Komoditas : Apel
Tahun 2004-2008 (653 judul)

Yusuke Ban, Naomi Oyama-Okubo, Chikako Honda, Masayoshi Nakayama, Takaya Moriguchi, Emitted and endogenous volatiles in `Tsugaru' apple: The mechanism of ester and (E,E)-[alpha]-farnesene accumulation, Food Chemistry, Volume 118, Issue 2, 15 January 2010, Pages 272-277, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.04.109.
(http://www.sciencedirect.com/science/article/B6T6R-4W74243-2/2/43883feb7054924452c6d720b08cdf3b)
Abstract:
Volatile compound production was studied in terms of biosynthetic gene expression in apple (`Tsugaru'). To this end, we first analysed the endogenous and emitted volatiles in the skin of ripened apple fruit. GC-MS and GC analyses suggested that the boiling point of the endogenous compounds in apple skin is an important determinant of the composition and amount of emitted volatiles. Since esters and (E,E)-[alpha]-farnesene are the major endogenous volatiles in apple, key biosynthetic genes were isolated from apple skin and their expression patterns were analysed with ethylene biosynthetic genes. During fruit development, the onset of alcohol acyltransferase (pMdAAT) expression in the skin, which is responsible for ester biosynthesis, coincided with the accumulation of 1-aminocyclopropane-1-carboxylate synthase (MdACSs, MdACS5B) mRNA. Thereafter, pMdAAT expression remained at a high level, even when no MdACS transcripts were observed. On the other hand, the accumulation of (E,E)-[alpha]-farnesene synthase (pMdAFS1) transcripts in the skin was associated with the expression of MdACSs and 1-aminocyclopropane-1-carboxylate oxidase (MdACO1). After harvest, the inhibition of pMdAAT expression in 1-methylcyclopropene (1-MCP)-treated apple skin was incomplete. In contrast, the expression of pMdAFS1 was repressed by 1-MCP treatment concomitant with considerable inhibition of ethylene production. These results suggest that pMdAFS1 expression is controlled by ethylene, whereas pMdAAT expression is developmentally regulated in the skin of `Tsugaru'.
Keywords: Alcohol acyltransferase (MdAAT); Apple (Malus x domestica); Ethylene; (E,E)-[alpha]-farnesene synthase (MdAFS1); Volatile compounds

Yolanda Dineiro Garcia, Belen Suarez Valles, Anna Picinelli Lobo, Phenolic and antioxidant composition of by-products from the cider industry: Apple pomace, Food Chemistry, Volume 117, Issue 4, 15 December 2009, Pages 731-738, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.04.049.
(http://www.sciencedirect.com/science/article/B6T6R-4W4CWTB-9/2/e2f38c2d04677d37b34180de42fc5501)
Abstract:
Eleven different cider apple pomaces (six single-cultivar and five from the cider-making industry) have been analysed for low molecular phenolic profiles and antioxidant capacity. The Folin index ranged between 2.3 and 15.1 g gallic acid per kg of dry matter. Major phenols were flavanols, dihydrochalcones (phloridzin and phloretin-2'-xyloglucoside), flavonols and cinnamic acids (chlorogenic and caffeic acids). The group of single-cultivar pomaces had higher contents of chlorogenic acid, (-)-epicatechin, procyanidin B2 and dihydrochalcones, whereas the industrial samples presented higher amounts of up to four unknown compounds, with absorption maxima between 256 and 284 nm. The antioxidant capacity of apple pomace, as determined by the DPPH and FRAP assays, was between 4.4 and 16.0 g ascorbic acid per kg of dry matter, thus confirming that apple pomace is a valuable source of antioxidants. PLSR analysis gave reliable mathematical models which allowed to predict the antioxidant activity of apple pomace as a function of the

phenolic profile. The variables with the higher modelling power were phloridzin > procyanidin B2 > rutin + isoquercitrin > protocatechuic acid > hyperin.
Keywords: Cider; By-products; Apple pomace; Polyphenols; Antioxidant capacity; DPPH; FRAP

Maria Cristiane Rabelo, Claudia P.M.L. Fontes, Sueli Rodrigues, Enzyme synthesis of oligosaccharides using cashew apple juice as substrate, Bioresource Technology, Volume 100, Issue 23, December 2009, Pages 5574-5580, ISSN 0960-8524, DOI: 10.1016/j.biortech.2009.06.060.
(http://www.sciencedirect.com/science/article/B6V24-4WS85S0-5/2/5d9285779421d9788ae0fc4a20635d94)
Abstract:
The use of agriculture substrates in industrial biotechnological processes has been increasing because of their low cost. In this work, the use of clarified cashew apple juice was investigated as substrate for enzyme synthesis of prebiotic oligosaccharide. The results showed that cashew apple juice is a good source of reducing sugars and can be used as substrate for the production of dextransucrase by Leuconostoc citreum B-742 for the synthesis of oligosaccharides using the crude enzyme. Optimal oligosaccharide yield (approximately 80%) was obtained for sucrose concentrations lower than 60 g/L and reducing sugar concentrations higher than 100 g/L.
Keywords: Low cost substrate; Response surface analysis; Cashew apple juice; Oligosaccharides

Charles M.A.P. Franz, Ingrid Specht, Gyu-Sung Cho, Volker Graef, Mario R. Stahl, UV-C-inactivation of microorganisms in naturally cloudy apple juice using novel inactivation equipment based on Dean vortex technology, Food Control, Volume 20, Issue 12, December 2009, Pages 1103-1107, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2009.02.010.
(http://www.sciencedirect.com/science/article/B6T6S-4VVXSTB-1/2/acd6561223e5eb07169f67652de2677b)
Abstract:
A novel UV-C irradiation device in laboratory scale was tested for its potential to inactivate bacteria in naturally cloudy apple juice. In this device, liquid flows through a helically wound tubing wrapped around a quartz glass tube containing a 9 W UV lamp with an irradiation intensity of 60 W/m2 at 254 nm. The equipment was capable of reducing numbers of inoculated Escherichia coli and Lactobacillus brevis from an initial concentration of approximately 106 CFU/ml or 104 CFU/ml to below detectable limits in commercial naturally cloudy apple juice at a flow rate of 2 l/h, and to well below 1 x 102 also at higher flow rates of 4 and 8 l/h. Numbers of Saccharomyces cerevisiae could be reduced from an initial level of ca. 1 x 104-1 x 102 CFU/ml or less at flow rates of 2 and 4 l/h. Although E. coli could be effectively inactivated also in self-extracted, as well as industrially processed apple juice, contaminating yeast and lactic acid bacteria were not completely eliminated.
Keywords: UV-C; Food irradiation; Bacteria and yeasts; Apple juice; Escherichia coli; Lactobacillus brevis; Saccharomyces cerevisiae; Dean vortex

Q. Tuan Pham, Inge Bulens, Q. Tri Ho, Bert E. Verlinden, Pieter Verboven, Bart Nicolai, Simultaneous measurement of ethane diffusivity and skin resistance of `Jonica' apples by efflux experiment, Journal of Food Engineering, Volume 95, Issue 3, December 2009, Pages 471-478, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2009.06.007.
(http://www.sciencedirect.com/science/article/B6T8J-4WH2KV3-2/2/8bfed26de0ea12c7cdb656a5060e09f8)
Abstract:
An experiment was carried out to simultaneously measure the diffusivity and skin resistance of ethane in `Jonica' apples by equilibrating them in an ethane-air mixture, transferring them to an ethane-free jar and monitoring the concentration of the air in the jar as the ethane is released. The

concentration curve is then curve fitted by a finite element model using a realistic axisymmetric geometry to determine the diffusivity and mass transfer coefficient (inverse of skin resistance). The solubility (Henry's law constant) of ethane in apple tissue was determined at equilibrium and was the same as that of ethane in water. The diffusivity of ethane in apple tissue was 19.4 x 10-8 m2 s-1, the skin resistance 1.26 x 106 s m-1 and the mass transfer Biot number (ratio of internal to external resistance) 0.61. The values of these parameters for O2, CO2 and neon were calculated from those for ethane using a two phase co-diffusion model. They disagree with results from previous efflux experiments but are consistent with direct measurement on cut tissue samples using the diffusion cell method. This can be explained by the hypothesis that the diffusivity determined by curve fitting is that of the inner cortex, while the resistance of the outer cortex is treated as part of skin resistance. Taken in combination with previous tests, the present results give an indication of the diffusivity profile across the apples.
Keywords: Apple; Fruit; Diffusivity; Skin resistance; Finite element method

Muriel Colin-Henrion, Emira Mehinagic, Catherine M.G.C. Renard, Pascal Richomme, Frederique Jourjon, From apple to applesauce: Processing effects on dietary fibres and cell wall polysaccharides, Food Chemistry, Volume 117, Issue 2, 15 November 2009, Pages 254-260, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.03.109.
(http://www.sciencedirect.com/science/article/B6T6R-4W0WJB9-B/2/e78af667297ec5d385fede8dd6c342dc)
Abstract:
Modifications in dietary fibre content of apples during industrial processing into applesauce were investigated. Samplings with different post-harvest storage times were performed at five different processing steps (apple sorting, cooking, refining, sugaring and pasteurisation) and the samples examined for their insoluble, soluble and total fibre contents, following the AOAC method. Total fibres were also estimated through preparation of alcohol-insoluble solids and polysaccharide compositions of the various fibre residues were determined. Total fibre content decreased from apple to applesauce from 2.4 to 1.7 g for 100 g of fresh weight and the soluble fraction increased. Fibre loss and soluble/insoluble redistribution occurred during processing. Refining triggered a loss of insoluble polysaccharides whilst cooking and, surprisingly, sugaring led to pectin solubilisation and further degradation due to prolonged heating. These pectic changes, moreover, seemed to be dependent on the post-maturity stage of the apples.
Keywords: Malus domestica Borkh; Post-harvest maturity; Puree; Pectins; Cooking; Refining

Leila Queiroz Zepka, Adriana Zerlotti Mercadante, Degradation compounds of carotenoids formed during heating of a simulated cashew apple juice, Food Chemistry, Volume 117, Issue 1, 1 November 2009, Pages 28-34, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.03.071.
(http://www.sciencedirect.com/science/article/B6T6R-4VXDV2X-1/2/3ff6c54927f8345ab8ad912f26e37fec)
Abstract:
The influence of organic acid and heating treatments on carotenoid degradation on a simulated cashew apple juice was assessed by high performance liquid chromatography coupled with a photodiode array and mass spectrometry detectors. A total of nineteen carotenoids were separated in unheated simulated cashew apple juice, with all-trans-[beta]-cryptoxanthin and all-trans-[beta]-carotene as the major ones. As a consequence of heating, five xanthophylls disappeared, whereas two new cis isomers and five epoxide or furanoid-derivatives were formed and the levels of all cis isomers increased. In addition, 12'-apo-[beta]-carotenal was formed at 90 [degree sign]C. Two oxidation compounds (12'-apo-[beta]-carotenal and 5,6-epoxy-[beta]-cryptoxanthin) were formed after [beta]-cryptoxanthin heating at 90 [degree sign]C in an aqueous-based system. In all systems, the amounts of total carotenoids lost were not compensated by those formed. These facts indicated that isomerisation and oxidation to both coloured and non-

coloured compounds were the main reactions occurring during heating of carotenoids in aqueous-based and juice systems.
Keywords: Carotenoids; Degradation compounds; Cashew apple juice; HPLC-PDA-MS/MS; Anacardium occidentale L.

Hyun-Gyun Yuk, David J. Geveke, Howard Q. Zhang, Tony Z. Jin, Comparison of aluminum thermal-death-time disks with a pilot-scale pasteurizer on the thermal inactivation of Escherichia coli K12 in apple cider, Food Control, Volume 20, Issue 11, November 2009, Pages 1053-1057, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.12.009.
(http://www.sciencedirect.com/science/article/B6T6S-4V76453-2/2/b40e5c320bef419f176e65f5ef5da42c)
Abstract:
This study was conducted to compare thermal inactivation kinetics obtained using a pilot-scale pasteurizer and a bench-scale processing system. Pilot-scale pasteurizers are useful for product development, but comparisons on thermal inactivation kinetics with smaller scale systems are lacking. Using an Armfield pilot-scale pasteurizer and aluminum thermal-death-time (TDT) disks, the D-values and z-values of Escherichia coli K12 in apple cider were determined in the temperature range of 54-62 [degree sign]C. Come-up times to 58 [degree sign]C were also measured and were 35 and 61 s for the TDT disks and pasteurizer, respectively. The D-values from the TDT disks were 9.66, 4.01, 1.44 and 0.44 min at temperatures of 54, 56, 58, and 60 [degree sign]C, respectively. The D-values from the pasteurizer were 3.48, 1.22, 0.10 and 0.05 min at temperatures of 56, 58, 60, and 62 [degree sign]C, respectively. The z-values from the TDT disks and the pasteurizer were 4.68 and 3.60 [degree sign]C, respectively. There was no significant ($P > 0.05$) difference in the D-values of the TDT disks and pasteurizer at 56 and 58 [degree sign]C, while there was a significant ($P < 0.05$) difference in the D-value at 60 [degree sign]C and in the z-value. This study revealed that the thermal inactivation kinetics obtained using bench scale TDT disks and an Armfield pilot-scale pasteurizer under certain conditions are similar. However, based on ease of use and other factors, TDT disks are preferable for acquiring thermal inactivation kinetics.
Keywords: Thermal inactivation; E. coli; Apple cider; Thermal-death-time disk; Pasteurizer

Roberto Quevedo, Marcela Jaramillo, Oscar Diaz, Franco Pedreschi, Jose Miguel Aguilera, Quantification of enzymatic browning in apple slices applying the fractal texture Fourier image, Journal of Food Engineering, Volume 95, Issue 2, November 2009, Pages 285-290, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2009.05.007.
(http://www.sciencedirect.com/science/article/B6T8J-4W85M9X-3/2/1ca8c63b0840db7cd697fc7cff8fdfb6)
Abstract:
A new approach (FBI) describing the enzymatic browning kinetics for three apple cultivars, is presented. It is based on quantification of the irregular color patterns that emerge from the apple surface during enzymatic browning, rather than using the color average in the same area analyzed. In the experiments, three apple cultivars slices were placed under a computer vision system and color digital images were captured. The images were transformed to Lab space color using a quadratic transformation function and the Fourier fractal texture image was used to calculate a fractal dimension value (FD), in order to represent the complexity of lightness intensity distribution (L) over the surface. FD (proposed method) and the mean L value (traditional method) were used indistinctly (as a fractional conversion) to model the enzymatic kinetic using the power-law model. The results showed that the fractal theory can be used to describe the browning kinetic and to distinguish apple cultivars, based on their browning sensitivity under the same experimental conditions. Enzymatic browning rates derived using the fractal kinetic method, were between 14.3 and 23.2 times (in absolute value) higher than the rates calculated with the traditional method. The

fractional first-order model was established only for kinetics calculated using the traditional method.
Keywords: Browning; Computer vision systems; Color; Apple slices; Fractal texture

Daniel Reese, Alan M. Lefcourt, Moon S. Kim, Y. Martin Lo, Using parabolic mirrors for complete imaging of apple surfaces, Bioresource Technology, Volume 100, Issue 19, October 2009, Pages 4499-4506, ISSN 0960-8524, DOI: 10.1016/j.biortech.2008.11.059.
(http://www.sciencedirect.com/science/article/B6V24-4W84GRX-2/2/8fea011ca7fc9a125ab5fe8eed0a560e)
Abstract:
Automated imaging systems offer the potential to inspect the quality and safety of fruits consumed by the public. One problem that has hindered adoption of automated technologies has been the inability to image the complete surface of an individual fruit. A particular problem is that both the stem and calyx are concave structures. The goal of this project was to examine tradeoffs for using multiple mirrors to image the surface of apples. For testing, individual apples were suspended using two thin wires, mirrors were placed around an apple, and movies were captured at 90 images per sec. Apples were rotated in all dimensions to examine the efficacy of different mirror configurations. It was determined that specific configurations of two, four, or six parabolic concave mirrors could image an entire surface. A configuration using two mirrors and multiple images acquired as apples roll by was also found to be viable.
Keywords: Imaging; Parabolic mirrors; Apples; Method; Machine vision

V.P. Valdramidis, W.D. Graham, A. Beattie, M. Linton, A. McKay, A.M. Fearon, M.F. Patterson, Defining the stability interfaces of apple juice: Implications on the optimisation and design of High Hydrostatic Pressure treatment, Innovative Food Science & Emerging Technologies, Volume 10, Issue 4, October 2009, Pages 396-404, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.02.006.
(http://www.sciencedirect.com/science/article/B6W6D-4VSB19S-1/2/84661b4c0d53be8a5797a8fb0e784602)
Abstract:
In this article an experimental approach is applied to determine the impact of High Hydrostatic Pressure (HHP) processing (350 to 550 MPa at 20 [degree sign]C and for 1 to 25 min of holding time) on the survival of Issatchenkia orientalis and the spoilage of apple juice (with 300 ppm added ascorbic acid) during different storage conditions, i.e., 4 to 12 [degree sign]C and 0 to 36 days of storage. Probabilistic modelling approaches based on logistic regression models were developed in order to describe quantitatively the spoilage/no spoilage and survival/death interfaces. For a microbially stable processed apple juice treated at 400 MPa, 10 [degree sign]C and a holding time of 15 min the degradation kinetics of vitamin C were described quantitatively during subsequent storage at 4, 8, 12 [degree sign]C. The rate of vitamin losses were highly reduced after the first 13 days of storage. The stability of the apple juice with respect to browning and cloudiness was evaluated by studying qualitatively the activity of polyphenol oxidase (PPO), and pectin methyl esterase (PME) enzymes at combined treatments of HHP and temperature (10 to 50 [degree sign]C, HHP at 750 MPa and holding time from 1 to 25 min). The highest achieved reduction of PPO and PME was 51.47% and PME 81.44%, respectively.Industrial relevance
This paper demonstrates an approach based on quantitative probabilistic and qualitative studies for defining the stability interfaces of apple juice. Its applicability contributes on the design and optimisation of High Hydrostatic Pressure treatments.
Keywords: Apple juice; Issatchenkia orientalis; Logistic regression; Pectin methyl esterase; Probabilistic modelling; Process optimisation; Stability interfaces; Polyphenol oxidase; Vitamin C

Roman Buckow, Ulrike Weiss, Dietrich Knorr, Inactivation kinetics of apple polyphenol oxidase in different pressure-temperature domains, Innovative Food Science & Emerging Technologies,

Volume 10, Issue 4, October 2009, Pages 441-448, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.05.005.
(http://www.sciencedirect.com/science/article/B6W6D-4W9XDWT-1/2/14a5d78e815640f4c95edd9b7c0ea55a)
Abstract:
The impact of high hydrostatic pressure and temperature on the stability of polyphenol oxidase (PPO) was studied in cloudy apple juice. Application of 200-500 MPa near room temperature or heat treatment at 45-55 [degree sign]C at ambient pressure caused an increase of PPO activity of up to 65% in freshly squeezed apple juice. Combined pressure-temperature inactivation experiments with fully activated PPO (5 min treatment at 400 MPa and 20 [degree sign]C) were carried out in the range of 0.1-700 MPa and 20-80 [degree sign]C. Enzyme inactivation kinetics followed a 2.2 order reaction scheme at all pressure-temperature conditions tested. A polynomial model was successfully applied to describe the rate of PPO inactivation as a function of pressure and temperature and was used to construct a pressure-temperature isokinetic diagram. This diagram clearly showed synergistic effects of pressure and temperature on the inactivation of apple PPO at pressures above 300 MPa and antagonistic effects at lower pressures. Compared to ambient pressure conditions, temperatures required to inactivate PPO in apple juice were increased 10-15 [degree sign]C at 100-300 MPa.Industrial relevance
High pressure processing of fresh fruits is gaining popularity in the food industry because of its ability to inactivate microorganisms and some enzymes near room temperature with little impact on flavour or nutritional attributes of the food. However, quantitative data regarding the impact of process parameters on the target reaction are required to economically utilise this technology. This paper provides a mathematical model describing the combined effect of pressure, temperature and treatment time on the inactivation of PPO in cloudy apple juice.
Keywords: Polyphenol oxidase; Apple; High pressure; Inactivation; Kinetics

Lara Manzocco, Andrea Dri, Barbara Quarta, Inactivation of pectic lyases by light exposure in model systems and fresh-cut apple, Innovative Food Science & Emerging Technologies, Volume 10, Issue 4, October 2009, Pages 500-505, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.06.002.
(http://www.sciencedirect.com/science/article/B6W6D-4WKB18P-1/2/37d6abcf37dad38cfae8a5e2295ff6f1)
Abstract:
UV-C light exposure caused the inactivation of pectin lyases from Aspergillus japonicus and pectate lyase from apple under non-thermal conditions. Samples exposed to 20 W m- 2 UV-C light showed DL values, defined as the time needed for 90% enzyme activity reduction, around 20 min. However, an initial activation phase was observed for fungin pectin lyase, while UV-C light resistant forms of pectate lyase were identified in apple. Lyase inactivation occurred as a consequence of enzyme cleavage into fragments without catalytic activity having MW around 5 kDa. Fresh-cut apple slices exposed for a few minutes to UV-C light resulted significantly firmer than the untreated ones during 4 days of refrigerated storage, reasonably due to the decrease in activity of both endogenous and microbial lyases on the surface of the wound apple tissue.Industrial relevance
UV-C light blanching allows to non-thermally increase the enzymatic stability of the surface of fresh-cut fruit and vegetables.
Keywords: UV-C light; Pectin lyase; Pectate lyase; Blanching; Apple

Lara Manzocco, Barbara Quarta, Andrea Dri, Polyphenoloxidase inactivation by light exposure in model systems and apple derivatives, Innovative Food Science & Emerging Technologies, Volume 10, Issue 4, October 2009, Pages 506-511, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.02.004.
(http://www.sciencedirect.com/science/article/B6W6D-4VP4TMH-2/2/d02fbb188b184bf416cea382b6e04a1e)

Abstract:
The effect of UV-C and visible light on the enzyme polyphenoloxidase was studied in model systems and food. Enzyme inactivation under non thermal conditions was achieved following both UV-C and visible light exposure. UV-C light promoted enzyme inactivation in the entire range of irradiance and exposure time tested whilst visible light was effective only at high doses since lower intensity treatments were associated to enzyme activation. Polyphenoloxidase inactivation upon UV-C light exposure occurred as a consequence of protein aggregations other than those derived from thermal denaturation.
The possibility to apply UV-C light exposure to achieve enzymatic stability of clear apple juice and fresh-cut apple slices was studied. Polyphenoloxidase inactivation in apple juice occurred to the detriment of natural occurring phenols which independently underwent photo oxidation. However, UV-C light exposure for few min prevented enzymatic browning during storage of refrigerated apple slices. The latter resulted comparable to the untreated apple slices from the sensory point of view.Industrial relevance
Light irradiation is very effective in promoting polyphenoloxidase inactivation. UV-C light treatment has a good potential of successful application to achieve enzymatic stability in fresh-cut vegetables under non thermal conditions.
Keywords: UV-C light; Visible light; Polyphenoloxidase; Blanching; Fresh-cut fruit

Pierre A. Picouet, Andreas Landl, Maribel Abadias, Massimo Castellari, Inmaculada Vinas, Minimal processing of a Granny Smith apple puree by microwave heating, Innovative Food Science & Emerging Technologies, Volume 10, Issue 4, October 2009, Pages 545-550, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.05.007.
(http://www.sciencedirect.com/science/article/B6W6D-4WBK7CH-1/2/bf3b5f91973adf27692ba3eab59011de)
Abstract:
Consumers are demanding more 'fresh appearing', more convenient and healthier fruit products. At the same time fruit industries look for technologies to decontaminate fruit products by minimising losses of nutritional and sensorial quality. Microwave heating technology gives the opportunity to have a fast heat process in a continuous mode. Granny Smith apple puree, with natural additives, was prepared and submitted to a) short microwave treatment during 35 s at 652 W. The effects of the treatment were evaluated looking for, the stability of vitamin C, total polyphenol content, as well as viscosity, colour and titratable acidity over a period of two weeks. Its effect on E. coli, L. innocua and indigenous microbiota was evaluated. Results showed that while a reduction of microorganisms was achieved, the treatment could not inactivate the enzymes present in the product and prevent vitamin C degradation. On the other hand the treatment did not affect the stability of the viscosity and titratable acidity during storage period.Industrial relevance
A minimal industrial process of apple products that reduces pathogenic microorganisms, while maintaining nutritional and sensorial attributes is needed to increase the competitiveness of the fruit sector. Short microwave treatment may be a solution to achieve this objective.
Keywords: Minimal processing; Microwave; Apple puree; Total polyphenol content; Nutritional apple quality; Ascorbic acid content; Escherichia coli O157:H7; Listeria innocua; Decontamination; Microbial reduction; Microbial stability; Shelf-life

Yu-Xin Yao, Ming Li, Zhi Liu, Chun-Xiang You, Dong-Mei Wang, Heng Zhai, Yu-Jin Hao, Molecular cloning of three malic acid related genes MdPEPC, MdVHA-A, MdcyME and their expression analysis in apple fruits, Scientia Horticulturae, Volume 122, Issue 3, 1 October 2009, Pages 404-408, ISSN 0304-4238, DOI: 10.1016/j.scienta.2009.05.033.
(http://www.sciencedirect.com/science/article/B6TC3-4WN8HCP-1/2/26e50c1d25ce5c6686530566e7a79898)
Abstract:

Malic acid (MA) in apple fruit is the predominant organic acid associated with taste, flavour and juice quality. In this study, three full-length cDNAs of MdPEPC, MdVHA-A and MdcyME were cloned from apple fruit. They encoded cytosolic phosphoenolpyruvate carboxylase (MdPEPC, EC 4.1.1.31), subunit A of vacuolar H+-ATPase (MdVHA, EC 3.6.1.3) and cytosolic NADP-dependent malic enzyme (MdcyME, EC 1.1.1.40), respectively, for MA synthesis, transportation and degradation. Real-time quantitative PCR discovered that the expression levels of three genes varied with development stages, and that their expression patterns differed between low acid (LA) and high acid (HA) genotypes. In addition, enzyme activity assay showed that PEPC and VHA contributed positively to MA accumulation during fruit development both in LA and HA, while cyME did negatively.
Keywords: Apple; Malic acid; Enzyme; Gene cloning; Expression analysis

Francilene Gracieli Kunradi Vieira, Graciele Da Silva Campelo Borges, Cristiane Copetti, Renata Dias De Mello Castanho Amboni, Frederico Denardi, Roseane Fett, Physico-chemical and antioxidant properties of six apple cultivars (Malus domestica Borkh) grown in southern Brazil, Scientia Horticulturae, Volume 122, Issue 3, 1 October 2009, Pages 421-425, ISSN 0304-4238, DOI: 10.1016/j.scienta.2009.06.012.
(http://www.sciencedirect.com/science/article/B6TC3-4WNGDFG-2/2/05aeb3c58d258917b86d1d3f062317ce)
Abstract:
The objective of this study was to compare the physico-chemical properties and antioxidant activity of six apple cultivars grown in southern Brazil. Apple peel color, dry matter, total soluble solids, pH, total sugars, titratable acidity, total phenolics, total monomeric anthocyanin and total antioxidant activity were measured in the apple cultivars Imperatriz, Daiane, Fred Hough, Fuji Suprema, Galaxy and Baronesa. The results showed great quantitative differences in the composition of the apple cultivars. Of all the cultivars, the peel of Galaxy was slightly more red-colored and that of Fred Hough was the least red-colored. The dry matter varied from 15.24% (Galaxy) to 19.55% (Fuji Suprema), the soluble solids content was between 11.8 (Fred Hough) and 14.0 (Daiane) [degree sign]Brix, pH values varied from 3.90 (Imperatriz) to 4.27 (Fred Hough), the total sugar content (g 100 g-1) ranged from 11.54 (Imperatriz) to 14.78 (Fuji Suprema) and the titratable acidity content (g 100 g-1) varied from 0.20 (Baronesa) to 0.36 (Imperatriz). The total phenolic content (GAE 100 g-1 fresh matter) observed in the apple cultivars was between 105.4 (Baronesa) and 269.7 mg (Imperatriz). The values of the total anthocyanin content (mg 100 g-1 FM) ranged from 4.79 (Fred Hough) to 41.96 (Galaxy). The highest total antioxidant activity was observed in Imperatriz (739 [mu]mol TEAC 100 g-1 FM), while the lowest value was found in Fuji Suprema (335 [mu]mol TEAC 100 g-1 FM). There was a strong correlation between total monomeric anthocyanin content and all peel color measurements and between antioxidant activity and total phenolic content. The results suggested that genotype is the main factor that determines the composition of bioactive compounds in apples and this provides important information on how to make the best use of the apple cultivars investigated.
Keywords: Apple; Physico-chemical analysis; Total phenolics; Anthocyanins; Antioxidant activity

H. Llaneza Coalla, J.M. Blanco Fernandez, M.A. Moris Moran, M.R. Lopez Bobo, Biogas generation apple pulp, Bioresource Technology, Volume 100, Issue 17, September 2009, Pages 3843-3847, ISSN 0960-8524, DOI: 10.1016/j.biortech.2009.03.012.
(http://www.sciencedirect.com/science/article/B6V24-4W0R3CJ-7/2/7070077a0f917764cc5b8c60b8b390bc)
Abstract:
In view of the pressing problem that appears in our region (Asturias, north of Spain) with the residues from the cider production, it was decided to test this kind of material as a co-substrate joint with slaughterhouse waste in a laboratory unit.

The anaerobic digestion of apple pulp was investigated for biogas production. This paper presents the results where apple pulp was co-digested with slaughterhouse waste (pig intestine and bovine stomach content) in a biogas laboratory unit (10 l CSTR reactor).
The production of biogas has reached very satisfactory values during the whole test (0.8 m3 kg-1 OTS), verifying that the process is kept in stable conditions of pH (near 8.0), and the volatile fatty acids was always underneath 3000 mg/l, when the pulp amount was lower than 100 g in mesophilic conditions.
The fat concentration into the digester remained always below the value that causes inhibition of the methanogenic bacteria, 500 mg/l. Finally, methane concentration (77-80%) and H2S concentration (400 ppm) in the biogas, they were similar to those obtained when the test was run out in the absence of apple pulp. The process efficiency with respect to COD removal was high, near 80% of the total COD. Finally, inhibitory effects of methanogenic bacteria were observed when pulp concentration was around 10% in the input material.
Keywords: Anaerobic co-digestion; Apple pulp; Slaughterhouse waste; Anaerobic continuous reactor; Mesophilic process

D. Molina-Delgado, S. Alegre, P. Barreiro, C. Valero, M. Ruiz-Altisent, I. Recasens, Addressing potential sources of variation in several non-destructive techniques for measuring firmness in apples, Biosystems Engineering, Volume 104, Issue 1, September 2009, Pages 33-46, ISSN 1537-5110, DOI: 10.1016/j.biosystemseng.2009.05.004.
(http://www.sciencedirect.com/science/article/B6WXV-4WPHRGX-2/2/b8b6ec2bbabc567e03adc38d8d956d98)
Abstract:
Measurements of firmness have traditionally been carried out according to the Magness Taylor (MT) procedure; using a texture analyser or penetrometer in reference texture tests. Non-destructive tests like the acoustic impulse response of acoustic firmness sensors (AFSs), a low-mass impact firmness sensor Sinclair International (SIQ-FT) and impact test (Lateral Impact - UPM) have also been used to measure texture and firmness. The objectives of this study were to evaluate the influence of different sources of variation in these three non-destructive tests and to evaluate their respective capabilities of discriminating between fruit maturity at two different harvest dates, turgidity before and after dehydration treatment and ripening after different storage periods. According to our results, fruit studied an unexpected AFS trend with turgidity. Contact measurements (Lateral Impact - UPM and SIQ-FT) appeared highly sensitive to changes in turgidity, but were less able to follow changes in ripening caused by storage period. Contact measurements were suitable for detecting differences between fruits from different harvest dates and showed higher correlation coefficients with reference texture tests than acoustic measurements. The Lateral Impact - UPM test proved better at separating fruits according to turgidity than the SIQ-FT instrument.

A.M. Lefcourt, P. Narayanan, U. Tasch, M.S. Kim, D. Reese, R. Rostamian, Y.M. Lo, Orienting apples for imaging using their inertial properties and random apple loading, Biosystems Engineering, Volume 104, Issue 1, September 2009, Pages 64-71, ISSN 1537-5110, DOI: 10.1016/j.biosystemseng.2009.06.002.
(http://www.sciencedirect.com/science/article/B6WXV-4WPS9KW-1/2/64d7e2830929e582a928f826ebd5e8f7)
Abstract:
The inability to control apple orientation during imaging has hindered the development of automated systems for sorting apples for defects such as bruises and for safety issues such as faecal contamination. Recently, a potential method for orienting apples based on their inertial properties was discovered. To test this method, apples were rolled down a track consisting of two parallel rails. As angular velocity increased, apples generally moved to an orientation where the

stem/calyx axis was parallel to the plane of the track and perpendicular to the direction of travel. However, theoretical analyses and experimental results have demonstrated that select initial loading conditions could prevent or impede this orientation process. In this study, the practical importance of initial loading conditions was tested using two different methods to randomly load apples onto a track. Replicate tests indicated that successful orientation at rates of about 80% for Red and Golden Delicious cultivar apples was random, and that only 5% of the apples exhibited undesirable loading condition and orientation. Results suggest that a commercially viable orientation system could be developed by recycling apples that are not oriented during imaging, and that it should be possible to improve single-pass orientation rates by addressing track compliance and loading velocity issues.

Agustin Rascon-Chu, Ana Luisa Martinez-Lopez, Elizabeth Carvajal-Millan, Nora E. Ponce de Leon-Renova, Jorge A. Marquez-Escalante, Alejandro Romo-Chacon, Pectin from low quality `Golden Delicious' apples: Composition and gelling capability, Food Chemistry, Volume 116, Issue 1, 1 September 2009, Pages 101-103, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.02.016.
(http://www.sciencedirect.com/science/article/B6T6R-4VM9KB6-5/2/8c97667b4a752dcba53126aa4bfc74e3)
Abstract:
Pectin was acid-extracted from low quality `Golden Delicious' apple fruit, yielding 16% (w pectin/w apple fruit). Composition and some of its physicochemical and functional properties were assessed. The pectin fraction presented a galacturonic acid content of 65% (w/w), an esterification degree of 57%, an intrinsic viscosity, [[eta]], of 307 ml/g and a molecular weight (Mw) of 112 kDa. Pectin gels were obtained in 60% (w/v) fructose and pH 2.7. Pectin gels at 2.0% and 3.0% (w/v) presented hardness values of 10.2 and 20.4 g after 12 h at 4 [degree sign]C. The gel hardness was greatly affected by aging (20% and 25% decrease in 48 h for gels at 2% and 3%, respectively). The results attained suggest the use of this gum as a potential texturing agent for the food industry.
Keywords: Apple fruit; Pectin; Gels

Piotr Baranowski, Wojciech Mazurek, Barbara Witkowska-Walczak, Cezary Slawinski, Detection of early apple bruises using pulsed-phase thermography, Postharvest Biology and Technology, Volume 53, Issue 3, September 2009, Pages 91-100, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2009.04.006.
(http://www.sciencedirect.com/science/article/B6TBJ-4WNPDHK-1/2/a5c38e19cee67fa73bbf46d4b03b304f)
Abstract:
The study is based on a hypothesis that internal defects and physiological disorders of fruit lead to changes in tissue thermal properties. During thermal stimulation, heterogeneities of thermal properties lead to the occurrence of thermal contrasts on the surface of fruit material, which can be successfully registered with the use of a thermographic device. A method was developed to detect apple bruising early using pulsed-phase thermography (PPT). In PPT the studied object is heated with an individual thermal pulse (most frequently a rectangular pulse) and the temperature decay on the surface is analysed on a pixel-by-pixel basis as a mixture of harmonic waves, thus enabling the computation of phase and amplitude images. The fast Fourier transform was used to obtain ampligrams and phasegrams of fruit heat response to defects occurring at different depths. The automatic segmentation procedure made it possible to select areas of bruised tissue in thermograms. A comparison of PPT results and visual inspection of bruising was performed, indicating high possibilities of the active thermography method for detecting defects up to several millimetres.
Keywords: Apple bruise detection; Pulsed-phase thermography; Heat conduction in fruit

Isabel Alegre, Maribel Abadias, Marina Anguera, Marcia Oliveira, Inmaculada Vinas, Factors affecting growth of foodborne pathogens on minimally processed apples, Food Microbiology, In Press, Accepted Manuscript, Available online 27 August 2009, ISSN 0740-0020, DOI: 10.1016/j.fm.2009.08.005.
(http://www.sciencedirect.com/science/article/B6WFP-4X3DMVY-1/2/ee2e26ab956ff55a49894c606bbf3374)
Abstract:
Escherichia coli O157:H7, Salmonella and Listeria innocua increased by more than 2 log10 units over a 24 h period on fresh-cut `Golden Delicious' apple plugs stored at 25 and 20 [degree sign]C. L. innocua reached the same final population level at 10 [degree sign]C meanwhile E. coli and Salmonella only increased 1.3 log10 units after 6 days. Only L. innocua was able to grow at 5 [degree sign]C. No significant differences were observed between the growth of foodborne pathogens on fresh-cut `Golden Delicious', `Granny Smith' and `Shampion' apples stored at 25 and 5 [degree sign]C. The treatment of `Golden Delicious' and `Granny Smith' apple plugs with the antioxidants, ascorbic acid (2 %) and NatureSeal(R) (6 %), did not affect pathogen growth. The effect of passive modified atmosphere packaging (MAP) on the growth of E. coli, Salmonella and L. innocua on `Golden Delicious' apple slices was also tested. There were no significant differences in growth of pathogens in MAP conditions compared with air packaging of `Golden Delicious' apple plugs, but the growth of mesophilic and psychrotrophic microorganisms was inhibited. These results highlight the importance of avoiding contamination of fresh-cut fruit with foodborne pathogens and the maintenance of the cold chain during storage until consumption.
Keywords: temperature; variety; antioxidant substances; modified atmosphere packaging; Escherichia coli; Salmonella; Listeria innocua

M. Vanoli, P. Eccher Zerbini, L. Spinelli, A. Torricelli, A. Rizzolo, Polyuronide content and correlation to optical properties measured by time-resolved reflectance spectroscopy in `Jonagored' apples stored in normal and controlled atmosphere, Food Chemistry, Volume 115, Issue 4, 15 August 2009, Pages 1450-1457, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2009.01.081.
(http://www.sciencedirect.com/science/article/B6T6R-4VJ0DSD-4/2/ac8447eab634f57edb7fc0867529412e)
Abstract:
Time-resolved reflectance spectroscopy (TRS) studies on fruit have shown that the absorption coefficient ([mu]a) at 670 nm is a good maturity index and that the scattering coefficient () at 780 nm allows an insight into the textural properties of apples. This work aimed at studying the relationship between the polyuronide pattern, firmness and TRS optical properties ([mu]a and) at 630, 670, 750 and 780 nm measured in `Jonagored' apples at harvest, after 6 months' storage in normal (NA) and controlled atmosphere (CA), and after 7 days of post-storage shelf life at 20 [degree sign]C. Results showed that fruit of different TRS maturity class had a different polyuronide content, even if their firmness was not different: `less mature' (high [mu]a630) fruit compared to `more mature' (low [mu]a630) ones showed at harvest higher total galacturonic acid (GA) content, residue insoluble pectin (RIP) and protopectin index (PI), and lower GA content in oxalate-soluble pectin (OSP) fraction, indicating a less advanced breakdown of insoluble protopectins to soluble pectins. The [mu]a630 and [mu]a670 were correlated to alcohol-insoluble substances (AIS) and GA content in RIP measured after storage: as maturity increased, GA decreased in RIP, showing pectin solubilisation. AIS, water-soluble pectin (WSP), RIP and PI measured after storage were highly correlated to scattering coefficients measured after storage. Generally, with increasing , AIS and GA in WSP increased while firmness, RIP and PI decreased. CA apples were characterised by lower values than NA ones, along with lower WSP and OSP and higher total GA, RIP and PI.

Keywords: Apples; Pectin composition; Time-resolved reflectance spectroscopy; Non-destructive method; Storage; Normal atmosphere; Controlled atmosphere; Scattering coefficient; Absorption coefficient

Laura Schechter, The Apple and Your Eye: Visual and Taste Rank-Ordered Probit Analysis with Correlated Errors, Food Quality and Preference, In Press, Accepted Manuscript, Available online 14 August 2009, ISSN 0950-3293, DOI: 10.1016/j.foodqual.2009.08.009.
(http://www.sciencedirect.com/science/article/B6T6T-4X0PBYN-1/2/89bfb0277e5ad02f024a2977110e763d)
Abstract:
I look at data from an experiment in which people rank apples according to how they think they will taste. They are then blindfolded and rank how they actually taste. I estimate a multinomial rank-ordered probit model with correlated errors between the taste and visual rankings. I find that the errors for visual characteristics are correlated based on coloring, while the errors for taste are correlated based on sweetness and tartness. Allowing for correlation between the errors in the two regressions shows that, although people often misperceive apple taste based upon visual cues, they do so in systematic ways. People who prefer the looks of an apple they think to be tart (Granny Smith), will like the taste of other apples which are also tart but less well-known (Jonagold).

Niranjala Perera, T.V. Gamage, L. Wakeling, G.G.S. Gamlath, C. Versteeg, Colour and texture of apples high pressure processed in pineapple juice, Innovative Food Science & Emerging Technologies, In Press, Accepted Manuscript, Available online 12 August 2009, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.08.003.
(http://www.sciencedirect.com/science/article/B6W6D-4X087GT-2/2/d697bccb64b0eb381c1161eb31cdcf2b)
Abstract:
Cubes of Granny Smith and Pink Lady apples were vacuum packed in barrier bags with 0% to 50% (v/v) pineapple juice (PJ) at Brix 20[degree sign] and subjected to high pressure processing (HPP) at 600 MPa for 1-5 min (22 [degree sign]C). The in-pack total colour change ([Delta]E) was observed over 4 weeks at 4 [degree sign]C. Within < 1 week of storage at 4 [degree sign]C, texture, polyphenoloxidase, pectinmethylesterase activities, changes in [Delta]E and visual browning after opening the bags during air exposure (22 [degree sign]C; 21% O2) for 5 h were also monitored. During the 4 weeks storage in bag visible colour changes were not observed. Texture and [Delta]E after 5 h air exposure were significantly affected by the apple variety, HPP time and % PJ used. The combined treatment significantly reduced residual PPO activity while PME activity was not affected in both varieties. Pineapple juice in combination with HPP could be used as a natural preservation system for minimally processed apples.
Keywords: high pressure processing; minimal processing; enzymatic browning; texture; pineapple juice; apples

Yi Zhu, Zhongli Pan, Tara H. McHugh, Diane M. Barrett, Processing and Quality Characteristics of Apple Slices Processed under Simultaneous Infrared Dry-blanching and Dehydration with Intermittent Heating, Journal of Food Engineering, In Press, Accepted Manuscript, Available online 4 August 2009, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2009.07.021.
(http://www.sciencedirect.com/science/article/B6T8J-4WXHBNS-2/2/32510ee9a39ccd1fc369c0a260bff54e)
Abstract:
This study investigated the effects of three processing parameters, e.g. product surface temperature, slice thickness and processing time, on blanching and dehydration characteristics of apple slices exposed to simultaneous infrared dry-blanching and dehydration (SIRDBD) with

intermittent heating. A three-factor factorial experiment design was conducted to determine the influence of processing parameters on product temperature, moisture reduction, drying rate, residual polyphenol oxidase (PPO) and peroxidase (POD) activities and surface color change. Slice thickness had a significant effect on product quality and processing characteristics, as faster inactivation of enzymes and quicker moisture reduction took place in thinner slices. A Page model performed well for describing drying behavior during the treatment, and first-order kinetics and a biphasic model fit well for PPO and POD inactivation, respectively. Surface color changes ([Delta]E) of apple slices during prolonged heating resulted from non-enzymatic browning with an increase in b value was observed. In order to achieve a 1 log reduction in POD activity, the process resulted in a reduction in moisture from 20% to 59% and in [Delta]E from 2.27 to 5.59. It is suggested that SIRDBD with intermittent heating could be used as an alternative to manufacture high quality blanched and partially dehydrated fruits and vegetables.
Keywords: Blanching; Partial drying; Apple; Infrared; Intermittent heating

Jianwei Qin, Renfu Lu, Monte Carlo simulation for quantification of light transport features in apples, Computers and Electronics in Agriculture, Volume 68, Issue 1, August 2009, Pages 44-51, ISSN 0168-1699, DOI: 10.1016/j.compag.2009.04.002.
(http://www.sciencedirect.com/science/article/B6T5M-4WCK056-1/2/4a21c5b95d935e98bd039a6676d5c1f0)
Abstract:
Light interaction with turbid biological materials involves absorption and scattering. Quantitative understanding of light transport process and features in the fruit is critical to designing better optical systems for inspection of food quality. This paper reports on the quantification of light transport in the apple fruit in the visible and short-wavelength near-infrared region using Monte Carlo simulations. The absorption and reduced scattering coefficients ([mu]a and [mu]'s, respectively) of 600 `Golden Delicious' apples were determined over the spectral range of 500-1000 nm using a spatially resolved hyperspectral imaging method coupled with a diffusion theory model. The [mu]a and [mu]'s values were used in Monte Carlo (MC) models to simulate light transport in the fruit tissue. MC simulation models were validated against the diffusion theory model and experimental data. The patterns of diffuse reflectance, internal absorption, and light penetration depth were determined using typical values of [mu]a and [mu]'s for the apples. Simulation results showed that up to 96.4% of the photons were absorbed under the maximum absorption condition, while 75.9% photons exited as diffuse reflectance for the maximum scattering case. The optimum sensing range under our imaging system setup was found to be 1-11 mm for `Golden Delicious' apples. Fruit tissue with a larger [mu]a value absorbed light energy rapidly in short depth and radial distances, whereas light in the tissue with small [mu]'s values tended to propagate forward to the deeper area of the sample. Light penetration depths in `Golden Delicious' apples, defined as the depths at which the incident light was reduced by 99%, were in the range of 0.43-8.67 cm over the 500-1000 nm spectral range, with a majority of the samples (approximately 68%) in the range of 0.81-4.48 cm. Pigments and water in the fruit tissue greatly influenced light penetration depth.
Keywords: Hyperspectral imaging; Optical properties; Fruits; Light transport; Monte Carlo simulation

Glynn C. Percival, Kelly Noviss, Ian Haynes, Field evaluation of systemic inducing resistance chemicals at different growth stages for the control of apple (Venturia inaequalis) and pear (Venturia pirina) scab, Crop Protection, Volume 28, Issue 8, August 2009, Pages 629-633, ISSN 0261-2194, DOI: 10.1016/j.cropro.2009.03.010.
(http://www.sciencedirect.com/science/article/B6T5T-4W14HJ4-1/2/efa3f7e70d4013be87a4bed0cc218b14)
Abstract:

Two field trials were conducted using established apple (Malus cv. Golden Delicious) and pear (Pyrus communis `Williams' Bon Chretien') to assess the efficacy of three commercially available systemic inducing resistance (SIR) products, Messenger (a.i. Harpin protein), Phoenix (a.i. Potassium phosphite) and Rigel (a.i. Salicylic acid derivative) applied at four different growth stages of tree development (bud break, green cluster, 90% petal fall, early fruitlet) against the foliar pathogens Venturia inaequalis and Venturia pirina which cause apple and pear scab respectively. A conventional synthetic fungicide (penconazole) used within the UK for apple and pear scab control was included for comparison. Little efficacy as scab protectants was demonstrated when each SIR product and penconazole was applied at only two growth stages (bud break, green cluster). However when the above compounds were applied at three or more growth stages efficacy as scab protectants was confirmed. The synthetic fungicide penconazole provided greatest protection against apple and pear scab in both the 2006 and 2007 field trials. There was little difference in the magnitude of scab protection conferred by each SIR agent. Results suggest application of at least three sprays during bud break to early fruitlet formation with an appropriate SIR agent may provide a useful addition to existing methods of apple and pear scab management under field conditions.
Keywords: Pathogen control; Urban landscapes; Orchard management; Plant health care; Integrated disease management; Fungicides

Nicole J. Bone, Linda J. Thomson, Peter M. Ridland, Peter Cole, Ary A. Hoffmann, Cover crops in Victorian apple orchards: Effects on production, natural enemies and pests across a season, Crop Protection, Volume 28, Issue 8, August 2009, Pages 675-683, ISSN 0261-2194, DOI: 10.1016/j.cropro.2009.03.021.
(http://www.sciencedirect.com/science/article/B6T5T-4W5M04X-2/2/d5e5ce12f73d8ca61f295ec2c705694e)
Abstract:
Cover crops have the potential to decrease chemical use against pests through promoting an increase in natural enemies providing fortuitous control, particularly in horticultural industries. Suitable plants must be able to grow in appropriate conditions and not compete for nutrients or water. Plants selected for potential beneficial effects on natural enemies without providing resources for hosts were grown as cover crops in three 5-6 year old apple orchards in Victoria, Australia, and compared to two common current practices, volunteer grasses and a commercially available grass mix. The cover crops tested - Queen Anne's lace Ammi majus/fennel Foeniculum vulgare (Apiaceae), chicory Cichorium intybus/yarrow Achillea millefolium (Asteraceae), white mustard Sinapis alba (Brassicaceae), buckwheat Fagopyrum esculentum (Polygonaceae) and fenugreek Trigonella foenum-graecum (Fabaceae) - established at some locations but reseeding was poor. By assessing natural enemies and insect pests across a season with yellow sticky traps, direct searching and an examination of fruit, we found no evidence for an increase in natural enemy activity in the apple trees, but evidence for increased pest and russeting problems as well as a detrimental effect on production in some treatments. These results emphasise the importance of local testing; while cover crops might increase numbers of beneficials under controlled conditions, beneficial effects may not extend to commercial settings particularly in areas with limited (<800 mm) annual rainfall.
Keywords: Cover crops; Natural enemies; Apples; Queen Anne's lace; Fennel; Chicory; Yarrow; White mustard; Buckwheat; Fenugreek

Pilar Martinez Viedma, Hikmate Abriouel, Angel Sobrino Lopez, Nabil Ben Omar, Rosario Lucas Lopez, Eva Valdivia, Olga Martin Belloso, Antonio Galvez, Effect of enterocin AS-48 in combination with high-intensity pulsed-electric field treatment against the spoilage bacterium Lactobacillus diolivorans in apple juice, Food Microbiology, Volume 26, Issue 5, August 2009, Pages 491-496, ISSN 0740-0020, DOI: 10.1016/j.fm.2009.03.001.

