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AROMATIC PLANTS

SPECIES (77 JDL)

A. Mennerat, Blue tits (Cyanistes caeruleus) respond to an experimental change in the aromatic plant odour composition of their nest,
Behavioural Processes, Volume 79, Issue 3, November 2008, Pages 189-191, ISSN 0376-6357, DOI: 10.1016/j.beproc.2008.07.003.
(http://www.sciencedirect.com/science/article/B6T2J-4T2633J-1/2/13475657ce80bef227973ed3afdc4b58)

Abstract:

Although the use of olfaction by birds is now widely recognised, the olfactory abilities of passerine birds remain poorly explored, for historical reasons. Several studies however suggest that passerines can perceive volatile compounds in several biologically relevant contexts. In Corsica, recent findings suggest that cavity-nesting blue tits may use volatile compounds in the context of nest building and maintenance. Although they build their nests mainly from moss, female blue tits also frequently incorporate fragments of several species of aromatic plants in the nest cup. In field experiments, breeding female blue tits altered their nest maintenance behaviour in response to experimental addition of aromatic plants in their nest. In aviary experiments, captive male blue tits could be trained to detect lavender odour from a distance. Here I report results from a field study aimed to test whether adult blue tits altered their chick-feeding behaviour after an experimental change in nest odour composition. I experimentally added fragments of aromatic plant species that differed from those brought in the nests before the start of the experiment in a set of experimental nests and added moss, the basic nest material, in a set of control nests. Both male and female blue tits hesitated significantly longer entering the nest cavity after addition of new aromatic plant fragments, as compared to moss addition. This response was especially observed during the first visit following the experimental change in nest plant composition. Nest composition treatment had no effect on the time spent in the nest. This study demonstrates that free-ranging blue tits detect changes in nest odour from outside the nest cavity.

Keywords: Aromatic plant; Nest greenery; Nest odour; Olfaction; Passerine

H. Rodolfo Juliani, Adolfina R. Koroch, Julio A. Zygadlo, Victorio S. Trippi, Evaluation of micropropagation for the introduction into cultivation and conservation of Lippia junelliana, an endemic aromatic plant from Argentina,
Industrial Crops and Products**,** In Press, Corrected Proof, Available online 11 January 2011, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2010.12.009.

(http://www.sciencedirect.com/science/article/B6T77-51XFXNM-2/2/43efc98b88177f75dd21f48ed65d0226)

Abstract:

The aims of this work were to introduce Lippia junelliana into cultivation, to compare the essential oil accumulation between cultivated and wild plants, and to reintroduce micropropagated plants in the location of the original population. The leaves and inflorescences of cultivated plants accumulated, on a dry weight basis, higher amounts of essential oil than their wild counterparts. Thus, total essential oil accumulation of cultivated plant parts was also significantly higher than that of wild counterparts. The cultivated plants showed the same essential oil profile than the wild plants. This work demonstrates that cultivation can be a more efficient vehicle to both preserve and exploit L. junelliana, than collection from the wild, because higher yields of biomass and oil accumulation can be achieved, while essential oil composition is less affected by the different treatments. The reintroduction of new plants into the species' original location has proved to be a viable alternative for their in situ preservation or enrichment planting. This model of introduction of aromatic plants into cultivation through micropropagation could be a useful technique to recover valuable chemotypes from the wild in the search for new alternatives in the agriculture and for the preservation of natural resources for future generations.

Keywords: Lippia junelliana; Verbenaceae; Salvialora; Essential oil; Cultivation; Wild populations; Collecting; Aromatic; Medicinal plant; Monoterpenes

Hong Liu, David Weisman, Yuan-bei Ye, Bo Cui, Yan-he Huang, Adan Colon-Carmona, Zong-hua Wang, An oxidative stress response to polycyclic aromatic hydrocarbon exposure is rapid and complex in Arabidopsis thaliana,

Plant Science, Volume 176, Issue 3, March 2009, Pages 375-382, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.12.002.
(http://www.sciencedirect.com/science/article/B6TBH-4V3SY33-3/2/97e408077bace7522aa7ab963a8df6d2)

Abstract:

Phytoremediation is the use of plants to remove pollutants from contaminated environments. Polycyclic aromatic hydrocarbons (PAHs), a class of widely distributed organic carcinogenic pollutants, are attractive candidates for phytoremediation. To better understand the biochemical, physiological, and molecular responses to PAHs in plants, Arabidopsis thaliana seedlings were treated with phenanthrene, a three-ringed PAH, to elucidate mechanistic details of oxidative stress. Activity of the antioxidant enzymes superoxide dismutase (SOD), peroxidase (POD), catalase (CAT), and ascorbate peroxidase (APX), as well as H2O2, the redox buffer glutathione (GSH), and lipid oxidation product malondialdehyde (MDA), were measured in leaf tissue after 30 d of treatment at five phenanthrene levels between 0.25 and 1.25 mM. SOD enzyme activity increased monotonically over this treatment range, while CAT activity remained relatively unaffected. POD and APX exhibited peak enzyme activities on 0.25 mM phenanthrene and declined at higher concentrations. H2O2, GSH, and MDA increased

with phenanthrene levels, and DAB staining indicated dose-dependent H2O2 accumulation. APX1 and CAT2 mRNA levels were measured at six time points during 72 h of 1 mM phenanthrene treatment, with APX1 peaking at nearly fivefold after 48 h, and CAT2 mRNA becoming minuscule before 12 h. Chlorophyll a and b levels fell with increasing phenanthrene concentration. Transmission electron microscopy revealed that chloroplast and mitochondria in treated plants underwent gross deformation, and cellular structures had collapsed. Taken together, these results support the hypothesis that oxidative stress is an important component of the PAH response in plants.

Keywords: Polycyclic aromatic hydrocarbons (PAHs); Phenanthrene; Phytoremediation; Arabidopsis thaliana; Oxidative stress

M.J. Gonzalez, J.M. Marioli, Antibacterial activity of water extracts and essential oils of various aromatic plants against Paenibacillus larvae, the causative agent of American Foulbrood,

Journal of Invertebrate Pathology, Volume 104, Issue 3, July 2010, Pages 209-213, ISSN 0022-2011, DOI: 10.1016/j.jip.2010.04.005.
(http://www.sciencedirect.com/science/article/B6WJV-4YVJ4BB-2/2/e8b8fbb2f5d672650ceebbdcbb56ecbd)

Abstract:

Vegetal water extracts, namely the water remaining after hydro-distillation and decoctions, and essential oils of 10 plant species were tested as inhibitors for the growth of Paenibacillus larvae, the causative agent of American Foulbrood. Achyrocline satureioides, Chenopodium ambrosioide, Eucalyptus cinerea, Gnaphalium gaudichaudianum, Lippia turbinata, Marrubium vulgare, Minthostachys verticillata, Origanum vulgare, Tagetes minuta and Thymus vulgaris were included in the study. The water remaining after hydro-distillation showed the highest antibacterial activities, the growth of almost all the P. larvae strains tested was inhibited by these extracts. Regarding the plants tested, E. cinerea and M. verticillata were the plant species with the highest biological activity with 100% efficacy (all its extracts inhibited the growth of all P. larvae strains). Essential oils were less active for the inhibition of P. larvae growth.

Keywords: Plant extracts; Essential oils; Antibacterial activity; Paenibacillus larvae; American Foulbrood; Biological control

L. Reynoso-Cuevas, M.E. Gallegos-Martinez, F. Cruz-Sosa, M. Gutierrez-Rojas, In vitro evaluation of germination and growth of five plant species on medium supplemented with hydrocarbons associated with contaminated soils,

Bioresource Technology, Volume 99, Issue 14, September 2008, Pages 6379-6385, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.11.074.
(http://www.sciencedirect.com/science/article/B6V24-4RNS336-2/2/69e572002ba0de1cfab6dd30cd22a9d2)

Abstract:

The effect of a hydrocarbon mixture (HCM) of three polycyclic aromatic hydrocarbons (PAH) and Maya crude oil on germination, growth and survival of four grasses (Bouteloua curtipendula, Cenchrus ciliaris, Echinochloa crusgalli and Rhynchelytrum repens) was studied and compared to a control (Festuca arundinacea) under in vitro conditions. The species were cultured on MS medium with different HCM initial concentrations. Germination was not affected for any assayed concentration; however, the length of the stems and roots decreased when HCM increased and the survival of the four species also diminished. Except for F. arundinacea, a direct link between hydrocarbon concentration and plant survival was observed. In vitro studies are clean and easy to handle techniques allowing isolation of the plant activity from that derived from associations with microorganisms in non-sterile cultures. To our knowledge, this is the first work towards phytoremediation assisted by in vitro plant cultivation.

Keywords: Polycyclic aromatic hydrocarbons (PAH); Maya crude; Phytoremediation; Poaceae

Oz Barazani, Avi Perevolotsky, Rivka Hadas, A problem of the rich: Prioritizing local plant genetic resources for ex situ conservation in Israel,
Biological Conservation, Volume 141, Issue 2, February 2008, Pages 596-600, ISSN 0006-3207, DOI: 10.1016/j.biocon.2007.10.014.
(http://www.sciencedirect.com/science/article/B6V5X-4RB5GMJ-3/2/c56b84160961ff0f1db5c0afede04cee)

Abstract:

A priority list of 323 plant species was created through a consultative process for ex situ conservation in the recently inaugurated Israel Plant Gene Bank (IGB). The IGB is set up to preserve plant genetic resources and the endangered genetic variability of the Israeli flora. Upon its inauguration, we consulted with the country's leading plant breeders and botanists in an attempt to create a list of the most important plant species to be included in the initial collections. The list includes crop wild relatives (CWRs), selected according to their contribution to humans: edible plants (grains, vegetables, oil); forage plants; species with potential industrial and biotechnological applications (e.g. spices, medicinal plants, aromatic plants, fibers, dyes), and species with horticultural and forestry potential. We further ranked the species on the basis of assessed values for each of seven characteristics: distribution range in the country; abundance; rarity of the growing habitats; endemism; red number index--representing imminent threat of extinction; availability of samples in Israeli collections, and genetic relationship to cultivated crops. The sum of the assessed values for these seven characteristics was used to group the species on the list into four main prioritized-collection schemes. Statistical analysis indicated that all attributes had similar influence on the collecting prioritization scheme. In general, rare species with low abundance in their growing habitats were ranked in the highest priority group, while highly distributed species were sorted together into a lower priority group. The

prioritization scheme will be used to optimize the collection in the IGB with the aim of establishing its collecting activities.

Keywords: Biodiversity; Ex situ conservation; Gene bank; Genetic resources; Israel Plant Gene Bank; Prioritization scheme

Dorine Desalme, Philippe Binet, Nadine Bernard, Daniel Gilbert, Marie-Laure Toussaint, Genevieve Chiapusio, Atmospheric phenanthrene transfer and effects on two grassland species and their root symbionts: A microcosm study,

Environmental and Experimental Botany, Volume 71, Issue 2, June 2011, Pages 146-151, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2010.11.009.
(http://www.sciencedirect.com/science/article/B6T66-51M0NBT-2/2/bc97b67de14afb43711a64e09f4bf35e)

Abstract:

The objective of this work was to determine the transfer of phenanthrene (PHE) from air to grassland plants and soil compartments and its effects on the plant growth and symbiotic root microorganisms (arbuscular mycorrhizal fungi and Rhizobium nodules). The experimental procedure exposed Trifolium pratense L. or Lolium perenne L. to atmospheric PHE pollution (150 [mu]g m-3) over the course of one month. PHE was transferred from the air to the leaves and to the soil surfaces. In leaves, PHE was mostly absorbed in the inner leaf tissues, representing 92% and 73% of the total PHE amount quantified in leaves, respectively for clover and ryegrass. In soils, most of PHE contamination was recovered in the top layer (0-1 cm) and did not readily diffuse into the deep layer (1-10 cm). The highest PHE concentration recovered in deep roots (1.8 and 4.5 [mu]g g-1 dry weight (DW), respectively for clover and ryegrass) related to the lowest PHE concentration recovered in its associated soil suggested a PHE translocation from shoots to roots within the two plant species. The large PHE amount quantified in clover shoots (124 [mu]g g-1 DW) induced a significant diminution by 30% of the shoot biomass whereas root biomass remained stable. Efficient mycorrhizal symbiosis was maintained during exposure whereas the Rhizobium nodule symbiosis was altered in the surface of soil. By contrast, neither biomass accumulation nor symbiotic association was affected in ryegrass, probably due to a lower sensitivity of this species to PHE exposure. Perspectives of carbon allocation and nitrogen nutrition perturbations are suggested in clovers.

Keywords: Atmospheric PAHs; Translocation; Trifolium pratense; Lolium perenne; Rhizobium; Mycorrhiza

Fabrizio De Mattia, Ilaria Bruni, Andrea Galimberti, Francesca Cattaneo, Maurizio Casiraghi, Massimo Labra, A comparative study of different DNA barcoding markers for the identification of some members of Lamiacaea,

Food Research International, In Press, Corrected Proof, Available online 30 December 2010, ISSN 0963-9969, DOI: 10.1016/j.foodres.2010.12.032.

(http://www.sciencedirect.com/science/article/B6T6V-51TYF07-1/2/df862970258482b4bcad8c8b4893fbf4)

Abstract:

The objective of the present work is to evaluate the efficacy of a DNA barcoding approach as a tool for the recognition of commercial kitchen spices belonging to the Lamiaceae family that are usually sold as enhancers of food flavor. A total of 64 spices samples, encompassing six different genera (i.e. Mentha, Ocimum, Origanum, Salvia, Thymus and Rosmarinus) were processed with a classical DNA barcoding approach by amplifying and sequencing four candidate barcode regions (rpoB, rbcL, matK and trnH-psbA) with universal primers. Results suggest that the non-coding trnH-psbA intergenic spacer is the most suitable marker for molecular spices identification followed by matK, with interspecific genetic distance values ranging between about 0% to 7% and 0% to 5%, respectively. Both markers were almost invariably able to distinguish spices species from closest taxa with the exclusion of samples belonging to the genus Oregano. Moreover, in a context of food traceability the two markers are useful to identify commercial processed spice species (sold as dried plant material). We also evaluated the potential benefits of a multilocus barcode approach over a single-marker and although the most suitable combination was the matK + trhH-psbA, the observed genetic distances values were very similar to the discriminatory performance of the trnH-psbA. Finally, this preliminary work provide clear evidences that the efficacy of a DNA barcoding approach to the recognition of commercial spices is biased by the occurrence of taxonomic criticisms as well as traces of hybridization events within the family Lamiaceae. For this reason, to better define a more practical and standardized DNA barcoding tool for spices traceability, the building of a dedicated aromatic plants database in which all species and cultivars are described (both morphologically and molecularly) is strongly required.

Keywords: Aromatic plant; Food traceability; DNA barcoding; Lamiaceae; Plastidial DNA markers

Meshack Obonyo, Fritz Schulthess, Juma Gerald, Onesmus Wanyama, Bruno Le Ru, Paul-Andre Calatayud, Location, acceptance and suitability of lepidopteran stemborers feeding on a cultivated and wild host-plant to the endoparasitoid Cotesia flavipes Cameron (Hymenoptera: Braconidae),

Biological Control, Volume 45, Issue 1, April 2008, Pages 36-47, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2007.11.010.

(http://www.sciencedirect.com/science/article/B6WBP-4R9JTVN-2/2/9d1fff5d9b4a0b49e662ee3b6019b23b)

Abstract:

Maize fields in Africa are usually surrounded by land occupied by wild plants many of which harbor lepidopteran stemborer species not found on crops. It is not known if the exotic braconid parasitoid Cotesia flavipes, which was released in Kenya in 1993 against the invasive crambid Chilo partellus, searches for and attacks these borers in their natural habitats and whether they are suitable for parasitoid development. The objective of this study was to assess the relationship between

acceptance and suitability of six stemborer species attacking cultivated sorghum (C. partellus, Busseola fusca, Sesamia calamistis, and S. nonagrioides) or Napier grass (Busseola phaia and Sciomesa piscator) to C. flavipes. Although all stemborer species were equally accepted for ovipositor probing by C. flavipes, only C. partellus and S. calamistis were suitable and produced parasitoids. In olfactometric bioassays, C. flavipes females were more attracted to stemborer-infested than uninfested plants. Analyses of the volatile compounds showed that they produced richer volatile profiles, mainly comprising C5-C6 alcohols, terpenoids, aromatic and aliphatic compounds, than uninfested plants. It can be concluded that stemborer species, that were accepted for oviposition but were unsuitable for parasitoid development, form a reproductive sink and that the exotic parasitoid would not establish in areas where these are the predominant species.

