon > nutmeg > basil [greater-or-equal, slanted] oregano >> thyme). When heated up to 180 [degree sign]C, nutmeg oil (but not the other essential oils under study) showed a significantly higher free radical-scavenger activity and evident changes in its chemical composition. Furthermore, the ability of these essential oils to protect [alpha]-tocopherol, contained in virgin olive oil, against thermal oxidative degradation was investigated. All the essential oils tested appeared able to prevent [alpha]-tocopherol loss following oil heating at 180 [degree sign]C for 10 min (efficiency order: clove > thyme [greater-or-equal, slanted] cinnamon > basil >> oregano > nutmeg). In conclusion, the essential oils under study exhibited good antioxidant properties and might be efficiently used to control lipid oxidation during food processing.
Keywords: Essential oil; Antioxidant; Heating; [alpha]-Tocopherol; Food processing

R.L. Smith, S.M. Cohen, J. Doull, V.J. Feron, J.I. Goodman, L.J. Marnett, P.S. Portoghese, W.J. Waddell, B.M.Wagner, R.L. Hall, N.A. Higley, C. Lucas-Gavin, T.B. Adams, A procedure for the safety evaluation of natural flavor complexes used as ingredients in food: essential oils, Food and Chemical Toxicology, Volume 43, Issue 3, March 2005, Pages 345-363, ISSN 0278-6915, DOI: 10.1016/j.fct.2004.11.007.
(http://www.sciencedirect.com/science/article/B6T6P-4F7Y91M-1/2/3a9cf2b0099d8fda18fc92d66997b5ba)
Abstract:
A scientifically based guide has been developed to evaluate the safety of naturally occurring mixtures, particularly essential oils, for their intended use as flavor ingredients. The approach relies on the complete chemical characterization of the essential oil and the variability of the composition of the oil in the product intended for commerce. Being products of common plant biochemical pathways, the chemically identified constituents are organized according to a limited number of well-established chemical groups called congeneric groups. The safety of the intake of the each congeneric group from consumption of the essential oil is evaluated in the context of data on absorption, metabolism, and toxicology of members of the congeneric group.
The intake of the group of unidentified constituents is evaluated in the context of the consumption of the essential oil as a food, a highly conservative toxicologic threshold, and toxicity data on the essential oil or an essential oil of similar chemotaxonomy. The flexibility of the guide is reflected in the fact that high intake of major congeneric groups of low toxicologic concern will be evaluated along with low intake of minor congeneric groups of significant toxicological concern (i.e., higher structural class). The guide also provides a comprehensive evaluation of all congeneric groups and constituents that account for the majority of the composition of the essential oil. The overall objective of the guide is to organize and prioritize the chemical constituents of an essential oil in order that no reasonably possible significant risk associated with the intake of essential oil goes unevaluated. The guide is, however, not intended to be a rigid checklist. The Flavor and Extract Manufacturers Association (FEMA) Expert Panel will continue to evaluate each essential oil on a

case by case basis applying their scientific judgment to insure that each natural flavor complex is exhaustively evaluated.
Keywords: Essential oils; Safety evaluation; Natural flavor complexes; Chemical mixtures

Hasan Baydar, Nilgun Gokturk Baydar, The effects of harvest date, fermentation duration and Tween 20 treatment on essential oil content and composition of industrial oil rose (Rosa damascena Mill.), Industrial Crops and Products, Volume 21, Issue 2, March 2005, Pages 251-255, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2004.04.004.
(http://www.sciencedirect.com/science/article/B6T77-4CG0VVY-2/2/f7033b79d24d279b9ffba2f8bd6b025a)
Abstract:
The essential oil of Rosa damascena Mill. is one of the most valuable and important base material in the flavor and fragrance industry. The aim of this study was to determine the effects of harvest date, fermentation duration and Tween 20 treatment on the essential oil content and composition of the rose petals. The essential oil content and composition were significantly different in the petals harvested at various dates (May 24, June 1, 8, and 15, 2002). The highest oil content was found on May 24 harvest (0.040%), and then a gradual decrease was observed up to last harvest date (0.032%). The highest percentages of geraniol, nerol, and phenylethyl alcohol were obtained from the petals harvested on May 24. However, the highest percentages of citronellol and linalool were found from the petals harvested on June 8. The petals collected freshly were fermented for various duration (0, 12, 24, and 36 h) at 25 [degree sign]C in sacks. The highest essential oil content was found in the non-fermented petals. As fermentation duration increased, essential oil content gradually decreased. The most significant changes during the fermentation were observed in citronellol and geraniol contents. Citronellol/geraniol (C/G) ratio increased from 0.57 to 10.31 throughout the fermentation. In the other experiment, Tween 20 was added into the distillation water at various concentrations (0, 1000, 2500, and 5000 ppm). Although Tween 20 generally raised the contents of essential oil, it did not significantly influence the oil composition. The highest oil content (0.045%) was obtained from the distillation treated with 2500 ppm of Tween 20. Oil content had high positive correlations with geraniol and linalool contents (r=0.55 and 0.53, respectively), but high negative correlation with citronellol content (r=-0.48).
Keywords: Rosa damascena Mill.; Harvest date; Fermentation; Tween 20; Rose oil composition

Adewale Martins Adio, Wilfried A. Konig, Sesquiterpene constituents from the essential oil of the liverwort Plagiochila asplenioides, Phytochemistry, Volume 66, Issue 5, March 2005, Pages 599-609, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2005.01.015.
(http://www.sciencedirect.com/science/article/B6TH7-4FFN4MV-2/2/02039b06b60b7ad5bbfe8e8c782e1350)
Abstract:
The essential oil of the liverwort Plagiochila asplenioides from two different locations in Northern Germany were investigated by chromatographic and spectroscopic methods. Seven compounds were isolated by preparative gas chromatography (GC) and their structures investigated by mass spectrometry (MS), NMR techniques and chemical correlations in combination with enantioselective GC. In addition to known constituents, aromadendra-1(10),3-diene, two aromatic sesquiterpene hydrocarbons, bisabola-1,3,5,7(14)-tetraene and bisabola-1,3,5,7-tetraene, three sesquiterpene ethers, muurolan-4,7-peroxide, plagiochilines W and X, in addition to ent-4-epi-maaliol, could be identified as natural compounds for the first time.
Keywords: Plagiochila asplenioides; Liverworts; Sesquiterpene hydrocarbons; Oxygenated sesquiterpenes; abeo-Amorphane/muurolane; seco-Aromadendrane-type sesquiterpenoids

Jolita Radusiene, Asta Judzentiene, Genovaite Bernotiene, Essential oil composition and variability of Hypericum perforatum L. growing in Lithuania, Biochemical Systematics and Ecology,

Volume 33, Issue 2, February 2005, Pages 113-124, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.06.010.
(http://www.sciencedirect.com/science/article/B6T4R-4DPC45F-1/2/e18818ae442866beeffb92672fd862a2)
Abstract:
The composition of essential oils obtained from flowers and leaves in 11 accessions of Hypericum perforatum L. was analysed by GC and GC-MS. All the analysed oils were dominated by their oxygenated sesquiterpene fraction. Differences were attributed to the main components: caryophyllene oxide, spathulenol and viridiflorol. There were only a few monoterpenes in essential oil of all accessions. The data indicated some differences in sesquiterpene and aliphatic hydrocarbons, as well as in oxygenated aliphatics biosynthesis in flowers and leaves. The concentrations of [beta]-caryophyllene and caryophyllene oxide in essential oils from leaves were higher than those from flowers, whereas dodecanol, spathulenol, viridiflorol, carotol and tetradecanol were present in higher quantities in flowers. Cluster analysis of all identified components grouped oils from flowers and from leaves into three clusters that corresponded with their major components: caryophyllene oxide, tetradecanal, tetradecanol and manool. Chemical variability of the analysed accessions seems likely to result from the genetic variability, since the influence of different environmental factors has been eliminated.
Keywords: Hypericum perforatum L.; Essential oil composition; GC-MS; Cluster analysis; Caryophyllene oxide; Tetradecanol; Manool

Suman P.S. Khanuja, Ajit K. Shasany, Anubha Pawar, R.K. Lal, M.P. Darokar, A.A. Naqvi, S. Rajkumar, V. Sundaresan, Nirupama Lal, Sushil Kumar, Essential oil constituents and RAPD markers to establish species relationship in Cymbopogon Spreng. (Poaceae), Biochemical Systematics and Ecology, Volume 33, Issue 2, February 2005, Pages 171-186, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.06.011.
(http://www.sciencedirect.com/science/article/B6T4R-4DTKX67-1/2/27dc716a74319a810a5b09546f30779b)
Abstract:
Nineteen Cymbopogon taxa belonging to 11 species, two varieties, one hybrid taxon and four unidentified species were analysed for their essential oil constituents and RAPD profiles to determine the extent of genetic similarity and thereby the phylogenetic relationships among them. Remarkable variation was observed in the essential oil yield ranging from 0.3% in Cymbopogon travancorensis Bor. to 1.2% in Cymbopogon martinii (Roxb.) Wats var. motia. Citral, a major essential oil constituent, was employed as the base marker for chemotypic clustering. Based on genetic analysis, elevation of Cymbopogon flexuosus var. microstachys (Hook. F.) Soenarko to species status and separate species status for C. travancorensis Bor., which has been merged under C. flexuosus (Steud.) Wats were suggested towards resolving some of the taxonomic complexes in Cymbopogon. The separate species status for the earlier proposed varieties of C. martinii (motia and sofia) is further substantiated by these analyses. The unidentified species of Cymbopogon have been observed as intermediate forms in the development of new taxa.
Keywords: Aromatic grasses; Cymbopogon; Essential oils; RAPD; Genetic diversity; Species relationships

Bektas Tepe, Munevver Sokmen, H. Askin Akpulat, Dimitra Daferera, Moschos Polissiou, Atalay Sokmen, Antioxidative activity of the essential oils of Thymus sipyleus subsp. sipyleus var. sipyleus and Thymus sipyleus subsp. sipyleus var. rosulans, Journal of Food Engineering, Volume 66, Issue 4, February 2005, Pages 447-454, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2004.04.015.
(http://www.sciencedirect.com/science/article/B6T8J-4CJVD48-4/2/d558e6ecac1425c8e4f60f7ee1ef5b1f)

Abstract:
The aim of present study was to compare the antioxidant potential of two Thymus species on the basis of the chemical compositions of oils obtained by hydrodistillation. In the case of Thymus sipyleus subsp. sipyleus var. sipyleus, 71 compounds were identified representing the 92.5% of the total oil. The major constituents of the oil were described as borneol (11.2%), [alpha]-muurolol (9.2%), [beta]-caryophyllene (7.6%), geranial (7.3%) and neral (5.4%). On the other hand, 47 compounds were identified representing 98.7% of the oil of Thymus sipyleus subsp. sipyleus var. rosulans. This oil is characterised by the high monoterpene fraction (94.0%) and especially by the presence of the phenolic carvacrol (58.1%), thymol (20.5%) and their precursors p-cymene (4.1%) and [gamma]-terpinene (4.4%). The oils were also subjected to screening for their possible antioxidant activity by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene/linoleic acid assays. In the first case, the free radical scavenging activity of the essential oil of T. sipyleus subsp. sipyleus var. rosulans was superior to var. sipyleus oil (IC50=220 +/- 0.5 and 2670 +/- 0.5 [mu]g/ml, respectively). In the case of linoleic acid system, oxidation of linoleic acid was effectively inhibited by T. sipyleus subsp. sipyleus var. rosulans (92.0%), while the var. sipyleus oil had no activity. In the latter case, the linoleic acid inhibition rate of var. rosulans oil is close to the synthetic antioxidant BHT (96.0%).
Keywords: Thymus sipyleus; Essential oil; Antioxidant activity; GC-MS

Winna A. Asuming, Philip S. Beauchamp, Josette T. Descalzo, Barbara C. Dev, Vasu Dev, Scott Frost, Catherine W. Ma, Essential oil composition of four Lomatium Raf. species and their chemotaxonomy, Biochemical Systematics and Ecology, Volume 33, Issue 1, January 2005, Pages 17-26, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.06.005.
(http://www.sciencedirect.com/science/article/B6T4R-4DK65P4-1/2/79900846dcfb554a598c2d599bf414e0)
Abstract:
The composition of the essential oils of Lomatium dasycarpum ssp. dasycarpum, Lomatium lucidum, Lomatium macrocarpum var. macrocarpum and Lomatium utriculatum is described. Identification of components was determined from their GC, GC/MS data and many were confirmed by coinjections with authentic samples. Several components were isolated by liquid and gas chromatographic techniques and their structures confirmed from their 1H and 13C NMR spectral data. 2-Methyl and 3-methylbutanoates were the major components of L. dasycarpum fruits as well as stems and leaves oils. [beta]-Phellandrene/limonene, decanal, dodecanal, bornyl acetate, germacrene D, [alpha]-humulene and bicyclogermacrene were the major components of the corresponding L. lucidum oils. [alpha]-Pinene and [beta]-pinene were the major components of the fruit oil of L. macrocarpum. Its stem and leaf oil was rich in peucenin 7-methyl ether, [beta]-caryophyllene, (Z)-3-hexenol, palmitic acid, linoleic acid and (E)-2-hexenal. Sabinene, (Z)-ligustilide, terpinen-4-ol, [beta]-phellandrene/limonene, [beta]-caryophyllene, myrcene, [alpha]-pinene and [beta]-pinene were the major compounds in L. utriculatum fruit oil, while its stem and leaf oil was rich in (Z)-ligustilide, palmitic acid, terpinen-4-ol, linoleic acid and germacrene D. (Z)-Falcarinol was a major component of all the four root oils.
Keywords: Essential oils; Apiaceae; Lomatium; L. dasycarpum; L. lucidum; L. macrocarpum; L. utriculatum; 3-Methyl-2-buten-1-yl 2-methylbutanoate; 3-Methyl-2-buten-1-yl 3-methylbutanoate; Lavandulyl 2-methylbutyrate; Senkyunolide; (Z)-Ligustilide; (Z)-Falcarinol; Osthol; Peucenin-7-methyl ether