(http://www.sciencedirect.com/science/article/B6WFP-4VVR1VF-1/2/fb2f5df68a0f9c4efb6467d736e99135)
Abstract:
Enterocin AS-48 was tested in apple juice against the cider-spoilage, exopolysaccharide-producing strain Lactobacillus diolivorans 29 in combination with high-intensity pulsed-electric field (HIPEF) treatment (35 kV/cm, 150 Hz, 4 [mu]s and bipolar mode). A response surface methodology was applied to study the bactericidal effects of the combined treatment, with AS-48 concentration and HIPEF treatment time as process variables. At subinhibitory bacteriocin concentrations, microbial inactivation by the combined treatment increased as the bacteriocin concentration and the HIPEF treatment time increased (from 0.5 to 2.0 [mu]g/ml and from 100 to 1000 [mu]s, respectively). Highest inactivation (4.87 logs) was achieved by 1000 [mu]s HIPEF treatment in combination with 2.0 [mu]g/ml AS-48. While application of treatments separately did not protect juice from survivors during storage, survivors to the combined treatment were inactivated within the following 24 h of storage, and the treated samples remained free from detectable lactobacilli for at least 15 days at temperatures of 4 [degree sign]C as well as 22 [degree sign]C. The combined treatment could be useful for inactivation of exopolysaccharide-producing L. diolivorans in apple juice.
Keywords: Cider spoilage; Bacteriocin; Pulsed-electric fields; Lactobacillus

Sophie Chassagne-Berces, Cecile Poirier, Marie-Francoise Devaux, Fernanda Fonseca, Marc Lahaye, Giuseppe Pigorini, Christel Girault, Michele Marin, Fabienne Guillon, Changes in texture, cellular structure and cell wall composition in apple tissue as a result of freezing, Food Research International, Volume 42, Issue 7, August 2009, Pages 788-797, ISSN 0963-9969, DOI: 10.1016/j.foodres.2009.03.001.
(http://www.sciencedirect.com/science/article/B6T6V-4VTKKR1-2/2/eb2ec78fb36e3443444518285841e5e4)
Abstract:
Apple texture is one of the critical quality features for the consumer. Texture depends on several factors that are difficult to control and which change with freezing. To better understand the mechanisms involved in the texture degradation of apple tissues following freezing/thawing, our approach was to combine mechanical properties, cellular structure and cell wall composition measurements on fresh and thawed apples (Granny Smith) after three different freezing protocols (at -20 [degree sign]C, -80 [degree sign]C and -196 [degree sign]C). This work highlighted the interest of applying macrovision and image texture analysis to quantify the freezing effects on cellular structure and ice crystal size. Freezing at -20 [degree sign]C and after immersion into liquid nitrogen were the protocols affecting the most fruit texture leading to cell membrane breakage resulting in cell wall collapse and tissue breakage, respectively, which accounted for the mechanical behaviour of the samples. All freezing protocols induced vacuole burst showing that the turgor pressure preservation remains critical during the freezing process.
Keywords: Fruit; Freezing rates; Physical parameters; Macrovision; CLSM; Cryo-SEM; Structure; Cell wall; Image texture analysis; Granulometry

Guoqiang Fan, Jianwen Zha, Ran Du, L. Gao, Determination of soluble solids and firmness of apples by Vis/NIR transmittance, Journal of Food Engineering, Volume 93, Issue 4, August 2009, Pages 416-420, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2009.02.006.
(http://www.sciencedirect.com/science/article/B6T8J-4VM9K6G-1/2/daccc93af559f701ed6dfc4e0c7d633c)
Abstract:
Firmness and soluble solids content (SSC) of Red Fuji apples were examined by Vis/NIR transmittance to find out factors to be considered in online detection. Four arrangements of light source and fruit-orientation were investigated. The wavelength range of 650-920 nm was selected

and two types of data pre-processing were used to enhance the precision of calibration models based on partial least square (PLS). The results show the precision of determination can be improved by using second derivate. The best fruit-orientation was the stem-calyx axis was vertical and the fruit surface was illuminated from the upper side. The precision of determination was enhanced by using multi lamps. According to the high grade of apple to export (SSC [greater-or-equal, slanted] 14 [degree sign]Brix, firmness [greater-or-equal, slanted] 8.0 kg/cm2), the classifying correctness was 86%. Validation models for SSC and firmness had a r2 of 0.9532 and 0.8136, as well as, SEP of 0.3838 and 0.5344, respectively.
Keywords: Near infrared spectroscopy; Fruit quality; Apple; Non-destructive analysis; [degree sign]Brix; Firmness

V.H. Tournas, S. Uppal Memon, Internal contamination and spoilage of harvested apples by patulin-producing and other toxigenic fungi, International Journal of Food Microbiology, Volume 133, Issues 1-2, 31 July 2009, Pages 206-209, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2009.05.025.
(http://www.sciencedirect.com/science/article/B6T7K-4WD7B1X-1/2/2bb43e3f178c959a62f62c7136311c2a)
Abstract:
A total of 424 apple samples comprised of six varieties (Gala, Red Delicious, Golden Delicious, Fuji, Granny Smith, and Braeburn) were analyzed for internal fungal contamination. Two hundred sixteen apples were incubated intact for 2-4 weeks at room temperature. The cores of the remaining 208 apples were aseptically removed and incubated without supplemental media at room temperature for 3 weeks. After the incubation period was over, the mycological profiles of the analyzed samples were determined. Twelve per cent of the intact apples showed visible growth after 2-4 weeks of incubation at room temperature. Penicillia (including the patulin producer, Penicillium expansum) were the most frequent, found in 8% of the samples followed by Fusarium and Alternaria spp. (each found in 3% of the samples tested). The highest mould incidence was observed in the Red Delicious and Fuji and the lowest in the Granny Smith variety.
A variety of microfungi including members of the toxigenic genera Alternaria, Penicillium and Fusarium were isolated from the apple cores. The predominant moulds were Alternaria, Cladosporium, Penicillium and Fusarium spp. recovered from 50, 22, 33 and 23% of the analyzed samples, respectively. Less common were Ulocladium spp., Botrytis cinerea and Aureobasidium pullulans found in less than 4% of the samples. Yeasts were found only in 2% of the samples. Apple cores from all varieties tested showed a high degree of mould contamination.
Keywords: Toxigenic moulds; Apples; Internal contamination

Mark Swanson, Adam Branscum, Peace Julie Nakayima, Promoting consumption of fruit in elementary school cafeterias. The effects of slicing apples and oranges, Appetite, In Press, Corrected Proof, Available online 25 July 2009, ISSN 0195-6663, DOI: 10.1016/j.appet.2009.07.015.
(http://www.sciencedirect.com/science/article/B6WB2-4WVF6HC-1/2/aea335c928b3c147bf05ded077538470)
Abstract:
We examined how slicing apples and oranges affected elementary students' selection and consumption of fruit. Slicing increased the percentage of children selecting and consuming oranges, while a similar effect was not found for apples. The impact of slicing fruit was greatest among younger students. These findings suggest that school cafeterias can increase accessibility and consumption of foods through simple, inexpensive food preparation techniques, with the impact of such measures varying by foods and student characteristics.
Keywords: Fruit; Children; School lunch; Accessibility

Hilde Henny Wijngaard, Nigel Brunton, The optimisation of solid-liquid extraction of antioxidants from apple pomace by response surface methodology, Journal of Food Engineering, In Press, Corrected Proof, Available online 18 July 2009, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2009.07.010.
(http://www.sciencedirect.com/science/article/B6T8J-4WSY46V-1/2/50411d19ab9764b49f7ad01ea586bb26)
Abstract:
Response surface methodology using two food grade solvents, acetone and ethanol, was used to optimise antioxidant extraction from industrially generated apple pomace. Efficiency of extraction was optimised by measuring antioxidant activity, phenol content and three individual polyphenol groups. Conditions for optimal antioxidant activity as measured by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay were 56% ethanol, 80 [degree sign]C and 31 min. Using these conditions an antioxidant value of 444 mg Trolox/100 g DW was obtained. For acetone extraction the optimal conditions were 65% acetone, 25 [degree sign]C and 60 min, resulting in an antioxidant value of 436 mg Trolox/100 g DW. Both ethanol and acetone would be suitable to replace methanol for a food grade and more environmental friendly solid-liquid extraction of antioxidants.
Keywords: Antioxidant activity; By-products; Polyphenols; Chlorogenic acid; Flavonols; DPPH; FCR

Flavia Gasperi, Eugenio Aprea, Franco Biasioli, Silvia Carlin, Isabella Endrizzi, Giuseppe Pirretti, Sara Spilimbergo, Effects of supercritical CO2 and N2O pasteurisation on the quality of fresh apple juice, Food Chemistry, Volume 115, Issue 1, 1 July 2009, Pages 129-136, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.11.078.
(http://www.sciencedirect.com/science/article/B6T6R-4V3546D-2/2/3f064eb21be93961831d3cee0ed80c34)
Abstract:
Supercritical pasteurisation is receiving increasing attention as an alternative technology for foodstuff pasteurisation, but often the possible effects on the perceptible quality are not sufficiently considered.
To address this latter issue, besides standard microbial analysis, we here investigate the impact of CO2/N2O supercritical pasteurisation (100 bar, 36 [degree sign]C and 10 min treatment time) on the quality traits of fresh apple juice, linked to consumer perception. Discriminative sensory analysis (triangle test) and basic chemical characterization (total solids, sugars, organic acids, polyphenols) could not clearly demonstrate any induced modification of the treated juice, while head space analysis of volatile compounds (both by GC-MS and PTR-MS) indicated a general depletion of the volatile compounds that must be considered in the development of a stabilization method based on supercritical gases.
Keywords: Supercritical pasteurisation; Dense carbon dioxide; Dense nitrous oxide; Apple juice; Sensory triangle test; Chemical characterization; Headspace analysis; SPME/GC-MS; PTR-MS

S.C. Cunha, M.A. Faria, J.O. Fernandes, Determination of patulin in apple and quince products by GC-MS using 13C5-7 patulin as internal standard, Food Chemistry, Volume 115, Issue 1, 1 July 2009, Pages 352-359, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.11.074.
(http://www.sciencedirect.com/science/article/B6T6R-4V3546D-4/2/cb659633142378cac6dfe35c95f2e1aa)
Abstract:
A reliable gas chromatographic mass spectrometric method has been validated for the determination of trace levels (<10 [mu]gL-1) of patulin in apple products and quince jam. The method was based on extraction of patulin with ethyl acetate-hexane, alkalinisation and silylation with N,O-bis-trimethylsilyltrifluoroacetamide with 1% of trimethylchloro-silane. The accurate

determination of patulin was achieved by employing commercial 13C5-7 patulin labelled as an internal standard, which allowed compensating target analyte losses and enhancement or suppression matrix effects. Limits of detection and quantification of method using real samples were 0.4 and 1.6 [mu]gkg-1, respectively. Recoveries of patulin from samples spiked at 8-50 [mu]gkg-1 levels ranged between 71% and 89%. The repeatability of measurements (expressed as relative standard deviation) was lower than 16%. The method was successfully applied to the determination of patulin in apple fruit and apple products including juice, cider and baby food, and also in quince fruit and quince jam. A new PCR system for the detection of Penicillium expansum in samples containing highly degraded DNA was developed which permitted the detection of the mould in 2/3 of the samples containing patulin, including juices and jams.
Keywords: Patulin; Gas chromatography-mass spectrometry (GC-MS); Apple products; Quince jam; PCR; Penicillium expansum

E. Hernandez, M. Raventos, J.M. Auleda, A. Ibarz, Concentration of apple and pear juices in a multi-plate freeze concentrator, Innovative Food Science & Emerging Technologies, Volume 10, Issue 3, July 2009, Pages 348-355, ISSN 1466-8564, DOI: 10.1016/j.ifset.2009.02.001.
(http://www.sciencedirect.com/science/article/B6W6D-4VKDMWG-1/2/2628ebcfbab76ef8369029e5a428a634)
Abstract:
In this article we will examine the process for concentration of apple and pear juices as well as concentration of sugar solutions modelling pear juice (simulation fluid) using a descending film multi-plate freeze concentrator. It has been determined in advance the freezing point of those fluids in the working concentration and temperature intervals. In addition, different parameters were studied to allow tracking of the process of freeze concentration, such as ice accumulation, variation of the content of soluble solids in the solution and in the ice removed, ice production and energy consumption. The apple and pear juices tested showed similar behaviour, while the mixture of sugars used for simulation showed better behaviour, due perhaps to the absence of foam in the process and to the quicker formation of ice. It has been obtained concentrations of 30.2 and 30.8 [degree sign]Bx with the apple and pear juices, respectively, and up to 32.7 [degree sign]Bx with the simulation fluid.Industrial relevance
The clarified juices usually are concentrated on an evaporation stage. In this stage the juice is subjected to high temperatures that cause undesirable reactions, such as non enzymatic browning and destruction of nutritive compounds. The freeze concentration is a technology that allows eliminating water from the juices at temperatures below the water's freezing point, what allows obtaining products of better quality. In this work has been applied this technology to concentrate apple and pear juices, obtaining promissory results.
Keywords: Freeze concentration; Apple and pear Juice; Multi-plate cryoconcentrator

Hannah J. James, Jenny J. Jobling, Contrasting the structure and morphology of the radial and diffuse flesh browning disorders and CO2 injury of `Cripps Pink' apples, Postharvest Biology and Technology, Volume 53, Issues 1-2, July-August 2009, Pages 36-42, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2009.02.001.
(http://www.sciencedirect.com/science/article/B6TBJ-4W3P04Y-1/2/f2842c9ef5b25368df486070744c94d9)
Abstract:
Flesh browning of `Cripps Pink' apples has been categorised into three separate disorders based on visual symptoms and cell morphology. Radial flesh browning (RFB) was identified by browning of the vascular tissue, in contrast diffuse flesh browning (DFB) was identified as browning of the cortex tissue. Carbon dioxide injury of `Cripps Pink' apples was identified by the formation of pits and cavities in the flesh of the fruit. The area of affected tissue within the fruit had a different distribution for the RFB and DFB disorders. The area of tissue affected by RFB was highest at the

stem end of the fruit decreasing towards the calyx end. In contrast the area of tissue affected by DFB was highest at the stem and calyx ends of the fruit and lowest in the middle section. Examination by scanning electron microscope (SEM) revealed that RFB and DFB were structurally different. The RFB disorder was associated with fractured cell walls whereas the DFB disorder was associated with the collapse of cells. Analysis of mineral nutrition and fruit density showed inconsistent relationships to the development of RFB and DFB of `Cripps Pink' apples.
Keywords: Apple; Chilling injury; Carbon dioxide injury; Storage; Malus x domestica; Flesh browning; Cripps Pink; Pink Lady; Mineral content; Density

Quan-Ying Wang, Dong-Mei Zhou, Long Cang, Microbial and enzyme properties of apple orchard soil as affected by long-term application of copper fungicide, Soil Biology and Biochemistry, Volume 41, Issue 7, July 2009, Pages 1504-1509, ISSN 0038-0717, DOI: 10.1016/j.soilbio.2009.04.010.
(http://www.sciencedirect.com/science/article/B6TC7-4W6VMYD-4/2/19505966d01f5f70f23e2a63aacbefdd)
Abstract:
Copper-based fungicides have been applied in apple orchards for a long time, which has resulted in increasing soil Cu concentration. However, the microbial and enzyme properties of the orchard soils remain poorly understood. This study aimed to evaluate the effect of long-term application of Cu-based fungicides on soil microbial (microbial biomass carbon (Cmic), C mineralization, and specific respiration rate) and enzyme (urease, acid phosphatase, and invertase activities) properties in apple orchards. Soil samples studied were collected from apple orchards 5, 15, 20, 30, and 45 years old, and one adjacent forest soil as for reference. The mean Cu concentrations of orchard soils significantly increased with increasing orchard ages ranging from 21.8 to 141 mg kg-1, and the CaCl2-extractable soil Cu concentrations varied from 0.00 to 4.26 mg kg-1. The soil mean Cmic values varied from 43.6 to 116 mg kg-1 in the orchard soils, and were lower than the value of the reference soil (144 mg kg-1). The ratio of soil Cmic to total organic C (Corg) increased from 8.10 to 18.3 mg Cmic g-1 Corg with decreasing orchard ages, and was 26.1 mg Cmic g-1 Corg for the reference soil. A significant correlation was observed between total- or CaCl2-extractable soil Cu and soil Cmic or Cmic/Corg, suggesting that the soil Cu was responsible for the significant reductions in Cmic and Cmic/Corg. The three enzyme activity assays also showed the similar phenomena, and declined with the increasing orchard ages. The mean soil C mineralization rates were elevated from 110 to 150 mg CO2-C kg-1 soil d-1 compared with the reference soil (80 mg CO2-C kg-1 soil d-1), and the mean specific respiration rate of the reference soil (0.63 mg CO2-C mg-1 biomass C d-1) was significantly smaller than the orchard soils from 1.19 to 3.55 mg CO2-C mg-1 biomass C d-1. The soil C mineralization rate and the specific respiration rate can be well explained by the CaCl2-extractable soil Cu. Thus, the long-term application of copper-based fungicides has shown adverse effects on soil microbial and enzyme properties.
Keywords: Apple orchard soil; Copper fungicide; Soil microbial biomass carbon; Soil enzyme activities; Soil C mineralization

Monika Kosmala, Krzysztof Kolodziejczyk, Jaroslaw Markowski, Monika Mieszczakowska, Christian Ginies, Catherine M.G.C. Renard, Co-products of black-currant and apple juice production: Hydration properties and polysaccharide composition, LWT - Food Science and Technology, In Press, Corrected Proof, Available online 30 June 2009, ISSN 0023-6438, DOI: 10.1016/j.lwt.2009.06.016.
(http://www.sciencedirect.com/science/article/B6WMV-4WN2Y1M-1/2/26d5d0d182cffb390d10daf2b38aab68)
Abstract:
The sugar composition in cell walls of apple and black currant pomaces was investigated with or without solvent extraction. Extraction of polyphenols by solvents changed the sugar composition of

cell walls by increasing the alcohol insoluble solids (AIS) contents and increasing glucose content. Water binding capacity was increased by the ethanol extractions, but decreased again after acetone treatments. The enzyme treatments used for juice extraction increased the swelling capacity but decreased the water binding capacity, probably by loosening the cell wall structure. They resulted in decreased degrees of methylation. Pectin extractability of black currant pomaces differed between the commercial pomace (higher Water Soluble Pectins fraction and Chelator Soluble Pectins fraction), and the experimental pomaces (higher Diluted Alkali Soluble Pectins fraction).
Keywords: Dietary fibre; Cell walls; Pectins; Degree of methylation

Patrizia Iacopini, Fabiano Camangi, Agostino Stefani, Luca Sebastiani, Antiradical potential of ancient Italian apple varieties of Malus x domestica Borkh. in a peroxynitrite-induced oxidative process, Journal of Food Composition and Analysis, In Press, Accepted Manuscript, Available online 26 June 2009, ISSN 0889-1575, DOI: 10.1016/j.jfca.2009.05.004.
(http://www.sciencedirect.com/science/article/B6WJH-4WM750W-1/2/ee44ef7cb6d0e3c1c3c7b60cce93ab56)
Abstract:
Ancient apple cultivars may be an important source of genes for apple breeding program and for the production of value-added apple cultivar. We evaluated the biochemical properties of six apple varieties grown in the Casentino area (Tuscany, Italy). Two commercial varieties (Golden and Stark Delicious) and four local varieties (Mora, Nesta, Panaia-red and Ruggine) were selected and their methanolic extracts were analysed for total phenolics and flavonoids. Moreover the content of catechin, epicatechin, rutin, chlorogenic and caffeic acid, five major phenolic constituents, was determined through HPLC-UV analysis. The radical-scavenging capacity of the methanolic extracts was assessed using two in vitro tests: the blanching of the stable DPPH. radical and the inhibition of tyrosine nitration induced by peroxynitrite. The four local varieties had the highest content of total phenols and flavonoids. Ruggine and Panaia-red apple had the highest content of the five phenolic compounds investigated and the highest antioxidant activity towards both radicals. The commercial varieties were characterized by lower phenolic content and antioxidant activity compared to old varieties. Finally, a significant correlation between phenolic content and antioxidant activity was found.
Keywords: Antioxidant activity; Caffeic acid; Chlorogenic acid; Catechin; DPPH; Epicatechin; Apple; Malus x domestica; Peroxynitrite; Rutin; Tyrosine nitration; Apple cultivar; Ancient cultivars; Biodiversity; Food analysis; Food composition

Clarice Maria de Araujo Chagas Vergara, Talita Lopes Honorato, Geraldo Arraes Maia, Sueli Rodrigues, Prebiotic effect of fermented cashew apple (Anacardium occidentale L) juice, LWT - Food Science and Technology, In Press, Corrected Proof, Available online 24 June 2009, ISSN 0023-6438, DOI: 10.1016/j.lwt.2009.06.009.
(http://www.sciencedirect.com/science/article/B6WMV-4WKTX4D-3/2/fc579d8dee24d73584b64d1b8aabd186)
Abstract:
Leuconostc mesenteroides B-512F and L. mesenteroides B-742 were cultivated in clarified cashew apple juice to produce prebiotic oligosaccharides. Yeast extract (20 g/L); K2HPO4 (g/L) and sucrose (50 g/L) were added to the juice to promote the microbial growth and dextransucrase production. Initial pH was adjusted to 6.5 with H3PO4. Fermentations were carried out at 30 [degree sign]C and 150 rpm for 24 h. The prebiotic effect of the fermented cashew apple juice, containing oligosaccharides, was evaluated through the Lactobacillus johnsonii B-2178 growth. L. johnsonii was incubated for 48 h using fermented cashew apple juice as substrate. Lactobacillus growth was compared to the microbial growth in non-fermented juice and in MRS broth. L.

johnsonii growth in the fermented cashew apple juice was threefolds the observed growth in the non-fermented juice.
Keywords: Lactobacillus; Fermented cashew apple juice; Prebiotic carbohydrates; Lactic acid bacteria

Barbara Lata, Aleksandra Trampczynska, Justyna Paczesna, Cultivar variation in apple peel and whole fruit phenolic composition, Scientia Horticulturae, Volume 121, Issue 2, 17 June 2009, Pages 176-181, ISSN 0304-4238, DOI: 10.1016/j.scienta.2009.01.038.
(http://www.sciencedirect.com/science/article/B6TC3-4VP1CS8-4/2/4f7cdc91197544b126a0e19c748b4901)
Abstract:
The quali-quantitative distribution of phenolic compounds varies considerably between apple flesh and peel, but the concentration of phenolics is substantially higher in the peel than flesh. Because the peel comprises only a small percentage of the entire fruit weight, its significance as a donor of phenolics is disputable. We assessed the contribution of the peel to the total phenolic yield of 19 apple cultivars. Calculations were based on the weight of the whole fruit and the peel (which is frequently discarded) and the concentration of individual phenolic compounds. On average, 8, 24, 32, 50 and 66% of chlorogenic acid, (+)-catechin, (-)-epicatechin, phloridzin, and rutin, respectively, were present in the peel, which constitutes about 6-8% of the whole apple weight. With the exception of chlorogenic acid, 50% or more, on average, of the above phenolics were present in the peel of `Granny Smith', `Idared', `Red Rome', `Jonamac' and `Gloster' apples; the highest percentage was found in `Starking Delicious' apple peel (82%). The lowest peel contribution to total phenolic content per whole apple ranged between 26 and 29% and was observed in `Pilot', `McIntosh' and `Prima' apples. Presented results may be useful for further investigations of the relationship between phenolics and agronomical parameters or future selection of apple genotypes having improved nutritional quality when consumed as fresh or as processed apple products.
Keywords: Malus domestica Borkh; Antioxidant; Flavan-3-ols; Hydroxycinnamic acids; Flavonols; HPLC

Hun-Sik Chung, Kwang-Deog Moon, Browning characteristics of fresh-cut `Tsugaru' apples as affected by pre-slicing storage atmospheres, Food Chemistry, Volume 114, Issue 4, 15 June 2009, Pages 1433-1437, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.11.027.
(http://www.sciencedirect.com/science/article/B6T6R-4TYR092-2/2/4e2920d6c3a9e680dc96c644b35da03e)
Abstract:
The change in browning characteristics of the slices processed from `Tsugaru' apples stored at 0 [degree sign]C for 5 months under controlled atmosphere (CA, 1 kPa O2 + 1 kPa CO2, 3 kPa O2 + 3 kPa CO2) or air has been investigated for 5 days at 20 [degree sign]C. Respiration and ethylene production of the slices from apples stored in CA were retarded. Electrolyte leakage and browning index were lower in the slices from apples stored under CA than air. Vitamin C and phenolic contents in the slices from apples stored under air were maintained at higher level compared to the slices from apples stored under CA. Polyphenol oxidase activity in the slices was not affected by pre-slicing storage atmospheres. Therefore, the atmospheres of pre-slicing storage affected browning development in fresh-cut products of `Tsugaru' apples and browning was found to be correlated with the levels of electrolyte leakage and phenolic compounds.
Keywords: Malus domestica Borkh.; Fresh-cut; Browning; Controlled atmosphere; Pre-slicing storage

Shogo Matsumoto, Ayumi Abe, Tsutomu Maejima, Foraging behavior of Osmia cornifrons in an apple orchard, Scientia Horticulturae, Volume 121, Issue 1, 2 June 2009, Pages 73-79, ISSN 0304-4238, DOI: 10.1016/j.scienta.2009.01.003.
(http://www.sciencedirect.com/science/article/B6TC3-4VHXF16-3/2/1178c17ead2fdc4b5864682cfc260655)
Abstract:
An apple orchard consisting of a single commercial cultivar and of pollinizers such as Crab apples under the condition of natural pollination needs pollinators for stable fruit production. We investigated the foraging behavior of pollinators, especially Osmia cornifrons Radoszkowski, in order to evaluate their use instead of honeybees.
O. cornifrons showed strong flower constancy for 4-8 min during one pollen-nectar foraging trip, as observed in honeybees. However, the bees seemed to forage for different types of flowers, e.g. from a red to a white petal color, during their 16-22 pollen-nectar foraging trips based on the S-RNase allele and simple sequence repeat (SSR) analyses of pollen loaves made during those trips. After one pollen-nectar foraging trip, the bees brushed their abdomen with their hind legs at a nester tube, but ca. 10% of pollen was not brushed from their bodies. The remaining pollen on the body retained the ability for the fertilization of apple for 12 days, suggesting that the pollen on the pollinator's body from a pollinizer could be used for the fertilization of a commercial cultivar visited on their next foraging trip.
O. cornifrons seems to be a useful pollinator in apple orchards consisting of a single cultivar, such as, `Fuji', and of pollinizers of different types, such as the red petal color type, `Maypole' or `Makamik'. Moreover, most pollen loaves investigated contained S28-RNase allele, which was specific for pollen of `Starking Delicious' planted at a great distance (55.2 m) from the nestiny shelter, suggesting that O. cornifrons is a useful pollinator for `Delicious', which is difficult for honeybees to use as a pollinator for its sideworking behavior.
Keywords: Osmia cornifrons; Apple pollinators; S-RNase; SSR; `Fuji'

D.I. Sokalska, D.Z. Haman, A. Szewczuk, J. Sobota, D. Deren, Spatial root distribution of mature apple trees under drip irrigation system, Agricultural Water Management, Volume 96, Issue 6, June 2009, Pages 917-924, ISSN 0378-3774, DOI: 10.1016/j.agwat.2008.12.003.
(http://www.sciencedirect.com/science/article/B6T3X-4VF4YS5-1/2/4e09919295bba6a049e5ebef3c471341)
Abstract:
The study was undertaken in order to quantify the effect of 12-year irrigation by drip emitters placed on one side of the tree trunk on the rooting pattern of Gloster apple trees (Malus domestica Borkh) grafted on M26 rootstock under the conditions of south-west Poland. The orchard was established in 1994 and since 1995 was drip irrigated under three treatments: V0 - without irrigation (control), V1 - intensive irrigation, and V2 - economical irrigation. In March 2007, after 12 years of irrigation, a profile trench observation method was used to map the number and the location of root distribution in clay loam (Luvisol) soil.
The root system architecture was largely affected by irrigation. In case of the trees irrigated intensively (V1), the study showed asymmetry in the distribution of roots of diameter <1 mm and 1-3 mm. In V1, shallow root system, concentrated in the wetted zone developed on the irrigated side of the tree, where on the side of the tree trunk opposite the emitter trees developed significantly larger numbers of roots, which penetrated deeper soil layers. There were no statistically significant differences in the number of roots between both sides of the tree trunk under the treatment with economical irrigation (V2). Moreover, spatial roots distribution over the entire soil profile was found to be the most uniform compared to the other experimental treatments (V0 and V1). Finally, the study examined the relationship between root system and yield. Obtained results showed that in the 3-year period less frequent water application (V2) resulted in the highest yield.
Keywords: Apple tree; Drip irrigation; Yield; Spatial root distribution

Laetitia Michodjehoun-Mestres, Jean-Marc Souquet, Helene Fulcrand, Emmanuelle Meudec, Max Reynes, Jean-Marc Brillouet, Characterisation of highly polymerised prodelphinidins from skin and flesh of four cashew apple (Anacardium occidentale L.) genotypes, Food Chemistry, Volume 114, Issue 3, 1 June 2009, Pages 989-995, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.10.052.
(http://www.sciencedirect.com/science/article/B6T6R-4TVJNRM-5/2/79414cf50ecfd65b054485ab5bbd12e7)
Abstract:
Tannins were extracted by acetone/water 60:40 from skin and flesh of four cashew apple genotypes from Brazil and Benin (West Africa), and separated from monomeric phenols. Tannins were submitted to acid-catalysed degradation in the presence of phloroglucinol and the products were analysed by HPLC-DAD/ESI-MS. Both skin and flesh tannins contained high percentages of (-)-epigallocatechin and (-)-epigallocatechin-O-gallate, followed by minor quantities of (-)-epicatechin and (-)-epicatechin-3-O-gallate; 100% of the compounds were the 2,3-cis configuration. Skin tannins were half as galloylated (~20%) than flesh tannins (~40%). Their weight-average molecular weight (Mw) was high.
Keywords: Cashew apple; Pseudo fruit; Skin; Flesh; Tannins; Prodelphinidins; Phloroglucinol; Epigallocatechin; Epigallocatechin gallate; Size-exclusion chromatography; Tannase

Maria Helena Iha, Scheilla V.C. de Souza, Myrna Sabino, Single-laboratory validation of a liquid chromatography method for the determination of patulin in apple juice, Food Control, Volume 20, Issue 6, June 2009, Pages 569-574, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.08.012.
(http://www.sciencedirect.com/science/article/B6T6S-4TBGDW7-2/2/720a9846556302ff4099fcb9a0edd274)
Abstract:
A method for patulin determination in apple juice was optimized and single-laboratory validated. Patulin was extracted with ethyl acetate and the extracts were cleaned-up in a column prepared in the laboratory. The determination was carried out by liquid chromatograph with a C18 column and diode array detector. Linearity was observed from 25.4 to 532.5 [mu]g/L. Mean recovery of 81.6% and relative standard deviations <5.7% were obtained for samples spiked with 27, 58 and 122 [mu]g/L. Limits of quantification and detection were 10 and 4 [mu]g/L, respectively. In the ruggedness experiment, seven factors were considered. The method presented the advantages of easiness, economical aspects, patulin identity confirmation and use of non-toxic solvents and reagents.
Keywords: Patulin; Apple juice; Single-laboratory validation

Shrestha Sony, Md. Abdul Alim, Sangwon Kim, Minsoo Kwon, Dongkyun Lee, Yonggyun Kim, Diagnostic molecular markers of six lepidopteran insect pests infesting apples in Korea, Journal of Asia-Pacific Entomology, Volume 12, Issue 2, June 2009, Pages 107-111, ISSN 1226-8615, DOI: 10.1016/j.aspen.2009.01.002.
(http://www.sciencedirect.com/science/article/B8JJN-4VF573C-2/2/e363dbc18f07d9bb2d9b7c7c105158d7)
Abstract:
Two molecular identification techniques for differentiating six lepidopteran pests infesting apples in Korea are presented. These six species include two internal fruit feeders (Grapholita molesta and Carposina sasakii), two leaf rollers (Adoxophyes sp. and Archips breviplicanus) and two leaf miners (Phyllonorycter ringoniella and Lyonetia prunifoliella). All species occur until near harvest and reduce apple production. A 489 bp fragment of mitochondrial cytochrome oxidase subunit I (COI) was sequenced in these six species. The sequence was used to select species-specific restriction enzyme sites and to design diagnostic polymerase chain reaction (PCR) primers,

resulting in the development of restriction fragment length polymorphism (RFLP)-PCR and diagnostic PCR. These methods were reliable and rapid in the identification of these six species.
Keywords: Apple; DNA barcode; Identification; Mitochondrial DNA; Moth; Quarantine

C. Barrera, N. Betoret, P. Corell, P. Fito, Effect of osmotic dehydration on the stabilization of calcium-fortified apple slices (var. Granny Smith): Influence of operating variables on process kinetics and compositional changes, Journal of Food Engineering, Volume 92, Issue 4, June 2009, Pages 416-424, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.12.034.
(http://www.sciencedirect.com/science/article/B6T8J-4VB01P0-1/2/1daf274693d23a1629b7e134dc61ed66)
Abstract:
Commonly available calcium-fortified foods include non-structured and formulated foods. In contrast, vacuum impregnation allows the introduction of physiologically active compounds to vegetal tissues without disrupting their cellular structure, but inducing changes in their behaviour during further processing. In the particular case of osmotic dehydration of apple slices (var. Granny Smith) with a 55 Brix sucrose solution, both the water loss and the gain in soluble solids were observed to be affected by the amount of calcium incorporated into their porous structure by means of vacuum impregnation, the processing temperature and the addition of 1% of calcium lactate to the osmotic solution. To be precise, water removal was observed to decrease as the calcium content of the vacuum impregnated samples increased from 0% to 40% of the recommended daily allowances for adults in a 200 g sample. Overall, the addition of 1% calcium lactate to the osmotic solution decreased the constant rate of both water loss and gain in soluble solids, but resulted in a final product with an increased mineral content. However, an increase in the temperature of the osmotic solution from 30 to 50 [degree sign]C was reported to promote faster water loss and soluble solids uptake, but to a different extent depending on the fortification level required for the processed samples. Despite the loss of part of the calcium incorporated to apple slices by means of vacuum impregnation, osmotic dehydration can be considered as a useful tool to increase the stability of this kind of product without seriously reducing its nutritional value.
Keywords: Functional foods; Calcium fortification; Vacuum impregnation; Osmotic dehydration

Nnadozie Oraguzie, Peter Alspach, Richard Volz, Claire Whitworth, Chandra Ranatunga, Rosemary Weskett, Roger Harker, Postharvest assessment of fruit quality parameters in apple using both instruments and an expert panel, Postharvest Biology and Technology, Volume 52, Issue 3, June 2009, Pages 279-287, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2009.01.004.
(http://www.sciencedirect.com/science/article/B6TBJ-4VW91FW-2/2/e96be3afd6742c121b119eef4783f8c1)
Abstract:
Most apple breeding programs use a small number of well-experienced assessors, or experts, to organoleptically score the quality of fruit from a large number of genotypes. Although instrumental readings are available for some traits, only those for weight, firmness, soluble solids and acidity are generally considered practical for most breeding purposes, at least in the early stages. However, heritabilities for instrumentally measured traits are typically higher than those for scored traits. This is likely to be partly because the use of scores introduces a new source of variation, viz. that attributable to differences in perception, which inflates the environmental variance component. We report on a trial, undertaken in the 2003 fruiting season, which was designed to measure the various sources of expert perception error in order to help devise an optimal strategy for postharvest fruit quality assessment. Four experts each independently assessed two fruit from each of 126 genotypes taken from 15 crosses which were part of a half diallel originally made to study powdery mildew genetics. Traits assessed were: firmness, acidity, sweetness, juiciness and crispness. Each fruit was assessed by two experts who did not know the identity of fruit they were

assessing, although they were aware of the purpose of the trial. Fruit were presented to the experts in a random order and this order was recorded. We found no evidence of fatigue despite the experts assessing up to 34 fruit in a session. However, there were differences between the experts, and a weak evidence of contrast effect for sweetness and acidity. The instrumental-sensory relationships obtained with the expert panel were similar to those reported for trained panelists. The use of expert panels for routine postharvest fruit quality assessment particularly for programs with limited budget is recommended.
Keywords: Apple fruit quality phenotyping; Expert panel; Sensory scores; Machine measurements; Inter-expert differences

Dong QIN, Jin-zheng WANG, Jian-min GUO, Heng ZHAI, The Relation Between Endogenous Hormones and Late-Germination in Buds of Avrolles Apple, Agricultural Sciences in China, Volume 8, Issue 5, May 2009, Pages 564-571, ISSN 1671-2927, DOI: 10.1016/S1671-2927(08)60247-3.
(http://www.sciencedirect.com/science/article/B82XG-4WCSPB7-8/2/923ada6d44e0b56b257c3153cca03603)
Abstract:
In order to provide the physiological bases for selecting late-germination cultivars that can avoid late frost damage, the very late-germination variety Avrolles (Malus domestica) was used to study the relation between the dynamic changes and balance of endogenous hormones and germination time. The concentrations of endogenous GA3, ABA, IAA, and ZR were determined in buds of Avrolles and Judeline (Malus domestica) from dormancy releasing to germination by capillary electrophoresis. The dynamic changes of endogenous hormones concentration in buds of Avrolles and Judeline were similar; but the magnitude and time of the change were significantly different between the two varieties, especially for GA3. GA3 concentration increased with dormancy releasing, then decreased, and increased again before germination in the two varieties. GA3 concentration in Avrolles was 1.72 times that in Judeline at the first peak, the gap increased to 2.22 times at germination. ZR concentration exhibited a continuous increase trend, but it decreased sharply before germination. ZR accumulation in Avrolles took 36 days longer than in Judeline, the peak value was 44% higher than in Judeline. Before germination, ZR concentration in Avrolles was 2.12 times that in Judeline. The differences between IAA and ABA concentration were relatively small in the two varieties, while the ratios of GA3/ABA and (GA3 + IAA + ZR)/ABA in Avrolles were 2.08 and 1.58 times those in Judeline, respectively. The germination of apple bud was regulated by the endogenous hormones. For the late-germination apple Avrolles, its germination requires higher concentration of GA3 and ZR, which leads to the high ratios of GA3/ABA and (GA3 + IAA + ZR)/ABA.
Keywords: Malus domestica cv. Avrolles; Malus domestica cv. Judeline; late-germination; endogenous hormone

D.S. Johnson, Triazole sprays induce diffuse browning disorder in `Cox's Orange Pippin' apples in controlled atmosphere storage, Postharvest Biology and Technology, Volume 52, Issue 2, May 2009, Pages 202-206, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.10.008.
(http://www.sciencedirect.com/science/article/B6TBJ-4VP12GC-1/2/b48c7dd931dc1618a5d84d727ab41455)
Abstract:
The inclusion of triazole chemicals in orchard spray programmes was investigated as a possible cause of a physiological storage disorder (diffuse browning disorder or DBD) that has seriously affected commercial consignments of `Cox's Orange Pippin' apples (Malus domestica Borkh.) since 2000. In 2006, spray regimes that included or excluded the triazole plant growth regulator paclobutrazol and triazole fungicides myclobutanil and penconazole were compared in each of nine commercial `Cox' orchards. In 2007 the number of orchards was reduced to eight but the

number of treatments was increased in order to compare the effects of paclobutrazol separately from those of the triazole fungicides. Apples were stored in controlled atmosphere (CA) conditions of 1.2 kPa O2 and <1 kPa CO2 at 3.5 [degree sign]C for 5 months and assessed for presence of DBD after a further 7 d at 20 [degree sign]C. In 2007 additional samples were subjected to a delayed cooling (7 d at 20 [degree sign]C) or postharvest treatment with diphenylamine (DPA) or 1-methylcyclopropene (1-MCP). In both years DBD did not develop where triazole chemicals were omitted from the spray programmes, whereas the inclusion of triazole chemicals resulted in DBD development in fruit from 67% and 71% of orchards in 2006 and 2007, respectively. Fungicide application was more conducive to DBD development than application of paclobutrazol but, in combination, induced the highest incidence of DBD. Triazole (fungicides + paclobutrazol) application generally increased the respiration rate of CA-stored fruit but ethylene production rates were not affected. The development of DBD was not affected by post harvest application of DPA or 1-MCP or a delayed cooling of the fruit.
Keywords: Diffuse browning disorder; Triazoles; Myclobutanil; Penconazole; Paclobutrazol; Malus domestica

Shengmin Lu, Jun Song, Leslie Campbell-Palmer, A modified chemiluminescence method for hydrogen peroxide determination in apple fruit tissues, Scientia Horticulturae, Volume 120, Issue 3, 1 May 2009, Pages 336-341, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.11.003.
(http://www.sciencedirect.com/science/article/B6TC3-4V87DS1-1/2/73802c4f24b6065d0e2b0c8cd961c654)
Abstract:
Hydrogen peroxide (H2O2) is one of the important by-products produced by plant and fruit tissues during normal metabolism as well as under stress conditions. Evidence suggests that it is actively involved in many physiological activities in plants, including ripening, senescence and the development of disorders. Quantitative measurement of H2O2 in fruit has been a challenge due to variations in methodologies, and their sensitivities and interferences present in plant samples. Among the currently used methodologies, chemiluminescence (CL) is one of the most promising, due to its high specificity and sensitivity. However, direct application of CL methods developed for leaf analysis is not suitable for fruit, especially fruit peel tissues, possibly due to interfering compounds in fruit tissues. In this study, evaluation of the efficiency of removal of interfering compounds by PVP, PVPP and activated charcoal revealed that the PVPP is the most effective compound to remove the interference. This modified protocol can measure H2O2 content in apple peel and flesh tissues. `Red Delicious' apple peel and flesh tissues were measured with amount of 1.48 and 1.03 [mu]mol/g FW, respectively. The established protocol can also be used for a wide variety of tissues in addition to apple fruit, including strawberry tissues (fruit, calyx and leaves) and spinach leaves. This protocol was applied to determine the H2O2 concentration in 1-MCP and DPA treated apples after 5 months of storage, but no significant difference in H2O2 in those samples was found. Direct comparison of CL with a commercial hydrogen peroxide measurement OXIS kit was also made. The challenges to accurately assay H2O2 in fruit/plant tissue were discussed.
Keywords: Hydrogen peroxide; fruit; apple; strawberry; PVPP

G. Versini, M.A. Franco, S. Moser, P. Barchetti, G. Manca, Characterisation of apple distillates from native varieties of Sardinia island and comparison with other Italian products, Food Chemistry, Volume 113, Issue 4, 15 April 2009, Pages 1176-1183, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.08.003.
(http://www.sciencedirect.com/science/article/B6T6R-4T5TPSB-4/2/001035dbc7ec129e776be26509aba193)
Abstract:

The aim of this study was to characterise the aroma fraction of Italian distillates from apples typical of the Province of Sassari in the northern region of Sardinia (Malus pumila, L. cvs. Miali and Appio) in comparison to some international obtained in the northern region of Trentino-Alto Adige (M. pumila, L. cvs. Renetta del Canada (Reinette du Canada or Canadian Rennet), Golden Delicious, Royal Gala, Morgenduft and Gravenstein). The distillates producted in Sardinia were obtained from the same producer over four years, while those from Trentino-Alto Adige by two distilleries over one year, both following the same production process. Analyses of the aroma fraction were performed by HRGC-FID and HRGC-MS techniques, with direct injection in GC of full proof distillates. Evaluation of the data by statistical analysis (ANOVA and Principal Component Analysis) revealed that the variables ethyl octanoate, hexyl 2-methylbutyrate, 1-hexanol, benzaldehyde and furfural are able to distinguish between the varieties. In the case of the Sardinian varieties the variables 3-methyl-1-butanol, total aldehydes, ethyl acetate and 6-methyl-5-hepten-2-ol are dependent from the year of production.
Keywords: Distillates; Apples; Aroma analysis; Discrimination

T. Rana, V. Chandel, V. Hallan, A.A. Zaidi, Molecular evidence for the presence of Apple chlorotic leaf spot virus in infected peach trees in India, Scientia Horticulturae, Volume 120, Issue 2, 2 April 2009, Pages 296-299, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.11.018.
(http://www.sciencedirect.com/science/article/B6TC3-4V7KBTX-1/2/053b8aa9da900ebf0601cd75a50abc82)
Abstract:
During surveys of Himachal Pradesh (HP) and Punjab states in northern India, Apple chlorotic ring spot virus (ACLSV) was detected in infected peach trees using Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay (DAS-ELISA). Identity of the virus was confirmed by reverse transcription-polymerase chain reaction (RT-PCR) giving an amplification of ~800 bp product using primer pair to amplify the complete coat protein (CP) gene. Multiple alignment of sequences of the CP from samples collected from Kullu and Solan in HP with sequences of other isolates of ACLSV originating from peach trees showed identity of 69-84% and 69-93% at the nucleotide and protein level, respectively. This variation is similar to that observed with other isolates of ACLSV. This is the first report of molecular characterization of ACLSV infecting peach trees in India.
Keywords: ACLSV; Coat protein; ELISA; RT-PCR

Tom De Swaef, Kathy Steppe, Raoul Lemeur, Determining reference values for stem water potential and maximum daily trunk shrinkage in young apple trees based on plant responses to water deficit, Agricultural Water Management, Volume 96, Issue 4, April 2009, Pages 541-550, ISSN 0378-3774, DOI: 10.1016/j.agwat.2008.09.013.
(http://www.sciencedirect.com/science/article/B6T3X-4TSC3Y0-2/2/4c09f6c61dfb3d7d024286f741d4b71c)
Abstract:
The use of plant water status indicators such as midday stem water potential ([Psi]stem) and maximum daily trunk shrinkage (MDS) in irrigation scheduling requires the definition of a reference or threshold value, beyond which irrigation is necessary. These reference values are generally obtained by comparing the seasonal variation of plant water status with the environmental conditions under non-limiting soil water availability. In the present study an alternative approach is presented based on the plant's response to water deficit. A drought experiment was carried out on two apple cultivars (Malus domestica Borkh. `Mutsu' and `Cox Orange') in which both indicators ([Psi]stem and MDS) were related to several plant physiological responses. Sap flow rates, maximum net photosynthesis rates and daily radial stem growth (DRSG) (derived from continuous stem diameter variation measurements) were considered in the assessment of the approach. Depending on the chosen plant response in relationship with [Psi]stem or MDS, the obtained

reference values varied between -1.04 and -1.46 MPa for [Psi]stem and between 0.17 and 0.28 mm for MDS. In both cultivars, the approach based on maximum photosynthesis rates resulted in less negative [Psi]stem values and smaller MDS values, compared to the approaches with sap flow and daily radial stem growth. In the well-irrigated apple trees, day-to-day variations in midday [Psi]stem and MDS were related to the evaporative demand. These variations were more substantial for MDS than for midday [Psi]stem.
Keywords: Threshold value; Irrigation scheduling; Midday stem water potential; Stem diameter variations; Sap flow; Growth; Photosynthesis

Gunnhild Jaastad, Nina Trandem, Berit Hovland, Sigrid Mogan, Effect of botanically derived pesticides on mirid pests and beneficials in apple, Crop Protection, Volume 28, Issue 4, April 2009, Pages 309-313, ISSN 0261-2194, DOI: 10.1016/j.cropro.2008.11.006.
(http://www.sciencedirect.com/science/article/B6T5T-4V4620H-1/2/91a68e861c92753b5c1f1b9a63d97886)
Abstract:
Mirid bugs (Hemiptera: Miridae) are important pests in apple and pear production in both Europe and the United States. Mirids feed on sap in shoot tips, flower buds and fruitlets, resulting in deformation and stony pits in the fruit. Due to withdrawal of pesticides and concern about the environment alternative control methods against capsids are needed. In this study the effect of neem extract (NeemAzal), garlic extract (Ecoguard), vegetable oil (soybean or rapeseed) and kaolin (Surround) were evaluated for their effect on populations and damage of mirids in apples. Results show that neem extract is a promising alternative, giving as good control of mirid damage as several synthetic pesticides. Kaolin, garlic extract and vegetable oil did not significantly reduce damage. Many omnivorous species were present in the experimental orchards, and a positive correlation between the numbers sampled and fruit damage indicated that several of them could be pests.
Keywords: Miridae; Garlic extract; Neem extract; Vegetable oil; Kaolin; Apple

Li-Song Chen, Pengmin Li, Lailiang Cheng, Comparison of thermotolerance of sun-exposed peel and shaded peel of `Fuji' apple, Environmental and Experimental Botany, Volume 66, Issue 1, April 2009, Pages 110-116, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2008.12.017.
(http://www.sciencedirect.com/science/article/B6T66-4VB5K2G-4/2/04241cd42d0c9ec4a36c332d2b06935c)
Abstract:
The thermotolerance of the sun-exposed peel and the shaded peel of `Fuji' apple (Malus domestica Borkh.) fruit was evaluated by measuring pigments, chlorophyll a fluorescence transients and O2 evolution or uptake after exposure to 25, 35, 40, 42, 44, 46 or 48 [degree sign]C for 30 min in the dark. A major effect of heat stress at 46-48 [degree sign]C on the chlorophyll a fluorescence transients was the appearance of a very clear K step at 200-300 [mu]s for both peel types. The K step was slightly more pronounced in the sun-exposed peel than in the shaded peel, suggesting that the resistance of oxygen-evolving complex to heat stress is slightly lower in the sun-exposed peel than in the shaded peel. Minimal fluorescence (FO), relative to the value at 25 [degree sign]C, increased to a greater extent in the shaded peel than in the sun-exposed peel after exposure to 46-48 [degree sign]C, but the temperature dependencies of FO changes were similar for both peel types. Maximum quantum yield of PSII (FV/FM) decreased to a similar extent in the sun-exposed peel and the shaded peel as temperature rose from 25 to 44 [degree sign]C, but the sun-exposed peel reached slightly lower values at 46-48 [degree sign]C. Correspondingly, gross O2 evolution rate, relative to that at 25 [degree sign]C, was also slightly lower in the sun-exposed peel than in the shaded peel at 46-48 [degree sign]C. In response to heat stress, the ratio of QA-reducing reaction centers (RCs) to total RCs and the ratio of QB-reducing RCs to QA-reducing RCs decreased, but both of them decreased to lower values in the sun-exposed peel than in the

shaded peel at 46-48 [degree sign]C, indicating that the capacity of electron transfer between P680+ and QB via QA was damaged to a greater extent in the sun-exposed peel than in the shaded peel. At each given temperature, dark respiration was similar between the two peel types. Overall, it appears that the exposure to higher surface temperature under high light does not make the sun-exposed peel more tolerant of heat stress than the shaded peel of apple fruit.
Keywords: Apple peel; Chlorophyll a fluorescence transient; Heat stress; Malus domestica; Shaded side; Sun-exposed side; Thermotolerance

Alonzo A. Gabriel, Hiroyuki Nakano, Inactivation of Salmonella, E. coli and Listeria monocytogenes in phosphate-buffered saline and apple juice by ultraviolet and heat treatments, Food Control, Volume 20, Issue 4, April 2009, Pages 443-446, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.08.008.
(http://www.sciencedirect.com/science/article/B6T6S-4T9VP57-1/2/68fd0b7697fd599321a09446a7bfbdaf)
Abstract:
Two strains of Escherichia coli (K-12 and O157:H7), Salmonella (enteritidis and typhimurium) and Listeria monocytogenes (AS-1 and M24-1) were individually suspended in phosphate-buffered saline (PBS) and apple juice prior to exposure to UV radiation (220-300 nm) and heating at 55 [degree sign]C. The calculated decimal reduction times (D value, min) varied with suspending medium and mode of inactivation. The AS-1 and M24-1 strains of L. monocytogenes were found to be most resistant to UV in PBS (0.28-0.29 min) while the AS-1 strain was most resistant in juice (1.26 min). The AS-1 strain of L. monocytogenes and E. coli O157:H7 were most heat resistant when suspended in PBS (4.41 min) and juice (4.43 min), respectively. Results obtained from this study may be used by apple juice processors in selecting appropriate organisms for UV irradiation or heat treatment lethality validations.
Keywords: Apple juice; Escherichia coli; Heat inactivation; Listeria monocytogenes; Salmonella enterica; Ultraviolet radiation

Yasmin Ioannides, John Seers, Marianne Defernez, Carol Raithatha, M. Scott Howarth, Andrew Smith, E. Kate Kemsley, Electromyography of the masticatory muscles can detect variation in the mechanical and sensory properties of apples, Food Quality and Preference, Volume 20, Issue 3, April 2009, Pages 203-215, ISSN 0950-3293, DOI: 10.1016/j.foodqual.2008.09.007.
(http://www.sciencedirect.com/science/article/B6T6T-4TNWGVD-1/2/4f3577b8e6fa06a13ddfbdec47d3ccb8)
Abstract:
Electromyography (EMG) of the masticatory muscles was compared with puncture testing and sensory evaluation, in a study of the textural properties of Red Delicious apples. An aim of the work was to use EMG in predictive models of sensory mealiness, as this property is strongly negatively associated with apple acceptability. It was found that subjects' EMG sensitivity and repeatability are as good as, and frequently better, than their sensory sensitivity and reliability. In addition to systematic effects associated with data recording session and subject, EMG data was also systematically affected by subjects' behavioural changes, specifically, the sensory evaluation being undertaken. Once these unwanted sources of variance were removed using suitable data pre-treatment, frequency-domain EMG data were correlated with puncture test data, and a significant relationship obtained for six out of thirteen subjects. For five out of these six subjects, the strength of this relationship was improved by making use only of higher frequencies (>15 Hz) in the EMG spectrum. EMG and puncture test data were each correlated with the sensory data. The nature of these relationships, in which the EMG frequency dependence effect was also clearly exhibited, demonstrated substantial common information content between the techniques. Finally, EMG and puncture test data were collectively used to model sensory mealiness, using univariate, bivariate and stepwise regression. Highly significant models were obtained for all but one subject's

sensory mealiness scores. In most cases, the best models used combinations of puncture test and EMG data from up to two of the four available electrodes.
Keywords: Electromyography; Mastication; Sensory evaluation; Puncture tests; Penetrometer; Texture; Mealiness; Apples

Marit Rodbotten, Berit Karoline Martinsen, Grethe Iren Borge, Hilde Skotland Mortvedt, Svein Halvor Knutsen, Per Lea, Tormod Naes, A cross-cultural study of preference for apple juice with different sugar and acid contents, Food Quality and Preference, Volume 20, Issue 3, April 2009, Pages 277-284, ISSN 0950-3293, DOI: 10.1016/j.foodqual.2008.11.002.
(http://www.sciencedirect.com/science/article/B6T6T-4V1666C-1/2/025d389299d281f9b4cd6b67e1192b3f)
Abstract:
This paper presents a sensory profile and a consumer study on apple juice with reduced sugar content compared to what is the normal sugar content in commercially available apple juices. Samples were made from concentrate and diluted with water, and sugar and acid were added in different concentrations. Results of sensory description of the samples followed the design of the sugar/acid content in the samples. The consumer study was conducted in both Spain and Norway. A majority of the consumers preferred the sweetest samples, i.e., those samples with the same sugar level as commercial juice. About half of the consumers preferred the samples with the highest acidity and the other half preferred the samples with the lowest acidity. No clear differences in preference for the juice samples were found between the two countries. When focus was given to sweetness using a JAR-scale, many consumers found the sweetest sample too sweet even if they preferred the sample before sweetness was in focus.
Keywords: Apple juice; Cross-cultural; Preference; Sensory profile; JAR-scale; Acid; Sugar

Songshan Qiu, Changwen Lu, Xihong Li, Peter M.A. Toivonen, Effect of 1-MCP on quality and antioxidant capacity of in vitro digests from `Sunrise' apples stored at different temperatures, Food Research International, Volume 42, Issue 3, April 2009, Pages 337-342, ISSN 0963-9969, DOI: 10.1016/j.foodres.2008.12.007.
(http://www.sciencedirect.com/science/article/B6T6V-4V752P4-4/2/b6650c4c3013ce48498994bc52afda11)
Abstract:
The antioxidant capacities of phenolic and non-phenolic fractions for in vitro digestates from `Sunrise' apple were assessed after postharvest application of 1-methylcyclopropene (1-MCP), a ripening inhibitor, and three weeks storage at 5, 13, 15, 18 and 22 [degree sign]C. An in vitro digestion system was used to generate the soluble bioaccessable digestate which was then fractionated into phenolic and non-phenolic fractions. The two fractions were assayed for Folin-Ciocalteu Reaction (FCR) reducing capacity and peroxyl radical scavenging capacity. Quality retention of the fruit was assessed by measuring internal ethylene concentration, firmness and titratable acidity. Treatment with 1-MCP inhibited internal ethylene concentration and better maintained the firmness and titratable acidity of `Sunrise' summer apples as compared with untreated control apples at storage temperatures of 15 [degree sign]C and above. The FCR reducing capacity of the phenolic fraction of the in vitro, simulated gastrointestinal digestates showed similar response as did the quality measures, with significantly higher activity in the 1-MCP treated fruit at higher storage temperatures. However, no consistent differences were found between 1-MCP and control treatments for the FCR reducing capacity of the non-phenolic fraction or for the peroxyl radical scavenging capacity of either fraction. The non-phenolic fractions consistently had higher levels of both types of antioxidant capacities. Treatment and storage of `Sunrise' apples at elevated temperatures (> 13 [degree sign]C) resulted in improved fruit quality and retention of reducing capacity in simulated gastrointestinal digestates.
Keywords: `Sunrise' apple; Bioaccessibility; 1-methylcyclopropene; Quality; in vitro digestion

Gamal ElMasry, Ning Wang, Clement Vigneault, Detecting chilling injury in Red Delicious apple using hyperspectral imaging and neural networks, Postharvest Biology and Technology, Volume 52, Issue 1, April 2009, Pages 1-8, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.11.008.
(http://www.sciencedirect.com/science/article/B6TBJ-4V9RHPK-2/2/47abeaa3e95c77536972f882174c1399)
Abstract:
Hyperspectral imaging (400-1000 nm) and artificial neural network (ANN) techniques were investigated for the detection of chilling injury in Red Delicious apples. A hyperspectral imaging system was established to acquire and pre-process apple images, as well as to extract apple spectral properties. Feed-forward back-propagation ANN models were developed to select the optimal wavelength(s), classify the apples, and detect firmness changes due to chilling injury. The five optimal wavelengths selected by ANN were 717, 751, 875, 960 and 980 nm. The ANN models were trained, tested, and validated using different groups of fruit in order to evaluate the robustness of the models. With the spectral and spatial responses at the selected five optimal wavelengths, an average classification accuracy of 98.4% was achieved for distinguishing between normal and injured fruit. The correlation coefficients between measured and predicted firmness values were 0.93, 0.91 and 0.92 for the training, testing, and validation sets, respectively. These results show the potential of the proposed techniques for detecting chilling injury and predicting apple firmness.
Keywords: Hyperspectral imaging; Artificial neural network (ANN); Apple; Optimal wavelength; Firmness; Chilling injury

Fanjaniaina Fawbush, Jacqueline F. Nock, Christopher B. Watkins, Antioxidant contents and activity of 1-methylcyclopropene (1-MCP)-treated `Empire' apples in air and controlled atmosphere storage, Postharvest Biology and Technology, Volume 52, Issue 1, April 2009, Pages 30-37, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.08.014.
(http://www.sciencedirect.com/science/article/B6TBJ-4TRHC3D-4/2/bf304a95b31c11ed5b12eae50c19166a)
Abstract:
The effect of 1-MCP on ripening and concentrations of total phenolics, flavonoids, anthocyanins and total antioxidant activity of `Empire' apples (Malus sylvestris (L.) Mill var. domestica (Borkh.) Mansf.) was studied. Fruit were stored in air for up to 5 months, and in controlled atmosphere (CA) of 2 and 3 kPa O2 (2 kPa CO2) at 0.5 and 2.2 [degree sign]C for 4.5 and 9 months. Ripening was delayed by 1-MCP treatment in both air and CA storage as indicated by lower internal ethylene concentrations and slower softening than in untreated fruit. Overall, total phenolic, flavonoid and anthocyanin concentrations as well as antioxidant activity were relatively stable during air and CA storage. In air-stored fruit, total phenolic concentrations were higher in the peel of 1-MCP treated fruit than in the control fruit, but slightly lower in the flesh of 1-MCP treated fruit. In CA-stored fruit, interactions between O2 partial pressures, temperature and storage duration were detected but overall, few consistent trends were observed. However, flavonoid concentrations were higher in the flesh of 1-MCP treated than untreated fruit kept in 2 kPa O2 while anthocyanin concentrations, only measured in the peel, were not affected by 1-MCP treatment. There were no correlations found between total phenolics and antioxidant activity. Ascorbic acid concentrations declined in both peel and flesh tissues of untreated and 1-MCP treated fruit stored in air, while changes of ascorbic acid concentrations in CA-stored fruit were inconsistent.
Keywords: Apple; Storage; Phenolics; Flavonoids; Anthocyanin; Antioxidant activity; Ascorbic acid

Aide Wang, Dongmei Tan, Miho Tatsuki, Atsushi Kasai, Tianzhong Li, Hiroshi Saito, Takeo Harada, Molecular mechanism of distinct ripening profiles in `Fuji' apple fruit and its early maturing

sports, Postharvest Biology and Technology, Volume 52, Issue 1, April 2009, Pages 38-43, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.09.001.
(http://www.sciencedirect.com/science/article/B6TBJ-4V936KP-1/2/9d471c0ec883708ed4db37b01d622da0)
Abstract:
Apple fruit (Malus x domestica Borkh.) `Hirosaki Fuji', a sport of `Fuji' that matures about 40 d earlier, produced almost the same amount of ethylene as `Fuji' during ripening, but rapidly lost flesh firmness, unlike `Fuji', which has a long shelf-life. Expression profiling of genes encoding ethylene biosynthesis enzymes (MdACS1, MdACO1), ethylene receptor proteins (MdETR1, MdERS1, MdERS2) and a cell wall degradation enzyme (MdPG1) in `Hirosaki Fuji' fruit gave significantly different results from those of `Fuji'. MdERS1 was more abundant during ripening in `Fuji'. Profiles of `Fuji' fruit from two other localities with different ambient temperatures revealed that the more southerly the trees were grown, the more strongly they expressed the ripening-related genes. The gene for a small heat shock protein (MdHSP17.5) homologous to a strawberry fruit ripening-related HSP was expressed in `Hirosaki Fuji' from before harvest on the tree, but was expressed in `Fuji' only after harvest. The molecular mechanisms explaining these distinct ripening responses are discussed.
Keywords: Apple; Ripening; Sport cultivar; Ethylene receptor; Ambient temperature; Small heat shock protein

Ki-Bok Kim, Sangdae Lee, Man-Soo Kim, Byoung-Kwan Cho, Determination of apple firmness by nondestructive ultrasonic measurement, Postharvest Biology and Technology, Volume 52, Issue 1, April 2009, Pages 44-48, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.04.006.
(http://www.sciencedirect.com/science/article/B6TBJ-4V57Y0B-1/2/cc506125d3ab8aece961d347f7425576)
Abstract:
One of the most important quality indicators for fruit is firmness, which is highly correlated with maturity and storage time. This study was conducted to evaluate the potential use of ultrasonic parameters for the determination of apple firmness. The ultrasonic transmission system consisted of an ultrasonic pulser, two ultrasonic transmitting and receiving transducers specially fabricated for fruit, a digital oscilloscope and personal computer. For firmness of apples, apparent elastic modulus and rupture point were measured from force-deformation curves obtained by a compression test apparatus. Ultrasonic parameters such as ultrasonic velocity, and attenuation were analyzed according to the storage time of the fruit. Correlation analyses among ultrasonic parameters and fruit firmness were performed. A multiple linear regression model describing the relationship between firmness and ultrasonic parameters is proposed. The calibration equations for measurement of apple firmness were developed and validated.
Keywords: Firmness; Apparent elastic modulus; Rupture point; Apple; Ultrasonic parameters

Maria Murillo-Arbizu, Susana Amezqueta, Elena Gonzalez-Penas, Adela Lopez de Cerain, Occurrence of patulin and its dietary intake through apple juice consumption by the Spanish population, Food Chemistry, Volume 113, Issue 2, 15 March 2009, Pages 420-423, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.07.054.
(http://www.sciencedirect.com/science/article/B6T6R-4T2S8WH-K/2/1aac0111bee8856811cea59603fd1fd8)
Abstract:
A survey was conducted to determine levels and dietary intake of Patulin (PAT) from apple juices consumed in Spain. One hundred samples of apple juice were bought from distinct supermarkets. PAT was extracted by a liquid-liquid extraction technique and analysed with a micellar electrokinetic chromatography (MEKC) method. 66% of the samples contained PAT over the limit of detection of the method (0.7 [mu]g L-1). The PAT apple juice mean and median levels obtained

were 19.4 and 4.8 [mu]g L-1, respectively, in a range between 0.7 and 118.7 [mu]g L-1. In 11% of the samples, PAT contamination exceeded the maximum permitted level of 50 [mu]g L-1 established by the EU regulation. In Spain, no significant variations were observed with respect to data published 15 years ago.
Intakes were calculated for average consumers among adults, children and babies and then compared with the provisional maximum tolerable daily intake (PMTDI) proposed by JECFA in 1995. Estimated daily intake of PAT in this study represents 14%, 39% and 63% of the PMTDI, respectively.
Keywords: Patulin; Mycotoxins; Capillary Electrophoresis; Dietary intake; Apple juice; Spain; Food safety; Risk assessment