Keywords: Sesamia nonagrioides; Sesamia calamistis; Chilo partellus; Busseola fusca; Busseola phaia; Sciomesa piscator; Sorghum bicolor; Pennisetum purpureum; Plant volatiles; Y-tube olfactometer; GC analyses

Niels Agerbirk, Carl Erik Olsen, Eva Poulsen, Niels Jacobsen, Paul Robert Hansen, Complex metabolism of aromatic glucosinolates in Pieris rapae caterpillars involving nitrile formation, hydroxylation, demethylation, sulfation, and host plant dependent carboxylic acid formation,

Insect Biochemistry and Molecular Biology, Volume 40, Issue 2, February 2010, Pages 126-137, ISSN 0965-1748, DOI: 10.1016/j.ibmb.2010.01.003.
(http://www.sciencedirect.com/science/article/B6T79-4Y5BMBJ-2/2/a6779d19ad3dd3d5091a45a9cefd7f17)

Abstract:

We investigated the metabolism of two chain elongated phenolic glucosinolates and the corresponding O-methyl derivatives upon ingestion by caterpillars of the butterfly Pieris rapae (L.). The glucosinolates (GSLs) were 4-hydroxyphenethylGSL, (R)-2-hydroxy-2-(4-hydroxyphenyl)ethylGSL, 4-methoxyphenethylGSL, and (R)-2-hydroxy-2-(4-methoxyphenyl)ethylGSL, variously occurring in foliage of two Arabis species: Arabis hirsuta (L.) Scop. and Arabis soyeri Reut. & Huet subsp. subcoriacea (Gren. ex Nyman) Breitstr. (Brassicaceae). Frass from caterpillars reared on each Arabis species contained two sulfated nitriles (4-sulfates of 3-(4-hydroxyphenyl)propanenitrile and 3-hydroxy-3-(4-hydroxyphenyl)propanenitrile) as apparent GSL metabolites. Comparison of glucosinolate levels in foliage and levels of sulfated nitriles in frass, and experiments with isolated GSLs spiked to crucifer foliage and ingested by P. rapae, demonstrated that phenolic GSLs and the corresponding O-methyl derivatives were metabolised to sulfated nitriles, and that metabolites lacking a [beta]-hydroxy group were partially hydroxylated in this position during metabolism in P. rapae. In contrast, an induction experiment did not show increased levels of [beta]-hydroxylated GSLs in A. soyeri plants upon caterpillar feeding. Frass contents of other putative GSL metabolites from the interaction with the two Arabis species differed significantly; caterpillars reared on A. hirsuta excreted significant amounts of four

carboxylic acids (3-(4-hydroxyphenyl)propanoic acid, 3-hydroxy-3-(4-hydroxyphenyl)propanoic acid, and the corresponding 4-sulfates), which were low or absent when the caterpillars were reared on A. soyeri. The excreted carboxylic acids could be formed by hydrolysis of nitriles to carboxylic acids in caterpillar guts by an ingested nitrilase enzyme from A. hirsuta foliage; this hypothesis was supported by demonstration of 3-(4-hydroxyphenyl)propanenitrile hydrolysing nitrilase activity (E.C. 3.5.5.x) in a crude A. hirsuta extract. Some hypothetic metabolites, glycine conjugates of phenolic carboxylic acids, were not detected. Conditions for group separation and HPLC isolation of intact GSLs and sulfated metabolites were optimised, NMR spectroscopic data of the compounds are reported, and evolutionary and ecological implications are discussed.

Keywords: Carboxylic acid; Detoxification; Glucosinolate; Nitrilase; Nitrile; Nitrile-specifier protein; O-Demethylase; P450; Sulfate conjugate

Marta D. Mendes, Helena Trindade, A. Cristina Figueiredo, Jose G. Barroso, Susana S. Fontinha, Luis G. Pedro, Volatile and molecular characterization of two Portuguese endemic species: Angelica lignescens and Melanoselinum decipiens,
Biochemical Systematics and Ecology, Volume 37, Issue 2, April 2009, Pages 98-105, ISSN 0305-1978, DOI: 10.1016/j.bse.2008.12.006.
(http://www.sciencedirect.com/science/article/B6T4R-4VH8Y77-1/2/288e558fa3172727b03e9dbc07c72663)

Abstract:

Chemical and genetic differences of 11 individuals of Angelica lignescens and 3 individuals of Melanoselinum decipiens were studied to determine whether volatile components could be used as taxonomical markers and to examine the correlation between molecular and chemical markers. The volatiles were isolated from each individual by distillation-extraction and analyzed by gas chromatography (GC) and gas chromatography-mass spectrometry (GC-MS). The same plants were analyzed by Inter Simple Sequence Repeat (ISSR) using 14 arbitrary primers. The main component of volatile fraction isolated from vegetative aerial parts of A. lignescens was limonene (57-86%) while in M. decipiens the main components detected were [beta]-pinene (38-47%) and sabinene (1-33%). Cluster analyses based both on the chemical composition of volatile fraction and on molecular markers grouped the 14 accessions in two main groups, corresponding to each of the two species under study. Considering the species together, a moderate Pearson's correlation of r = 0.61 was obtained between the two analyses.

Keywords: Apiaceae; Umbelliferae; Aromatic plants; Volatile compounds; Inter simple sequence repeats; Molecular markers

A.M. Carvalho, M.M.C. Bustamante, F.A. Alcantara, I.S. Resck, S.S. Lemos, Characterization by solid-state CPMAS 13C NMR spectroscopy of decomposing plant residues in conventional and no-tillage systems in Central Brazil,
Soil and Tillage Research, Volume 102, Issue 1, January 2009, Pages 144-150, ISSN 0167-1987, DOI: 10.1016/j.still.2008.08.006.
(http://www.sciencedirect.com/science/article/B6TC6-4TP1F5X-1/2/c0e7a20a632ad7d0bfded0473007400d)

Abstract:

The Savanna region of Central Brazil is currently the most important area for grain production in the country but intensive agricultural activities are related to high losses of soil organic carbon. No-tillage systems were introduced in the mid 1980's but the use of cover plants in no-tillage systems is poorly studied and there is a demand for selection of suitable species to improve soil organic carbon. This study characterizes the chemical composition of decomposing plant residues of different cover plants (Crotalaria juncea, Canavalia brasiliensis, Cajanus cajan, Mucuna pruriens, Helianthus annuus, Pennisetum glaucum, Raphanus sativus and natural fallow, as a control). Cover plants were used in rotation with maize, under conventional and no-tillage systems. Decomposition rates were estimated using litter bags and residues of C. juncea, C. brasiliensis, M. pruriens and R. sativus were analyzed by CPMAS 13C NMR. The highest decomposition rates were found for C. brasiliensis and C. juncea, while the lowest for M. pruriens, C. cajan and P. glaucum. C. cajan presented the lowest content of polysaccharides and along with M. pruriens, the highest percentage of aromatic C, reflecting the slow decomposition of highly lignified material. The residues of these two species also presented high hydrophobicity, as a consequence of the presence of aromatic groups. Incorporation of plant residues accelerated the decomposition in comparison to no-tillage system. C. cajan, P. glaucum and M. pruriens are more appropriate to increase soil cover due to lower decomposition rates while C. brasiliensis, R. sativus and H. annus, which presented higher decomposition rates, are indicated for an improvement of nutrient availability.

Keywords: Cover plants; Decomposition rate; Carbon groups; Savanna; CPMA 13C NMR

Luciana L. Machado, Joao Sammy N. Souza, Marcos Carlos de Mattos, Solange K. Sakata, Geoffrey A. Cordell, Telma L.G. Lemos, Bioreduction of aldehydes and ketones using Manihot species,
Phytochemistry, Volume 67, Issue 15, Rod Croteau Special Issue, Part 1, August 2006, Pages 1637-1643, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2006.02.008.
(http://www.sciencedirect.com/science/article/B6TH7-4JN2P1K-1/2/512d7f2fb412907209a01a3bfff66ad1)

Abstract:

Biocatalysis constitutes an important tool in organic synthesis, especially for the preparation of chiral molecules of biological interest. A series of aliphatic and aromatic aldehydes and two ketones were reduced using plant cell preparations from Manihot esculenta and Manihot dulcis roots. The reduced products were typically obtained in

excellent yields (80-96%), and with excellent enantiomeric excess (94-98%), except for vanillin. Esters, a nitrile, and an amide were also examined, but were not reduced. Preliminary conversion rate studies are reported. This is the first attempt to perform the biotransformation of carbonyl compounds using Manihot species.

Keywords: Manihot esculenta; Manihot dulcis; Euphorbiaceae; Biocatalytic reduction; Aliphatic and aromatic aldehydes and ketones; Ester hydrolysis

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

Andreas Jurgens, Heike Feldhaar, Barbara Feldmeyer, Brigitte Fiala, Chemical composition of leaf volatiles in Macaranga species (Euphorbiaceae) and their potential role as olfactory cues in host-localization of foundress queens of specific ant partners,

Biochemical Systematics and Ecology, Volume 34, Issue 2, February 2006, Pages 97-113, ISSN 0305-1978, DOI: 10.1016/j.bse.2005.08.005.
(http://www.sciencedirect.com/science/article/B6T4R-4HNSBCD-1/2/0a944456e973da6b0150f00a141da8e4)

Abstract:

Host-plant finding by foundress queens is an important step in the establishment of ant-plant symbioses and olfactory cues may play a crucial role in the Macaranga-Crematogaster ant-plant system for attracting foundresses over longer distances. MicroSPE was used to investigate leaf volatiles of 11 myrmecophytic and non-myrmecophytic Macaranga species. Chemical analysis (GC-MS) yielded a total of 114 compounds comprising a great diversity, including aliphatic compounds, aromatics, mono- and sesquiterpenoids. An analysis of the volatile data using the CNESS distances of the chemical profiles, followed by visualization of the data with non-metric multidimensional scaling (NMDS) showed that even closely related species sharing the same ant partners have clearly different scent patterns. Comparison of spectra of volatile compounds between obligate myrmecophytic Macaranga species and myrmecophilous species that are only facultatively associated with unspecific arboreal ants did not reveal general differences. Choice experiments conducted with foundresses revealed that the ants have the capacity to distinguish between different host species. However, the behavior of the foundresses following surface contact with saplings indicates that other cues, like surface structure, may play a more important role in host-recognition over short distances than volatile compounds. We discuss alternative hypotheses for the possible role of leaf volatiles in the examined Macaranga species as chemical defense against herbivores.

Keywords: Ant-plant symbiosis; GC-MS; Host-choice experiments; Host-finding; Leaf volatiles; Macaranga; MicroSPE; Myrmecophytes

R.S. Chauhan, M.K. Kaul, Arun Kumar, M.C. Nautiyal, Pollination behaviour of Nardostachys jatamansi DC., an endangered medicinal and aromatic herb,
Scientia Horticulturae, Volume 117, Issue 1, 12 June 2008, Pages 78-81, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.03.018.
(http://www.sciencedirect.com/science/article/B6TC3-4SFR7W6-2/2/22b9756f3a77692e823ca07960db932e)

Abstract:

Nardostachys jatamansi is a perennial, endangered medicinal and aromatic herb of family Valerianaceae, distributed in subalpine to alpine areas. Being an endangered species it should be conserved through in situ as well as ex situ methods. Study of reproductive biology is necessary for effective conservation of endangered plants and pollination behaviour is an integral part of reproductive biology. Present study deals with pollination behaviour of N. jatamansi. Parthenocarpy, passive autogamy, active autogamy, geitonogamy and xenogamy experiments were applied in this study. Flowering (peak) takes place during the month of July-August and anthesis between 7:00-11:00 h. Anthers disperse pollen grains after 24 h of anthesis. Stigma is of protogynous type. Fruit set recorded in above experiments was 40% in passive autogamy, 70% in active autogamy, 53.33% in xenogamy and 86.67% in geitonogamy as well as open pollination experiments. The species is self-pollinated but dependent on pollinators for optimum pollination. Cross pollination may have adaptive value for

species as it compensate failure of autogamy and also maintains genetic variability in the population. Crop improvement program may be initiated through xenogamy.

Keywords: Anthesis; Allogamy; Autogamy; Conservation; Crop improvement; Protogyny

S.-L. Steenhuisen, R.A. Raguso, A. Jurgens, S.D. Johnson, Variation in scent emission among floral parts and inflorescence developmental stages in beetle-pollinated Protea species (Proteaceae),

South African Journal of Botany, Volume 76, Issue 4, Chemical diversity and biological functions of plant volatiles, October 2010, Pages 779-787, ISSN 0254-6299, DOI: 10.1016/j.sajb.2010.08.008.
(http://www.sciencedirect.com/science/article/B7XN9-511H3J0-1/2/0867c0f43ae8bf404aa10d0d28d4778a)

Abstract:

Floral fragrances are an important component for pollinator attraction in beetle-pollinated flowers. Several genera in the Proteaceae contain beetle-pollinated species. However, there is no information on the floral scent chemistry of beetle-pollinated members of the family. In this paper we report on the spatial variation and differences between developmental stages in emission of inflorescence (flowerhead) volatiles of four South African Protea species (P. caffra, P. dracomontana, P. simplex, and P. welwitschii) that are pollinated by cetoniine beetles. The scents from different inflorescence parts (bracts, perianth, styles, and nectar) and from successive anthesis stages of whole inflorescences were sampled using dynamic headspace collection and identified using GC-MS. Although the four species shared many scent compounds, possibly reflecting their close phylogenetic relationships and common pollinators, they showed significant differences in overall scent composition due to various species-specific compounds, such as the unique tiglate esters found in the scent of P. welwitschii. The strongest emissions and largest number of volatiles, especially monoterpenes, were from inflorescences at full pollen dehiscence. Senescing inflorescences of two species and nectars of all species emitted proportionally high amounts of acetoin (3-hydroxy-2-butanone) and aromatic alcohols, typical fermentation products. As a consequence, the scent composition of nectar was much more similar among species than was the scent composition of other parts of the inflorescence. These results illustrate how the blends of compounds that make up the overall floral scent are a dynamic consequence of emissions from various plant parts.

Keywords: Anthesis; Beetle pollination; Fermentation volatiles; Flower scents; GC-MS; Scented nectar

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

Suleyman Kizil, Determination of essential oil variations of Thymbra spicata var. spicata L. naturally growing in the wild flora of East Mediterranean and Southeastern Anatolia regions of Turkey,

Industrial Crops and Products, Volume 32, Issue 3, November 2010, Pages 593-600, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2010.07.008.
(http://www.sciencedirect.com/science/article/B6T77-50V0F5K-2/2/43dddcaf7212b1ab2e412307483e406b)

Abstract:

Thymbra spicata var. spicata is an important medicinal and aromatic plant species growing wild in various parts of Turkey with high significance in pharmaceutical and food industry. It makes it important to know the factors affecting higher yields of essential oil and possible influence of its mineral elements on pharmacological characteristics. This study was carried out to determine variations among seeds, mineral element content of herbs, yield of essential oils and oil composition of T. spicata accessions collected from 30 different locations lying at an altitude of 121-1249 m in Southeastern Anatolia and Mediterranean regions of Turkey.

Essential oils from aerial parts of T. spicata were obtained by hydro-distillation and their components were identified by gas chromatography/mass spectrometry.
The results showed that Thymbra herbages were rich in microelements Al, Ca, Mg, Na and P. Essential oil composition of the samples ranged 1.57-3.27% with characterisation of two different chemotypes. The samples collected from Diyarbakir-Kulp location had 53% (approx.) [gamma]-terpinene in their essential oil, whereas, the other samples had carvacrol as dominant chemical component with a range of 49.7-94.5%. It is planned to select T. spicata populations and introduce them as cultivars with high essential oil, fresh and dry herbage yield.