Guido Flamini, Pier Luigi Cioni, Ivano Morelli, Sezgin Celik, R. Suleyman Gokturk, Orhan Unal, Essential oil of Stachys aleurites from Turkey, Biochemical Systematics and Ecology, Volume 33, Issue 1, January 2005, Pages 61-66, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.05.013.
(http://www.sciencedirect.com/science/article/B6T4R-4D48XC8-1/2/2e4623515df755f9aa98b12b28e124b4)

Abstract:
The essential oil obtained from the aerial parts of the Turkish endemism Stachys aleurites (Lamiaceae) has been studied. The main constituents were sesquiterpene hydrocarbons: [beta]-caryophyllene (33.7%), bicyclogermacrene (14.5%) and germacrene D (9.6%). The main monoterpene was [alpha]-pinene (8.4%). Some chemotaxonomical considerations have been provided.
Keywords: Stachys aleurites; Lamiaceae; Essential oil composition; Turkey; [beta]-Caryophyllene; Bicyclogermacrene; Germacrene D; [alpha]-Pinene

E. Vagi, B. Simandi, A. Suhajda, E. Hethelyi, Essential oil composition and antimicrobial activity of Origanum majorana L. extracts obtained with ethyl alcohol and supercritical carbon dioxide, Food Research International, Volume 38, Issue 1, January 2005, Pages 51-57, ISSN 0963-9969, DOI: 10.1016/j.foodres.2004.07.006.
(http://www.sciencedirect.com/science/article/B6T6V-4D98JJ4-1/2/0c6a08aca19ffc96652eb37de9c1cbc3)
Abstract:
Volatile components of marjoram (Origanum majorana L.) essential oil obtained by hydrodistillation and extracts obtained by solvent extraction with ethyl alcohol and supercritical fluid extraction (SFE) were investigated. The compositions of volatile compounds in essential oil, ethanolic and SFE extracts were determined by GC and GC-MS. The antimicrobial properties of marjoram solvent extracts were investigated with microbiological tests against food borne fungi and bacteria strains. Extracts obtained by SFE at high pressure and temperature showed significantly stronger antimicrobial properties in comparison to the slight inhibitory effects of the ethanolic extract. The results support the notion that extracts obtained by SFE might have a role as flavourings and natural colourants as well as use as preservatives in food and cosmetic systems.
Keywords: Antimicrobial properties; GC analysis of volatile components; Marjoram (Origanum majorana L.); Supercritical fluid extraction; Soxhlet extraction

B. R. Rajeswara Rao, P. N. Kaul, K. V. Syamasundar, S. Ramesh, Chemical profiles of primary and secondary essential oils of palmarosa (Cymbopogon martinii (Roxb.) Wats var. motia Burk.), Industrial Crops and Products, Volume 21, Issue 1, January 2005, Pages 121-127, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2004.02.002.
(http://www.sciencedirect.com/science/article/B6T77-4C4X4B2-1/2/3169b32433903f2ef5aa06bbd7d12cda)
Abstract:
Natural essential oils extracted from aromatic crops through steam distillation are extensively used in fragrance, flavour and pharmaceutical industries and in aromatherapy. During steam distillation, a part of the essential oil becomes dissolved in condensate or distillation water and is lost as this water is discarded. A method was developed to recover the dissolved essential oil from condensate water. Palmarosa (Cymbopogon martinii (Roxb.) Wats. var. motia Burk., family: Poaceae), an important aromatic grass was used as the test crop. The distillation water of palmarosa mixed with hexane in 10:1 proportion was thoroughly shaken for 30 min to trap the dissolved essential oil. Hexane was then distilled to yield `secondary' or `recovered' oil. In palmarosa, the `primary' or `decanted' oil (obtained directly by distilling the crop biomass) accounted for 92% and the recovered oil accounted for 8% of the total oil yield. The solvent loss in this process was 4-7%. Experiments conducted in the laboratory with the essential oil showed that the water solubility of palmarosa oil ranged from 0.12 to 0.15% at 31 [degree sign]C and 0.15 to 0.20% at 80 [degree sign]C. Hexane recovered up to 97% of the dissolved essential oil in water. The recovered essential oil was richer in organoleptically important oxygenated compounds linalool (2.6-3.8%), geraniol (91.8-92.8%) and geranial (1.8-2.0%) compared to the primary oil.

Keywords: Palmarosa; Distillation water; Hexane extraction; Primary or decanted oil; Secondary or recovered oil; Essential oil chemical profile

Guillaume K. Ketoh, Honore K. Koumaglo, Isabelle A. Glitho, Inhibition of Callosobruchus maculatus (F.) (Coleoptera: Bruchidae) development with essential oil extracted from Cymbopogon schoenanthus L. Spreng. (Poaceae), and the wasp Dinarmus basalis (Rondani) (Hymenoptera: Pteromalidae), Journal of Stored Products Research, Volume 41, Issue 4, 2005, Pages 363-371, ISSN 0022-474X, DOI: 10.1016/j.jspr.2004.02.002.
(http://www.sciencedirect.com/science/article/B6T8Y-4FRJ741-2/2/640a4d0e0edf7a999ce949882259f3bb)
Abstract:
The control of the development of Callosobruchus maculatus was studied using a method that combined exposure to essential oil extracted from Cymbopogon schoenanthus and the introduction of a pteromalid natural enemy of the bruchid, Dinarmus basalis. The effect of the essential oil used was evaluated on all developmental stages of C. maculatus and on adults of D. basalis. At the highest concentration tested (33.3 [mu]l/l) all adults of C. maculatus were killed within 24 h of exposure to the oil and the development of newly laid eggs and neonate larvae was also inhibited. However, the oil had variable efficacy against the bruchid instars developing inside the seeds: 5-day-old larvae (63% LI and 37% LII) of C. maculatus developing inside the seeds proving to be highly susceptible while 15-day-old insects (84% of pupae and 16% of larvae) were tolerant. Under the same conditions (33.3 [mu]l/l), adults of D. basalis were very susceptible to oil vapours and to the residual activity of the oil after 3 or 6 days. However, the introduction of 10 pairs of adult D. basalis into a jar containing 100 hosts aged 10 days, 3 or 6 days before the oil application, gave respectively an emergence of 26 or 18 adults of the parasitoid compared to 28 in the control and there was no adult emergence of the host. The possibility of an integrated pest management strategy by using allelochemicals such as essential oils and indigenous natural enemies to control C. maculatus development in cowpea stocks is discussed.
Keywords: Essential oil; Cymbopogon schoenanthus; Callosobruchus maculatus; Dinarmus basalis; Integrated pest management

A. L. Tapondjou, C. Adler, D. A. Fontem, H. Bouda, C. Reichmuth, Bioactivities of cymol and essential oils of Cupressus sempervirens and Eucalyptus saligna against Sitophilus zeamais Motschulsky and Tribolium confusum du Val, Journal of Stored Products Research, Volume 41, Issue 1, 2005, Pages 91-102, ISSN 0022-474X, DOI: 10.1016/j.jspr.2004.01.004.
(http://www.sciencedirect.com/science/article/B6T8Y-4CC2XXB-1/2/4e66c943f305227656b2b7045af3a206)
Abstract:
The essential oils extracted from Eucalyptus saligna and Cupressus sempervirens leaves were analysed by GC-MS and evaluated along with cymol, one of their main constituents for their repellent and toxic effects on Sitophilus zeamais and Tribolium confusum. Contact toxicity assayed by impregnation on filter paper discs or coating onto maize grains showed that these chemicals caused significant mortality of the test insects. Eucalyptus oil was more toxic than Cupressus oil to both insect species (LD50=0.36 [mu]l/cm2 for S. zeamais and 0.48 [mu]l/cm2 for T. confusum) on filter paper discs, and was more toxic to S. zeamais on maize (LD50=38.05 [mu]l/40 g grain). Both oils considerably reduced the F1 progeny production and grain weight loss. Moreover, both crude oil extracts produced a stronger repellent activity against the test insects than did cymol. These results suggest that the essential oils from E. saligna and C. sempervirens may be used in grain storage against insect pests.
Keywords: Eucalyptus saligna; Cupressus sempervirens; Essential oil; Cymol; Sitophilus zeamais; Tribolium confusum; Repellency; Contact toxicity

Robert P. Adams, Mitiku Habte, Sunghun Park, Mark R. Dafforn, Preliminary comparison of vetiver root essential oils from cleansed (bacteria- and fungus-free) versus non-cleansed (normal) vetiver plants, Biochemical Systematics and Ecology, Volume 32, Issue 12, December 2004, Pages 1137-1144, ISSN 0305-1978, DOI: 10.1016/j.bse.2004.03.013.
(http://www.sciencedirect.com/science/article/B6T4R-4CWBJ2V-1/2/ae60cb4fcd674b314c0737b011df5b89)
Abstract:
The `Sunshine' cultivar of vetiver (Vetiveria zizanioides (L.) Nash, =Chrysopogon zizanioides (L.) Roberty) was subjected to meristem tissue culture in order to produce plants that were bacteria- and fungi-free. Tissue cultured ('cleansed' or phytosanitary) vetiver was grown for five months in pots of sterilized soil, and the oil compared to non-cleansed (normal) vetiver plants grown in the same conditions except using pots of unsterilized soil. The steam distilled (24 h) oil of the roots from tissue cultured (cleansed) vetiver yielded 0.02% clear oil compared to a 0.35% yield of light yellow oil for the normal vetiver plants, a 17-fold smaller yield. GC/MS analyses of the oils revealed that the non-cleansed (normal) vetiver had the typical vetiver oil profile, whereas the tissue cultured (cleansed) vetiver produced large amounts of C19-C29 alkanes plus several alkanols along with typical vetiver oil compounds, but lacked presumed fungal metabolites such as [beta]-funebrene, prezizaene, [alpha]-amorphene, and [beta]-vetispirene. An unidentified biotic factor (apparently bacteria or fungi) appears to enhance the oil production in normal vetiver by both increasing yield and by the generation of signature oil compounds. These preliminary results of endogenous microbial transformations of plant chemistry may have broader physiological implications, especially among monocotyledons (including cereals).
Keywords: Vetiver; Vetiveria zizanioides; Chrysopogon zizanioides; Poaceae; Essential oils; Mycorrhiza; Bacteria; Biotransformation

F. Sefidkon, Z. Jamzad, M. Mirza, Chemical variation in the essential oil of Satureja sahendica from Iran, Food Chemistry, Volume 88, Issue 3, December 2004, Pages 325-328, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2003.12.044.
(http://www.sciencedirect.com/science/article/B6T6R-4CNGPC1-1/2/f724ce989ca2bc5bd3a01e7bfe62b260)
Abstract:
Hydro-distilled volatile oils from the aerial parts of eight populations of Satureja sahendica Bornm. were investigated, mainly by a combination of GC and GC/MS. S. sahendica is one of the endemic species of Satureja in Iran. Thirty-nine components were identified in the oils. The main constituents of the essential oils were thymol (19.6-41.7%), p-cymene (32.5-54.9%) and [gamma]-terpinene (1.0-12.8%). Although the main components of all the oils are common, their percentages are different.
Keywords: Satureja sahendica; Labiatae; Essential oil composition; Thymol; p-cymene; [gamma]-terpinene; Iran

Atalay Sokmen, Medine Gulluce, H. Askin Akpulat, Dimitra Daferera, Bektas Tepe, Moschos Polissiou, Munevver Sokmen, Fikrettin Sahin, The in vitro antimicrobial and antioxidant activities of the essential oils and methanol extracts of endemic Thymus spathulifolius, Food Control, Volume 15, Issue 8, December 2004, Pages 627-634, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2003.10.005.
(http://www.sciencedirect.com/science/article/B6T6S-4B6686H-1/2/9e8046bfdb809b54d0177e83887d7311)
Abstract:
The present study was conducted to evaluate the in vitro antimicrobial and antioxidant properties of essential oil and methanol extracts from a unique and endemic plant, Thymus spathulifolius (Hausskn. and Velen.). The antimicrobial test results showed that the essential oil of T.

spathulifolius strongly inhibited the growth of test microorganisms studied, except for 4 fungi species while polar and non-polar subfractions of the methanol extract had moderate antibacterial, but not antifungal and anticandidal activity. The antioxidative potential of the samples was evaluated using two separate methods, inhibition of free radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) and [beta]-carotene-linoleic acid systems. The polar subfraction of the methanol extract was able to reduce the stable free radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) with an IC50 of 16.15 +/- 0.5 [mu]g/ml, which was lower than that of synthetic antioxidant, BHT, (19.8 +/- 0.5 [mu]g/ml). Inhibition values of linoleic acid oxidation were calculated as 92% and 89% for the oil and the polar subfraction, respectively. Gallic acid equivalent total phenolic constituent of the polar subfraction was 141.00 +/- 0.90 [mu]g/mg (14.1%, w/w). The chemical composition of a hydrodistilled essential oil of T. spathulifolius was analyzed by a GC and GC/MS system. A total of 28 constituents representing 99.2% of the oil were identified; thymol (36.5%), carvacrol (29.8%), p-cymene (10.0%) and [gamma]-terpinene (6.3%) were the main components comprising 82.6% of the oil. Results presented here may suggest that the essential oil and extracts of T. spathulifolius possess antimicrobial and antioxidant properties, and therefore, they can be used as a natural preservative ingredient in food and/or pharmaceutical industry.
Keywords: Thymus spathulifolius; Antimicrobial activity; Antioxidant activity