Sofia F.A.R. Reis, Silvia M. Rocha, Antonio S. Barros, Ivonne Delgadillo, Manuel A. Coimbra, Establishment of the volatile profile of `Bravo de Esmolfe' apple variety and identification of varietal markers, Food Chemistry, Volume 113, Issue 2, 15 March 2009, Pages 513-521, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.07.093.
(http://www.sciencedirect.com/science/article/B6T6R-4T4XRFY-2/2/80b42a5ccb1722058232b7ba782b906c)
Abstract:
The volatile composition of `Bravo de Esmolfe' (BE) apple was achieved by headspace-solid phase microextraction (HS-SPME) followed by gas chromatography-mass spectrometry (GC-qMS) analysis using fruits from two different rootstocks (PAJAM2 and MM106), different trees of each rootstock, and different sections of each tree (north and south). Fruits were harvested in the maturity state defined for this variety and then stored for four months at 4 [degree sign]C. During this period, analyses were made monthly. [alpha]-Farnesene was the compound found in the volatile profile of BE apple with the largest GC area. A large number of esters were also detected. Rootstocks, trees, and tree sections did not have statistical significance on the volatile composition of BE apples. However, the volatile composition changed throughout the storage period. The principal component analysis (PCA) allowed distinguishing between the apples obtained immediately after harvest and those stored for 4 months. In the first case, the volatile composition was related to the occurrence of aldehydes, aromatic hydrocarbons, and phenols and, in the second case, to esters and terpenoids. Ocymene, cymene, [alpha]-bergamotene, geranyl acetone, nerolidol, and ethyl 3-(methylthio)-propionate were identified for the first time in apples. This peculiar profile allows to propose them as varietal markers of BE apple variety. However, as this methodology has only been applied to BE apple, the occurrence of these compounds in other cultivars can not be excluded.
Keywords: Solid phase microextraction; Volatile composition; Harvest; Rootstock; Storage; Volatile marker

Finian Bannon, Gerrit Gort, Gerard van Leeuwen, Imre Holb, Mike Jeger, Diurnal patterns in dispersal of Monilinia fructigena conidia in an apple orchard in relation to weather factors, Agricultural and Forest Meteorology, Volume 149, Issues 3-4, 11 March 2009, Pages 518-525, ISSN 0168-1923, DOI: 10.1016/j.agrformet.2008.10.001.
(http://www.sciencedirect.com/science/article/B6V8W-4TY3XS8-1/2/1ecc49c9421d11130b58b38ebec8d40e)
Abstract:
The aerial concentration of Monilinia fructigena (causing brown rot in pome fruit) conidia was sampled during 1997 and 1998 in an apple orchard and was related to weather conditions. The highest hourly concentration measured in 1997 was 230 conidia/m3, in 1998 concentrations were lower than in 1997 throughout the season. In both years concentrations were highest in the afternoon hours. Generalised linear models, employing a Poisson distribution for the spore counts and a logarithm link function, were used to study the relationships between spore counts and

lagged weather variables. In 1997 the best fitting model had variables temperature lagged at 100 h, an east-west component of wind direction, and wind speed; whereas in 1998 the best model included in addition an effect of relative humidity. Temperature and wind direction had consistent effects on hourly spore counts in both years, but whereas temperature has a biologically relevant effect on spore production and maturation, the effect of wind direction is likely to reflect the purely local effect of orchard layout. Results are compared with observations made in stone fruit orchards where Monilinia laxa and Monilinia fructicola are the predominant species, and differences in epidemiology between these systems are discussed.
Keywords: Aerial dispersal; Brown rot fungi; Epidemiology; Generalised linear model

W.A. Overholt, L. Markle, E. Rosskopf, V. Manrique, J. Albano, E. Cave, S. Adkins, The interactions of tropical soda apple mosaic tobamovirus and Gratiana boliviana (Coleoptera: Chrysomelidae), an introduced biological control agent of tropical soda apple (Solanum viarum), Biological Control, Volume 48, Issue 3, March 2009, Pages 294-300, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2008.10.018.
(http://www.sciencedirect.com/science/article/B6WBP-4TVTJM3-4/2/e075ae110a595bcbb2f2c731100dd0ad)
Abstract:
Tropical soda apple (Solanum viarum Dunal (Solanaceae) is a South American invasive plant of rangelands, pastures and natural areas in Florida. A chrysomelid beetle from South America, Gratiana boliviana Spaeth, has been released at >300 locations in Florida for biological control of tropical soda apple since 2003. Tropical soda apple is a host of several plant viruses, including the newly described tropical soda apple mosaic virus (TSAMV). We investigated the influence of TSAMV infection of tropical soda apple plants on developmental time, leaf tissue consumption, longevity, fecundity, and feeding preference of G. boliviana, and also tested transmission of the virus by the beetle. Developmental time was approximately 10% slower, and adults consumed only about 50% as much leaf tissue, for beetles fed on infected plants compared to uninfected plants. Longevity did not differ between females reared on infected and uninfected plants, but females fed on uninfected plants produced 71% more eggs than those fed on infected plants. Adult G. boliviana preferentially fed on uninfected plants when given a choice. There was no evidence of TSAMV transmission by G. boliviana. The potential impacts of TSAMV infection on the effectiveness of G. boliviana as a biological control agent are discussed.
Keywords: Biological control; Gratiana boliviana; Tropical soda apple; Solanum viarum; Tropical soda apple mosaic virus; TSAMV; Plant pathogen/insect herbivore interactions

M. Amzad Hossain, S.M. Salehuddin, M.J. Kabir, S.M.M. Rahman, H.P. Vasantha Rupasinghe, Sinensetin, rutin, 3'-hydroxy-5, 6, 7, 4'-tetramethoxyflavone and rosmarinic acid contents and antioxidative effect of the skin of apple fruit, Food Chemistry, Volume 113, Issue 1, 1 March 2009, Pages 185-190, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.07.085.
(http://www.sciencedirect.com/science/article/B6T6R-4T4Y615-1/2/8c14bebbb723b11529070be93ef5a852)
Abstract:
A GC-MS method was developed for the separation and quantifiation of three flavones: sinensetin (SEN), rutin (RU) and 3'-hydroxy-5, 6, 7, 4'-tetramethoxyflavone (TMF) and rosmarinic acid (RA), a caffeic acid derivative, in the skin of apple fruit collected from different local markets of Bangladesh. The results showed significant variation in the amount of these markers in methanolic extracts of skin samples from different markets of Bangladesh, even though the values were almost identical for most of the cases. A variation in antioxidant activities, ranging from 62.82 to 92.34%, and variations in total phenolics, ranging from 6.69 to 10.20 mg caffeic acid/g dry weight of the methanol extracts, were observed. Antioxidative potency of the methanolic extracts was

comparable to that of pure quercetin and the synthetic antioxidant butylated hydroxylanisole (BHA).
Keywords: Malus sylvestris; Rosaceae; Apple fruit; Flavonoids; Antioxidant activity; Total phenol; GC-MS

Dazhou Zhu, Baoping Ji, Hyang Lan Eum, Manuela Zude, Evaluation of the non-enzymatic browning in thermally processed apple juice by front-face fluorescence spectroscopy, Food Chemistry, Volume 113, Issue 1, 1 March 2009, Pages 272-279, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.07.009.
(http://www.sciencedirect.com/science/article/B6T6R-4SYTCCX-2/2/84121aa23d45ff4f923504375ae3aaa5)
Abstract:
Fresh apple juice was heated at 95 [degree sign]C for 30 and 60 min, and then stored for 6 days for obtaining different extent of non-enzymatic browning. Front-face fluorescence excitation-emission-matrix (EEM) with excitation at 355 and 400 nm and emission ranges of 385-600, and 430-600 nm was used to measure the juice samples. The sign test pointed out an enhanced sensitivity of EEM compared to commonly used browning indicators, such as non-enzymatic browning index (NEBI), color readings in L*a*b* space, and the concentration of 5-hydroxymethylfurfural (HMF). Using the fluorescence data, the correctness of classifications of fresh juice, heated juice, and stored juice were >85%. Multivariate analyses were applied to study the relations of fluorescence emission spectra and common indicators. For predicting NEBI, b*, and HMF, the correlation coefficients were >0.80. Resulting, the spectroscopic analyses of fluorescent neoformed products such as HMF provide a feasible approach to monitor non-enzymatic browning of juice.
Keywords: Apple juice; Browning; Chemometrics; Colorimetry; Fluorescence spectroscopy; Heating; HMF

Jee-Young Imm, Sun-Chul Kim, Convenient partial purification of polyphenol oxidase from apple skin by cationic reversed micellar extraction, Food Chemistry, Volume 113, Issue 1, 1 March 2009, Pages 302-306, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.07.028.
(http://www.sciencedirect.com/science/article/B6T6R-4T0WK0W-C/2/7c683ca769606c3381f680884a41d706)
Abstract:
Polyphenol oxidase (PPO) was selectively extracted from reconstituted freeze-dried apple skin using reverse micelles formed by a cationic surfactant, dodecyl trimethyl ammonium bromide (DTAB). An optimum forward extraction was achieved with sodium phosphate buffer (pH 6, 100 mM, no added KCl) and an organic phase (isooctane:hexanol at a ratio of 5:1) containing 100 mM DTAB. The solubilised PPO was efficiently recovered by a stripping solution (pH 6, 1 M KCl) containing 10% ethanol. Under the optimised conditions, the purification fold and recovered activity of PPO were 12.6% and 71%, respectively. This purification fold and recovery were maintained when the extraction volume increased from 10-200 ml. Overall, reversed micellar extraction can be used as an efficient first step for the purification of PPO from apple skin.
Keywords: Polyphenol oxidase; Reverse micelle; Purification; Cationic surfactant

G.J. Funes, S.L. Resnik, Determination of patulin in solid and semisolid apple and pear products marketed in Argentina, Food Control, Volume 20, Issue 3, March 2009, Pages 277-280, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.05.010.
(http://www.sciencedirect.com/science/article/B6T6S-4SK62TF-1/2/f437425b7d136283f322a5c550c92874)
Abstract:

Patulin is an important index of quality and several methods are described for apple juice, but there is a lack of information about other products. The aim of this study was to implement an analytical method for solid and semisolid apple and pear products marketed in Argentina to evaluate patulin contamination. This method used a depectinization step and rapid clean-up with (SPE) Multisep(R)228 AflaPat multifunctional columns.
The results showed that 21.6% of 51 products were contaminated (range 17-221 [mu]g/kg, average of positive samples 61.7 [mu]g/kg), but the highest levels were found in apple puree with 50% contaminated samples (average of positive samples 123 [mu]g/kg). Efforts to decrease patulin on apple puree should be made.
Keywords: Patulin; Apple and pear products

Elisa I. Benitez, Diego B. Genovese, Jorge E. Lozano, Effect of typical sugars on the viscosity and colloidal stability of apple juice, Food Hydrocolloids, Volume 23, Issue 2, March 2009, Pages 519-525, ISSN 0268-005X, DOI: 10.1016/j.foodhyd.2008.03.005.
(http://www.sciencedirect.com/science/article/B6VP9-4S32NRY-2/2/136bb7032e9c9b31d7596ce991d4e867)
Abstract:
Cloudy apple juice may be modeled as a dilute colloidal dispersion of solid particles in a solution of pectins, sugars, organic acids, and salts. In order to evaluate the effect of sugars on the viscosity and stability of the juice, it was diafiltered by ultrafiltration to remove the native soluble solids, and controlled amounts of sugars (glucose, sucrose, and maltose) were added afterwards. The addition of sugars produced a linear increase of the specific viscosity at decreasing water activities. The rates of increase (slopes) were proportional to the hydration capacity of each sugar. The specific viscosity of a colloidal dispersion of solid particles in sugar solution depends on three types of interactions: particle-particle (p-p), particle-water (p-w), and particle-sugar (p-s). P-p and p-w interactions were estimated from the extended DLVO theory in terms of the energy barrier between pairs of particles, and found to decrease at increasing sugar concentrations. Then, the increase of the specific viscosity was attributed to an increase of p-s interactions. The total energy barrier of the system (a measure of its stability) was modeled to be the sum of a p-p (including p-w) contribution plus a p-s contribution, and estimated from specific viscosity vs. particle volume fraction data at different sugar concentrations. The p-s contribution was estimated by difference. It was found to be positive (which was attributed to hydration repulsion) and higher than the p-p contribution at sugar concentrations [greater-or-equal, slanted]0.04 mol/mol.
Keywords: Juice; Particles; Viscosity; Stability; Sugars; Apple

Sang-Hyun Koh, JeongJoon Ahn, Jae-Sung Im, Chuleui Jung, Si Hyeock Lee, Joon-Ho Lee, Monitoring of acaricide resistance of Tetranychus urticae (Acari: Tetranychidae) from Korean apple orchards, Journal of Asia-Pacific Entomology, Volume 12, Issue 1, March 2009, Pages 15-21, ISSN 1226-8615, DOI: 10.1016/j.aspen.2008.10.004.
(http://www.sciencedirect.com/science/article/B8JJN-4TVTK15-1/2/1b471dc51f63a574e84d41e332b4ba22)
Abstract:
Tetranychus urticae populations were collected from ten commercial apple orchards and their susceptibilities to 12 acaricides were tested using a leaf disc bioassay. The resistance of each T. urticae population was reported as the LC50 value, the resistance ratio (RR) and the slope of the probit-concentration regression. Cross resistances of T. urticae populations were estimated using the Spearman's rank correlation coefficient. Most local populations showed low resistance levels (RR <= 10). Development of resistance to METI and pyrethroid acaricides differed among local populations. The highest RR value (154.6) was found in the Uiseong population to tebufenpyrad. The Geochang population was highly resistant, especially to METI and pyrethroid acaricides. T. urticae populations collected from Suwon, Chungju, Yeongju and Geochang showed moderate

resistance (10 < RR <= 40) to more than two acaricides. Resistance ratios to abamectin, chlorfenapyr, fenbutatin-oxide and milbemectin were low (RR <= 10) in all populations. The LC50 values of abamectin, chlorfenapyr, fenbutatin-oxide and milbemectin ranged from 0.06 to 0.2 mg/l, from 0.67 to 3.38 mg/l, from 10.12 to 40.85 mg/l and from 0.47 to 3.01 mg/l, respectively. We discuss possible cross-resistance to acaricides using Spearman's rank correlation coefficient.
Keywords: Tetranychus urticae; Apple orchard; Acaricide resistance; Correlation coefficient; LC50

M.L. Castello, M. Igual, P.J. Fito, A. Chiralt, Influence of osmotic dehydration on texture, respiration and microbial stability of apple slices (Var. Granny Smith), Journal of Food Engineering, Volume 91, Issue 1, March 2009, Pages 1-9, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.07.025.
(http://www.sciencedirect.com/science/article/B6T8J-4T4Y5NV-3/2/9cdaba2588711ed13a86168160e712c9)
Abstract:
In order to analyse the feasibility of obtaining minimally processed apple samples, the effect of osmotic dehydration, at atmospheric pressure (OD) and by applying a vacuum pulse (PVOD), on mechanical properties, respiration rates and microbial stability of apple slices was analysed throughout storage at 10 [degree sign]C. Treatments were carried out until reaching 20 and 30 [degree sign]Brix in the samples. They caused a decrease in the values of the force dependent mechanical parameters, especially when applying vacuum pulse, whereas a small increase was observed when 1% calcium was applied. Nevertheless, these parameters were better preserved during storage when sample concentration was 20 [degree sign]Brix and vacuum was applied. Osmotic treatments reduced oxygen consumption and, only when samples had 30 [degree sign]Brix did CO2 generation increase. During storage, treated samples showed lower respiration rates than the control ones, which remain practically constant during storage when they had 20 [degree sign]Brix. A greater microbial stability was obtained in dehydrated samples, especially in PVOD treated ones.
Keywords: Osmodehydration; Vacuum impregnation; Apple; Texture; Respiration; Microbiology; Calcium

L. Atares, A. Chiralt, C. Gonzalez-Martinez, Effect of the impregnated solute on air drying and rehydration of apple slices (cv. Granny Smith), Journal of Food Engineering, Volume 91, Issue 2, March 2009, Pages 305-310, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.09.008.
(http://www.sciencedirect.com/science/article/B6T8J-4TGS788-1/2/64b44dbddc72ef8445ac7cbae28f8bfb)
Abstract:
Apple (cv. Granny Smith) slices (8 mm thickness, 20 mm internal diameter, 64 mm external diameter) were vacuum impregnated with solutions of glucose, sucrose and trehalose. These were hot air dried and rehydrated in solutions of the same solutes. For impregnating solutions, aw was 0.96 whereas for rehydration aw was 0.99. Throughout dehydration (45 [degree sign]C) the water effective diffusion coefficient in the product's liquid phase (De) was determined. This was lower in sucrose and trehalose impregnated samples. Throughout rehydration (25 [degree sign]C, 8 h), water gain, solute loss and compositional changes were quantified. Peleg's equation accurately described the mass and water gain, solute loss and compositional changes. Glucose impregnated slices showed the greatest mass recovery, whereas those treated with disaccharides showed less solute leaching during rehydration and better liquid phase retention during centrifugation. These results point to particular interactions of the impregnated solutes with the fruit matrix, giving rise to quality changes in the dried product.
Keywords: Vacuum pulse; Hot air drying; Rehydration; Apple; Trehalose

C. Villatoro, I. Lara, J. Graell, G. Echeverria, M.L. Lopez, Cold storage conditions affect the persistence of diphenylamine, folpet and imazalil residues in `Pink Lady(R)' apples, LWT - Food Science and Technology, Volume 42, Issue 2, March 2009, Pages 557-562, ISSN 0023-6438, DOI: 10.1016/j.lwt.2008.07.014.
(http://www.sciencedirect.com/science/article/B6WMV-4T4Y633-1/2/df2e1922d1aeb21a0ffda5bc79f16a06)
Abstract:
`Pink Lady(R)' apples (Malus domestica) fruit were harvested at commercial maturity treated with three different agrochemical products, and stored at 1 [degree sign]C under either air or controlled atmosphere conditions (2.5 kPa O2 + 3 kPa CO2 and 1 kPa O2 + 2 kPa CO2) for 15 and 28 weeks. Diphenylamine, folpet and imazalil contents in both skin and flesh were simultaneously determined after cold storage plus a simulated marketing period of 1 or 7 days at 20 [degree sign]C. Results showed that apples stored in 2.5 kPa O2 + 3 kPa CO2 retained higher contents of diphenylamine residues in comparison with those stored in 1 kPa O2 + 2 kPa CO2 or refrigerated air. Significant differences in imazalil skin contents were found throughout the simulated marketing period at 20 [degree sign]C after storage for 28 weeks in controlled atmospheres.
Keywords: `Pink Lady(R)'; Apples; Residues; Diphenylamine; Fungicides and cold storage

Panchalee Pathanibul, T. Matthew Taylor, P. Michael Davidson, Federico Harte, Inactivation of Escherichia coli and Listeria innocua in apple and carrot juices using high pressure homogenization and nisin, International Journal of Food Microbiology, Volume 129, Issue 3, 28 February 2009, Pages 316-320, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.12.020.
(http://www.sciencedirect.com/science/article/B6T7K-4V761X6-2/2/1d57ae126968f6f053807169ea09979e)
Abstract:
High pressure homogenization has been of growing interest as a nonthermal technology for the inactivation of microorganisms in fruit and vegetable juices. Cells of Escherichia coli and Listeria innocua, used as surrogates for foodborne pathogens, were inoculated into apple or carrot juice (~ 7 log10 CFU/ml) containing 0 or 10 IU/ml nisin and subjected to 350 to 0 MPa high pressure homogenization. At 50 MPa homogenization pressure intervals, juice samples were collected, immediately cooled to < 10 [degree sign]C, and then serially diluted and plated on nonselective recovery media. Following incubation, survivors were enumerated. As processing pressure increased, inactivation of E. coli increased, and a > 5 log reduction of cells was achieved following exposure to pressures in excess > 250 MPa. In contrast, little inactivation was observed for L. innocua with pressure < 250 MPa and up to 350 MPa processing pressure was required to achieve an equivalent 5 log inactivation. The addition of 10 IU nisin, together with high pressure homogenization, did not exhibit significant additional E. coli inactivation, but interactions were observed with L. innocua. Results indicate that high pressure homogenization processing is a promising technology to achieve pathogen decontamination in fruit and vegetable juices.
Keywords: High pressure homogenization; Nisin; Escherichia coli; Listeria innocua; Apple juice; Carrot juice

Achour Amiri, Robert Dugas, Anne L. Pichot, Gilbert Bompeix, Erratum to 'In vitro and in vitro activity of eugenol oil (Eugenia caryophylata) against four important postharvest apple pathogens' [Int. J. of Food Microbiol. 126 (2008) 13-19], International Journal of Food Microbiology, Volume 129, Issue 3, 28 February 2009, Page 325, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.08.012.
(http://www.sciencedirect.com/science/article/B6T7K-4TJT95S-1/2/51e58378d400ffe2c7c7744733db2d28)

Ji-Hong Liu, Kazuyoshi Nada, Toshihito Kurosawa, Yusuke Ban, Takaya Moriguchi, Potential regulation of apple in vitro shoot growth via modulation of cellular polyamine contents, Scientia Horticulturae, Volume 119, Issue 4, 17 February 2009, Pages 423-429, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.09.015.
(http://www.sciencedirect.com/science/article/B6TC3-4TRR90F-1/2/1b09a68fc00fdcc42570861e9a3a358d)
Abstract:
In the present research attempts were made to elucidate effects of d-arginine (d-arg), a potential inhibitor of arginine decarboxylase (ADC) involved in polyamine biosynthesis, on growth and polyamine biosynthesis of apple [Malus sylvestris (L.) Mill. var. domestica (Borkh.) Mansf.] in vitro shoots. Growth of the shoots cultured on proliferation medium added with 1 or 5 mM d-arg was inhibited over a 3-week treatment, with 5 mM being more effective. Activity of ADC was slightly or remarkably inhibited by 1 and 5 mM d-arg, respectively, in line with change of free putrescine (Put) content in the treated shoots. Activity of ornithine decarboxylase (ODC) was only repressed by 5 mM d-arg. Application of exogenous Put at 1 mM slightly recovered the growth of impaired apple shoots, while exogenous Put at 5 mM could resume the growth to a level similar with the control. Addition of exogenous Put led to notable increase in endogenous free Put, coupled with corresponding recovery of ADC and ODC activities. Transcriptional levels of several key genes involved in polyamine biosynthesis were more or less repressed by 5 mM d-arg relative to the untreated shoots, which were otherwise up-regulated by exogenously applied Put. The data presented herein showed that it is possible to regulate apple shoot growth via modulation of cellular polyamine contents.
Keywords: Malus sylvestris (L.) Mill. var. domestica (Borkh.) Mansf.; Arginine decarboxylase; d-Arginine; Gene expression; In vitro shoot growth; Ornithine decarboxylase; Polyamine; Putrescine

Gorji Marzban, Anita Herndl, Sara Pietrozotto, Srijib Banerjee, Christian Obinger, Fatemeh Maghuly, Rainer Hahn, Donato Boscia, Hermann Katinger, Margit Laimer, Conformational changes of Mal d 2, a thaumatin-like apple allergen, induced by food processing, Food Chemistry, Volume 112, Issue 4, 15 February 2009, Pages 803-811, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.06.051.
(http://www.sciencedirect.com/science/article/B6T6R-4SVKSVW-2/2/f64c7a1317c04cd954ecb3a48ebd477b)
Abstract:
Mal d 2, a thaumatin-like protein from apple was previously described to react to almost 75% of the apple allergic patient sera. Based on the molecular structure of this protein, the present study focused on the conformational stability of Mal d 2 in relation to in vitro IgE-binding under different physico-chemical conditions and proteolysis. The structural integrity of Mal d 2 was monitored using SDS-PAGE, Western blotting using polyclonal antibodies and human sera, fluorescence spectrometry and circular dichroism. Results confirmed the stability of Mal d 2. However, Mal d 2 was reactive to human serum IgEs mainly after reduction of disulphide bridges fixing the [alpha]-helical domain II. Contrary to previous assumptions, the current findings suggest that the allergenic epitopes of Mal d 2 are hidden inside the protein structure and none of the rigorous conditions applied in industrial juice processing or digestive proteolysis enhance or reduce the binding to IgE molecules.
Keywords: Fruit processing; Apple allergen; IgE-reactivity; Allergen stability

Laetitia Michodjehoun-Mestres, Jean-Marc Souquet, Helene Fulcrand, Claire Bouchut, Max Reynes, Jean-Marc Brillouet, Monomeric phenols of cashew apple (Anacardium occidentale L.), Food Chemistry, Volume 112, Issue 4, 15 February 2009, Pages 851-857, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.06.056.

(http://www.sciencedirect.com/science/article/B6T6R-4SX3P3G-2/2/46e2d990aa9b6c8f180ecfbb7b418d30)
Abstract:
Monomeric phenols were extracted by acetone/water (60:40) from the skin and flesh of four cashew apple genotypes from Brazil and Benin (West Africa), purified by absorption chromatography and subjected to HPLC-DAD/ESI-MS analysis. Skins were found much richer than fleshes in simple phenolics. Flavonol glycosides were dominant with myricetin and quercetin hexosides (2 of each), pentosides (3 of each), and rhamnosides as major compounds. Anthocyanidin glycosides were detected in skins from the two scarlet and orange pigmented genotypes as peonidin, petunidin and cyanidin 3-O-hexosides, and were absent from fleshes.
Keywords: Anacardium occidentale; Anacardiaceae; Cashew apple; Pseudo fruit; Monomeric phenols; Skin; Flesh; Flavonol glycosides; Anthocyanidin glycosides; HPLC-DAD/ESI-MS

Fang Chen, Lingqin Zeng, Yuanyuan Zhang, Xiaojun Liao, Yiqiang Ge, Xiaosong Hu, Lianzhou Jiang, Degradation behaviour of methamidophos and chlorpyrifos in apple juice treated with pulsed electric fields, Food Chemistry, Volume 112, Issue 4, 15 February 2009, Pages 956-961, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.07.016.
(http://www.sciencedirect.com/science/article/B6T6R-4T0FFB6-7/2/f2620b3d39e71bfd436a6337f2c3453e)
Abstract:
Apple juice (13 [degree sign]Brix) spiked with methamidophos and chlorpyrifos (2-3 mg/l of each compound) was treated by pulsed electric fields (PEF), and pesticide residues were quantified by gas chromatography with flame photometric detection (GC-FPD). Results showed that electric field strength (8-20 kV/cm) and pulse number (6-26 pulses) have significant effects on the degradation of methamidophos and chlorpyrifos. PEF treatment is effective for the degradation of methamidophos and chlorpyrifos residues in apple juice, and chlorpyrifos is much more labile to PEF than methamidophos. An increase in either pulse number or electric field strength could speed the degradation of methamidophos and chlorpyrifos, and the kinetics equations and related parameters quantitatively characterized the degradation behavior of the pesticides. The exponential model better fits the experimental data for all treatments than the linear model.
Keywords: Pulsed electric field (PEF); Methamidophos; Chlorpyrifos; Degradation; Apple juice

Claudio Di Vaio, Chiara Cirillo, Marina Buccheri, Francesco Limongelli, Effect of interstock (M.9 and M.27) on vegetative growth and yield of apple trees (cv 'Annurca'), Scientia Horticulturae, Volume 119, Issue 3, 3 February 2009, Pages 270-274, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.08.019.
(http://www.sciencedirect.com/science/article/B6TC3-4TN8BX3-1/2/b18adb49ff18f7f28530ee530a03933e)
Abstract:
With the purpose of obtaining apple plants with reduced vigour but deep and expanded root apparatus, more adapted for establishment of apple orchards in dry, windy areas and higher altitudes, different interstem/rootstock combinations were compared, using seedling as rootstock and, alternatively, two weak interstocks (M.9 and M.27). For all treatments the plants were grafted at two height from soil (10 and 20 cm), interposing interstock 10 or 20 cm long. Plants with interstock showed lower vegetative growth in comparison with control plants with a reduction of 80% (M.27) and of 50% (M.9) of canopy growth. Moreover, use of interstock determined, as compared with the control plants, an increase of fruit production and average fruit weight. It was noted that increasing the interstock length, caused reduction of plants vigour and fruit production. The results showed that, the combination 'Annurca Rossa del Sud'/M.9 (10 cm long)/seedling rootstock (20 cm high) was the most efficient for productivity, early maturing and plant vigour control.

Keywords: Apple; Interstock; Grafting; Rootstock; Annurca

Thomas Nesme, Francoise Lescourret, Stephane Bellon, Robert Habib, A modelling approach to explore nitrogen fertilisation practices of growers and their consequences in apple orchards, Agricultural Systems, Volume 99, Issues 2-3, February 2009, Pages 76-85, ISSN 0308-521X, DOI: 10.1016/j.agsy.2008.09.004.
(http://www.sciencedirect.com/science/article/B6T3W-4V11M8H-1/2/5fac8604d5652489318a4cbf4efbeb82)
Abstract:
Modelling can be a powerful tool to help us understand and evaluate farmers' practices. It can provide us with references that can then be compared to farmers' practices. We applied this type of modelling approach in order to understand and to evaluate N fertilisation in apple orchards. We used Epistics, an agronomic model that simulates the N and water dynamics in apple orchards and that generates N fertilisation schedules by using a supply demand approach over fixed planning horizons. A schedule is characterised by a total N amount and an application timing. These types of model-generated schedules were evaluated on nitrate leaching and fulfilment of crop N requirements. Schedule generation was performed with different weightings of these two objectives. Farmers' practices were compared to fertilisation schedules generated by Epistics, either with user-defined or with optimised parameters of schedule generation. Model analysis showed that not taking environmental risks into account led to considerable over-fertilisation (e.g., mean of 141 kg N/ha/yr for year 2003 for all plots) with high leaching. With limited consideration of environmental risks, a sharp decrease of the model-generated total N amount to be applied per ha and per year was observed (e.g., mean of 57 kg N/ha/yr for year 2003 for all plots) without restricting fulfilment of N requirements. Farmers' fertilisation practices were similar to those generated by the model that took limited environmental risks into account. They corresponded, on average, to a moderate over-fertilisation, aimed at fulfilling about twice the crop N requirements. For a given total N amount to be applied per ha and per year, the farmers' different fertilisation timing did not influence N leaching or the fulfilment of crop N requirements. Although the variability of total N amounts applied by farmers is partly unexplained, this approach, which combines the analysis and evaluation of farmers' practices, contributed to understanding and improving farmers' fertilisation practices.
Keywords: Apple orchards; Crop modelling; Cultural practices; Model parameter optimisation; Nitrogen dynamics; Nitrogen fertilisation

M. Saudreau, A. Marquier, B. Adam, P. Monney, H. Sinoquet, Experimental study of fruit temperature dynamics within apple tree crowns, Agricultural and Forest Meteorology, Volume 149, Issue 2, February 2009, Pages 362-372, ISSN 0168-1923, DOI: 10.1016/j.agrformet.2008.09.001.
(http://www.sciencedirect.com/science/article/B6V8W-4TVJJMJ-1/2/4afb2c3d1251d7ed43ad278f32c0a92d)
Abstract:
Inner and surface temperatures of several `Golden Delicious' apples in orchard and air temperature were measured during more than 2 months. In addition to temperature measurements, the 3D canopy structure was measured to compute the light interception of each measured `Golden Delicious' apple. From this we extracted quantitative information about fruit temperature dynamics and fruit temperature variability within a tree crown in relation to air temperature fluctuations and fruit sunniness. Especially, fruit temperature dynamics were analyzed at daily and monthly time scales and compared to the air temperature dynamics. Results showed that when an averaged fruit per tree and a daily time scale were considered, as it is commonly done in fruit or pest development models, fruit temperature was equal to air temperature. However, during daytime, large departure from air temperature and large inner temperature gradients which could have significant effect on fruit physiological processes were measured.

Moreover, such departures were highly variable among fruits within a tree canopy. To explain such within tree variability, the light interception by fruits must be taken into account. From this experiment, useful relationships between fruit temperature, air temperature and fruit light interception for fruit physiological model were derived and explained from physical principles.
Keywords: Architecture; Interception; Light; Tree mock-ups; Variability

Jerry V. Cross, David R. Hall, Peter Shaw, Gianfranco Anfora, Exploitation of the sex pheromone of apple leaf midge Dasineura mali Kieffer (Diptera: Cecidomyiidae): Part 2. Use of sex pheromone traps for pest monitoring, Crop Protection, Volume 28, Issue 2, February 2009, Pages 128-133, ISSN 0261-2194, DOI: 10.1016/j.cropro.2008.09.004.
(http://www.sciencedirect.com/science/article/B6T5T-4TY3XRJ-1/2/3898c5adca4865c702a5e8adfafc4e1e)
Abstract:
Catches of apple leaf midge, Dasineura mali, in sex pheromone traps and subsequent galling damage to shoots over four successive midge generations per season were investigated during 2004 and 2005 in apple orchards in Kent, south eastern England, Trentino, northern Italy and South Island, New Zealand. The orchards were newly planted or established, had widely varying apple leaf midge populations and were subjected to different pesticide management regimes. The Julian date of the peak catch of midges in the sex pheromone traps increased approximately linearly with increasing generation number. There was also a strong increasing relationship between the Julian date of peak catch and increasing absolute value of latitude. A linear relationship was fitted within the range of 41 -51 degrees latitude included. Strong linear relationships on log-log transformed scales were found between the total and peak numbers of midges caught per generation and the populations of galls that developed subsequently. The best fit of log10(total galls/ha) = 2.138 + log10(total no. midges caught/generation) was obtained for the first and second generations. The relationship indicates that each male midge caught in a trap for a particular generation corresponds to approximately 137 galls being formed per hectare subsequently for that generation, providing that there are sufficient shoots and tender young leaves present to accommodate them. Clearly the proportion of shoots and leaves galled per hectare will depend on the numbers of shoots and leaves present in the particular orchard but knowledge of these parameters should allow simple estimates to be made. The regressions were significantly weakened when the third and especially the fourth generations were included, largely because of gall saturation or because tree growth had ceased. The relationships were not significantly affected by pesticide management regime, orchard age or country of location. In a further study, a good correspondence was found between pheromone trap catches and the percentage of shoots infested with eggs of D. mali for the first and second generation in an experimental orchard in Kent during 2006. The results indicate that the sex pheromone traps are effective for monitoring the flight activity of successive generations of D. mali, can be used to predict the severity of galling attacks to shoots and are likely to be useful for timing insecticide sprays.
Keywords: Apple leaf curling midge; Dasineura mali; Cecidomyiidae; Sex pheromone; Pest monitoring; Damage threshold; Insecticide spray timing

Jerry V. Cross, David R. Hall, Exploitation of the sex pheromone of apple leaf midge Dasineura mali Kieffer (Diptera: Cecidomyiidae) for pest monitoring: Part 1. Development of lure and trap, Crop Protection, Volume 28, Issue 2, February 2009, Pages 139-144, ISSN 0261-2194, DOI: 10.1016/j.cropro.2008.09.008.
(http://www.sciencedirect.com/science/article/B6T5T-4TYXKX1-2/2/1f9c34700f9a1ebfbbc6167a32eb273e)
Abstract:

In previous work, the female sex pheromone of the apple leaf midge, Dasineura mali (Kieffer) (Diptera: Cecidomyiidae), was identified by us as (Z)-13-acetoxy-8-heptadecen-2-one. Only one enantiomer of the chiral compound was attractive to male midges but the racemic mixture was equally attractive. A series of replicated field experiments was carried out during 2004-2006 to develop an optimised pheromone trap system for monitoring populations of D. mali in commercial orchards. With rubber septa dispensers numbers of midges caught increased with increase in loading of pheromone over the range tested from 1 [mu]g to 100 [mu]g and a loading of 3 [mu]g was found to be suitable for pest monitoring purposes. Polyethylene vial dispensers were unattractive during these tests. Release rate studies in the laboratory showed reasonably uniform release of pheromone from the septa for at least 574 days at 27 [degree sign]C and 8 km/h wind speed. With the vials there was a delay of 10 days before the start of release of pheromone under these conditions. Funnel, bottle, Petri dish, delta and dish traps all caught midges, those with the larger catching surfaces being more sensitive. In practice, it was concluded that the standard delta trap is the best design for use by growers. The colour of the trap had no effect on attractiveness to D. mali males, but catches of non-target arthropods in red, green and black traps were significantly lower than in white, yellow or blue traps. The red traps are recommended for use by growers. Numbers of male midges caught were greatest in traps at ground level and decreased strongly with increasing height of trap deployment. A standard deployment height of 0.5 m was chosen. Males were attracted to traps over a distance of at least 50 m from an infested orchard. They showed a strong diurnal pattern of flight activity. Numbers caught rose steeply in the morning starting at 07:00 h (2 h after dawn), reached a peak at 09:00 h and steadily declined throughout the day thereafter. Conversely, numbers of ovipositing females were very low at 09:00 h but increased steadily, reaching a peak at 11:00-12:00 h and declining thereafter.
Keywords: Sex pheromone; Pest monitoring; Apple leaf curling midge; Dasineura mali; Pheromone lure and trap

Rosa M. Raybaudi-Massilia, Jonathan Mosqueda-Melgar, Olga Martin-Belloso, Antimicrobial activity of malic acid against Listeria monocytogenes, Salmonella Enteritidis and Escherichia coli O157:H7 in apple, pear and melon juices, Food Control, Volume 20, Issue 2, February 2009, Pages 105-112, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.02.009.
(http://www.sciencedirect.com/science/article/B6T6S-4S0YXKJ-2/2/1d956b23b8c34ff9e864623978394203)
Abstract:
Minimal inhibitory (MIC) and minimal bactericidal (MBC) concentrations of malic acid against Listeria monocytogenes, Salmonella Enteritidis and Escherichia coli O157:H7 inoculated in apple, pear and melon juices stored at 5, 20 and 35 [degree sign]C were evaluated. MICs and MBCs against L. monocytogenes, S. Enteritidis and E. coli O157:H7 were significantly affected by storage temperature, juice characteristics and type of microorganism. Malic acid was more effective at 35 and 20 [degree sign]C than at 5 [degree sign]C in all studied fruit juices. E. coli O157:H7 was more resistant to malic acid than S. Enteritidis and L. monocytogenes. Apple, pear and melon juices without malic acid were inhibitory to E. coli O157:H7, S. Enteritidis and L. monocytogenes at 5 [degree sign]C, whereas, MBCs of 1.5% (v/v) of malic acid in apple and pear juices, and 2% (v/v) in melon juice at 5 [degree sign]C were needed to reduce E. coli O157:H7, those concentrations being higher than those required to reduce S. Enteritidis and L. monocytogenes in those fruit juices. In addition, concentrations of 2%, 2.5% and 2.5% (v/v) of malic acid added to apple, pear and melon juices, respectively, were required to inactivate the three pathogens by more than 5 log cycles after 24 h of storage at 5 [degree sign]C. Transmission electron microscopy showed that malic acid produced damage in the cell cytoplasm of pathogens without apparent changes in the cell membrane.
Keywords: Malic acid; Pathogenic microorganisms; Fruit juices

N. Basaran-Akgul, J.J. Churey, P. Basaran, R.W. Worobo, Inactivation of different strains of Escherichia coli O157:H7 in various apple ciders treated with dimethyl dicarbonate (DMDC) and sulfur dioxide (SO2) as an alternative method, Food Microbiology, Volume 26, Issue 1, February 2009, Pages 8-15, ISSN 0740-0020, DOI: 10.1016/j.fm.2008.07.011.
(http://www.sciencedirect.com/science/article/B6WFP-4T8HHDC-9/2/07697a2972b95bd1b0cbf4eb8e096a20)
Abstract:
Escherichia coli has been identified as the causative agent in numerous foodborne illness outbreaks associated with the consumption of fresh apple cider. Apple cider has a pH which is normally below 4.0 and would not be considered a medium capable of supporting the growth of foodborne pathogens. The association of unpasteurized apple cider with foodborne illness due to E. coli O157:H7 has however, led to increased interest in potential alternative methods to produce pathogen free cider. Apple cider was prepared from eight different apple cultivars, inoculated with approximately 106-107 CFU of three strains of E. coli O157:H7 per ml (933, ATCC 43889, and ATCC 43895) and tested to determine the effectiveness of sulfur dioxide (SO2) and dimethyl dicarbonate (DMDC). Bacterial populations for treated and untreated samples were then enumerated by using non-selective media. Eight different ciders were treated with DMDC (125 and 250 ppm) and SO2 (25, 50, 75, 100 ppm). Greater than a 5-log reduction was achieved at room temperature with 250 ppm of DMDC and 50 ppm of SO2 after the incubation time of 6 h and 24 h, respectively. Addition of DMDC and/or SO2 may offer an inexpensive alternative to thermal pasteurization for the production of safe apple cider for small apple cider producers.
Keywords: Escherichia coli O157:H7; Dimethyl dicarbonate (DMDC); Sulfur dioxide (SO2); Apple cider; Pathogen; Non-thermal pasteurization

Yi Zhu, Zhongli Pan, Processing and quality characteristics of apple slices under simultaneous infrared dry-blanching and dehydration with continuous heating, Journal of Food Engineering, Volume 90, Issue 4, February 2009, Pages 441-452, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.07.015.
(http://www.sciencedirect.com/science/article/B6T8J-4T2S8K4-1/2/16f0ebd4e541e7f7796913ed2b1fe4a2)
Abstract:
This study investigated the effects of various processing parameters on apple slices exposed to infrared (IR) radiation heating in a continuous heating mode for achieving simultaneous infrared dry-blanching and dehydration (SIRDBD). The investigated parameters were radiation intensity, slice thickness and processing time. A three-factor factorial experiment design was conducted to determine the influence of parameters on the heating and drying rates, product temperature, moisture reduction, residual polyphenol oxidase (PPO) and peroxidase (POD) activities and surface color change ([Delta]E). High radiation intensity and/or thin slices had faster increase of product temperature, and quicker moisture removal and inactivation of PPO and POD, than did low radiation intensity and/or thick slices. The simple page model performed well for describing drying behavior during SIRDBD. The first-order kinetics and the fractional conversion models fitted well for PPO and POD inactivation curves, respectively. Surface color changes of apple slices were mainly due to the decrease of L value and increase of a value, which corresponded to enzymatic browning occurred during the process. To achieve 1 log reduction of POD, the SIRDBD treatments resulted in moisture reductions of 15.35-49.29% and [Delta]E between 2.030 and 5.518. It has been concluded that SIRDBD with continuous heating could be used as an alternative to the current processing methods for producing high-quality blanched and partially dehydrated fruits and vegetables.
Keywords: Infrared; Continuous heating; Blanching; Dehydration; Apple

Christian Gosch, Heidi Halbwirth, Jasmin Kuhn, Silvija Miosic, Karl Stich, Biosynthesis of phloridzin in apple (Malus domestica Borkh.), Plant Science, Volume 176, Issue 2, February 2009, Pages 223-231, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.10.011.
(http://www.sciencedirect.com/science/article/B6TBH-4TVJNDJ-1/2/19c2aaca0b10cb2e042de47747a2a377)
Abstract:
In contrast to the ubiquitously present flavonoids, dihydrochalcones seem to be restricted to approx. 30 plant families. In apple (Malus domestica Borkh.), the dihydrochalcone phloridzin (phloretin 2'-O-glucoside) is dominant representing more than 90% of the soluble phenolics in the leaves. Dihydrochalcones are biochemically related to flavonoids, but the knowledge of their biosynthesis is still limited. We investigated three biosynthetic steps leading to phloridzin formation in apple: (i) NADPH-dependent formation of 4-hydroxydihydrocinnamoyl-CoA from p-coumaroyl-CoA, (ii) phloretin formation by chalcone synthase (CHS) and (iii) glucosylation of phloretin in position 2'. The formation of 4-hydroxydihydrocinnamoyl-CoA does not seem to be apple specific, although not all plants tested were able to catalyze the reaction. Four CHS cDNAs were identified as showing sequence differences at the amino acid level. The recombinant isoenzymes catalyzed both the formation of naringenin chalcone and phloretin to a comparable extent. This underpins the hypothesis that the dihydrochalcone core structure is formed by the common CHS. The absence of phloridzin in the closely related pear (Pyrus communis L.) is based on the lack of ability to catalyze the first step in the phloridzin biosynthesis.
Keywords: Malus domestica; Dihydrochalcone; Phloridzin; Chalcone synthase; Dihydrochalcone 2'-O-glucosyltransferase; Medium chain acyl-CoA dehydrogenase

Ross G. Atkinson, Sarah L. Johnston, Yar-Khing Yauk, Neelam N. Sharma, Roswitha Schroder, Analysis of xyloglucan endotransglucosylase/hydrolase (XTH) gene families in kiwifruit and apple, Postharvest Biology and Technology, Volume 51, Issue 2, February 2009, Pages 149-157, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.06.014.
(http://www.sciencedirect.com/science/article/B6TBJ-4T5HJ10-3/2/5355494b94628fdfd018e2d9fb17f571)
Abstract:
Xyloglucan endotransglucosylase/hydrolase (XTH) enzymes are thought to play a key role in fruit ripening by loosening the cell wall in preparation for further modification by other cell wall-associated enzymes and through disassembly of xyloglucan. Twenty-five XTH genes were isolated and characterised from kiwifruit and apple databases containing >270,000 expressed sequence tags (ESTs). The XTH genes (14 from kiwifruit, 11 from apple) encoded putative proteins with similar molecular weights, but with isoelectric points ranging from acidic to basic. All 25 XTH amino acid sequences contained the two conserved glutamic acid residues at the active site of the XTH enzyme. Phylogenetic analysis produced trees with branches each containing kiwifruit, apple, tomato and Arabidopsis XTH sequences, suggesting the potential for functional orthology. EST expression profiling and quantitative PCR analysis were used to identify kiwifruit and apple XTH transcripts expressed in root tip, flower, young leaf and ripe fruit. In ripe apple fruit, the transcripts for two XTH genes (Md-XTH2 and Md-XTH10) were the most abundant, whilst in ripe kiwifruit three transcripts predominated (Ad-XTH4, 5 and 7). Ad-XTH7 was highly expressed in the outer pericarp of firm kiwifruit at commercial harvest and expression of this mRNA decreased during the rapid softening phase. Three kiwifruit XTH genes (Ad-XTH5, Ad-XTH7 and Ac-XTH14) were expressed in Escherichia coli and the recombinant proteins were shown to have xyloglucan endotransglucosylase activity. This research lays the groundwork for understanding the role of XTHs during fruit ripening and storage in kiwifruit and apple.
Keywords: Apple; Fruit ripening; Genomics; Kiwifruit; Xyloglucan endotransglucosylase/hydrolase

Behrouz Ehsani-Moghaddam, Jennifer DeEll, Correlation and path-coefficient analyses of ripening attributes and storage disorders in `Ambrosia' and `Empire' apples, Postharvest Biology and Technology, Volume 51, Issue 2, February 2009, Pages 168-173, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.07.006.
(http://www.sciencedirect.com/science/article/B6TBJ-4T9JWC9-4/2/693057af15353aebe65de029a8c03afe)
Abstract:
The objectives of this study were: (1) to determine correlation effects among the ripening attributes of `Empire' and `Ambrosia' apples during storage, and (2) to determine the direct and indirect contributions of these ripening attributes on the incidence of physiological disorders and storage rots using path-coefficient analysis. The analysis was applied to data obtained from a variety of harvest dates and storage regimes from apples. Pearson correlation analysis of the data indicated a strong positive correlation between internal ethylene concentration (IEC) and peel greasiness, a negative correlation between IEC and soluble solids concentration, and a negative correlation between firmness and peel greasiness in both cultivars, as well as a negative correlation between IEC and firmness in `Empire'. Results indicated that increased IEC in `Ambrosia' apples during storage was related to higher incidences of core browning and lenticel damage and lower incidence of internal browning. Higher IEC in `Empire' apples during storage was associated with less internal browning. Several significant correlations, representing different relationships among the ripening attributes and storage disorders were obtained.
Keywords: Fruit maturity; Malus domestica; Path analysis; Postharvest; Storage disorder

Robert A. Spotts, Kelly M. Wallis, Maryna Serdani, Daniel T. O'Gorman, Peter L. Sholberg, Real time polymerase chain reaction for rapid and quantitative determination of Cystofilobasidium infirmominiatum on the surfaces of apple, pear, and sweet cherry fruit, Postharvest Biology and Technology, Volume 51, Issue 2, February 2009, Pages 227-231, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.07.015.
(http://www.sciencedirect.com/science/article/B6TBJ-4TX6W1H-5/2/aeede5d8334bdfaf7d74d72030e326e1)
Abstract:
The objectives of this study were to develop primers and a real time PCR protocol for the postharvest biocontrol yeast Cystofilobasidium infirmominiatum (Cim). The application of this technology was developed to quantify Cim on the surfaces of apple, two pear cultivars, and sweet cherry fruit treated over a range of concentrations. Statistically significant relationships were observed between Cim DNA on fruit surfaces, expressed as [mu]g/m2, and CFU/L of dip suspensions for apple, pear, and sweet cherry. In addition, the relationship for each fruit was significantly different from the other three fruits. Threshold values of concentrations of Cim DNA on the fruit surface were calculated based on regression equations and a dose of 2.0 x 1011 CFU/L of dip suspension, the dose for optimum decay control, and were 4.8, 7.0, 16.5, and 25.2 [mu]g/m2 for Bosc pear, Lapins sweet cherry, d'Anjou pear, and Golden Delicious apple, respectively. Monitoring Cim DNA concentration on fruit surfaces will assure that Cim is being properly applied to fruit and that a sufficient number of cells are present for optimum decay control.
Keywords: Biological control; Detection; Malus sylvestris; Prunus avium; Pyrus communis; Real time PCR

Satoru Kondo, Siriwan Meemak, Yusuke Ban, Takaya Moriguchi, Takeo Harada, Effects of auxin and jasmonates on 1-aminocyclopropane-1-carboxylate (ACC) synthase and ACC oxidase gene expression during ripening of apple fruit, Postharvest Biology and Technology, Volume 51, Issue 2, February 2009, Pages 281-284, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.07.012.
(http://www.sciencedirect.com/science/article/B6TBJ-4TXDXGJ-1/2/cf515394153389e1485384d170d5bc6d)

Abstract:
1-Aminocyclopropane-1-carboxylate (ACC) synthase and oxidase activities, their gene expression, and ethylene production in apple fruit [Malus sylvestris (L.) Mill. Var. domestica (Borkh.) Mansf.] treated with a synthetic auxin 2,4-dichlorophenoxy-propionic acid (2,4-DP) and n-propyl dihydrojasmonate (PDJ), a jasmonic acid derivative, has been investigated to clarify the action of auxin and jasmonates on ethylene production. The fruit was harvested at 103 d after full bloom (preclimacteric). The expression of MdACS4 messenger RNA (mRNA) at 48 and 96 h after treatment was higher in fruit treated with 2,4-DP than in the untreated control, but those of MdACS1 and MdACO1 were not affected by treatment. The ethylene production in 2,4-DP-treated fruit increased at 96 h after treatment. In contrast, expression of mRNAs hybridized with MdACS1 and MdACO1 probes in the skin of PDJ-treated fruit were higher than those in the untreated control. In addition, ACC synthase activity and ethylene production also increased after treatment. These results show that the ethylene production rate may differ with the kind of genes which were stimulated by auxin or jasmonates.
Keywords: Auxin; Ethylene; Jasmonates; Malus sylvestris (L.); Preclimacteric

C. Le Bourvellec, S. Guyot, C.M.G.C. Renard, Interactions between apple (Malus x domestica Borkh.) polyphenols and cell walls modulate the extractability of polysaccharides, Carbohydrate Polymers, Volume 75, Issue 2, 22 January 2009, Pages 251-261, ISSN 0144-8617, DOI: 10.1016/j.carbpol.2008.07.010.
(http://www.sciencedirect.com/science/article/B6TFD-4SYJS6H-2/2/408fa955fe5f7690d32d7208b8ea4ec3)
Abstract:
Apple polyphenol (procyanidin)-cell wall interactions were investigated and their impact on polysaccharide extractability were determined. Native and oxidised procyanidins with average degrees of polymerisation of 13 and 55 were incubated with cell walls. The effect of polyphenol oxidation was evaluated according to two designs: polyphenols were chemically oxidised either before or during interaction. The extent of procyanidin binding to cell walls was assessed by the weight increase of procyanidin-cell wall complexes as compared to weights of cell walls alone. Pectins and hemicelluloses were subsequently extracted from cell walls and from cell wall-procyanidin adducts using a chelating agent (ammonium oxalate), a pectin lyase treatment and NaOH.
Weight increases of complexes ranged from 20% to 29%. Weight gains increased in the following order: native, pre-oxidised, simultaneously oxidised and bound procyanidins, these different fractions were, respectively, bound to cell walls. In presence of native procyanidins, oxalate extracted less pectins, and those pectins had lower degrees of methylation, as compared to cell walls alone. When cell walls were incubated with oxidised and oxidising procyanidins, even less pectins with lower degree of methylation were extracted. Major findings indicated that procyanidins mainly bound to pectins as compared to other cell wall compounds: (1) the procyanidin adsorption to cell walls limited the depolymerisation of pectins supposedly induced by pectin lyase. Thus less pectins were extracted but their degree of methylation increased, indicative of products of lysis of pectin lyase. (2) Hemicelluloses extracted using NaOH (4 M) were more abundant in pectins when oxidised or oxidising procyanidins were complexed rather than non complexed to cell walls.
Keywords: Tannin; Pectin; Hemicellulose; Sequential extraction

Harender Raj, S.D. Sharma, Integration of soil solarization and chemical sterilization with beneficial microorganisms for the control of white root rot and growth of nursery apple, Scientia Horticulturae, Volume 119, Issue 2, 6 January 2009, Pages 126-131, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.07.025.
(http://www.sciencedirect.com/science/article/B6TC3-4T9BXNK-3/2/5ecede567d2a116b7a17c43d1c86d8d7)

Abstract:
White root rot (Dematophora necatrix (Mart.)) is a serious disease of apple (Malus domestica Borkh) in nurseries and orchards in India. In 2002 and 2003, field experiments were conducted to integrate soil solarization with native isolates of Azotobacter chrococcum and vesicular-arbuscular mycorrhizal fungi and observe its effect on the incidence of white root rot and growth of the saplings. Apple seeds coated with two native isolates of A. chrococcum (AZUHF1 and AZUHF2) were sown in plots inoculated with 4 native isolates of va-mycorrhiza, i.e. AMUHF1 (Glomus fesiculatum), AMUHF2 (Glomus macrocarpum), AMUHF3 (Glomus mosseae) and AMUHF4 (Gigaspora sp.) in 14 different combinations and these plots were solarized with transparent polyethylene mulch (25 [mu]m thick) for 40 days in summer months. Soil solarization resulted around 9 [degree sign]C higher temperature with average maximum temperature of 38-39 [degree sign]C. Inoculation of saplings with AMUHF1 isolate of va-mycorrhiza and AZUHF1 isolate of A. chrococcum and then their planting in solarized soil was found most effective with no incidence of white root rot in comparison to 33.6-35.4% in control accompanied with 78-113% increase in shoot length and 81.6-84.3% increase in root length. Shoot and root length of the saplings was 9.6-10.6 and 9.2-16.0% higher, respectively, in solarized plots in comparison to sterilized plots.
Keywords: Apple; Soil solarization; VA-mycorrhiza; Azotobacter chrococcum; Dematophora necatrix

Hua-Jun Gao, Hong-Qiang Yang, Jia-Xi Wang, Arginine metabolism in roots and leaves of apple (Malus domestica Borkh.): The tissue-specific formation of both nitric oxide and polyamines, Scientia Horticulturae, Volume 119, Issue 2, 6 January 2009, Pages 147-152, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.07.034.
(http://www.sciencedirect.com/science/article/B6TC3-4TCXGHX-1/2/5f946c4e03b1c3f4aa28ec0499f4aa51)
Abstract:
In addition to serving as an important nitrogen reserve, l-Arginine participates in various physiological processes in plants. In plants, like in animals, nitric oxide (NO) is synthesized through nitric oxide synthase (NOS) pathway, while polyamines (PAs) are through arginine decarboxylase (ADC) and/or arginase-ornithine decarboxylase (ODC) pathway in arginine metabolism. In this study, arginine metabolism in fine roots and leaves of different development stages (white roots, brown roots, young leaves and mature leaves) were investigated, using potted 3-year-old apple plants. The results showed that different pathways in arginine metabolism are positively correlated, producing polyamines and nitric oxide in a tissue-specific manner. Higher levels of arginine, polyamines and nitric oxide, as well as arginase, ADC, ODC and NOS activities exist in roots than in leaves. White roots and young leaves exhibit higher levels of arginine metabolism than brown roots and mature leaves, respectively. As both polyamines and nitric oxide are multifunctional molecules involved in plant development and stress response, it is possible to conclude that the unique physiological roles of l-Arginine in plants might be associated with the coordinated biosynthesis of both polyamines and nitric oxide via arginine metabolism.
Keywords: Arginine metabolism; Polyamine; Nitric oxide; Tissue-specific; Root signalling

L. van Schoor, S. Denman, N.C. Cook, Characterisation of apple replant disease under South African conditions and potential biological management strategies, Scientia Horticulturae, Volume 119, Issue 2, 6 January 2009, Pages 153-162, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.07.032.
(http://www.sciencedirect.com/science/article/B6TC3-4TF69HK-1/2/06d8f7a788f0d571b8a5e1547a107a2b)
Abstract:
A possible biological origin of apple replant disease (ARD) in South Africa was investigated. Elements responsible for stunted growth and root discolouration could not be reduced to a level

having no negative effect on apple seedlings by dilution of the original ARD field soils, with increased proportions of fumigated soil, from 100% to 25%. Pythium, Fusarium and Cylindrocarpon spp. were consistently isolated from all replant soils forming part of this study and Rhizoctonia spp. to a lesser degree, indicating that these fungi may play a role in ARD etiology in South Africa. Further research is needed, since identifications were not made to species level and no pathogenicity tests were performed. Nematodes implicated in ARD were inconsistently associated with the ARD soils tested, indicating only a secondary role. Furthermore, studies were conducted to investigate more environmentally friendly disease control alternatives to replace methyl bromide in ARD management. Applications of compost and compost extracts were identified as promising, practical tools for managing ARD, especially under the marginal production conditions of South African apple producing regions. In pot trials, the application of compost, as well as sterilised and unsterilised compost extracts, significantly increased growth of apple seedlings in ARD soils. Although results varied with addition of a slow release fertiliser, compost and compost extracts still significantly increased seedling growth parameters for several of the ARD soils tested, suggesting that they can ameliorate the effects of ARD, in addition to supplying nutrients. Three field trials were conducted in commercial orchards to verify pot trial results and to compare the impact of organic amendments on ARD severity with the standard fumigation control methods. Compost and mulch consistently increased shoot growth to the same or greater extent as the standard chemical treatments, for the 2-year trial period.
Keywords: Apple replant disease; Compost; Compost extract; Fumigation

T.E. Sackett, C.M. Buddle, C. Vincent, Dynamics of spider colonization of apple orchards from adjacent deciduous forest, Agriculture, Ecosystems & Environment, Volume 129, Issues 1-3, January 2009, Pages 144-148, ISSN 0167-8809, DOI: 10.1016/j.agee.2008.08.005.
(http://www.sciencedirect.com/science/article/B6T3Y-4TFV8XX-2/2/f1e47c488f8a5e529a42bad7ea878c87)
Abstract:
The colonization of foliage-dwelling spiders into insecticide-free 'micro' apple orchards at two distances (10 and 50 m) from an adjacent source habitat of deciduous forest was quantified in southern Quebec, Canada. Both colonization rate and composition of colonizing spider assemblages were affected by distance at this small spatial scale: the samples from the micro-orchards 10 m from the forest were intermediate in composition between the assemblages in the deciduous forest and those in the micro-orchards 50 m from the forest. Spider species found in micro-orchards were the same as those documented from collections from older, insecticide-free orchards although species evenness was higher in the older orchards indicating that species composition shifts over time within the habitat. Maintaining deciduous forest near to orchards will provide a source of annual colonists for spider populations within the orchard.
Keywords: Araneae; Diversity; Species richness; Abundance; Composition; Dispersal

Hongyin Zhang, Lei Wang, Longchuan Ma, Ying Dong, Song Jiang, Bin Xu, Xiaodong Zheng, Biocontrol of major postharvest pathogens on apple using Rhodotorula glutinis and its effects on postharvest quality parameters, Biological Control, Volume 48, Issue 1, January 2009, Pages 79-83, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2008.09.004.
(http://www.sciencedirect.com/science/article/B6WBP-4TJ1HKN-1/2/b153653903f2c884fff5efcec396ad10)
Abstract:
The biocontrol activity of Rhodotorula glutinis on gray mold decay and blue mold decay of apple caused by Botrytis cinerea and Penicillium expansum, respectively, was investigated, as well as its effects on postharvest quality of apple fruits. The results show there was a significant negative correlation between concentrations of the yeast cells and the disease incidence of the pathogens. The higher concentration of the R. glutinis, the better effect of the biocontrol capacity. At

concentrations of R. glutinis 1 x 108 CFU ml-1, the amount of gray mold decay was completely inhibited after 5 days incubation at 20 [degree sign]C, after challenge with B. cinerea spores suspension of 1 x 105 spores ml-1; While the blue mold decay was completely inhibited at concentrations of 5 x 108 CFU ml-1, at challenged with P. expansum spores suspension of 5 x 104 spores ml-1. These results demonstrated that the efficacy of R. glutinis in controlling of gray mold decay of apples was better than the efficacy of controlling blue mold. R. glutinis within inoculated wounds on apples increased in numbers at 20 [degree sign]C from an initial level of 9.5 x 105 CFU per wound to 2.24 x 107 CFU at 20 [degree sign]C after 1 day. The highest population of the yeast was recovered 4 days after inoculation, the yeast population in wounds increased by 56.9 times. After that, the population of the yeast began to decline very slowly. R. glutinis significantly reduced the incidence of natural infections on intact fruit from 75% in the control fruit to 28.3% after 5 days at 20 [degree sign]C, and from 58.3 to 6.7% after 30 days at 4 [degree sign]C followed by 4 days at 20 [degree sign]C. R. glutinis treatment had no deleterious effect on quality parameters after 5 days at 20 [degree sign]C or after 30 days at 4 [degree sign]C followed by 4 days at 20 [degree sign]C.
Keywords: Apple; Gray mold; Blue mold; Postharvest decay; Biocontrol; Rhodotorula glutinis; Quality parameters

Glynn C. Percival, Shirley Boyle, Evaluation of film forming polymers to control apple scab (Venturia inaequalis (Cooke) G. Wint.) under laboratory and field conditions, Crop Protection, Volume 28, Issue 1, January 2009, Pages 30-35, ISSN 0261-2194, DOI: 10.1016/j.cropro.2008.08.005.
(http://www.sciencedirect.com/science/article/B6T5T-4TJTTFP-2/2/1a642c0d82498b1915de7c1d35902eb2)
Abstract:
A detached leaf bioassay was used to determine the influence of several film forming polymers and a conventional triazole fungicide on apple scab (Venturia inaequalis (Cooke) G. Wint.) development under laboratory in vitro conditions, supported by two field trials using established apple cv. Golden Delicious to further assess the efficacy of foliar applied film forming polymers as scab protectant compounds. All film forming polymers used in this investigation (Bond, Designer, Nu-Film P, Spray Gard, Moisturin, Companion PCT12) inhibited germination of conidia, subsequent formation of appressoria and reduced leaf scab severity using a detached leaf bioassay. Regardless of treatment, there were no obvious trends in the percentage of conidia with one to four appressoria 5 days after inoculation. The synthetic fungicide penconazole resulted in the greatest levels of germination inhibition, appressorium development and least leaf scab severity. Under field conditions, scab severity on leaves and fruit of apple cv. Golden Delicious treated with a film forming polymer (Bond, Spray Gard, Moisturin) was less than on untreated controls. However, greatest protection in both field trials was provided by the synthetic fungicide penconazole. Higher chlorophyll fluorescence Fv/Fm emissions in polymer and penconazole treated trees indicated less damage to the leaf photosynthetic system as a result of fungal invasion. In addition, higher SPAD values as measures of leaf chlorophyll content were recorded in polymer and penconazole treated trees. Application of a film forming polymer or penconazole resulted in a higher apple yield per tree at harvest in both the 2005 and 2006 field trials compared to untreated controls. Results suggest application of an appropriate film forming polymer may provide a useful addition to existing methods of apple scab management.
Keywords: Urban trees; Disease control; Foliar pathogens; Integrated disease management; Fungicides; Pathogen control; Orchard management; Tree production

Juliane Elisa Welke, Michele Hoeltz, Horacio Alberto Dottori, Isa Beatriz Noll, Effect of processing stages of apple juice concentrate on patulin levels, Food Control, Volume 20, Issue 1, January 2009, Pages 48-52, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2008.02.001.