Keywords: Thymbra spicata var. spicata L.; Carvacrol chemotype; Essential oil; Mediterranean region; Minerals; Southeastern Anatolia region

Aline Vieira Santos, Maria Fatima Arrigoni-Blank, Arie Fitzgerald Blank, Fernanda Ferreira Tavares, Roberta Pereira Miranda Fernandes, Hugo Cesar Ramos Jesus, Pericles Barreto Alves, Mass multiplication of Pogostemon cablin (Blanco) Benth genotypes and increase of essential oil and patchoulol yield,

Industrial Crops and Products, Volume 32, Issue 3, November 2010, Pages 445-449, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2010.06.015.
(http://www.sciencedirect.com/science/article/B6T77-50G0F14-1/2/2c1babfa71568a80e9abe5a5adc4fc79)

Abstract:

Patchouli (Pogostemon cablin) is an aromatic species indigenous to Asia that has been cultivated in many parts of the world for the extraction of essential oils from its leaves. The objective of this study is to develop protocols for plant regeneration and acclimatization from three genotypes of patchouli. For the plant regeneration experiment, a completely randomized factorial design, employing the growth regulators kinetin and indole acetic acid (IAA), was used. The acclimatization used different mixtures of coconut coir dust and vermiculite supplemented with NPK fertilizer and limestone. Direct regeneration of plants was observed for MS medium supplemented with low concentrations (0.5-2.0 mg L-1) of kinetin and IAA alone or in combination for all of the studied genotypes. For genotypes POG014 and POG021, there were 175 and 154 shoots, respectively, obtained per explant with the use of 1.0 mg L-1 kinetin and 0.5 mg L-1 IAA. For genotype POG002, there were 41 shoots obtained per explant in a medium supplemented with 1.0 mg L-1 kinetin. The acclimatization of micropropagated plantlets of all three genotypes showed the best results with the vermiculite substrate plus MS medium salts. Essential oil content and the percentage of patchoulol were higher in plants derived from micropropagation in the three genotypes studied.

Keywords: Patchouli; Organogenesis; Plant regeneration; Acclimatization; Chemical constituents; Patchoulol

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

PAN Sheng-wang, WEI Shi-qiang, YUAN Xin, CAO Sheng-xian, The Removal and Remediation of Phenanthrene and Pyrene in Soil by Mixed Cropping of Alfalfa and Rape,
Agricultural Sciences in China, Volume 7, Issue 11, November 2008, Pages 1355-1364, ISSN 1671-2927, DOI: 10.1016/S1671-2927(08)60185-6.
(http://www.sciencedirect.com/science/article/B82XG-4V0M7MN-B/2/fbb295cabaab479cf42d6723a8f1735b)

Abstract:

The mechanisms and efficiencies of the removal and remediation of polycyclic aromatic hydrocarbons (PAHs) in soils by different planting patterns with rape (Brassica campestris) and alfalfa (Medicago sativa) were studied by pot experiments in a greenhouse. Results showed that the remediation efficiencies under mixed cropping of alfalfa and rape significantly exceeded those under single cropping when the initial concentrations of phenanthrene and pyrene were at 20.05-322.06 mg kg-1 and 20.24-321.42 mg kg-1, respectively. After 70 days plantation of crops, the contents of extractable PAHs in soils under mixed cropping were much lower than those under single cropping. About 65.17-83.52% of phenanthrene and 60.09%-75.34% of pyrene

was removed from the soils under mixed cropping, respectively, which were averagely 43.26 and 40.38% for phenanthrene, and 11.03 and 16.29% for pyren higher than those under single cropping. Alfalfa or rape did absorb and accumulate PAHs from the soils apparently; the PAHs concentrations in plants monotonically increased with the increase of initial PAHs concentrations in soil; the accumulations of PAHs in plants showed following sequence as roots > above parts, phenanthrene > pyrene and single cropping > mixed cropping at same contamination level. Despite the presence of vegetation significantly enhanced the remediation of PAHs in soils, contributions of abiotic loss, plant uptake, accumulation and microbial degradation was much lower than those of plant-microbial interactions in the process of phytoremediation. Thus plant-microbial interactions are the main mechanisms for the remediation enhancement of soil PAHs pollution under mixed cropping models. Results suggested a feasibility of the establishment of multi-species phytoremediation for the improvement of remediation efficiencies of PAHs, which may decrease accumulations of PAHs in crops and thus reduce their risks.

Keywords: phytoremediation; polycyclic aromatic hydrocarbons; mixed cropping models; plant-microbial interactions; soil

Katy Euliss, Chi-hua Ho, A.P. Schwab, Steve Rock, M. Katherine Banks, Greenhouse and field assessment of phytoremediation for petroleum contaminants in a riparian zone,
Bioresource Technology, Volume 99, Issue 6, April 2008, Pages 1961-1971, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.03.055.
(http://www.sciencedirect.com/science/article/B6V24-4NT93RP-8/2/6f85cc9ea67c5fcc8fb7dd6fa5fee971)

Abstract:

Greenhouse and field studies were conducted to evaluate the feasibility of phytoremediation for clean-up of highly contaminated sediments from Indiana Harbor. In the greenhouse study, plant species evaluated were willow (Salix exigua), poplar (Populus spp.), eastern gamagrass (Tripsacum dactyloides), arrowhead (Sagitaria latifolia), switchgrass (Panicum virgatum), and sedge (Carex stricta). Sediments with sedge, switchgrass, and gamagrass had significantly less residual total petroleum hydrocarbons (TPH) after one year of growth (approximately 70% reduction) than sediments containing willow, poplar, or no plants (approximately 20% reduction). Although not all polycyclic aromatic hydrocarbons (PAH) had concentration differences due to the presence of plants, residual pyrene concentrations in the unvegetated pots were significantly higher than in pots containing sedge, switchgrass, arrowhead, and gamagrass. As evaluated by TPH dissipation in the upper section of the pots, the sedge, switchgrass, and gamagrass treatments had higher TPH degradation than the unvegetated, willow and poplar treatments. These trends were similar for soil at the bottom of the pots, with the exception that in the switchgrass treatment, degradation was not significantly different than in the unvegetated soil. Two target contaminants, pyrene and benzo[b]fluoranthene, showed differences in degradation between planted and unvegetated treatments. In the field study, phytoremediation plant species were

eastern gamagrass (T. dactyloides), switchgrass (P. virgatum), and sedge (C. stricta). In addition, rhizosphere characteristics of arrowhead (S. latifolia) and sedge were assessed. Arrowhead- and sedge-impacted soils were found to contain significantly more PAH-degrading bacteria than unvegetated soils. However, over the 12-month field study, no significant differences in contamination were found between the planted and unplanted soils for TPH and PAH concentrations. TPH concentrations near the canal were greater than concentrations further from the canal, indicating that the canal may have served as a continuous source of contamination during the study.

Keywords: Phytoremediation; Plant; Petroleum; Contamination; Soil

Fu-Liu Xu, Wen-Jing Wu, Jun-Jun Wang, Ning Qin, Yan Wang, Qi-Shuang He, Wei He, Shu Tao, Residual levels and health risk of polycyclic aromatic hydrocarbons in freshwater fishes from Lake Small Bai-Yang-Dian, Northern China,
Ecological Modelling, Volume 222, Issue 2, Wetlands in China, 24 January 2011, Pages 275-286, ISSN 0304-3800, DOI: 10.1016/j.ecolmodel.2010.10.001.
(http://www.sciencedirect.com/science/article/B6VBS-519PRPD-1/2/786f09419129aee9bd2ce83f4fb200e6)

Abstract:

The residual levels of polycyclic aromatic hydrocarbons (PAHs) in the liver, brain, gill and muscle tissues of four common edible freshwater fish species including crucian carp, snakehead fish, grass carp and silver carp collected from Lake Small Bai-Yang-Dian in northern China were measured by GC-MS. The distribution and composition pattern of PAHs in the fish tissues, and the effects of lipid contents in fish tissues and the octanol-water partition coefficient (Kow) of PAHs congeners on them were analyzed. The human health risk of PAHs though fish consumptions was estimated. The following results were obtained: (1) The average residual levels of total PAHs (PAH16) on wet weight base in the different tissues of each fish species ranged from 4.764 to 144.254 ng/g ww. The differences in the average residual levels on wet weight base for PAH16 within four fish species were not statistically significant ($P > 0.05$); however, these within four fish tissues were statistically significant ($P < 0.01$). (2) There were very similar distribution patterns of PAH congeners among both the fish tissues and the fish species, as indicated by statistically significant positive interrelationships ($R = 0.58$-0.97, $P < 0.01$ or $P < 0.05$). Low molecular weight (LMW) PAHs predominated the distribution in the fish tissues, accounting for 89.97% of total PAHs. Phe was the most dominant component, according for 37.79% of total PAHs, followed by Ant (18.59%), Flo (12.59%), Nap (10.79%), Fla (9.82%) and Pyr (6.43%). (3) The PAHs residues and distribution in the fish tissues are dependent on both the Kow of PAH congeners and the lipid contents in the fish tissues. There was a significant positive relationship ($R = 0.7116$, $P < 0.0001$) between lipid contents and PAHs residual levels. The statistically significant negative relationships ($P < 0.05$) were found between LogKow and log-transformed PAHs contents on wet weight base for all fish tissues except for the muscle tissue of snakehead fish, the brain and liver tissues of crucian carp. (4) The risk levels of total PAHs were lower than 10-5 for the muscle tissues of four studied fish species and for the brain tissues of grass carp and

snakehead fish; while these were higher than 10-5 for the brain tissues of crucian carp and silver carp. The risk levels of total PAHs in the liver tissues of four studied fish species except for snakehead fish exceeded 10-5 for 2-4.5 times. However, the potency equivalent concentration (PEC) of total PAHs in four studied fish tissues were still lower than the maximum permissible BaP limits for crops and baked meat and for plants in the national criterions. The distributions of PAH congeners in fish were well simulated by a level III fugacity model, especially for low molecule weight PAHs.

Keywords: PAHs; Freshwater fish; Residual level; Level III fugacity model; Human health risk; Lake Small Bai-Yang-Dian

Julien Paolini, Alessandra Falchi, Yann Quilichini, Jean-Marie Desjobert, Marie-Cecile De Cian, Laurent Varesi, Jean Costa, Morphological, chemical and genetic differentiation of two subspecies of Cistus creticus L. (C. creticus subsp. eriocephalus and C. creticus subsp. corsicus),

Phytochemistry, Volume 70, Issue 9, June 2009, Pages 1146-1160, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2009.06.013.
(http://www.sciencedirect.com/science/article/B6TH7-4WXR08V-2/2/5da0772b7fea98aeb442380cb01726c3)

Abstract:

Cistus creticus L., an aromatic species from the Mediterranean area, contains various diterpenes bearing the labdane skeleton. The production of essential oil from this species has potential economic value, but so far, it has not been optimized. In order to contribute to a better knowledge of this species and to its differentiation, the morphological characters, volatile chemical composition and genetic data of two subspecies (C. creticus subsp. eriocephalus and C. creticus subsp. corsicus) were investigated. The leaf trichomes were studied using scanning electron microscopy. The chemical composition of Corsican essential oil (C. creticus subsp. corsicus) has been reported using GC, GC/MS and 13C NMR; the main constituents were oxygenated labdane diterpenes (33.9%) such as 13-epi-manoyl oxide (18.5%). Using plant material (54 samples) collected from 18 geographically distinct areas of the islands of Corsica and Sardinia, the basis of variation in the headspace solid-phase microextraction volatile fraction and an inter-simple sequence repeat genetic analysis were also examined. It was shown that the two subspecies of C. creticus differed in morphology, essential oil production, volatile fraction composition and genetic data.

Keywords: Cistus creticus; SEM; Labdane diterpene; GC/MS; HS-SPME; ISSR; Statistical analysis

Stephane C. Corgie, Thierry Beguiristain, Corinne Leyval, Profiling 16S bacterial DNA and RNA: Difference between community structure and transcriptional activity in phenanthrene polluted sand in the vicinity of plant roots,

Soil Biology and Biochemistry, Volume 38, Issue 7, July 2006, Pages 1545-1553, ISSN 0038-0717, DOI: 10.1016/j.soilbio.2005.11.005.

(http://www.sciencedirect.com/science/article/B6TC7-4J55GSK-1/2/4336da3afad95c18ed27d19d201509a2)

Abstract:

Biodegradation of polycyclic aromatic hydrocarbons (PAH) in soil is mainly performed by endogenous bacteria. The density and activity of soil bacteria are usually increased in the rhizosphere. A compartmentalized device was used to follow biodegradation of phenanthrene and bacterial community structure as a function of distance from roots. Isolation of total DNA and RNA, followed by PCR-TTGE and RT-PCR-TTGE on a 16S rDNA partial sequence, was performed to describe the structure of bacterial community and of active species, respectively. After 4 weeks, active species profiles in the immediate vicinity of roots were the same as in non-planted treatment, with similar biodegradation efficiency (approx. 60%) whereas community structure clearly indicated that bacterial populations were different. On the opposite, at a furthest distance (6-9 mm) from the roots where biodegradation was lower, bacterial community structure was similar to the non-planted treatment whereas active species differed. A specie activity factor (Saf) was calculated for five relevant species to follow their transcriptional state in the rhizosphere and showed spatial variations as a function of species and distance from roots. We conclude that depending on distance from roots, the rhizosphere selected different bacterial communities, and different active species within these communities, resulting in different degradation values. Potential biases of molecular protocols used in this study are discussed as well as their relevance to describe the bacterial component of the rhizosphere involved in PAH biodegradation.

Keywords: Bacterial community; DNA/RNA; Polycyclic aromatic hydrocarbon; Rhizodegradation; RT-PCR; TTGE

Andreina Traversa, Elisabetta Loffredo, C. Eliana Gattullo, Nicola Senesi, Water-extractable organic matter of different composts: A comparative study of properties and allelochemical effects on horticultural plants,

Geoderma, Volume 156, Issues 3-4, 15 May 2010, Pages 287-292, ISSN 0016-7061, DOI: 10.1016/j.geoderma.2010.02.028.
(http://www.sciencedirect.com/science/article/B6V67-4YPGJ2M-1/2/3d8aaf9442ff0eeaa0bba59ebbcc1e6d)

Abstract:

The water-extractable organic matter (WEOM) was obtained from a green compost (GC WEOM), a mixed compost (MC WEOM) and a coffee compost (CC WEOM) and then characterized by means of chemical and physico-chemical methods, such as pH, electrical conductivity, total organic carbon (TOC), E4/E6 ratio, fluorescence and Fourier Transform infrared (FT IR) spectroscopies and high performance liquid chromatography (HPLC). The comparative evaluation of the three WEOM samples highlighted significant differences among them. In particular, the TOC content, the E4/E6 ratio, the [epsilon]280 value and the humification index followed the same order: CC WEOM > MC WEOM > GC WEOM. The fluorescence analysis of the three WEOM samples showed the presence of a common fluorophore unit possibly

associated to simple aromatic units such as phenolic-like, hydroxy-substituted benzoic and cinnamic acid derivatives. The FT IR spectra of all WEOM samples indicated the presence of aromatic phenolic structures, while the HPLC analysis showed the presence of benzoic acid derivatives such as phthalic and salicylic acids. The allelochemical potential of each WEOM sample at two concentrations was tested on tomato and lettuce germination and early growth. In general, for both species, each WEOM sample at the two doses caused a significant increase of shoot length and plant fresh weight. The germination percentage of both plants and root elongation of lettuce resulted unaffected, whereas tomato roots resulted generally shorter in the presence of any WEOM sample, particularly at the higher dose.