Andrea Velluti, Sonia Marin, Pilar Gonzalez, Antonio J. Ramos, Vicente Sanchis, Initial screening for inhibitory activity of essential oils on growth of Fusarium verticillioides, F. proliferatum and F. graminearum on maize-based agar media, Food Microbiology, Volume 21, Issue 6, December 2004, Pages 649-656, ISSN 0740-0020, DOI: 10.1016/j.fm.2004.03.009.
(http://www.sciencedirect.com/science/article/B6WFP-4D3W9F4-4/2/9d1d3b6fc41490aabbffde35f137ddaa)
Abstract:
An in vitro initial screening of a range of 37 essential oils on inhibition of mycelial growth of Fusarium verticillioides, F. proliferatum and F. graminearum under different temperature (20-30[degree sign]C) and water activity (aw) (0.95-0.995) conditions was made. The basic medium was a 3% maize meal extract agar. The maize meal agar was modified with glycerol to a range of water activity conditions and the essential oils were incorporated at different concentrations (0, 500, 1000 [mu]g ml-1). Cinnamon leaf, clove, lemongrass, oregano and palmarosa oils were the products tested suitable for being used as novel preservatives in the control of the three Fusarium species studied. Although water activity was determinant for the growth of the isolates, in general, the preservative effects of the oils were not linked to aw. However, a trend to a higher inhibition by the oils when aw was low was observed. Temperature had a minor importance in the inhibitory effect of the preservatives. In vivo studies may be required to confirm the usefulness of the results obtained.
Keywords: Fusarium; Essential oil; Growth; Inhibition

Barakat S. M. Mahmoud, Koji Yamazaki, Kazuo Miyashita, Shin Il-Shik, Chang Dong-Suk, Tetsuya Suzuki, Bacterial microflora of carp (Cyprinus carpio) and its shelf-life extension by essential oil compounds, Food Microbiology, Volume 21, Issue 6, December 2004, Pages 657-666, ISSN 0740-0020, DOI: 10.1016/j.fm.2004.03.001.
(http://www.sciencedirect.com/science/article/B6WFP-4D3W9F4-5/2/14a629831f66617b49bb8d89d04f4afb)
Abstract:
The microflora of common carp (Cyprinus carpio) skin, gill and intestine were analysed and the antimicrobial activities of garlic oil and nine constituents of essential oils (allyl isothiocyanate, carvacrol, cinnamaldehyde, citral, cuminnaldehyde, eugenol, isoeugenol, linalool and thymol) against the carp isolates were studied to identify compounds that might extend the shelf-life of carp fillet. A total of 90 isolated strains were identified to belong to seven genera: Acinetobacter

(6), Alcaligenes (2), Bacillus (2), Flavobacterium (20), Micrococcus (2), Moraxella (6) and Pseudomonas (4), and two families Enterobacteriaceae (14) and Vibrionaceae (34). The dominant micro-organisms of carp were found to be Flavobacterium (37%) and Vibrionaceae (33%) in skin, Flavobacterium (33%) in gill and Vibrionaceae (63%) and Flavobacterium (37%) in intestine. Against these isolates, thymol, carvcarol and cinnamaldehyde had the strongest antimicrobial activities, followed by isoeugenol, eugenol, garlic oil, and then citral. The antimicrobial properties of the other constituents tested (cuminnaldehyde, linalool and allyl isothiocyanate) were low. In tests of mixed compounds, a combination of carvacrol and thymol had the highest antimicrobial activity. Moraxella, Flavobacterium and Vibrionaceae were more sensitive to the compounds, whereas Alcaligenes strains were resistant. Dipping carp fillets in a solution of 0.5% carvacrol and 0.5% thymol before storage at 5[degree sign]C and 10[degree sign]C reduced both the total microbial load by about 100-fold and the Volatile Bases Nitrogen (VB-N), as compared with controls. In addition, dipping treatment delayed bacterial growth and extended the shelf-life of the fillets from 4 to 12 days at low temperature (5[degree sign]C). However, the treated and control fillets showed little difference during storage at 10[degree sign]C. Data from sensory evaluation showed that dipped fillets in 1% (carvacrol+thymol) extended the shelf-life of carp fillets by 8 and 4 days at 5[degree sign] and 10[degree sign]C, respectively. Thus, carvacrol and thymol dipping can improve the microbial stability of fish fillets by removing bacteria and by inhibiting bacterial growth.
Keywords: Antimicrobial; Carp fillet; Essential oil; Microflora; Shelf-life

C.-C. Wu, J.G. Chung, S.-J. Tsai, J.H. Yang, L.Y. Sheen, Differential effects of allyl sulfides from garlic essential oil on cell cycle regulation in human liver tumor cells, Food and Chemical Toxicology, Volume 42, Issue 12, December 2004, Pages 1937-1947, ISSN 0278-6915, DOI: 10.1016/j.fct.2004.07.008.
(http://www.sciencedirect.com/science/article/B6T6P-4D98FTC-4/2/060edffaec07833af79141cc6818fffa)
Abstract:
In this study, diallyl sulfide (DAS), diallyl disulfide (DADS) and diallyl trisulfide (DATS), which are major organosulfur compounds (OSCs) of garlic, were used as experimental materials to investigate their modulation effects on cell viability and cell cycle in human liver tumor cells (J5). According to the results of cell viability assay, 50 or 100 [mu]M DATS significantly decreased the cell viability as compared with the control ($P < 0.05$) in dose and time dependent relations. Phenomena of cell number loss, shape deformation and lysis were observed after treatment with 100 [mu]M DATS for 24 h. Cell cycle studies showed that J5 cells were significantly arrested in G2/M phase as the cells were treated with 100 [mu]M DADS, 10, 50 or 100 [mu]M DATS for 24 h ($P < 0.05$). DATS was more effective in arresting cells in G2/M phase than DADS, and the phenomena of arresting J5 cells in G2/M phase increased obviously in dose and time dependent relations. According to the Western blot analysis, DATS decreased cyclin-dependent kinase (Cdks)-Cdk7 (i.e. Cdc2 activate kinase) protein levels in J5 cells but increased cyclin B1 protein level. The modulation potency to cyclin B1 and Cdk7 expressions was in the order of DATS > DADS > DAS. The modulation potency to cyclin B1 and Cdk7 protein levels increased with increasing in DATS concentration and culture time. In conclusion, DATS might affect cell viability and cell morphological changes in J5 cells and lead cells to be arrested in G2/M phase via controlling the expression of cyclin B1 and Cdk7 in J5 cells, and the controlling action might relate to the sulfuric atom numbers in the structures of all these allyl sulfides.
Keywords: Garlic; Diallyl sulfide; Diallyl disulfide; Diallyl trisulfide; Cell cycle; Human liver tumor cells

T. Dzudie, C. P. Kouebou, J. J. Essia-Ngang, C. M. F. Mbofung, Lipid sources and essential oils effects on quality and stability of beef patties, Journal of Food Engineering, Volume 65, Issue 1, November 2004, Pages 67-72, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2003.12.004.

(http://www.sciencedirect.com/science/article/B6T8J-4BNVWPD-1/2/e0268665891dee884f953ee48a3b8008)
Abstract:
The effects of addition of animal fats (beef and pork fat), vegetable oils (ground-nut and maize oils) at a 20% level and essential oils (ginger and basilica essential oils) at a 0.2% level on the quality and stability of beef patties were investigated. The inclusion of animal fats and vegetable oils in the formulations significantly ($P<0.05$) decreased the moisture and the protein contents but increased the fat content of the beef patties. While the highest pH values were found in the beef patties formulated with beef and pork fats, the lowest water holding capacity and the highest cooking losses were observed with the patties containing vegetable oils. The storage time significantly affected thiobarbituric acid (TBA) values. Formulations containing maize oil and essential oils showed the best characteristics in relation to oxidative and microbial stability with the lowest values for TBA and the lowest microbial loads when compared with the other samples.
Keywords: Beef; Patties; Animal fats; Vegetable oils; Essential oils; Quality; Stability

F. Sahin, M. Gulluce, D. Daferera, A. Sokmen, M. Sokmen, M. Polissiou, G. Agar, H. Ozer, Biological activities of the essential oils and methanol extract of Origanum vulgare ssp. vulgare in the Eastern Anatolia region of Turkey, Food Control, Volume 15, Issue 7, October 2004, Pages 549-557, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2003.08.009.
(http://www.sciencedirect.com/science/article/B6T6S-49Y3H38-1/2/d8226486659eac782cdc724777633fbd)
Abstract:
The present study was conducted to evaluate the antimicrobial activities, antioxidant and properties of essential oils and methanol extracts of Origanum vulgare ssp. vulgare plants. The chemical composition of a hydrodistilled essential oil of O. vulgare ssp. vulgare was analyzed by a GC/MS system. A total 62 constituents were identified. Caryophyllene and spathulenol were found to be the main constituents, followed by germacrene-D and [alpha]-terpineol. Antioxidant activity was measured employing two methods namely, scavenging of free radical DPPH and the inhibition of linoleic acid oxidation by methanol extracts and the essential oil of O. vulgare ssp. vulgare. Antioxidant studies suggested that methanol extract behaved as a strong free radical scavenger providing IC50 at only 9.9 [mu]g/ml, whereas the oil showed weaker activity with IC50 at 8.9 mg/ml. Total phenolic constituents based on gallic acid equivalents revealed the presence of total soluble phenolics in the extract as 220 [mu]g/mg dry extract (22%, w/w) and, most probably, they are responsible for the radical scavenging activity of methanol extracts. Methanol extract was not effectively able to inhibit linoleic acid oxidation and only 32% inhibition was achieved at 2 mg/ml concentration, far below that of the positive control (butylated hyroxytoluene, BHT) at the same concentration. However, 2.2 mg/ml essential oil solutions provided 50% inhibition in the linoleic acid oxidation test system.
The antimicrobial test results showed that the essential oil of O. vulgare ssp. vulgare had great potential of antimicrobial activity against all 10 bacteria, and 15 fungi and yeast species tested. In contrast, the methanol extract from aerial parts of O. vulgare plant showed no antimicrobial activity. The result may suggest that the essential oil O. vulgare ssp. vulgare possesses compounds with antimicrobial properties as well as antioxidant activity, and therefore can be used as a natural preservative ingredient in food and/or pharmaceutical industry.
Keywords: Origanum vulgare ssp. vulgare; Essential oil; Antimicrobial activity; Antioxidant activity; DPPH; [beta]-carotene-linoleic acid

Maurice O. Omolo, Denis Okinyo, Isaiah O. Ndiege, Wilber Lwande, Ahmed Hassanali, Repellency of essential oils of some Kenyan plants against Anopheles gambiae, Phytochemistry, Volume 65, Issue 20, October 2004, Pages 2797-2802, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2004.08.035.

(http://www.sciencedirect.com/science/article/B6TH7-4DCWDBT-6/2/97d4ac672b1d0f8e3aeda8697ef72a2b)
Abstract: Graphical abstract
Five mosquito repellents have been identified from the essential oils of 6 plants growing in Kenya. These include (S)-(-)-cis-perillyl alcohol, (S)-(-)-cis-verbenol, (S)-(-)-cis-carveol, (S)-(-)-perillaldehyde, caryophyllene oxide and (S)-(-)-cis-perillyl alcohol. (S)-(-)-cis-perillyl alcohol and (S)-(-)-cis-verbenol were the most potent.
Essential oils of six plants growing in Kenya were screened for repellent activities against Anopheles gambiae sensu stricto. The oils of Conyza newii (Compositeae) and Plectranthus marrubioides (Labiateae) were the most repellent (RD50 = 8.9 x 10-5 mg cm-2, 95% CI) followed by Lippia javanica (Verbenaceae), Lippia ukambensis (Verbenaceae), Tetradenia riparia, (Iboza multiflora) (Labiateae) and Tarchonanthus camphoratus (Compositeae). Eight constituents of the different oils (perillyl alcohol, cis-verbenol, cis-carveol, geraniol, citronellal, perillaldehyde, caryophyllene oxide and a sesquiterpene alcohol) exhibited relatively high repellency. Four synthetic blends of the major components (present in [greater-or-equal, slanted]1.5%) of the essential oils were found to exhibit comparable repellent activity to the parent oils.
Keywords: Anopheles gambiae; Repellent plants; Essential oils; Terpenoids; Alcohols; Epoxides

Massimo Labra, Mariangela Miele, Bernardetta Ledda, Fabrizio Grassi, Mauro Mazzei, Francesco Sala, Morphological characterization, essential oil composition and DNA genotyping of Ocimum basilicum L. cultivars, Plant Science, Volume 167, Issue 4, October 2004, Pages 725-731, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2004.04.026.
(http://www.sciencedirect.com/science/article/B6TBH-4CG0MC1-1/2/a9ff230e71b3b2fca1b74c6c58365b2b)
Abstract:
The Ocimum genus includes more than 150 species. However, some attributions are difficult, due to the interference of man with selection, cultivation and hybridisation within the genus and to large morphological variation among the different species. A system of standardized descriptors, based on volatile oils, has been proposed, but its use is limited by the fact that several environmental factors may influence the plant chemical composition. In this paper, we experiment the usefulness of molecular markers of DNA polymorphism, based on AFLP analysis, to unravel disputed attributions. We conclude that the combined analysis of morphological traits, volatile oil composition and molecular markers represents the optimal approach to verify taxonomy and to correlate it with agronomic traits.
Keywords: AFLP; Basil; DNA fingerprinting; Essential oil; Ocimum basilicum L.