(http://www.sciencedirect.com/science/article/B6T6S-4RV17HD-3/2/6bbd3f62207c9a18da7e5bcca5a861bc)
Abstract:
The effects of different stages of apple juice concentrate production on patulin levels were investigated. Patulin was detected in all samples analyzed in concentrations ranging from 56 to 653 [mu]g/L. Apple paste resulted from milling process had high levels of patulin. The results of this study indicate that it is possible to reduce patulin level in apple juices. After pasteurization, enzymatic treatment, microfiltration and evaporation processes, the mean loss of patulin was 39.6, 28.3, 20.1 and 28.4%, respectively. When apple juices concentrate were diluted from 69 to 12[degree sign]Brix to consume, patulin content ranged from 15 to 46 [mu]g/L. Patulin content in all juice samples was lower than the limit of 50 [mu]g/L considered acceptable by the Codex Alimentarius Commission. But if consider the maximum permitted concentration established for apple products intended for infants and young children by The Commission of the European Communities all samples were found to exceed patulin concentration of 10 [mu]g/L.
Keywords: Patulin; Apple juice; Processing stages

Manuel Angel Palazon, Dario Perez-Conesa, Pedro Abellan, Gaspar Ros, Fernando Romero, Maria Luisa Vidal, Determination of shelf-life of homogenized apple-based beikost storage at different temperatures using Weibull hazard model, LWT - Food Science and Technology, Volume 42, Issue 1, 2009, Pages 319-326, ISSN 0023-6438, DOI: 10.1016/j.lwt.2008.03.011.
(http://www.sciencedirect.com/science/article/B6WMV-4S6P27R-1/2/0f1cc23de294d5ae85e5eb55e06ca66c)
Abstract:
A shelf-life model based on the storage temperature was developed for a homogenized fruit-based baby food. Bottles of apple compote for infant feeding were collected from a food company and stored at three different temperatures (23, 30 and 37 [degree sign]C) during 420 days. CIELAB color space parameters, vitamin C, 5-hydroxymethylfurfural were measured and sensory analysis (sensory attributes and overall acceptability) was carried out during the length of the study. Weibull Hazard Method was utilized to set the shelf-life end-point of the product at 37 [degree sign]C according to overall acceptability score given by the sensory panel. Considering a 50% probability of panellists to find the product as being unacceptable, the end of shelf-life for the apple-based beikost stored at 37 [degree sign]C was achieved after 346 days. The statistical analysis of the data enabled us to select the most adequate zero- and first-order kinetic equations for both physicochemical and sensory attributes in samples stored at 37 [degree sign]C. Color CIELAB parameters, vitamin C and sensory attributes (color and taste) were selected as the critical parameters. Their rejection times at 23 and 30 [degree sign]C storage temperatures were obtained by extrapolation of the results given by Weibull method at 37 [degree sign]C. Finally, rejection times for critical parameters were used to propose a shelf-life equation that showed 4.5 and 3.4 years of shelf-life when stored at 20 and 23 [degree sign]C, respectively.
Keywords: Modelling; Reaction kinetics; Baby food; Vitamin C; Color; Sensory analysis; HMF

L. Atares, A. Chiralt, M.G. Corradini, C. Gonzalez-Martinez, Effect of the solute on the development of compositional profiles in osmotic dehydrated apple slices, LWT - Food Science and Technology, Volume 42, Issue 1, 2009, Pages 412-417, ISSN 0023-6438, DOI: 10.1016/j.lwt.2008.03.009.
(http://www.sciencedirect.com/science/article/B6WMV-4S39MT4-1/2/5d72e90fae4d4dc665482c2369abc6a2)
Abstract:
Apple (cv. Granny Smith) slices, 30-mm thick, were osmotically dehydrated for 9 h at 30 [degree sign]C using glucose, sucrose and trehalose solutions with the same water activity (aw = 0.96). After OD treatment, water and solute content were analysed in 1.5-mm thick serial disks of the

apple slices to determine the effect of osmotic dehydration on the compositional profiles. Diffusional and 'Advancing Disturbance Front' (ADF) models were applied to the experimental data, both showing a good fit. Changes in the compositional profiles of osmotically dehydrated slices were also analysed throughout storage time. For this purpose, the 30-mm thick dehydrated slices were kept at 10 [degree sign]C for 7 days in hermetic plastic bags and compositional profiles were analysed after 1, 2, 3 and 7 days and modelled using Fermi's equation. Throughout storage, the profiles became flatter due to the counter-current migration of water and solutes associated to the concentration gradients. Mass transfer rate during dehydration was faster when sucrose or glucose was used, but trehalose implied an increase in the mass transfer resistance of the tissue. This behaviour was also observed in the mass transfer processes during storage. This effect was attributed to the changes induced by trehalose in the permeability of cell membranes through component interactions.
Keywords: Osmotic dehydration; Storage; Concentration profiles; Trehalose

David A. Felicetti, Larry E. Schrader, Changes in pigment concentrations associated with sunburn browning of five apple cultivars. I. Chlorophylls and carotenoids, Plant Science, Volume 176, Issue 1, January 2009, Pages 78-83, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.09.013.
(http://www.sciencedirect.com/science/article/B6TBH-4TNWGPY-1/2/c9a53db15839446dccd3d389e7d745bf)
Abstract:
Peel disks were taken from the sunburned area (SB-2), the area around the sunburned area (halo), the area around the halo (OH), and the center of the sun-exposed side of non-sunburned (NB) `Fuji', `Gala', `Delicious', `Golden Delicious', and `Granny Smith' apples (Malus domestica Borkh). Chlorophyll a and b concentrations in SB-2 peels of all five cultivars were generally significantly ($P <= 0.05$) lower than those in the halo, OH and NB peels. Significantly higher concentrations of [beta]-carotene, violaxanthin, and antheraxanthin were observed in `Fuji' and `Delicious' SB-2 peel as compared to OH and NB peels. Lower concentrations of [beta]-carotene and L were observed in `Granny Smith' SB-2 and halo peels than in OH and NB peels, with no differences observed in violaxanthin and antheraxanthin concentrations. The results indicate uniform changes in chlorophyll concentrations as a result of sunburn, while changes in carotenoid concentration are cultivar specific.
Keywords: Apple; Carotenoids; Chlorophyll; Malus domestica; Sunburn

David A. Felicetti, Larry E. Schrader, Changes in pigment concentrations associated with sunburn browning of five apple cultivars. II. Phenolics, Plant Science, Volume 176, Issue 1, January 2009, Pages 84-89, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.09.010.
(http://www.sciencedirect.com/science/article/B6TBH-4TK928X-1/2/c539aefb5a21d10bfd2bd3852ce7459e)
Abstract:
Changes in pigment concentrations associated with sunburn were studied by taking peel disks from the sunburned area (SB-2), the area around the sunburned area (halo), the area around the halo (OH), and the center of the sun-exposed side of non-sunburned (NB) `Fuji', `Gala', `Delicious', `Golden Delicious', and `Granny Smith' apples (Malus domestica Borkh). Idaein concentrations in the red cultivars (i.e. `Fuji', `Gala', and `Delicious') decreased from NB to OH to halo to SB-2. Total quercetin glycosides increased from OH to halo to SB-2 in all cultivars except `Delicious.' Chlorogenic acid (CA) concentrations were typically highest in the SB-2 peel and lowest in NB, except in `Granny Smith' where no CA was detected in any peel type.
Keywords: Anthocyanin; Apple; HPLC; Malus domestica; Quercetin glycosides; Sunburn

Anna B. Marin, Ann E. Colonna, Koei Kudo, Eugene M. Kupferman, James P. Mattheis, Measuring consumer response to `Gala' apples treated with 1-methylcyclopropene (1-MCP), Postharvest

Biology and Technology, Volume 51, Issue 1, January 2009, Pages 73-79, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.06.008.
(http://www.sciencedirect.com/science/article/B6TBJ-4T4HJDT-2/2/28201d29bce33f9dd1bec028a23ad2f9)
Abstract:
Post-harvest apple treatment with 1-methylcyclopropene (1-MCP) was previously found to inhibit fruit ripening but also to inhibit the production of volatile compounds that contribute to apple flavor. The first objective of this study was to determine if consumers could distinguish 1-MCP treated and untreated Gala apples [Malus sylvestris L. (Mill.) var. domestica Borkh. Mansf.] following long-term storage. Chemical analysis showed 1-MCP treated fruit had reduced flavor volatiles compared to untreated fruit. Consumer difference tests showed they could distinguish between 1-MCP treated and untreated fruit. A second objective was to compare consumers' acceptance for 1-MCP treated to untreated apples. Both 1-MCP treated and untreated apples received high overall liking scores that were not significantly different. Equal numbers of consumers indicated preference for 1-MCP treated and untreated fruit and there was no difference in purchase intent. However, subsets of consumers who eat Gala, Fuji or Red Delicious apples showed preference for untreated over 1-MCP treated fruit compared to consumers who do not eat these varieties.
Keywords: Gala apples; Malus sylvestris L. (Mill.) var. domestica Borkh. Mansf.; 1-Methylcyclopropene; 1-MCP; Consumer taste tests

C. Villatoro, M.L. Lopez, G. Echeverria, J. Graell, I. Lara, Influence of the combination of different atmospheres on diphenylamine, folpet and imazalil content in cold-stored `Pink Lady(R)' apples, Postharvest Biology and Technology, Volume 51, Issue 1, January 2009, Pages 104-109, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.05.016.
(http://www.sciencedirect.com/science/article/B6TBJ-4T9JWC9-2/2/9f2c98fe8c46d0ee51eb7d8a939b950f)
Abstract:
`Pink Lady(R)' apples were harvested at commercial maturity, treated with three different agrochemical products, and stored at 1 [degree sign]C under either air or controlled atmosphere conditions (2 kPa O2 + 2 kPa CO2 and 1 kPa O2 + 1 kPa CO2) for 13 and 27 weeks, followed by 4 weeks storage in air at 1 [degree sign]C. Diphenylamine, folpet and imazalil contents in both the skin and flesh were simultaneously determined after cold storage plus simulated marketing periods of 1 and 7 d at 20 [degree sign]C. After 27 weeks plus 7 d, diphenylamine and folpet levels in apple skin were lower for fruit stored in low O2 (2 kPa) or air than for those kept under ultra-low O2 (1 kPa). An additional storage period of 4 weeks in air reduced diphenylamine and folpet contents in whole apples stored for 13 weeks in the low O2 controlled atmosphere. For imazalil, the same result was obtained in apple skins stored for 27 weeks under an ultra-low O2 controlled atmosphere. Differences in diphenylamine and folpet contents were found for skin and flesh samples throughout the simulated marketing period, but there were observable differences in imazalil contents only for flesh samples.
Keywords: `Pink Lady(R)' apple; Diphenylamine; Imazalil; Folpet; Controlled atmosphere

Carine Floch, Yvan Capowiez, Steven Criquet, Enzyme activities in apple orchard agroecosystems: How are they affected by management strategy and soil properties, Soil Biology and Biochemistry, Volume 41, Issue 1, January 2009, Pages 61-68, ISSN 0038-0717, DOI: 10.1016/j.soilbio.2008.09.018.
(http://www.sciencedirect.com/science/article/B6TC7-4TR9D07-3/2/3e44a061c2c4933a8716ba95b3ddcc23)
Abstract:
This study under field experimental conditions in apple orchard agroecosystems investigated the effects of pest management strategies (i.e. none, organic, conventional and integrated) on enzyme

activities, in relation to soil properties. Enzyme activities chosen are implicated in the major biogeochemical nutrient cycles such as C (cellulase, fluoresceine diacetate hydrolase, [beta]-galactosidase, [beta]-glucosidase, phenol oxidase), N (arylamidase), P (acid and alkaline phosphomonoesterases, phosphodiesterase and phosphotriesterase) and S (arylsulfatase). Redundancy analyses and decomposition of the variances were performed to clarify how enzyme activities are affected by management strategy and soil properties. Results showed that the effects and their proportion attributable to management strategy and soil properties varied considerably depending on enzyme activity. Phenol oxidase activity was the only case where total variance was principally explained by management strategy (i.e. conventional and integrated) rather than by soil properties, and thus it seems to be an attractive potential indicator to assess soil quality in this agrochemical context.
Keywords: Enzyme activities; Management strategy; Soil properties; Redundancy analysis; Variance decomposition

M.H. Asif, N. Pathak, T. Solomos, P.K. Trivedi, Effect of low oxygen, temperature and 1-methylcyclopropene on the expression of genes regulating ethylene biosynthesis and perception during ripening in apple, South African Journal of Botany, Volume 75, Issue 1, January 2009, Pages 137-144, ISSN 0254-6299, DOI: 10.1016/j.sajb.2008.09.002.
(http://www.sciencedirect.com/science/article/B7XN9-4TNG59T-1/2/28d891e4da81790ee4356bfd9710e1dc)
Abstract:
Ethylene initiates and controls ripening in climacteric fruit which is developmentally regulated. During this process, ethylene production generates a strong signaling process inducing/suppressing various target genes that are associated with several attributes of fruit ripening. In apple, low temperature, low oxygen and 1-methylcyclopropene (1-MCP) treatments have been used to increase shelf life. In the present study, effort has been made to understand the molecular basis of the increase in shelf life under the influence of temperature, low oxygen and 1-MCP in Granny Smith apple. The apple fruit were exposed to these treatments either individually or in combination and levels of ethylene as well as transcript accumulation of the genes responsible for ethylene biosynthesis and ethylene receptors were measured. A tight regulation of the ethylene production was observed through differential expression of MdACS1 and MdERS1 genes. The ethylene levels were highly dependent on temperature, oxygen concentration and 1-MCP and effects of each were not only additive but associated with the expression of MdACS1 and MdERS1.
Keywords: 1-methylcyclopropene; Ethylene biosynthesis; Ethylene receptor; Fruit ripening; Hypoxia; Malus domestica; Temperature

Pilar Martinez Viedma, Angel Sobrino Lopez, Nabil Ben Omar, Hikmate Abriouel, Rosario Lucas Lopez, Eva Valdivia, Olga Martin Belloso, Antonio Galvez, Enhanced bactericidal effect of enterocin AS-48 in combination with high-intensity pulsed-electric field treatment against Salmonella enterica in apple juice, International Journal of Food Microbiology, Volume 128, Issue 2, 10 December 2008, Pages 244-249, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.08.014.
(http://www.sciencedirect.com/science/article/B6T7K-4TC920K-1/2/d6315356e4734449b0ed13a10d93be8c)
Abstract:
The effect of the broad spectrum cyclic antimicrobial peptide enterocin AS-48 combination with high-intensity pulsed-electric field (HIPEF) treatment (35 kV/cm, 150 Hz, 4 [mu]s and bipolar mode) was tested on Salmonella enterica CECT 915 in apple juice. A response surface methodology was applied to study the bactericidal effects of the combined treatment. The process variables were AS-48 concentration, temperature, and HIPEF treatment time. While treatment with enterocin AS-48 alone up to 60 [mu]g/ml had no effect on the viability of S. enterica in apple juice,

an increased bactericidal activity was observed in combination with HIPEF treatments. Survival fraction was affected by treatment time, enterocin AS48 concentration and treatment temperature. The combination of 100 [mu]s of HIPEF treatment, 30 [mu]g/ml of AS-48, and temperature of 20 [degree sign]C resulted in the lowest inactivation, with only a 1.2-log reduction. The maximum inactivation of 4.5-log cycles was achieved with HIPEF treatment for 1000 [mu]s in combination with 60 [mu]g/ml of AS-48 and a treatment temperature of 40 [degree sign]C. Synergism between enterocin AS-48 and HIPEF treatment depended on the sequence order application, since it was observed only when HIPEF was applied in the presence of previously-added bacteriocin. The combined treatment could improve the safety of freshly-made apple juice against S. enterica transmission.
Keywords: Bacteriocin; Pulsed-electric fields; Juice; Salmonella

I. Iglesias, G. Echeverria, Y. Soria, Differences in fruit colour development, anthocyanin content, fruit quality and consumer acceptability of eight `Gala' apple strains, Scientia Horticulturae, Volume 119, Issue 1, 10 December 2008, Pages 32-40, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.07.004.
(http://www.sciencedirect.com/science/article/B6TC3-4T6CF63-1/2/df76a5097a0a01f3e199d7132ee9abec)
Abstract:
The effect of strain on fruit colour development, chromaticity values and anthocyanin content, fruit quality and consumer acceptance was evaluated on eight `Gala' apple strains (Malus domestica Borkh.) at the IRTA (Spain), during a period from 4 weeks before to 1 week after commercial harvest. Based on fruit colour, measured with a Minolta CR-200 portable tristimulus colorimeter, and anthocyanin content, the most coloured strains were `Royal Beaut', `Buckeye Gala' (both semistriped) and `Ruby Gala' (blushed). `Brookfield' and `Schniga' (both striped) provided an intermediate level of colour, while `Galaxy' and `Mondial Gala' (both striped) were the least coloured ones. The most important increase in colour development was recorded from 2 weeks before the commercial harvest and continued also increasing after harvest. Highly coloured strains developed a red colour on both fruit sides with greater average of fruit surface coloured, while the less coloured strains exhibited different colouration between sides, more bicolour fruits and lower average of fruit coloured.
Fruit size and yield were, in general, the same for all strains. Instrumental fruit quality parameters along the different harvest date: fruit firmness, soluble solids content (SSC), titratable acidity (TA), and starch index were similar for the different cultivars. Differences in fruit colour/anthocyanin content were not related to differences in fruit quality parameters of different strains. Thus, ripening time was not related to the degree of fruit colour.
Principal component analysis of the samples characterized by all the variables showed a chronological distribution along the first principal component PC1, indicating different maturity stages. Internal preference mapping showed three consumer clusters and indicated that the largest number of consumers preferred samples harvested at commercial harvest or 2 weeks before this date. We also observed a clear influence of maturity stage on consumer acceptance but there was no clear influence with respect to strain.
Keywords: Apple; `Gala' strains; Colour; Anthocyanin; Fruit quality; Consumer acceptability

Sophie Chassagne, Fabienne Guillon, Marie-Francoise Devaux, Marc Lahaye, Giuseppe Piggorini, Christel Girault, Michele Marin, Fernanda Fonseca, 50. Textural, histological and cell wall composition changes in apple tissue caused by freezing, Cryobiology, Volume 57, Issue 3, December 2008, Page 325, ISSN 0011-2240, DOI: 10.1016/j.cryobiol.2008.10.051.
(http://www.sciencedirect.com/science/article/B6WD5-4V15XNB-1T/2/2a112db7089f27574961a5c4a82d9c9f)

Lara Manzocco, Monica Anese, M. Cristina Nicoli, Radiofrequency inactivation of oxidative food enzymes in model systems and apple derivatives, Food Research International, Volume 41, Issue 10, December 2008, Pages 1044-1049, ISSN 0963-9969, DOI: 10.1016/j.foodres.2008.07.020.
(http://www.sciencedirect.com/science/article/B6T6V-4T542BN-4/2/abdbaa8861fd34b8aaf36fedf28b3ade)
Abstract:
The effect of increasing radiofrequency (RF) electric fields on the activity of oxidative enzymes was studied in model systems and food. In particular, the mechanisms of enzyme inactivation by RF treatments were studied on polyphenoloxidase (PPO) and lipoxygenase (LOX) model systems. RF treatments efficiently inactivated both enzymes, although PPO was more sensitive to an increase in the RF electric field. RF efficacy was attributed to the generated thermal effect, while the contribution of the electromagnetic field resulted negligible.
Following, the efficacy of RF in blanching vegetables to obtain color stable derivatives was evaluated. To this aim, RF and conventionally water blanched apples were processed to get purees which were analyzed for color, sensory attributes and consumer preference. RF allowed apples to be adequately blanched. In particular, the puree obtained from the RF blanched apples was judged comparable to the conventionally water blanched one for color and sensory attributes. However, a slightly higher perceivable sweetness of the RF blanched sample was found, probably due to the fact that the RF treatment allowed any contact with water to be avoided.
Keywords: Radio frequency; Polyphenoloxidase; Lipoxygenase; Blanching; Apple derivatives

M. Walkling-Ribeiro, F. Noci, D.A. Cronin, J. Riener, J.G. Lyng, D.J. Morgan, Reduction of Staphylococcus aureus and quality changes in apple juice processed by ultraviolet irradiation, pre-heating and pulsed electric fields, Journal of Food Engineering, Volume 89, Issue 3, December 2008, Pages 267-273, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.05.001.
(http://www.sciencedirect.com/science/article/B6T8J-4SGKB8P-4/2/d61fdbe013161241e18d11af15fcc5f0)
Abstract:
Apple juice inoculated with Staphylococcus aureus (SST 2.4) was processed by a hurdle sequence including ultraviolet irradiation (UV; 30 min, 20 [degree sign]C), pre-heating and pulsed electric fields (PEF). Four different levels of pre-heating temperature (35-50 [degree sign]C), electric field strength (28-40 kV cm-1) and total treatment time (25-100 [mu]s), were used in an orthogonal design, evaluating their impact on S. aureus. Selected physical and chemical quality attributes were measured and compared to conventional pasteurisation (26 s, 94 [degree sign]C). A higher reduction ($P < 0.05$) of S. aureus was achieved with a hurdle approach (UV; 46 [degree sign]C (PEF inlet) and 58 [degree sign]C (PEF outlet); PEF 40 kV cm-1 and 100 [mu]s) in comparison to conventional pasteurisation (9.5 vs. 8.2 log10, respectively). Bacterial inactivation was not affected by pre-heating temperature (P [greater-or-equal, slanted] 0.05), while increasing electric field strength and treatment time both induced a reduction in bacterial numbers ($P < 0.05$). An analysis of the normalised energy densities for all UV/PEF processing conditions indicated a maximised energy efficiency at higher electric field strengths and shorter treatment times. Treatments showed little effect on the measured quality attributes.
Keywords: Apple juice; Staphylococcus aureus; PEF; UV; Hurdle approach; Non-thermal optimisation

Frank Will, Manuela Roth, Melanie Olk, Michael Ludwig, Helmut Dietrich, Processing and analytical characterisation of pulp-enriched cloudy apple juices, LWT - Food Science and Technology, Volume 41, Issue 10, December 2008, Pages 2057-2063, ISSN 0023-6438, DOI: 10.1016/j.lwt.2008.01.004.
(http://www.sciencedirect.com/science/article/B6WMV-4RJYVDS-2/2/104c63e69e9d478ee2c5e808270d68ea)

Abstract:
Pulp-enriched cloudy apple juices were manufactured from two apple varieties by blending of apple puree with natural cloudy apple juice in order to enrich bioactive secondary plant substances. Finishing of the puree with a 0.6-mm mesh screen and final product homogenisation revealed as the optimum processing technology for the novel 100% fruit beverage. The presence of large particles originating from the puree prevented long-term cloud stability, but due to the proportion of cloud-stable juice a complete phase separation did not occur. Optimal drinkability was achieved at a viscosity of 11.5 mPa s. Polyphenol compositions and concentrations were determined by means of RP-HPLC/PDA. The results ranged from 109 to 610 mg/l. All samples showed the typical polyphenol pattern of apples with dominating hydroxycinnamic acids followed by flavanols and flavonols. The puree addition to the cloudy apple juices increased the polyphenol concentrations by average 100%. Relatively, the highest increase could be observed for dimeric procyanidins. Different technological variants did not affect significantly the polyphenol concentrations. The dietary fibre contents of the pulp-enriched cloudy apple juices ranged from 5.8 to 9.4 g/l.
Keywords: Cloudy apple juice; Pulp-enriched cloudy apple juice; Apple puree; Polyphenols; TEAC; Dietary fibre; Particle size; Viscosity; Fruit processing

Yu-Hua Ma, Feng-Wang Ma, Jun-Ke Zhang, Ming-Jun Li, Yong-Hong Wang, Dong Liang, Effects of high temperature on activities and gene expression of enzymes involved in ascorbate-glutathione cycle in apple leaves, Plant Science, Volume 175, Issue 6, December 2008, Pages 761-766, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.07.010.
(http://www.sciencedirect.com/science/article/B6TBH-4T4HP15-7/2/e8d5f0363dd5dc799ea54814308b3dd6)
Abstract:
Higher plants growing in natural environments experience various stresses. In order to characterize the response of antioxidative system to high temperature, 2-year-old potted apple (Malus domestica Borkh.) plants were exposed to 28 [degree sign]C as control or high temperature at 40 [degree sign]C, respectively. The thermal dependent malondialdehyde (MDA) content, hydrogen peroxide (H2O2) content, the activity of protective enzymes, as well as the gene expression of dehydroascorbate reductase (DHAR, EC 1.8.5.1), ascorbate peroxidase (APX, EC 1.11.1.11) and glutathione reductase (GR, EC 1.6.4.2) at control or high temperature were determined after 0, 2, 4, 6 and 8 h treatment. The MDA and H2O2 concentrations in apple leaves increased at the high temperature. The content of total ascorbate, reduced ascorbic acid (AsA), total glutathione (GSH) was the highest at 2 h in the high temperature treatment, followed by a continuous decline with further increases in treatment duration. Activity of protective enzymes reached the highest point at 4 h of high temperature treatment duration, and then decreased. Gene expression of DHAR, APX and GR showed the same changes as the enzyme activities. The results suggest that the ascorbate-glutathione cycle is up-regulated in response to high temperature, but its regulation ability declines obviously after reaching the maximum with further increases in treatment duration.
Keywords: Malus domestica; High temperature; Ascorbate-glutathione cycle; Enzyme activity; Gene expression

Rosario Muleo, Stefano Morini, Physiological dissection of blue and red light regulation of apical dominance and branching in M9 apple rootstock growing in vitro, Journal of Plant Physiology, Volume 165, Issue 17, 28 November 2008, Pages 1838-1846, ISSN 0176-1617, DOI: 10.1016/j.jplph.2008.01.007.
(http://www.sciencedirect.com/science/article/B7GJ7-4S9FGY9-3/2/2f0a3124ee437791d3a3caccc24db1ad)
Abstract:

This paper presents the results of the interaction of red light (R) with blue light (B), applied to shoots of M9 apple (Malus pumila paradisiaca Schmid) rootstock, on the regulation of stem growth, apical dominance and branching. These results are compared with the active form of phytochromes (PHYs) under monochromatic and dichromatic light treatments. The inhibition of internode elongation was determined by PHY photoequilibrium, with the additional effect of B, by means of a separate photoreceptor. The development of phytomers appeared to be primarily due to the active form of PHY, with a marginal effect from B. Shoot growth, which combines internode elongation and development of the phytomer, was highest under R and lowest under B and far red light (FR), showing the largely positive role of PHY photoequilibrium. Under FR, reduced stem elongation was due to the very small number of phytomers formed. Apical dominance was inhibited, while branching was increased under R, corresponding to the highest values of PHY photoequilibrium determined. Apical dominance was increased and branching was reduced by B, indicating a complex interaction between PHY and B receptor. In the shoot cluster system, photomorphogenic behavior was dependent on the time of exposure to the different light qualities. The information gained from the study will be helpful in improving the set up of in vitro growth light conditions, and in providing useful insights into research of the development of the woody plant canopy, an important factor in ecological plant communities.
Keywords: Development; Light quality; Malus; Photoregulation; Phytochrome

Iryna I. Tartachnyk, Michael M. Blanke, Temperature, evapotranspiration and primary photochemical responses of apple leaves to hail, Journal of Plant Physiology, Volume 165, Issue 17, 28 November 2008, Pages 1847-1852, ISSN 0176-1617, DOI: 10.1016/j.jplph.2007.11.011.
(http://www.sciencedirect.com/science/article/B7GJ7-4S9FGY9-1/2/b664ecd2bfd1b2c7cc360ee2299e2c55)
Abstract: Summary
The objective of this work was to examine immediate physiological plant responses to hail and subsequent recovery in terms of evapotranspiration, leaf temperature and primary photochemical processes using apple as a model crop. Thermal emission pictures were taken in darkness to avoid interference from stomatal movements; temperature gradients were identified in concentric rings around sites of hail injury, with a distinct drop in temperature of up to 2.3 [degree sign]C in the center immediately after the induced hail injury. This was due to enhanced evapotranspiration from the injured tissue. Six to twelve minutes after hail injury, the initial decrease in leaf temperature partially reversed.
Chlorophyll fluorescence kinetics of light-adapted leaves showed a dramatic decrease in effective photosynthetic electron transport rate (ETR), from 20.5 to 9.0 [mu]mol electron m-2 s-1 within 5 min from hail injury, and a rapid recovery to 14.1 [mu]mol electron m-2 s-1 within the next 5 min. After 7 h, ETR partially recovered to 17.4 [mu]mol electron m-2 s-1. An initial drop in non-photochemical efficiency (NPQ) from 1.07 to 0.90 units within 5 min after hail injury was followed by a sharp increase to 1.67 units after another 5 min. During the next hour, NPQ gradually decreased to the initial level. This indicates increased thermal dissipation in photosystem II (PS II) as a protective mechanism against incident excessive energy in the leaves with closed stomata for 1 h after hail injury.
In contrast to the fluorescence kinetics of light-adapted leaves, maximum quantum yield Fv/Fm of PSII in the dark-adapted state remained unchanged at 0.79-0.81 relative units for the first 5 min after hail injury. Thereafter, Fv/Fm slowly declined to 0.75 within 1 h, and to a trough of 0.73 at 3 h. Seven hours after hail injury, Fv/Fm values were at 0.76, indicating partial recovery of PS II efficiency. The discrepancy in the dynamics of ETR and Fv/Fm responses may be explained by the formation of alternative electron sinks such as reactive oxygen species, particularly superoxides, which withdraw electrons from the photosynthetic transport, resulting in apparently higher values of calculated ETR.

Keywords: Electron transport rate (ETR); Mechanically induced stress (MIS); Photosynthesis; Stomata; Climate change

Yann Guedon, Jean Michel Legave, Analyzing the time-course variation of apple and pear tree dates of flowering stages in the global warming context, Ecological Modelling, Volume 219, Issues 1-2, 24 November 2008, Pages 189-199, ISSN 0304-3800, DOI: 10.1016/j.ecolmodel.2008.08.010.
(http://www.sciencedirect.com/science/article/B6VBS-4TPS79Y-1/2/481a2a3070cebfff6d2bbbfab1f3e2de)
Abstract:
Over the last 40 years, perceptible advances in dates of flowering stages have been observed in apple and pear trees growing in three cropping areas in France and one in Switzerland. The time-course variation of dates of flowering stages was established for eight chronological sequences. Our aim was to propose a statistical modelling framework for such sequences with the objective of characterizing the relationship between flowering advances in fruit trees and global warming. After an exploratory analysis, change-point models were applied to multivariate and univariate sequences. The results clearly support the occurrence of a significant abrupt change in the time-course variation of flowering dates at the end of the 1980s toward more frequent early dates, the most probable change instant being between 1988 and 1989. The coincidence between this abrupt change in phenological variations and marked increases in temperature recorded particularly in France at the end of the 1980s led us to consider the flowering advances in apple and pear trees as impacts of global warming. The suddenness in the response to global warming could be explained by changes in rates for completion of chilling and heat requirements, successively essential to the development of floral primordia within buds. In all cropping areas, annual mean temperatures had suddenly increased since 1988 (1.1-1.3 [degree sign]C), but including noticeable monthly differences. Particularly, warming was clearly more pronounced in February and March (mean temperature increases of 1.6 [degree sign]C) corresponding to the main period of heat requirements, than in November and December (0.8 [degree sign]C) corresponding to the main period of chilling requirements. So marked temperature increases during the heat phase would have suddenly resulted in more frequent years with relatively short duration for completion of the heat requirements and consequently more frequent early flowering years, despite some years with relatively long duration of chilling requirements.
Keywords: Change-point detection; Chilling requirement; Climate change; Fruit tree; Heat requirement; Phenology

Pawel Satora, Pawel Sroka, Aleksandra Duda-Chodak, Tomasz Tarko, Tadeusz Tuszynski, The profile of volatile compounds and polyphenols in wines produced from dessert varieties of apples, Food Chemistry, Volume 111, Issue 2, 15 November 2008, Pages 513-519, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.04.007.
(http://www.sciencedirect.com/science/article/B6T6R-4S7J5RF-1/2/9cd9da8da8f1ca6674bb0f5a8fe76a19)
Abstract:
The aim of this study was to determine the influence of apple variety (Sampion, Idared and Gloster) on the polyphenol profile, volatile composition and sensory characteristics of apple wines. Apples were harvested from the orchard in Garlica Murowana (Poland) and the experiments were conducted on a laboratory scale. Statistically significant differences were detected in the chemical composition of the analyzed wines. The highest antioxidant activity was found in Sampion wines, which was associated with a relatively high concentration of chlorogenic acid and procyanidins. These samples also contained high amounts of acetaldehyde, ethyl acetate and methanol. Idared wines showed a similar polyphenol profile, but they had lower antioxidant capacity and were characterized by a high level of butanol and acetic acid. Gloster wines were distinguished from

other samples by a lower concentration of polyphenols and higher concentration of fusel alcohols. During sensory evaluation, wines produced from Idared apples scored the highest value for overall quality.
Keywords: Apple wines; Antioxidant activity; Polyphenols; Volatile compounds; GC-SPME

Aiman K.A. Mohamed, Erratum to 'The effect of chilling, defoliation and hydrogen cyanamide on dormancy release, bud break and fruiting of Anna apple cultivar' [Sci. Hortic. 118 (2008) 25-32], Scientia Horticulturae, Volume 118, Issue 4, 4 November 2008, Pages 351-352, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.08.021.
(http://www.sciencedirect.com/science/article/B6TC3-4TK7XDW-1/2/65f4bad58264c50cd06ebe77b8129312)

Ri-Na Wu, Ya-Li Dang, Le Niu, Hong Hu, Application of matrix solid-phase dispersion-HPLC method to determine patulin in apple and apple juice concentrate, Journal of Food Composition and Analysis, Volume 21, Issue 7, November 2008, Pages 582-586, ISSN 0889-1575, DOI: 10.1016/j.jfca.2008.05.010.
(http://www.sciencedirect.com/science/article/B6WJH-4SVC5KY-1/2/53ed8f00bf50b13c098db22731ce61fc)
Abstract:
The occurrence of patulin as a natural contaminant of apple juice is a worldwide problem. Most analytical methods consist of multiple liquid-liquid partition steps for the extraction of patulin in apple juice. Matrix solid-phase dispersion (MSPD) is a valuable tool for extracting the analytes from foodstuffs .In MSPD clean-up is carried out simultaneously with, generally, good recoveries and precision. In this study, an efficient method with MSPD using C18-bonded silica as sorbent was developed for the analysis of patulin in apple and apple juice concentrate by high-performance liquid chromatography (HPLC). Recoveries of apple juice concentrate (AJC) sample and apple sample were in the range of 89.80-103.16% and 85.23-97.98%, respectively, for standard patulin solution. The coefficients of variations (CV) were 2.96-5.45% and the limit of detection (LOD) was 6 [mu]g/kg. The MSPD method is fast, easy, accurate and reliable. Therefore, the proposed method is applicable to the efficient determination of patulin in the course of apple juice concentrate processing.
Keywords: Matrix Solid-phase dispersion (MSPD); Patulin; Apple; Apple juice concentrate (AJC); HPLC; Liquid-liquid extraction (LLE)

L. Atares, A. Chiralt, C. Gonzalez-Martinez, Effect of solute on osmotic dehydration and rehydration of vacuum impregnated apple cylinders (cv. Granny Smith), Journal of Food Engineering, Volume 89, Issue 1, November 2008, Pages 49-56, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.04.002.
(http://www.sciencedirect.com/science/article/B6T8J-4S85D8P-1/2/9867d276b225adb7ad3aed4b2d398aa0)
Abstract:
Apple (cv. Granny Smith) cylinders (10 mm diameter, 10 mm height) were vacuum impregnated, osmodehydrated and rehydrated using solutions of glucose, sucrose and trehalose. For dehydration solutions aw was 0.96, whereas for rehydration aw was 0.99. Throughout dehydration, total and component mass variations and sample shrinkage were quantified. Peleg's equation was used to model changes in water and solute contents. The kind of solute affected mass transfer rate and the glucose solution showed the lowest kinetics. Over rehydration time (up to 10 h) water and solute fluxes and solute concentration of the sample liquid phase were quantified and modelled by applying Peleg's equation. Samples treated with trehalose rehydrated to a greater extent, and showed better liquid phase retention which demonstrates the protecting role of this sugar on cell membranes.

Keywords: Osmotic dehydration; Rehydration; Vacuum pulse; Apple; Trehalose

Shonosuke Sagisaka, The proliferation of amyloplasts in meristematic cells of developing stolons of potato and apple callus: Progenitors of proplastids, Journal of Plant Physiology, Volume 165, Issue 16, 1 November 2008, Pages 1678-1690, ISSN 0176-1617, DOI: 10.1016/j.jplph.2008.02.003.
(http://www.sciencedirect.com/science/article/B7GJ7-4SB9DR4-2/2/01d0cf5b8370ae109278c58a5b911e61)
Abstract: Summary
To monitor the events in the proliferation of amyloplasts, the ultrastructure of relevant structures in the cytosol has to be studied. For this investigation, photographs of cellular ultrastructures in developing potato stolons and apple callus were taken and examined. The images indicated that the contribution to proliferation of the division of mature amyloplasts was extremely low and that the major pathway involved the generation of the proplastids from 'mother' amyloplasts. The generation of proplastids was followed either by division into small bodies of 1 [mu]m or less in diameter or by growth to slender proplastids of 5 [mu]m in length. The elongated proplastids multiplied by splitting at random sites, with subsequent enlargement to mature sizes. The latter process contributed to the massive accumulation of amyloplasts in cells but has not previously been adequately emphasized. With respect to the putative 'mother' amyloplasts, numerous divergent amyloplasts were observed with a considerably different ultrastructure compared to the normal types, and with a characteristically extended and constricted stroma. Various lines of evidence indicated that the divergent amyloplasts were the 'mother' amyloplasts of the proplastids. No other plastidic organelles with features that suggest the generation of proplastids were detected in the cytosol.
Keywords: Amyloplast (proliferation); Apple callus; Potato stolon; Proplastid (generation and development)

Yun Deng, Yanyun Zhao, Effect of pulsed vacuum and ultrasound osmopretreatments on glass transition temperature, texture, microstructure and calcium penetration of dried apples (Fuji), LWT - Food Science and Technology, Volume 41, Issue 9, November 2008, Pages 1575-1585, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.10.018.
(http://www.sciencedirect.com/science/article/B6WMV-4RDR1KM-6/2/7f116797e9e103b8152ef708d3b92b7b)
Abstract:
The effect of pulsed vacuum and ultrasound pretreatments on glass transition, texture, rehydration, microstructure and other selected properties of air- and freeze-dried apples (Fuji) were investigated. Apple cylinders (15 mm height x 15 mm diameter) were first osmoconcentrated in a 60 g/100 g high-fructose corn syrup solution containing 7.5 g/100 g Gluconal Cal(R) combined with agitation, pulsed vacuum (PV), or ultrasound for 3 h, then hot-air or freeze dried. Changes in glass transition temperature, hardness, crispness, and rehydration rate were measured, microstructure was observed using scanning electronic microscopy (SEM), and calcium ions distributions were analyzed by a laser ablation inductively coupled mass spectrometry (LA-ICP-MS). Under the same drying method, ultrasound led to a higher glass transition temperature, lower water activity, moisture content and rehydration rate, severer structure collapse, less cavities and calcium uptake than PV did. Different osmoconcentration pretreatment had no significant ($P < 0.05$) effect on the hardness, crispness, shrinkage and rehydration rate. Compared to hot-air drying, freeze-dried apples showed the porous structure, minimal shrinkage, softer texture, better rehydration capacity, lighter color, and slightly lower glass transition temperature.
Keywords: Pulsed vacuum; Ultrasound; Glass transition; Microstructure; Drying

P.M.A. Toivonen, Influence of harvest maturity on cut-edge browning of `Granny Smith' fresh apple slices treated with anti-browning solution after cutting, LWT - Food Science and Technology, Volume 41, Issue 9, November 2008, Pages 1607-1609, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.10.005.
(http://www.sciencedirect.com/science/article/B6WMV-4RDR1KM-2/2/cfcc6f4be22f6e448447fef036707f00)
Abstract:
Over several years, many fresh-cut apple processors have complained about browning of slices made from `Granny Smith' apples during the harvest season, before fruit have been stored for any length of time. `Granny Smith' apples are a late harvest apples and quite often, at higher latitudes, they are harvested to avoid frost injury and may not always be physiologically mature. It was postulated that immature fruit would have greater susceptibility to browning, despite the application of anti-browning solution after cutting. Fruits were harvested from selected trees beginning five weeks before anticipated commercial harvest and continued weekly until two weeks after commercial harvest. The maturity indicators internal ethylene and starch clearing indices were measured. Ten fruits were sliced, dipped in 7 g L-1 NatureSeal(R) and then packaged in zip-loc bags and held at 5 [degree sign]C. Slices made from apples that were harvested two weeks early or earlier than the optimal maturity, as determined by the maturity measures, had significant levels of cut-edge browning despite the post-cutting application of anti-browning dip. These results clearly indicate that `Granny Smith' apples harvested two weeks or earlier before induction of climacteric ethylene production (when starch index is less than 2.5) should be avoided for use in fresh slicing.
Keywords: Fresh-cut apples; Browning; Maturity

G. Echeverria, J. Graell, I. Lara, M.L. Lopez, Physicochemical measurements in `Mondial Gala(R)' apples stored at different atmospheres: Influence on consumer acceptability, Postharvest Biology and Technology, Volume 50, Issues 2-3, November 2008, Pages 135-144, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.05.002.
(http://www.sciencedirect.com/science/article/B6TBJ-4T4WKX6-1/2/88c87709ea58716cd1a9583253168300)
Abstract:
Standard quality parameters, consumer acceptability, emission of volatile compounds and ethylene production of `Mondial Gala(R)' apples (Malus x domestica Borkh.) were determined in relation to storage atmosphere, storage period and shelf-life period. Fruit were harvested at the commercial date and stored in AIR (21 kPa O2:0.03 kPa CO2) or under three different controlled atmospheres (CAs): LO (2 kPa O2:2 kPa CO2), ULO1 (1 kPa O2:1 kPa CO2), or ULO2 (1 kPa O2:2 kPa CO2). Fruit samples were analysed after 12 and 26 weeks of storage plus 1 or 7 d at 20 [degree sign]C.
Apples stored in CA maintained better standard quality parameters than AIR-stored fruit. The volatile compounds that contributed most to the characteristic aroma of `Mondial Gala(R)' apples after storage were butyl, hexyl and 2-methylbutyl acetate, hexyl propanoate, ethyl butanoate, ethyl hexanoate, ethyl, butyl and hexyl 2-methylbutanoate. Data obtained from fruit analysis were subjected to principal component analysis (PCA). The apples most accepted by consumers showed the highest emission of ethyl 2-methylbutanoate, ethyl hexanoate, tert-butyl propanoate and ethyl acetate, in addition to the highest titratable acidity and firmness values.
Keywords: Volatile compounds; Atmospheres; Malus x domestica; Physicochemical parameters; Principal component analysis; Shelf-life; Storage period

L.M.M. Tijskens, P.J. Konopacki, R.E. Schouten, J. Hribar, M. Simcic, Biological variance in the colour of Granny Smith apples: Modelling the effect of senescence and chilling injury, Postharvest

Biology and Technology, Volume 50, Issues 2-3, November 2008, Pages 153-163, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.05.008.
(http://www.sciencedirect.com/science/article/B6TBJ-4T4J1BD-1/2/8bab72bcab3fb5d4d3224eb1c3bd2b4b)
Abstract:
The colour of `Granny Smith' apples, harvested from three orchards at two stages of maturity, was measured individually using the CIE L*a*b* system during storage in regular atmosphere at three temperatures: 1, 4 and 10 [degree sign]C. A model was developed based on a simplified mechanism to describe the development of the apple colour during storage as affected by senescence (aging) and chilling injury. Monitoring of individual apples made it possible to include and to describe the biological variance of colour in batches of apples and to correct the colour of each apple individually for its own biological shift factor (biological age; random effect). The biological shift factor is related to the initial condition and range of colour change. The rate of the colour development was estimated in common (fixed effects) for all batches using non-linear mixed effects regression analysis. The variance accounted for by the developed model, including effects of temperature, harvest maturity and orchard location, was more than 95% on 3211 observations. The overall reaction rate constant of decolouration, combining the effects of senescence and chilling injury, was found to depend on temperature. The temperature that showed the lowest overall reaction rate of decolouration is 8 [degree sign]C, which is in contrast with the currently recommended storage temperature for `Granny Smith' apples.
Keywords: Biological variance; Modelling; Maturity at harvest; Growing conditions

Stefano Farris, Serena Gobbi, Danila Torreggiani, Luciano Piergiovanni, Assessment of two different rapid compression tests for the evaluation of texture differences in osmo-air-dried apple rings, Journal of Food Engineering, Volume 88, Issue 4, October 2008, Pages 484-491, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.03.006.
(http://www.sciencedirect.com/science/article/B6T8J-4S2F5FW-2/2/b384cc206a4b4245de373f3b4b7789a8)
Abstract:
Mechanical properties of dried apples rings were studied through two different rapid compression tests. A bending-snapping test and a modified compression-relaxation test were performed in order to differentiate between osmo-air-dried apple rings as a function of variety (Golden Delicious and Pink Lady(R)) and drying temperature (70 [degree sign]C, 80 [degree sign]C, 90 [degree sign]C). Elastic modulus during bending, fracturability indices, peaks density, and relaxation coefficient during compression were taken into consideration. The obtained results reflect primarily the effect of the drying process on the moisture content of both varieties, but also the different changes in the tissues structure related to both the different solid-liquid exchanges during the osmotic pre-treatment and the drying process. Undergoing the same drying treatment, Pink Lady(R) rings showed a more rigid and stiff texture than Golden Delicious, which in contrast had a more brittle texture. The obtained results described satisfactorily structural changes of apple tissues, giving the possibility to discriminate, in a rapid way, between different categories of dried apples.
Keywords: Apple rings; Drying; Texture; Compression test; Fracturability

Seok-Kyu Jung, Chris B. Watkins, Superficial scald control after delayed treatment of apple fruit with diphenylamine (DPA) and 1-methylcyclopropene (1-MCP), Postharvest Biology and Technology, Volume 50, Issue 1, October 2008, Pages 45-52, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.05.006.
(http://www.sciencedirect.com/science/article/B6TBJ-4SV6PF5-1/2/907e86093f0e5f0d958d237f8e609e1f)
Abstract:

The effects of delayed treatments of diphenylamine (DPA) and 1-methylcyclopropene (1-MCP) on superficial scald development of `Cortland' and `Law Rome' apples were examined. Fruit were stored in air at 0.5 [degree sign]C for 24 weeks after being treated with DPA or 1-MCP at harvest or after delays of 1, 7, 14 or 21 d (`Law Rome', experiment 1) or at harvest or after delays of 3, 7, 14 or 21 d (`Cortland' and `Law Rome', experiment 2). Inhibition of scald development was affected by cultivar, DPA concentration, and delays between harvest and either DPA or 1-MCP application. Loss of scald control was associated with increasing internal ethylene concentrations (IEC) in the fruit with greater time delays before treatment, but to a greater extent for 1-MCP than DPA. DPA effects on scald development were independent of [alpha]-farnesene accumulation in the fruit skin but were associated with inhibition of its oxidation as indicated by lower concentrations of conjugated trienols (CTols). In contrast, 1-MCP effects were dependent on inhibition of [alpha]-farnesene accumulation and thereby the availability of less substrate for oxidation. The results show that minimal delays between harvest and treatment of fruit with either DPA or 1-MCP are necessary to maximize control of scald, but may be more critical for 1-MCP than for DPA.
Keywords: Apple; Superficial scald; Ethylene; Firmness; [alpha]-Farnesene; Malus x domestica Borkh; Senescent breakdown

Q. Tuan Pham, Wendy Schotsmans, Q. Tri Ho, Bert E. Verlinden, Pieter Verboven, Bart M. Nicolai, Simultaneous measurement of neon diffusivity and skin resistance of `Braeburn' and `Jonica' apples, Postharvest Biology and Technology, Volume 50, Issue 1, October 2008, Pages 53-63, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.04.002.
(http://www.sciencedirect.com/science/article/B6TBJ-4T1SFJC-1/2/16ef0508235d6a343158fcd7ea5bbc30)
Abstract:
A new method was developed to calculate the diffusivity of apple cortex tissue and skin resistance to transport of metabolic gases simultaneously from the results of tracer gas efflux experiments. It is based on curvefitting the gas concentrations calculated from a finite element gas transport model to measured data. The latter were obtained by impregnating apples with the inert tracer gas neon and transferring them to a neon-free jar, where they release the absorbed neon; the neon concentration in the second jar was monitored. Two models were tested, one where neon is absorbed into the gas phase (pores) only and one where it was also absorbed into the cells. The test involved two cultivars, `Braeburn' and `Jonica' (a Jonagold color mutant), each stored for one, 17 and 33 weeks under controlled atmosphere, with 30 replicates in each batch. For the outer cortex region the average diffusivity (based on the concentration gradient in the fruit) was 7.59 x 10-8 m2 s-1 for `Braeburn' and 14.4 x 10-8 m2 s-1 for `Jonica'. Average skin resistances were 4.28 x 105 for `Braeburn' and 4.54 x 105 for `Jonica'. Using a co-diffusion model the diffusivities of O2 and CO2 were also estimated from the results for neon. The diffusivity results imply that the response time of the fruit to a change in atmosphere is of the order of 5-10 h. The lower diffusivity and hence lack of uniformity in the internal atmosphere of `Braeburn' apples might explain why they are more susceptible to core damage than `Jonica'. The main limitation of the present tests is that only the first few minutes of the efflux period was monitored, hence the property values obtained relate only to the outer layers of tissue (about 3 mm).
Keywords: Apple; Fruit; Diffusivity; Skin resistance; Finite element method

P. Varela, A. Salvador, S. Fiszman, Shelf-life estimation of `Fuji' apples: II. The behavior of recently harvested fruit during storage at ambient conditions, Postharvest Biology and Technology, Volume 50, Issue 1, October 2008, Pages 64-69, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.03.016.
(http://www.sciencedirect.com/science/article/B6TBJ-4T0FHP8-1/2/11c28e909cd367ee1b9f27fefa9a84ca)

Abstract:
Variations in the eating quality of recently harvested `Fuji' apples during long-term storage at ambient temperature were analyzed from different approaches: sensory (consumers and trained descriptive panel), instrumental (texture and dynamic rheology), and physicochemical (acidity, soluble solids, and pectin content). In particular, the application of dynamic rheological tests is a new tool which proved to be successful to characterize the whole apple tissue. The percentage of consumers rejecting the apples did not increase with storage time, even at 61 d of storage and the overall acceptability was not significantly different between the sampling dates over all the storage period, and most quality parameters remained stable up to more than 61 d storage (20 [degree sign]C, no controlled atmosphere (CA)). From day 70, the apples became shriveled as a result of the non-controlled atmosphere storage; this physiological deterioration would cause rejection of the fruit before consumption, this being the major determinant of their shelf-life.
Keywords: `Fuji' apples; Shelf-life; Consumer acceptability; Descriptive analysis; Rheology; Texture

F. Roger Harker, Eugene M. Kupferman, Anna B. Marin, F. Anne Gunson, Christopher M. Triggs, Eating quality standards for apples based on consumer preferences, Postharvest Biology and Technology, Volume 50, Issue 1, October 2008, Pages 70-78, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.03.020.
(http://www.sciencedirect.com/science/article/B6TBJ-4SP49WS-2/2/56ec553d4f3b41f176cfdc2a0a2b3b30)
Abstract:
Consumer acceptance and liking of `Red Delicious', `Gala', `Fuji', `Golden Delicious' and `Braeburn' apples were assessed in separate trials for each cultivar. Apples were sorted into six or eight categories using a mixture of destructive and non-destructive measurements of texture and taste. Non-destructive measurements included an acoustic texture measurement (Aweta Acoustical Firmness Sensor, AFS), Sinclair Internal Quality Firmness Tester (SIQ-FT) and Near Infra-Red (NIR) spectroscopy. Destructive measurements included firmness by puncture tests, soluble solids content (SSC), titratable acidity (TA) and pH. More than 100 US consumers evaluated the fruit at each evaluation date, with individuals tasting an apple from each of the 6-8 texture/taste categories. Preference mapping and other statistical methods reaffirmed that firmness is the primary edible quality factor that contributes to consumer acceptance and preference in the USA. High SSC and/or TA may result in further improvements in consumer acceptance, but usually only in apples that are firm. While there is a general positive trend for increasing preference with firmness, some consumers will prefer softer apples, and some will dislike the firmest apples. Using combinations of firmness SSC and TA, it was possible to identify categories of apples that achieved consumer acceptability levels from 43% to 90%.
Keywords: Consumers; Apple; Firmness; Souble solids; Acidity

Aiman K.A. Mohamed, The effect of chilling, defoliation and hydrogen cyanamide on dormancy release, bud break and fruiting of Anna apple cultivar, Scientia Horticulturae, Volume 118, Issue 1, 2 September 2008, Pages 25-32, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.05.015.
(http://www.sciencedirect.com/science/article/B6TC3-4SXS3FF-3/2/f9a1076e02c2ebb40a1d0a274730fdf2)
Abstract:
The effect of defoliation (DEF) alone or combined with hydrogen cyanamide (HC) on dormancy state, fruit quality and yield of Anna apple cultivar was studied. Trees were manually defoliated on three successive dates, November 15th, December 1st and December 15th. The flower buds (FB) entered the endodormancy synchronized with vegetative buds (VB) for most of the treatments. Most of the treatments terminated endodormancy between January 27th and February 8th during the season 2004/2005 and between January 18th and February 8th during the season 2005/2006.