Keywords: Compost; Water-extractable organic matter; Allelochemical effect; Horticultural plants

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

Gustavo Agostini, Sergio Echeverrigaray, Tatiana Teixeira de Souza-Chies, Genetic diversity of the endangered Brazilian endemic herb Cunila menthoides Benth. (Lamiaceae) and its implications for conservation,
Biochemical Systematics and Ecology, Volume 38, Issue 6, December 2010, Pages 1111-1115, ISSN 0305-1978, DOI: 10.1016/j.bse.2010.12.001.
(http://www.sciencedirect.com/science/article/B6T4R-51WV6XP-1/2/c973546ae4c9cb82a3eddb7da3f216fa)

Abstract:

Cunila menthoides is classified as a xylopodiferous subshrub found in fragmented environments threatened by local agriculture and pasture activities. The species presents strong and pleasant smell, and is commonly used in south Brazilian folk medicine. Based on the species' medicinal and aromatic potential, the aim of this work was to examine the genetic variation within and among C. menthoides populations, focusing on the conservation of this species. In this context, six C. menthoides populations collected in Rio Grande do Sul, Brazil, were analyzed by ISSR. The populations were sorted as four clusters according to geographic distribution. The six C. menthoides populations analyzed presented low genetic variability, indicating that each population derives from a limited number of plants in a low gene flow scenario. In situ and ex situ conservation approaches may be useful in this species. Conservation strategies for the species should be based on in situ and ex situ approaches.

Keywords: Medicinal plants; Lamiaceae; ISSR; Low gene flow; Fragmented environments; Conservation

N.Q. Liu, F. Van der Kooy, R. Verpoorte, Artemisia afra: A potential flagship for African medicinal plants?,
South African Journal of Botany, Volume 75, Issue 2, April 2009, Pages 185-195, ISSN 0254-6299, DOI: 10.1016/j.sajb.2008.11.001.
(http://www.sciencedirect.com/science/article/B7XN9-4V462GN-1/2/157993363f9c1db6303b674f9165f703)

Abstract:

The genus Artemisia consists of about 500 species, occurring throughout the world. Some very important drug leads have been discovered from this genus, notably artemisinin, the well known anti-malarial drug isolated from the Chinese herb Artemisia annua. The genus is also known for its aromatic nature and hence research has been focussed on the chemical compositions of the volatile secondary metabolites obtained from various Artemisia species. In the southern African region, A. afra is one of the most popular and commonly used herbal medicines. It is used to treat various ailments ranging from coughs and colds to malaria and diabetes. Although it is one of the most popular local herbal medicines, only limited scientific research, mainly focussing on the volatile secondary metabolites content, has been conducted on this species. The aim of this review was therefore to collect all available scientific literature published on A. afra and combine it into this paper. In this review, a general overview will be given on the morphology, taxonomy and geographical distribution of A. afra. The major focus

will however be on the secondary metabolites, mainly the volatile secondary metabolites, which have been identified from this species. In addition all of the reported biological activities of the extracts derived from this species have been included as well as the literature on the pharmacology and toxicology. We aim at bringing together most of the available scientific research conducted on this species, which is currently scattered across various publications, into this review paper.

Keywords: Artemisia afra; Traditional African Medicine; Volatile secondary metabolites

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

S. Bruna, E. Portis, C. Cervelli, L. De Benedetti, T. Schiva, A. Mercuri, AFLP-based genetic relationships in the Mediterranean myrtle (Myrtus communis L.),
Scientia Horticulturae, Volume 113, Issue 4, 14 August 2007, Pages 370-375, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.04.007.
(http://www.sciencedirect.com/science/article/B6TC3-4NVCG5G-2/2/594d1be3fbca46cd9897c7da5045bd11)

Abstract:

Myrtle is an important plant species of the Mediterranean maquis, and is widely exploited for its aromatic properties. It is used in Italy for the production of a typical liqueur, for cut foliage and as an ornamental pot plant. We report the use of amplified fragment length polymorphism (AFLP) profiling to estimate genetic similarities within myrtle germplasm collected from six Italian regions, and from the Botanical Gardens of six other Mediterranean countries (including the outgroup Myrtus communis subsp. tarentina). Five AFLP primer combinations identified 122 polymorphic fragments analysing 92 individual samples, most of them (56%) were informative in discriminating among the populations. The AFLP patterns indicated that the majority of the variation occurs among rather than within populations (GST = 0.61). A neighbour-joining (NJ) tree separated the populations into two main branches: the first one grouped some of the Italian populations with those from Spain and Portugal; the second one included a Southern Italian subcluster together with samples from Greece, Israel, France and Croatia. A principal coordinate analysis supported the two major branches identified in the NJ analysis and showed the separation of Western and Eastern Mediterranean populations along the first axis. The Italian populations did not cluster in a single clade, but rather form distinct regional groups. The present analysis suggests that Italy represents a botanical transition zone between the Western and Eastern Mediterranean region in Myrtus communis.

Keywords: Myrtle; Molecular markers; Genetic similarity; Mediterranean maquis

Daizy R. Batish, Komal Arora, Harminder P. Singh, Ravinder K. Kohli, Potential utilization of dried powder of Tagetes minuta as a natural herbicide for managing rice weeds,
Crop Protection, Volume 26, Issue 4, April 2007, Pages 566-571, ISSN 0261-2194, DOI: 10.1016/j.cropro.2006.05.008.
(http://www.sciencedirect.com/science/article/B6T5T-4K8S5CH-4/2/5003ff40d32f7bef9fa9e7172d3686df)

Abstract:

Tagetes minuta is an aromatic essential plant with wide range of biological activity including medicinal properties. A study was undertaken to explore the potential herbicidal activity of Tagetes minuta leaf powder (at 1, 2, and 4 t ha-1) towards two invasive weeds--Echinochloa crus-galli and Cyperus rotundus--of rice fields. It was observed that T. minuta leaf powder applied to rice field soil significantly reduced emergence and growth of both the weed species in pots under greenhouse and in rice field plots. At 1 and 2 t ha-1 dose of application, emergence and growth of weeds was severally affected, whereas there was no effect on the growth and yield attributes of

rice. Rather, at this dose of application yield of rice increased significantly and the effect was similar to that observed with the herbicidal application under field conditions. Based on the study, it could be concluded that T. minuta possesses weed-suppressing ability and could be used as a natural herbicide.

Keywords: Tagetes minuta; Mexican marigold; Inhibition; Weed control; Natural herbicide

Kristin Lammers, Georgia Arbuckle-Keil, John Dighton, FT-IR study of the changes in carbohydrate chemistry of three New Jersey pine barrens leaf litters during simulated control burning,

Soil Biology and Biochemistry, Volume 41, Issue 2, February 2009, Pages 340-347, ISSN 0038-0717, DOI: 10.1016/j.soilbio.2008.11.005.
(http://www.sciencedirect.com/science/article/B6TC7-4V2PMMW-1/2/157547270fbf349f4942ad6f40ba563d)

Abstract:

Low intensity control burns are a standard fuel reduction management tool used in pine barrens ecosystems. Periodic disturbances through fire can be an important influence on the cycling of nutrients within the ecosystem. Previous studies have shown that the inorganic chemistry of leaf litter residues differs with increasing temperature. Our study compared chemical changes in white oak (Quercus alba), pitch pine (Pinus rigida) and black huckleberry (Gaylussacia baccata), characteristic of the New Jersey pine barrens, during thermal decomposition using FT-IR spectroscopy. Three replicates of senescent leaf material were ground and separately heated for 2 h at: 100, 200, 300, 400 and 550 [degree sign]C. These temperatures are representative of the range seen in fuel reducing prescribed burns in the pine barrens. Unburned litter of each species was used as a control. An optimization process using varying amounts of KBr and oak litter was performed to develop favorable FT-IR spectral conditions for a sample to KBr ratio of 0.75%. Chemometric analysis of the FT-IR spectra using principal component analysis (PCA) was used to analyze the changes in carbohydrate chemistry of each litter plant species (leaf litter species) at each temperature. In general, it appears that there is clear separation of leaf litter species at the different combustion temperatures. Infrared spectroscopy illustrated that all three species shared wavenumbers characteristic of the primary components of leaves such as cellulose, lignin and hemicellulose. Results from the PCA indicated separation of litter species and species by combustion temperature. PC axis 1 corresponds to the effects of temperature on leaf litter species and PC axis 2 separates the leaf litter species. At the low temperatures (control-200 [degree sign]C), oak, pine and huckleberry litter species separated from each other. Wavenumbers that contributed to the separation of species at low temperatures belonged to functional group stretching frequencies of outer surface waxes, basic sugars, fatty acids and aldehydes. It appears that oak had more IR bands specific to suberin content. Convergence of these species occurs at 300 [degree sign]C. Complexity of chemical composition decreases at this particular temperature as is shown by the decrease in wavenumber richness when compared to litters at low and high temperatures. Oak, pine and huckleberry had similar IR spectra

showing bands belonging to outer surface wax content, pectin, lignin and hemicellulose. With increasing temperatures (400-550 [degree sign]C), differences between litter species increased slightly. Plant material was reduced to similar composition due to thermal decomposition, which consisted of inorganic materials such as carbonate, phosphate and sulfate ions and possible fused aromatics.

Keywords: Quercus alba, Pinus rigida, Gaylussacia baccata; Pine barrens; FT-IR; Plant carbohydrate chemistry; PCA; Leaf litter; Control burns

G. Farias, O. Brutti, R. Grau, P. Di Leo Lira, D. Retta, C. van Baren, S. Vento, A.L. Bandoni, Morphological, yielding and quality descriptors of four clones of Origanum spp. (Lamiaceae) from the Argentine Littoral region Germplasm bank,

Industrial Crops and Products, Volume 32, Issue 3, November 2010, Pages 472-480, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2010.06.019.
(http://www.sciencedirect.com/science/article/B6T77-50KMVPC-2/2/a19b042b96644435f2804dcf4328f697)

Abstract:

In order to preserve, characterize and improve the quality of some accessions in Entre Rios province, Argentina, a germplasm bank of aromatic and medicinal plants has been set up, including among other species, the oregano (Origanum spp.). To simplify the identification and characterization of the accession entries belonging to this genus, a chart containing 41 descriptors has been elaborated to allow the easy and quick individualization of any material being added to the collection. The first four accessions added to the collection were characterized using this chart and studied taking into account their biomass and essential oil yields and the quality of their volatile fraction. The materials analyzed are locally known as '27-09', 'Peruvian' and 'native' clones and are taxonomically identified as hybrids of Origanum x majoricum Cambess; and a fourth material, known as 'green Spanish' clone belonging to the species Origanum vulgare L. ssp. viridulum (Martrin-Donos) Nyman. The essential oil yield was similar for all the materials (1.7% (v/w) on dried basis). The estimated aired biomass yield was superior for the Origanum x majoricum hybrid clones (ranging from 4700 to 11,900 kg ha-1), whereas the 'green Spanish' clone only reached a biomass of 2450 kg ha-1. Meanwhile, based on the quality of the essential oils, O. vulgare ssp. viridulum was more promissory, since it corresponded to a carvacrol type oregano. Finally, it will be necessary to assess the role of the agronomical and ecological variables on the latter clone, in order to increase the content of carvacrol in the essential oil and, at the same time, to improve its biomass yield.

Keywords: Origanum; Morphological descriptors; Yield; Essential oil; Carvacrol; Germplasm bank

S. Selvakumaran, Atya Kapley, Vipin C. Kalia, Hemant J. Purohit, Phenotypic and phylogenic groups to evaluate the diversity of Citrobacter isolates from activated biomass of effluent treatment plants,
Bioresource Technology, Volume 99, Issue 5, March 2008, Pages 1189-1195, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.02.021.
(http://www.sciencedirect.com/science/article/B6V24-4NMCV1J-1/2/53bbf30468c504d28f44f0f97202b8f4)
Abstract:

The diversity of Citrobacter isolated from effluent treatment plants (ETPs) was studied using three different parameters. Thirty Citrobacter strains were isolated from different ETPs treating wastewaters generated at various industries. All the isolates were characterized based on biochemical tests, antibiotic assay/functional analysis, and phylogenetic analysis. Results demonstrated that the pattern of grouping varied based on the selected criteria for analysis. Species that clustered together by biochemical analysis were found to vary by functional and 16S rDNA analysis and vice versa. This suggests that multiple methods approach needs to be carried out to understand the microbial diversity.Bacteria in effluent treatment plants are exposed to diverse categories of pollutants. Salicylate is a key intermediate formed during biodegradation of several aromatic compounds, a scenario expected in ETPs. Hence, the Citrobacter isolates were screened for their capability to utilize salicylate. In future studies, these isolates can be incorporated in a bioremediation program.
Keywords: Microbial diversity; Citrobacter; Phylogenetic analysis; Polymerase chain reaction; Genetic diversity

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

Valeria D'Orazio, Nicola Senesi, Spectroscopic properties of humic acids isolated from the rhizosphere and bulk soil compartments and fractionated by size-exclusion chromatography,

Soil Biology and Biochemistry, Volume 41, Issue 9, September 2009, Pages 1775-1781, ISSN 0038-0717, DOI: 10.1016/j.soilbio.2008.02.001.
(http://www.sciencedirect.com/science/article/B6TC7-4SFHCKP-8/2/0ce58717207d0624520e99e45aba0494)

Abstract:

The humic acids (HAs) isolated by conventional procedure from rhizosphere (r) and bulk (c) soils were analyzed by means of chemical and physico-chemical techniques. Two different crops were selected, tomato (T) and artichoke (A), and each HA was fractionated by size-exclusion chromatography (SEC) into three fractions with increasing molecular size, respectively, Fraction I (FrI) < Fraction II (FrII) < Fraction III (FrIII). Elemental analysis data indicated greater N and S contents in the rhizosphere T-HAs, with respect to rhizosphere A-HA, which suggests the occurrence in the former ones of a large amount of organic nitrogen- and sulfur-containing compounds that are released by the rhizodeposition processes. Further, the three HA fractions from the bulk soils of the two series showed a gradual increase of C, H, and N contents, and a decrease of O and S contents and C/N and C/H ratios. These results suggested that the lowest molecular size fractions are richer in oxygenated functional groups, whereas the higher molecular size fractions are richer in N-containing groups and structural C- and H-containing units. The three HA fractions from the rhizosphere soils of the two series showed a gradual decrease in C content, and an increase of H, N, and O contents, which suggests the possible incorporation into soil HAs of a multitude of C-containing compounds of low molecular size released by plant roots. The FT-IR data, in general, suggested that the contents of carboxylic, phenolic and N-containing groups and polysaccharide-like components in HAs from rhizosphere soils are larger than those of HAs from the corresponding bulk soils. Further, the FrI fraction consisted mainly of simple structural units, likely quinonic and phenolic units with a prevalent aromatic character, whereas the FrII and, especially, FrIII fractions featured a mixed aliphatic/aromatic nature and a greater molecular complexity. The extent of these

differences appeared to depend on the plant species and age, and is mainly due to the partial incorporation into rhizosphere HAs of typical root exudate components, such as amino acids, amides, aliphatic and aromatic acids of low molecular size, polysaccharides and sugars, fatty acids and sterols, and enzymes.

Keywords: Soil; Rhizosphere; Humic acids; Size-exclusion chromatography; FT-IR spectroscopy

D.B. Turley, Q. Chaudhry, R.W. Watkins, J.H. Clark, F.E.I. Deswarte, Chemical products from temperate forest tree species--Developing strategies for exploitation, ***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 238-243, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2006.06.016.
(http://www.sciencedirect.com/science/article/B6T77-4KKNN6X-1/2/9e836cfad5651677f276cabf7baba118)

Abstract:

Forest trees are integral to the landscape and rural economy. Unfortunately, the economic returns from timber production have declined significantly across Europe. Only 25% of felled wood is converted to timber, the remaining material is a rich composite of primary and secondary metabolites and plant fibres, a relatively unexplored and unexploited resource for potentially novel products that could compliment revenue from traditional market outlets. Wood from temperate forest trees has traditionally been used as a source of tannins, terpenes, rosins and aromatic phenolic compounds. Existing information on such chemical groups, and other secondary metabolites was collated for a range of temperate forest tree species including, alder (Alnus glutinosa L. Gaertn.), ash (Fraxinus excelsior L.), aspen (Populus tremula L.), beech (Fagus sylvatica L.), birch (Betula pendula Roth., Betula pubescens Ehrh.), cherry (Prunus avium L.), Corsican pine (Pinus nigra Arnold), Douglas fir (Pseudotsuga menziesii Mirib. Franco), larch (Larix deciduas Mill., Larix kaempferi Sarg.), oak (Quercus robur L., Quercus petraea Mattuschka, Liebl), poplar (Populus nigra L., Populus gileadensis Rouleau, Populus alba L., Populus canescens Ait. Sm.), Scots pine (Pinus sylvestris L.), sitka spruce (Picea sitchensis Bong. Carr.) and willow (Salix alba L., Salix fragilis L.).