Ahmet Cakir, Essential oil and fatty acid composition of the fruits of Hippophae rhamnoides L. (Sea Buckthorn) and Myrtus communis L. from Turkey, Biochemical Systematics and Ecology, Volume 32, Issue 9, September 2004, Pages 809-816, ISSN 0305-1978, DOI: 10.1016/j.bse.2003.11.010.
(http://www.sciencedirect.com/science/article/B6T4R-4C47J46-6/2/6784867389b7d6c6f216ecb6632d1b46)
Abstract:
The composition of the volatile oil isolated from Hippophae rhamnoides L. fruits was analysed by GC and GC-MS, and thirty constituents were identified, representing 94.6% of the oil. The major components were ethyl dodecenoate (39.4%), ethyl octanoate (9.9%), decanol (5.6%), ethyl decanoate (5.5%) and ethyl dodecanoate (3.7%). The composition of fatty acids in the lipid extracts obtained from the mesocarps and seeds of H. rhamnoides and Myrtus communis L. fruits were also investigated by GC. Fifteen different fatty acids were determined. Palmitoleic acid (47.8%) and palmitic acid (29.3%) were the major fatty acids in the mesocarp of H. rhamnoides fruits; oleic acid (32.8%), palmitic acid (26.3%) and linoleic acid (21.7%) were the major fatty acids

in the seeds. Likewise, in the mesocarps and seeds of M. communis L., oleic acid was the predominant fatty acid with proportions up to 72.1 and 64.1%, respectively. In addition, free fatty acid composition of the lipids extracted from the seeds of M. communis was analysed by GC and oleic (69.5%), palmitic (17.8%) and stearic (6.4%) acids were found as the main fatty acids. In all extracts, the quantities of unsaturated fatty acids were higher than that of saturated analogue.
Keywords: Hippophae rhamnoides; Myrtus communis; Eleagnaceae; Myrtaceae; Essential oil composition; Fatty acids

Fernando L. Palhano, Thabita T. B. Vilches, Reginaldo B. Santos, Marcos T. D. Orlando, J. Aires Ventura, Patricia M. B. Fernandes, Inactivation of Colletotrichum gloeosporioides spores by high hydrostatic pressure combined with citral or lemongrass essential oil, International Journal of Food Microbiology, Volume 95, Issue 1, 15 August 2004, Pages 61-66, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2004.02.002.
(http://www.sciencedirect.com/science/article/B6T7K-4C1NG4D-5/2/82d7d2012c53127740c677e13e0213ff)
Abstract:
Anthracnose, caused by the fungus Colletotrichum gloeosporioides, is the main post-harvest disease of the papaya. Inactivation of the spores of C. gloeosporioides in saline solution by the use of high hydrostatic pressure, citral oil and lemongrass oil, alone and in combination, was studied. C. gloeosporioides spores were efficiently inhibited after a pressure treatment of 350 MPa for 30 min. When C. gloeosporioides was treated with 0.75 mg ml-1 of citral or lemongrass oil, the pressure needed to achieve the same spore inhibition was 150 MPa. This work suggests the use of high hydrostatic pressure and plant essential oils as an alternative control for fruit diseases.
Keywords: Phytopathogenic fungus; Papaya; Essential oil; Anthracnose; Cymbopogon citratus; Food decontamination

Mostafa Khajeh, Yadollah Yamini, Fatemeh Sefidkon, Naader Bahramifar, Comparison of essential oil composition of Carum copticum obtained by supercritical carbon dioxide extraction and hydrodistillation methods, Food Chemistry, Volume 86, Issue 4, August 2004, Pages 587-591, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2003.09.041.
(http://www.sciencedirect.com/science/article/B6T6R-4B3K1T3-7/2/50d9d1195a64d0b83dde1a6adce0ac50)
Abstract:
Essential oil of Carum copticum cultivated in Iran was obtained by hydrodistillation and supercritical (CO2) extraction (SFE) methods. The oils were analysed by capillary gas chromatography, using flame ionization and mass spectrometric detection. The compounds were identified according to their retention indices and mass spectra (EI, 70 eV). The effects of different parameters, such as pressure, temperature, modifier volume and extraction time, on the supercritical fluid extraction of C. copticum oil were investigated. The results showed that, under pressure of 30.4 MPa, temperature 35 [degree sign]C, methanol 0% and dynamic extraction time of 30 min, the method was most selective for the extraction of thymol. Eight compounds were identified in the hydrodistilled oil. The major components of C. copticum were thymol (49.0%), [gamma]-terpinene (30.8%), p-cymene (15.7), [beta]-pinene (2.1%), myrcene (0.8%) and limonene (0.7%). However, by using supercritical carbon dioxide under optimum conditions, only three components constituted more than 99% of the oil. The extraction yield, based on hydrodistillation was 2.8% (v/w). Extraction yield based on the SFE varied in the range of 1.0-5.8% (w/w) under different conditions. The results show that, in Iranian C. copticum oil, thymol is a major component.
Keywords: Carum copticum; Supercritical; Carbon dioxide; Hydrodistillation; Essential oil; Thymol

Sara Burt, Essential oils: their antibacterial properties and potential applications in foods--a review, International Journal of Food Microbiology, Volume 94, Issue 3, 1 August 2004, Pages 223-253, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2004.03.022.
(http://www.sciencedirect.com/science/article/B6T7K-4CJVG62-1/2/6de93e60b18f069bc01e9880a524f8d4)
Abstract:
In vitro studies have demonstrated antibacterial activity of essential oils (EOs) against Listeria monocytogenes, Salmonella typhimurium, Escherichia coli O157:H7, Shigella dysenteria, Bacillus cereus and Staphylococcus aureus at levels between 0.2 and 10 [mu]l ml-1. Gram-negative organisms are slightly less susceptible than gram-positive bacteria. A number of EO components has been identified as effective antibacterials, e.g. carvacrol, thymol, eugenol, perillaldehyde, cinnamaldehyde and cinnamic acid, having minimum inhibitory concentrations (MICs) of 0.05-5 [mu]l ml-1 in vitro. A higher concentration is needed to achieve the same effect in foods. Studies with fresh meat, meat products, fish, milk, dairy products, vegetables, fruit and cooked rice have shown that the concentration needed to achieve a significant antibacterial effect is around 0.5-20 [mu]l g-1 in foods and about 0.1-10 [mu]l ml-1 in solutions for washing fruit and vegetables. EOs comprise a large number of components and it is likely that their mode of action involves several targets in the bacterial cell. The hydrophobicity of EOs enables them to partition in the lipids of the cell membrane and mitochondria, rendering them permeable and leading to leakage of cell contents. Physical conditions that improve the action of EOs are low pH, low temperature and low oxygen levels. Synergism has been observed between carvacrol and its precursor p-cymene and between cinnamaldehyde and eugenol. Synergy between EO components and mild preservation methods has also been observed. Some EO components are legally registered flavourings in the EU and the USA. Undesirable organoleptic effects can be limited by careful selection of EOs according to the type of food.
Keywords: Essential oils; Antibacterial; Preservatives; Food borne pathogens

Daphne Phillips Daifas, James P. Smith, Burke Blanchfield, Greg Sanders, John W. Austin, John Koukoutisis, Effects of mastic resin and its essential oil on the growth of proteolytic Clostridium botulinum, International Journal of Food Microbiology, Volume 94, Issue 3, 1 August 2004, Pages 313-322, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2004.01.017.
(http://www.sciencedirect.com/science/article/B6T7K-4CCFB67-1/2/5547668f31e250a77efccc208619b607)
Abstract:
Studies were done to determine the effect of mastic resin and its essential oil, alone and in conjunction with ethanol, on the growth of proteolytic strains of Clostridium botulinum in media, and on neurotoxin production in challenge studies with English-style crumpets. Preliminary studies, using a spot-on-the-lawn method, indicated that high levels of mastic resin in ethanol (~8% w/w) were required for complete inhibition of all strains of C. botulinum tested, but mastic resin in ethanol had a greater anti-botulinal effect than ethanol alone. However, only low levels of mastic oil (~0.3% v/v) were required for inhibition of proteolytic strains of C. botulinum. Both studies showed a strain specific inhibition, with C. botulinum type A strains being more sensitive to mastic resin and its essential oil than type B strains. However, mastic resin in ethanol proved to be more effective when used as a vapor phase inhibitor applied to cotton pads and placed inside inoculated plates than when added directly to media. While both mastic resin and its essential oil inhibited the growth of proteolytic strains of C. botulinum in vitro, they failed to inhibit neurotoxin production in challenge studies with C. botulinum in English-style crumpets.
Keywords: Mastic; Ethanol; Clostridium botulinum; Botulinum neurotoxin

J. Nguefack, V. Leth, P. H. Amvam Zollo, S. B. Mathur, Evaluation of five essential oils from aromatic plants of Cameroon for controlling food spoilage and mycotoxin producing fungi,

International Journal of Food Microbiology, Volume 94, Issue 3, 1 August 2004, Pages 329-334, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2004.02.017.
(http://www.sciencedirect.com/science/article/B6T7K-4C82CF4-5/2/c783260eb6953bf62764adc14270fb02)
Abstract:
Five essential oils (EO) extracted from Cymbopogon citratus, Monodora myristica, Ocimum gratissimum, Thymus vulgaris and Zingiber officinale were investigated for their inhibitory effect against three food spoilage and mycotoxin producing fungi, Fusarium moniliforme, Aspergillus flavus and Aspergillus fumigatus. Five strains of each fungus were tested. The agar dilution technique was used to determine the inhibitory effect of each EO on the radial growth of the fungus, and a dose response was recorded. The EO from O. gratissimum, T. vulgaris and C. citratus were the most effective and prevented conidial germination and the growth of all three fungi on corn meal agar at 800, 1000 and 1200 ppm, respectively. Moderate activity was observed for the EO from Z. officinale between 800 and 2500 ppm, while the EO from M. myristica was less inhibitory. These effects against food spoilage and mycotoxin producing fungi indicated the possible ability of each essential oil as a food preservative. A comparative test on the preservative ability of the EO from O. gratissimum and potassium sorbate against A. flavus at pH 3.0 and 4.5 showed that the EO remained stable at both pH, whereas the efficacy of potassium sorbate was reduced at higher pH. We concluded that the EO from O. gratissimum is a potential food preservative with a pH dependent superiority against potassium sorbate, and these are novel scientific information.
Keywords: Essential oils; Food preservatives; Fungi; Growth inhibition; Radial growth

Vijai K. Agnihotri, Rajendra K. Thappa, Baleshwar Meena, Bal K. Kapahi, Rajendra K. Saxena, Ghulam N. Qazi, Shri G. Agarwal, Essential oil composition of aerial parts of Angelica glauca growing wild in North-West Himalaya (India), Phytochemistry, Volume 65, Issue 16, August 2004, Pages 2411-2413, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2004.07.004.
(http://www.sciencedirect.com/science/article/B6TH7-4D16SDT-3/2/f1f3c57065d28c8e15684c7cda115cde)
Abstract:
Fresh aerial parts of Angelica glauca, growing wild in Kashmir valley in higher Himalaya (Jammu and Kashmir, India), collected at flowering stage from different locations, on hydro-distillation provided a refreshing light pale coloured essential oil with characteristic floral woody flavour. The oil was found to be a complex mixture of mono- and sesquiterpenes and 34 compounds accounting for nearly 97.4% of the oil were characterized with the help of capillary GC, GC-MS, and NMR. Major compounds of the oil were characterized as [alpha]-phellandrene (13.5%), trans-carveol (12.0%), [beta]-pinene (11.7%), thujene (7.5%), [beta]-caryophyllene oxide (7.2%), [beta]-caryophyllene (7.0%), [gamma]-terpinene (6.7%), nerolidol (6.5%), [beta]-bisabolene (5.2%) and germacrene D (4.5%). It is the first report to exploit the essential oil from Himalayan A. glauca herb collected at flowering stage.
Keywords: Angelica glauca; North-West Himalaya; Essential oil composition; [beta]-Pinene; [alpha]-Phellandrene; trans-Carveol

Stephan H. von Reu[ss], Chia-Li Wu, Hermann Muhle, Wilfried A. Konig, Sesquiterpene constituents from the essential oils of the liverworts Mylia taylorii and Mylia nuda, Phytochemistry, Volume 65, Issue 15, August 2004, Pages 2277-2291, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2004.04.039.
(http://www.sciencedirect.com/science/article/B6TH7-4D09DDH-1/2/38935dff77421ca60d32547506148921)
Abstract:

The essential oils and extracts of Mylia taylorii and M. nuda were investigated by gas chromatography, mass spectrometry, NMR spectroscopy and chemical correlations. Beside several known compounds 13 new constituents including three new carbon skeletons could be identified. Four hydrocarbons with a molecular formula of C15H22 (m/z 202) were identified as myli-4(15)-ene (1), aromadendra-1(10),4(15)-diene (19), aromadendra-4,10(14)-diene (20) and aromadendra-4,9-diene (21). Three oxaspiro-compounds were identified as 7-epi-bourbon-3-en-5,11-oxide (22), guai-3,10(14)-dien-5,11-oxide (23) and guai-3,9-dien-5,11-oxide (24). The absolute configuration of myli-4(15)-en-3-one (5) could be established by chemical correlation. Together with [alpha]-taylorione (7) the corresponding 6,11-seco-compound taylopyran (25) with a new carbon skeleton was identified which serves as a precursor to taylocyclane (26) and taylofuran (27). Taynudol (28) contains a new carbon skeleton with a cyclobutenyl structure.
Keywords: Mylia taylorii; Mylia nuda; Liverworts; Sesquiterpenoids; Structure elucidation

Assem M. El-Shazly, Karam T. Hussein, Chemical analysis and biological activities of the essential oil of Teucrium leucocladum Boiss. (Lamiaceae), Biochemical Systematics and Ecology, Volume 32, Issue 7, July 2004, Pages 665-674, ISSN 0305-1978, DOI: 10.1016/j.bse.2003.12.009.
(http://www.sciencedirect.com/science/article/B6T4R-4C8NHKS-1/2/04b4dddd92e5f88edb9b38fc816c78a3)
Abstract:
The chemical composition of the water-distilled essential oil and n-hexane-ether extract of Teucrium leucocladum Boiss. were determined by GLC and GLC-MS. Altogether 72 compounds were identified. The sesquiterpene alcohols, patchouli alcohol (31.24% and 29.66%) and [alpha]-cadinol (9.29% and 21.54%) were the main components in the oil and the extract, respectively. [alpha]-Cadinol was isolated and characterized using MS, 1H- and 13C-NMR spectral analyses. Furthermore, the oil and the extract were tested for their bacterostatic and antifungal activities; they showed broad and potent activity against Pseudomonas aeruginosa, Bacillus subtilis and Candida albicans. A marked larvicidal activity of the essential oil, n-hexane-ether extract and crude ethanolic extract was also observed against Culex pipiens, Musca domestica and Ceratitis capitata larvae.
Keywords: Teucrium leucocladum; Lamiaceae; Essential oil; n-Hexane-ether extract; Patchouli alcohol; [alpha]-Cadinol; Larvicidal; Antimicrobial