The treatments were effective in dormancy release of FB and somewhat with VB. Defoliation on November 15th + HC recorded the lowest chilling accumulation needed to reach 50% bud break. All the treatments exceeded the control considering the percentage of flower (FBB) and vegetative bud break (VBB) either in the lab or at the field. Growing degree hours and the number of days required to reach each stage of fruiting were differed between the two studied seasons. The control and DEF on December 15th exceeded all the treatments regarding initial fruit set percentage (IFS). The defoliation treatments alone gave the highest yield (kg/tree). Defoliation + HC treatments gave the best fruit quality, while the control gave the least values.
Keywords: Endodormancy; Chill units; Growing degree hours; Dormex; Dormancy-breaking agents

C. Contreras, M.E. Martin-Esparza, A. Chiralt, N. Martinez-Navarrete, Influence of microwave application on convective drying: Effects on drying kinetics, and optical and mechanical properties of apple and strawberry, Journal of Food Engineering, Volume 88, Issue 1, September 2008, Pages 55-64, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2008.01.014.
(http://www.sciencedirect.com/science/article/B6T8J-4RP0MD1-6/2/ae126ba49ad03226393f496d81438c6a)
Abstract:
The influence of air temperature, microwave application and vacuum impregnation or pulsed vacuum osmotic dehydration, as pre-treatments undertaken prior to convective drying, on the drying kinetics of apple and strawberry has been studied. Furthermore, the effect of the above pre-treatments on the optical and mechanical characteristics of dried samples has also been investigated. Empirical equations (linear and page) were used to assess the effect of these factors on drying kinetics, with a good fit being observed between experimental data and model. The effect of microwave on the decrease in drying time was significantly greater than the effect of increasing the air temperature. A dehydrated product with less colour change and a more rigid and firmer structure was obtained at higher air temperature or when applying microwave. However, the higher temperatures during microwave treatment increased pigment degradation. The increase in the liquid phase volume occurring with pre-treatments prolonged the convective drying time process and also implied greater colour changes in the samples. Nevertheless, they enhance the resistance to deformation and fracture of the dehydrated product.
Keywords: Air drying; Drying model; Dried fruits; Colour; Translucency; Puncture test

K.L. Foster, An Apple a Day - Are Seniors Getting Their Five-a-Day?, Journal of the American Dietetic Association, Volume 108, Issue 9, Supplement 1, ADA 2008 Food & Nutrition Conference & Expo, ADA 2008 Food & Nutrition Conference & Expo, September 2008, Page A84, ISSN 0002-8223, DOI: 10.1016/j.jada.2008.06.224.
(http://www.sciencedirect.com/science/article/B758G-4T8SD0X-9G/2/8fbebd4b4303de8442f8f345643a7561)

Yanmin Zhu, David R. Rudell, James P. Mattheis, Characterization of cultivar differences in alcohol acyltransferase and 1-aminocyclopropane-1-carboxylate synthase gene expression and volatile ester emission during apple fruit maturation and ripening, Postharvest Biology and Technology, Volume 49, Issue 3, September 2008, Pages 330-339, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.03.015.
(http://www.sciencedirect.com/science/article/B6TBJ-4SH1HX0-2/2/ad7e79cca10da699d0fc2e400019f0c6)
Abstract:
Alcohol acyltransferase (AAT) catalyzes the last step of volatile ester biosynthesis, and ethylene purportedly regulates AAT gene expression. In this study, expression patterns of apple (Malus x domestica Borkh.) AAT genes and ethylene biosynthesis genes of 1-aminocyclopropane-1-carboxylate synthase (ACS) were investigated in cultivars with relatively high (`Golden Delicious')

or low (`Granny Smith') volatile ester production. All four AAT genes expressed stronger in `Golden Delicious' than in `Granny Smith'. MdAAT1 and MdAAT2 are the predominant genes expressed in fruit tissues. The expression levels of MdAAT1 and MdAAT2 were increasing as ripening progressed and were consistent with the total amount of esters detected between two cultivars. The transcript levels of MdAAT3 and MdAAT4 decreased at or after the onset of ripening. The expression of MdACS1 was significantly increased at the onset of ripening in both cultivars, while the expression of MdACS3 was detected throughout the harvest period in `Golden Delicious'. Postharvest methylcyclopropene (1-MCP) exposure had little impact on expression of MdAAT1 and MdACS3 genes, but substantially suppressed the transcript level for MdACS1 in both cultivars, and MdAAT2 in `Golden Delicious'. The results indicated that (1) differential expression of AAT genes may contribute to phenotypic variation of volatile ester biosynthesis, and (2) the expression of MdACS3 may play a role on induction of AAT genes expression in early fruit development, because it was expressed prior to ACS1. (3) The climacteric expression of MdACS1 greatly enhanced the expression levels of MdAAT1 and MdAAT2 genes and the emission of aromatic volatile esters. (4) Postharvest 1-MCP treatment showed selected inhibition on gene expression of specific AAT and ACS family members.
Keywords: Malus domestica (Borkh.); Volatile esters; Ethylene; 1-Methylcyclopropene; Fruit ripening

Wojciech J. Janisiewicz, Robert A. Saftner, William S. Conway, Keith S. Yoder, Control of blue mold decay of apple during commercial controlled atmosphere storage with yeast antagonists and sodium bicarbonate, Postharvest Biology and Technology, Volume 49, Issue 3, September 2008, Pages 374-378, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.03.011.
(http://www.sciencedirect.com/science/article/B6TBJ-4SH7DVD-1/2/9726d01f19369303e5a5f8c53d48efb9)
Abstract:
A mixture of two yeast antagonists, Metschnikowia pulcherrima and Cryptococcus laurentii, originally isolated from apples and exhibiting greater biocontrol activity against blue mold of apple than either yeast applied alone, were used in combination with sodium bicarbonate (SBC) in a pilot test in which treated fruit were stored under commercial controlled atmosphere (CA) storage conditions. Conidia of Penicillium expansum, antagonists cells and SBC were added to the drench solution. The treatments were applied to apples by drenching entire bins filled with apples containing 100 wounded fruit evenly distributed among five positions in each bin. The treated fruit were stored in commercial CA storages for approximately six months in the 2005-2006 and 2006-2007 storage seasons and then evaluated for incidence of decay. In both years, the treatments with the antagonist alone or in combination with SBC were equally effective and reduced blue mold incidence by 84-97% in 2005-2006 and 73-82% in 2006-2007. SBC alone significantly reduced blue mold incidence compared to the non-treated control but was less effective than the antagonist alone or in combination with SBC. This pilot test showed that the combination of these two antagonists and SBC can be an effective decay control method under commercial CA conditions, confirming results from our earlier laboratory studies using similarly treated fruit stored under CA conditions.
Keywords: Postharvest biological control; Cryptococcus laurentii; Metschnikowia pulcherrima; Penicillium expansum

Dorothea F.K. Rawn, Sue C. Quade, Wing-Fung Sun, Andre Fouguet, Andre Belanger, Mark Smith, Captan residue reduction in apples as a result of rinsing and peeling, Food Chemistry, Volume 109, Issue 4, 15 August 2008, Pages 790-796, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2008.01.061.
(http://www.sciencedirect.com/science/article/B6T6R-4RSBYFW-2/2/d4c2d7a20273fd6eec0b5e848fc15e27)

Abstract:
Apples, treated with captan for disease control in a commercial orchard in Quebec, Canada, were collected and sorted into post-harvest preparation types (no preparation; rinse; rinse and peel). Captan residues were greatest (25.5-5100 ng/g) in apples with no post-harvest preparation and lowest (0.146-136 ng/g) in apples that had been rinsed and peeled prior to extraction and analysis. Residues were significantly lower ($p = 0.003$) in apples that had been rinsed prior to extraction than in apples with no post-harvest preparation. Similarly, apples subjected to rinsing and peeling had significantly lower captan residues than had apples that had been rinsed alone ($p < 0.0001$). Although captan residues in rinsed apples were approximately 50% lower than those in apples that received no post-harvest preparation, the reduction associated with peeling of apples was much greater (98%). Estimated mean captan intakes resulting from consumption of raw apples were established and single day intakes, based on apples with no preparation, ranged from 2.58 [mu]g/kg in females >70 years to 9.48 [mu]g/kg for individuals aged three years (at this age no distinction is made between males and females). Mean intakes estimated using rinsed and peeled apples were approximately two orders of magnitude lower than intakes estimated using apples with no post-harvest preparation, demonstrating the effect of post-harvest preparation on captan intakes. Mean captan intake estimates from all post-harvest preparation types were well below the World Health Organization acceptable daily intake of 100 [mu]g/kg/day, based on raw apple consumption.
Keywords: Captan; Residue reduction; Rinsing; Peeling; Intake

Achour Amiri, Robert Dugas, Anne L. Pichot, Gilbert Bompeix, In vitro and in vitro activity of eugenol oil (Eugenia caryophylata) against four important postharvest apple pathogens, International Journal of Food Microbiology, Volume 126, Issues 1-2, 15 August 2008, Pages 13-19, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2008.04.022.
(http://www.sciencedirect.com/science/article/B6T7K-4SDPX40-5/2/484213298f7e56288a538563e4d9659a)
Abstract:
The activity of eugenol oil was evaluated in vitro and in vivo against four apple pathogens namely Phlyctema vagabunda, Penicillium expansum, Botrytis cinerea and Monilinia fructigena. The minimum inhibitory concentration (MIC) of eugenol incorporated in malt extract agar medium was found to be 2 mg ml- 1. Mycelial growth of the four test pathogens was completely inhibited when treated with 150 [micro sign]l l- 1 of volatile eugenol whether at 4 or 20 [degree sign]C. Conidia of P. vagabunda, P. expansum, M. fructigena and B. cinerea suspended for 2 min in eugenol solution at 2 mg ml- 1 heated to 50 [degree sign]C germinated at rates of 19, 37, 38 and 39%, respectively. Three different eugenol formulations (Tween 80, ethoxylate and lecithin) were tested for their in vivo efficacy against the tested pathogens on apples. Ethoxylate- and Tween 80-eugenol formulations applied at room temperature were ineffective in reducing disease incidence. When heated to 50 [degree sign]C, both formulations induced phytotoxicity on apple surface and caused cuticle damages as revealed by scanning electronic microscopic observations. A mixture of eugenol at 2 mg ml- 1 and soy lecithin at 50 mg ml- 1 suppressed the phytotoxic symptoms produced by eugenol on apples and reduced the disease incidence of P. expansum, P. vagabunda, B. cinerea and M. fructigena to less than 7, 6, 4 and 2% respectively after 6 months of storage at 2 [degree sign]C. The application of heated lecithin-formulated eugenol could become a successful alternative to the traditional fungicides used in postharvest disease management of apple fruit.
Keywords: Botrytis; Formulations; Heat treatment; Lecithin; Malus domestica; Monilinia; Penicillium; Phlyctema

Ting Yu, Hongyin Zhang, Xiaoling Li, Xiaodong Zheng, Biocontrol of Botrytis cinerea in apple fruit by Cryptococcus laurentii and indole-3-acetic acid, Biological Control, Volume 46, Issue 2, August 2008, Pages 171-177, ISSN 1049-9644, DOI: 10.1016/j.biocontrol.2008.04.008.
(http://www.sciencedirect.com/science/article/B6WBP-4S9P5PV-4/2/c304726248e791d749c1e300bb29ab3c)
Abstract:
This study evaluated the effect of a yeast antagonist Cryptococcus laurentii and a plant regulator indole-3-acetic acid (IAA) on inhibition of Botrytis cinerea infection in harvested apple fruit. The results showed that the combined treatment with C. laurentii and IAA at 20 [mu]g/ml was a more effective approach to reduce the gray mold rot in apple wounds than the C. laurentii alone. After 4 days of incubation, gray mold incidence in the combined treatment with C. laurentii and IAA was about 18%, which was a 50% reduction in incidence compared to the treatment with C. laurentii alone. Although IAA had no direct antifungal activity against B. cinerea infection when the time interval between IAA treatment and pathogen inoculation was within 2 h, application of IAA strongly reduced gray mold infection when IAA was applied 24 h prior to inoculation with B. cinerea in apple fruit wounds. Moreover, combination of IAA and C. laurentii stimulated the activities of superoxide dismutase, catalase and peroxidase with above 1.5-fold higher than that treatment with C. laurentii alone at 48 h. Therefore, combination of C. laurentii with IAA, which integrated the dual biological activity from the antagonistic yeast and plant regulator, might be developed to be a useful approach to control gray mold in harvested apple fruit.
Keywords: Apple; Biocontrol; Cryptococcus laurentii; Gray mold; Indole-3-acetic acid; Postharvest

Shahrokh Khanizadeh, Rong Tsao, Djamila Rekika, Raymond Yang, Marie Therese Charles, H.P. Vasantha Rupasinghe, Polyphenol composition and total antioxidant capacity of selected apple genotypes for processing, Journal of Food Composition and Analysis, Volume 21, Issue 5, August 2008, Pages 396-401, ISSN 0889-1575, DOI: 10.1016/j.jfca.2008.03.004.
(http://www.sciencedirect.com/science/article/B6WJH-4S7BDDP-1/2/4a5562120e1b556456905c42e4361b1b)
Abstract:
The phenolic composition, concentration and total antioxidant capacity (TAC) were determined in the flesh and peel of eight advanced cider apple breeding lines and cultivars to be used for cider production in Canada. The total phenolic content (TPC) assayed by the Folin-Ciocalteu method, the individual phenolics determined by HPLC/DAD and TAC measured using ferric reducing antioxidant power (FRAP) differed significantly among the advanced apple lines and cultivars studied. Higher concentrations of the measured parameters were found in the peel of all tested lines compared to the flesh. 'McIntosh Summerland' and 'Spartan' had the highest concentrations of polyphenols and TAC and 'SJCA16R5A15' had the lowest. There was a positive correlation between TPC and TAC in both flesh and peel (R2=0.74 and 0.51, respectively). However, a weak correlation was found between total phenolics determined by HPLC and TAC (R2=0.29 and 0.43 in flesh and peel, respectively). Results showed that procyanidins are the most predominant phenolic group in both flesh and peel, followed by hydroxycinnamic acids in the flesh and flavonols in the peel, and all are of great interest in cider making.
Keywords: Polyphenol; Phenolic; Apple; Cultivar; Apple genotype; Cider; HPLC; Antioxidant capacity; FRAP; Canada; Food composition; Food analysis

M. Gonzalez-Fesler, D. Salvatori, P. Gomez, S.M. Alzamora, Convective air drying of apples as affected by blanching and calcium impregnation, Journal of Food Engineering, Volume 87, Issue 3, August 2008, Pages 323-332, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.12.007.
(http://www.sciencedirect.com/science/article/B6T8J-4RDPYKK-1/2/8cb9e8e151caff53580b1d8ff11a19b9)
Abstract:

The effect of previous blanching and calcium impregnation at atmospheric pressure (AI) or in vacuum (VI) on the rate of moisture movement during the first falling rate period of air drying of apples at 60 [degree sign]C was studied. It was found that the effective diffusion coefficient of water (Def) calculated with Fick's second law was strongly affected by heat pretreatment. With the exception of non-blanched tissues subjected to VI or VI followed by AI for 1.5 h, calcium uptake during impregnation step appeared to modify the matrix resistance to water flux only when tissue was previously heated. Light microscopy studies of apple tissues allowed explaining the observed drying behaviour.
Keywords: Calcium enrichment; Impregnation techniques; Apple; Air drying; Blanching

Lixiong He, Yusuke Ban, Hiromichi Inoue, Narumi Matsuda, Jihong Liu, Takaya Moriguchi, Enhancement of spermidine content and antioxidant capacity in transgenic pear shoots overexpressing apple spermidine synthase in response to salinity and hyperosmosis, Phytochemistry, Volume 69, Issue 11, August 2008, Pages 2133-2141, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2008.05.015.
(http://www.sciencedirect.com/science/article/B6TH7-4SVRPSF-1/2/8e423c3bfe7a7c0c0d0deb856d9c46a8)
Abstract:
In our previous work, an apple spermidine synthase (SPDS)-overexpressing transgenic European pear (Pyrus communis L. `Ballad'), line no. 32 (#32), demonstrated attenuated susceptibility to stress treatment. In the current paper, changes in enzymatic and non-enzymatic antioxidant capacity of the transgenic pear (line #32) were investigated in response to NaCl or mannitol stress. Under non-stressed conditions (before stress treatment), spermidine (Spd) contents and SPDS activity of line #32 were higher than those of the non-transformant (wild type). However, no significant differences were detected between line #32 and the wild type as regards contents of malondialdehyde (MDA) and H2O2, and activities of antioxidant enzymes like superoxide dismutase (SOD), ascorbate peroxidase (APX), monodehydroascorbate reductase (MDHAR) and glutathione reductase (GR). When exposed to NaCl or mannitol stress, both the wild type and line #32 exhibited accumulation of Spd with the latter accumulating more. The transgenic line contained higher antioxidant enzyme activities, less MDA and H2O2 than the wild, implying it suffered from less injury. These results suggested that increase of Spd content in the transgenic line could, at least in part, lead to enhancing enzymatic and non-enzymatic antioxidant capacity.
Keywords: ADC, arginine decarboxylase; APX, ascorbate peroxidase; AsA, ascorbate; DHA, dehydroascorbate; DCIP, 2,6-dichlorophenolindophenol; DTPA, diethylenetriamine-N,N,N',N'',N'''-pentaacetic acid dianhydride; DW, dry weight; FW, fresh weight; GR, glutathione reductase; IBA, indolebutyric acid; MDA, malondialdehyde; MDHAR, monodehydroascorbate reductase; ODC, ornithine decarboxylase; Put, putrescine; ROS, reactive oxygen species; SAMDC, S-adenosylmethionine decarboxylase; SH, shoot height; SOD, superoxide dismutase; Spd, spermidine; SPDS, spermidine synthase; Spm, spermine; Pyrus communis; Rosaceae; Antioxidant enzymes; Polyamines; Stress tolerance; Transgenic plant

Edward Dintwa, Michael Van Zeebroeck, Herman Ramon, Engelbert Tijskens, Finite element analysis of the dynamic collision of apple fruit, Postharvest Biology and Technology, Volume 49, Issue 2, August 2008, Pages 260-276, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2008.01.012.
(http://www.sciencedirect.com/science/article/B6TBJ-4SDNK78-1/2/aa23fd9da28562a6715a7b914a620474)
Abstract:
Possible sources of modelling error in discrete element method simulations of postharvest bulk processes are discussed. Finite element models are used to analyse the dynamic process of the collision of apple fruit amongst each other or with rigid walls. The major objective was to use these models to investigate the collision of apples in conditions that closely resemble typical practical

collision regimes of such fruit during unit operations such as transportation in trucks, sorting operations or any other handling operations. Specifically, information on the quantity of energy loss that can be attributed to the excitation of elastic waves within the body was assessed in isolation to energy dissipation due to the viscoelastic nature of the material. Viscous dissipation effects of the fruit collisions are also studied. In particular, an assessment of two different methods of determining the effective viscous coefficient for a collision involving two viscoelastic objects (namely, the sum of inverses method and the arithmetic mean method) is carried out. For soft and relatively large objects such as the apple, the absorption of dynamic waves excited during collisions can lead to substantial kinetic energy losses. Amount of energy loss is dependent on the elastic properties of the material, the geometrical size of the colliding objects as well as the collision velocity. The currently available techniques for obtaining the viscoelastic properties of fruit using the stress relaxation experiments are not suitable for providing the characterization needed to describe the very short term processes such as collisions. The arithmetic mean method advocated by some researchers to determine the effective viscous coefficient during the collision of objects of different viscous properties is not appropriate. A more theoretically accurate assessment of the problem is necessary.
Keywords: Discrete element method; Restitution coefficient; Dissipation; Viscoelasticity; Apple; Elastic waves

M. Hofer, Ch. Grafe, A. Boudichevskaja, A. Lopez, M.A. Bueno, D. Roen, Characterization of plant material obtained by in vitro androgenesis and in situ parthenogenesis in apple, Scientia Horticulturae, Volume 117, Issue 3, 23 July 2008, Pages 203-211, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.02.020.
(http://www.sciencedirect.com/science/article/B6TC3-4SPSHK7-1/2/397e0309cdd5e17a82c1fe1ca01d3500)
Abstract:
The production of doubled haploids offers new possibilities for genetic studies and breeding. In apple Malus x domestica Borkh., double haploid and thus homozygous material was obtained by in vitro androgenesis and in situ parthenogenesis followed by embryo or cotyledon culture. This paper describes a comprehensive evaluation of material induced concerning ploidy level, zygosity state using isozyme and SSR analysis, tree morphology, flower, and fruit quality, respectively. The use of homozygous lines in apple will be discussed in view of the efficiency of the induction process and the fertility of the plant material. The application in running breeding programmes is not a realistic approach at present, while single lines with selected characteristics can already be used for pre-breeding experiments and detailed genetic studies.
Keywords: Androgenesis; Parthenogenesis; Evaluation; Malus

T.F. Wegrzyn, J.M. Farr, D.C. Hunter, J. Au, M.W. Wohlers, M.A. Skinner, R.A. Stanley, D. Sun-Waterhouse, Stability of antioxidants in an apple polyphenol-milk model system, Food Chemistry, Volume 109, Issue 2, 15 July 2008, Pages 310-318, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.12.034.
(http://www.sciencedirect.com/science/article/B6T6R-4RR86W0-2/2/1c0acdeb56c5f9ceb67dff404f9140ae)
Abstract:
The stability of antioxidants in an apple polyphenol-milk model system was examined. The model system consisted of skim milk fortified with pH-neutralised apple polyphenols (AP, 0-200 mg per 100 ml milk), with or without ascorbic acid (100 mg per 100 ml milk). Physical and chemical changes were evaluated after thermal treatment (120 [degree sign]C, 5 min) and oxidative storage (20 [degree sign]C and 38 [degree sign]C, up to 12 weeks). Antioxidant capacity was determined using both oxygen radical absorbance capacity (ORAC) assay and ferric reducing antioxidant

power (FRAP) assay. Significant antioxidant capacity was detected in the presence of milk. Antioxidant capacity was retained during thermal treatment but decreased slowly during storage. The concentration of ascorbic acid decreased rapidly, and was close to zero after 2-week storage at 38 [degree sign]C or 10-week storage at 20 [degree sign]C. The brownness of the polyphenol-milk system increased over storage duration of 0-12 weeks; this effect was retarded by the addition of ascorbic acid. This high polyphenol-milk has demonstrated good physical stability.
Keywords: Apple polyphenol-milk; ORAC assay; FRAP assay; Physical stability; Ascorbic acid

Gordana Cetkovic, Jasna Canadanovic-Brunet, Sonja Djilas, Sladjana Savatovic, Anamarija Mandic, Vesna Tumbas, Assessment of polyphenolic content and in vitro antiradical characteristics of apple pomace, Food Chemistry, Volume 109, Issue 2, 15 July 2008, Pages 340-347, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.12.046.
(http://www.sciencedirect.com/science/article/B6T6R-4RF45D6-C/2/369586b55e377f41fc7ed580e37c5427)
Abstract:
Apple pomaces, a by-product in the apple juice processing, were subjected to evaluation as potential sources of antioxidant phytochemicals on the basis of their total content of phenolics (from 4.22 to 8.67 mg/g), total flavonoids (from 0.45 to 1.19 mg/g) and total flavan-3-ols (from 2.27 to 9.51 mg/g), and in vitro antiradical activities. Some individual phenolic compounds including caffeic and chlorogenic acids, (+)-catechin and (-)-epicatechin, rutin, quercetin glycosides and phloridzin were identified and quantified by HPLC. The antiradical activity of apple pomaces was tested by measuring their ability to scavenge DPPH and hydroxyl radicals by ESR spectroscopy. The highest DPPH and hydroxyl radical scavenging activities were obtained in the case of Reinders pomace. The regression analysis produced moderate to high correlation coefficients between the antiradical activities (and), and total phenolics, total flavonoids, total flavan-3-ols, and some individual phenolic compounds.
Keywords: Apple pomace; Phenolic compounds; HPLC; Antiradical activity; DPPH radical; Hydroxyl radical; ESR

Jia-Jun Wu, Ka-Wing Cheng, Edmund T.S. Li, Mingfu Wang, Wen-Cai Ye, Antibrowning activity of MRPs in enzyme and fresh-cut apple slice models, Food Chemistry, Volume 109, Issue 2, 15 July 2008, Pages 379-385, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.12.051.
(http://www.sciencedirect.com/science/article/B6T6R-4RF45D6-K/2/c75ecc0247db24cd0d250f92c46bba9b)
Abstract:
The present study examined various types of Maillard reaction products (MRPs) for their inhibitory effect on mushroom tyrosinase. Results showed that monosaccharide-GSH (glutathione) but not polysaccharide-GSH derived MRPs were more active than GSH in inhibiting mushroom tyrosinase. However, in fresh-cut apple slice model, surprisingly GSH performed much better than sucrose-GSH derived MRPs when the apple slices were stored at room temperature for 24 h. Further time-course study did find deterioration in tyrosinase mushroom inhibitory activity of sugar-GSH derived MRPs over time, suggesting the formed tyrosinase inhibitors in MRPs are unstable. Different combinations of chemical agents with sucrose-GSH derived MRPs were also investigated on apple slices. A synergistic effect was observed when sucrose-GSH derived MRPs (3.125 mM) were applied in combination with 0.5% ascorbic acid. Apart from instability of principal inhibitors, observation of an unpleasant odor from apple slices treated with MRPs raised another concern about the probable negative impact of these inhibitors on the sensory quality of food products. Our research indicates the limited application of MRPs as antibrowning agents for food products.
Keywords: Maillard reaction products; Tyrosinase inhibitors; Thiol compounds; Synergistic effect; Sensory quality

Joerg Riener, Francesco Noci, Denis A. Cronin, Desmond J. Morgan, James G. Lyng, Combined effect of temperature and pulsed electric fields on apple juice peroxidase and polyphenoloxidase inactivation, Food Chemistry, Volume 109, Issue 2, 15 July 2008, Pages 402-407, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.12.059.
(http://www.sciencedirect.com/science/article/B6T6R-4RFSD1R-4/2/d238cb26297808ba52a85c07304dfd1d)
Abstract:
Pulsed electric fields (PEF) were applied to freshly prepared apple juice using a laboratory scale continuous PEF system to study the feasibility of inactivating peroxidase (POD) and polyphenoloxidase (PPO). Square wave PEF using different combinations of electric field strength, pre-treatment temperature and treatment time were evaluated in this study and compared to conventional pasteurisation (72 [degree sign]C; 26 s). Inactivation curves for the enzyme were plotted for each parameter and inactivation kinetics were calculated. Results showed the highest level of decrease in the enzymatic activity of 71% and 68%, for PPO and POD, respectively, were obtained by using a combination of preheating to 50 [degree sign]C, and a PEF treatment time of 100 [mu]s at 40 kV/cm. This level of inactivation was significantly higher ($P < 0.05$) than that recorded in juice processed by conventional mild pasteurisation where the activity of PPO and POD decreased by 46% and 48%, respectively. The kinetic data for the inactivation of both enzymes could be described using a 1st-order model ($P < 0.001$).
Keywords: Pulsed electric field; Peroxidase; Polyphenoloxidase; Apple juice; Kinetics

Selima Naija, Nadhra Elloumi, Najoua Jbir, Saida Ammar, Claire Kevers, Anatomical and biochemical changes during adventitious rooting of apple rootstocks MM 106 cultured in vitro, Comptes Rendus Biologies, Volume 331, Issue 7, July 2008, Pages 518-525, ISSN 1631-0691, DOI: 10.1016/j.crvi.2008.04.002.
(http://www.sciencedirect.com/science/article/B6X1F-4SH1J0M-1/2/7f8f714a3f52cb94fc8214f908fb78c4)
Abstract:
Adventitious rooting in microcuttings of Malus rootstocks MM106 was studied as regards their histological and biochemical aspects. Microcuttings from shoots raised in Murashige and Skoog's (1962) medium were transferred into a rooting medium containing IBA in the dark, then fixed 0, 3, 5, 7 and 10 days after. Some cambial zone and adjacent phloem cells became dense cytoplasm, nuclei with prominent nucleoli and the first cell divisions were observed at day 3. Meristemoids became individualized, consisting of densely staining cells (with enlarged nucleoli) formed outside the xylem by day 5. Identifiable root primordia with a conical shape and several cell layers were present at day 7. Roots with organized tissue system emerged from the stem 10 days after the root induction treatment. From these histological observations, it can be established that the rooting induction stage ended before day 3. The initiation stage, with the first histological modifications to the formation of meristemoids, would correspond to the transient increase of our biochemical marker (peroxidase activity) until day 5. The best rooting percentage obtained with cultures in the presence of auxin during 5 days confirms this hypothesis. The expression of rooting can then take place. To cite this article: S. Naija et al., C. R. Biologies 331 (2008).
Keywords: Adventitious roots; Anatomical study; Biochemical marker; Histology; Malus rootstocks; Peroxidase activity; Rooting; Anatomie; Activite peroxydasique; Enracinement; Histologie; Marqueur biochimique; Porte-greffe de pommier; Racines adventives

M. Araya-Farias, M. Mondor, F. Lamarche, S. Tajchakavit, J. Makhlouf, Clarification of apple juice by electroflotation, Innovative Food Science & Emerging Technologies, Volume 9, Issue 3, July 2008, Pages 320-327, ISSN 1466-8564, DOI: 10.1016/j.ifset.2007.08.002.
(http://www.sciencedirect.com/science/article/B6W6D-4R5VYVY-1/2/8a56ff4cdce99ab27d182feba3641025)

Abstract:
Apple Juice industry is in search of a simplified technology which enables a quick clarification and stabilisation of apple juice. This study aimed to evaluate the potential of electroflotation as an alternative for the clarification of apple juice. Clarification of apple juice by electroflotation was first done at various current densities (10, 20 and 40 mA/cm2) with and without addition of gelatin (200 mg/l). Afterwards, the electroflotation treatments were done at a current density of 20 mA/cm2 with various concentrations of added gelatin (0, 50, 100 and 200 mg/l). It was shown that electroflotation treatments alone was efficient to reduce the tannin and protein contents of apple juice. However, the decrease in the protein content was in large part due to the use of pectinases prior to the electroflotation treatments. The use of gelatin in combination with the electroflotation aided in the clarification process. The highest gelatin concentration used in this study (200 mg/l) resulted in a better reduction of tannin and protein levels, while a current density of 20 mA/cm2 was found to be optimal. Turbidity observed in the juices clarified with electroflotation treatments was in average lower than 10 NTU but higher than 2 NTU which is generally required to produce a stable clarified juice. Brix degree and pH of the apple juice was not affected by the electroflotation treatments while the color was improved.Industrial relevance
The production of clarified and stable apple juice is a subject of interest for the beverages industries. The clarification step which remained long and discontinuous implied the addition of a large quantity of pectolytic enzyme and of clarifying agents (such as gelatin) to the freshly pressed juice to induce the precipitation of proteins and other suspended matter in 15-20 h. Fining treatments were followed by a separation step usually consisting of decantation and classical filtration on filter-press, or flotation by dispersed gas. The development of membrane separation processes to replace the traditional approach has enabled the automation of the whole production resulting in lower labor requirement and a considerably shorter process time than the traditional process.
However, the performance of membrane separation processes is influenced by the declining permeate flux with time, which is due to membrane fouling. In some instances, permeate flux decline makes membrane separation processes unattractive for the clarification of apple juice. To our knowledge, we are the first research group to use electroflotation (EF) for clarification of apple juice. It was shown that EF treatments alone were efficient to reduce the tannin and protein contents of apple juice. In addition, the use of gelatin in combination with the EF aided in the clarification process. Turbidity observed in the juices clarified with EF treatments for 30 min was in average lower than 10 NTU. Brix degree and pH of the apple juice were not affected by the EF treatments while the color was improved.
When compared to the values reported in the literature for flotation by dispersed gas, it seems that EF shows better efficiency than flotation in decreasing the juice turbidity (99% decrease for EF as compared to 90% decrease for flotation). In addition, for experiments carried out by conventional flotation larger amount of fining agent are used (70-150 mg of gelatin/l, 400-800 mg/l of silica sol and 200-500 mg/l of bentonite). For these reasons, the new process we propose is advantageous when compared to the traditional flotation approach and it should have a measurable impact on the advancements in the production of clarified apple juice. If used as a pre-treatment to ultrafiltration clarification, it is expected that it would reduce membrane fouling resulting in higher productivity.
Keywords: Apple juice; Clarification; Electroflotation; Stability; Turbidity

A. Matusek, B. Czukor, P. Meresz, Comparison of sucrose and fructo-oligosaccharides as osmotic agents in apple, Innovative Food Science & Emerging Technologies, Volume 9, Issue 3, July 2008, Pages 365-373, ISSN 1466-8564, DOI: 10.1016/j.ifset.2007.10.003.
(http://www.sciencedirect.com/science/article/B6W6D-4R29621-1/2/b3cfdb304bb06e779de63dcfc60cc90f)
Abstract:

Fructo-oligosaccharides and sucrose were compared as osmotic agents in the osmotic dehydration of apple cv. Idared. Dehydration process of apple cubes (10 * 10 * 10 mm) was performed to determine the weight reduction (WR), moisture content (MC), water loss (WL) and solid gain (SG) over a range of osmotic solutions (40-60% w/v), temperature (40-60 [degree sign]C) and processing time (20-40 min) The effective diffusion coefficient of water and solute was calculated assuming the processes to be governed by Fick's unsteady state diffusion. The effective diffusion coefficients were found to be of the order of 10- 9 m2 s- 1 and were effected by the type of solute significantly. The WR, MC, WL and SG were predicted as weighted linear combinations of temperature, concentration of solute and time of OD.Industrial relevance
The use of fructo-oligosaccharides (FOS) in different fruit based products is an efficient way to enrich human diet with functional component, because of the well-known health benefits of FOS. The osmotic behaviour of fructo-oligosaccharides were studied and compared to the conventional used sucrose. In view of the changes of different osmotics regarding to unit parameters of osmotic dehydration the results give possibility to industrial technology planning of products containing FOS, which are available for consumption in every season of the year and are favourable also in processed form e.g. muesli, dairy products.
Keywords: Osmotic dehydration; Fructo-oligosaccharides; Apple; Diffusion coefficient

Duraisamy Saravanakumar, Annalisa Ciavorella, Davide Spadaro, Angelo Garibaldi, M. Lodovica Gullino, Metschnikowia pulcherrima strain MACH1 outcompetes Botrytis cinerea, Alternaria alternata and Penicillium expansum in apples through iron depletion, Postharvest Biology and Technology, Volume 49, Issue 1, July 2008, Pages 121-128, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.11.006.
(http://www.sciencedirect.com/science/article/B6TBJ-4S0357F-1/2/3703ca77c94046ef59ffc4fac577d677)
Abstract:
A new strain of Metschnikowia pulcherrima (MACH1) was studied for its efficacy as a biocontrol agent against Botrytis cinerea, Penicillium expansum and Alternaria alternata on apples stored for 8 months at 1 [degree sign]C. The results of two semi-commercial trials demonstrated the efficacy of the biocontrol strain MACH1. In order to understand the mechanism of action involved, the yeast strain was investigated for its competitive ability for iron against postharvest pathogens of apple. M. pulcherrima strain MACH1 was cultivated on PDA with different concentrations of iron (supplemented as FeCl3) against A. alternata and B. cinerea. The yeast strain MACH1 produced a wider pigmented inhibition zone against both pathogens in low iron amendments while less inhibition was measured with increased iron concentrations. At the coloured inhibition zone, B. cinerea and A. alternata conidia did not germinate and mycelial degeneration was observed. In addition, a high reduction in infection by both pathogens was recorded in apples treated with M. pulcherrima strain MACH1 supplemented with low iron amendments compared to higher iron concentrations. The same experiments were carried out in vivo and in vitro against P. expansum. M. pulcherrima strain MACH1 amended with low iron concentration (5 [mu]g mL-1 FeCl3), showing modest lesion diameter reduction and no effect on P. expansum under increased iron and without iron amendments. This study illustrated that iron depletion by the yeast strain MACH1 under low iron conditions could reduce the growth of some postharvest pathogens in vitro and in vivo. Although, iron depletion seems to be a primary mode of action against the postharvest pathogens studied, other mechanisms of action cannot be excluded in the biocontrol employed by M. pulcherrima strain MACH1.
Keywords: Biocontrol; Competition; Iron depletion; Pulcherrimin; Postharvest diseases; Yeast

S. Pereira-Lorenzo, A.M. Ramos-Cabrer, A.J. Gonzalez-Diaz, M.B. Diaz-Hernandez, Genetic assessment of local apple cultivars from La Palma, Spain, using simple sequence repeats (SSRs),

Scientia Horticulturae, Volume 117, Issue 2, 26 June 2008, Pages 160-166, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.03.033.
(http://www.sciencedirect.com/science/article/B6TC3-4SH1J2R-3/2/cdf3e43f455fd1dd138f2fbadd99a6af)
Abstract:
Apple cultivars from Canary Islands can possibly be valuable genetic resources for subtropical areas. We localised 31 accessions considered by growers to be local, and confirmed by historical references that apple crop was introduced in XV century. These accessions were compared with 77 Spanish and 26 commercial cultivars in order to detect synonyms. A set of 10 SSRs were studied, and 2 of them presented 2 loci. Cultivars from La Palma (Canary Islands) presented five specific alleles not found in other Spanish regions. Those polymorphisms allowed detecting one introgressant in La Palma from non-native cultivars, and the other 30 accessions were classified into 14 genotypes. Some accessions derived from non-native cultivars such as Golden Delicious. A main cultivar could be detected, Del Pais, with 14 accessions. Secondary ones were Camuesa and Pero. Genetic differentiation was small between regions (Fst = 0.057) but significant, confirmed by analysis of molecular variance (AMOVA). Major genetic differentiation was found between non-native cultivars and cultivars from Asturias and Basque Country. Bayesian method and admixture analysis reconstructed three ancestral groups (RPP), Asturian and Basque cultivars grouped in RPPI (mainly those used for cider production), a mixture of cultivars from Galicia and La Palma in RPPII and non-native cultivars were in RPPIII. This genetic differentiation was also confirmed by factorial correspondence analyses (FCA). AMOVA over RPPs increased the genetic differentiation. Allelic variation found in this study showed that Spanish local cultivars represent a differentiated genetic pool that will provide original genotypes to diversify the reduced number of cultivars used in commercial production. In addition, differentiated genotypes localised in La Palma will be preserved in the local Germplasm Bank.
Keywords: Malus x domestica; Classification; Genetic differentiation; Microsatellites

Rui Zhou, Lailiang Cheng, Competitive inhibition of phosphoglucose isomerase of apple leaves by sorbitol 6-phosphate, Journal of Plant Physiology, Volume 165, Issue 9, 16 June 2008, Pages 903-910, ISSN 0176-1617, DOI: 10.1016/j.jplph.2007.12.002.
(http://www.sciencedirect.com/science/article/B7GJ7-4RR82SY-2/2/046d59442f226677e9b7b8bb8ae66642)
Abstract: Summary
Apple leaf cytosolic phosphoglucose isomerase (PGI, EC 5.3.1.9) was purified to an apparent homogeneity with a specific activity of 2456 units/mg protein, and chloroplastic PGI was partially purified to a specific activity of 72 units/mg protein to characterize their biochemical properties. These two isoforms showed differential responses to heat treatment; incubation at 50 [degree sign]C for 10 min resulted in a complete loss of the chloroplastic PGI activity, whereas the cytosolic PGI only lost 50% of its activity. Apple cytosolic PGI is a dimeric enzyme with a molecular mass of 66 kDa for each monomer. The activity of both isoforms was strongly inhibited by erythrose 4-phosphate (E4P) with a Ki of 1.2 and 3.0 [mu]M for the cytosolic PGI and chloroplastic PGI, respectively. Sorbitol 6-phosphate (Sor6P), an intermediate in sorbitol biosynthesis, was found to be a competitive inhibitor for both cytosolic and chloroplastic PGIs with a Ki of 61 and 40 [mu]M, respectively. PGIs from both spinach and tomato leaves were also inhibited by Sor6P in a similar manner. The possible physiological significance of this finding is discussed.
Keywords: Apple; Phosphoglucose isomerase; Sorbitol 6-phosphate

Barbara Lata, Apple peel antioxidant status in relation to genotype, storage type and time, Scientia Horticulturae, Volume 117, Issue 1, 12 June 2008, Pages 45-52, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.03.011.

(http://www.sciencedirect.com/science/article/B6TC3-4SDNG6G-1/2/c0ff0f0cf160a9e7ce758c0ec8cf6da7)
Abstract:
It is expected that crop cultivars with a higher antioxidant ability have better stress resistance, nutritional quality and storage characteristics. In this study the antioxidant metabolism in apple peel, as a primary target of unfavorable environmental factors during common cold (CCS) or controlled atmosphere (CA) storage in cultivars varying in their storage potential was monitored over two seasons. In general, the examined cultivars kept their antioxidant status, but it was difficult to definitively link its value with the extent of apple storage length ability. `Jonagold', which expressed the highest storability, had the poorest antioxidant characteristics, but with a quite good stability level specified, especially in relation to enzyme activity. Since storage characteristics might be probably more attached to antioxidant status after harvest, followed by supporting high redox state enzymes and antioxidant precursors finally keeping relative stability of bioactives through storage, than by their global pool. Differences between storage types in preserving antioxidant status were more distinct after longer time of storage. The first storage period (45 days) resulted in an increase of the antioxidant pool. The increase of ascorbate, thiols and phenolic compounds was more pronounced in the CA conditions. After the second storage period (90 days) the antioxidant status was kept more efficiently in CA as compared to CCS. Glutathione maintained its reduced form and redox state at a higher level than ascorbate.
Keywords: Malus domestica Borkh; Bioactive compounds; Common cold storage; Controlled atmosphere storage; Glutathione-ascorbate cycle; Phenolics

L. Brun, F. Didelot, L. Parisi, Effects of apple cultivar susceptibility to Venturia inaequalis on scab epidemics in apple orchards, Crop Protection, Volume 27, Issue 6, June 2008, Pages 1009-1019, ISSN 0261-2194, DOI: 10.1016/j.cropro.2007.12.009.
(http://www.sciencedirect.com/science/article/B6T5T-4RR82ST-1/2/9fb8abd98137539f1b4fe4f8d323e22c)
Abstract:
The effects of cultivar susceptibility on the development of scab caused by Venturia inaequalis were observed in two experimental orchards where no fungicide protection was used against scab over a 5-year period. The weather during a 4-year period was conducive to apple scab development, and the results obtained demonstrate the advantages of using low-susceptibility cultivars to limit the development of apple scab epidemics on leaves as well as on fruits. Whereas 95.2-100% of the fruits of susceptible cultivars had apple scab at harvest, low-susceptibility cultivars were relatively less scabbed with only 3.1-46.5% of scabbed fruits. During years with low scab stress, it was very interesting to observe the almost total absence of the disease on the low-susceptibility cultivar, Reine des Reinettes, whereas on the susceptible cultivar, Gala, 40% of leaves and 22% of fruits were scabbed at harvest. These results confirm the interest of partial resistance for scab management in orchards. It is possible to take the level of susceptibility of cultivars into consideration within the framework of integrated fungicide protection against apple scab.
Keywords: Apple scab; Venturia inaequalis; Partial resistance; Integrated management

Anis Arnous, Anne S. Meyer, Comparison of methods for compositional characterization of grape (Vitis vinifera L.) and apple (Malus domestica) skins, Food and Bioproducts Processing, Volume 86, Issue 2, ECCE-6, June 2008, Pages 79-86, ISSN 0960-3085, DOI: 10.1016/j.fbp.2008.03.004.
(http://www.sciencedirect.com/science/article/B8JGD-4SG559T-1/2/5720d2264c3252a99f31d5a91e587732)
Abstract:
A fundamental prerequisite for upgrading of fruit skins in press residues from juice, cider, and wine processes to food ingredients or supplements is the provision of methods for evaluation of the

phenolics and cell wall carbohydrates in the materials. This study compared the monosaccharide yields obtained for different wine grape skin (Cabernet Sauvignon, Merlot, and Shiraz) and apple skin (Red Delicious (RD) and Golden Delicious (GD)) samples by trifluoroacetic (TFA) acid vs. hydrochloric (HCl) acid hydrolysis. Recovery values of monosaccharide standards after the acid treatments were also compared. TFA hydrolysis (2 M, 121 [degree sign]C, and 2 h) resulted in higher monosaccharide yields from the fruit skin samples than HCl hydrolysis under the same conditions--after recovery value adjustments. Analyses of the phenols after extensive, sequential aqueous methanol (60%, w/w) extraction of the fruit skins confirmed that grape skins are a good source of anthocyanin pigments, notably the 3-glucosides of malvidin and cyanidin, and demonstrated that apple skins are a potential source of catechins.
Keywords: Monosaccharides; Phenolics; Skin cell walls; HPAEC-PAD; HPLC-DAD; Trifluoroacetic (TFA) acid

M. Murillo-Arbizu, E. Gonzalez-Penas, S.H. Hansen, S. Amezqueta, J. Ostergaard, Development and validation of a microemulsion electrokinetic chromatography method for patulin quantification in commercial apple juice, Food and Chemical Toxicology, Volume 46, Issue 6, June 2008, Pages 2251-2257, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.02.027.
(http://www.sciencedirect.com/science/article/B6T6P-4S0YXST-1/2/67ffb8bef55a9a7d8e0c844d7af95027)
Abstract:
A microemulsion electrokinetic chromatography (MEECK) method for patulin (PAT) quantification in apple juice samples has been developed. The effects of several important factors such as co-surfactant type, concentration of surfactant, acetonitrile percentage in the microemulsion, and running voltage and temperature were investigated to determine the optimum conditions. They resulted to be: a background electrolyte (BGE) composed of 25 mM of sodium tetraborate, SDS (2.16% w/w), ethanol (6.49% w/w), n-octanol (0.82% w/w) and 2% v/v acetonitrile; applied voltage of +15 kV; and a capillary temperature of 35 [degree sign]C. PAT was detected at 276 nm. Quantification and detection limits (LOQ and LOD) in apple juice samples were 8.0 [mu]g L-1 and 3.2 [mu]g L-1, respectively. Patulin was extracted from apple juice using ethyl acetate with a mean recovery value of 75.3% (RSD = 4.5).
This method was applied to the measurement of patulin in twenty commercial apple juice samples obtained from different Danish supermarkets. The PAT apple juice mean and median levels obtained were 35.9 and 10.9 [mu]g L-1, respectively.
The comparison with a previously validated micellar electrokinetic chromatography (MEKC) method for PAT analysis showed the suitability of using MEEKC for this mycotoxin analysis. However, the expectations of obtaining a higher efficiency and thus lower limits of detection and quantitation when using MEEKC were not met.
Keywords: Apple juice; Electrokinetic chromatography; Mycotoxins; Patulin; Validation

Anne Guillemin, Pascal Degraeve, Claude Noel, Remi Saurel, Influence of impregnation solution viscosity and osmolarity on solute uptake during vacuum impregnation of apple cubes (var. Granny Smith), Journal of Food Engineering, Volume 86, Issue 4, June 2008, Pages 475-483, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.10.023.
(http://www.sciencedirect.com/science/article/B6T8J-4R1MDVK-1/2/c01a3c87f0d79069f890f734ad9a6c61)
Abstract:
Vacuum-assisted impregnation of pectinmethylesterase (PME) solution has been recognized as an efficient pretreatment to improve the firmness of heat-treated fruit. In order to improve the control of solute infusion into fruit pieces, the effect of the osmolarity and viscosity of vacuum impregnation solution on solute penetration and distribution was studied in 1.5 cm apple cubes, using model PME-based solutions containing sodium chloride and/or sodium alginate. While

vacuum impregnation of either a viscous hypotonic or a non-viscous hypertonic solution infused solutes homogeneously into fruit pieces, the penetration of viscous hypertonic solutions was much lower, and PME or chloride infusion was limited primarily to the superficial zone of apple cubes. Similar penetration was observed with a highly concentrated sucrose solution. These findings may result from a synergistic combination of negative osmotic and friction effects during liquid flow into fruit pores.
Keywords: Osmolarity; Viscosity; Mass transfer; Vacuum impregnation; Fruit; Pectinmethylesterase

M.C. Alamar, E. Vanstreels, M.L. Oey, E. Molto, B.M. Nicolai, Micromechanical behaviour of apple tissue in tensile and compression tests: Storage conditions and cultivar effect, Journal of Food Engineering, Volume 86, Issue 3, June 2008, Pages 324-333, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.10.012.
(http://www.sciencedirect.com/science/article/B6T8J-4PYP6TN-1/2/0b56b94eb8dfcf4fc115d5dac981994a)
Abstract:
The micromechanical behaviour of apple tissue was studied using a miniature tensile stage positioned underneath a microscope that allowed for simultaneous acquisition of force-displacement curves while the deformation of the individual cells was followed and recorded. Tensile and compression tests were performed on small samples of apple parenchyma of two different cultivars (Jonagored and Braeburn) and two storage conditions (control and shelf-life). Tests on the repeatability of the methods has provided satisfactory results and will allow the reduction of samples in further experiments. Under tensile loading, no differences for any of the mechanical parameters were found between cultivars, while a significant storage effect was observed for both cultivars. This opens the possibility of developing new sensors for quality assessment. Differences were found when studying the relationship of mechanical properties at the micro- and macro-level, which requires further investigation. The insights gained in this research will be useful when developing mathematical models based upon the mechanical behaviour of apple tissue.
Keywords: Malus domestica; Texture; Firmness; Elasticity; Storage; Histology

A. Derossi, T. De Pilli, C. Severini, M.J. McCarthy, Mass transfer during osmotic dehydration of apples, Journal of Food Engineering, Volume 86, Issue 4, June 2008, Pages 519-528, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.11.007.
(http://www.sciencedirect.com/science/article/B6T8J-4R5VYDK-1/2/3e26a295c9865800eee18813f6df36ef)
Abstract:
Osmotic dehydration processes are widely applied to obtain high quality intermediate moisture food. The study of dehydration kinetics and mass transfer mechanisms is very important for understanding and controlling the osmotic dehydration process. The internal changes and kinetics of both moisture change and mobility during osmotic dehydration of apples is reported. The effective diffusion coefficient of water was not constant during the dehydration treatment. Initially the effective diffusion coefficient calculated using a Fickian-based model was 2 * 10-10 m2/s and increased to 5 * 10-10 m2/s during treatment. Moreover, results showed the existence of an osmotic dehydration front that moves from the surface to the core of apple samples. It was not possible to explain the osmotic treatment process using only diffusion-based mechanisms. All layers of cells appear to be involved in the moisture transport process at the same time.
Keywords: Osmotic dehydration; MRI; Mobility water; Structural changes

Ming-Jun Li, Feng-Wang Ma, Min Zhang, Fei Pu, Distribution and metabolism of ascorbic acid in apple fruits (Malus domestica Borkh cv. Gala), Plant Science, Volume 174, Issue 6, June 2008, Pages 606-612, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2008.03.008.
(http://www.sciencedirect.com/science/article/B6TBH-4S4TNS8-1/2/86d1de6ef3eeadf01e2305001e07b33c)
Abstract:
The objective of this study was to determine ascorbic acid (AsA) distribution, biosynthesis and recycling in different tissues of young and mature fruit of cv. Gala apple (Malus domestica Borkh). Our results showed that the peel of `Gala' apple had the highest AsA levels among all the tissue types, which resulted from a combination of, lower ascorbate peroxidase (APX, EC 1.11.1.11) activity consuming AsA, and higher dehydroascorbate reductase (DHAR, EC 1.8.5.1) and monodehydroascorbate reductase (MDHAR, EC 1.6.5.4) activities used to recycle AsA. Exogenous feeding of AsA synthesis precursors demonstrated that the peel was capable of de nono AsA biosynthesis via l-galactose and d-galacturonic acid pathways whereas the flesh and seed were only able to synthesize AsA via l-galactose pathway. The young fruit had higher AsA concentration and stronger capability of AsA biosynthesis and recycling. The sun-exposed peel had higher AsA concentration and stronger capability of recycling AsA than the shaded peel, while there was no difference in the flesh between the sun-exposed side and the shaded side. Abundant AsA was found in fruit vascular tissue, which suggests that AsA can be transported to vascular tissues of fruit or vascular tissues could synthesize AsA itself in `Gala' apple.
Keywords: Apple fruits; Ascorbic acid; Distribution; Metabolism

N. Marigheto, Luca Venturi, B. Hills, Two-dimensional NMR relaxation studies of apple quality, Postharvest Biology and Technology, Volume 48, Issue 3, June 2008, Pages 331-340, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.11.002.
(http://www.sciencedirect.com/science/article/B6TBJ-4S02JVW-1/2/48c5fd117b877016d2aa5271abec5df5)
Abstract:
The internal sub-cellular physiological changes associated with ripening and mealiness in apples were investigated with novel two-dimensional NMR relaxation and diffusion techniques. It is shown that two-dimensional relaxometry reveals more subtle physiological changes than hitherto observed with conventional one-dimensional relaxometry. In particular it is shown that the T1 of the peak associated with the cell wall in mealy apples is much longer than that of fresh apples. These changes could, perhaps, be exploited in the development of on-line NMR sensors of fruit quality.
Keywords: NMR; Apple; Mealiness; Relaxation; Diffusion

Masahiro Shishido, Kazunori Sakamoto, Hidemi Yokoyama, Noriaki Momma, Shun-Iichiro Miyashita, Changes in microbial communities in an apple orchard and its adjacent bush soil in response to season, land-use, and violet root rot infestation, Soil Biology and Biochemistry, Volume 40, Issue 6, Special Section: Functional Microbial Ecology: Molecular Approaches to Microbial Ecology and Microbial Habitats, 18th World Congress of Soil Science, June 2008, Pages 1460-1473, ISSN 0038-0717, DOI: 10.1016/j.soilbio.2007.12.024.
(http://www.sciencedirect.com/science/article/B6TC7-4RNJB1P-3/2/bccc4e374ebe84b5ff6d94a8ff274d9a)
Abstract:
Soil microbial communities in an apple orchard and its adjacent boundary bush with or without infestation by violet root rot were investigated for 2 years. Effects of season (spring, summer, and fall), land-use (apple orchard and boundary bush), and violet root rot (infested and healthy) on soil microbial populations, microbial activity, and microbial community structures were determined using physiological, cytochemical, and molecular (PCR-DGGE) approaches. Seasonal fluctuations

were significant ($P<0.05$) in viable bacteria and fungal populations, bacterial FAME, fluorescein diacetate (FDA) hydrolysis, and diversity (H') and evenness (J') of community-level physiological profile (CLPP) in both years. However, seasonal differences of soil microbial guilds that utilize carbon substrate groups observed in the first year were not reproduced in the second year. The land-use factor differentiated the apple orchard from the boundary bush where viable bacterial population, bacterial FAME and FDA hydrolysis were significantly greater in both years. Infestation status of violet root rot, on the other hand, significantly increased bacterial FAME and FDA hydrolysis in both years. In addition, neither the land-use nor the disease infestation factor significantly influenced the utilization patterns of individual substrate guilds for the 2 years. In both years, saturated fatty acids were significantly more abundant in the orchard than in the bush soil, and monosaturated fatty acids vice versa. Principal component analyses for CLPP, FAME, and denaturing gradient gel electrophoresis (DGGE) consistently exhibited that, although the violet root rot influenced the soil microbial community structures both in the apple orchard and the boundary bush, overall magnitude of the difference in communities between the violet root rot infested and non-infested sites in the bush were greater than in the orchard, irrespective of the season. These results suggested that the seasonal and the land-use factors affected soil microbial community both quantitatively and qualitatively, whereas the impact of the violet root rot on the soil microbial community was mainly qualitative and more pronounced in the adjacent bush than in the orchard.
Keywords: Soil microbial community; Apple orchard; Boundary bush; Violet root rot; Season