Over 37,000 records were extracted from phytochemical databases, research papers, conference proceedings, books, unpublished reports and company literature, covering identified metabolites, the tissues from which they were extracted (e.g., bark, leaves, heartwood, roots), reported yields, properties and hazards. Very little data exists on the yield or variability of individual metabolites limiting the ability to assess economic potential. The information sourced is collated in a database, available to view at http://tree-chemicals.csl.gov.uk.Traditional and new markets for exploitation of tree metabolites are reviewed along with possible methods of extraction. Computer-aided Quantitative-Structure Activity Relationship Modelling (QSAR) augmented the search for novel applications for the tree metabolites. By this method, monoterpenes with useful anti-microbial properties were identified. Application of green chemical

technologies also show promise in adding value to tree metabolites including the modification of cellulose and the benign extraction of valuable chemical products. Opportunities for possible future routes of exploitation of wood biomass are presented and discussed.

Keywords: Metabolites; Wood extractives; Tree extractives; Phytochemicals

Louis V. Verchot, Laure Dutaur, Keith D. Shepherd, Alain Albrecht, Organic matter stabilization in soil aggregates: Understanding the biogeochemical mechanisms that determine the fate of carbon inputs in soils,
Geoderma, Volume 161, Issues 3-4, 15 March 2011, Pages 182-193, ISSN 0016-7061, DOI: 10.1016/j.geoderma.2010.12.017.
(http://www.sciencedirect.com/science/article/B6V67-522SRKW-2/2/b6a4ff7220e2a0d47c5129b18a586235)

Abstract:

We studied the biochemical and biophysical processes of carbon sequestration in an intensive agroforestry system on two soils (Feralsol - Luero; Arenosol - Teso) in W. Kenya to elucidate the mechanisms associated with long-term carbon storage. Specifically, we looked at a top-down model (macro-aggregates form around organic matter particles and micro-aggregates form within the macro-aggregates) and a bottom-up model (micro-aggregates form independently and are incorporated into macro-aggregates) of soil aggregate formation. Soil samples were collected from experiments on improved tree fallows using different species and two tillage treatments; water-stable aggregates were extracted and sorted into three size classes: macro-aggregates (> 212 [mu]m), meso-aggregates (53-212 [mu]m) and micro-aggregates (20-53 [mu]m). Organic matter characterization of each fraction was based on 13C isotope abundance, Fourier transform infrared (FTIR) spectroscopy and the abundance of polysaccharides. Improved fallows increased soil C by 0.28 and 0.26 kg m[soft hyphen]2 in the top 20 cm of the soil profile in Luero and Teso, respectively. Tillage altered the distribution of aggregates among size classes. Changes in the [delta]13C signature in each fraction indicated that more of the new carbon was found in the macro-aggregates (35-70%) and meso-aggregates (18-49%) in Luero and less (9-17%) was found in the micro-aggregates. In Teso, about 40-80% of the new aggregate C was found in the meso-aggregates, 14-45% was found in the micro-aggregates and only 4-26% was found in the macro-aggregates. The meso-aggregates and macro-aggregates to a lesser extent, in both sites, were enriched in carboxylic-C and aromatic-C, indicating the importance of OM decomposition and plant-derived C in the stabilization of larger aggregates, supporting the top-down model of aggregate formation. Microbially derived polysaccharides play a leading role in the formation of stable micro-aggregates and carboxylic-C promotes stabilization through surface occlusion. This bottom-up process is essential to promote long-term carbon sequestration in soils. Additionally, the micro-aggregates at both sites were enriched in polysaccharides and had elevated ratios of galactose + mannose:arabinose + xylose than the other aggregate fractions, indicating the

importance of microbial processes in the formation of stable micro-aggregates and supporting the bottom-up model.

Keywords: Carbon sequestration; Carbohydrates; 13C; FTIR; Aggregates; Improved fallow

S. Shokrollahzadeh, F. Azizmohseni, F. Golmohammad, H. Shokouhi, F. Khademhaghighat, Biodegradation potential and bacterial diversity of a petrochemical wastewater treatment plant in Iran,

Bioresource Technology, Volume 99, Issue 14, September 2008, Pages 6127-6133, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.12.034.
(http://www.sciencedirect.com/science/article/B6V24-4RS3TFD-3/2/915642033c4724b2d833be6883a1eec9)

Abstract:

An activated sludge treatment was evaluated for its effectiveness in cleaning up a petrochemical wastewater in Iran. For assessing biodegradation potential of activated sludge, seven characteristics of wastewater (temperature, pH, dissolved oxygen, chemical oxygen demand, concentrations of ethylene dichloride, vinyl chloride, and total hydrocarbons) were monitored during six months. It was shown that dominant pollutants in order of magnitude were normal-alkanes (C10-C21), aromatics, and polycyclic hydrocarbons. The activated sludge treatment revealed maximum reduction of 89%, 99%, 92%, and 80% in COD, ethylene dichloride, vinyl chloride and total hydrocarbons concentrations, respectively. Preliminary screening of culturable petrochemical-degrading microorganisms of the activated sludge resulted in the collection of 67 bacterial and one mold species. Bacterial strains mainly belonged to Pseudomonas, Flavobacterium, Comamonas, Cytophaga, Acidovorax, Sphingomonas, Bacillus and Acinetobacter genera. The isolated mold was identified as Trichoderma sp.

Keywords: Activated sludge; Biological treatment; Biodegradation; Petrochemical wastewater; Bacterial diversity

Monica R. Zuzarte, Augusto M. Dinis, Carlos Cavaleiro, Ligia R. Salgueiro, Jorge M. Canhoto, Trichomes, essential oils and in vitro propagation of Lavandula pedunculata (Lamiaceae),

Industrial Crops and Products, Volume 32, Issue 3, November 2010, Pages 580-587, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2010.07.010.
(http://www.sciencedirect.com/science/article/B6T77-50V0F5K-3/2/f8d9ad70d9423cb5895b916c82cf99c9)

Abstract:

Lavanders (Lavandula spp.) are aromatic plants with high industrial and commercial value, used in food industry, perfumery and pharmaceutical preparations. Micropropagation can be used for large-scale multiplication of essential oil producing plants thus avoiding an overexploitation of natural resources. This work aims to

develop a reliable protocol for the in vitro propagation of Lavandula pedunculata and to evaluate the potential of these plants for essential oil production with industrial application.In vitro cultures were established on media with different concentrations of benzyladenine. Trichome morphology was examined by SEM and their secretion analyzed by histochemical tests. Essential oils were isolated by hydrodistillation and analyzed by GC and GC-MS. The essential oils and trichomes of in vitro plants were compared with those of field-growing plants.Best propagation rates were achieved with 0.25 mg/l BA. Rooting occurred without treatment with auxins thus preventing callus growth. Trichomes and essential oils of the in vitro propagated plants were similar to those of the parent plants. Two chemotypes were characterized: 1,8-cineole/camphor type and fenchone type.Since trichomes and essential oils of L. pedunculata micropropagated plantlets are identical to those produced by field-growing plants, in vitro cultures can be used for essential oil production without affecting natural resources. Moreover, the quality of the essential oils is assured and this protocol can be further applied to the propagation of selected chemotypes for industrial purposes.

Keywords: Lavandula pedunculata; Essential oils; Glandular trichomes; Micropropagation

F. Maggi, T. Bilek, D. Lucarini, F. Papa, G. Sagratini, S. Vittori, Melittis melissophyllum L. subsp. melissophyllum (Lamiaceae) from central Italy: A new source of a mushroom-like flavour,

Food Chemistry, Volume 113, Issue 1, 1 March 2009, Pages 216-221, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.07.066.
(http://www.sciencedirect.com/science/article/B6T6R-4T3DD19-8/2/5119c2976c1c0da06d357a3ace4cae04)

Abstract:

1-Octen-3-ol is the most important C8 mushroom aromatic compound produced by many species of edible fungi and is also an aroma component in several food and beverages products. Under this view, the essential oil of flowering aerial parts of Melittis melissophyllum subsp. melissophyllum (Lamiaceae) growing in central Italy, obtained by hydrodistillation was characterised by GC-FID and GC-MS. This oil contained extremely high amount of the mushroom-like aroma component 1-octen-3-ol (43.6-54.2%), and could be considered as a new natural product for the use as flavouring agent in the food industry. Furthermore, headspace analysis suggested that this aromatic compound is only present in low concentration in the plant part, and is primarily formed in higher amount during hydrodistillation of this material.

Keywords: Melittis melissophyllum subsp. melissophyllum; Lamiaceae; Essential oil; 1-Octen-3-ol; GC; GC-MS; Multiple standard addition; Headspace

V. Rozman, I. Kalinovic, Z. Korunic, Toxicity of naturally occurring compounds of Lamiaceae and Lauraceae to three stored-product insects,
Journal of Stored Products Research, Volume 43, Issue 4, 2007, Pages 349-355, ISSN 0022-474X, DOI: 10.1016/j.jspr.2006.09.001.
(http://www.sciencedirect.com/science/article/B6T8Y-4MJC20S-1/2/01e13341f628da4500f512fb595d4e76)

Abstract:

The compounds 1,8-cineole, camphor, eugenol, linalool, carvacrol, thymol, borneol, bornyl acetate and linalyl acetate occur naturally in the essential oils of the aromatic plants Lavandula angustifolia, Rosmarinus officinalis, Thymus vulgaris and Laurus nobilis. These compounds were evaluated for fumigant activity against adults of Sitophilus oryzae, Rhyzopertha dominica and Tribolium castaneum. The insecticidal activities varied with insect species, compound and the exposure time. The most sensitive species was S. oryzae, followed by Rhyzopertha dominica. Tribolium castaneum was highly tolerant of the tested compounds. 1,8-Cineole, borneol and thymol were highly effective against S. oryzae when applied for 24 h at the lowest dose (0.1 [mu]l/720 ml volume). For Rhyzopertha dominica camphor and linalool were highly effective and produced 100% mortality in the same conditions. Against Tribolium castaneum no oil compounds achieved more than 20% mortality after exposure for 24 h, even with the highest dose (100 [mu]l/720 ml volume). However, after 7 days exposure 1,8-cineole produced 92.5% mortality, followed by camphor (77.5%) and linalool (70.0%). These compounds may be suitable as fumigants because of their high volatility, effectiveness, and their safety.

Keywords: 1; 8-cineole; Camphor; Eugenol; Linalool; Carvacrol; Thymol; Borneol; Bornyl acetate; Linalyl acetate; Fumigant toxicity; Sitophilus oryzae; Rhyzopertha dominica; Tribolium castaneum; Wheat

Edoardo M. Napoli, Giusy Curcuruto, Giuseppe Ruberto, Screening of the essential oil composition of wild Sicilian thyme,
Biochemical Systematics and Ecology, Volume 38, Issue 4, August 2010, Pages 816-822, ISSN 0305-1978, DOI: 10.1016/j.bse.2010.08.008.
(http://www.sciencedirect.com/science/article/B6T4R-512DT2K-1/2/648d44fbd96fff128dffba296fce7725)

Abstract:

Thirty samples of wild thyme collected from as many Sicilian locations have been analysed for their qualitative and quantitative essential oil profiles. The oils, obtained by hydrodistillation, have been analysed by a combination of GC-FID-MS; in all, 46 components, representing more than 98% of the oils, were fully characterized. Monoterpenes, both hydrocarbons and oxygenated, were the most highly represented components: the former with a range of 8-61% and the latter with a range of 31-86%. Carvacrol was the main compound in 29 samples, ranging between 49 and 83%, suggesting that Thymus capitatus Hoff. et Link. [syn. Coridothymus capitatus (L.) Rchb.f., Satureja capitata L., Thymbra capitata (L.) Cav.] is the most widespread wild

species in the Sicilian area. Only one sample, identified as Thymus longicaulis C. Presl., collected from the North-East of Sicily showed a different composition, p-cymene and thymol being the main compounds with 40 and 16%, respectively. Statistical analyses allowed establishing a single broad group, confirming the substantial compositional uniformity of the essential oil profiles of the wild Sicilian thyme.

Keywords: Thymus capitatus Hoff. et Link; Thymus longicaulis C. Presl.; Lamiaceae; Essential oil; Carvacrol; p-Cymene; GC-MS; Cluster analysis; Sicily

Vera Lucia Sarda Ribeiro, Jaqueline Campiol dos Santos, Sergio A.L. Bordignon, Miriam A. Apel, Amelia T. Henriques, Gilsane L. von Poser, Acaricidal properties of the essential oil from Hesperozygis ringens (Lamiaceae) on the cattle tick Riphicephalus (Boophilus) microplus,

Bioresource Technology, Volume 101, Issue 7, April 2010, Pages 2506-2509, ISSN 0960-8524, DOI: 10.1016/j.biortech.2009.11.016.
(http://www.sciencedirect.com/science/article/B6V24-4XTYCYT-5/2/a110ee30f4be74d50f16f3ac0a58268a)

Abstract:

Hesperozygis ringens (Benth.) Epling (Lamiaceae) is a strongly aromatic plant employed popularly for its antiparasitic properties. The leaves afforded 4% of essential oil constituted mainly by pulegone (86%). Laboratory tests were carried out to determine the toxicity of the essential oil species on engorged females and larvae of the cattle tick Riphicephalus (Boophilus) microplus using the adult immersion test (AIT) and the larval immersion test (LIT). It was observed that the essential oil at the concentration of 50 [mu]L/mL and 25 [mu]L/mL inhibited the egg laying significatively in relation to the controls and the eggs from these treated females were affected by the oil; the hatching was inhibited in 95% and 30%, respectively. In the LIT it was verified that the LC99.9, LC50 and LC1 was 0.541 [mu]L/mL, 0.260 [mu]L/mL and 0.015 [mu]L/mL, respectively. Pulegone, isolated from the oil, showed similar effect on the females and on the larvae, indicating that it is responsible for the oil activity.

Keywords: Hesperozygis ringens (Benth.) Epling; Lamiaceae; Essential oil; Pulegone; Riphicephalus (Boophilus) microplus

Xianmin Chang, Peter G. Alderson, Charles J. Wright, Solar irradiance level alters the growth of basil (Ocimum basilicum L.) and its content of volatile oils,

Environmental and Experimental Botany, Volume 63, Issues 1-3, May 2008, Pages 216-223, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2007.10.017.
(http://www.sciencedirect.com/science/article/B6T66-4PWKSNS-2/2/407a50b352f9182a23b6a8bd7dd344b0)

Abstract:

The experiments were commenced in March 2003 and repeated in June 2003 at Sutton Bonington Campus, the University of Nottingham, UK, to investigate the effect of irradiance on plant growth and volatile oil content and composition in plants of basil. Four levels of irradiance were provided in the glasshouse, i.e. no shade (control), 25, 50 and 75% glasshouse irradiance. It suggested that basil grows well in full sun, however it can tolerate light shade. Heavy shading (75%) to provide a light integral of 5.3 moles m-2 d-1 resulted in shorter plants, lower weight, smaller leaf area, less shoots and higher specific leaf area, and also strongly reduced the rate of photosynthesis. There was no difference in CO2 assimilation rate between 24.9 moles m-2 d-1 light integrals (no shading) and 13.5 moles m-2 d-1 light integrals (25% shading). Shading effectively reduced leaf temperature when air temperature was less than 30 [degree sign]C, but heavy shading (75%) could not reduce leaf temperature when air temperature was above 36 [degree sign]C due to a limitation of free air convection. Consequently, leaf temperature increased. Heavy shading strongly reduced total volatile oil content in fresh leaves, especially in older plants (shading treatment applied at the 3 leaf-pair growth stage). There were three chemical compounds in basil leaves, namely linalool, eugenol and methyl eugenol, influenced by the shading treatments. Linalool and eugenol, which contribute to the characteristic taste of basil, were significantly increased by high daily light integrals, whereas methyleugenol was increased by lower daily light integrals. No differences in the relative content of 1,8-cineole, one of the key aromatic compounds of Ocimum species, were observed.