Rupam Kapoor, Bhoopander Giri, Krishna G. Mukerji, Improved growth and essential oil yield and quality in Foeniculum vulgare mill on mycorrhizal inoculation supplemented with P-fertilizer, Bioresource Technology, Volume 93, Issue 3, July 2004, Pages 307-311, ISSN 0960-8524, DOI: 10.1016/j.biortech.2003.10.028.
(http://www.sciencedirect.com/science/article/B6V24-4C0TFPT-1/2/43a80a24f891db82530b1881441bd96e)
Abstract:
Two arbuscular mycorrhizal (AM) fungi Glomus macrocarpum and Glomus fasciculatum significantly improved growth and essential oil concentration of Foeniculum vulgare Mill. However, AM inoculation of plants along with phosphorus fertilization significantly enhanced growth, P-uptake and essential oil content of plants compared to either of the components applied separately. Among the two fungal inoculants, G. fasciculatum registered the highest growth at both levels of phosphorus used with up to 78% increase in essential oil concentration of fennel seeds over non-mycorrhizal control. The essential oil characterization by gas liquid chromatography revealed that the level of anethol was significantly enhanced on mycorrhization.
Keywords: Arbuscular mycorrhiza; Foeniculum vulgare; Growth promotion; Essential oil

Margarida Moldao-Martins, Sara Beirao-da-Costa, Catia Neves, Carlos Cavaleiro, Ligia Salgueiro, Maria Luisa Beirao-da-Costa, Olive oil flavoured by the essential oils of Mentha x piperita and

Thymus mastichina L., Food Quality and Preference, Volume 15, Issue 5, July 2004, Pages 447-452, ISSN 0950-3293, DOI: 10.1016/j.foodqual.2003.08.001.
(http://www.sciencedirect.com/science/article/B6T6T-49H708B-1/2/45f0ac7c5703654188f697aeeaf65562)
Abstract:
The present study reports the development of flavoured olive oils by the incorporation of Mentha xpiperita L. and Thymus mastichina subsp. mastichina essential oils. This M. x piperita L. is an unusual cultivar characterized by a high content of linalyl acetate (72.0%) and linalool (12.3%). T. mastichina is a 1,8-cineole chemotype (64.1%). Preliminary sensory tests were carried out to establish the lower levels and the upper levels of the essential oils incorporation. Response surface methodology (RSM) was used to access a convenient ratio of T. mastichina and M. x piperita essential oils. According to RSM results three mixtures located in regions that produced higher sensory scores to aromatic plant aroma, cooling and pungency were selected and subjected to a consumer test. Results indicated that high levels of Thymus essential oil (0.008 mg/kg) were those ranked the best but Mentha essential oil incorporation must be kept at low levels (0.002 mg/kg).
Keywords: Flavoured olive oil; Essential oil; T. mastichina; M. x piperita; Chemical composition; Sensory analysis

Yidong Lei, Peng Nan, Tashi Tsering, Li Wang, Shiping Liu, Yang Zhong, Interpopulation variability of rhizome essential oils in Rhodiola crenulata from Tibet and Yunnan, China, Biochemical Systematics and Ecology, Volume 32, Issue 6, June 2004, Pages 611-614, ISSN 0305-1978, DOI: 10.1016/j.bse.2003.10.007.
(http://www.sciencedirect.com/science/article/B6T4R-4B9D6GG-9/2/b5e8dca772c189b5f2f8c5e63f19b517)
Keywords: Rhodiola crenulata; Essential oil; Tibet; Yunnan

G. Miguel, M. Simoes, A. C. Figueiredo, J. G. Barroso, L. G. Pedro, L. Carvalho, Composition and antioxidant activities of the essential oils of Thymus caespititius, Thymus camphoratus and Thymus mastichina, Food Chemistry, Volume 86, Issue 2, June 2004, Pages 183-188, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2003.08.031.
(http://www.sciencedirect.com/science/article/B6T6R-4B2CMGG-2/2/3d6ba232680b89f9da9fe1145af8687f)
Abstract:
The essential oils, isolated by hydrodistillation, from the aerial parts of Thymus caespititius, Thymus camphoratus and Thymus mastichina, collected during the vegetative phase, were analysed by gas chromatography (GC) and gas chromatography coupled to mass spectrometry (GC-MS). The antioxidant property of these oils was tested, with and without peroxidation inducer, by the egg yolk-based thiobarbituric acid-reactive substances assay, in the concentrations of 62.5, 125, 250 and 500 mg l-1. [alpha]-Terpineol (32%) dominated Th. caespititius essential oil and 1,8-cineole (58%) that of Th. mastichina. Linalool (17%), linalyl acetate (15%) and 1,8-cineole (11%) were the main components of Th. camphoratus oil. The oils demonstrated antioxidant capacity in the absence of radical inducer 2,2'-azobis-(2-amidinopropane) dihydrochloride (ABAP), mainly that of Th. caespititius at 250 and 500 mg l-1, comparable in some cases to that of [alpha]-tocopherol and butylated hydroxytoluene (BHT). The presence of ABAP diminished the antioxidant ability of all essential oils tested, Th. caespititius oil still showing the highest antioxidant capacity at 500 mg l-1. At 250 and 500 mg l-1, for BHA, and 500 mg l-1, for [alpha]-tocopherol, the antioxidant capacity significantly increased in the presence of ABAP.
Keywords: Thymus caespititius; Thymus camphoratus; Thymus mastichina; Essential oils; GC-MS; Antioxidant activity; TBARS assay

Koji Yamazaki, Tatsuhiko Yamamoto, Yuji Kawai, Norio Inoue, Enhancement of antilisterial activity of essential oil constituents by nisin and diglycerol fatty acid ester, Food Microbiology, Volume 21, Issue 3, June 2004, Pages 283-289, ISSN 0740-0020, DOI: 10.1016/j.fm.2003.08.009.
(http://www.sciencedirect.com/science/article/B6WFP-4BVJPBS-5/2/00542b34c6b23b5a568054047f71efe3)
Abstract:
Plant-derived essential oil components in combination with nisin and diglycerol fatty acid esters were investigated for their antibacterial activity against Listeria monocytogenes. Carvacrol and thymol were found to have the strongest antilisterial properties, followed by eugenol, cinnamaldehyde and isoeugenol. The antilisterial activity of the other essential oils (limonene, pinene, ally lisothiocyanate and linalool) was found to be low, even at the highest concentration used (0.1%). Among the diglycerol esters of fatty acids with different carbon chain lengths, diglycerol monolaurate was the most active against L. monocytogenes. A combined antilisterial effect was observed between nisin and the essential oils (carvacrol, thymol and eugenol); moreover, the addition of diglycerol monolaurate as a third preservative factor led to further combined antilisterial activities between the essential oil constituents (carvacrol, thymol and eugenol) and nisin even at lower, sub-lethal concentrations. These results indicate that nisin and diglycerol monolaurate can be used to enhance the antilisterial activity of essential oils, allowing for a reduction in the dosage used in food preservation and thereby resulting in the reduction of undesirable flavors.
Keywords: Listeria monocytogenes; Essential oil; Antilisterial activity; Combined effect; Nisin; Diglycerol esters

Sonia Marin, Andrea Velluti, Antonio J. Ramos, Vicente Sanchis, Effect of essential oils on zearalenone and deoxynivalenol production by Fusarium graminearum in non-sterilized maize grain, Food Microbiology, Volume 21, Issue 3, June 2004, Pages 313-318, ISSN 0740-0020, DOI: 10.1016/j.fm.2003.08.002.
(http://www.sciencedirect.com/science/article/B6WFP-4BVJPBS-9/2/aef790446a1c3f4b97c5093decc61ae1)
Abstract:
The effect of cinnamon, clove, oregano, palmarosa and lemongrass oils on zearalenone (ZEA) and deoxynivalenol (DON) accumulation by one isolate of Fusarium graminearum in non-sterilized naturally contaminated maize grain at 0.995 and 0.950 aw and at 20[degree sign]C and 30[degree sign]C was evaluated at a 500 mg kg-1 level. Efficacy of essential oils was found to be poor, clove essential oil being that with a broader applicability. In general, competing mycoflora seemed to control to a large extent ZEA and DON accumulation, and then the effectiveness of essential oils could only be observed under certain environmental conditions, 0.950 aw/30[degree sign]C for ZEA, and 0.995 aw/30[degree sign]C for DON. Better results might be obtained by applying higher dosages; sensory quality, however, should not be compromised.
Keywords: Mycotoxins; Zearalenone; Deoxynivalenol; Fusarium graminearum; Maize; Essential oils

R. Molero, M. Ibars, S. Calsamiglia, A. Ferret, R. Losa, Effects of a specific blend of essential oil compounds on dry matter and crude protein degradability in heifers fed diets with different forage to concentrate ratios, Animal Feed Science and Technology, Volume 114, Issues 1-4, 3 May 2004, Pages 91-104, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2003.11.011.
(http://www.sciencedirect.com/science/article/B6T42-4BMTHWT-2/2/b86b49eaf2b3ad7390c86969d5eb9894)
Abstract:
Two 4x4 Latin square experiments, with four growing heifers (398+/-7.1 kg BW in experiment 1 and 272+/-6.6 kg BW in experiment 2) and four periods, were used to study effects of a specific

blend of essential oil compounds (EOB, CRINA(R) RUMINANTS) on in situ ruminal degradability of dry matter (DM) and crude protein (CP) of six feeds. Treatments were assigned in a 2x2 factorial design, with the main factors being type of diet and addition of EOB. In experiment 1, treatments were a high concentrate diet (HC) that consisted of 7 kg per day of concentrate with barley straw offered ad libitum, and a low concentrate diet (LC) consisting of 1 kg of the same concentrate and alfalfa hay offered likewise, with (700 mg per day) or without addition of EOB. Each experimental period consisted of a 10-day adaptation period and 7 days for incubations of soybean meal, maize gluten feed, lupin seeds, green peas, sunflower meal and fish meal. In heifers fed the HC diet, DM and CP degradation of protein supplements were lower versus the LC diet. Use of EOB in the HC diet reduced CP degradation of lupin seeds, green peas and sunflower meal. In experiment 2, treatments were a 68:32 (DM) forage to concentrate ratio diet (HF) or a 40:60 forage to concentrate ratio diet (MF), with (700 mg per day) or without addition of EOB. Diets were offered as a total mixed ration. Each experimental period consisted of a 28-day adaptation period and 7 days for incubations of soybean meal, maize gluten feed, lupin seeds, green peas, sunflower meal and alfalfa hay. In heifers fed the MF diet, CP degradation of soybean meal and sunflower meal was lower versus the HF diet. Use of EOB in the HF diet tended to reduce CP degradation of soybean meal. In the HF diet, the effect of EOB on soluble and potentially degradable protein fractions was only observed after 28 days of adaptation of rumen microflora.
Keywords: Essential oil compounds; Feed additive; Protein; In situ degradation

C. J. Newbold, F. M. McIntosh, P. Williams, Riccardo Losa, R. J. Wallace, Effects of a specific blend of essential oil compounds on rumen fermentation, Animal Feed Science and Technology, Volume 114, Issues 1-4, 3 May 2004, Pages 105-112, ISSN 0377-8401, DOI: 10.1016/j.anifeedsci.2003.12.006.
(http://www.sciencedirect.com/science/article/B6T42-4BMTHWT-3/2/311367f390f7689c60c3c7fb05f5d7dd)
Abstract:
Effects of a specific preparation of essential oil compounds on rumen fermentation were determined using four mature sheep, each fitted with a permanent rumen cannula and receiving 110 mg per day of dietary essential oils compounds (EO; CRINA RUMINANTS, AKZO Nobel Surface Chemistry Ltd, Hertfordshire, UK). The basal ration comprised 1 kg DM per day of a 40:60 (DM) concentrate:forage mix fed in two equal meals. The forage was grass silage and the concentrate contained crushed barley grain, rapeseed meal, soyabean meal, molasses and a mineral and vitamin supplement (730, 125, 50, 80 and 15 g/kg fresh weight, respectively). Unsupplemented and EO-supplemented diets were fed in a 2x2 design with 6-week periods. EO inhibited ruminal degradation of soyabean meal N from dacron bags incubated in situ but not heat-treated rapeseed meal or hay. Deamination of amino acids measured in vitro in rumen fluid removed from the sheep decreased by 25% ($P<0.05$). However, EO did not have a major influence on other aspects of rumen fermentation. Volatile fatty acid and ammonia concentrations were unaffected, and EO had no influence on proteolytic or peptidolytic activity of rumen fluid or on microbial protein production or protozoal numbers. Results suggest that EO alters protein degradation and amino acid deamination by inhibiting rumen microorganisms.
Keywords: Rumen; Protein degradation; Essential oils

Hugo Merle, Montserrat Moron, M. Amparo Blazquez, Herminio Boira, Taxonomical contribution of essential oils in mandarins cultivars, Biochemical Systematics and Ecology, Volume 32, Issue 5, May 2004, Pages 491-497, ISSN 0305-1978, DOI: 10.1016/j.bse.2003.09.010.
(http://www.sciencedirect.com/science/article/B6T4R-4BHJTT5-4/2/714c1a5835b037706d6761baadfd287f)
Abstract:

