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GENERAL

1-METHYLCYCLOPROPENE

Li, Pengxia, et al. 2017. Shelf life extension of fresh lotus pods and seeds (*Nelumbonucifera* Gaertn.) in response to treatments with **1-MCP** and lacquer wax. *Postharvest Biol. Tec.* 125: 140-149.

Abstract

Lotus pods were treated with 0.5 $\mu\text{L L}^{-1}$ of 1-methylcyclopropene (1-MCP) and 3% lacquer wax and then stored at 25 ± 1 °C and 90%–95% relative humidity to investigate their effects alone and in combination on browning and postharvest quality during 8 d of shelf life. Respiration rate, firmness, reactive oxygen species (superoxide anion ($\text{O}_2^{\cdot-}$) production rate and H_2O_2 concentration), malondialdehyde (MDA) and total phenol concentrations, and the activities of superoxide dismutase (SOD), catalase (CAT), peroxidase (POD) and polyphenol oxidase (PPO) were evaluated. 1-MCP or lacquer wax reduced browning and retained the quality of lotus pods and seeds. However, lacquer wax had little influence on the respiration rate, and 1-MCP-treated pods were firmer than untreated pods for only 6 d. The combination treatment of lacquer wax followed by 1-MCP treatment showed equivalent effects on respiration rate and firmness to lacquer wax alone. However, the lotus pods that were treated with 1-MCP first, and then coated with lacquer wax, had better retention of firmness and total phenol concentration, reduced respiration rate, $\text{O}_2^{\cdot-}$ production rate, accumulation of H_2O_2 and MDA, and browning degree, increased SOD and CAT activities, and decreased PPO and POD activities when compared with those in other treatments. Compared with controls, 1-MCP treatment followed by lacquer wax coating treatment also delayed cell wall degradation, plasmolysis, and preserved cellular integrity of lotus seeds. These results indicate combination treatment provided an effective method to delay the postharvest senescence of fresh lotus pods and seeds.

Keywords: /1-Methylcyclopropene/ /Senescence/

COLD STORAGE

Del Carmen Villalobos, Maria, et al. 2017. Characterization of microbial population of breba and main crops (*Ficus carica*) during **cold storage**: Influence of passive modified atmospheres (MAP) and antimicrobial extract application. *Food Microbiol.* 63: 35-46.

Abstract

The purpose of this work was to study the changes of bacterial and fungal population of breba fruits such as ‘Banane’ and ‘San Antonio’ as well as ‘CuelloDama Negro’, ‘CuelloDama Blanco’ and ‘San Antonio’ fig cultivars stored in passive modified atmospheres (MAP) by the use of three different microperforated films (M10 with 16 holes; M30 with five holes and M50 with three holes). Moreover the effects of the application of aqueous soy polyphenolic antimicrobial extract (APE), alone or combined with MAP, were also studied for ‘CuelloDama Negro’ and ‘CuelloDama Blanco’ fig cultivars. Bacteria and fungi isolates were identified by PCR-RFLP of 16S rRNA and ITS regions, respectively, and subsequently sequence of the different patterns obtained. The results indicated that *Pseudomonas*

gessardii, *Pantoea agglomerans* and *Enterobacter asburiae* were the main species of bacteria found in all the treatments studied. The fungal species identified were *Aureobasidium pullulans*, *Cladosporium cladosporioides* and *Alternaria alternata*, which were found in a lower percentage in fruit stored in MAP and fruits treated with antimicrobial extracts, as this treatment allowed to reduce the microbial growth of moulds and yeasts. Thus, the application of treatments such as M30, M50 or the combination of MAP with antimicrobial extract was highly effective to control fruit spoilage in fig and breba crops.

Keywords: /Cold Storage/ /Modified Atmosphere/ /Fig/

COOL CHAIN

Cevoli, Chiara and Angelo Fabbri. 2017. Heat transfer finite element model of fresh fruit salad insulating packages in non-refrigerated conditions. *Biosyst. Eng.* 153: 89-98.