Keywords: Ocimum basilicum; Irradiance; Growth; Volatile oils

D.K. Olivier, E.A. Shikanga, S. Combrinck, R.W.M. Krause, T. Regnier, T.P. Dlamini, Phenylethanoid glycosides from Lippia javanica,
South African Journal of Botany, Volume 76, Issue 1, January 2010, Pages 58-63, ISSN 0254-6299, DOI: 10.1016/j.sajb.2009.07.002.
(http://www.sciencedirect.com/science/article/B7XN9-4X00PDH-1/2/b6939a0274d25572d571b51535ce9e3c)

Abstract:

Lippia javanica (N.L.Burm.) Spreng. is an aromatic, multipurpose medicinal plant from which a number of volatile compounds have been identified, together with toxic triterpenoids and iridoid glycosides. Two additional phenylethanoid glycosides, verbascoside and isoverbascoside, were isolated from L. javanica and characterized. High performance liquid chromatography analyses of polar extracts of three other Lippia species (L. scaberrima, L. rehmannii and L. wilmsii), indigenous to South Africa, revealed the presence of both isomers. When compared to the other indigenous Lippia species, the leaves of L. javanica were found to contain the highest concentrations of both isomers. In addition, the intraspecies variation of the verbascoside/isoverbascoside content of L. javanica, harvested from the same and different localities, was investigated. The concentrations of the two phenylethanoids remained fairly consistent within and between different populations, even when

geographically separated. While these compounds are produced by many genera, they may now be added to the list of iridoid glucosides employed as chemotaxonomic markers for Lippia species.

Keywords: Chemotaxonomic marker; Isoverbascoside; Lippia; Phenylethanoids; Verbascoside; Verbenaceae

Jong H. Kim, Jiujiang Yu, Noreen Mahoney, Kathleen L. Chan, Russell J. Molyneux, John Varga, Deepak Bhatnagar, Thomas E. Cleveland, William C. Nierman, Bruce C. Campbell, Elucidation of the functional genomics of antioxidant-based inhibition of aflatoxin biosynthesis, ***International Journal of Food Microbiology***, Volume 122, Issues 1-2, 29 February 2008, Pages 49-60, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.11.058.
(http://www.sciencedirect.com/science/article/B6T7K-4R7NPVT-8/2/d5fd68401ee6b5e60f6285d053d665db)

Abstract:

Caffeic acid (3,4-dihydroxycinnamic acid, 12 mM) added to a fat-based growth medium reduces > 95% of aflatoxin production by Aspergillus flavus NRRL 3357, without affecting fungal growth. Microarray analysis of caffeic acid-treated A. flavus indicated expression of almost all genes in the aflatoxin biosynthetic cluster were down-regulated, ranging from a log2 ratio of caffeic acid treated and untreated of - 1.12 (medium) to - 3.13 (high). The only exceptions were genes norB and the aflatoxin pathway regulator-gene, aflJ, which showed low expression levels in both treated and control fungi. The secondary metabolism regulator-gene, laeA, also showed little change in expression levels between the fungal cohorts. Alternatively, expression of genes in metabolic pathways (i.e., amino acid biosynthesis, metabolism of aromatic compounds, etc.) increased (log2 ratio > 1.5). The most notable up-regulation of A. flavus expression occurred in four genes that are orthologs of the Saccharomyces cerevisiae AHP1 family of genes. These genes encode alkyl hydroperoxide reductases that detoxify organic peroxides. These increases ranged from a log2 ratio of 1.08 to 2.65 (moderate to high), according to real-time quantitative reverse transcription-PCR (qRT-PCR) assays. Based on responses of S. cerevisiae gene deletion mutants involved in oxidative stress response, caffeic, chlorogenic, gallic and ascorbic acids were potent antioxidants under oxidative stress induced by organic peroxides, tert-butyl and cumene hydroperoxides. Differential hypersensitivity to these peroxides and hydrogen peroxide occurred among different mutants in addition to their ability to recover with different antioxidants. These findings suggest antioxidants may trigger induction of genes encoding alkyl hydroperoxide reductases in A. flavus. The possibilities that induction of these genes protects the fungus from oxidizing agents (e.g., lipoperoxides, reactive oxygen species, etc.) produced during host-plant infection and this detoxification attenuates upstream signals triggering aflatoxigenesis are discussed.

Keywords: Phenolic compounds; Aspergillus; Saccharomyces cerevisiae; Chemogenomics; Alkyl hydroperoxide reductase; Peroxiredoxin

Guodong Niu, Sanjeewa G. Rupasinghe, Arthur R. Zangerl, Joel P. Siegel, Mary A. Schuler, May R. Berenbaum, A substrate-specific cytochrome P450 monooxygenase, CYP6AB11, from the polyphagous navel orangeworm (Amyelois transitella),
Insect Biochemistry and Molecular Biology, In Press, Corrected Proof, Available online 8 January 2011, ISSN 0965-1748, DOI: 10.1016/j.ibmb.2010.12.009.
(http://www.sciencedirect.com/science/article/B6T79-51WV02M-2/2/eaa65551be6ea43f95c6f78eb5e5855d)

Abstract:

The navel orangeworm Amyelois transitella (Walker) (Lepidoptera: Pyralidae) is a serious pest of many tree crops in California orchards, including almonds, pistachios, walnuts and figs. To understand the molecular mechanisms underlying detoxification of phytochemicals, insecticides and mycotoxins by this species, full-length CYP6AB11 cDNA was isolated from larval midguts using RACE PCR. Phylogenetic analysis of this insect cytochrome P450 monooxygenase established its evolutionary relationship to a P450 that selectively metabolizes imperatorin (a linear furanocoumarin) and myristicin (a natural methylenedioxyphenyl compound) in another lepidopteran species. Metabolic assays conducted with baculovirus-expressed P450 protein, P450 reductase and cytochrome b5 on 16 compounds, including phytochemicals, mycotoxins, and synthetic pesticides, indicated that CYP6AB11 efficiently metabolizes imperatorin (0.88 pmol/min/pmol P450) and slowly metabolizes piperonyl butoxide (0.11 pmol/min/pmol P450). LC-MS analysis indicated that the imperatorin metabolite is an epoxide generated by oxidation of the double bond in its extended isoprenyl side chain. Predictive structures for CYP6AB11 suggested that its catalytic site contains a doughnut-like constriction over the heme that excludes aromatic rings on substrates and allows only their extended side chains to access the catalytic site. CYP6AB11 can also metabolize the principal insecticide synergist piperonyl butoxide (PBO), a synthetic methylenedioxyphenyl compound, albeit slowly, which raises the possibility that resistance may evolve in this species after exposure to synergists under field conditions.

Keywords: Amyelois transitella; Cytochrome P450 monooxygenase; Imperatorin; Piperonyl butoxide; Insect-plant interactions

Yegao Chen, Ying Liu, Jinhe Jiang, Yan Zhang, Benlin Yin, Dendronone, a new phenanthrenequinone from Dendrobium cariniferum,
Food Chemistry, Volume 111, Issue 1, 1 November 2008, Pages 11-12, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.03.017.
(http://www.sciencedirect.com/science/article/B6T6R-4S33NBT-B/2/5d7ca7edae65f00aa74ffc5ffe9fd9e9)

Abstract:

The stems of several Dendrobium species of the Orchidaceae, used as health foods and nutrients, are rich sources of aromatics, such as bibenzyls, phenanthrenes, fluorenones and simple aromatic acids and esters with antitumour, antioxidant and antimutagenic activities. From the chloroform extract of the whole plant of Dendrobium cariniferum, a new phenanthrenequinone, dendronone, was isolated. Its structure was

identified as 5-hydroxy-7-methoxy-9,10-dihydro-1,4-phenanthrenequinone, based on extensive spectroscopic studies, including HRESIMS, EIMS, 1H NMR, 13C NMR, DEPT, H-H COSY, HSQC, HMBC and NOESY spectra. In this paper, we described the isolation procedure and the structural elucidation of this new compound, as well as the detection of gigantol and batatasin III by co-chromatography with authentic standards.

Keywords: Dendrobium cariniferum; Orchidaceae; Phenanthrenequinone; Dendronone; 5-Hydroxy-7-methoxy-9,10-dihydro-1,4-phenanthrenequinone

V.B. Xavier, R.M.F. Vargas, E. Cassel, A.M. Lucas, M.A. Santos, C.A. Mondin, E.R. Santarem, L.V. Astarita, T. Sartor, Mathematical modeling for extraction of essential oil from Baccharis spp. by steam distillation,
Industrial Crops and Products, In Press, Corrected Proof, Available online 15 January 2011, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2010.12.019.
(http://www.sciencedirect.com/science/article/B6T77-51YGH4P-1/2/6e324a82437821a57708b3a1b65a312f)

Abstract:

Baccharis (Compositae-Asteraceae) is a large genus of plants distributed from the USA to Argentina, of which 90% are located in South America. In recent decades, species of the genus have been studied, due to their importance as sources of novel active components with possible applications in the pharmaceutical and chemical industries. This work studied three species of Baccharis: Baccharis uncinella DC, Baccharis anomala DC and Baccharis dentata (Vell) G.M. Barroso collected in Sao Francisco de Paula in southern Brazil. The aim of this work is the evaluation of the aromatic potential of the essential oil obtained by steam distillation method and the simulation of the extraction data by means of a mathematical model. A mathematical model based on mass transfer fundamentals is developed and applied to correlate the experimental data. This model is based on the existence of the broken and intact cells, in which the oil located in the broken cells is rapidly extracted and the oil from intact cells diffuses slowly to the surface of the vegetal material. The analysis of the essential oil was carried through by GC-MS and the major compounds identified to both processes were [alpha]-pinene, [beta]-pinene, and spathulenol (B. uncinella), spathulenol, [beta]-caryophyllene, and [beta]-selinene (B. anomala), and germacrene-D, caryophyllene oxide, and spathulenol (B. dentata).

Keywords: Essential oil; Steam distillation; Mathematical model; Mass transfer; Baccharis spp.

Natalia Venturini, Pablo Muniz, Marcia C. Bicego, Cesar C. Martins, Luiz Roberto Tommasi, Petroleum contamination impact on macrobenthic communities under the influence of an oil refinery: Integrating chemical and biological multivariate data, Estuarine,
Coastal and Shelf Science, Volume 78, Issue 3, 10 July 2008, Pages 457-467, ISSN 0272-7714, DOI: 10.1016/j.ecss.2008.01.008.
(http://www.sciencedirect.com/science/article/B6WDV-4RR8YWX-2/2/1c5d9242aced89c1556c12b7d16e37da)

Abstract:

Petroleum contamination impact on macrobenthic communities in the northeast portion of Todos os Santos Bay was assessed combining in multivariate analyses, chemical parameters such as aliphatic and polycyclic aromatic hydrocarbon indices and concentration ratios with benthic ecological parameters. Sediment samples were taken in August 2000 with a 0.05 m2 van Veen grab at 28 sampling locations. The predominance of n-alkanes with more than 24 carbons, together with CPI values close to one, and the fact that most of the stations showed UCM/resolved aliphatic hydrocarbons ratios (UCM:R) higher than two, indicated a high degree of anthropogenic contribution, the presence of terrestrial plant detritus, petroleum products and evidence of chronic oil pollution. The indices used to determine the origin of PAH indicated the occurrence of a petrogenic contribution. A pyrolytic contribution constituted mainly by fossil fuel combustion derived PAH was also observed. The results of the stepwise multiple regression analysis performed with chemical data and benthic ecological descriptors demonstrated that not only total PAH concentrations but also specific concentration ratios or indices such as >=C24:<C24, An/178 and Fl/Fl + Py, are determining the structure of benthic communities within the study area. According to the BIO-ENV results petroleum related variables seemed to have a main influence on macrofauna community structure. The PCA ordination performed with the chemical data resulted in the formation of three groups of stations. The decrease in macrofauna density, number of species and diversity from groups III to I seemed to be related to the occurrence of high aliphatic hydrocarbon and PAH concentrations associated with fine sediments. Our results showed that macrobenthic communities in the northeast portion of Todos os Santos Bay are subjected to the impact of chronic oil pollution as was reflected by the reduction in the number of species and diversity. These results emphasise the importance to combine in multivariate approaches not only total hydrocarbon concentrations but also indices, isomer pair ratios and specific compound concentrations with biological data to improve the assessment of anthropogenic impact on marine ecosystems.

Keywords: oil refinery; sediments; hydrocarbon ratios; macrofauna; ecological descriptors; multivariate analyses

Vincenzo Lettera, Alessandra Piscitelli, Gabriella Leo, Leila Birolo, Cinzia Pezzella, Giovanni Sannia, Identification of a new member of Pleurotus ostreatus laccase family from mature fruiting body,

Fungal Biology, Volume 114, Issue 9, September 2010, Pages 724-730, ISSN 1878-6146, DOI: 10.1016/j.funbio.2010.06.004.
(http://www.sciencedirect.com/science/article/B9879-50B5PX4-2/2/a595d90379072e9bb9e66da919d769f4)

Abstract:

Laccases (benzenediol:oxygen oxidoreductases, EC 1.10.3.2) are blue multicopper oxidases, catalyzing the oxidation of an array of aromatic substrates concomitantly with the reduction of molecular oxygen to water. Most of the known laccases have fungal or plant origins, although few laccases have been also identified in bacteria and insects. Most of the fungal laccases reported thus far are extra-cellular enzymes, whereas only few enzymes from fruiting bodies have been described so far. Multiple isoforms of laccases are usually secreted by each fungus depending on species and environmental conditions. As a fact, a laccase gene family has been demonstrated in the white-rot fungus Pleurotus ostreatus.

This work allowed identification and characterization of the first laccase isoenzyme from the fruiting body of P. ostreatus. Discovery through mass spectrometry of LACC12 proves the expression of a functional protein by the related deduced encoding transcript. The topology of phylogenetic tree of fungal laccases proves that LACC12 falls in cluster with the members of P. ostreatus LACC10 (=POXC) subfamily, although lacc12 deduced intron-exon structure differs from that of the subfamily members and the related locus is located in a different chromosome. Results show that the evolutionary pattern of lacc12 and that of the other laccase isozyme genes may have evolved independently, possibly through duplication-divergence events.

The reported data add a new piece to the knowledge about P. ostreatus laccase multigene family and shed light on the role(s) played by individual laccase isoforms in P. ostreatus.

Keywords: Fruiting body; Fungi; Laccase family; Physiological role

Maja Mellergaard Larsen, Anne Adsersen, Aaron P. Davis, M. Dolores Lledo, Anna K. Jager, Nina Ronsted, Using a phylogenetic approach to selection of target plants in drug discovery of acetylcholinesterase inhibiting alkaloids in Amaryllidaceae tribe Galantheae,

Biochemical Systematics and Ecology, Volume 38, Issue 5, October 2010, Pages 1026-1034, ISSN 0305-1978, DOI: 10.1016/j.bse.2010.10.005.
(http://www.sciencedirect.com/science/article/B6T4R-51F81B5-2/2/06345d0f4b70a1b0499a526bd2a7f849)

Abstract:

We present phylogenetic analyses of 32 taxa of Amaryllidaceae tribe Galantheae, 6 taxa of other Eurasian genera of Amaryllidaceae and Phaedranassa dubia as outgroup in order to provide a phylogenetic framework for selection of candidate plants for lead discovery in relation to Alzheimer's disease. We used DNA

sequences from the nuclear ribosomal internal transcribed spacer (ITS) and the plastid matK and trnL-F regions. Phylogenetic analyses using maximum parsimony and Bayesian inference strongly support a monophyletic tribe Galantheae in a narrow sense, including only Acis, Galanthus and Leucojum. Infrageneric relationships of Galanthus only partly support previous classifications. Alkaloid profiles and inhibition of acetylcholinesterase (AChE) were investigated for 18 taxa using gas chromatography-mass spectrometry (GC-MS) and an assay measuring inhibition of AChE activity. AChE inhibitory activity was found in all investigated clades and was correlated with alkaloid profiles of the plants. Lowest IC50 values were expressed by extracts containing either galanthamine or lycorine type compounds. Evaluation of available chemistry and activity data in a phylogenetic framework could be used to select target species for further investigation.