Rind oils of nine cultivars of mandarin originated by recent mutation (Loretina, Marisol, Arrufatina, Clemenules, Clemenpons, Hernandina, Oronules, Satsuma Okitsu, Satsuma Owari) belonging to the Citrus reticulata Blanco species and 2 hybrids Fortune (Citrus tangerine Hort. ex Tan x Citrus clementina Hort ex Tan) and Nova (Tangelo Orlando x Citrus clementina Hort ex Tan) were obtained from ripe fruits of trees growing in the same environmental and cultivated conditions. The study of their chemical composition was carried out by capillary GC, GC/MS and the results were submitted to discriminant analysis. The first discriminant function separates the [alpha]-thujene chemocultivar, corresponding to oriental mandarin cultivars (Satsuma Okitsu, Satsuma Owari), from the Mediterranean cultivars. Inside this last group, the second discriminant function split up the sabinene chemocultivar (Marisol, Arrufatina Clemenpons and Loretina from the hybrids group (Fortuna and Nova) and alters (Clemenules and Hernandina)). The differential compounds of these groups are: [alpha]-thujene [alpha]-pinene, sabinene, myrcene, limonene, linalool, [alpha]-terpineol and germacrene-D.
Keywords: Essential oils; Cluster analysis; Citrus; Chemotaxonomy; Discriminant analysis

Tanu, Anil Prakash, Alok Adholeya, Effect of different organic manures/composts on the herbage and essential oil yield of Cymbopogon winterianus and their influence on the native AM population in a marginal alfisol, Bioresource Technology, Volume 92, Issue 3, May 2004, Pages 311-319, ISSN 0960-8524, DOI: 10.1016/S0960-8524(03)00198-6.
(http://www.sciencedirect.com/science/article/B6V24-4B8BBCS-1/2/5226fc397b066093ad08d1f4ac77cc2f)
Abstract:
Four organic amendments: leaf compost (LC), vegetable compost (VC), poultry manure (PM) and sewage sludge (SSL) applied at four doses (40, 80, 100 and 120 t ha-1) were evaluated for their effect on the herbage yield, essential oil content and inoculum potential (IP) of native arbuscular mycorrhizal fungi (AMF) on three varieties of Java citronella, Cymbopogon winterianus Jowitt (Manjusha, Mandakini, and Bio-13). PM applied at 100 t ha-1 followed by SSL increased the herbage, essential oil content and dry matter yield significantly. Bio-13 performed better and produced the highest herbage, essential oil and dry matter yield. The type and dose of the various organic amendments also significantly influenced the indigenous AMF infectious propagules in soil. Highest number of AMF propagules were recorded in the LC amended plots in all the three varieties. Amongst the varieties, highest native mycorrhizal inoculum was recorded in the Bio-13. Least number of AM infectious propagules were recorded in the Mandakini plants grown in 40 t ha-1 SSL.
Keywords: Compost/manures; Cymbopogon sp.; Arbuscular mycorrhizal fungi; Inoculum potential; Herbage yield; Essential oil content

Renato Bruni, Alessandro Medici, Elisa Andreotti, Carlo Fantin, Mariavittoria Muzzoli, Marco Dehesa, Carlo Romagnoli, Gianni Sacchetti, Chemical composition and biological activities of Ishpingo essential oil, a traditional Ecuadorian spice from Ocotea quixos (Lam.) Kosterm. (Lauraceae) flower calices, Food Chemistry, Volume 85, Issue 3, May 2004, Pages 415-421, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2003.07.019.
(http://www.sciencedirect.com/science/article/B6T6R-4BD9THR-2/2/932d6e851bcf7694c74a433b55b0875c)
Abstract:
The essential oil of Ishpingo (Ocotea quixos, Lauraceae) fruit calices was analysed by GC (gas chromatography) and GC-MS (gas chromatography-mass spectrometry). Fourty-four compounds were identified. The main components detected were trans-cinnamaldehyde (27.9%), methylcinnamate (21.6%), 1,8-cineole (8.0%), benzaldehyde (3.6%), and [beta]-selinene (2.1%). In vitro antioxidant properties of the essential oil, obtained by DPPH (1,1-diphenyl-2-picrylhydrazyl) and [beta]-carotene bleaching assays, were also evaluated. The oil exerted a relatively good

capacity to act as a non-specific donor of hydrogen atoms or electrons when checked by the diphenylpicrylhydrazyl assay, quenching 52% of the radical. On the other hand, it showed weak effects in inhibiting oxidation of linoleic acid when assayed by the [beta]-carotene bleaching test. Antibacterial activity of the essential oil was also checked against gram positive (Enterococcus foecalis, Staphylococcus aureus) and gram negative strains (Escherichia coli, Pseudomonas aeruginosa). The oil also showed a dose-dependent antifungal activity against Candida albicans, Saccharomyces cerevisiae, phytopathogen Pythium ultimum and dermatophyte Trichophyton mentagrophytes.
Keywords: Ocotea quixos; Lauraceae; Essential oil; Antioxidant activity; Antibacterial activity; Antifungal activity; Cinnamaldehyde; Methyl cinnamate

T. Kulisic, A. Radonic, V. Katalinic, M. Milos, Use of different methods for testing antioxidative activity of oregano essential oil, Food Chemistry, Volume 85, Issue 4, May 2004, Pages 633-640, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2003.07.024.
(http://www.sciencedirect.com/science/article/B6T6R-49V3GS9-H/2/a444d04aca13472d617a5c597be0c9fe)
Abstract:
The antioxidant properties of the essential oil from oregano in relation to its chemical composition were examined. The antioxidant activity was investigated with three different methods: the [beta]-carotene bleaching (BCB) test, the 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging method and the thiobarbituric acid reactive species (TBARS) assay. It was found that the total essential oil, its fraction as well as its pure constituents have a significant antioxidant effect when tested by each method, respectively. Generally the antioxidant activity of the oregano essential oil is less effective than the ascorbic acid, but comparable with the [alpha]-tocopherol and the synthetic antioxidant butylated hydroxytoluene (BHT). The synergy among minor oxygen containing compounds was suggested as possible factor, which influenced the antioxidant power of the oregano essential oil. The antioxidant concentrations influenced its antioxidant power, too.
Keywords: Origanum vulgare L; Essential oil; Natural antioxidants; Antioxidant activity; [beta]-Carotene bleaching; DPPH radical scavenging

Malcolm H. Douglas, John W. van Klink, Bruce M. Smallfield, Nigel B. Perry, Rosemary E. Anderson, Peter Johnstone, Rex T. Weavers, Essential oils from New Zealand manuka: triketone and other chemotypes of Leptospermum scoparium, Phytochemistry, Volume 65, Issue 9, May 2004, Pages 1255-1264, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2004.03.019.
(http://www.sciencedirect.com/science/article/B6TH7-4C76BD4-4/2/70afda2139c1da5a133a1f1918ab9db6)
Abstract:
The triketone chemotype of manuka, Leptospermum scoparium (Myrtaceae), is commercially important because of its antimicrobial activity. Oils from 36 individual plants on the East Cape of New Zealand all showed similar high triketone contents (>20% total triketones) with little seasonal variation. Analyses of oils from 261 individual manuka plants collected from 87 sites throughout New Zealand showed that the high triketone chemotype was localised on the East Cape, although oils with triketone levels up to 20% were found in the Marlborough Sounds area of the South Island. Cluster analysis revealed other chemotypes localised on other areas. Ten further chemotypes are described: [alpha]-pinene; sesquiterpene-rich with high myrcene; sesquiterpene-rich with elevated caryophyllene and humulene; sesquiterpene-rich with an unidentified sesquiterpene hydrocarbon; high geranyl acetate; sesquiterpene-rich with high [gamma]-ylangene + [alpha]-copaene and elevated triketones; sesquiterpene-rich with no distinctive components; sesquiterpene-rich with high trans-methyl cinnamate; high linalol; and sesquiterpene-rich with elevated elemene and selinene. Some of the chemotypes contained aroma compounds at

relatively high levels, with a geranyl acetate-rich oil being most notable. Possible origins for this complex array of chemotypes are proposed.
Keywords: Leptospermum scoparium; Myrtaceae; Manuka; Essential oil; Chemotype; Triketones; Sesquiterpenes; Monoterpenes; Geranyl acetate; Methyl cinnamate

Soon-Il Kim, Jee-Hwan Yi, Jun-hyung Tak, Young-Joon Ahn, Acaricidal activity of plant essential oils against Dermanyssus gallinae (Acari: Dermanyssidae), Veterinary Parasitology, Volume 120, Issue 4, 15 April 2004, Pages 297-304, ISSN 0304-4017, DOI: 10.1016/j.vetpar.2003.12.016.
(http://www.sciencedirect.com/science/article/B6TD7-4BWYRT6-2/2/ebd6b5c026028eb940ea6dec445e53a9)
Abstract:
The acaricial activity of 56 plant essential oils against poultry house-collected adult Dermanyssus gallinae De Geer was examined using direct contact and fumigation methods. In a filter paper contact bioassay, 100% mortality at 0.07 mg cm-2 was observed in bay, cade, cinnamon, clove bud, coriander, horseradish, lime dis 5F, mustard, pennyroyal, pimento berry, spearmint, thyme red and thyme white oils, whereas the mortality of these oils was significantly decreased at 0.02 mg cm-2. In fumigation tests with adult D. gallinae at 0.28 mg cm-2, cade, clove bud, coriander, horseradish and mustard oils were more effective in closed containers than in open ones, indicating that the effect of these essential oils was largely due to action in the vapour phase. Plant essential oils described herein merit further study as potential D. gallinae control agents.
Keywords: Dermanyssus gallinae; Natural acaricide; Essential oil; Fumigant; Mode of action

Andrea Schmidt, Christina Bischof-Deichnik, Elisabeth Stahl-Biskup, Essential oil polymorphism of Thymus praecox subsp. arcticus on the British Isles, Biochemical Systematics and Ecology, Volume 32, Issue 4, April 2004, Pages 409-421, ISSN 0305-1978, DOI: 10.1016/j.bse.2003.10.003.
(http://www.sciencedirect.com/science/article/B6T4R-4BHJTT5-2/2/3dd3b7b041a0928cdc875957414eb0a3)
Abstract:
The essential oils of 732 individual plants of Thymus praecox Opiz subsp. arcticus (E. Durand) Jalas (syn. T. drucei Ronn.) collected in Scotland, Ireland, and in the south of England have been analysed by gas chromatography (GC) and mass spectrometry (GC-MS) in order to elucidate the chemical character of this subspecies on the British Isles. In total, 69 components were identified, most of them monoterpenoids and sesquiterpenoids with hedycaryol, linalyl acetate, linalool, the germacradienols, trans-nerolidol, T-cadinol, and [beta]-caryophyllene being the most important compounds. The analysis of the quantitative essential oil data by means of neural networks revealed that T. praecox subsp. arcticus growing in Britain is highly polymorphous. There were 17 chemotypes with the hedycaryol chemotype as the most frequent (24% of the plants), followed by the linalool/linalyl acetate chemotype (22% of the plants) and germacra-1(10),4-dien-6-ol chemotype (18% of the plants). It seems that each part of the British Isles has its special chemotype pattern with 13 chemotypes in Scotland, 11 in Ireland, and 17 in the south of England. An overview of the North Atlantic region of Europe revealed that the polymorphism of T. praecox subsp. arcticus in the essential oil is more distinctive in the southern than in the northern regions, with only 2, 5, and 1 chemotypes in Greenland, Iceland, and Norway, respectively.
Keywords: Thymus praecox subsp. arcticus; Lamiaceae; British Isles; Essential oil; Hedycaryol; Linalyl acetate; Chemotypes; Neuronal networks

Silvio Chericoni, Guido Flamini, Elisabetta Campeol, Pier Luigi Cioni, Ivano Morelli, GC-MS analyses of the essential oil from the aerial parts of Artemisia verlotiorum: variability during the year, Biochemical Systematics and Ecology, Volume 32, Issue 4, April 2004, Pages 423-429, ISSN 0305-1978, DOI: 10.1016/j.bse.2003.10.002.

(http://www.sciencedirect.com/science/article/B6T4R-4B9D6GG-6/2/011b987d7f4705d40506103f5abc6497)
Abstract:
The seasonal variations of the composition of the essential oil of Artemisia verlotiorum leaves have been analyzed by ion-trap GC-EIMS and GC-CIMS. Twelve samples have been collected, one for each month of the year. The main components identified were: 1,8-cineole, germacrene D, [beta]-thujone, [beta]-caryophyllene, borneol, camphor, and myrcene. Qualitative and quantitative have been observed for some compounds. With the exception of November, 1,8-cineole was the main component of the essential oil.
Keywords: Artemisia verlotiorum; Asteraceae; Essential oil composition; GC-MS; Seasonal variations; 1,8-Cineole

Hasan Baydar, Osman Sagdic, Gulcan Ozkan, Tahsin Karadogan, Antibacterial activity and composition of essential oils from Origanum, Thymbra and Satureja species with commercial importance in Turkey, Food Control, Volume 15, Issue 3, April 2004, Pages 169-172, ISSN 0956-7135, DOI: 10.1016/S0956-7135(03)00028-8.
(http://www.sciencedirect.com/science/article/B6T6S-48BC0B5-1/2/f1e83e29307f1721bd5de70e13bfe646)
Abstract:
The antibacterial activity of essential oils and their derivatives has been recognized for a long time. In the present study, the chemical composition and the antibacterial properties of the essential oils obtained from the aerial parts of the four Lamiaceae species, wild oregano (Origanum minutiflorum) (endemic in Turkey), oregano (Origanum onites), black thyme (Thymbra spicata) and wild savory (Satureja cuneifolia), with commercial importance in Turkey, were evaluated.
The major constituent of the oils determined by GC was cavracrol (86.9% in O. onites, 84.6% in O. minutiflorum, 75.5% in T. spicata and 53.3% in S. cuneifolia). Four essential oils were investigated for activity against Aeromonas hydrophila, Bacillus amyloliquefaciens, B. brevis, B. cereus, B. subtilis, Corynebacterium xerosis, Enterococcus faecalis, Escherichia coli, Klebsiella pneumoniae, Listeria monocytogenes, Micrococcus luteus, Mycobacterium smegmatis, Proteus vulgaris, Staphylococcus aureus and Yersinia enterocolitica, using a paper disc diffusion method. All essential oils inhibited all bacteria at concentrations of <1/100 (v/v). The essential oil of T. spicata was the most active. B. amyloliquefaciens was the most sensitive. The results of this study confirmed the possibility of using these four essential oils in food systems to prevent the growth of foodborne bacteria and extend the shelf life of processed foods.
Keywords: Lamiaceae; Antibacterial activity; Essential oils