Yasunori Hamauzu, Miho Irie, Makoto Kondo, Tomoyuki Fujita, Antiulcerative properties of crude polyphenols and juice of apple, and Chinese quince extracts, Food Chemistry, Volume 108, Issue 2, 15 May 2008, Pages 488-495, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.10.084.
(http://www.sciencedirect.com/science/article/B6T6R-4R53WJ8-2/2/f67be2401c41266275007f5af802883a)
Abstract:
Effects of Chinese quince extract, apple juice, semi-purified phenolics and soluble pectin from these fruits on ethanol-induced gastric ulcers in rats were investigated. In rats given Chinese quince extract or apple juice, ulcer induction was strongly suppressed, and the effect was stronger for Chinese quince extract than for apple juice. Myeloperoxidase activity in gastric mucosa showed a similar tendency. The DPPH radical scavenging activity and total phenolic content were 4 times higher in Chinese quince extract than in apple juice. Semi-purified phenolics from both fruits strongly suppressed ulcer induction at doses of 5-10 mg; however, a 20 mg dose of apple phenolics showed a pro-ulcerative effect. The soluble pectin fraction also showed moderate activity. These results suggest that phenolic compounds are responsible for antiulcerative activity of Chinese quince extract and apple juice, and that concentration may be an important factor in the case of apple phenolics.
Keywords: Polyphenols; Procyanidin; Chlorogenic acid; Pectin; Myeloperoxidase; Gastric mucosa injury

Masoomeh Shaghaghi, Jamshid L. Manzoori, Abolghasem Jouyban, Determination of total phenols in tea infusions, tomato and apple juice by terbium sensitized fluorescence method as an alternative approach to the Folin-Ciocalteu spectrophotometric method, Food Chemistry, Volume 108, Issue 2, 15 May 2008, Pages 695-701, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.11.008.
(http://www.sciencedirect.com/science/article/B6T6R-4R53WJ8-6/2/1a10282fe1ea8057e1bff87b7ae08365)
Abstract:
A fast screening of total phenols in tea infusions, tomato and apple juice samples using terbium sensitized fluorescence is described. The proposed method is based on the fluorescence sensitization of terbium (Tb^{3+}) by complexation with flavonols (quercein as a reference standard)

(at pH 7.0), which fluoresces intensely with an emission maximum at 545 nm when excited at 310 nm. Quercetin and terbium cations (at pH 7.0) form a stable complex and the resulted emission at 545 nm can be used for the determination of the total phenols concentration expressed in terms of 'quercetin equivalent'. Based on the obtained results, a sensitive, simple and rapid spectrofluorimetric method was developed for the determination of total phenols. In the optimum conditions, the calibration graph was linear from 0.01 to 2 [mu]g mL-1, with the limit of detection of 0.002 [mu]g mL-1. The relative standard deviation values were in the range of 0.75-2.3%. The total concentrations of quercetin equivalent in five tested samples were found in the range of 6.6-27.9 [mu]g mL-1 and the results compare favorably with those obtained by spectrophotometric method (r = 0.999).
Keywords: Sensitized fluorescence; Flavonols; Total phenols; Terbium

T.A. Forge, E.J. Hogue, G. Neilsen, D. Neilsen, Organic mulches alter nematode communities, root growth and fluxes of phosphorus in the root zone of apple, Applied Soil Ecology, Volume 39, Issue 1, May 2008, Pages 15-22, ISSN 0929-1393, DOI: 10.1016/j.apsoil.2007.11.004.
(http://www.sciencedirect.com/science/article/B6T4B-4RHXTD5-1/2/a9a5c3cbc992d502f00a5724563d1740)
Abstract:
Nematode community structure, root biomass and P availability indices (in situ incubation of anion-exchange resin strips, lab incubation of resin strips, extractable P) were assessed for root zone soil of Golden Delicious/M9 apple trees that were mulched with (1) shredded office paper, (2) a mixture of compost plus biosolids, (3) office paper applied over the compost + biosolids treatment, and (4) non-mulched control plots. Two-week long in situ incubations of anion-exchange resin strips indicated that shredded paper mulch reduced availability of P in root zone soil, probably as a result of microbial immobilization driven by C inputs from the paper mulch. Apple leaf-P was not reduced in paper mulch plots, however, indicating that other factors affected by the paper mulch may have allowed for adequate P uptake despite the apparent P immobilization. Paper mulch increased nematode indicators of enhanced nutrient cycling, indicating that fluxes of nutrients through the soil biota were increased under paper mulch; enhanced P fluxes could have compensated for the low P availability. Fine root biomass in the 0-15 cm horizon was doubled by shredded paper, and we speculate that increased root abundance allowed for adequate P acquisition despite the reduced availability of P. The number of root-lesion nematodes (Pratylenchus penetrans) per gram fine root was also reduced under paper mulch, and reduced nematode damage is one of several possible reasons for the enhanced root growth under paper mulch.
Keywords: Biosolids; Compost; Soil ecology; Soil organic matter; Pratylenchus penetrans; Rhizosphere

Gloria del Campo, Inaki Berregi, Jose Ignacio Santos, Maite Duenas, Ana Irastorza, Development of alcoholic and malolactic fermentations in highly acidic and phenolic apple musts, Bioresource Technology, Volume 99, Issue 8, May 2008, Pages 2857-2863, ISSN 0960-8524, DOI: 10.1016/j.biortech.2007.06.007.
(http://www.sciencedirect.com/science/article/B6V24-4PDK47B-1/2/a89484e4fc1cbd04b8b3d5bcb217d2de)
Abstract:
This work reports the influence of the high acidity and high phenolic content in apple musts on the development of alcoholic and malolactic fermentations and on the final chemical and microbiological composition of the ciders. Four different musts were obtained by pressing several varieties and proportions of cider apples from the Basque Country (Northern Spain). Specially acidic and phenolic varieties were selected. Three musts were obtained in experimental stations and the fourth one, in a cider factory following usual procedures. The evolution of these musts was

monitored during five months by measuring 18 parameters throughout eight samplings. In the most acidic of the three experimental musts, yeasts were added to complete the alcoholic fermentation. In the rest of the musts, alcoholic and malolactic fermentations took place spontaneously due to natural microflora and no chemical was added to control these processes. Malolactic fermentation (MLF) finished before alcoholic fermentation in the three tanks obtained in experimental stations, even in the most acidic and phenolic one (pH 3.18, 1.78 g tannic acid/l). After four months, these ciders maintained low levels of lactic acid bacteria ([less-than-or-equals, slant]104 CFU/ml) and low content of acetic acid (<0.60 g/l). Both fermentations began simultaneously in the must obtained in the cider factory, but MLF finished 10 days after alcoholic fermentation. Subsequently, this must maintained a high population of lactic acid bacteria (>106 CFU/ml), causing a higher production of acetic acid (>1.00 g/l) than in the other ciders. These results show the possible advantages of MLF finishing before alcoholic fermentation.
Keywords: Cider; Alcoholic fermentation; Malolactic fermentation

Anna Kaminska, Piotr P. Lewicki, Pawel Malczyk, Mass transfer in osmotically dehydrated apple stored at temperatures above zero, Journal of Food Engineering, Volume 86, Issue 1, May 2008, Pages 140-149, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.09.020.
(http://www.sciencedirect.com/science/article/B6T8J-4PRRBCM-3/2/f6155f27c04c8b587848b79ae4f2a33a)
Abstract:
Material dehydrated in sucrose solution by osmosis for 3 h at 30 [degree sign]C and for 1 h at 70 [degree sign]C was stored for 24, 72 and 144 h at 5, 9, 15 and 20 [degree sign]C. Internal gradients of dry matter and sucrose concentration caused mass transfer in the material. Dry matter content in the surface layers was close to 40%, while sucrose concentration was between 20% and 23%. At the distance of 10 mm from the mass transfer surface dry matter content was still higher than that in raw apple, but sucrose concentration was that of raw apple. Concentration profiles of sucrose changed with time and storage temperature. The higher was the temperature the faster was the diffusion of sucrose. In material osmosed at 30 [degree sign]C for 3 h and stored for 72 h at 5, 9 and 15 [degree sign]C sucrose concentration gradients were still present. However, after 144 h at 9 [degree sign]C the concentration of sucrose became independent on the distance from the mass exchange surface. Diffusion of sucrose in material osmosed at 70 [degree sign]C for 1 h was much faster than that observed in samples osmosed at lower temperature. The effective diffusion coefficient of sucrose was dependent on temperature and time of storage, and distance from the mass transfer surface as well. Since distance was related to concentration a relationship between sucrose concentration and effective diffusion coefficient was found. The effective diffusion coefficient was of the order of 10-9-10-12 m2/s.
Keywords: Apple; Osmotic dehydration; Mass transfer; Diffusion coefficient; Sucrose concentration profile

Elena de Castro, Diane M. Barrett, Jennifer Jobling, Elizabeth J. Mitcham, Biochemical factors associated with a CO2-induced flesh browning disorder of Pink Lady apples, Postharvest Biology and Technology, Volume 48, Issue 2, May 2008, Pages 182-191, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.09.027.
(http://www.sciencedirect.com/science/article/B6TBJ-4R70K08-1/2/8eaac1a2a51ba6b05c196f398ef176c8)
Abstract:
The underlying biochemical factors associated with a CO2-induced internal flesh browning (FB) disorder of Pink Lady apples (Malus domestica Borkh `Cripps Pink') are poorly understood. To investigate this disorder, Pink Lady apples were stored in air or controlled atmosphere (CA) with 1.5 kPa O2 and 5 kPa CO2 at 0.5 [degree sign]C for 2 and 4 months in 2004 and 2005. Following CA storage, fruit were separated into two categories, damaged (FB) and undamaged tissue from

each of the categories was studied separately. Cell viability studies revealed that the cells were dead in the brown tissue of damaged apples. All healthy tissue in the same apples contained viable cells. Both brown and surrounding healthy tissues in apples with FB showed a decrease in ascorbic acid and an increase in dehydroascorbic acid during the first 2 months of storage in CA, the time period when FB developed. Undamaged, CA-stored apples retained a higher concentration of ascorbic acid after 2 months in storage. The level of hydrogen peroxide (H2O2) increased more in the flesh of CA-stored apples than in air-stored apples, an indication of tissue stress. In addition, concentrations of H2O2 were significantly lower in diphenylamine (DPA)-treated apples. Treatment with DPA also inhibited FB completely compared to untreated apples. Polyphenol oxidase (PPO) activity was similar for apples kept in air or CA storage and between undamaged and damaged fruit. The results showed a closer association between FB and the oxidant-antioxidant mechanisms such as ascorbic acid, H2O2 and DPA, than to the activity of specific browning enzymes like PPO. Further investigation of the protective effect of ascorbic acid is warranted as is further research on the underlying causes of apple fruit susceptibility to FB.
Keywords: Ascorbic acid; Calcium; Cell viability; CO2 injury; Hydrogen peroxide; Malus domestica; Polyphenol oxidase

Mary L. Parker, Walter Guerra, Occurrence and implications for postharvest quality of intercellular callus hair growth in the outer cortex of apples of `Fuji' and `Fuji' sports, Postharvest Biology and Technology, Volume 48, Issue 2, May 2008, Pages 192-198, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.10.007.
(http://www.sciencedirect.com/science/article/B6TBJ-4RGX2B0-2/2/080c71fb0af9175255dcd5d64d9dac03)
Abstract:
Mature apples of `Fuji' and `Fuji' sports sourced from around the world were found to possess clumps of multicellular, branched callus hairs in the outer 17 mm of the outer cortex. The clumps of callus hairs were particularly well developed in samples of `Fuji Suprema' from Brazil, moderately developed in `Fuji KIKU' from Italy and in `Fuji' from South Africa, Chile, New Zealand and the USA, and were consistently least developed in `Fuji' from China. These previously unreported callus hairs grow in the intercellular air spaces between the parenchyma cells and also in larger air lacunae in the apple flesh. In both of these locations they have the potential to reduce the efficiency of gas exchange into and out of the fruit during storage. Initial observations suggest that the callus hairs within a clump do not continue to develop after harvest. In ripe apples, the cells of the callus hairs contain chlorophyll and starch and under UV light the contents of the vacuoles autofluoresce an intense blue colour. The outer surface of each callus hair cell is covered with characteristic globular protuberances which attach the hairs to each other and to the surrounding parenchyma. After a period of storage, many of the clumps of callus hairs remain packed with starch granules even though starch has been metabolised from the surrounding parenchyma.
Keywords: `Fuji' apples; Callus; Cell proliferation; Outer cortex; Gas exchange; Internal browning; Storage

Zhaoshen Qing, Baoping Ji, Manuela Zude, Non-destructive analyses of apple quality parameters by means of laser-induced light backscattering imaging, Postharvest Biology and Technology, Volume 48, Issue 2, May 2008, Pages 215-222, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.10.004.
(http://www.sciencedirect.com/science/article/B6TBJ-4RWC875-2/2/9078bfd035c68bcdb603a8d3719ec148)
Abstract:
Monitoring of apple fruit development is necessary to determine appropriate production measures. Furthermore, consumer acceptance of apples depends on internal quality especially regarding the soluble solids content (SSC) and fruit flesh firmness. In the present work, laser-induced light

backscattering imaging was applied to analyze fruit SSC and firmness during apple development in different growing locations by means of non-destructive readings, showing potential for rapid site-specific fruit evaluation during production. Spectral images of the backscattering of light on the fruit surface were obtained from `Elstar' and `Pinova' apples using laser diodes emitting at five wavelengths (10 nm bandpass) between 600 and 1100 nm, addressing the fruit absorption and scattering properties. Different multivariate calibration methods were tested on the frequency of different intensities of backscattering each for the five wavelength bands to analyze SSC and firmness. The method was applied on two cultivars picked at weekly intervals during fruit development grown in sites with different plant water availability. During fruit development the mean values of SSC data of drought stressed and sufficiently irrigated regions of orchard ranged from 11.1 to 15.4 and 10.5 to 14.5 [degree sign]Brix, respectively. The mean values of fruit firmness at the two different field regions developed from 130.9 to 71.6 and 116.1 to 68.3 N/cm2, respectively.
Using partial least squares regression, calibration uncertainty in cross-validation ranged between 6 and 2% for SSC and firmness, while a validation on a test-set gave a percentage error of prediction in the range of 10% for SSC and 9% for firmness with respect to refractometrical SSC readings and the Magness-Taylor firmness test, respectively. Variation in fruit parameters due to slight drought stress was found in the range of 12-13%. A calibration on the specific fruit material is necessary for assessing the spatial distribution of fruit quality parameters in the orchard, however, laser-induced backscattering imaging is an inexpensive method for rapidly receiving relevant information for site-specific measures.
Keywords: Apple; Firmness; Fruit development; Imaging; Laser; Non-destructive; Scattering; SSC

Jan Kuckenberg, Iryna Tartachnyk, Georg Noga, Evaluation of fluorescence and remission techniques for monitoring changes in peel chlorophyll and internal fruit characteristics in sunlit and shaded sides of apple fruit during shelf-life, Postharvest Biology and Technology, Volume 48, Issue 2, May 2008, Pages 231-241, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.10.013.
(http://www.sciencedirect.com/science/article/B6TBJ-4RFD69B-1/2/781352d75ef59eefbd01f5f39d75b5e7)
Abstract:
The objective of the present study was to assess the potential of laser-induced fluorescence (LIF) and light remission techniques for detection of senescence-induced changes in apple peel chlorophyll content and internal fruit quality characteristics under shelf-life conditions. Results obtained with `Jonagold' and `Golden Delicious' fruit indicate that fruit ground colour alterations due to chlorophyll breakdown can be successfully monitored by LIF and light remission techniques. Normalized difference vegetation index (NDVI) and LIF at 730 nm (F730) showed strongest correlations with chlorophyll content in the apple peel with r in the range of 0.87-0.93. The intensity of red pigmentation of apples could be estimated by a light remission normalized anthocyanin index (NAI). Since the occurrence of anthocyanin pigmentation was accompanied by increased concentration of underlying chlorophyll, red patches of `Jonagold' fruit displayed higher NDVI, F690 or F730 and lower F690/F730 values than those which were apparently green. The multipoint scanning mode of LIF provides information on fruit colour heterogeneity. Among internal fruit quality parameters, the strongest correlation with the apple peel chlorophyll content was found for fruit firmness. For green `Golden Delicious' fruit, there were no differences in the Pearson's coefficients calculated for the data from sunlit (r = 0.78), shaded (r = 0.77) or both sides (r = 0.77). For `Jonagold' fruit, in contrast, r calculated for the data from both fruit sides was lower (r = 0.65) compared to those from sunlit (r = 0.74) or shaded (r = 0.76) sides, due to the different chlorophyll content and same firmness values on the sunlit and shaded sides of fruit of this cultivar. The correlation coefficients between the non-destructively evaluated indices of apple peel chlorophyll content and the Streif fruit maturity index could be significantly improved in both cultivars by considering differences in pigment contents and flesh characteristics on the sunlit and shaded

apple sides. Thus, the methods are ideal for sensitive and rapid monitoring of senescence-induced changes in peel chlorophyll and may enhance the accuracy of non-invasive external and internal fruit quality evaluation.
Keywords: Malus x domestica; Senescence; Anthocyanin; Peel; Lenticels; Post-harvest

R. Gregori, M. Mari, P. Bertolini, J.A. Sanudo Barajas, J.B. Tian, J.M. Labavitch, Reduction of Colletotrichum acutatum infection by a polygalacturonase inhibitor protein extracted from apple, Postharvest Biology and Technology, Volume 48, Issue 2, May 2008, Pages 309-313, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.10.006.
(http://www.sciencedirect.com/science/article/B6TBJ-4RFKKHV-1/2/84f74dac49aa2f5778351bc0c81253a6)
Abstract:
Colletotrichum acutatum, a fungal pathogen that causes soft rot in fruit, produced polygalacturonases (PGs) when grown on pectin or apple wall polysaccharides, as revealed by a clear zone around the well filled with C. acutatum medium in a radial diffusion assay. A PG-inhibiting protein (PGIP) was also extracted from healthy stored `Cripps Pink' apple and its activity was tested in vitro and in vivo against an endo-PG (EC 3.2.1.15) of C. acutatum. In in vitro trials the inhibition determined by radial diffusion assay was over 62% after 24 h while in inoculated fruit the inhibition ranged from 33.9% to 54.4% after 4 days at 20 [degree sign]C. The PG inhibitor extracted from healthy skin apple was a heat-denaturable protein since the halo produced by protein extracted from C. acutatum and added to boiled protein extracted from healthy skin apple tissue was 246 mm2, significantly higher than the halo produced by protein extracted from C. acutatum diluted with fresh protein extracted from healthy tissue (93.6 mm2). More investigations are required to better understand the nature of the substance responsible for C. acutatum inhibition in apple and to evaluate the possibility of manipulating the PGIP levels in fruit to reduce soft rot caused by C. acutatum.
Keywords: Cripps Pink; Soft rot; Quiescent infection; Radial diffusion assay; Heat-denaturable protein

E. Lotze, J. Joubert, K.I. Theron, Evaluating pre-harvest foliar calcium applications to increase fruit calcium and reduce bitter pit in `Golden Delicious' apples, Scientia Horticulturae, Volume 116, Issue 3, 1 May 2008, Pages 299-304, ISSN 0304-4238, DOI: 10.1016/j.scienta.2008.01.006.
(http://www.sciencedirect.com/science/article/B6TC3-4S02DDG-1/2/e7ba3506066c3472643066fc6dbb91b3)
Abstract:
In all major apple producing countries, applications of foliar calcium (Ca) products to increase fruit Ca content and reduce the incidence of bitter pit in apples are used. Calcium nitrate (Ca(NO3)2), Calcimax and Ca acetate were applied, commencing at three different developmental stages (early, mid and late) of fruit growth. Late Ca(NO3)2 (80 days after full bloom (dafb)) applications increased the Ca content of fruit at harvest more than early (six dafb) and mid (40 dafb) applications. There was a trend towards an increase in bitter pit from early to late applications of Ca(NO3)2 and Calcimax, confirming previous results obtained when applying only Ca(NO3)2. In spite of the very low incidences of bitter pit during these seasons (less than 7%), significant differences between treatments were found between Ca(NO3)2 Mid and other treatments in 2004/2005, as well as Ca(NO3)2 and Calcimax Early and other treatments in 2005/2006. Ca acetate applications did not show any trends in fruit Ca content or bitter pit incidence when applied during the three stages. Thus, products may differ in efficiency of Ca absorption and effectiveness in decreasing bitter pit in fruit when applied during different developmental stages.
Keywords: Commercial application; Developmental stages; Mineral fruit analysis

Jan Oszmianski, Michal Wolniak, Aneta Wojdylo, Iwona Wawer, Influence of apple puree preparation and storage on polyphenol contents and antioxidant activity, Food Chemistry, Volume 107, Issue 4, 15 April 2008, Pages 1473-1484, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.10.003.
(http://www.sciencedirect.com/science/article/B6T6R-4PTW51B-3/2/33caf2e17a7cc1338f3bf9afbcdfea6a)
Abstract:
The polyphenolic components of Idared and Shampion apple purees were determined by HPLC; chlorogenic acid was the most abundant acid (20.0 mg/100 g in microwaved Idared); other polyphenols identified in high concentrations included (-)-epicatechin, procyanidin B1 and B2; quercetin and cyanidin glycosides were found in minor concentrations. The Shampion purees had higher total phenolics (142 mg/100 g) and procyanidin B2 concentrations (17.3 mg/100 g) than the Idared ones, and polymeric procyanidins represented 41% of all polyphenols. Antioxidant capacities of the samples, determined by spectrophotometric methods and EPR spectroscopy, correlated well with the concentration of polyphenols. The antioxidant properties could be better represented by EPR than by UV-vis measurements. The latter require transparent (clear) samples whereas EPR can be a method of choice in the assessment of radical-scavenging activity of dense and cloudy apple purees. Our results support the putative high antioxidant value of apple purees and define their capacity in terms of the major constituents. Apple purees are a rich source of natural antioxidants, especially of chlorogenic acid and procyanidins.
Keywords: Malus domestica; Procyanidins; Ascorbic acid; Colour; Microwave; Processing; EPR; Antioxidant activity

M. Mariscal, P. Bouchon, Comparison between atmospheric and vacuum frying of apple slices, Food Chemistry, Volume 107, Issue 4, 15 April 2008, Pages 1561-1569, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.09.031.
(http://www.sciencedirect.com/science/article/B6T6R-4PPF6FG-3/2/91f3e718b6038deaef51ebcaad11fb56)
Abstract:
Vacuum deep-fat frying is a new technology that can be used to improve quality attributes of fried food because of the low temperatures employed and minimal exposure to oxygen. In this paper atmospheric and vacuum frying of apple slices were compared, in terms of oil uptake, moisture loss and color development. In addition, some apple slices were pre-dried (up to 64% w.b.) before vacuum frying to determine the overall effect. To carry out appropriate comparisons between both technologies equivalent thermal driving forces were used in both processes ([Delta]T = 40, 50, 60 [degree sign]C), keeping a constant difference between the oil temperature and the boiling point of water at the working pressure. Vacuum frying was shown to be a promising technique that can be used to reduce oil content in fried apple slices while preserving the color of the product. Particularly, drying prior to vacuum frying was shown to give the best results. For instance, when using a driving force of [Delta]T = 60 [degree sign]C, pre-dried vacuum fried slices absorbed less than 50% of the oil absorbed by atmospheric fried ones. Interestingly, a strong relationship between water loss and oil content was observed in both technologies, allowing the extension of observations that have been made for atmospheric frying.
Keywords: Vacuum frying; Oil uptake; Apple; Deep-fat frying

Satoshi Kasai, Hiroko Hayama, Yoshiki Kashimura, Satoshi Kudo, Yoshiaki Osanai, Relationship between fruit cracking and expression of the expansin gene MdEXPA3 in `Fuji' apples (Malus domestica Borkh.), Scientia Horticulturae, Volume 116, Issue 2, 4 April 2008, Pages 194-198, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.12.002.
(http://www.sciencedirect.com/science/article/B6TC3-4RR86VK-2/2/ec97fa2307ac0495c3d55ea5bcf628f8)

Abstract:
In `Fuji' apples, fruit cracking causes great economic loss. To understand its mechanisms, we analyzed the relationship between fruit cracking and the expression of an apple expansin gene (MdEXPA3) in pericarp and mesocarp during fruit growth. Fruit cracking is divided into two types; internal ring cracking (IRC) and stem-end splitting (SES). The former is an early symptom sometimes followed by the lattar. In this study, IRC mostly was observed during the phase of rapid fruit growth. MdEXPA3 transcripts appeared in the mesocarp at 30 days after full bloom (DAFB), reached a maximum at 95 DAFB and then decreased, thus paralleling the fruit growth rate. In contrast, the transcript level in the pericarp was below the detection limit until 50 DAFB, then increased until 109 DAFB to remain high until the end of observation. As IRC began to occur just before the increase of MdEXPA3 transcript levels in the pericarp, the differential expression in pericarp and mesocarp may be related to the initiation of IRC. Bagging reduced the incidence rate of both IRC and SES to one eighth without affecting fruit enlargement, and induced MdEXPA3 expression at earlier stage in the pericarp but not in mesocarp. These results suggested that induced accumulation of MdEXPA3 mRNA in pericarp reduced the susceptibility of fruit cracking. Thus, early symptoms of fruit cracking coincide with situations in which MdEXPA3 expression in the mesocarp exceeds that in the pericarp. In such situations, pericarp cells may be unable to follow the expansion of mesocarp cells due to insufficient levels of growth promoting expansins. If so, IRC appears as a consequence of the imbalance of expansin-dependent tissue growth rates.
Keywords: `Fuji' apples (Malus domestica Borkh.); Fruit cracking; Fruit growth; Pericarp; Expansin gene expression

Michael M. Blanke, Alternatives to reflective mulch cloth (Extenday(TM)) for apple under hail net?, Scientia Horticulturae, Volume 116, Issue 2, 4 April 2008, Pages 223-226, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.12.004.
(http://www.sciencedirect.com/science/article/B6TC3-4RPD491-2/2/6f175685ef248875c681ff34ed046bd7)
Abstract:
Fruit grown under hail net often suffer from lesser quality, lack of red colouration, insufficient fruit firmness viz storability and less sugar viz taste. Reflective white woven mulch cloth Extenday(TM) can overcome these shortcomings by improving light utilisation in the orchard, if spread 5-6 weeks prior to anticipated harvest on the grass of the alleys between the tree rows. The objective of the present work was to examine alternatives such as sustainable, organic materials including straw, lime and biodegradable white paint using 7-year-old cv. `Jonagold' apple trees under a white hail net in Klein-Altendorf Research Centre near Bonn, Germany in August 2005. Uncovered grass strips served as control with a constant 6.6% light (PAR) reflection at 1.5 m height. When freshly applied, white paint initially reflected up to 8%, while fresh wheat straw reflected 13.6% light (PAR) commensurate to the reflective cloth Extenday(TM) with 13.9%, equivalent to a 2.1-fold increase in light reflection relative to the uncovered grassed control. No differences in ripening and starch breakdown were observed in the apple fruits, but reflective mulch improved their sugar content, and hence taste, by ca. 8% from 13.5% sugar in the control (uncovered grass alleys) to 14.6% sugar, without affecting the fruit size. The reflective mulch increased the percentage of class I fruit with >25% colouration by 8.3% (from 47.6 to 55.9%) under hail net in the grading relative to the control (grass alleys), resulting in financial gross or net gains of [euro]870 or 530 ha-1. The apparent discrepancy between the large initial light reflection of the straw, and paint to a lesser extent, but poor fruit quality 6-7 weeks later at harvest may be explained by the grass, which eventually penetrated the straw over time and white paint being washed off by precipitation in the autumn, whereas the grass maintained its optical properties, indicating no organic alternative to the reflective white, woven cloth.

Keywords: Apple (Malus domestica Borkh.); Acidity; Anthocyanin; Fruit colouration; Fruit quality; Hail net; Light reflection; Mulch; Organic; PAL; PAR; Phytochrome; Sugar; Sustainability; Taste; UV-B; Climate change

Keiichiro Matsukura, Hisaaki Tsumuki, Yohei Izumi, Takashi Wada, Changes in chemical components in the freshwater apple snail, Pomacea canaliculata (Gastropoda: Ampullariidae), in relation to the development of its cold hardiness, Cryobiology, Volume 56, Issue 2, April 2008, Pages 131-137, ISSN 0011-2240, DOI: 10.1016/j.cryobiol.2007.12.001.
(http://www.sciencedirect.com/science/article/B6WD5-4R9JTXR-1/2/0c18d8b7bb41f9a4a9965915bafab6cb)
Abstract:
The apple snail, Pomacea canaliculata, is an invasive freshwater snail. It increases its cold hardiness before winter. However, the physiological mechanism of cold hardiness in molluscs is poorly understood, especially in freshwater molluscs. In this study, we examined the changes in low molecular weight compounds, glycogen and lipids, in the body of P. canaliculata in association with the development of cold hardiness. When snails without cold hardiness were experimentally cold-acclimated, the amount of glycerol, glutamine, and carnosine increased, while glycogen and phenylalanine decreased. Overwintering cold-tolerant snails collected from a drained paddy field in November also showed increased glycerol in their bodies with decreasing glycogen concentration, compared to summer snails collected from a submerged field. Water content also decreased during the cold acclimation, although the water loss was minimal. These results indicate that the freshwater snail, P. canaliculata enhances cold hardiness by accumulation of some kinds of low molecular weight compounds in its body as some insects do. However, the actual function of each low molecular compound is still unknown.
Keywords: Pomacea canaliculata; Snail; Cold hardiness; Acclimation; Glycerol; Glucose; Glycogen; Amino acid

H.P. Vasantha Rupasinghe, Laixin Wang, Gwendolyn M. Huber, Nancy L. Pitts, Effect of baking on dietary fibre and phenolics of muffins incorporated with apple skin powder, Food Chemistry, Volume 107, Issue 3, 1 April 2008, Pages 1217-1224, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.09.057.
(http://www.sciencedirect.com/science/article/B6T6R-4PSK918-6/2/b2ede6ea0c9b30fe12f5ff70028f534a)
Abstract:
Apple fruit skin, a rich source of dietary fibre and phenolics, is a by-product of apple processing. The effect of baking on the dietary fibre, phenolics, and total antioxidant capacity was investigated using a model system of muffins incorporated with dried apple skin powder (ASP) as a value-added food ingredient. The blanched, dehydrated, and ground ASP contained approximately 41% total dietary fibre and oxygen radical absorption capacity (ORAC) of 52 mg Trolox equivalents g-1 dry weight. The total dietary fibre content, total phenolic content, and total antioxidant capacity of muffins were positively correlated to the amount of ASP incorporated into muffins. The mean percent recovery of quercetin glycosides, catechins, chlorogenic acid, phloridzin, and cyanidin galactoside after baking were 61%, 57%, 53%, 44%, and 20%.
Keywords: Malus domestica; Apple skin; Food ingredient; Dietary fibre; Polyphenolics; Antioxidant; Baking

David R. Katerere, Sonja Stockenstrom, Gordon S. Shephard, HPLC-DAD method for the determination of patulin in dried apple rings, Food Control, Volume 19, Issue 4, April 2008, Pages 389-392, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.04.015.
(http://www.sciencedirect.com/science/article/B6T6S-4NMWPYV-2/2/2e2db42c9ee42f5934583f108c201699)

Abstract:
Patulin is an important mycotoxin in apples and apple products and it is also a marker of quality in the apple and apple juice industry. Numerous methods are described in the literature regarding its extraction and analysis from clear and cloudy apple juice as well as liquidized solid apples. However there is a dearth of information concerning patulin analysis in dry solid apple products e.g. apple rings which cannot be liquidized. We developed a method to solve this problem and validated it for precision, accuracy and linearity at 10, 30 and 50 ppb. The method is based on solid phase extraction and isocratic separation on HPLC-DAD. Depectinization was found to reduce patulin recoveries and was therefore avoided. Eight industrial samples were analysed and all of them were well within the recommended range of 25 ppb patulin concentration in solid apple products and compotes.
Keywords: Patulin; Mycotoxin; SPE; Solid dried apple; HPLC; Depectinization

Maria Helena Iha, Myrna Sabino, Incidence of patulin in Brazilian apple-based drinks, Food Control, Volume 19, Issue 4, April 2008, Pages 417-422, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.05.001.
(http://www.sciencedirect.com/science/article/B6T6S-4NS2GF8-2/2/ac18556b9a5e37ec2195a2ec0a319184)
Abstract:
The objective of this study was to investigate the occurrence of patulin in apple-based drinks commercialized in cities of the State of Sao Paulo, Brazil. Sixty-three nectars, 27 apple juices, 10 light nectars and 34 soybean-based drinks containing apple juice were analyzed. Patulin in concentrations ranging from 3 to 7 [mu]g/L was detected in only four samples (3%). The results of this study showed that patulin does not seem to be a problem in apple-based drink commercialized in the State of Sao Paulo. Although incidence and levels of patulin found were low, constant surveillance is recommended, since the occurrence of the toxin in apple products is dependent on many factors.
Keywords: Patulin; Apple juice; Incidence

Alina Wilinska, Ana Sofia de Figueiredo Rodrigues, Jolanta Bryjak, Milan Polakovic, Thermal inactivation of exogenous pectin methylesterase in apple and cloudberry juices, Journal of Food Engineering, Volume 85, Issue 3, April 2008, Pages 459-465, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.08.009.
(http://www.sciencedirect.com/science/article/B6T8J-4PFDDGP-3/2/7391c80cf23ee2505637cdc1bb8df876)
Abstract:
The stability and inactivation kinetics of exogenous Aspergillus niger pectin methylesterase in fruit juices was studied in the temperature interval of 52-66 [degree sign]C. The temperature treatment was applied to two kinds of non-pasteurized apple juices, two cloudberry juices and 0.1 M acetate buffer for the assessment of the influence of juice components on the enzyme stability. The enzyme was very thermally labile in the studied temperature range with the z-value around 7 [degree sign]C. The composition of juices caused a considerable difference in the enzyme susceptibility to thermal inactivation. The enzyme inactivation however followed first-order kinetics with approximately the same value of the activation energy of 300 kJ/mol for each material.
Keywords: Pectin methylesterase; Apple juice; Cloudberry juice; Thermal inactivation; Multi-temperature evaluation

Luis F. Goulao, Daniel J. Cosgrove, Cristina M. Oliveira, Cloning, characterisation and expression analyses of cDNA clones encoding cell wall-modifying enzymes isolated from ripe apples, Postharvest Biology and Technology, Volume 48, Issue 1, April 2008, Pages 37-51, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.09.022.

(http://www.sciencedirect.com/science/article/B6TBJ-4R7F438-1/2/f11ea1b481f949c10b00a6ddfdc07fba)
Abstract:
Fruit softening is accompanied by modifications of the cell wall pectic and hemicellulosic fractions, as the result of the combined action of several cell wall-modifying enzymes. The objective of this work was to clone specific cDNAs that encode isoforms of cell wall-modifying enzymes, which are expressed during the final stages of apple softening, and to establish a temporal sequence of their accumulation. A cDNA library enriched with mRNA isolated from over-ripe fruit was constructed and screened. A pectin methylesterase (MdPME1), a pectate lyase (MdPL1), an [alpha]-l-arabinofuranosidase (MdAF1) an endo-1,4-[beta]-glucanase (MdEG1), two xyloglucan endotransglucosylase/hydrolases (Md-XTH1 and Md-XTH2), and an alpha-expansin (MdEXPA3) specific cDNAs were identified by homology-based cloning, and their mRNA accumulation was examined during fruit growth and ripening. The expression of an apple [beta]-galactosidase ([beta]-Gal; pABG1) and a polygalacturonase (PG; pGDPG-1) mRNA previously reported was also investigated using the same biological material. Transcripts of all enzymes, except MdPME1, could be unambiguously detected by semi-quantitative RT-PCR in fruit during ripening. However, transcripts of MdEG1 were more abundant at fruit set and MdPL1 exhibited higher expression before commercial maturity. The strongest RT-PCR signals in over-ripe fruit were observed for PG, [beta]-Gal and Md-XTH1 clones. Two XTHs were detected in over-ripe fruit. While Md-XTH1 acts constitutively during fruit development, Md-XTH2 showed a ripening-related pattern. The Md-XTH2-encoded protein was heterologously expressed in Saccharomyces cerevisiae and showed both transglycosylase and hydrolase activities. Expression analyses conducted in flowers, peduncles, young and expanded leaves, and petioles of senescent leaves revealed that none of the cloned cDNAs is fruit specific.
Keywords: Apple; Cell wall; Fruit ripening; Gene expression; Malus x domestica; Postharvest

Yankun Peng, Renfu Lu, Analysis of spatially resolved hyperspectral scattering images for assessing apple fruit firmness and soluble solids content, Postharvest Biology and Technology, Volume 48, Issue 1, April 2008, Pages 52-62, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.09.019.
(http://www.sciencedirect.com/science/article/B6TBJ-4R2Y48B-1/2/5d76543a2809c7cefc796d971a285a17)
Abstract:
Hyperspectral scattering is a promising technique for nondestructive sensing of multiple quality attributes of apple fruit. This research evaluated and compared different mathematical models for describing the hyperspectral scattering profiles over the spectral region between 450 nm and 1000 nm in order to select an optimal model for predicting fruit firmness and soluble solids content (SSC) of `Golden Delicious' apples. Ten modified Lorentzian distribution functions of various forms were proposed to fit the spectral scattering profiles at individual wavelengths, each of which gave superior fitting to the data with the average correlation coefficient (r) being greater than 0.995. Mathematical equations were derived to correct the spectral scattering intensity and distance by taking into account the instrument response and individual apples' size. The 10 modified Lorentzian distribution functions were compared for predicting fruit firmness and SSC using multi-linear regression and cross-validation methods. The modified Lorentzian function with three parameters (representing scattering peak value, width and slope) gave good predictions of fruit firmness with r = 0.894 and the standard error of prediction (S.E.P.) of 6.14 N, and of SSC with r = 0.883 and S.E.P. = 0.73%. Twenty-one and 23 wavelengths were needed to obtain the best predictions of fruit firmness and SSC, respectively. This new function, coupled with the scattering profile correction methods, improved the hyperspectral scattering technique for measuring fruit quality.

Keywords: Fruit; Apples; Firmness; Soluble solids content; Near-infrared; Scattering; Hyperspectral imaging; Modified Lorentzian function

Fanjaniaina Fawbush, Jacqueline F. Nock, Christopher B. Watkins, External carbon dioxide injury and 1-methylcyclopropene (1-MCP) in the `Empire' apple, Postharvest Biology and Technology, Volume 48, Issue 1, April 2008, Pages 92-98, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.09.005.
(http://www.sciencedirect.com/science/article/B6TBJ-4R2GRX4-3/2/ff60945944bd8fa05a84c9d7ca55ee80)
Abstract:
The effects of several factors on the susceptibility of untreated and 1-MCP-treated `Empire' apple (Malus sylvestris (L.) Mill var. domestica (Borkh.) Mansf.) fruit to external CO2 injury have been investigated. These factors include CO2 partial pressure, the timing of elevated CO2 exposure, delays between harvest and exposure to elevated CO2, DPA concentration, and the timing of DPA treatment after exposure of fruit to 1-MCP. 1-MCP-treated fruit were more susceptible to external CO2 injury than untreated fruit when stored in 5 kPa, but not 1 kPa, CO2 (in 2 kPa O2). 1-MCP did not increase the period of highest susceptibility to injury during controlled atmosphere storage. The greatest sensitivity to injury occurred 0-3 weeks after harvest. Sensitivity to injury decreased when untreated fruit were kept in air for up to 14 days before exposure to 5 kPa CO2, but not for 1-MCP-treated fruit. DPA treatment prevented development of CO2 injury even at a level as low as 250 [mu]L L-1. DPA treatment could be delayed for 4 days after 1-MCP treatment while fruit were exposed to 5 kPa CO2 in air without injury development. Overall the data indicate that 1-MCP enhances the risk of external CO2 injury, but this injury can be prevented by treatment of fruit with DPA at harvest. In the absence of DPA treatment, handling procedures such as maintaining low CO2 partial pressures in the storage atmosphere must be used.
Keywords: Apple; Storage; Ethylene; Carbon dioxide injury; Malus x domestica

Shu-fei Lin, Christopher S. Walsh, Studies of the 'tree factor' and its role in the maturation and ripening of `Gala' and `Fuji' apples, Postharvest Biology and Technology, Volume 48, Issue 1, April 2008, Pages 99-106, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.09.009.
(http://www.sciencedirect.com/science/article/B6TBJ-4R05BN7-2/2/4dbbabc3b3ec4d8532c948a79499a573)
Abstract:
The difference in ethylene production between attached and detached apple (Malus domestica Borkh) fruit is hypothesized to be modulated by a putative inhibitor termed the 'tree factor'. This inhibitor is thought to affect System 2 ethylene production. Preharvest treatments, including girdling plus defoliation and detachment, were applied to `Gala' and `Fuji' trees and fruit during fruit maturation. Internal ethylene concentration (IEC) and other commercially-used maturity indices were used to follow the effects of these treatments over 3 years. Two distinct patterns of maturation and ripening behavior were observed. `Gala' apples demonstrated the expected 'tree factor'. Attached fruit produced less ethylene than detached fruit or fruit harvested from girdled and defoliated limbs. `Fuji' ripening was confounded by cold weather in one season. `Fuji' also did not display the expected 'tree factor' in this study. Starch degradation was enhanced in both cultivars by detachment or by girdling and defoliation. The effect of the treatment on fruit softening was cultivar-dependent. `Gala' fruit softened rapidly during maturation regardless of treatment but the softening of detached, and girdled plus defoliated `Fuji' fruit was delayed. The IEC of harvested `Gala' apples was higher than that of attached apples, perhaps a result of stress responses associated with detachment. The strength of the 'tree factor' was found to decline as fruit maturity progressed and tended to be more obvious in `Gala' that has a shorter growing season and matures during hot weather.

Keywords: Apple fruit; Malus domestica; Tree factor; Fruit maturation and ripening; Internal ethylene concentration; Stress-induced ripening

A. Mikani, H.R. Etebarian, P.L. Sholberg, D.T. O'Gorman, S. Stokes, A. Alizadeh, Biological control of apple gray mold caused by Botrytis mali with Pseudomonas fluorescens strains, Postharvest Biology and Technology, Volume 48, Issue 1, April 2008, Pages 107-112, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.09.020.
(http://www.sciencedirect.com/science/article/B6TBJ-4R2GRX4-5/2/05e3fae6eb7ebd417792fc24b678d57f)
Abstract:
Two hundred and ten Pseudomonas spp. strains were obtained from leaf surfaces and apple fruit using serial dilution methods on semi-selective King B medium. These strains were screened in vitro against Botrytis mali, a casual agent of gray mold of apple. B. mali was originally described in the state of Washington and has been recently revived in British Columbia, Canada. When compared to Botrytis cinerea it differs by producing smaller sclerotia and has a different DNA sequence on the [beta]-tubulin gene. Ten promising Pseudomonas fluorescens strains from the 210 Pseudomonads were selected and evaluated as potential biocontrol agents for control of gray mold on apple in vitro and in vivo. Dual culture, cell free metabolite and volatile tests showed that all 10 strains of P. fluorescens inhibited growth of B. mali. Inhibition varied from 49% to 68% in the dual culture tests; 75-99% in the cell free metabolite tests; and 52-97% in the volatile tests. Apple fruit wounds were inoculated with 20 [mu]L of a bacterial suspension (1011 CFU L-1) of P. fluorescens followed 48 h later by B. mali (108 conidia L-1). The apples were then incubated at 20 [degree sign]C for 20 d or at 5 [degree sign]C for 25 d. All 10 fluorescent Pseudomonads appeared to be good antagonists of gray mold on apple at 20 and 5 [degree sign]C. P. fluorescens strain Pf1 appeared to be the best biocontrol agent preventing B. mali from expanding to no more than 0.6 cm2 compared to 14.5 cm2 for the control at 5 [degree sign]C.
Keywords: Botrytis cinerea; B. mali; Malus domestica; Postharvest disease

Rosalia Trias, Lluis Baneras, Esther Badosa, Emilio Montesinos, Bioprotection of Golden Delicious apples and Iceberg lettuce against foodborne bacterial pathogens by lactic acid bacteria, International Journal of Food Microbiology, Volume 123, Issues 1-2, 31 March 2008, Pages 50-60, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.11.065.
(http://www.sciencedirect.com/science/article/B6T7K-4R8NB5F-5/2/c07429abaafe23bd3771b5937a85e3f9)
Abstract:
Lactic acid bacteria were isolated from fresh vegetables and fruit and its ability to inhibit the growth of foodborne human pathogens (Escherichia coli, Listeria monocytogenes, Pseudomonas aeruginosa, Salmonella typhimurium, and Staphylococcus aureus) was tested using the agar spot assay. Eighteen isolates showed a strong antagonistic capacity and were further characterised and identified using 16S rDNA sequencing and API 50CH. Most of them pertained to Leuconostoc spp. and Lactobacillus plantarum, and a few corresponded to Weissella spp. and Lactococcus lactis. Growth and efficacy of control of foodborne pathogen test bacteria by selected strains were tested in wounded Golden Delicious apples and Iceberg lettuce leaf cuts. The strains grew on the substrates and did not cause negative effects on the general aspect of tissues of apple or lettuce. Treatment of apple wounds and lettuce cuts with the antagonistic strains reduced the cell count of S. typhimurium and E .coli by 1 to 2 log cfu/wound or g, whereas the growth of L. monocytogenes was completely inhibited. Results support the potential use of lactic acid bacteria as bioprotective agents against foodborne human pathogens in ready-to-eat fresh fruit and vegetable products.
Keywords: Lactic acid bacteria; Antagonistic activity; Foodborne pathogens; Ready-to-eat vegetables; Fresh fruit

Zhong-Tian Xue, Anna Holefors, Margareta Welander, Intron splicing in 5' untranslated region of the rolA transcript in transgenic apple, Journal of Plant Physiology, Volume 165, Issue 5, 31 March 2008, Pages 544-552, ISSN 0176-1617, DOI: 10.1016/j.jplph.2006.11.010.
(http://www.sciencedirect.com/science/article/B7GJ7-4NNYFVP-1/2/3ccbcdf49b29a495b7eb3421577a916d)
Abstract: Summary
The rolA gene encoded on the Ri plasmid of Agrobacterium rhizogenes causes developmental alterations, including dwarfing characteristics in the transgenic plants. In an attempt to introduce dwarfing characteristics into apple rootstocks for breeding purposes, the rolA gene was incorporated into the apple rootstock M26 and obtained four transgenic clones. All the clones exhibited reduced growth compared to untransformed control plants but different degree of dwarfing and wrinkled leaves. In the present study, expression of the rolA gene was further investigated by analysing the structure of the rolA transcript and the levels of the rolA mRNAs from these clones. The nucleotide (nt) sequence of the rolA transcript showed two forms of the transcript: one, the unspliced form, was co-linear with the rolA sequence in the genomic DNA; the other was spliced mRNA in which an 85-base pair (bp) intron sequence in the 5' untranslated region (5'UTR) was spliced out. The position of splicing is different from that in Arabidopsis thaliana but similar to the splicing site found in tobacco. The transcription start region of the rolA gene in apple was 206 bp upstream of that in Arabidopsis and 277 bp upstream to Nicotiana tabacum transcription start. A hairpin-like secondary structure and an upstream open reading frame (uORF) were revealed in the rolA 5'UTR. The levels of the rolA mRNA in the apple transgenic clones were analysed by semi-quantitative reverse transcription-polymerase chain reaction (RT-PCR). The results showed slight variation in the shoot tissues of the transgenic clones.
Keywords: Dwarfing phenotype; rolA transcript; Semi-quantitative RT-PCR; Transgenic apple; 5' untranslated region (5'UTR)

Hariklia Vaikousi, Konstantinos Koutsoumanis, Costas G. Biliaderis, Kinetic modelling of non-enzymatic browning of apple juice concentrates differing in water activity under isothermal and dynamic heating conditions, Food Chemistry, Volume 107, Issue 2, 15 March 2008, Pages 785-796, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.08.078.
(http://www.sciencedirect.com/science/article/B6T6R-4PKPH0T-4/2/0a6458eb0a368b2fcbc80d7c29054adf)
Abstract:
The kinetics of non-enzymatic browning in apple juice concentrates were investigated. The effect of aw (in the range of 0.74-0.99) and/or reactant concentration on brown pigment formation was monitored under isothermal heat treatment at four temperatures (60, 70, 80 and 90 [degree sign]C) in apple juice solutions having either the same or different concentrations of reactant solutes. The extent of the Maillard reaction was evaluated by spectrophotometric measurements at 420 nm (A420). The absorbance-time curves were fitted to five different kinetic models (zero and first order, weibull, logistic and the parabolic model) and estimates of browning rate constants and other model parameters were obtained. Regression analysis revealed that the logistic model was the most appropriate for describing browning in apple juice. The initial reactant concentration, but not water activity, had a significant effect on the colour change of apple juice. The processing temperature also had a strong impact on browning kinetics. Secondary models, expressing the dependence of the best fitted primary model parameters on temperature and aw, were further developed and validated by comparing the predicted model parameters with the values observed in independent isothermal experiments. Finally, the derived model was further evaluated against the observed browning responses of apple juice under dynamic heating conditions, underlining the applicability of the developed model as a practical prediction tool for the study of non-enzymatic browning.