Keywords: Amaryllidaceae; Galantheae; AChE; Alkaloids; Phylogeny; Galanthus; DNA; Drug discovery

Nina Ronsted, Vincent Savolainen, Per Molgaard, Anna K. Jager, Phylogenetic selection of Narcissus species for drug discovery,
Biochemical Systematics and Ecology, Volume 36, Issues 5-6, May-June 2008, Pages 417-422, ISSN 0305-1978, DOI: 10.1016/j.bse.2007.12.010.
(http://www.sciencedirect.com/science/article/B6T4R-4RTCPW6-2/2/d47a369e5eb33e9c38653b59bc2e167a)

Abstract:

Plants are of immense importance in providing healthcare worldwide. With over 250[punctuation space]000 species of angiosperms alone, the potential for finding new medicinal plants and lead compounds for drug development is enormous. Some way of selecting plants for drug discovery programs is necessary. Phylogenies have great explanatory power and also enable a predictive perspective not offered by previous classifications of plants. Phylogenetic selection of target species is a new approach to drug discovery and the present study is the first attempt to correlate acetylcholine esterase (AChE) inhibitory activity and alkaloid distribution with a molecular phylogenetic hypothesis of Narcissus. The distribution of alkaloids with AChE inhibitory activity is significantly constrained by the phylogeny. Simultaneous evaluation of all available information of alkaloids and AChE inhibitory activity in a phylogenetic framework allowed us to discuss various strategies for selection of target species for further studies of AChE inhibitory activity.

Keywords: Alzheimer's disease; Amaryllidaceae; Daffodils; Drug discovery; trnL-F; Narcissus; ndhF; Selection

S.O. Amoo, A.R. Ndhlala, J.F. Finnie, J. Van Staden, Antifungal, acetylcholinesterase inhibition, antioxidant and phytochemical properties of three Barleria species,
South African Journal of Botany, In Press, Corrected Proof, Available online 10 February 2011, ISSN 0254-6299, DOI: 10.1016/j.sajb.2010.11.002.
(http://www.sciencedirect.com/science/article/B7XN9-524XPBH-1/2/175b9aeb88f0bd8daddff8113997fa11)

Abstract:

This study was aimed at evaluating the antifungal, acetylcholinesterase inhibition and antioxidant activities of petroleum ether, dichloromethane, ethanol and methanol extracts from different parts of Barleria prionitis, Barleria greenii and Barleria albostellata. Their phytochemical properties and the possibility of plant-part substitution as a conservation strategy against destructive harvesting (use of aerial parts and roots) of these species for medicinal purposes were also investigated. Microtitre plate assays were used in determining their antifungal (against Candida albicans) and acetylcholinesterase inhibition activities. All the extracts demonstrated both fungistatic and fungicidal activities with the minimum inhibitory concentration ranging from 0.78 to 9.38 mg/ml and minimum fungicidal concentration ranging from 1.17 to 12.50 mg/ml. The higher inhibitory activity of B. greenii leaf extracts in most cases compared to similar extracts of the stems and roots suggest the potential of B. greenii leaves in plant-part substitution. At the lowest extract concentration (0.156 mg/ml), the leaf extract of B. greenii demonstrated a significantly higher acetylcholinesterase (AChE) inhibition than its stem and root extracts. In B. albostellata, the AChE inhibitory activity demonstrated by the stem was significantly greater than that recorded in its leaf extract. These findings suggest that the idea of plant part substitution may be species and/or biological activity dependent. In the DPPH radical scavenging assay, different parts of Barleria species showed free radical scavenging activity with EC50 values ranging from 6.65 to 12.56 [mu]g/ml. The ability of the extracts from different plant parts to reduce ferric ion/ferricyanide complex to the ferrous form and decrease carotenoid bleaching rate suggests the presence of antioxidant compounds capable of donating electrons and hydrogen atoms in their reaction mechanisms. Flavonoids, iridoids and tannins were detected in the different parts of these Barleria species. These phytochemicals might be responsible for the observed biological activities. The isolation of specific bioactive compounds through bioassay-guided fractionation and their characterization as well as studies evaluating their safety may be necessary in the exploration of these species for potential new therapeutic drugs or drug leads.

Keywords: AChE; Alzheimer's disease; Candida albicans; Candidiasis; DPPH radical scavenging; Secondary metabolites

E.A. Adewusi, N. Moodley, V. Steenkamp, Antioxidant and acetylcholinesterase inhibitory activity of selected southern African medicinal plants,
South African Journal of Botany, In Press, Corrected Proof, Available online 1 February 2011, ISSN 0254-6299, DOI: 10.1016/j.sajb.2010.12.009.
(http://www.sciencedirect.com/science/article/B7XN9-522YCC5-1/2/09fc42cac6951238d2bd0602e67a7192)

Abstract:

Alzheimer's disease (AD) is the most common type of dementia in the aging population. Enhancement of acetylcholine levels in the brain is one means of treating the disease. However, the drugs presently used in the management of the disease have various drawbacks. New treatments are required and in this study, extracts of Salvia tiliifolia Vahl. (whole plant), Chamaecrista mimosoides L. Greene (roots), Buddleja salviifolia (L.) Lam. (whole plant) and Schotia brachypetala Sond. (root and bark) were evaluated to determine their polyphenolic content, antioxidant and acetylcholinesterase inhibitory (AChEI) activity. The DPPH and ABTS assays were used to determine antioxidant activity and Ellman colorimetric method to quantify AChEI activity. Although all four plants showed activity in both assays, the organic extracts of C. mimosoides root was found to contain the highest AChEI activity (IC50 = 0.03 0.08 mg/ml) and B. salviifolia whole plant had the highest antioxidant activity (ABTS; IC50 = 0.14 0.08 mg/ml and DPPH; IC50 = 0.23 0.01 mg/ml). The results suggest that the tested plant species may provide a substantial source of secondary metabolites, which act as natural antioxidants and acetylcholinesterase inhibitors, and may be beneficial in the treatment of AD.

Keywords: Acetylcholinesterase; Alzheimer's disease; Antioxidant; Medicinal plants; Neurodegeneration

M.G.K. Bay-Smidt, A.K. Jager, K. Krydsfeldt, A.W. Meerow, G.I. Stafford, J. Van Staden, N. Ronsted, Phylogenetic selection of target species in Amaryllidaceae tribe Haemantheae for acetylcholinesterase inhibition and affinity to the serotonin reuptake transport protein,

South African Journal of Botany, Volume 77, Issue 1, January 2011, Pages 175-183, ISSN 0254-6299, DOI: 10.1016/j.sajb.2010.07.016.

(http://www.sciencedirect.com/science/article/B7XN9-50WY7S9-4/2/922a272b71d43e4fc36e9ecabf25e037)

Abstract:

We present phylogenetic analyses of 37 taxa of Amaryllidaceae, tribe Haemantheae and Amaryllis belladonna L. as an outgroup, in order to provide a phylogenetic framework for the selection of candidate plants for lead discoveries in relation to Alzheimer's disease and depression. DNA sequences from the nuclear ribosomal internal transcribed spacer (ITS) and the plastid trnL-F regions were used. Maximum parsimony analyses provide increased support for the sister relationship of Haemanthus and Scadoxus. Within Haemanthus, a well supported clade (89% BS) corresponds to a summer rainfall group (mainly Eastern Cape) with white-pale pink flowers. A second strongly supported clade (100% BS) corresponds to a winter rainfall group (mainly Western Cape) with red-pale pink flowers. Haemanthus montanus, which is from the summer rainfall region, is sister to the winter rainfall group. Alkaloid profiles and bioactivity profiles were investigated for 16 taxa using gas chromatography-mass spectrometry (GC-MS) and assays measuring acetylcholinesterase (AChE) inhibition and affinity to the serotonin reuptake transport protein (SERT). No alkaloids were detected by GC-MS in extracts of the two species of

Gethyllis included in the present study suggesting that Gethyllis (and possibly Apodolirion) species may not produce the alkaloids characteristic for the family. AChE inhibitory activity was found in all investigated clades except the Apodolirion-Gethyllis clade, which can be explained by the apparent lack of alkaloids in this clade. In spite of infra-specific variability of alkaloid profiles observed, dose-dependent SERT activity appears to be pronounced and restricted to the genus Haemanthus within tribe Haemantheae. Three of eight Haemanthus species tested had IC50 < 10 [mu]g/ml. Two of the most active extracts in the present study contained primarily montanine type alkaloids which have not been tested for SERT affinity previously. Simultaneous evaluation of bioactivity and alkaloid profiles in a phylogenetic framework can potentially be used to select candidate species for phytotherapy and drug discovery.

Keywords: Acetylcholinesterase; Amaryllidaceae; Drug discovery; Internal transcribed spacer; Phylogeny; Serotonin-reuptake-transport-protein; trnL-F

C.N. Muthaura, G.M. Rukunga, S.C. Chhabra, G.M. Mungai, E.N.M. Njagi, Traditional phytotherapy of some remedies used in treatment of malaria in Meru district of Kenya, ***South African Journal of Botany***, Volume 73, Issue 3, July 2007, Pages 402-411, ISSN 0254-6299, DOI: 10.1016/j.sajb.2007.03.004.
(http://www.sciencedirect.com/science/article/B7XN9-4NKB279-1/2/1578e953e347653e6b6de176cd57abcb)

Abstract:

In Kenya, most people especially in rural areas use traditional medicine and medicinal plants to treat many diseases including malaria. Malaria is of national concern in Kenya in view of development of resistant strains of Plasmodium falciparum to drugs especially chloroquine, which had been effective and affordable. This has led the Government to provide free antimalarial treatment because the cost of newer antimalarial drugs is unaffordable to local communities. However, traditional remedies against malaria are practised among the rural communities because of ease of availability and convenience and also due to social, psychological and cultural reasons. This paper examines the use of antimalarial plants among the Meru community of Imenti forest area and Gatunga, in Eastern Province, Kenya. Forty seven plant species belonging to 28 families were encountered during the study. Rutaceae, Compositae and Celestraceae families represented the species most commonly cited in treatment of malaria. Six plant species namely: Periploca linearifolia, Maytenus heterophylla, M. putterlickioides, Albizia amara, Teclea simplicifolia and Olea capensis are documented for the first time for treatment of malaria.

Keywords: Antimalarial plants; Meru district

Fiona R. Saunders, Heather M. Wallace, On the natural chemoprevention of cancer, ***Plant Physiology and Biochemistry***, Volume 48, Issue 7, Polyamines - Dedicated to the memory of Nello Bagni, July 2010, Pages 621-626, ISSN 0981-9428, DOI: 10.1016/j.plaphy.2010.03.001.
(http://www.sciencedirect.com/science/article/B6VRD-4YJT5CK-1/2/85192c930f6a5356f83afe6fcd18faa5)

Abstract:

Cancer is a complex disease to treat and the treatments have not progressed significantly in the last few years. Alternative strategies such as chemoprevention are being investigated. Proof of concept of chemoprevention has been shown with the non-steroidal anti-inflammatory drugs (NSAIDs); however there is significantly more interest in plant and naturally available compounds for chemoprevention. A number of different naturally occurring chemical compounds are reviewed here for their potential benefits and the pathways which they may target, in particular the polyamine pathway.

Keywords: Cancer; Therapy; Prevention; Polyamines; Polyphenols; Flavonols

Kalpana Ghimire, Rishi Ram Bastakoti, Ethnomedicinal knowledge and healthcare practices among the Tharus of Nawalparasi district in central Nepal, ***Forest Ecology and Management***, Volume 257, Issue 10, Traditional forest-related knowledge in Asia, 30 April 2009, Pages 2066-2072, ISSN 0378-1127, DOI: 10.1016/j.foreco.2009.01.039.
(http://www.sciencedirect.com/science/article/B6T6X-4VPKPXC-4/2/cf0ba4b1a7bdfde4ef64439ffe0cf908)

Abstract:

Documentation of ethnomedicinal use of plants has been considered a high priority to support the discovery of new drugs to benefit mankind. This paper deals with the field observations recorded on the use of medicinal plants in traditional health care systems of the Tharus of three Villages of Nawalparasi district of central Nepal. The Tharus are isolated forest dwellers who have lived harmoniously with nature over the centuries and accumulated a vast knowledge of plant use to cure various ailments. First-hand information on the ethnomedicinal uses of 110 plants species belonging to 52 families were documented from the study. These plant species are used by the Tharus to treat ailments ranging from fever and headache to cough and cold, rheumatic pain and fracture to urinary tract infection and menstrual disorders. The scientific names of these plants are presented in tabular format according to alphabetic order, family, parts used, medicine preparation process and use and method of application. Increasing accessibility of modern health care facilities, low recognition of traditional healers and decreasing interest amongst the young generation has resulted in declining trends in the use of traditional medicine among the Tharus. Thus, the documentation of such knowledge is an important step for preservation of traditional knowledge, conservation and management of valuable plant resources and commercialization of ethnomedicines.

Keywords: Health care; Medicinal plant; Nepal; Tharus; Traditional knowledge

N.Q. Liu, F. Van der Kooy, R. Verpoorte, Artemisia afra: A potential flagship for African medicinal plants?,
South African Journal of Botany, Volume 75, Issue 2, April 2009, Pages 185-195, ISSN 0254-6299, DOI: 10.1016/j.sajb.2008.11.001.
(http://www.sciencedirect.com/science/article/B7XN9-4V462GN-1/2/157993363f9c1db6303b674f9165f703)

Abstract:

The genus Artemisia consists of about 500 species, occurring throughout the world. Some very important drug leads have been discovered from this genus, notably artemisinin, the well known anti-malarial drug isolated from the Chinese herb Artemisia annua. The genus is also known for its aromatic nature and hence research has been focussed on the chemical compositions of the volatile secondary metabolites obtained from various Artemisia species. In the southern African region, A. afra is one of the most popular and commonly used herbal medicines. It is used to treat various ailments ranging from coughs and colds to malaria and diabetes. Although it is one of the most popular local herbal medicines, only limited scientific research, mainly focussing on the volatile secondary metabolites content, has been conducted on this species. The aim of this review was therefore to collect all available scientific literature published on A. afra and combine it into this paper. In this review, a general overview will be given on the morphology, taxonomy and geographical distribution of A. afra. The major focus will however be on the secondary metabolites, mainly the volatile secondary metabolites, which have been identified from this species. In addition all of the reported biological activities of the extracts derived from this species have been included as well as the literature on the pharmacology and toxicology. We aim at bringing together most of the available scientific research conducted on this species, which is currently scattered across various publications, into this review paper.

Keywords: Artemisia afra; Traditional African Medicine; Volatile secondary metabolites

B.G. Kelly, A. Vespermann, D.J. Bolton, Gene transfer events and their occurrence in selected environments,
Food and Chemical Toxicology, Volume 47, Issue 5, Early Awareness of Emerging Risks to Food and Feed Safety, May 2009, Pages 978-983, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.06.012.
(http://www.sciencedirect.com/science/article/B6T6P-4SWFNW7-1/2/33a6d64a3cd58016366597b4cfbe2bda)

Abstract:

Genes encoding virulence determinants are transferred between species in many different environments. In this review we describe gene transfer events to and from different species of bacteria, from bacteria to plants, and from plants to bacteria. Examples of the setting for these transfer events include: the GI tract, the rumen, the oral cavity, and in food matrixes. As a case study, the flux of virulence factors from E.coli O157:H7 is described as an example of gene flow in the environment.