N. Canillac, A. Mourey, Effects of several environmental factors on the anti-Listeria monocytogenes activity of an essential oil of Picea excelsa, International Journal of Food Microbiology, Volume 92, Issue 1, 1 April 2004, Pages 95-103, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2003.09.001.
(http://www.sciencedirect.com/science/article/B6T7K-4BBHCJR-1/2/16ba400c06675d5e4c624837c9006ea0)
Abstract:
The effects of several environmental factors on the anti-Listeria monocytogenes activity of an essential oil of Picea excelsa were explored by determination of active concentrations using two methods and with survival curves. In trial conditions, the serovars 1/2c and 4b behaved similarly. A dose of 0.2-0.3% (v/v) of essential oil was bactericidal for 105-107 cells contained in 1 ml of Tryptone Soy Broth Yeast Extract at pH 6 and 7 incubated at 13 and 37 [degree sign]C and of medium supplemented with levan. Introduction of sodium caseinate, agar or fat into the test medium and use of a cheese medium decreased the bactericidal effects of the essential oil. Basic pH, addition of NaCl or use of Tryptone Soy Broth and saline solution increased its antilisterial

activity. Serovar 1/2c survival curves exhibited an exponential death rate followed by a tailing effect in the presence of the minimal bactericidal concentration of the essential oil. A three log10 reduction of cell viability was obtained within 100 min in Tryptone Soy Broth Yeast Extract, within longer exposure in media supplemented with NaCl or at basic pH.
Keywords: Listeria monocytogenes; Spruce essential oil; Antimicrobial; Environmental factors

Martin B. Ngassoum, H. Ousmaila, Leonard T. Ngamo, Pierre M. Maponmetsem, Leopold Jirovetz, Gerhard Buchbauer, Aroma compounds of essential oils of two varieties of the spice plant Ocimum canum Sims from northern Cameroon, Journal of Food Composition and Analysis, Volume 17, Issue 2, April 2004, Pages 197-204, ISSN 0889-1575, DOI: 10.1016/j.jfca.2003.08.002.
(http://www.sciencedirect.com/science/article/B6WJH-4BHVCR2-2/2/f58f1824ae8cfcb078151eb6f6c77025)
Abstract:
Ocimum canum Sims (Lamiaceae) is a well-known spice in Cameroon (locally named 'cotimajo'), in Africa and in Asia, where the aerial plant parts are used, for example, to flavour fish soup. The essential oils of flowers and leaves of two varieties (chemotypes) of O. canum from Cameroon were analysed by GC, GC/MS and olfactometry. The significant odour impression of the essential O. canum leaf oil of type-I is an intense floral-fruity aroma (direction of lavender, rose and citrus), while the essential oils of leaves and flowers of O. canum of variety II show intense fresh-fruity (direction of eucalyptus and citrus) odour notes with pinene-like and warm-spicy-woody (cadinene-like) side notes. The essential O. canum leaf oil of type I is characterized by a high percentage of monoterpene alcohols (total 91.9%), represented especially by linalool (44.9%) and geraniol (38.2%). The essential leaf and flower oils of O. canum from type-II contain less oxygenated monoterpenes (total about 25.0% and 30.9%), but more monoterpene hydrocarbons (total about 61.3-24.1%) and sesquiterpene derivatives (total about 13.2-44.0%) with the main components limonene (41.5% and 5.7%) 1,8-cineole (10.1% and 18.5%), [delta]-cadinene (4.0% and 18.0%), [alpha]-pinene (4.7% and 10.2%) and [alpha]-terpineol (6.9% and 6.4%).
Keywords: Ocimum canum; Lamiaceae; Spice; Essential oil composition; GC; GC-MS; Olfactometry

Jianqing Yu, Jiachuan Lei, Huaidong Yu, Xuan Cai, Guolin Zou, Chemical composition and antimicrobial activity of the essential oil of Scutellaria barbata, Phytochemistry, Volume 65, Issue 7, April 2004, Pages 881-884, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2004.02.005.
(http://www.sciencedirect.com/science/article/B6TH7-4BY3T4T-3/2/aeca9e74666c6ddce4d05ce936a814e9)
Abstract:
The essential oil of Scutellaria barbata was obtained by hydrodistillation with a 0.3% (v/w) yield and analysed by GC and GC-MS. The main compounds in the oil were hexahydrofarnesylacetone (11.0%), 3,7,11,15-tetramethyl-2-hexadecen-1-ol (7.8%), menthol (7.7%) and 1-octen-3-ol (7.1%). The antimicrobial activity of the oil was evaluated against 17 microorganisms using disc diffusion and broth microdilution methods. The gram-positive bacteria, including methicillin-resistant Staphlococcus aureus, were more sensitive to the oil than gram-negative bacteria and yeasts.
Keywords: Scutellaria barbata; Essential oil; Antimicrobial; Lamiaceae

Naser A. Arikat, Fawzia M. Jawad, Nabila S. Karam, Rida A. Shibli, Micropropagation and accumulation of essential oils in wild sage (Salvia fruticosa Mill.), Scientia Horticulturae, Volume 100, Issues 1-4, 19 March 2004, Pages 193-202, ISSN 0304-4238, DOI: 10.1016/j.scienta.2003.07.006.
(http://www.sciencedirect.com/science/article/B6TC3-49S76XK-5/2/529caa10b33c9047a61776ec7cd86ef4)
Abstract:

A protocol for in vitro propagation of the wild three-lobed sage (Salvia fruticosa Mill.) (Synonym, Salvia triloba L.) was developed. Shoot tips were excised from in vitro seedlings and established on MS, Nitch and Nitch (NN), or B5 medium. For shoot proliferation, in vitro nodal and apical explants were cultured on MS medium containing 0.25-2 [mu]M 6-benzylaminopurine (BA), 6-furfurylaminopurine (kinetin), or thidiazuron (TDZ). Proliferated microshoots were rooted on MS medium supplemented with 2.7-11.4 [mu]M indole-3-butyric acid (IBA), indole-3-acetic acid (IAA), or [alpha]-naphthaleneacetic acid (NAA). Results indicated that shoots established at 100% regardless of media type, however, shoot height, nodes per shoot, and leaf number were highest for explants established on MS medium compared to NN or B5. Number and height of proliferated shoots, nodes per shoot, and leaf number were highest for nodal explants cultured on a medium containing 0.75 [mu]M BA. Microshoots cultured on a medium supplemented with 2.7 [mu]M IBA exhibited the highest rooting percentage compared to those cultured with IAA or NAA. Essential oil composition in microshoots and shoots of greenhouse-grown plants was determined by gas chromatography/mass spectrometry. The major essential oils detected in both plant materials were [alpha]-pinene, 1,8-cineole, camphor, and borneol. No [alpha]-thujone or [beta]-thujone was detected. The content of essential oils, camphor, and borneol were higher in the microshoots than in shoots of greenhouse-grown plants.
Keywords: Volatile oils; Lamiaceae; Salvia triloba

Bektas Tepe, Erol Donmez, Mehmet Unlu, Ferda Candan, Dimitra Daferera, Gulhan Vardar-Unlu, Moschos Polissiou, Atalay Sokmen, Antimicrobial and antioxidative activities of the essential oils and methanol extracts of Salvia cryptantha (Montbret et Aucher ex Benth.) and Salvia multicaulis (Vahl), Food Chemistry, Volume 84, Issue 4, March 2004, Pages 519-525, ISSN 0308-8146, DOI: 10.1016/S0308-8146(03)00267-X.
(http://www.sciencedirect.com/science/article/B6T6R-49N982F-F/2/69d16d24a079fa13922615fce9b3cbd9)
Abstract:
The essential oils and methanolic extracts of Salvia cryptantha and Salvia multicaulis were examined for their potential antimicrobial and radical scavenging activities. No, or slight, activity was observed when the polar and non-polar subfractions of the extracts were tested, whereas essential oils exhibited antimicrobial activity. The essential oils isolated from S. cryptantha and S. multicaulis were analysed by GC-MS and 53 and 47 constituents were identified, respectively. Antioxidant activities of the polar subfraction and the essential oil were examined using 2,2-diphenyl-1-picrylhydrazyl (DPPH), hydroxyl radical-scavenging and lipid peroxidation assays. The essential oils, in particular, and the non-polar subfractions of methanol extracts, showed antioxidant activity. In conclusion, the results indicate that the oils of S. cryptantha and S. multicaulis have the capacity to scavenge free radicals and to inhibit the growth of pathogenic microorganisms. Therefore they could be suitable for using as antimicrobial and antioxidative agents in the food industry.
Keywords: Salvia cryptantha; Salvia multicaulis; Essential oil; Antimicrobial activity; Antioxidant activity; GC-MS

Irfan Aslan, Hikmet Ozbek, Onder Calmasur, Fikrettin Sahin, Toxicity of essential oil vapours to two greenhouse pests, Tetranychus urticae Koch and Bemisia tabaci Genn., Industrial Crops and Products, Volume 19, Issue 2, March 2004, Pages 167-173, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2003.09.003.
(http://www.sciencedirect.com/science/article/B6T77-4B2CWKM-1/2/08e15bd081fd7a26050c0855af94911d)
Abstract:
Essential oil vapours from Satureja hortensis L., Ocimum basilicum L. and Thymus vulgaris L. (Lamiacae) were tested for their toxicities against the nymphs and adults of Tetranychus urticae

Koch (Acari: Tetranychidae) and adults of Bemisia tabaci Genn. (Homoptera: Aleyrodidae). The amounts of essential oils applied were 1.56, 3.125, 6.25 and 12.5 [mu]l in each of the desiccators with 4 l capacity, corresponding to 0.39, 0.782, 1.563 and 3.125 [mu]l/l air. Although desirable insecticidal and acaricidal activities against both of these pest species were achieved with essential oils of the three plant species, S. hortensis was found to be the most effective, compared with the other two species.
It can be concluded that essential oils from these three plants are potential control agents against T. urticae and B. tabaci in greenhouse conditions.
Keywords: Tetranychus urticae; Bemisia tabaci; Essential oil; Fumigation; Toxicity

A. G. Ponce, C. E. del Valle, S. I. Roura, Natural essential oils as reducing agents of peroxidase activity in leafy vegetables, Lebensmittel-Wissenschaft und-Technologie, Volume 37, Issue 2, March 2004, Pages 199-204, ISSN 0023-6438, DOI: 10.1016/j.lwt.2003.07.005.
(http://www.sciencedirect.com/science/article/B6WMV-49S75PH-1/2/b560ebdd0f4e01ff9c53f3a5693d071a)
Abstract:
The effectiveness of natural essential oils eucalyptus (Eucalyptus globulus), tea tree (Melaleuca alternifolia), melisa (Melissa officinalis), roomer (Rosmarinus officinalis), clove (Syzygium aromaticum) and lemon (Citrus limonum) to reduce peroxidase activity of organic leafy vegetables extracts was evaluated. Three oil concentrations at the minimum inhibitory concentration (MIC, 2xMIC and 4xMIC) of each natural essential oils were used. Crude vegetable extracts of Swiss chard, spinach, lettuce, butter lettuce and cabbage were the source of peroxidase activity. The effectiveness of the essential oils as natural antioxidants varied with the enzyme sources. At the MIC, clove, rosemary, lemon, melisa and tea tree had the high antioxidant properties being clove more effective than the other oils.
Keywords: Natural essential oils; Antioxidant properties; Enzymatic browning; Leafy vegetables

N. Benkeblia, Antimicrobial activity of essential oil extracts of various onions (Allium cepa) and garlic (Allium sativum), Lebensmittel-Wissenschaft und-Technologie, Volume 37, Issue 2, March 2004, Pages 263-268, ISSN 0023-6438, DOI: 10.1016/j.lwt.2003.09.001.
(http://www.sciencedirect.com/science/article/B6WMV-49V7951-1/2/9c1fc55a9d5869662090d73ffd4425a5)
Abstract:
Antimicrobial activity of different concentrations (50, 100, 200, 300 and 500 ml/l) of essential oil extracts of three type of onions (green, yellow and red) and garlic against two bacteria, Staphylococcus aureus, Salmomella Enteritidis, and three fungi, Aspergillus niger, Penicillium cyclopium and Fusarium oxysporum, was investigated. The essential oil (EO) extracts of these Allium plants (garlic and onions) exhibited marked antibacterial activity, with garlic showing the highest inhibition and green onion the lowest. Comparatively, 50 and 100 ml/l concentrations of onions extracts were less inhibitory than 200, 300 and 500 ml/l concentrations. However, with garlic extract, high inhibitory activity was observed for all tested concentrations. S. aureus showed less sensitivity towards EO extracts inhibition, however S. Enteritidis was strongly inhibited by red onion and garlic extracts. The fungus F. oxysporum showed the lowest sensitivity towards EO extracts, whereas A. niger and P. cyclopium were significantly inhibited particularly at low concentrations. Conclusively, where seasoning is desired, essential oil extracts of onions and garlic can be used as natural antimicrobial additives for incorporating in various food products.
Keywords: Essential oils; Inhibition; Allium cepa; Allium sativum; Bacteria; Fungi

Soheil S. Mahmoud, Matthew Williams, Rodney Croteau, Cosuppression of limonene-3-hydroxylase in peppermint promotes accumulation of limonene in the essential oil, Phytochemistry,