Keywords: Apple juice; Kinetic modelling; Non-enzymatic browning; Effect of aw; Reactant concentration; Dynamic conditions

R.Q. Bai, T.K. Schlegel, J. Schonherr, P.W. Masinde, The effects of foliar applied CaCl2[middle dot]2H2O, Ca(OH)2 and K2CO3 combined with the surfactants Glucopon and Plantacare on gas exchange of 1 year old apple (Malus domestica BORKH.) and broad bean (Vicia faba L.) leaves, Scientia Horticulturae, Volume 116, Issue 1, 10 March 2008, Pages 52-57, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.10.026.
(http://www.sciencedirect.com/science/article/B6TC3-4RCW7DG-1/2/c28121916be4c34b00832e97ba3c97df)
Abstract:
Calcium chloride, calcium hydroxide, potassium carbonate and the alkylpolyglycoside surfactants Glucopon 215 CSUP and Plantacare 12 UP are salts applied to leaves as foliar nutrients and fungicides. These chemicals were sprayed on apple (Malus domestica BORKH.) and broad bean (Vicia faba L.) leaves. Stomatal conductance and rates of net photosynthesis were measured continuously in the light and in the dark using a Portable Photosynthesis System CIRAS-1. All compounds with the exception of Ca(OH)2 affected stomatal conductance and net photosynthesis, albeit to different degrees. In light, Plantacare either alone (0.2 g l-1) or in combination with CaCl2[middle dot]2H2O (5 g l-1) or K2CO3 (5 g l-1) caused a rapid initial increase in stomatal conductance during the first 1-3 h after spraying on the leaves, maximum conductances were observed about 6 h after application. A rather high stomatal conductance was observed during the dark period when Glucopon (0.2 g l-1) was applied either alone or in combination with Ca(OH)2. The combination CaCl2[middle dot]2H2O + Glucopon did not cause this elevated stomatal conductance during the dark. CaCl2[middle dot]2H2O reduced stomatal conductance in combination with both Glucopon and Plantacare. The surfactant Plantacare reduced net photosynthesis during the first light period (12 h), if applied alone or in combination with CaCl2[middle dot]2H2O. Treatment of broad bean leaves with K2CO3 + Plantacare resulted in a rapid decrease in net photosynthesis during the first hour, and then the rates of net photosynthesis increased rapidly and approached to those of the water control. The effects of surfactants and salts on net photosynthesis had nearly disappeared by the beginning of the second light period. Non-specific glycosidases presumably cleaved the glycosidic bond between the alkyl and the sugar moieties during the preceding night. Our data showed that foliar applications of CaCl2[middle dot]2H2O and K2CO3 together with alkyl polyglycoside surfactants can affect gas exchange. However, the effects of the chemicals at the concentrations used in our study were not very large and were transient. They practically vanished within 24 h and a detrimental effect on growth and development of crops was not likely.
Keywords: Foliar nutrients; Fungicides; Glucopon; Photosynthesis; Plantacare; Stomatal conductance; Surfactants; Transpiration

Pawel Wojcik, Marzena Wojcik, Krzysztof Klamkowski, Response of apple trees to boron fertilization under conditions of low soil boron availability, Scientia Horticulturae, Volume 116, Issue 1, 10 March 2008, Pages 58-64, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.10.032.
(http://www.sciencedirect.com/science/article/B6TC3-4RB5BRG-3/2/69ee8bedfbb5300df6b322319cb92c8c)
Abstract:
The aim of the study was to examine the effect of boron (B) fertilization on the vegetative and the reproductive responses of apple (Malus domestica Borkh.) trees grown at low soil B availability. The experiment was carried out in 2005 under a greenhouse on 5-year-old `Jonagold' apple trees/M.9 EMLA planted singly in 50-L containers filled with a sandy loam soil with hot water-soluble B concentration of 0.32 mg kg-1. The trees were fertilized with B as foliar or soil application. Foliar B sprays were applied at the stage of pink bud, beginning of flowering, petal fall,

and 10 days after flowering, at a solution concentration of 0.03%. Soil B fertilization was done at the bud break stage at a rate of 2 g per tree (27 mg B kg-1 soil). The trees untreated with B served as the control. The results showed that soil B fertilization improved root development and tree vigor. Leaves of trees supplied with B to the soil had higher B concentration and chlorophyll, net photosynthetic rate, stomatal conductance, and activity of catalase and glutathione reductase than those of the control plants. Boron fertilization, regardless of application mode, increased fruit yield; the efficiency of foliar B sprays was higher than soil B application. Apple fruits of trees fertilized with B to the soil were bigger, more colored, richer in B, and had higher soluble solids concentration, and titratable acidity compared to those of the control trees.
Keywords: Apple trees; Soil and foliar boron fertilization; Physiological and enzymatic responses

R.G. Roberts, A.J. Sawyer, An updated pest risk assessment for spread of Erwinia amylovora and fire blight via commercial apple fruit, Crop Protection, Volume 27, Issues 3-5, March-May 2008, Pages 362-368, ISSN 0261-2194, DOI: 10.1016/j.cropro.2007.06.007.
(http://www.sciencedirect.com/science/article/B6T5T-4PCH43H-2/2/8a2f6fb2eb464885753c875e8358845f)
Abstract:
The phytosanitary risk associated with the movement of export-quality apple fruit to countries where fire blight does not occur is reassessed based upon additional data available since 1998 and clarification or correction of previously misinterpreted data present in the literature. The low epiphytic fitness of Erwinia amylovora (Ea) on apple fruit, the documented low incidence of viable Ea populations on mature apple fruit and the lack of a documented pathway by which susceptible host material could become infected from fruit-borne inoculum remain unchanged, and support the view that movement of Ea via commercial apple fruit is highly unlikely. With this new information, we updated a previously published model to re-estimate the likelihood of fire blight outbreaks in new areas because of commercial fruit shipment. This likelihood decreased in every scenario, and ranged from one outbreak in 5217 years to one in 753,144 years. By using the corrected and newly published data and by making assumptions based upon documented pathogen biology, the model gives more robust statistical support to the opinion that the risk of importing Ea on commercial apple fruit and the concomitant risk of establishing new outbreaks of fire blight is so small as to be insignificant.
Keywords: Trade restriction; Quarantine; Phytosanitary; Long-range spread

Marcos Minarro, Enrique Dapena, Tolerance of some scab-resistant apple cultivars to the rosy apple aphid, Dysaphis plantaginea, Crop Protection, Volume 27, Issues 3-5, March-May 2008, Pages 391-395, ISSN 0261-2194, DOI: 10.1016/j.cropro.2007.07.003.
(http://www.sciencedirect.com/science/article/B6T5T-4PGXF00-1/2/5b3162634707bb7982ce799a9a799ff6)
Abstract:
Rosy apple aphid (RAA), Dysaphis plantaginea Passerini (Homoptera: Aphididae), is a major apple pest that is normally controlled by insecticide sprays. The use of tolerant cultivars to reduce damage of this aphid would contribute to a non-chemical crop protection. This study evaluated the susceptibility of nine scab-resistant apple cultivars (`Dayton', `Freedom', `Galarina', `GoldRush', `Jonafree', `Liberty', `Priscilla', `Redfree' and `Williams' Pride') to RAA. Greenhouse trials and field observations were conducted for 2 years. Significant differences were observed among cultivars in aphid abundance and damage level 21 days after an infestation in the greenhouse. `GoldRush' and `Galarina' did not show typical leaf-rolls induced by RAA and were considered tolerant to this aphid species. Some cultivars showed low susceptibility while the cultivars `Jonafree' and `Redfree' turned out to be highly susceptible. Aphid abundance and damage levels were positively correlated. Field surveys confirmed greenhouse results. Growing cultivars resistant to scab and

tolerant or only slightly susceptible to RAA would reduce pesticide use and increase opportunities for sustainable apple production.
Keywords: Goldrush; Galarina; Malus domestica; Scab resistance; Tolerance; Vf gene

Ravindra C. Joshi, Ricardo San Martin, Cesar Saez-Navarrete, John Alarcon, Javier Sainz, Mina M. Antolin, Antonio R. Martin, Leocadio S. Sebastian, Efficacy of quinoa (Chenopodium quinoa) saponins against golden apple snail (Pomacea canaliculata) in the Philippines under laboratory conditions, Crop Protection, Volume 27, Issues 3-5, March-May 2008, Pages 553-557, ISSN 0261-2194, DOI: 10.1016/j.cropro.2007.08.010.
(http://www.sciencedirect.com/science/article/B6T5T-4PPWM50-2/2/15f73ee9234d3409f4b98176948f5b7a)
Abstract:
A novel product for managing Pomacea canaliculata, golden apple snail (GAS), containing quinoa saponins (Chenopodium quinoa), was evaluated under laboratory conditions for the protection of newly sprouted rice seeds. Experimental methods mimicked conditions found in direct-seeded rice cultivation in the Philippines, but with a very high GAS density (90 snails/m2). Protection of newly sprouted seeds was directly proportional to saponin concentration in rice water. At 9 and 11 ppm saponin, seedling protection after 48 h against GAS of different sizes was 93% and 95%, respectively. Seedling recovery after 5 d with 11 ppm saponin was 93%. This value declined to 0% and 4%, for the control (untreated) and niclosamide, a synthetic chemical molluscicide, respectively. The results indicated that although niclosamide provides high efficacy against GAS (100% mortality, 24 h), it has a serious detrimental effect on rice seedlings. Mean GAS mortality with 11 ppm saponin was low at 24 h (45%), but increased to 94% at 48 h. Thus, seedling protection was probably due to an almost immediate closure of the snail's opercula when exposed to saponin solutions, followed by significant death rates within 24 and 48 h. The product also exhibits ovicidal effects, particularly with 1-5 d old egg masses; older egg masses were less susceptible to the product. The use of 11 ppm saponin slightly affected shoot growth, but this effect disappeared with time and the plants attained normal development. Saponin application rates at 10 ppm saponin in the rice water correspond to ca. 6 kg product/ha under cultivation conditions used in the Philippines. These results suggest that quinoa saponins may represent a commercially feasible environmentally benign alternative to synthetic chemical molluscicides against GAS, particularly in direct-seeded rice culture.
Keywords: Golden apple snail; Pomacea canaliculata; Chenopodium quinoa; Saponin

Imre J. Holb, Timing of first and final sprays against apple scab combined with leaf removal and pruning in organic apple production, Crop Protection, Volume 27, Issues 3-5, March-May 2008, Pages 814-822, ISSN 0261-2194, DOI: 10.1016/j.cropro.2007.11.009.
(http://www.sciencedirect.com/science/article/B6T5T-4RSJ52F-5/2/b1bd6bc6f15b00d167a23ed0266441a7)
Abstract:
The aim of this two-crop season study was to evaluate scab development and scab control efficacy in integrated approaches of (i) three sanitation treatments (fallen leaf removal combined with winter pruning and non-sanitized control), (ii) three onsets of first fungicide sprays (dormant bud, early tight cluster and pink bud stage) and (iii) three final dates for finishing fungicide programmes (mid-July, mid-August and mid-September). The study was performed in a Hungarian commercial organic apple orchard on a scab-resistant cultivar Prima and a moderately scab-susceptible apple cultivar, Jonathan. Final scab incidence of cultivar Prima was low on both leaves (below 3%) and fruits (below 1%) at harvest in all treatments, and delaying the first spray and/or omitting final sprays did not significantly affect fruit scab development on this cultivar. Results on cultivar Prima indicated that sprays against scab could be omitted before pink bud stage and after mid-July if the cultivar is not susceptible to summer fruit diseases and fruit scab incidence remains

below 1% by harvest. On cultivar Jonathan, a delay in the onset of the first spray until pink bud stage resulted in higher scab incidences on both leaves (16.6-20.6%) and fruits (13.1-15.3%) compared with the non-delayed (dormant bud) spray treatments (5.2-8.3% and 6.7-9.4%, respectively). Final leaf and fruit scab incidence of cultivar Jonathan increased significantly when sprays were omitted after mid-July compared with spray treatments finished at mid-August or mid-September. Treatments of combining leaf removal with winter pruning resulted in lower scab incidence (5.2-11.8%) compared with treatments of non-sanitized plots (6.7-14.7%) when spray treatments were finished at mid-August or mid-September. Results on cultivar Jonathan suggested that sprays against scab could only be omitted before early tight cluster stage and after mid-August if removal of fallen leaves combined with pruning was applied and if the cultivar expressed <15% leaf scab incidence at harvest.
Keywords: Disease management; Malusxdomestica; Organic apple; Sanitation; Scab control; Venturia inaequalis

Zou Xiaobo, Zhao Jiewen, Comparative analyses of apple aroma by a tin-oxide gas sensor array device and GC/MS, Food Chemistry, Volume 107, Issue 1, 1 March 2008, Pages 120-128, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.07.071.
(http://www.sciencedirect.com/science/article/B6T6R-4PBDR4P-1/2/c522419fa50b844666135aeff884b38b)
Abstract:
The apple cultivars 'fuji', 'jina' and 'huaniu' aroma volatiles were collected and analyzed using a tin-oxide gas sensor array device and the gas chromatography combined with mass spectrometry (GC-MS). Twenty two of the most abundant volatile compounds were taken into account for further study. Eight compounds were found in every cultivar. The principal components analysis (PCA), partial least squares (PLS) and back-propagation feed-forward artificial neural network (BP-ANN) were used to analyze the sensor array and SPME-GC-MS measurements. From the plots of the first two PCs by PCA, different apple cultivars could be clearly distinguished by SPME-GC-MS measurements, while there was slight overlap by sensor array measurements. BP-ANN was used to distinguish different cultivars based on gas sensor array responses, and the accuracy was 87%. Due to the composition of gas sensors in the array, results of PLS models showed that the correlation between fourteen gas sensor array responses and the two PCs of twenty-two compounds were better than the correlation between those and each volatile compound. Furthermore, an ANN was used to build the relationship between the two predicted PCs by PLS model and the three cultivars. The recognition probability was increased to 97%.
Keywords: Apple; Aromas; Gas sensor array; GC-MS; Principal component analysis; BP-ANN; PLS

Jana Ticha, Jana Hajslova, Martin Jech, Jiri Honzicek, Ondrej Lacina, Jana Kohoutkova, Vladimir Kocourek, Miroslav Lansky, Jana Kloutvorova, Vladan Falta, Changes of pesticide residues in apples during cold storage, Food Control, Volume 19, Issue 3, March 2008, Pages 247-256, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2007.03.011.
(http://www.sciencedirect.com/science/article/B6T6S-4ND60KB-4/2/760f47b16e020630adc9358ef42ee403)
Abstract:
The dynamics of incurred pesticide residues in apples, variety Melrose, was monitored during their cold storage at 1-3 [degree sign]C for 5 months. Of 21 active ingredients contained in pesticide preparations applied within four experimental pre-harvest regimes, only six fungicides (captan, cyprodinyl, dodine, pyrimethanil, tebuconazole, tolyfluanid) and one insecticide (phosalone) were detected at the time of harvest. The other active ingredients - acetamiprid, chlorpyrifos-methyl, difenoconazole, diflubenzuron, dithianon, EBDCs (represented by mancozeb and thiram in this study), fenoxycarb, kresoxim-methyl, teflubenzuron, thiacloprid, triazamate, trifloxystrobin and

triflumuron did not exceed detection limit of LC-MS/MS or GC-MS methods used for sample analysis. Successive decrease of residues occurred during storage period, after 5 months only fungicide dodin and insecticide phosalone were detected.
Keywords: Apples; Storage; Field experiments; Pesticide residues; LC-MS/MS; GC-MS

Pilar Martinez-Viedma, Hikmate Abriouel, Nabil Ben Omar, Eva Valdivia, Rosario Lucas Lopez, Antonio Galvez, Inactivation of exopolysaccharide and 3-hydroxypropionaldehyde-producing lactic acid bacteria in apple juice and apple cider by enterocin AS-48, Food and Chemical Toxicology, Volume 46, Issue 3, March 2008, Pages 1143-1151, ISSN 0278-6915, DOI: 10.1016/j.fct.2007.11.010.
(http://www.sciencedirect.com/science/article/B6T6P-4R6B2RP-2/2/53c8f0767f97f68f647580bad81a5769)
Abstract:
The bacteriocin enterocin AS-48 was tested against exopolysaccharide producing lactic acid bacteria (LAB) strains of Lactobacillus collinoides, Lactobacillus dioliovorans and Pediococcus parvulus as well as two 3-hydroxypropionaldehyde (3-HPA)-producing Lb. collinoides strains causing apple cider spoilage. In fresh-made apple juice, a bacteriocin concentration of 2.5 [mu]g/ml reduced the LAB viable cell counts below detection levels during the course of incubation at 10 and 22 [degree sign]C for most strains tested, except for Lb. collinoides 5 and Lb. dioliovorans 29. These two strains were significantly inhibited at 10 [degree sign]C by 5 [mu]g/ml AS-48 or completely inactivated at 22 [degree sign]C. In a commercial Basque apple cider, the added bacteriocin (2.5 [mu]g/ml for Lb. collinoides strains 9 and 10, and 5 [mu]g/ml for the rest of strains) completely inactivated all LAB strains tested during storage at 10 as well as 22 [degree sign]C. In the commercial Asturian apple cider tested the LAB strains showed a poor capacity for survival, but the added bacteriocin was equally effective in reducing the numbers of survivors. When a cocktail of the five LAB strains was tested in commercial Basque apple cider, viable cell counts were reduced below detection levels after 2 days for a bacteriocin concentration of 12.5 [mu]g/ml regardless of storage temperature. Comparison of RAPD-PCR profiles revealed that strain Lb. dioliovorans 29 was always the predominant survivor detected in bacteriocin-treated samples.
Keywords: Apple cider; Ropy spoilage; Acrolein; Bacteriocin; Lactobacillus; Pediococcus

David J. Geveke, Christopher Brunkhorst, Radio frequency electric fields inactivation of Escherichia coli in apple cider, Journal of Food Engineering, Volume 85, Issue 2, March 2008, Pages 215-221, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.06.029.
(http://www.sciencedirect.com/science/article/B6T8J-4PB6VP2-4/2/026c955bc60876ea6ed703e9b1feceb2)
Abstract:
A nonthermal process using radio frequency electric fields (RFEF) was developed to pasteurize apple cider. An 80 kW RFEF pilot plant system was used to process cider at flow rates of 1.5 and 1.9 l/min. Escherichia coli K12 in apple cider was exposed to electric field strengths of 20-30 kV/cm at frequencies of 21, 30, and 41 kHz. Treatment times varied from 140 to 420 [mu]s. Electrical energy costs were calculated using the measured voltages and currents. Energy balances were performed using the inlet and outlet temperatures. RFEF processing at an outlet temperature of 60 [degree sign]C reduced the population of E. coli by 4.8 log, whereas thermal processing at the same conditions had no effect. Varying the frequency between 21 and 41 kHz had no effect on the level of microbial inactivation; however, increasing the treatment time, field strength and outlet temperature enhanced inactivation. The inactivation data at 20 kV/cm and 60 [degree sign]C follow first order kinetics with a calculated D values of 74 [mu]s. The inactivation data are represented well by the electric field strength model; the calculated critical electric field strength, Ec, for 60 [degree sign]C was 4.0 kV/cm. The electrical energy for RFEF pasteurization

was 260 J/ml. The electrical cost was $0.0050/l of apple cider. Processing temperature had the greatest influence on energy efficiency. A RFEF nonthermal process has been developed to pasteurize apple cider. The effect of varying processing conditions on energy efficiency was investigated and at the optimum condition, the electrical cost appears to be minor. In addition, the RFEF process can be correlated using first order kinetic models.
Keywords: Radio frequency electric fields; Apple cider; Nonthermal pasteurization; Electrical costs; Kinetics

Nuria C. Acevedo, Vilbett Briones, Pilar Buera, Jose M. Aguilera, Microstructure affects the rate of chemical, physical and color changes during storage of dried apple discs, Journal of Food Engineering, Volume 85, Issue 2, March 2008, Pages 222-231, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.06.037.
(http://www.sciencedirect.com/science/article/B6T8J-4PCGRPF-3/2/cd6a92c40bf15e68e4921b1f9bc003a3)
Abstract:
Blanching, freezing and drying induce major changes in the physical properties of processed foods. Microstructural changes induced by these processes in apple discs were related to the degree and kinetics of browning and to fracture mechanics after drying and later storage at 70 [degree sign]C under a wide range of relative humidity (RH). Blanched and unblanched apple discs were dehydrated by vacuum drying or freeze-drying to induce the formation of different structures, then equilibrated from 33% to 75% RH and stored at 70 [degree sign]C in order to promote browning. Color changes on the surface of apple discs were analyzed non-invasively by image analysis using a computerized vision system. Pre-treatments and drying conditions modified the structural characteristics of apple discs, which in turn, changed sorption properties, texture hardness and browning development. Microstructural changes (e.g., loss of cellular integrity) promoted higher browning rates, the rate and degree of browning was analyzed.
Keywords: Apple; Microstructure; Browning; Kinetics; Hardness; Freeze-drying; Vacuum drying; Color

Yun Deng, Yanyun Zhao, Effects of pulsed-vacuum and ultrasound on the osmodehydration kinetics and microstructure of apples (Fuji), Journal of Food Engineering, Volume 85, Issue 1, March 2008, Pages 84-93, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.07.016.
(http://www.sciencedirect.com/science/article/B6T8J-4PB6VP2-6/2/f65d8fe4085c0e46754a07223fb6dca8)
Abstract:
The influence of pulsed-vacuum (PV) and ultrasound on the osmodehydration kinetics and microstructure of apples (Fuji) was investigated. Apple cylinders (15 mm height x 15 mm diameter) immersed in a 60% (w/w) high-fructose corn syrup solution were subjected to shaking (55 rpm), PV (13 MPa vacuum for 5 min + atmospheric pressure for 5 min + same vacuum for 5 min, then atmospheric pressure), or ultrasound treatment (50/60 Hz and 185 W) for 3 h. Changes in water loss, solid gain, and firmness of apples were measured, and the data were fitted using Weibull and Peleg models. In addition, microstructure was observed using scanning electronic microscopy (SEM). The high regression coefficients (R2 > 0.96) and low percent mean relative deviations (E < 6.37%) indicated the acceptability of Weibull model for predicting both water loss and solid gain under all treatments. The Peleg model well described the sample firmness changes with a R2 ~ 0.98 and E ~ 3.24-6.14%. PV resulted in the lowest shape parameter [alpha] value (0.74) for solid gain and the greatest rate constant k1 (40.98 s) for firmness loss, indicating the largest amount of solid gain (3.02%) and the least firmness loss of samples, while ultrasound led to the lowest [alpha] value (0.45) for water loss and k1 value (33.42 s) for firmness loss: the highest water and firmness losses (56.3% and 22.3%, respectively) in samples among three treatments. SEM showed that cell deformation and cell structure collapse were the most severe in ultrasound

treated samples, but moderate in PV samples. SEM also revealed a larger amount of solute uptake in the cells of PV and ultrasound treated samples.
Keywords: Osmotic process; Pulsed-vacuum; Ultrasound; Peleg and Weibull model; Kinetics; Microstructure; Apples

F. Noci, J. Riener, M. Walkling-Ribeiro, D.A. Cronin, D.J. Morgan, J.G. Lyng, Ultraviolet irradiation and pulsed electric fields (PEF) in a hurdle strategy for the preservation of fresh apple Juice, Journal of Food Engineering, Volume 85, Issue 1, March 2008, Pages 141-146, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.07.011.
(http://www.sciencedirect.com/science/article/B6T8J-4PB6VP2-B/2/0279ced72aaca6a8a8cf6eccf15c49af)
Abstract:
The influence of ultraviolet irradiation (UV) and pulsed electric fields (PEF) on microbial inactivation, selected quality attributes (colour, pH, Brix, non-enzymatic browning index (NEBI) and antioxidant capacity) and enzymatic activity (polyphenol oxidase (PPO) and peroxidase (POD)) of fresh apple juice was investigated. The two technologies were applied as stand-alone treatments (TUV or TPEF) or in combination (TUV+PEF or TPEF+UV). TUV was a batch process while TPEF was continuous and consisted of 100 square-wave pulses (1 [mu]s, 15 Hz) at 40 kV/cm. Apple juice samples processed by a heat exchanger at 72 [degree sign]C (TH72) or 94 [degree sign]C (TH94) for 26 s were used as controls. TUV and TPEF resulted in a 2.2 and 5.4 log reduction respectively, while the respective reductions for TH72 and TH94 were 6.0 and 6.7 log cycles. TPEF+UV and TUV+PEF achieved similar reduction to TH94 (6.2 and 7.1 log cycles, respectively) on an incubated sample (48 h at 37 [degree sign]C), with TUV+PEF producing a greater microbial reduction than TPEF. Juice colour and level of phenolic compounds were less affected by the alternative treatments than by heat pasteurisation. Reduction of PPO and POD activity was greater ($P < 0.001$) in TPEF, TUV+PEF or TPEF+UV than in TH72. This experiment showed the potential of a combination of UV irradiation and PEF to obtain satisfactory total microbial inactivation and improved product quality compared to heat pasteurisation.
Keywords: Ultraviolet irradiation; High-voltage electric pulses; Apple juice; Pasteurisation

Mysore N. Shashirekha, Revathy Baskaran, Lingamallu Jaganmohan Rao, Munusamy R. Vijayalakshmi, Somasundaram Rajarathnam, Influence of processing conditions on flavour compounds of custard apple (Annona squamosa L.), LWT - Food Science and Technology, Volume 41, Issue 2, March 2008, Pages 236-243, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.03.005.
(http://www.sciencedirect.com/science/article/B6WMV-4NBC001-1/2/ae76ed1899363c2ba906340ceb9ebfaf)
Abstract:
Changes in volatile compounds of fruit pulp of Annona squamosa, as influenced by the conditions of processing, were studied. Sweet and pleasant flavored pulp from mature ripe fruits was subjected to treatments such as frozen and stored (for 12 months), heated to 55 [degree sign]C (critical temperature) and 85 [degree sign]C (pasteurization temperature) for 20 min each, and spray dried with skim and whole milk powders. Volatiles from these samples were extracted into dichloromethane and n-pentane (1:1), and were subjected to gas chromatograph (GC) and gas chromatograph-mass spectrometer (GC-MS) analysis for identification and quantification of chemical constituents. Terpenes such as [alpha]-pinene, [beta]-pinene, linalool, germacrene-d and spathulenol, esters like sec-butylbutanoate, and methyllinolenate, along with benzyl alcohol and two oxygenated sesquiterpenes were found to be the major volatiles of the fresh pulp. The 12-month-stored frozen pulp did not differ from the fresh pulp in the flavour spectrum. Heating fresh pulp at 55 and 85 [degree sign]C, tended to produce increased flavour spectrum, the compounds relatively being more at 85 [degree sign]C. At 55 [degree sign]C, significant increase in the

quantities of [alpha]-pinene, [beta]-pinene, linalool, germacrene and spathulenol were observed; higher quantities of cineole, limonene, [alpha]-cubebene and [alpha]-copaene, caryophyllene, [alpha]-farnecene and [delta]-cadenene were formed, while these were totally absent in fresh pulp. Significant increase in quantities of [alpha]-pinene, [beta]-pinene, 1,8-cineole, limonene, aromadendrene, [alpha]-farnecene, [gamma]-cadenene, [delta]-cadenene and spathulenol were found by heating pulp at 85 [degree sign]C. Spray-dried samples, showed increased flavor note with the use of whole milk powder as compared to the skim milk powder.
Keywords: Annona squamosa; Custard apple; Pulp; Heat; Spray dried; Frozen; Flavours; Gas chromatography; Mass spectrometry

Gamal ElMasry, Ning Wang, Clement Vigneault, Jun Qiao, Adel ElSayed, Early detection of apple bruises on different background colors using hyperspectral imaging, LWT - Food Science and Technology, Volume 41, Issue 2, March 2008, Pages 337-345, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.02.022.
(http://www.sciencedirect.com/science/article/B6WMV-4N7RY99-2/2/311de2e280d5e966a78ed370d07633c6)
Abstract:
The potentials of a hyperspectral imaging system were investigated for early detection of bruises on `McIntosh' apples. A hyperspectral imaging system was developed based on a spectral region between 400 and 1000 nm. Partial least squares method and stepwise discrimination analysis were used for data dimensionality reduction and selecting the effective wavelengths. Three effective wavelengths in the near infrared region (750, 820, 960 nm) were selected to realize multispectral imaging tests. The classification results indicated that the bruised apples were successfully distinguished from the sound apples. The accuracy of the system is superior to detect bruise after 1 h of bruising.
Keywords: Hyperspectral imaging; Apple bruise; Wavelength selection; Partial least squares; Variable importance for the projection; Stepwise discrimination method

C. Villatoro, R. Altisent, G. Echeverria, J. Graell, M.L. Lopez, I. Lara, Changes in biosynthesis of aroma volatile compounds during on-tree maturation of `Pink Lady(R)' apples, Postharvest Biology and Technology, Volume 47, Issue 3, March 2008, Pages 286-295, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.07.003.
(http://www.sciencedirect.com/science/article/B6TBJ-4PS5F39-2/2/094d8f5e9e75acaa73bfbba5a961af28)
Abstract:
The production of aroma volatile compounds and standard quality attributes, in addition to lipoxygenase (LOX), hydroperoxide lyase (HPL), pyruvate decarboxylase (PDC), alcohol dehydrogenase (ADH) and alcohol o-acyltransferase (AAT) activities, were assessed during maturation of `Pink Lady(R)' apples. Low production of aroma volatiles was observed in early harvested fruit, which gradually increased as ripeness approached. Hexyl acetate, hexyl 2-methylbutanoate, hexyl hexanoate, hexyl butanoate, 2-methylbutyl acetate and butyl acetate were prominent within the blend of volatiles produced by fruit throughout maturation. Multivariate analysis showed these compounds had the highest influence on differentiation of maturity stages, indicating that aroma volatile emission is an important factor for definition of fruit ripeness, which suggests production of these esters might be useful as an index of maturity. No large variations in AAT activity were found throughout the experimental period despite increasing ester emission, suggesting the enhancement of ester production by `Pink Lady(R)' apples at ripening arises mainly from greater availability of substrates. Increased LOX activity was observed at later stages of fruit development, and the possible role of this enzyme activity on enhanced capacity for aroma volatile biosynthesis in more mature fruit is discussed.

Keywords: Aroma; Alcohol dehydrogenase; Alcohol o-acyltransferase; Hydroperoxide lyase; Lipoxygenase; Pyruvate decarboxylase; Malus x domestica; Maturation; `Pink Lady(R)' apple; Quality; Volatile compounds

Ludivine Billy, Emira Mehinagic, Gaelle Royer, Catherine M.G.C. Renard, Gaelle Arvisenet, Carole Prost, Frederique Jourjon, Relationship between texture and pectin composition of two apple cultivars during storage, Postharvest Biology and Technology, Volume 47, Issue 3, March 2008, Pages 315-324, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.07.011.
(http://www.sciencedirect.com/science/article/B6TBJ-4R110SV-1/2/98408148d251df41b0181bf75b1d123c)
Abstract:
The texture of two apple cultivars was characterised by sensory and instrumental methods for five different storage periods. The aim of this study was to explain the changes in apple texture during storage by different physical (penetrometry, compression) and chemical measurements (extraction and analysis of pectin composition). The emphasis was on determining the most relevant biochemical markers in relation to different sensory properties of apple texture.
Contrary to `Fuji', `Golden Delicious' fruit softened easily during storage, became mealy and had higher neutral sugar concentrations in their alcohol-insoluble residues (AIR) and more galacturonic acid in the water-soluble pectin extracts (WSP). The most relevant biochemical marker linked to texture change was the galacturonic acid content in the water-soluble pectin extracts. High and positive correlation coefficients were observed between sensory mealiness (R = 0.84) and galacturonic acid content in the WSP while, sensory crunchiness and instrumentally measured firmness were negatively correlated with this component. The total neutral sugar content in the alcohol-insoluble residues and in the water-soluble pectin fractions also changed with apple texture properties.
Keywords: Apple; Malus domestica Borkh; Texture; Cell wall; Mechanical properties; Sensory analysis

Piotr Baranowski, Janusz Lipecki, Wojciech Mazurek, Ryszard T. Walczak, Detection of watercore in `Gloster' apples using thermography, Postharvest Biology and Technology, Volume 47, Issue 3, March 2008, Pages 358-366, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.07.014.
(http://www.sciencedirect.com/science/article/B6TBJ-4R008H3-1/2/967860e57814b81518373e4519751877)
Abstract:
Watercore is an internal physiological disorder of certain apple cultivars in which the intercellular air spaces throughout the fruit become filled with fluid resulting in characteristic translucent tissue. Detection methods based on colour vision of the fruit surface are not applicable because the injury is visible only in fruit with very severe injury. Therefore, we decided to use dynamic thermography to distinguish affected and unaffected apples. The derivative of apple temperature in time per apple mass is a good parameter to evaluate the differences in thermal properties between apples with and without watercore affected tissues. For apples with watercore the rates of temperature increase per mass in particular initial stages of heating were considerably lower than for apples without watercore affected tissue, irrespective of the part of the fruit surface from which the measurements were made. A good correlation was found between the derivative of apple temperature in time per apple mass and the fruit density.
Keywords: Apple watercore; Thermography; Fruit soluble solid content; Fruit firmness; Fruit density

Hector Morales, Vicente Sanchis, Josep Usall, Antonio J. Ramos, Sonia Marin, Effect of biocontrol agents Candida sake and Pantoea agglomerans on Penicillium expansum growth and patulin

accumulation in apples, International Journal of Food Microbiology, Volume 122, Issues 1-2, 29 February 2008, Pages 61-67, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.11.056.
(http://www.sciencedirect.com/science/article/B6T7K-4R7NPVT-7/2/1b866830664124f64437d82ccba07488)
Abstract:
Penicillium expansum is the major responsible of fruit pome decaying in cold storage. Apples spoiled by P. expansum are expected to contain patulin, a mycotoxin which is proven to affect human health.
The use of chemicals is the most common procedure to prevent rots in postharvest but legislation is becoming more and more restrictive. The use of biocontrol agents (BCA) as an alternative tool is currently being proposed. The aim of this study was to evaluate the effect of two BCA (Candida sake CPA-2 and Pantoea agglomerans CPA-1) on P. expansum growth and patulin accumulation in cold storage and further deck (ambient) storage.
Wounded apples were inoculated with a cell suspension of either C. sake or P. agglomerans and with a P. expansum conidial suspension. Apples were cold stored at 1 [degree sign]C until lesion diameter reached 2 or 4 cm. Half the apples of each treatment were further stored at 20 [degree sign]C for three days before patulin analyses.
Both BCA tested controlled blue rot and patulin accumulation during cold storage. The control of P. expansum growth was enhanced in C. sake treated apples. On the other side, control of patulin accumulation in P. agglomerans treated apples seemed to be more efficient. BCA treatment could not control blue rot and patulin accumulation during further storage at room temperature and in some cases, an increase in P. expansum aggressiveness was observed.
Keywords: Penicillium expansum; Patulin; Biocontrol; BCA; Candida sake; Pantoea agglomerans

Rachid Lahlali, Sebastien Massart, M. Najib Serrhini, M. Haissam Jijakli, A Box-Behnken design for predicting the combined effects of relative humidity and temperature on antagonistic yeast population density at the surface of apples, International Journal of Food Microbiology, Volume 122, Issues 1-2, 29 February 2008, Pages 100-108, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.11.053.
(http://www.sciencedirect.com/science/article/B6T7K-4R7NPVT-3/2/e40494369e94a817125aa34e68a47514)
Abstract:
The objective of this work was to develop models predicting the combined effects of relative humidity (RH, 75-98%), temperature (5-25 [degree sign]C), and initial applied yeast concentration (104-108 CFU/ml) on the apple-surface population densities of two biocontrol agents fused against postharvest diseases; the antagonistic yeasts Pichia anomala strain K and Candida oleophila strain O. Experiments were carried out according to a Box-Behnken matrix. Multiple regression analyses showed that both models yielded a good prediction of yeast density. The effect of relative humidity appeared greater than that of temperature. The number of yeast colony-forming units per square centimeter of apple fruit surface increased with increasing relative humidity, temperature, and initial applied yeast concentration. The models predict that under optimal growth conditions (25 [degree sign]C, 98%), strains O and K should reach a density of 104 CFU/cm2 when applied initially at 2 x 107 (strain O) or 107 CFU/ml (strain K). The model results suggest that rainfall was likely the principal cause of the variability of yeast efficacy reported for previous preharvest orchard trials spanning two successive years. Temperature may also contribute to this variation. The models developed here are important tools for predicting population densities of both strains on the apple surface within the experimental limits. The use of these results should contribute to achieving yeast densities of 104 CFU/cm2 on apples by controlling yeast application and environmental factors such as relative humidity and temperature. The results of this study also confirm our previous in vitro findings that water activity has a greater effect than temperature on yeast population density.

Keywords: Population density; Pichia anomala strain K; Candida oleophila strain O; Relative humidity; Temperature and Box-Behnken design

S.K. Whale, Zora Singh, M.H. Behboudian, J. Janes, S.S. Dhaliwal, Fruit quality in `Cripp's Pink' apple, especially colour, as affected by preharvest sprays of aminoethoxyvinylglycine and ethephon, Scientia Horticulturae, Volume 115, Issue 4, 21 February 2008, Pages 342-351, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.10.015.
(http://www.sciencedirect.com/science/article/B6TC3-4R718NS-1/2/6be55549df8fc39f21c6668c86437b62)
Abstract:
`Cripp's Pink' apple grown in Western Australia often develops poor colour at commercial harvest resulting in economic losses. To determine if fruit colour could be improved without advancing ripening, `Cripp's Pink' apple fruit on trees were sprayed with aminoethoxyvinylglycine (AVG) alone, ethephon alone, or AVG followed by ethephon. The experiments were conducted at two different locations in Western Australia in 2002 and 2003. Fruit sprayed with AVG alone had retarded colour development at harvest. However, ethephon applied after AVG enhanced percent red blush, anthocyanin concentration and reduced chlorophyll concentration in the fruit skin in both locations. These fruit had similar colour to those treated with ethephon alone. Internal ethylene concentration and fruit firmness were unaffected by the different treatments in 2002. However, in 2003 AVG with or without ethephon reduced internal ethylene concentration and maintained firmness compared to ethephon alone. In conclusion, AVG treatment alone delayed colour development and ripening of `Cripp's Pink', while AVG application 5 weeks before harvest followed by an ethephon application 2 weeks later enhanced red colour at commercial harvest. This is, therefore, an effective tool for improving colour of `Cripp's Pink' apples at commercial harvest without adversely affecting other fruit quality attributes.
Keywords: Fruit colour; Storage; Anthocyanins; AVG; Ethylene; Apple; Flavonoids and phenolic compounds

I. Kavdir, D.E. Guyer, Evaluation of different pattern recognition techniques for apple sorting, Biosystems Engineering, Volume 99, Issue 2, February 2008, Pages 211-219, ISSN 1537-5110, DOI: 10.1016/j.biosystemseng.2007.09.019.
(http://www.sciencedirect.com/science/article/B6WXV-4R7CYWD-1/2/df0dd9a62c8d35186edacf3373ead088)
Abstract:
Golden Delicious apples were classified using parametric and non-parametric classifiers into three quality classes. The features used in classification of apples were hue angle (for colour), shape defect, circumference, firmness, weight, blush percentage (red natural spots on the surface of the apple), russet (natural netlike formation on the surface of an apple), bruise content and number of natural defects. Different feature sets including four, five and nine features were also tested to find out the best classifier and feature set combination for an optimal classification success. The effects of using different feature sets and classifiers on classification performance were investigated. The feature set including five features produced slightly better classification results in general compared to feature sets including four and nine features. When the classifiers were compared, it was determined that the multi-layer perceptron neural network produced the highest classification results (up to 90%) while 1-nearest-neighbour and 2-nearest-neighbour classifiers followed this classifier with an 81.11% classification success. The 3-nearest-neighbour and decision tree classifiers resulted in similar classification success (75.56%). The parametric plug-in decision rule classification resulted in the lowest classification success. Principal component analysis and linear discriminant analysis techniques were applied on the training data with nine, five and four features to visualise the degree of separation of the three quality classes of apples. As a result of this application, some improvements were observed in separation of the three quality

classes from using four input features to nine features especially using principal components although some overlaps still existed among the classes.

Hector Morales, Vicente Sanchis, Joan Coromines, Antonio J. Ramos, Sonia Marin, Inoculum size and intraspecific interactions affects Penicillium expansum growth and patulin accumulation in apples, Food Microbiology, Volume 25, Issue 2, February 2008, Pages 378-385, ISSN 0740-0020, DOI: 10.1016/j.fm.2007.09.008.
(http://www.sciencedirect.com/science/article/B6WFP-4PV2RX7-3/2/845e1d986a76579ca9cad9e11b0701d0)
Abstract:
Penicillium expansum is the most important fungal species causing spoilage in cold stored apples. P. expansum produces patulin, a toxic secondary metabolite.
The aim of this work was to study the changes in growth parameters and patulin accumulation that may occur when two different isolates of P. expansum germinate and develop in the same wound. The effect of the inoculum size was also studied. For that purpose, apples were point inoculated with two different isolates of P. expansum at two different conidia concentrations. Both isolates were also inoculated together. Apples were cold stored at 1 [degree sign]C or incubated at 20 [degree sign]C until lesion diameter reached 2.5 cm. Patulin from decayed tissue was analysed at the end of cold storage/incubation.
It seems that intraspecific interactions occur. The interactions resulted in slower growth in which patulin content was lower. A competition for resources followed by either a 'combat-like' interaction may be involved in this. Higher inoculum size led to shorter lag phase, which reflects the importance of the hygiene in packinghouses facilities. The inoculum size also affected growth rate and patulin accumulation, which suggests that interactions between individuals of the same strain may occur. Competition for resources and a combat-like interaction may take place. In vitro studies should be carried out in order to assess the patterns of the interactions observed.
Keywords: Penicillium expansum; Inoculum size; Intraspecific interactions; Patulin; Apples

Vivian C.H. Wu, Xujian Qiu, Y.-H. Peggy Hsieh, Evaluation of Escherichia coli O157:H7 in apple juice with Cornus fruit (Cornus officinalis Sieb. et Zucc.) extract by conventional media and thin agar layer method, Food Microbiology, Volume 25, Issue 1, February 2008, Pages 190-195, ISSN 0740-0020, DOI: 10.1016/j.fm.2007.09.005.
(http://www.sciencedirect.com/science/article/B6WFP-4PPW71W-1/2/af94c77def698bf01cec98c0591c2334)
Abstract:
Escherichia coli O157:H7 survival in apple juice supplemented with Cornus fruit (Cornus officinalis Sieb. et Zucc.) extract was studied. Inoculated samples with or without Cornus fruit extract were kept at 21 and 7 [degree sign]C. Microbial analysis was conducted on days 0, 1, 3, 5, and 7. MacConkey sorbitol agar (MSA), tryptic soy agar (TSA), and thin agar layer (TAL) medium were used to compare the recovery of bacteria stressed under combination treatment. Influence of temperature, storage time, and Cornus fruit on survival of cells was evaluated. The most dramatic reduction of E. coli O157:H7 was observed in apple juice with Cornus fruit extract at 21 [degree sign]C. At 7 [degree sign]C, E. coli O157:H7 was reduced by 2.3 log cfu/ml in the apple juice with Cornus fruit extract compared to the control sample on day 7. TAL and TSA were more efficient than MSA. Cornus fruit extract can be used in combination with temperature and storage time controls to inactivate E. coli O157:H7 in apple juice. This study has shown that TAL is a viable method of recovering and differentiating injured microorganisms and apple juice supplemented with Cornus fruit has potential as a value-added beverage with antimicrobial effects and potential health benefits.
Keywords: Apple juice; Cornus fruit extract; Escherichia coli O157:H7; Thin agar layer method

Katleen Baert, Frank Devlieghere, Li Bo, Johan Debevere, Bruno De Meulenaer, The effect of inoculum size on the growth of Penicillium expansum in apples, Food Microbiology, Volume 25, Issue 1, February 2008, Pages 212-217, ISSN 0740-0020, DOI: 10.1016/j.fm.2007.06.002.
(http://www.sciencedirect.com/science/article/B6WFP-4P47GGM-2/2/c8a2724fff5f338fbae9029deba05736)
Abstract:
Penicillium expansum is the most important cause of blue mould rot, a major post-harvest disease of apples worldwide. The objective of this study was to evaluate the effect of the inoculum size on the germination and growth parameters of P. expansum under different storage conditions in apples. Growth of P. expansum was observed in more than 90% of the inoculations, when the inoculum was equal or higher than 2x104 spores. The use of a low inoculum level resulted in longer lag phases and a larger variability of the estimated lag phase. This indicates that more replications are necessary to estimate the lag phase of the mould in the specified circumstances. At lower temperature, more inoculum was necessary to reduce the variability of the estimated lag phase, showing that this effect is temperature dependent. Moreover, the effect of the inoculum level on the lag phase is even more pronounced for a slower growing strain. These results imply that the inoculum size influences the estimated growth parameters and should be considered in quantitative risk assessments and for the design of challenge tests and experiments to gather data for predictive growth models.
Keywords: Inoculum size; Growth; Penicillium expansum; Apples; Variability

H.X. Li, C.L. Xiao, Baseline sensitivities to fludioxonil and pyrimethanil in Penicillium expansum populations from apple in Washington State, Postharvest Biology and Technology, Volume 47, Issue 2, February 2008, Pages 239-245, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.06.022.
(http://www.sciencedirect.com/science/article/B6TBJ-4PNF2MG-1/2/4f60658f6c5b34b005071f5715683acf)
Abstract:
Penicillium expansum is the primary cause of blue mold, a common postharvest fruit rot disease of apple. In 2004, two new fungicides, fludioxonil and pyrimethanil, were registered for postharvest use on pome fruits in the U.S. To establish distribution of baseline sensitivity of P. expansum to fludioxonil and pyrimethanil before their commercial use, 120 isolates recovered from apple orchards and fruit packinghouses across the apple growing areas in central Washington were selected and tested in vitro for sensitivity to these two fungicides using mycelial growth assays. Baseline EC50 values ranged from 0.011 to 0.068 (average = 0.020) mg/L for fludioxonil and from 0.519 to 2.054 (average = 1.340) mg/L for pyrimethanil. One isolate showed reduced sensitivity to fludioxonil with an EC50 of 0.068 mg/L, which was significantly higher ($P < 0.0001$) than those of remaining isolates tested. Fludioxonil at 0.5 mg/L completely inhibited mycelial growth of all isolates tested except for the isolate with reduced sensitivity. Conidial germination and germ-tube elongation were completely inhibited by pyrimethanil at 0.5 mg/L and by fludioxonil at 0.1 mg/L except for the isolate with reduced sensitivity based on the mycelial growth assay. Discriminatory concentrations of 0.5 mg/L fludioxonil for mycelial growth and 0.5 mg/L pyrimethanil for germ-tube elongation were recommended for phenotyping isolates of P. expansum for resistance to these two fungicides. No cross-sensitivity correlation in P. expansum was observed among thiabendazole, fludioxonil, and pyrimethanil. Fludioxonil and pyrimethanil applied at label rates were effective in controlling blue mold on apple fruit inoculated with isolates exhibiting different degrees of sensitivity to these two fungicides. The results indicate that the current population of P. expansum can be effectively controlled by these two new postharvest fungicides. The information generated in this study on baseline sensitivity distribution is useful in monitoring future shifts in sensitivities to these two new fungicides in P. expansum populations from apples in the region.

Keywords: Blue mold; Fungicide resistance; Penbotec; Postharvest disease; Scholar; Thiabendazole

Rosa T.S. Frighetto, Rodolfo M. Welendorf, Eduardo N. Nigro, Nelson Frighetto, Antonio C. Siani, Isolation of ursolic acid from apple peels by high speed counter-current chromatography, Food Chemistry, Volume 106, Issue 2, 15 January 2008, Pages 767-771, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.06.003.
(http://www.sciencedirect.com/science/article/B6T6R-4P06CN2-4/2/3f9f6c54407953ebbfc50f68cffa1040)
Abstract:
Cuticular waxes of four varieties of Malus domestica were investigated regarding their content of ursolic acid. Peels from Fuji, Gala, Smith and Granny Smith apples were extracted with chloroform, ethyl acetate and/or ethanol. The crude extracts were purified by high speed counter-current chromatography (HSCCC), by using mobile and stationary phases derived from the two-phase solvent system composed by n-hexane:ethyl acetate:methanol:water in the proportion of 10:5:2.5:1. The phase proportions and the relative distribution of ursolic acid between the two-phases were optimized by TLC and optical densitometry, by comparison with an authentic sample of ursolic acid. The amount of ursolic acid present in the extracts as well as the characterization of the isolated compound were made by high resolution gas chromatography coupled to mass spectrometry (GC-MS), 13C nuclear magnetic resonance (13C NMR), Infrared; and by comparing thin layer chromatography and flame ionization detection gas chromatography (GC-FID) patterns with the commercial sample. The average content of ursolic acid of 0.8 mg/cm2 in the peel (around 50 mg per medium sized fruit with a surface area of 50-70 cm2) was found in the Fuji and Smith varieties, whereas 0.5 mg/cm2 and 0.2 mg/cm2 were the amounts calculated for Granny Smith and Gala, respectively. The HSCCC technique was shown to be a good method to purify free ursolic acid from apple peels and could represent a new technological tool to be developed to exploit industrially this source of product.
Keywords: High speed counter-current chromatography (HSCCC); Malus domestica; Apple peel; Ursolic acid

Pavlina D. Drogoudi, Zisis Michailidis, George Pantelidis, Peel and flesh antioxidant content and harvest quality characteristics of seven apple cultivars, Scientia Horticulturae, Volume 115, Issue 2, 7 January 2008, Pages 149-153, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.08.010.
(http://www.sciencedirect.com/science/article/B6TC3-4PRRHGS-4/2/7a8475571014b7d50a84098c1b2788a6)
Abstract:
The variation in the antioxidant content and the associations that may exist with harvest quality characteristics in peel and flesh tissue from seven apple cultivars were studied. Total antioxidant activity, total phenolic and ascorbic acid content, total soluble solids, total acidity and color parameters were measured in flesh and peel fruit tissues from the apple cultivars Fuji, Golden Delicious, Granny Smith, Jonagored, Mutsu, Starkrimson and Fyriki. In flesh tissue, Fyriki contained the highest antioxidant activity and total phenolic content (up to 82% and 67% more, respectively), while the lowest values were found in Fuji, Golden Delicious and Granny Smith. The ascorbic acid content was also greatest in the flesh tissue of Fyriki (up to 36% more). In peel tissue, the greatest antioxidant activity and total phenolic content were found in Starkrimson (up to 64% more) whereas the lowest values were found in Golden Delicious and Granny Smith. Apple peel contain from 1.5 to 9.2 times greater total antioxidant activity and from 1.2 to 3.3 times greater total phenolic content compared with flesh. Principal component analysis and correlation analysis showed that a more nutritious peel may be darker, redder and bluer, while a more nutritious flesh may have a lighter color and lower soluble solid content. It is concluded that Starkimson and the

local cultivar Fyriki should be regarded as a valuable source of antioxidants, while fruit harvest quality characteristics may suggest for nutritional properties of apple.
Keywords: Antioxidant activity; Ascorbic acid; Fruit color; Soluble solids content; Total acid; Total phenolics

Beatriz Gullon, Remedios Yanez, Jose Luis Alonso, J.C. Parajo, l-Lactic acid production from apple pomace by sequential hydrolysis and fermentation, Bioresource Technology, Volume 99, Issue 2, January 2008, Pages 308-319, ISSN 0960-8524, DOI: 10.1016/j.biortech.2006.12.018.
(http://www.sciencedirect.com/science/article/B6V24-4N4406S-2/2/608106b0dc778153aff1f54f5ba7e149)
Abstract:
The potential of apple pomace (a solid waste from cider and apple juice making factories) as a source of sugars and other compounds for fermentation was evaluated. The effect of the cellulase-to-solid ratio (CSR) and the liquor-to-solid ratio (LSR) on the kinetics of glucose and total monosaccharide generation was studied. Mathematical models suitable for reproducing and predicting the hydrolyzate composition were developed.
When samples of apple pomace were subjected to enzymatic hydrolysis, the glucose and fructose present in the raw material as free monosaccharides were extracted at the beginning of the process. Using low cellulase and cellobiase charges (8.5 FPU/g-solid and 8.5 IU/g-solid, respectively), 79% of total glucan was saccharified after 12 h, leading to solutions containing up to 43.8 g monosaccharides/L (glucose, 22.8 g/L; fructose, 14.8 g/L; xylose + mannose + galactose, 2.5 g/L; arabinose + rhamnose, 2.8 g/L). These results correspond to a monosaccharide/cellulase ratio of 0.06 g/FPU and to a volumetric productivity of 3.65 g of monosaccharides/L h.
Liquors obtained under these conditions were used for fermentative lactic acid production with Lactobacillus rhamnosus CECT-288, leading to media containing up to 32.5 g/L of l-lactic acid after 6 h (volumetric productivity = 5.41 g/L h, product yield = 0.88 g/g).
Keywords: Apple pomace; Enzymatic saccharification; Oligosaccharides; Lactobacillus rhamnosus; l-Lactic acid

Ji-Hong Liu, Hiromichi Inoue, Takaya Moriguchi, Salt stress-mediated changes in free polyamine titers and expression of genes responsible for polyamine biosynthesis of apple in vitro shoots, Environmental and Experimental Botany, Volume 62, Issue 1, January 2008, Pages 28-35, ISSN 0098-8472, DOI: 10.1016/j.envexpbot.2007.07.002.
(http://www.sciencedirect.com/science/article/B6T66-4P5NX4M-1/2/63b388d2143cc49681ba19c009dc1171)
Abstract:
In the present paper, changes in contents of free polyamines and expression of genes responsible for polyamine biosynthesis of apple [Malus sylvestris (L.) Mill. var. domestica (Borkh.) Mansf.] in vitro shoots exposed to 100 mM or 200 mM NaCl for 10 days were investigated. Salt stress led to severe growth retardation, based on electrolyte leakage (EL), net increase in fresh weight and shoot length. Na concentration in salt-treated shoots was significantly higher than that of the control, and K was unexpectedly enhanced, particularly by 100 mM NaCl. Three commonly occurring polyamines, putrescine (Put), spermidine (SPd) and spermine (Spm), were detected in the shoots, in which Spd and Spm were the most and the least abundant part, respectively. Both types of salt stress led to significant reduction of free Put, and Spm was significantly reduced by 100 mM NaCl, whereas Spd underwent negligible fluctuation. The genes encoding for polyamine biosynthetic enzymes showed diverse expression patterns in response to salt treatment. Salt stress led to induction of MdADC, MdSAMDC1, MdSPDS1 and MdSPMS, whereas it appreciably inhibited transcript level of MdACL5 in a concentration-dependent manner, indicating that the genes were differentially affected by salt stress. The data presented herein showed that salt stress led to conspicuous alteration of free polyamine contents and that mRNA levels of some genes

involved in polyamine biosynthesis were strongly influenced. Mechanism underlying the decrease in free Put and gene expression patterns following long-term salt stress were discussed.
Keywords: Free polyamines; Gene expression; In vitro shoot growth; Malus sylvestris (L.) Mill. var. domestica (Borkh.) Mansf.; Polyamine biosynthetic gene; Salt stress

Leandro F. Damasceno, Fabiano A.N. Fernandes, Margarida M.A. Magalhaes, Edy S. Brito, Non-enzymatic browning in clarified cashew apple juice during thermal treatment: Kinetics and process control, Food Chemistry, Volume 106, Issue 1, 1 January 2008, Pages 172-179, ISSN 0308-8146, DOI: 10.1016/j.foodchem.2007.05.063.
(http://www.sciencedirect.com/science/article/B6T6R-4NWCH44-8/2/3e640ea1cb37c94eb5409e2867aa4a35)
Abstract:
The effect of thermal treatment on clarified cashew apple juice was studied at temperatures from 88 to 121 [degree sign]C. Changes in colour measured with colorimetric parameters (reflectance spectra, colour difference and CIELAB), and the variation in ascorbic acid, 5-hydroxymethylfurfural (5-HMF) and sugar content were used to evaluate non-enzymatic browning. Kinetic models were applied to the changes in reflectance spectra, ascorbic acid and 5-HMF. The effect of temperature on kinetic constants was described by an Arrhenius type equation. The sugar content remained constant during thermal treatment and did not affect non-enzymatic browning, which was mainly affected by degradation of ascorbic acid. The kinetic models were used to optimise and control the thermal treatment for clarified cashew apple juice.
Keywords: Cashew apple juice; Non-enzymatic browning; Thermal treatment; Optimization

Anderson de Souza Sant'Ana, Amauri Rosenthal, Pilar Rodriguez de Massaguer, The fate of patulin in apple juice processing: A review, Food Research International, Volume 41, Issue 5, 2008, Pages 441-453, ISSN 0963-9969, DOI: 10.1016/j.foodres.2008.03.001.
(http://www.sciencedirect.com/science/article/B6T6V-4S1C2N9-1/2/cef4d7a97fd2bbbfa235d6c6fefd6608)
Abstract:
This article is a review about the effects of each of the processing stages of pasteurized apple juice on the increase, prevalence or reduction of patulin (PAT) levels in the final product. Recommendations are included for the control and reduction of the incidence of the moulds that produce it and the mycotoxin itself, from the pre-harvest to the final manufacturing stages of apple juice, studies required for a better understanding of the behaviour of this mycotoxin during processing also being indicated. Although the initial stages of the juice manufacturing process (washing, selection and trimming) are highly efficient in reducing the levels of PAT, control of the mycotoxin should always be focused on the production stages of the process that guarantee the inhibition of its production (pre-harvest, harvest and post-harvest).
Keywords: Patulin; Apple juice; Control methods; Juice processing; Mycotoxins

M. Murillo, E. Gonzalez-Penas, S. Amezqueta, Determination of patulin in commercial apple juice by micellar electrokinetic chromatography, Food and Chemical Toxicology, Volume 46, Issue 1, January 2008, Pages 57-64, ISSN 0278-6915, DOI: 10.1016/j.fct.2007.06.024.
(http://www.sciencedirect.com/science/article/B6T6P-4P2S95K-6/2/eb4dbb8632e5c64a72fd9e8e065d35a9)
Abstract:
A novel and validated micellar electrokinetic capillary chromatography (MEKC) method using ultraviolet detection (UV) has been applied to the quantitative analysis of patulin (PAT) in commercial apple juice.
Patulin was extracted from samples with an ethylacetate solution. The micellar electrokinetic capillary chromatography (MECK) parameters studied for method optimization were buffer

composition, voltage, temperature, and a separation between PAT and 5-hydroxymethylfurfural (HMF) (main interference in apple juice PAT analysis) peaks until reaching baseline.
The method passes a series of validation tests including selectivity, linearity, limit of detection and quantification (0.7 and 2.5 [mu]g L-1, respectively), precision (within and between-day variability) and recovery (80.2% RSD = 4%), accuracy, and robustness. This method was successfully applied to the measurement of 20 apple juice samples obtained from different supermarkets. One hundred percent of the samples were contaminated with a level greater than the limit of detection, with mean and median values of 41.3 and 35.7 [mu]g L-1, respectively.
Keywords: Mycotoxins; Patulin; Micellar electrokinetic chromatography; Apple juice; Validation

Maria A. Rojas-Grau, Maria S. Tapia, Olga Martin-Belloso, Using polysaccharide-based edible coatings to maintain quality of fresh-cut Fuji apples, LWT - Food Science and Technology, Volume 41, Issue 1, January 2008, Pages 139-147, ISSN 0023-6438, DOI: 10.1016/j.lwt.2007.01.009.
(http://www.sciencedirect.com/science/article/B6WMV-4MYD69D-2/2/bd7907c6d9eb72c8ecfe3a153bd9d5d4)
Abstract:
The effect of alginate and gellan-based edible coatings on the shelf-life of fresh-cut Fuji apples packed in trays with a plastic film of a known permeability to oxygen (110 cm3 O2 m-2 bar-1 day-1) was investigated by measuring changes in headspace atmosphere, color, firmness and microbial growth during 23 days of storage at 4 [degree sign]C. Concentration of O2 and CO2 in the package was measured and no significant differences between coated and uncoated fresh-cut apples were observed. Ethylene concentration in coated apples seemed to be delayed since it remained below 50 [mu]l l-1 throughout the whole refrigerated storage period, while production of this gas was detected in uncoated apples from the very initial days of storage. Coated apple wedges exhibited ethanol and acetaldehyde formation from the second week of storage indicating fermentative metabolism. Polymers were crosslinked with a calcium chloride solution, to which the antibrowning agent N-acetylcysteine was added, being incorporated into the coatings formulation and helping to maintain firmness and color of apple wedges during the entire storage time. The application of the edible coatings also retarded the microbiological deterioration of fresh-cut apples. Alginate and gellan edible coatings effectively prolonged the shelf-life of Fuji apple wedges by 2 weeks of storage compared with the control apple slices which showed a considerable cut surface browning and tissue softening from the very early days of storage, limiting their shelf-life to less than 4 days.
Keywords: Shelf-life; Alginate; Gellan; Edible coatings; Fresh-cut apples

Byoung-Kwan Cho, Watcharapol Chayaprasert, Richard L. Stroshine, Effects of internal browning and watercore on low field (5.4 MHz) proton magnetic resonance measurements of T2 values of whole apples, Postharvest Biology and Technology, Volume 47, Issue 1, January 2008, Pages 81-89, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.05.018.
(http://www.sciencedirect.com/science/article/B6TBJ-4PHJMHP-1/2/30fc057875da2e0ffc328fca2fcd676b)
Abstract:
Apples with internal browning and/or watercore along with unaffected apples were tested using a low frequency (5.4 MHz) proton magnetic resonance (1H MR) sensor. A three-term exponential model was fit to the spin-spin relaxation (T2) curves obtained from individual apples. The contributions from terms of the model associated with extracellular spaces, a (ca. 16 ms) and the cytoplasm, b (ca. 300 ms) increased with the severity of internal browning (r2 = 0.7, 0.9, respectively). Conversely, the contribution of the term associated with water in the vacuoles, c (ca. 1260 ms) decreased as the severity of internal browning increased (r2 = 0.9). The changes in the model parameters were different for apples having only internal browning compared to apples with both moderate watercore and slight or no internal browning and the differences were statistically

significant ($P < 0.05$). Percent total soluble solids (TSS) in the apples was not affected by the severity of the internal browning for apples with moderate watercore while it increased with severity of internal browning for apples without moderate watercore. In addition, the density of the apples decreased as the contribution of the term associated with water in the vacuoles increased. Finally, two of the model parameters were significantly correlated with TSS in unaffected apples and one parameter was significantly correlated with TSS in apples with moderate watercore and no internal browning (r2 [congruent with] 0.7). The results of this study suggest that when a three-term exponential model is fit to the T2 relaxation curve from a low field 1H MR sensor, the changes in the parameters may give an indication of the presence and severity of internal browning as well as the presence of watercore in the apple.
Keywords: Proton magnetic resonance; Spin-spin relaxation; Apples; Internal browning; Watercore

D.R. Rudell, J.P. Mattheis, Synergism exists between ethylene and methyl jasmonate in artificial light-induced pigment enhancement of `Fuji' apple fruit peel, Postharvest Biology and Technology, Volume 47, Issue 1, January 2008, Pages 136-140, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.05.021.
(http://www.sciencedirect.com/science/article/B6TBJ-4PHJMHP-2/2/047c57b685e2a99c2c8cebeac1a6384b)
Abstract:
The pigment content of detached `Fuji' apple peel was characterized in fruit exposed to ethylene and/or treated with methyl jasmonate (MJ), then irradiated with ultraviolet (UV)/white light. Peel pigments were analyzed using reversed-phase high-performance liquid chromatography coupled with scanning UV-vis absorbance detection. Treatment with MJ alone enhanced anthocyanin content, including idaein, the major anthocyanin in apple fruit. Anthocyanin content was further enhanced by treatment with MJ + ethylene. Treatment with the ethylene action inhibitor 1-MCP plus MJ reduced red coloration compared with MJ alone. Treatment with ethylene or 1-MCP alone, or ethylene + 1-MCP had no effect on anthocyanin accumulation. Production of hyperin, the major quercetin glycoside in peel tissue, was enhanced by MJ and inhibition of ethylene action with 1-MCP enhanced the impact of MJ. 1-MCP with or without MJ increased phloridzin content. Chlorogenic acid synthesis was enhanced following treatment with MJ and/or ethylene, however, treatment with 1-MCP alone or 1-MCP plus MJ resulted in reduced chlorogenic acid content. [beta]-Carotene synthesis increased following MJ plus ethylene, but was not enhanced by MJ or ethylene alone. The results indicate synergistic or additive responses between ethylene and MJ exists for regulation of apple peel pigment synthesis pathways.
Keywords: Malus sylvestris var. domestica; Color; Chlorophyll; Carotenoid; Light stress; 1-Methylcyclopropene; Ethylene; Methyl jasmonate