Keywords: Gene transfer; Rumen; Gastrointestinal tract; Food; E.coli O157:H7

James Kirby, Minobu Nishimoto, J. Genevieve Park, Sydnor T. Withers, Farnaz Nowroozi, Dominik Behrendt, Elizabeth J. Garcia Rutledge, Jeffrey L. Fortman, Holly E. Johnson, James V. Anderson, Jay D. Keasling, Cloning of casbene and neocembrene synthases from Euphorbiaceae plants and expression in Saccharomyces cerevisiae,
Phytochemistry, Volume 71, Issue 13, September 2010, Pages 1466-1473, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2010.06.001.
(http://www.sciencedirect.com/science/article/B6TH7-50F2NSR-2/2/9ce2cd36b15e2329fa33b126640a1727)

Abstract:

A large number of diterpenes have been isolated from Euphorbiaceae plants, many of which are of interest due to toxicity or potential therapeutic activity. Specific Euphorbiaceae diterpenes of medical interest include the latent HIV-1 activator prostratin (and related 12-deoxyphorbol esters), the analgesic resiniferatoxin, and the anticancer drug candidate ingenol 3-angelate. In spite of the large number of diterpenes isolated from these plants and the similarity of their core structures, there is little known about their biosynthetic pathways. Other than the enzymes involved in gibberellin biosynthesis, the only diterpene synthase isolated to date from the Euphorbiaceae has been casbene synthase, responsible for biosynthesis of a macrocyclic diterpene in the castor bean (Ricinus communis). Here, we have selected five Euphorbiaceae species in which to investigate terpene biosynthesis and report on the distribution of diterpene synthases within this family. We have discovered genes encoding putative casbene synthases in all of our selected Euphorbiaceae species and have demonstrated high-level casbene production through expression of four of these genes in a metabolically engineered strain of Saccharomyces cerevisiae. The only other diterpene synthase found among the five plants was a neocembrene synthase from R. communis (this being the first report of a neocembrene synthase gene). Based on the prevalence of casbene synthases, the lack of other candidates, and the structure of the casbene skeleton, we consider it likely that casbene is the precursor to a large number of Euphorbiaceae diterpenes. Casbene production levels of 31 mg/L were achieved in S. cerevisiae and we discuss strategies to further increase production by maximizing flux through the mevalonate pathway.

Keywords: Ricinus communis; Sapium sebiferum; Euphorbia esula; Euphorbia resinifera; Homalanthus nutans; Euphorbiaceae; Metabolic engineering; Isoprenoid; Yeast; Phorbol; Ingenol

Nathalie Galland, Paul A.M. Michels, Comparison of the peroxisomal matrix protein import system of different organisms. Exploration of possibilities for developing inhibitors of the import system of trypanosomatids for anti-parasite chemotherapy,
European Journal of Cell Biology**,** Volume 89, Issue 9, September 2010, Pages 621-637, ISSN 0171-9335, DOI: 10.1016/j.ejcb.2010.04.001.
(http://www.sciencedirect.com/science/article/B7GJ2-5003BR7-1/2/31da61d5b6925a198ddc1468536f891b)

Abstract:

In recent decades, research on peroxisome biogenesis has been particularly boosted since the role of these organelles in metabolism became unraveled. Indeed in plants, yeasts and fungi, peroxisomes play an important role in the adaptation of metabolism during developmental processes and/or altered environmental conditions. In mammals their importance is illustrated by the fact that several severe human inherited diseases have been identified as peroxisome biogenesis disorders (PBD). Particularly interesting are the glycosomes - peroxisome-like organelles in trypanosomatids where the major part of the glycolytic pathway is sequestered - because it was demonstrated that proper compartmentalization of matrix proteins inside glycosomes is essential for the parasite.Although the overall process of peroxisome biogenesis seems well conserved between species, careful study of the literature reveals nonetheless many differences at various steps. In this review, we present a comparison of the first two steps of peroxisome biogenesis - receptor loading and docking at the peroxisomal membrane - in yeasts, mammals, plants and trypanosomatids and highlight major differences in the import process between species despite the conservation of (some of) the proteins involved.Some of the unique features of the process as it occurs in trypanosomatids will be discussed with regard to the possibilities for exploiting them for the development of compounds that could specifically disturb interactions between trypanosomatid peroxins. This strategy could eventually lead to the discovery of drugs against the diseases caused by these parasites.

Keywords: Peroxisomes; Glycosomes; Matrix protein import; Peroxisomal-targeting signal; PTS-receptor; Docking complex; Peroxin; Trypanosomatidae; Parasites; Drugs

Jorg M. Augustin, Vera Kuzina, Sven B. Andersen, Soren Bak, Molecular activities, biosynthesis and evolution of triterpenoid saponins, Phytochemistry, In Press, Corrected Proof, Available online 16 February 2011, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2011.01.015.
(http://www.sciencedirect.com/science/article/B6TH7-5269KW3-1/2/7cd18451396ebd0b3ac984bcf1a0f416)

Abstract:

Saponins are bioactive compounds generally considered to be produced by plants to counteract pathogens and herbivores. Besides their role in plant defense, saponins are of growing interest for drug research as they are active constituents of several folk medicines and provide valuable pharmacological properties. Accordingly, much effort has been put into unraveling the modes of action of saponins, as well as in exploration of their potential for industrial processes and pharmacology. However, the exploitation of saponins for bioengineering crop plants with improved resistances against pests as well as circumvention of laborious and uneconomical extraction procedures for industrial production from plants is hampered by the lack of knowledge and availability of genes in saponin biosynthesis. Although the ability to produce saponins is rather widespread among plants, a complete synthetic pathway has not

been elucidated in any single species. Current conceptions consider saponins to be derived from intermediates of the phytosterol pathway, and predominantly enzymes belonging to the multigene families of oxidosqualene cyclases (OSCs), cytochromes P450 (P450s) and family 1 UDP-glycosyltransferases (UGTs) are thought to be involved in their biosynthesis. Formation of unique structural features involves additional biosynthetical enzymes of diverse phylogenetic background. As an example of this, a serine carboxypeptidase-like acyltransferase (SCPL) was recently found to be involved in synthesis of triterpenoid saponins in oats. However, the total number of identified genes in saponin biosynthesis remains low as the complexity and diversity of these multigene families impede gene discovery based on sequence analysis and phylogeny.This review summarizes current knowledge of triterpenoid saponin biosynthesis in plants, molecular activities, evolutionary aspects and perspectives for further gene discovery.

Keywords: Saponins; Hemolytic activity; Triterpenes; Oxidosqualene cyclases; Cytochromes P450; UDP-gylcosyltransferases; Phylogeny; Gene discovery

K. Dhalwal, V.M. Shinde, Y.S. Biradar, K.R. Mahadik, Simultaneous quantification of bergenin, catechin, and gallic acid from Bergenia ciliata and Bergenia ligulata by using thin-layer chromatography,
Journal of Food Composition and Analysis, Volume 21, Issue 6, September 2008, Pages 496-500, ISSN 0889-1575, DOI: 10.1016/j.jfca.2008.02.008.
(http://www.sciencedirect.com/science/article/B6WJH-4SDPX6D-9/2/56732567e844470f3371ebadcca7b05a)

Abstract:

Bergenia ciliata Sternb. and Bergenia ligulata Wall. (Saxifragaceae) are reputed drugs of Ayurveda, commonly known as Paashaanbhed. A simple TLC method has been developed for the simultaneous quantification of bergenin, catechin, and gallic acid from different parts of B. ciliata and B. ligulata using HPTLC plate precoated with silica gel 60 F254. The method was developed in toluene:ethyl acetate:formic acid (4:6:1, v/v) and validated in terms of precision, repeatability, and accuracy. The linearity range for bergenin, catechin and gallic acid were found to be 160-800, 160-480 and 160-560 ng/spot respectively with correlation coefficients of 0.999, 0.999 and 0.999, respectively, which were indicative of good linear dependence of peak area on concentration. The method permits reliable quantification and showed good resolution and separation from other constituents of extract. Accuracy of the method was checked by conducting recovery studies at three different levels for all the three marker compounds and the average percentage recoveries were found to 99.29%, 98.66%, and 99.23%, respectively. The rhizomes were found to contain higher concentration of bergenin, catechin, and gallic acid than other parts of the plants. The proposed method was found to be simple, precise, specific, sensitive, and accurate. It can be used for routine quality control of herbal material and formulations containing bergenia species.

Keywords: Bergenia ligulata; Bergenia ciliata; Bergenin; Catechin; Gallic acid; Thin-layer chromatography

Anita M. Brinker, Jun Ma, Peter E. Lipsky, Ilya Raskin, Medicinal chemistry and pharmacology of genus Tripterygium (Celastraceae),
Phytochemistry, Volume 68, Issue 6, March 2007, Pages 732-766, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2006.11.029.
(http://www.sciencedirect.com/science/article/B6TH7-4MWGYPF-1/2/9a24d96e662d91356532cf2b60eda311)

Abstract:

Plants in the genus Tripterygium, such as Tripterygium wilfordii Hook.f., have a long history of use in traditional Chinese medicine. In recent years there has been considerable interest in the use of Tripterygium extracts and of the main bioactive constituent, the diterpene triepoxide triptolide (1), to treat a variety of autoimmune and inflammation-related conditions. The main mode of action of the Tripterygium extracts and triptolide (1) is the inhibition of expression of proinflammatory genes such as those for interleukin-2 (IL-2), inducible nitric oxide synthase (iNOS), tumor necrosis factor-[alpha] (TNF-[alpha]), cyclooxygenase-2 (COX-2) and interferon-gamma (IFN-[gamma]). The efficacy and safety of certain types of Tripterygium extracts were confirmed in human clinical trials in the US and abroad. Over 300 compounds have been identified in the genus Tripterygium, and many of these have been evaluated for biological activity. The overall activity of the extract is based on the interaction between its components. Therefore, the safety and efficacy of the extract cannot be fully mimicked by any individual constituent. This review discusses the biochemical composition and biological and pharmacological activities of Tripterygium extracts, and their main bioactive components.

Keywords: Tripterygium; Celastraceae; Thunder god vine; Terpenoids; Triptolide; Inflammation; Antiinflammatory drugs; Immunosuppression

Pedro Morais, Jesus Lamas, Manuel L. Sanmartin, Francisco Orallo, Jose Leiro, Resveratrol Induces Mitochondrial Alterations, Autophagy and a Cryptobiosis-like State in Scuticociliates, ***Protist***, Volume 160, Issue 4, November 2009, Pages 552-564, ISSN 1434-4610, DOI: 10.1016/j.protis.2009.04.004.
(http://www.sciencedirect.com/science/article/B7GX3-4WW170T-1/2/15c155331d625df8efca913fe62b5d5a)

Abstract:

The phytoalexin resveratrol (RESV), a defensive substance produced by plants in response to infection by pathogenic microorganisms, displays a wide range of biological effects in mammalian cells. In the present study, we analysed the in vitro effect of RESV on the amphizoic ciliate Philasterides dicentrarchi and demonstrated for the first time that this polyphenol causes cellular and metabolic abnormalities that generate an autophagic process and a state similar to cryptobiosis in the ciliate. At concentrations between 50 and 100 [mu]M, RESV had a cytocidal effect when the ciliate was grown in medium with low levels of nutrients, and a cytostatic effect when the parasite was grown in culture media rich in nutrients. At these concentrations, RESV induced alterations in mitochondria, generated autophagy, provoked a reduction

in the cell volume, and also drastically reduced the ciliate endocytic activity in small ciliates, generating a state compatible with cryptobiosis. The results demonstrate that RESV is a potent inducer of autophagy in the scuticociliate P. dicentrarchi. The ciliate may therefore be a good experimental organism for identifying autophagy-inducing drugs with therapeutic potential in diseases in which autophagy plays a protective role.

Keywords: resveratrol; Philasterides dicentrarchi; ciliates; autophagy; mitochondria; cytotoxicity

Valtcho D. Zheljazkov, Charles L. Cantrell, Tess Astatkie, Variation in podophyllotoxin concentration in leaves and rhizomes of American mayapple (Podophyllum peltatum L.), ***Industrial Crops and Products***, In Press, Corrected Proof, Available online 15 January 2011, ISSN 0926-6690, DOI: 10.1016/j.indcrop.2010.12.025.
(http://www.sciencedirect.com/science/article/B6T77-51YGH4P-2/2/82fb7927050bcd653f12e4722f932f51)

Abstract:

Podophyllotoxin is a precursor for compounds used in the synthesis of commercially available anticancer drugs and their precursors etoposide, teniposide, and etopophos. Podophyllotoxin is currently obtained from the underground plant parts (roots and rhizomes) of Himalayan mayapple (Podophyllum emodii Wall.) but is also found in several other species, including American mayapple. There is no information in the literature on podophyllotoxin concentration in the roots or rhizomes of the American mayapple, and it was not clear if podophyllotoxin concentration in underground plant parts is correlated with the concentration in aboveground plant parts. The objective of this study was to estimate podophyllotoxin concentration in the leaves and rhizomes of 28 accessions of American mayapple under natural conditions (wild) and compare this to podophyllotoxin concentrations of the same accessions in the leaves when cultivated. Podophyllotoxin concentration in the rhizomes was positively correlated to soil organic matter content and to the concentrations of soil-available P and Na. Podophyllotoxin in the leaves was negatively correlated to soil-available Mg concentrations. The concentration of podophyllotoxin in the leaves varied from undetectable amounts to 2.52%, whereas podophyllotoxin in rhizomes varied from 0.14% to 0.42%. Most of the accessions had greater than 0.45% podophyllotoxin concentration in the leaves under both wild and cultivated conditions. There was no significant correlation between the podophyllotoxin concentrations in rhizomes and leaves; nine accessions had the highest podophyllotoxin concentration in leaves under natural environment. Another nine accessions had the highest podophyllotoxin in the leaves under cultivated conditions, and an additional eight accessions had greater podophyllotoxin concentrations in roots than in leaves irrespective of the environment. The results from this study may contribute toward developing American mayapple into a new cash crop for U.S. farmers.

Keywords: Mayapple; Podophyllum; Podophyllotoxin; Leaves; Roots

Edit Kaszab, Sandor Szoboszlay, Csaba Dobolyi, Judit Hahn, Nikoletta Pek, Balazs Kriszt, Antibiotic resistance profiles and virulence markers of Pseudomonas aeruginosa strains isolated from composts,
Bioresource Technology, Volume 102, Issue 2, January 2011, Pages 1543-1548, ISSN 0960-8524, DOI: 10.1016/j.biortech.2010.08.027.
(http://www.sciencedirect.com/science/article/B6V24-50RP1X9-2/2/624ec6dde332ad3b61b662fa91d0d5a2)

Abstract:

The aim of our work was to determine the presence of Pseudomonas aeruginosa in compost raw materials, immature and mature compost, and compost-treated soil. Twenty-five strains of P. aeruginosa were isolated from a raw material (plant straw), immature and mature compost and compost-treated soil samples. The strains were identified using the PCR method for the detection of species specific variable regions of 16S rDNA. Strains were examined for the presence of five different virulence-related gene sequences (exoA, exoU, exoT, exoS and exoY) and their antibiotic resistance profiles were determined. Based on our results, species P. aeruginosa can reach significant numbers (up to 106 MPN/g sample) during composting and 92.0% of the isolated strains carrying at least two gene sequences encoding toxic proteins. Various types of drug resistance were detected among compost originating strains, mainly against third generation Cephalosporins and Carbapenems. Six isolates were able to resist two different classes of antibiotics (third generation Cephalosporins and Carbapenems, wide spectrum Penicillins or Aminoglycosides, respectively). Based on our results, composts can be a source of P. aeruginosa and might be a concern to individuals susceptible to this opportunistic pathogen.

Keywords: Compost; Pseudomonas aeruginosa; Virulence genes; Antibiotic resistance