Volume 65, Issue 5, March 2004, Pages 547-554, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2004.01.005.
(http://www.sciencedirect.com/science/article/B6TH7-4BTY5S2-2/2/2931a667b3abf3b2e24b036bfe55e5a1)
Abstract:
cDNA clones encoding limonene synthase and limonene-3-hydroxylase, both driven by the CaMV 35S promoter, were independently transformed into peppermint (Menthaxpiperita) to alter the production and disposition of (-)-limonene, the first committed intermediate of essential oil biosynthesis in this species. Although both genes were constitutively expressed in leaves of transformed plants, the corresponding enzyme activities were not significantly increased in the glandular trichome sites of essential oil biosynthesis; thus, there was no effect on oil yield or composition in the regenerated plants. Cosuppression of the hydroxylase gene, however, resulted in the accumulation of limonene (up to 80% of the essential oil compared to about 2% of the oil in wild type plants), without influence on oil yield. These results indicate that limonene does not impose negative feedback on the synthase, or apparently influence other enzymes of monoterpene biosynthesis in peppermint, and suggests that pathway engineering can be employed to significantly alter essential oil composition without adverse metabolic consequences.
Keywords: Peppermint; Menthaxpiperita; Lamiaceae; Limonene synthase; Limonene-3-hydroxylase; Essential oil; Monoterpene biosynthesis; Metabolic engineering

C. F. Bagamboula, M. Uyttendaele, J. Debevere, Inhibitory effect of thyme and basil essential oils, carvacrol, thymol, estragol, linalool and p-cymene towards Shigella sonnei and S. flexneri, Food Microbiology, Volume 21, Issue 1, February 2004, Pages 33-42, ISSN 0740-0020, DOI: 10.1016/S0740-0020(03)00046-7.
(http://www.sciencedirect.com/science/article/B6WFP-49XWVF1-5/2/8a330c78f908e50c741a636736570d14)
Abstract:
There are a few reports on the antimicrobial activity of essential oils or their major constituents towards Shigella sp. The antimicrobial effect of basil and thyme essential oil and its major constituents thymol, p-cymene, estragol, linalool, and carvacrol was determined using the agar well diffusion assay. Thyme essential oil and thymol and carvacrol showed inhibition of Shigella sp. in the agar well diffusion method. The potential of thyme essential oil, thymol and carvacrol at 0.5% and 1.0% v/v for decontamination of lettuce was evaluated. A decrease of the shigellae was observed after washing with 0.5% while at 1% Shigella numbers dropped below the detection limit. However, the antimicrobial effect on a subsequent lettuce sample in the same decontamination solution was significantly decreased. In addition, application of thyme essential oil or thymol or carvacrol for decontamination is hampered by sensoric properties of the lettuce (browning, strong odour).
Keywords: Shigella; Essential oil; Thyme; Basil; Carvacrol; Decontamination; Lettuce

M. Uyttendaele, K. Neyts, H. Vanderswalmen, E. Notebaert, J. Debevere, Control of Aeromonas on minimally processed vegetables by decontamination with lactic acid, chlorinated water, or thyme essential oil solution, International Journal of Food Microbiology, Volume 90, Issue 3, 1 February 2004, Pages 263-271, ISSN 0168-1605, DOI: 10.1016/S0168-1605(03)00309-X.
(http://www.sciencedirect.com/science/article/B6T7K-496NMY9-1/2/af4b6709eec95e03f9a6cae06ad6216b)
Abstract:
Aeromonas is an opportunistic pathogen, which, although in low numbers, may be present on minimally processed vegetables. Although the intrinsic and extrinsic factors of minimally processed prepacked vegetable mixes are not inhibitory to the growth of Aeromonas species, multiplication to high numbers during processing and storage of naturally contaminated grated carrots, mixed

lettuce, and chopped bell peppers was not observed. Aeromonas was shown to be resistant towards chlorination of water, but was susceptible to 1% and 2% lactic acid and 0.5% and 1.0% thyme essential oil treatment, although the latter provoked adverse sensory properties when applied for decontamination of chopped bell peppers. Integration of a decontamination step with 2% lactic acid in the processing line of grated carrots was shown to have the potential to control the overall microbial quality of the grated carrots and was particularly effective towards Aeromonas.
Keywords: Aeromonas; Minimal processing; Vegetables; Decontamination; Lactic acid; Chlorination; Thyme essential oil

R. Chizzola, W. Hochsteiner, S. Hajek, GC analysis of essential oils in the rumen fluid after incubation of Thuja orientalis twigs in the Rusitec system, Research in Veterinary Science, Volume 76, Issue 1, February 2004, Pages 77-82, ISSN 0034-5288, DOI: 10.1016/j.rvsc.2003.07.001.
(http://www.sciencedirect.com/science/article/B6WWR-49N97TW-1/2/b6e3c5b8e6688210a06f3631e4dcebd0)
Abstract:
Methods for the chemical analysis of toxic plant substances in the rumen of ruminants are of importance for the diagnosis of intoxications with poisonous plants. The present work establishes a method to estimate monoterpene components of the essential oil of thuja (Thuja orientalis, Cupressaceae) in these types of samples. [alpha]-Thujone, which is regarded as the toxic principle, is present at a concentration of 50-60% in the essential oil.
The rumen simulation technique (Rusitec) was used to simulate natural digestion. Chopped twigs of thuja were subjected to rumen content in a closed container with an overflow device. The flow of saliva was simulated by the continuous addition of a buffer solution. Samples for analysis were taken from the overflow at 24 and 48 h. A further sample was taken from the remaining liquid fraction of the rumen content in the container at 48 h. The essential oils were extracted with hexane and concentrated. A quantitative determination was done by capillary gas chromatography.
Together in the three fractions analysed this resulted in total mean recoveries of 6.8% for [alpha]-thujone, 5.3% for [beta]-thujone, 18.9% for fenchone and 27.8% for camphor. The observation that the thujones were recovered to a lesser extent than other oil components is evidence of their fast decomposition in the rumen medium. Under these circumstances the calculated detection limit is 100-200 g thuja twigs in cows with rumen volumes of 60-100 litres.
The main essential oil degradation products found in the rumen fluid of all three fractions in the Rusitec system were discovered to be iso-3-thujanol, neo-3-thujanol, carvomenthol and carvomenthone.
Keywords: Essential oils; Monoterpenes; Thuja; Rumen analysis; Gas chromatography; RUSITEC (Rumen simulation technique)

Valery A. Isidorov, Urszula Krajewska, Vera T. Vinogorova, Lidia V. Vetchinnikova, Irma L. Fuksman, Karol Bal, Gas chromatographic analysis of essential oil from buds of different birch species with preliminary partition of components, Biochemical Systematics and Ecology, Volume 32, Issue 1, January 2004, Pages 1-13, ISSN 0305-1978, DOI: 10.1016/S0305-1978(03)00175-3.
(http://www.sciencedirect.com/science/article/B6T4R-49FGM31-2/2/c465fb7b90c3f3922190642ee0c6723b)
Abstract:
The results of gas chromatographic analysis of essential oils from the buds of four birch forms growing in Karelia are reported. This includes 61 compounds, some of which have been identified for the first time in these oils. Differences in the composition of sesquiterpenes in the essential oils from B. pubescens and B. pendula were recorded. In the case of B. pendula, compounds of the cadinane and selinane groups are prevalent. In the essential oils from the buds of B. pubescens,

compounds of the caryophyllane and humulane groups and the methanoazulene C10H16 hydrocarbon cedrane are the major components. A new algorithm is proposed to increase the reliability of the identification of individual compounds. It is based on the simultaneous use of retention indices and partition coefficients of components in the n-hexane-acetonitrile heterogenic system. In the first stage, the components of the mixture are assigned to certain homologous series and in the second stage they are identified within these series. The advantages and limitations of this algorithm are discussed.
Keywords: Birch; B. pubescens Ehrh.; B. pendula Roth.; B. pendula Roth., var. carelica Mercklin; B. pendula Roth., var. dalecarlica Schneid; Buds; Essential oils; GC analysis; Algorithm of identification

E. S. Suyenaga, M. A. Apel, C. G. Chaves, J. A. Zuanazzi, A. T. Henriques, Essential oil composition of Heterothalamus psiadioides Less, Biochemical Systematics and Ecology, Volume 32, Issue 1, January 2004, Pages 83-86, ISSN 0305-1978, DOI: 10.1016/S0305-1978(03)00190-X.
(http://www.sciencedirect.com/science/article/B6T4R-49JHGSN-1/2/77dcc2135ef367e7e9bc568406ef8e55)
Keywords: Heterothalamus psiadioides; Asteraceae; Essential oil composition; Germacrene D; Bicyclogermacrene; [beta]-pinene

Isabelle Schwob, Jean-Marie Bessiere, Veronique Masotti, Josette Viano, Changes in essential oil composition in Saint John's wort (Hypericum perforatum L.) aerial parts during its phenological cycle, Biochemical Systematics and Ecology, Volume 32, Issue 8, August 2004, Pages 735-745, ISSN 0305-1978, DOI: 10.1016/j.bse.2003.12.005.
(http://www.sciencedirect.com/science/article/B6T4R-4C4BHKY-1/2/7b8fa4f8852c58369cbd9aaaca779c9f)
Abstract:
The quantitative and qualitative variations of the essential oil from the aerial parts of Hypericum perforatum were examined. Plant material was harvested at different phenological stages (i.e. vegetative, floral budding, flowering, and fruiting stages) of the life cycle of the species. Analysis by GC and GC/MS of the essential oils enabled us to identify 69 of the 97 components. In all the oils analysed, the main components were caryophyllene oxide, [beta]-caryophyllene, spathulenol, 1-tetradecanol, [beta]-funebrene, 1-dodecanol, and [gamma]-muurolene; 64 of the identified compounds were common to all these oils. However, monoterpenoids composition and levels of aliphatic alcohols varied with the phenological cycle and the number of compounds detected increased during ontogenesis.
Keywords: Hypericum perforatum var. perforatum; Hypericaceae; Essential oil composition; Phenological cycle; Caryophyllene oxide; [beta]-Caryophyllene; Spathulenol

L. Ceccarini, M. Macchia, G. Flamini, P. L. Cioni, C. Caponi, I. Morelli, Essential oil composition of Helianthus annuus L. leaves and heads of two cultivated hybrids 'Carlos' and 'Florom 350', Industrial Crops and Products, Volume 19, Issue 1, January 2004, Pages 13-17, ISSN 0926-6690, DOI: 10.1016/S0926-6690(03)00076-1.
(http://www.sciencedirect.com/science/article/B6T77-4979PCT-1/2/95c55122476bdc1f334300077318430e)
Abstract:
The composition of essential oils from leaves and flowers of two hybrids (Carlos and Florom 350) of Helianthus annuus cultivated in Tuscany (Italy) was investigated. The compounds were identified using gas chromatography (GC)/mass spectrometry (MS) analyses. Sixty-nine compounds were identified in the essential oils of leaves and flowers of sunflower plants harvested in July. Significant percentage variations were recorded between the leaves and flowers oil

content. The monoterpenes were the major compounds present in both essential oils examined. [alpha]-pinene content was higher in flowers (72.6%) than in leaves (28.6%). The content of sabinene was ~2 times higher in leaves than in flowers. There were no significant differences between the essential oil composition of the oils obtained from the same organs of the two hybrids.
Keywords: Helianthus annuus (L.); Leaves; Flowers; Chemical composition; Essential oil

D. P. Papachristos, D. C. Stamopoulos, Fumigant toxicity of three essential oils on the eggs of Acanthoscelides obtectus (Say) (Coleoptera: Bruchidae), Journal of Stored Products Research, Volume 40, Issue 5, 2004, Pages 517-525, ISSN 0022-474X, DOI: 10.1016/j.jspr.2003.07.002.
(http://www.sciencedirect.com/science/article/B6T8Y-49S7WM3-1/2/d014d7f58ac55816f1a2759637660183)
Abstract:
Fumigant toxicity of the essential oils from Lavandula hybrida, Rosmarinus officinalis and Eucalyptus globulus against the eggs of Acanthoscelides obtectus was assessed. The essential oil vapours were toxic to eggs with LC50 values ranging between 1.3 and 35.1 [mu]l/l air, depending on egg age and the essential oil. In all cases, the young eggs ([less-than-or-equals, slant]3-day old) were more tolerant to essential oil vapours than the older ones ([greater-or-equal, slanted]4-day old). Apart from the inhibition of hatching, the exposure of eggs to essential oil vapours increased the subsequent mortality of hatched larvae. The influence of length of exposure to essential oil vapours on egg hatchability was also significant.
Keywords: Acanthoscelides obtectus; Eggs; Age effect; Essential oil vapours; Lavender; Rosemary; Eucalyptus; Fumigant toxicity

Byung-Ho Lee, Peter C. Annis, Fa'ale Tumaalii, Won-Sik Choi, Fumigant toxicity of essential oils from the Myrtaceae family and 1,8-cineole against 3 major stored-grain insects, Journal of Stored Products Research, Volume 40, Issue 5, 2004, Pages 553-564, ISSN 0022-474X, DOI: 10.1016/j.jspr.2003.09.001.
(http://www.sciencedirect.com/science/article/B6T8Y-4BM69PD-1/2/98ca044d98523cbd1f3984f4d74054a7)
Abstract:
Six out of 42 essential oils extracted from species of the family Myrtaceae found in Australia were shown to have potent fumigant toxicity against three major stored-grain insects: Sitophilus oryzae, Tribolium castaneum and Rhyzopertha dominica. These were the essential oils from Eucalyptus nicholii, E. codonocarpa, E. blakelyi, Callistemon sieberi, Melaleuca fulgens and M. armillaris. The LD50 and LD95 of the selected essential oils against S. oryzae adults were between 19.0-30.6 and 43.6-56.0 [mu]l/l air, respectively. Also, these oils were approximately twice as toxic to T. castaneum and R. dominica at the LD95. Fumigant effects of the essential oils rich in 1,8-cineole were considered to warrant further research into their potential for commercial use.
Keywords: Essential oils; Cineole; Eucalyptus; Fumigant; Mortality