Jerneja Jakopic, Robert Veberic, Franci Stampar, The effect of reflective foil and hail nets on the lighting, color and anthocyanins of `Fuji' apple, Scientia Horticulturae, Volume 115, Issue 1, 10 December 2007, Pages 40-46, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.07.014.
(http://www.sciencedirect.com/science/article/B6TC3-4PP7RCM-1/2/f767e091de343482086d9808c64e5b91)
Abstract:
We studied the influence of covering the orchard floor with reflective foil on photosynthetic active radiation (PAR) both under and outside hail nets, and the possibility that the reflective foil under the hail net compensates for light reduction in last month before harvest time. On the lower side of fruit in the canopy, the reflective foil increased PAR. The chromaticity value a* showed a difference in the intensity of red coloration in the reflective foil and hail net treatments. Amounts of individual cyanidins were detected by using HPLC-MS. The accumulation of five individual anthocyanins (cyanidin-galactoside, three cyanidin-pentoses and cyanidin) was investigated during last month before harvest time. Concentrations of the main, cyanidin-galactoside in `Fuji' apple increased

before harvest time, and at harvest time the reflective foil caused an increase in all identified anthocyanins.
Keywords: Photosynthetic active radiation (PAR); Anthocyanin; Reflective foil; Hail net; Light

R. Lewis, A. Yoxall, L.A. Canty, E. Reina Romo, Development of engineering design tools to help reduce apple bruising, Journal of Food Engineering, Volume 83, Issue 3, December 2007, Pages 356-365, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.03.005.
(http://www.sciencedirect.com/science/article/B6T8J-4N859SM-3/2/5c88e27be231248437a5eabbbfb6099d)
Abstract:
A large percentage of apples are wasted each year due to damage such as bruising. The apple journey from orchard to supermarket is very complex and apples are subjected to a variety of static and dynamic loads that could result in this damage occurring.
The main aim of this work was to carry out numerical modelling to develop a design tool that can be used to optimise the design of harvesting and sorting equipment and packaging media to reduce the likelihood of apple bruise formation resulting from impact loads. An experimental study, along with analytical calculations, varying apple drop heights and counterface material properties, were used to provide data to validate the numerical modelling.
Good correlation was seen between the models and experiments and this approach combined with previous work on static modelling should provide a comprehensive design tool for reducing the likelihood of apple bruising occurring.
Keywords: Apple bruising; Design tools; Packaging optimisation

V.Y. Martinez, A.B. Nieto, M.A. Castro, D. Salvatori, S.M. Alzamora, Viscoelastic characteristics of Granny Smith apple during glucose osmotic dehydration, Journal of Food Engineering, Volume 83, Issue 3, December 2007, Pages 394-403, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.03.025.
(http://www.sciencedirect.com/science/article/B6T8J-4NB997T-6/2/db1c8fb5445be75f8f061b6c4c525558)
Abstract:
Viscoelastic properties of apple tissue during osmotic dehydration in a 25.0% w/w glucose aqueous solution at 20 [degree sign]C were analyzed in a dynamic rheometer using oscillatory shear and creep-recovery tests. Both storage (G') and loss (G'') moduli for fresh and osmotically dehydrated tissues showed a weaker dependence with angular frequency. All samples had a viscoelastic solid behavior with G' dominating the viscoelastic response, but in general both moduli decreased with time of osmosis. For the time scale of the experiments, a generalized Kelvin model with six elements properly predicted the creep compliance response, with a correlation coefficient >0.999 for all samples. In general, initial (J0) and decay compliances (J1 and J2) and steady-state fluidity ([eta]N) significantly increased as treatment proceeded. Between 40 and 90 or 120 min osmosis, many rheological parameters (G' at frequencies in the range 1-100 s-1; loss tangent at 0.1 s-1, J1, retardation times ([lambda]1 and [lambda]2), relative contribution of each type of compliance, [eta]N, plasticity, and overall compliance) showed a turning point, fluctuations or the greatest changes in the evolution along treatment. This behavior was related with shrinkage and posterior round shape recuperation and swelling of the cells, as seen in previous light and environmental scanning electron microscopy studies.
Keywords: Apple; Osmotic dehydration; Glucose; Viscoelastic properties

Wen-chuan Guo, Stuart O. Nelson, Samir Trabelsi, Stanley J. Kays, 10-1800-MHz dielectric properties of fresh apples during storage, Journal of Food Engineering, Volume 83, Issue 4, December 2007, Pages 562-569, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.04.009.
(http://www.sciencedirect.com/science/article/B6T8J-4NJ0TB8-3/2/99a5f68ad020456a51d2096e8b9ff6a4)

Abstract:
The dielectric properties of fresh apples of three cultivars were measured at 24 [degree sign]C over 10 weeks in storage at 4 [degree sign]C to determine whether these properties might be used to determine quality factors such as soluble solids content (SSC), firmness, moisture content and pH. The dielectric constants and dielectric loss factors at 51 frequencies from 10 to 1800 MHz were determined for external surface and interior tissue measurements along with moisture content, firmness, and SSC and pH of juice expelled from the internal tissues. Dielectric properties of the three apple cultivars are presented graphically for all frequencies, and correlations between the dielectric properties and measured quality factors are discussed. Although a high correlation was observed in a linear relationship between the dielectric constant divided by SSC and the dielectric loss factor divided by SSC in the complex plane, the SSC was not predicted well from that relationship, and no high correlations were found between the dielectric properties and SSC, moisture content, firmness, or pH. The dielectric constant and loss factor remained essentially constant during the 10-week storage period.
Keywords: Fresh apples; Storage; Dielectric properties; Dielectric constant; Dielectric loss factor; Firmness; Moisture content; Soluble solids content; pH

S. Elss, S. Kleinhenz, P. Schreier, Odor and taste thresholds of potential carry-over/off-flavor compounds in orange and apple juice, LWT - Food Science and Technology, Volume 40, Issue 10, December 2007, Pages 1826-1831, ISSN 0023-6438, DOI: 10.1016/j.lwt.2006.12.010.
(http://www.sciencedirect.com/science/article/B6WMV-4MWXR2H-3/2/d8f91f55febd617f2e188e7abed5948b)
Abstract:
The odor and taste threshold values of six aroma substances known to be constituents of fruit juices and other fruit products, i.e. limonene, [alpha]-terpineol, carvone, methyl 2-methylbutanoate, ethyl 2-methylbutanoate, and [gamma]-decalactone, were determined in various matrices, i.e. model sugar/acid solution, apple and orange juice, as well as apple and orange substitute (made by dilution of fruit juice concentrate with water). Whereas for [alpha]-terpineol thresholds in the 1.2-11 mg/l area were defined, limonene and carvone were determined to be sensorially effective each at 0.5 mg/l. Very low thresholds were measured for [gamma]-decalactone, methyl 2-methylbutanoate and ethyl 2-methylbutanoate that showed sensory activity in the area of 20, 1.5, and 0.5 [mu]g/l, respectively. In relation to the aroma composition determined by high resolution gas chromatography-mass spectrometry (HRGC-MS), these results provide an objective possibility to evaluate the sensory efficacy and/or an `off-flavor' potential of these compounds in fruit juices.
Keywords: Apple; Carvone; [gamma]-decalactone; Ethyl 2-methylbutanoate; Limonene; Methyl 2-methylbutanoate; Odor and taste thresholds; Orange; [alpha]-terpineol

Eileen M. Perry, Joan R. Davenport, Spectral and spatial differences in response of vegetation indices to nitrogen treatments on apple, Computers and Electronics in Agriculture, Volume 59, Issues 1-2, November 2007, Pages 56-65, ISSN 0168-1699, DOI: 10.1016/j.compag.2007.05.002.
(http://www.sciencedirect.com/science/article/B6T5M-4P2JCSJ-1/2/8fe9d7e73f9668f4f97ee40a7d22c4cb)
Abstract:
Handheld chlorophyll sensors and remote sensing are two nondestructive approaches for estimating plant nitrogen (N) status, which are now commercially available. In this paper we address three questions on the application of these technologies in perennial fruit trees: (1) can individual leaf meter measurements be used to predict N status for surrounding trees?, (2) are narrow band indices more sensitive than the normalized difference vegetation index (NDVI) to differences in plant N?, and (3) is NDVI from satellite remote sensing correlated to leaf level vegetation indices? We evaluated data from a N rate trial conducted in a commercial Fuji apple orchard (Malus domestica Borkh. cv. `Fuji'). SPAD and CM1000 handheld chlorophyll meters and

reflectance measurements using a portable spectrometer were made on individual leaves three or four times during each growing season. The reflectance measurements were used to determine NDVI and three narrow band vegetation indices. Satellite imagery from the Quickbird sensor was acquired two or three times during each growing season and used to generate NDVI for individual trees. The leaf meter measurements and vegetation indices were compared with the N application rate and plant N status measured as total leaf tissue N.
We evaluated how well single leaf meter measurements predict N status for surrounding trees by calculating the differences between actual and estimated N applications from individual measurements. On average, a sample of 12 leaves (from the same treatment and same measurement date) resulted in an estimation error of 30 kg ha-1 for either the SPAD or the CM1000 sensor, representing almost half of the range in N treatment rates. To evaluate any improvement in prediction of applied N using narrow band indices, we used analysis of variance (ANOVA) to compare three narrow band indices with the leaf meters and NDVI measured at leaf and canopy levels. Two narrow band indices, red edge vegetation stress index (RVSI) and modified chlorophyll absorption in reflectance index (MCARI) had higher F-values (31 and 41, respectively) than did NDVI from leaf level measurements (26), from satellite NDVI (6), or the CM1000 chlorophyll meter (12). The ANOVA results support improvements in leaf sensors using index values other than NDVI. We found that NDVI from satellite imagery acquired close to the leaf level measurement dates were positively correlated to the chlorophyll sensors and vegetation indices. When the data was averaged to the experiment plot level (twelve leaves total), the correlation coefficients between the satellite NDVI and the other sensors ranged from 0.68 for NDVI from leaf level reflectance to 0.84 with the CM1000 chlorophyll meter. Given the level of correlations, remote sensing might be a useful tool to extrapolate handheld measurements spatially throughout an orchard.
Keywords: Leaf chlorophyll meter; Leaf reflectance; Nitrogen assessment; Vegetation indices

Hector Morales, Vicente Sanchis, Alexandre Rovira, Antonio J. Ramos, Sonia Marin, Patulin accumulation in apples during postharvest: Effect of controlled atmosphere storage and fungicide treatments, Food Control, Volume 18, Issue 11, November 2007, Pages 1443-1448, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2006.10.008.
(http://www.sciencedirect.com/science/article/B6T6S-4MHPBNW-1/2/95958efa81d8a843c403fb648f3de6e8)
Abstract:
The aim of this study was to assess the opportunities of Penicillium expansum to develop and produce patulin in apples under two different CA storage methods (LOW and U-LOW) at 1 [degree sign]C. Differences in lesion diameter and patulin accumulation depending on CO2 and O2 partial pressure were studied. Further apple rot and patulin production during a three days post-storing stage at 20 [degree sign]C was also monitored so that effect of further storage at room temperature could be assesed.
Two lots of apples of Golden variety with different ripeness degrees were used. Half of each lot was fungicide treated. Apples were inoculated with patulin producer P. expansum strains and stored at 1 [degree sign]C for either two month or 2.5 months at both LOW and U-LOW conditions. The extent of lesions and patulin accumulation both at the end of CA cold storage and after three days at 20 [degree sign]C were assessed. CA storage conditions had strong significance in P. expansum growth on apples and factors such as fruit ripeness, fungicide treatment and time at the storage room had significant influence. In general, bigger lesions were observed under U-LOW than under LOW conditions, lesions being similar or bigger when increasing the storage time from 2 to 2.5 months. P. expansum grew faster in riper apples, although fungicide application was clearly more effective for ripe rather than for underripe apples. Although lesions were evident after both storage conditions, no patulin was detected. Increase of lesion when fruits were subsequently

stored at 20 [degree sign]C was evident in all cases and patulin was detected at this moment. No differences in patulin content were found at this stage between LOW and U-LOW stored apples.
Keywords: Penicillium expansum; Patulin; CA storage

Katleen Baert, Frank Devlieghere, Heidi Flyps, Murielle Oosterlinck, Monzur Morshed Ahmed, Andreja Rajkovic, Bert Verlinden, Bart Nicolai, Johan Debevere, Bruno De Meulenaer, Influence of storage conditions of apples on growth and patulin production by Penicillium expansum, International Journal of Food Microbiology, Volume 119, Issue 3, 1 November 2007, Pages 170-181, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.07.061.
(http://www.sciencedirect.com/science/article/B6T7K-4PFW629-1/2/dab818fb903ab269d99e3f79cac2503e)
Abstract:
Penicillium expansum causes blue mould rot, a serious post-harvest disease of apples, and is the main producer of the mycotoxin patulin. The present study aimed to determine the influence of storage conditions (i.e. temperature and O2 level) on growth and patulin production by different P. expansum strains on a simulation medium and on apples. Growth was strongly influenced by the temperature, while the used atmosphere (20, 3, and 1% O2; < 1% CO2) had no effect. Optimal growth was observed at 25 [degree sign]C for every strain tested. Patulin production was stimulated when the temperature decreased (from 20 to 10 or 4 [degree sign]C), while a further decrease of the temperature to 1 [degree sign]C caused a reduction in patulin production. The temperature at which the stimulation was changed into suppression was strain dependent. Similar results were observed for the O2 level. A reduction of the O2 level from 20 to 3% O2 could stimulate or suppress patulin production depending on the strain, while a clear decrease of the patulin production was observed when the O2 level was reduced from 3 to 1%. These results show that the induction of limited stress to the fungus, such as lowering the temperature or lowering the O2 levels stimulates patulin production. However, the combination of different stress conditions (e.g. low temperature and low O2) will result in a reduced formation of the toxin. The combination of stress conditions, at which the transition from stimulation to suppression is observed, is strain dependent. Moreover, patulin production is characterized by a high natural variability. The presented results show that the temperature and O2 level has to be as low as possible during the storage of apples in order to suppress patulin production and to guarantee food safety.
Keywords: Patulin; Penicillium expansum; Apple; Temperature; Controlled atmosphere; Strain variability

S.F. Aguilar-Rosas, M.L. Ballinas-Casarrubias, G.V. Nevarez-Moorillon, O. Martin-Belloso, E. Ortega-Rivas, Thermal and pulsed electric fields pasteurization of apple juice: Effects on physicochemical properties and flavour compounds, Journal of Food Engineering, Volume 83, Issue 1, Future of Food Engineering - Selected Papers from the 2nd International Symposium of CIGR Section VI on Future of Food Engineering, November 2007, Pages 41-46, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2006.12.011.
(http://www.sciencedirect.com/science/article/B6T8J-4MSXT3D-3/2/7b61325304a6d681d2e86738553196bd)
Abstract:
Apple juice, extracted from golden delicious fruits, was pasteurized using a pulsed electric field (PEF) treatment and compared with a conventional high temperature-short time (HTST) method. The PEF treatment was carried out using a PEF laboratory unit, set with a bipolar pulse (4 [mu]s wide), an intensity of 35 kV/cm, and a frequency of 1200 pulses per second (pps). The thermal pasteurization was performed at 90 [degree sign]C for 30 s with an adapted laboratory set-up. Effects of variables of both treatments on pH, total acidity, phenolics content, and volatile compounds were investigated. While minimal variability was observed in pH and no significant

changes were detected in acidity, phenolics content and volatile compounds concentration showed statistical significant differences between treatments. In general, these measured variables were less affected by the PEF treatment than by the thermal pasteurization.
Keywords: Apple juice; Thermal pasteurization; High voltage pulsed electric fields (PEF); High temperature-short time (HTST) pasteurization; Sensory attributes

N. Betoret, A. Andres, L. Segui, P. Fito, Application of safes (systematic approach to food engineering systems) methodology to dehydration of apple by combined methods, Journal of Food Engineering, Volume 83, Issue 2, EFFoST 2005 Annual Meeting: Innovations in Traditional Foods, November 2007, Pages 186-192, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.02.018.
(http://www.sciencedirect.com/science/article/B6T8J-4N3NYX8-6/2/4dea5fe28a999ec59c57d637f943fa87)
Abstract:
SAFES methodology has been specifically designed to describe and analyze foods, operations and processes systematically. It is based on the multicomponent and polyphasic character of foods, requires establishing simplificative hypothesis and it allows us to quantify the changes that the operations and processes cause in food as well as the mechanisms responsible for them, making possible a quality control in the final product. The application of SAFES methodology to dehydration of apple by combined methods requires considering it as a biologic system constituted by cells which assemble in a tissue including intercellular connexions, intercellular spaces and pores. In this system, the phases and components considered should not limit the mechanisms involved in removing water. Five components distributed in five different phases have been considered in the definition of composition matrix of raw material and products after each operation. Experimental data for mass (total, water and solutes) and volume changes after each step and simplified hypothesis concerning water distribution among phases and location of liquid phase have been necessary to apply the SAFES methodology, determining the evolution of composition and volume in each phase (composition matrix and volume vector) and analyzing driving forces and mechanisms involved in the main changes of the product. The application of SAFES methodology to dehydration of apple by combined methods reveals that traditional methods based on the analysis of foods as a continuous and homogeneous system are inadequate to control the changes in the quality properties of the product. Consequently, it is necessary a rigorous analysis directed to establish relations between food properties and physico-chemical changes in the product along the process.
Keywords: Combined drying; Apple; Quality; Safes

C. Barrera, N. Betoret, A. Heredia, P. Fito, Application of SAFES (systematic approach to food engineering systems) methodology to apple candying, Journal of Food Engineering, Volume 83, Issue 2, EFFoST 2005 Annual Meeting: Innovations in Traditional Foods, November 2007, Pages 193-200, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.02.034.
(http://www.sciencedirect.com/science/article/B6T8J-4N3WYCJ-4/2/ad015294eae31e2b144b3181be7695db)
Abstract:
The application of a vacuum pulse for a specified time before long term osmotic dehydration has been proposed to obtain candied fruits at mild temperatures, thus maintaining the characteristic attributes of fresh fruits. Information about main changes involved in apple candying by long term pulsed vacuum osmotic dehydration is missed by applying traditional methods of modelling foods and processes.
A new systematic approach to food engineering systems (SAFES) methodology has been recently developed and applied to predict quality and safety attributes from compositional and volumetric changes taking part throughout food processing. Identification and quantification of main components, phases and aggregation states at different stages of changes in which the process

can be divided into would be required. Apart from experimental data and data found in references, several hypotheses related to water and soluble solids flow were also formulated for this purpose. The application of SAFES methodology to the apple candying process highlights the usefulness of this tool in making evident that different mechanisms are involved in the process in a coupled way. Indeed, not only osmotic, but also pseudo-difusional and hydrodynamic mechanisms were responsible for compositional and volumetric changes occurring during apple candying to a different extend, depending on the concrete stage of the process. As a result, it should be necessary to analyse the process in different steps in order to avoid a confused knowledge of it.
Keywords: Candying; Vacuum impregnation; Osmotic dehydration; SAFES

Souad Timoumi, Daoued Mihoubi, Fethi Zagrouba, Shrinkage, vitamin C degradation and aroma losses during infra-red drying of apple slices, LWT - Food Science and Technology, Volume 40, Issue 9, November 2007, Pages 1648-1654, ISSN 0023-6438, DOI: 10.1016/j.lwt.2006.11.008.
(http://www.sciencedirect.com/science/article/B6WMV-4MY6TC9-1/2/ff924f11041d47692aaee200b6541b81)
Abstract:
The goal of this study was to determine the effect of drying temperature on the shrinkage, ascorbic acid (vitamin C) degradation and aroma retention of apples. Apple samples were found to shrink continuously until a water content value of 2 kg/kg d.b. The degradation of ascorbic acid followed a pseudo-first-order reaction and the degradation rate constant increased when temperature increased from 40 to 70 [degree sign]C. The loss of aroma volatiles increased with temperature and drying time.
Keywords: Apple; Aroma; Ascorbic acid; Drying; Shrinkage

Masato Wada, Ayano Ureshino, Qiu-fen Cao, Hideo Bessho, Genomic varieties of apple AFL genes, Plant Science, Volume 173, Issue 5, November 2007, Pages 559-566, ISSN 0168-9452, DOI: 10.1016/j.plantsci.2007.08.009.
(http://www.sciencedirect.com/science/article/B6TBH-4PJV1CB-1/2/a3ddacb75e45765bc679cbb2298e55de)
Abstract: Summary
AFL (Apple FLORICAULA LEAFY) genes were screened from the apple genome. The resultant clones showed the AFL1, AFL2, and AFL1a genes, which included several-kilobase lengths of their 5' upstream regions. They were highly conserved and consisted of three exons and two introns. The expression analysis with Arabidopsis indicated that the 5' upstream region of AFL2, about 2.5 kb, linked [beta]-glucuronidase (GUS) showed GUS activity on the young flower buds such as that of the Arabidopsis LFY promoter. The corresponding upstream region from AFL1 had a highly homologous 700 bp region flanking the ATG site. But the upstream region (about 2.4 kb) from the AFL1 genome never showed GUS activity on flower buds. The AFL1 and AFL1a genes were almost identical besides the 790 bp insertion in the first intron of AFL1a. The insertion sequence had an RNA polymerase III motif and a T-rich sequence as well as a 9 bp direct repeat at each end. Some of the insertion sequence's trait indicated that the insertion was a novel Short Interspersed Repetitive Element (SINE) from apple. This insertion occurs at a rate of more than 1,000 copies in an apple genome, and appeared to be conserved in the Malus genus.
Keywords: Apple; Malus; AFL; GUS; Retroposon; SINE

Sanae Krimi Bencheqroun, Mohammed Bajji, Sebastien Massart, Mustapha Labhilili, Samir El Jaafari, M. Haissam Jijakli, In vitro and in situ study of postharvest apple blue mold biocontrol by Aureobasidium pullulans: Evidence for the involvement of competition for nutrients, Postharvest Biology and Technology, Volume 46, Issue 2, November 2007, Pages 128-135, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.05.005.

(http://www.sciencedirect.com/science/article/B6TBJ-4PHSFC0-2/2/d4562a69a1a9b32f23263794559e7388)
Abstract:
Aureobasidium pullulans strain Ach1-1 was selected for its effectiveness against blue mold caused by Penicillium expansum on stored apple fruit. The possible involvement of competition for nutrients in the biocontrol activity of this antagonistic strain was investigated both in vitro and in situ. For in vitro assays, the effect of strain Ach1-1 on germination percentages of P. expansum conidia was evaluated after a 24 h incubation period in the presence of increasing apple juice concentrations (0-5%) using a system allowing the physical separation of both agents. In the absence of strain Ach1-1, conidial germination was strongly promoted by apple juice whatever the concentration. However, germination was significantly reduced by the presence of strain Ach1-1 except at the highest juice concentration. For conidia previously inhibited at 0.5% juice, germination after 24 h of incubation was partially recovered in the presence of strain Ach1-1 when fresh juice was added to a final concentration of 5%, and completely restored at both 0.5 and 5% juice concentrations in the absence of strain Ach1-1. For in situ assays, strain Ach1-1 was very protective against P. expansum on postharvest wounded apples. However, the application of high concentrations of exogenous sugars, vitamins and most particularly amino acids, significantly reduced such protection. Time-course analysis of apple amino acids at the wound site revealed that these compounds were more depleted in wounds treated with strain Ach1-1 alone and especially in those treated with both agents (strain Ach1-1 and P. expansum) compared to wounds treated with P. expansum alone or to untreated ones. Exogenous amino acids, applied at high concentrations on apple wounds as a mixture of specific amino acid groups or as individuals, significantly decreased strain Ach1-1 efficacy against P. expansum. The present study provides in vitro and in situ evidence that competition for apple nutrients, most particularly amino acids, may be a main mechanism of the biocontrol activity of A. pullulans strain Ach1-1 against blue mold caused by P. expansum on harvested apple fruit.
Keywords: Amino acids; Aureobasidium pullulans; Biocontrol; Nutrient competition; Penicillium expansum; Postharvest apples

Taehyun Ahn, Gopinadhan Paliyath, Dennis P. Murr, Antioxidant enzyme activities in apple varieties and resistance to superficial scald development, Food Research International, Volume 40, Issue 8, October 2007, Pages 1012-1019, ISSN 0963-9969, DOI: 10.1016/j.foodres.2007.05.007.
(http://www.sciencedirect.com/science/article/B6T6V-4NT84M6-2/2/ae80f0ed29112c56c5f8bcda2f5c7010)
Abstract:
The activities and isozyme profiles of superoxide dismutase (SOD), guaiacol peroxidase (POX) and ascorbate peroxidase (APX) were monitored in skin tissues of scald-resistant and scald-susceptible apple cultivars (Malus domestica Borkh.). SOD activity was high in Gala, with moderately high levels in Idared, McIntosh and Delicious, and low levels in Cortland and Empire. Guaiacol peroxidase activities were high in Empire, McIntosh and Delicious, with moderate to low levels in Cortland, Gala and Idared. Ascorbate peroxidase activity was nearly similar in all the cultivars. Native PAGE and activity staining showed great differences in the guaiacol peroxidase isozyme profiles. Ascorbate peroxidase isozyme profiles showed a fast moving isozyme present in all cultivars. Tissue printing for peroxidase in varieties such as Empire and Crispin showed intense activity, especially in the epidermal region. [alpha]-Farnesene levels were variable in all the cultivars. The results suggest that other biochemical characteristics in addition to the antioxidant enzyme activities and [alpha]-farnesene levels may be involved in determining the susceptibility/resistance to superficial scald development.
Keywords: [alpha]-Farnesene; Ascorbate peroxidase; Malus domestica Borkh; Guaiacol peroxidase; Superoxide dismutase

Frank Will, Henriette Zessner, Hans Becker, Helmut Dietrich, Semi-preparative isolation and physico-chemical characterization of 4-coumaroylquinic acid and phloretin-2'-xyloglucoside from laccase-oxidized apple juice, LWT - Food Science and Technology, Volume 40, Issue 8, October 2007, Pages 1344-1351, ISSN 0023-6438, DOI: 10.1016/j.lwt.2006.09.011.
(http://www.sciencedirect.com/science/article/B6WMV-4MBJYB0-3/2/a06f1da3726a13d863c8ff4b4f9d0341)
Abstract:
Two not commercially available apple polyphenols, 4-coumaroylquinic acid and phloretin-2'-xyloglucoside, were isolated from an apple juice previously oxidized with a laccase (polyphenol oxidase, EC 1.10.3.2). Juice oxidation in combination with ultrafiltration removed polyphenols with ortho-dihydroxyphenol structures, e.g. caffeic acid, flavanols and flavonols, which led to a reduced number of peaks in the chromatogram. Subsequently, a polyphenol extract from this juice was manufactured using an adsorber resin technique. The extract served as a basis for the proper isolation of the target substances by means of semi-preparative RP-HPLC. The structures of 4-coumaroylquinic acid and phloretin-2'-xyloglucoside were confirmed with LCMS- and NMR-data, respectively. The use of the isolated target substances as quantification references improved the quantitative HPLC of apple juices distinctly. Besides the reference compounds could be used for testing their biological activity.
Keywords: Apple; Polyphenols; Laccase; Ultrafiltration; Adsorber resin; LCMS; NMR

Yucheng Fu, Kaili Zhang, Niya Wang, Jinhua Du, Effects of aqueous chlorine dioxide treatment on polyphenol oxidases from Golden Delicious apple, LWT - Food Science and Technology, Volume 40, Issue 8, October 2007, Pages 1362-1368, ISSN 0023-6438, DOI: 10.1016/j.lwt.2006.11.001.
(http://www.sciencedirect.com/science/article/B6WMV-4MNRN6K-1/2/0a2f3ffdaf2b3f2aba893337390a0bbb)
Abstract:
Effects of chlorine dioxide (ClO2) treatment on the activity and characteristics of polyphenol oxidase (PPO) in Golden Delicious apples were studied. The treatment with 50 mg/l ClO2 for 1 h did not affect some characteristics of the PPO, including its optimum pH value (5.0) and temperature (40 [degree sign]C) as well as the maximum absorption wavelength (412 nm) of the final products. With increasing ClO2 concentrations from 0 to 100 mg/l, the value reduced and value changed irregularly. When the concentration of ClO2 increased from 0 to 60 mg/l, residual PPO activities significantly decreased, showing a negative linear-correlation with ClO2 concentration. For 10 and 50 mg/l ClO2 treatments, partial inhibition of PPO was achieved within 0.5 h and the PPO activities did not significantly decrease after 0.5 h. The inhibition and inactivation of PPO by ClO2 treatment were observed at processing temperatures (30 and 70 [degree sign]C) and storing temperatures (20, 0-4, and -18 [degree sign]C).
Keywords: Inhibition; Anti-browning; Enzyme; Chemical treatment; Enzymatic kinetics

Yi-Pei Lin, Feng-Lin Hsu, Chien-Shu Chen, Ji-Wang Chern, Mei-Hsien Lee, Corrigendum to 'Constituents from the Formosan apple reduce tyrosinase activity in human epidermal melanocytes' [Phytochemistry 68 (2007) 1189-1199], Phytochemistry, Volume 68, Issue 19, Reports on Structure Elucidation, October 2007, Page 2498, ISSN 0031-9422, DOI: 10.1016/j.phytochem.2007.05.034.
(http://www.sciencedirect.com/science/article/B6TH7-4P2S2BF-3/2/8d551faeed040ca9636bd79b44e0adc4)

M. Van Zeebroeck, V. Van linden, P. Darius, B. De Ketelaere, H. Ramon, E. Tijskens, The effect of fruit factors on the bruise susceptibility of apples, Postharvest Biology and Technology, Volume

46, Issue 1, October 2007, Pages 10-19, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.03.017.
(http://www.sciencedirect.com/science/article/B6TBJ-4P301WC-1/2/35715d23c48eb98d79171a7b816af090)
Abstract:
Bruise prediction models which are essential for the applicability of the discrete element method (DEM) to simulate bruise damage during fruit transport and handling are discussed. Bruise prediction models relate the contact force during impact, as calculated by DEM through contact force models, with the real bruise damage. Apart from DEM, bruise prediction models can provide useful information about the influence of fruit factors (e.g. ripeness) on bruise susceptibility, leading to recommendations for fruit handling. Regression models were built with impact energy or peak contact force as independent variables. Advantages and disadvantages of both models are discussed. Bruise prediction models were constructed for the apple cultivar `Jonagold', with impacts controlled by a pendulum. Multiple linear and nonlinear regression models were built to link fruit factors such as ripeness, acoustic stiffness, fruit temperature, radius of curvature and harvest date, with bruise damage. Bruise volume was used as a measure for apple bruising. Significant main effects and significant interactions between fruit factors were identified. Interactions between fruit factors (e.g. interaction between harvest date and stiffness), along with interactions between fruit factors and the degree of bruising, were identified. Most of the effects of those fruit factors on bruise damage could be explained by applying theoretical bruise models described in the literature.
Keywords: Bruise; Fruit; Apple; Mechanical damage; Modelling; Discrete element; Regression models

Hongmei Liao, Xiaosong Hu, Xiaojun Liao, Fang Chen, Jihong Wu, Inactivation of Escherichia coli inoculated into cloudy apple juice exposed to dense phase carbon dioxide, International Journal of Food Microbiology, Volume 118, Issue 2, 15 September 2007, Pages 126-131, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.06.018.
(http://www.sciencedirect.com/science/article/B6T7K-4P6M5X1-3/2/a486b42dffc9de171e93f9641cb3e11b)
Abstract:
The inactivation of Escherichia coli in cloudy apple juice by dense phase carbon dioxide (DPCD) was investigated. With CO2 at 20 MPa and 37 [degree sign]C or at 30 MPa and 42 [degree sign]C, the inactivation of E. coli significantly increased ($p < 0.05$) when increasing the exposure time, which conformed to a fast-to-slow two-stage kinetics. The two stages were well fitted to first-order reactions. Higher temperature or pressure significantly enhanced the bactericidal effect of DPCD ($p < 0.05$), the maximum reduction was 7.66 log CFU at 45 MPa and 52 [degree sign]C for 30 min. The survival curves against temperature or pressure were fitted using a linear equation with high regression coefficients ($R2 > 0.94$). The temperature inactivation rate (kT) and pressure inactivation rate (kP) were obtained. Higher kT or kP indicated higher susceptibility of E. coli to temperature or pressure. Moreover, there was good linear correlation of kT with pressure ($R2 = 1.00$). Also, kP increased with increasing temperature except for 37 [degree sign]C. Greater inactivation of E. coli was obtained with 99.9% CO2 than with 99.5% CO2 or with the initial number of 105 CFU/mL than with that of 108 CFU/mL at 20 MPa and 37 [degree sign]C.
Keywords: Escherichia coli; Inactivation; Dense phase carbon dioxide; Cloudy apple juice

Katleen Baert, Antonio Valero, Bruno De Meulenaer, Simbarashe Samapundo, Monzur Morshed Ahmed, Li Bo, Johan Debevere, Frank Devlieghere, Modeling the effect of temperature on the growth rate and lag phase of Penicillium expansum in apples, International Journal of Food Microbiology, Volume 118, Issue 2, 15 September 2007, Pages 139-150, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2007.07.006.

(http://www.sciencedirect.com/science/article/B6T7K-4P61N2S-3/2/4666b3480ca98fb2324f1160d6a9b914)
Abstract:
The objective of the present study was to develop validated models that describe the effect of storage temperature on the growth rate and lag phase of six Penicillium expansum strains. The growth of the selected strains was therefore studied on Apple Puree Agar Medium (APAM) at 30, 25, 16, 10, 4 and 2 [degree sign]C. Growth rates and lag phases were estimated using linear regression. Several secondary models were evaluated and for the growth rate, a modification of the extended Ratkowsky model was selected. Regarding the lag phase, the Arrhenius-Davey model provided the best adjustment to the observed data. Model validation was performed in two steps. Firstly, the developed models were validated on APAM. The obtained bias factors (Bf) ranged from 0.91 to 1.14 and the accuracy factors (Af) were < 1.2 for the validation performed on APAM, indicating that the models were good predictors of the true mean colony growth rate and lag phase. Afterwards, an external validation was carried out in apples. For the growth rate, Bf ranged from 0.64 to 0.81 and Af < 1.39, indicating conservative predictions. On the contrary for the lag phase, a clear deviation was observed between predictions and observed values on apples (0.35 < Bf < 0.7 and Af > 1.6). These results highlight that the use of simulation or synthetic media for the development of predictive models for the lag phase of moulds can lead to inadequate predictions and that a validation on the real food matrix is necessary. Application of the developed models is possible in the framework of Quantitative Risk Assessment to develop control strategies against blue mould rot in apple and enables the inclusion of strain variability. However, possible underestimation of the lag phase should be taken into account.
Keywords: Apple; Penicillium expansum; Model; Growth rate; Lag phase; Validation; Simulation medium

Huseyin Karlidag, Ahmet Esitken, Metin Turan, Fikrettin Sahin, Effects of root inoculation of plant growth promoting rhizobacteria (PGPR) on yield, growth and nutrient element contents of leaves of apple, Scientia Horticulturae, Volume 114, Issue 1, 11 September 2007, Pages 16-20, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.04.013.
(http://www.sciencedirect.com/science/article/B6TC3-4NX8RKN-4/2/d007f6c33e1f099c079e9cd4738c6dcc)
Abstract:
From 2002 to 2006, plant growth promoting effects of Bacillus M3, Bacillus OSU-142 and Microbacterium FS01 were tested alone or in combination on apple (Malus domestica L.) cv. Granny Smith in terms of yield, growth and nutrient composition of leaves in the province of Malatya, Turkey. The presence of M3 and/or OSU-142 and/or FS01 combinations stimulated plant growth and resulted in significant yield increases in Granny Smith. Root inoculation of PGPR strains significantly increased cumulative yield (26.0-88.0%), fruit weight (13.9-25.5%), shoot length (16.4-29.6%) and shoot diameter (15.9-18.4%) compared with the control. In addition, all nutrient element contents (N, P, K, Mg, Ca, Fe, Mn and Zn) investigated in Granny Smith, except Mg was significantly affected by bacterial applications compared with the control. The highest N content (3.38%) was obtained from OSU-142 + FS01 application. Phosphorus contents of leaves of Granny Smith increased from 0.29% in the control to 0.42, 0.37, 0.36, 0.36 and 0.35% by M3, M3 + FS01, M3 + OSU-142, OSU-142 and M3 + OSU-142 + FS01 application, respectively. All bacterial applications significantly increased Ca content of leaves. The highest K, Fe, Mn, Cu and Zn content of leaves were obtained from OSU-142, M3, FS01, M3 and M3 + FS01 applications, respectively. The results of this study suggest that Bacillus M3 and/or OSU-142 and/or Microbacterium FS01 in combination have the potential to increase the yield, growth and nutrition of apple trees.
Keywords: PGPR; Root inoculation; Malus domestica; Yield; Growth; Nutrition

Maja Mikulic Petkovsek, Franci Stampar, Robert Veberic, Parameters of inner quality of the apple scab resistant and susceptible apple cultivars (Malus domestica Borkh.), Scientia Horticulturae, Volume 114, Issue 1, 11 September 2007, Pages 37-44, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.05.004.
(http://www.sciencedirect.com/science/article/B6TC3-4P5RM4X-2/2/c066ce57beb04f196418030720452cdc)
Abstract:
Individual organic acids and sugars were analysed in the fruits of scab resistant and susceptible apple cultivars. The total sugars ranged between 128.2 and 191.6 g/kg, and the total organic acid between 5.1 and 13.4 g/kg. In the flesh and peels of different apple varieties single phenolics (gallic, protocatehuic, chlorogenic, caffeic, ferulic and p-coumaric acid, phloridzin, epicatechin, catechin, quercitrin and rutin) were analysed together with their total phenolic content (TPC). `Golden Delicious' was the cultivar with the lowest TPC whereas `Rubinola', `Jonagold' and `Goldrush' had the highest level of TPC in the pulp. Peels showed a 2-9 times higher phenolic content than the pulp. `Goldrush' had the highest content of TPC in its peel. The total antioxidant capacity of peels was about 2-5 times higher than respective pulps. Scab resistant apple cultivars had significantly higher content of some single and total phenolic contents in comparison with the scab susceptible, especially the pulp.
Keywords: Malus domestica; Apple scab; Sugars; Organic acids; Phenolic compounds; Antioxidant capacity; Scab resistance

Raul T. Villanueva, James F. Walgenbach, Phenology, management and effects of Surround on behavior of the apple maggot (Diptera: Tephritidae) in North Carolina, Crop Protection, Volume 26, Issue 9, September 2007, Pages 1404-1411, ISSN 0261-2194, DOI: 10.1016/j.cropro.2006.12.001.
(http://www.sciencedirect.com/science/article/B6T5T-4N08WVH-1/2/2f87d265792b3c8ceff80c41ccd5a437)
Abstract:
Studies were conducted in 2002 and 2003 to evaluate the phenology of the apple maggot, Rhagoletis pomonella (Walsh), in Henderson County, NC, and to compare the efficacy of various products for protection of fruit from maggot infestation. The period of peak trap capture on red spheres differed among orchards, with two orchards having peak captures in early June, and in an abandoned orchard peak capture occurred in late July-September. Surround WP, a particle film kaolin clay product, was evaluated for management of apple maggot at 28.0 kg/ha at two spray volumes (935 and 1870 L/ha) and two application intervals (7- and 14-d). The percentage of apple maggot-infested fruit in Surround treatments, regardless of the spray volume evaluated, was equivalent to that of azinphosmethyl and spinosad treatments. Application of Surround with an airblast sprayer resulted in heterogeneous coverage of fruit within the tree canopy, with higher deposition on fruit on the periphery of trees compared with those in the inner or upper canopy. In choice tests with apple maggot populations in an abandoned orchard, fewer flies alighted on Surround-treated foliage or fruit compared with the water controls, suggesting that the whitish color of Surround-treated trees interfered with visual cues used by flies to locate hosts. In an abandoned orchard with >60% of non-treated fruit infested with apple maggot, the chloronicotinyl compounds imidacloprid (10.0%) and thiacloprid (5.3%) resulted in comparable levels of control to that of azinphosmethyl (8.0%), while spinosad, indoxacarb, and thiamethoxam all had >33% infested fruit. These studies demonstrated that Surround and a number of chloronicotinyl insecticides may be alternatives to azinphosmethyl for management of apple maggot in North Carolina.
Keywords: Rhagoletis pomonella; Kaolin; Choice test; Reduced-risk insecticides

D. Spadaro, A. Ciavorella, S. Frati, A. Garibaldi, M.L. Gullino, Incidence and level of patulin contamination in pure and mixed apple juices marketed in Italy, Food Control, Volume 18, Issue 9, September 2007, Pages 1098-1102, ISSN 0956-7135, DOI: 10.1016/j.foodcont.2006.07.007.
(http://www.sciencedirect.com/science/article/B6T6S-4KW5WB6-1/2/cd88661b807a6a61d8868152fe4b3c12)
Abstract:
A survey on the occurrence of patulin was conducted during 2005 on commercial pure apple juices (53 samples) and mixed apple juices (82 samples) marketed in Italy. The current study was undertaken to investigate the possible influence of the agro-food production process employed (conventional or organic), of the fruit percentage in the commercial product (higher or lower than 50%) and of the type of apple juice (clear or cloudy) on the occurrence and level of patulin contamination. Patulin could be quantified in 34.8% of the samples ranging from 1.58 to 55.41 [mu]g kg-1. With the exception of one sample, the level of patulin was lower than 50 [mu]g kg-1, the maximum permitted threshold in fruit juices according to the European legislation. Mean levels of patulin were significantly lower in mixed apple juices (4.54 [mu]g kg-1) than in pure apple juices (9.32 [mu]g kg-1). Levels of patulin contamination were comparable in clear and cloudy juices. A similar incidence of positive samples was found in conventional and organic apple based juices, and the magnitude between the mean contamination levels, although higher in organic (10.92 [mu]g kg-1) than in conventional juices (4.77 [mu]g kg-1), was not statistically significant ($p = 0.771$; Mann-Whitney test). The magnitude between the means of patulin contamination in juices containing more than 50% fruit (11.26 [mu]g kg-1) and in juices with 50% or less fruit (3.35 [mu]g kg-1) was statistically significant ($p = 0.016$; Mann-Whitney test).
Keywords: Apple juice; HPLC; Mycotoxin; Patulin; Penicillium expansum

Sylvain Guyot, Solenn Serrand, Jean Michel Le Quere, Philippe Sanoner, Catherine M.G.C. Renard, Enzymatic synthesis and physicochemical characterisation of phloridzin oxidation products (POP), a new water-soluble yellow dye deriving from apple, Innovative Food Science & Emerging Technologies, Volume 8, Issue 3, 4th International Congress on Pigments in Food: Pigments in Food - A Challenge to Life Sciences, September 2007, Pages 443-450, ISSN 1466-8564, DOI: 10.1016/j.ifset.2007.03.021.
(http://www.sciencedirect.com/science/article/B6W6D-4ND0RT0-4/2/b7d8339561394d5340e42f5ae2ca60b6)
Abstract:
Phloridzin is a phenolic compound specifically found in apple and particularly concentrated in the pomace. Its oxidation by mushroom polyphenol oxidase followed a very specific pathway: phloridzin was first almost totally converted to a colourless intermediate (POPi), which was then converted to a yellow pigment (POPj) without any significant side reactions. The pigment could be an alternative to tartrazin for use as a food dye. Maximum yields were 84% for both compounds, depending on the incubation time. POPj had a bright yellow colour at pH 3 to 5, turning to orange for higher pHs. Half saturation at pH 3 was obtained for a concentration close to 30 mg/L. Kinetics of degradation of POPj in aqueous solution were determined as a function of pH and temperature. Treatments for several hours at high temperature (above 80 [degree sign]C) resulted in a partial degradation, which was accelerated when the pH increased. However, POPj was only weakly degraded by prolonged storage at ambient temperature. Esterification of POPi and POPj in ethanol/HCl yielded the corresponding ethyl esters with 60 and 98% yields, respectively. POPi and its ethyl ester showed free radical scavenging activities (DPPH method) comparable to those of well-known antioxidants such as ascorbic acid, trolox or (-)-epicatechin.Industrial relevance
In the field of food dyes, industries are more and more interested in alternatives to synthetic dye. The purpose of this study is to show the benefits and also the limits of a new bright yellow and highly hydrosoluble dye resulting from the enzymatic oxidation of phloridzin by polyphenoloxidase. Phloridzin is concentrated in apple pomace which is the major by-product of apple juice and cider

production. Therefore, the use of apple pomace for the production of a new yellow dye might be possible. The pigment could be an alternative to tartrazin for use as a food dye.
Keywords: Dihydrochalcones; Polyphenoloxidase; Kinetics; Colorant; Stability; Tartrazin; Pigment

Yankun Peng, Renfu Lu, Prediction of apple fruit firmness and soluble solids content using characteristics of multispectral scattering images, Journal of Food Engineering, Volume 82, Issue 2, September 2007, Pages 142-152, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2006.12.027.
(http://www.sciencedirect.com/science/article/B6T8J-4N0X5J3-6/2/68d51590c7be65dee2e3c64935e1bf7d)
Abstract:
Multispectral scattering is a promising technique for non-destructive sensing of multiple quality attributes of apple fruit. This research developed new, improved methods for processing and analyzing multispectral scattering profiles in order to design and build a better multispectral imaging system for real-time measurement of apple fruit firmness and soluble solids content. Spectral scattering images were obtained from Golden Delicious apples at four selected wavebands (680, 800, 900 and 950 nm) using a common-aperture multispectral imaging system. The scattering intensity and distance were corrected by incorporating the effect of individual apples' size. A new method of correcting scattering image profiles was proposed to minimize the effect of light source variation on the calculation of scattering function parameters. Modified Gompertz and Lorentzian functions with four parameters and their variants were evaluated and compared for predicting fruit firmness and soluble solids content using multi-linear regression and cross-validation methods. The modified Gompertz function had better prediction results with a correlation coefficient (r) of 0.896 and a standard error of prediction (SEP) of 6.50 N for firmness, and r = 0.816 and SEP = 0.92% for soluble solids content. This new function, coupled with the scattering profile correction methods, improved the multispectral scattering technique for measuring fruit quality.
Keywords: Fruit; Apples; Firmness; Soluble solids content; Multispectral imaging; Scattering; Modified Lorentzian function; Modified Gompertz function

Zhaoshen Qing, Baoping Ji, Manuela Zude, Predicting soluble solid content and firmness in apple fruit by means of laser light backscattering image analysis, Journal of Food Engineering, Volume 82, Issue 1, September 2007, Pages 58-67, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.01.016.
(http://www.sciencedirect.com/science/article/B6T8J-4N0HJ8Y-2/2/5104f14e247da7c7faeba170280c9012)
Abstract:
Laser-induced light backscattering imaging was studied regarding its potential for analyzing apple soluble solids content (SSC) and fruit flesh firmness. Images of the backscattering of light on the fruit surface were obtained from `Elstar' and `Pinova' apples using laser diodes emitting at five wavelength bands. Image processing algorithms were tested to correct for dissimilar equator and shape of fruit. Particularly the frequencies of gray scale intensities obtained for selected wavelengths were used for the first time to calibrate on the fruit firmness and SSC using partial least squares regression. Calibration with highest performance for predicting `Elstar' SSC was based on the corrected intensity frequency of raw data set with correlation coefficient of r = 0.89 and standard error of cross validation %SECV = 4.14. For evaluating `Elstar' flesh firmness, corrected frequency gave the highest r = 0.90, and %SECV = 5.49. An inter-cultivar test-set validation of the method resulted in SEP < 13% for SSC and firmness prediction.
Keywords: Apples; Firmness; SSC; Scattering; Imaging

William S. Conway, Wojciech J. Janisiewicz, Britta Leverentz, Robert A. Saftner, Mary J. Camp, Control of blue mold of apple by combining controlled atmosphere, an antagonist mixture, and

sodium bicarbonate, Postharvest Biology and Technology, Volume 45, Issue 3, September 2007, Pages 326-332, ISSN 0925-5214, DOI: 10.1016/j.postharvbio.2007.03.005.
(http://www.sciencedirect.com/science/article/B6TBJ-4NK473V-3/2/b0e2fbb9716374cd67a452fa6ebc3b7d)
Abstract:
`Golden Delicious' apples were wound-inoculated with Penicillium expansum and treated with various combinations of sodium bicarbonate and two antagonists (Metschnikowia pulcherrima, Cryptococcus laurentii), and then stored in air or controlled atmosphere (CA = 1.4 kPa O2 and 3 kPa CO2) for 2 or 4 months at 1 [degree sign]C. The antagonists survived and their populations increased during both air and CA storage. The antagonists alone reduced blue mold but were more effective when combined. Sodium bicarbonate tended to reduce lesion size when used with these antagonist, either when they were used alone or combined. Storage under CA conditions also increased the effectiveness of both antagonist, when used alone or in combination. The only treatment that completely eliminated P. expansum-incited decay was the combination of the two antagonists and sodium bicarbonate on fruit stored under CA conditions. The proper combination of alternative control measures can provide commercially acceptable long-term control of fruit decay and could help reduce our dependency on fungicides.
Keywords: Metschnikowia pulcherrima; Cryptococcus laurentii; Postharvest biocontrol; Integrated control

Helena Sircelj, Michael Tausz, Dieter Grill, Franc Batic, Detecting different levels of drought stress in apple trees (Malus domestica Borkh.) with selected biochemical and physiological parameters, Scientia Horticulturae, Volume 113, Issue 4, 14 August 2007, Pages 362-369, ISSN 0304-4238, DOI: 10.1016/j.scienta.2007.04.012.
(http://www.sciencedirect.com/science/article/B6TC3-4P00SC9-1/2/4cfdaea355bc9113db138f75d3ff47bb)
Abstract:
Rational irrigation scheduling based on sensing drought stress directly in plants is becoming more important due to increasing worldwide scarcity of fresh water supplies. In order to evaluate a set of potential biochemical and physiological stress indicators and select the best drought stress markers in apple trees, two experiments with potted trees and an experiment with intensive orchard grown apple trees `Elstar' and `Jonagold Wilmuta' were conducted in early summer in tree following years. Biochemical parameters: ascorbic acid, glutathione, tocopherols, chlorophylls, carotenoids, free amino acids, soluble carbohydrates, and physiological parameters already known as stress indicators in apple trees: predawn and midday leaf water potential, net photosynthesis (Pn), stomatal conductance (gs), transpiration (Tr) and intercellular CO2 concentration (Ci) were measured in leaves of apple trees subjected to different intensities of slowly progressing drought or no drought. Our study pointed out zeaxanthin and glutathione as the best drought stress markers in apple trees. Ascorbate and sorbitol appeared to be reliable indicators of moderate drought only. Responses of other tested biochemical parameters were not consistent enough to prove their role as drought stress markers in apple trees. Relative air humidity should be taken in consideration when physiological parameters gs, Pn, Tr and Ci are used as drought stress markers in apple trees. Our study revealed that in situations where low relative air humidity affects gs and with gs connected physiological parameters, biochemical markers may be better tool for determination of drought stress intensities in apple trees.
Keywords: Apple; Tree; Drought; Stress; Marker; Irrigation scheduling

J.V. Cross, S. Cubison, A. Harris, R. Harrington, Autumn control of rosy apple aphid, Dysaphis plantaginea (Passerini), with aphicides, Crop Protection, Volume 26, Issue 8, August 2007, Pages 1140-1149, ISSN 0261-2194, DOI: 10.1016/j.cropro.2006.10.007.

(http://www.sciencedirect.com/science/article/B6T5T-4MM8B5K-1/2/c99c05937c177685a02d17be27ed72e3)
Abstract:
Rosy apple aphid, Dysaphis plantaginea (Passerini), is normally controlled in commercial apple orchards by an application of an aphicide in the spring. Control is often inadequate, especially in organic production where the range of aphicides permitted, which are only contact acting, is very restricted. A series of eight large-scale replicated orchard experiments evaluated control of rosy apple aphid by autumn applications of aphicides. The experiments showed that control of the aphid in the autumn with pirimicarb or pirimicarb+cypermethrin can be highly effective and, with 2-3 sprays of the organically permitted insecticide pyrethrum, moderately effective. The optimum time for spraying was week 40-41 (early-mid October), coinciding with the start of migration of males and before mating and egg laying, as indicated by Rothamsted Insect Survey suction traps at 8 sites throughout England. The other organically acceptable materials tested (potassium soap, rotenone, garlic extract, kaolin, neem extract, starch-based plant extracts) did not give useful control.
The vulnerability of gynoparae and oviparae on the flat undersides of leaves (i.e. leaves not curled by aphid feeding) in the autumn where they can be directly intercepted with sprays, compared to the inaccessibility of fundatrices and fundatrigeniae enclosed in blossom clusters and leaves curled by aphid feeding in spring, is discussed. The need to develop assessment methods and treatment thresholds for autumn treatment so routine spraying can be avoided, is highlighted.
Keywords: Insecticide; Gynoparae; Oviparae; Dysaphis plantaginea; Apple; Organic; Chemical control; Rosy apple aphid; Kaolin; Neem extract; Pyrethrum; Pirimicarb; Cypermethrin

E.I. Benitez, D.B. Genovese, J.E. Lozano, Scattering efficiency of a cloudy apple juice: Effect of particles characteristics and serum composition, Food Research International, Volume 40, Issue 7, August 2007, Pages 915-922, ISSN 0963-9969, DOI: 10.1016/j.foodres.2007.03.004.
(http://www.sciencedirect.com/science/article/B6T6V-4NDDM05-1/2/fdb6427f17b036b85e63008896c23050)
Abstract:
The effect of particles and serum characteristics on turbidity of natural, or 'regular', and modeled cloudy apple juices was studied in this work. Modeled apple juices were made by re-dispersing a determined quantity of apple particles in a simplified serum (mainly glucose, hydrolyzed pectin, and malic acid in water). Only glucose was found to have a significant effect on turbidity. Particle size was affected by soluble solids concentration, which was attributed to conformational changes in juice particles aggregates, simultaneously with a reduction in particle solvatation. Scattering efficiency was determined in natural and modeled cloudy apple juice both experimentally from a nephelometric method, , and theoretically with the Mie theory, QMie. Decrease in juice specific turbidity at increasing soluble solids concentrations (X), was governed by the decrease of at increasing refractive index of the liquid medium nm. As predicted by theory, the scattering efficiency increased at increasing particle size, for a constant nm. Finally, calculated values of and QMie followed a power law relationship when correlated. This non-linear behavior was explained by considering that QMie is the theoretical scattering efficiency of monodisperse-homogeneous spheres, while is the experimental nephelometric scattering efficiency of polydisperse-irregular particles.
Keywords: Scattering efficiency; Cloudy apple juice

Mya Mya Khin, Weibiao Zhou, Shi Yun Yeo, Mass transfer in the osmotic dehydration of coated apple cubes by using maltodextrin as the coating material and their textural properties, Journal of Food Engineering, Volume 81, Issue 3, August 2007, Pages 514-522, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2006.12.005.

(http://www.sciencedirect.com/science/article/B6T8J-4MMPNCW-1/2/d958f9f8e7091df3b4d60c4f313b8cdf)
Abstract:
Apple cubes of 1 cm3 were coated by using 20% and 50% (w/v) maltodextrin solutions, respectively. They were subsequently dried in an oven at 70 [degree sign]C for 10 and 40 min, respectively, to solidify the coating. Osmotic dehydration was then conducted to both coated and non-coated samples under the process temperature of 30 [degree sign]C and osmotic solution concentration of 61.5% (w/v) sucrose. The food to solution ratio was kept constant at 1:20 throughout the osmotic dehydration process. Results showed that the coated samples using 20% (w/v) maltodextrin solution and oven-dried for 40 min yielded negative dry matter gain and sugar gain during the osmotic dehydration process. Furthermore, the coated samples using 50% (w/v) maltodextrin solution and oven-dried for 10 and 40 min also yielded negative dry matter gain and sugar gain during the osmotic dehydration process. Possible reasons for these unusual negative gains were investigated, including dissolution of the coating material during the osmotic dehydration process and strong correlation between the drying time and shrinkage of the cells within the apple cubes. In addition, moisture loss of the coated samples was much smaller than that of non-coated samples. Instrumental texture profile analysis (TPA) of the non-coated and coated samples was performed, measuring the quality attributes such as hardness, brittleness, springiness and cohesiveness. Results showed that the structure of most samples was altered after the osmotic dehydration except those coated using 50% or 20% (w/v) maltodextrin solutions and oven-dried for 10 min.
Keywords: Osmotic dehydration; Coating; Maltodextrin; TPA; Microscopic analysis; Apple tissue

Bin Zhu, Lu Jiang, Yaguang Luo, Yang Tao, Gabor feature-based apple quality inspection using kernel principal component analysis, Journal of Food Engineering, Volume 81, Issue 4, August 2007, Pages 741-749, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2007.01.008.
(http://www.sciencedirect.com/science/article/B6T8J-4MXBF7B-3/2/7dcd276b08365f3438fda67cf5cbd54e)
Abstract:
Automated inspection of apple quality involves computer recognition of good apples and blemished apples based on geometric or statistical features derived from apple images. This paper introduces a Gabor feature-based kernel principal component analysis (PCA) method by combining Gabor wavelet representation of apple images and the kernel PCA method for apple quality inspection using near-infrared (NIR) imaging. First, Gabor wavelet decomposition of whole apple NIR images was employed to extract appropriate Gabor features. Then, the kernel PCA method with polynomial kernels was applied in the Gabor feature space to handle non-linear separable features. The results show the effectiveness of the Gabor-based kernel PCA method in terms of its absolute performance and comparative performance compared to the PCA, kernel PCA with polynomial kernels, Gabor-based PCA and the support vector machine methods. Using the proposed Gabor kernel PCA eliminated the need for local feature segmentation, but also resolved the non-linear separable problem. An overall 90.6% recognition rate was achieved.
Keywords: Gabor wavelet; Principal component analysis (PCA); Kernel PCA; Gabor-based kernel PCA; Apple quality inspection; Near-infrared

Maria A. Rojas-Grau, Roberto J. Avena-Bustillos, Carl Olsen, Mendel Friedman, Philip R. Henika, Olga Martin-Belloso, Zhongli Pan, Tara H. McHugh, Effects of plant essential oils and oil compounds on mechanical, barrier and antimicrobial properties of algi