Abstract

The quality of many foods is significantly affected by temperature fluctuations that can occur during distribution and transport. Packaging materials can help to shield the product from temperature variation by increasing the heat transfer resistance. Thermal insulation power is influenced by several factors, such as material, geometry, and degree of contact between materials. To maintain the cool chain of fruit salad with syrup during the transportation (temperature less than 5°C), thermal insulation effect of different packaging materials was investigated. A parametric analysis using a finite element model able to describe the heat transfer inside the containers, on varying packaging material (expanded polystyrene: EPS, and air), geometry, dimension, and boundary conditions, was developed and validated. Good agreement was obtained between numerical and experimental results (R^2 up to 0.98). The effectiveness of the insulation configurations was evaluated by determining the time taken for the temperature to rise the critical value of 5°C. Results showed that insulating performance of the air is better than EPS. This is realistic only taking into account insulation layer less than 0.013 m. From a practical point of view, an EPS packaging could result stronger compared to a packaging characterized by an insulating air layer. For the same EPS insulation thickness, product temperature exponentially decreases with the volumetric capacity ($R^2 = 0.99$).

Keywords: /Cool chain/ /Fruit salad/

ETHYLENE

Wu, Fan, et al. 2017. **Ethylene**-influenced development of tree peony cut flowers and characterization of genes involved in ethylene biosynthesis and perception. *Postharvest Biol. Tec.* 125: 150-160.

Abstract

Effect of ethylene and ethylene antagonist 1-methylcyclopropene (1-MCP) on postharvest development of two *Paeonia suffruticosa* cultivars was investigated. According to the monitoring results, postharvest development of 'Luoyang Hong' was accelerated by ethylene and postponed by 1-MCP treatment, while 'Xue Ying Tao Hua' was ethylene-insensitive. Ethylene production was elevated by ethylene treatment in 'Luoyang Hong', but our study failed to provide evidence for involvement of the isolated biosynthetic genes in ethylene response. Three ethylene receptor genes were isolated and clustered with *AtETR1*, *AtERS1*, *AtEIN4*, respectively. Expression patterns of genes involved in ethylene

signal pathway were tested during development of the two cultivars and in response to exogenous ethylene and 1-MCP. Expression patterns of *PsERS1* and *PsEIN4* showed significant differences between 'Luoyang Hong' and 'Xue Ying Tao Hua'. Besides, *PsEIL2*, *PsEIL3* and *PsERF1* may play a role in regulation of ethylene response of tree peony. The present study provides insights into ethylene biosynthesis and signal transduction in tree peony cut flowers. However, further studies were needed to verify the gene function and to understand the mechanism underlying postharvest development of tree peony.

Keywords: /Ethylene/ /Ethylene sensitivity/ /Cut flowers/

FOOD SAFETY

Masson, Marine, Julien Delarue and David Blumenthal. 2017. An observational study of refrigerator food storage by consumers in controlled conditions. *Food Qual. Prefer.* 56: 294-300.

Abstract

Europeans and North Americans produce a total of 95–115 kg of annual food waste per capita, which corresponds to more than one-third of the total food production in these countries. One of the different assumptions presented in the literature is the food storage practices. With regards to food safety, poor and unhygienic handling as well as inappropriate storage conditions at the consumer level are critical issues. Consumers do not consider the nature of the food in the organization of the refrigerator. To investigate this assumption, a methodology was developed to study consumer behavior while placing food in the refrigerator. To approximate a home environment, the study was conducted in a test kitchen. Twenty consumers participated in the study. The experiments were filmed with different camera systems (four cameras fixed on the ceiling and one portable camera). The consumers were tasked with storing food from delivery bags in the refrigerator and in a kitchen closet. They also completed a questionnaire about their habits concerning food purchases and storage. This study reveals a wide diversity of behaviors for storing food in the refrigerator. The recommendations from the French Agriculture and Food Department are clearly not observed or even known. The main safety issues concern meats, ready-to-eat salads, and ready-made dough because they are sensitive to contamination with pathogens.

Keywords: /Food safety/ /Food storage/ /Refrigerator/

FRESH PRODUCE

Burgos, M^a Jose Grande, et al. 2017. Biofilms formed by microbiota recovered from fresh produce: Bacterial biodiversity, and inactivation by benzalkonium chloride and enterocin AS-48. *LWT-Food Sci. Technol.* 77: 80-84.

Abstract

Microbiota recovered from fresh produce (Romaine lettuce, endives and cucumbers) was allowed to form biofilms on stainless steel coupons. The formed biofilms were treated with benzalkonium chloride (BC) at three different concentrations (0.01, 0.1, and 1.0 g/l), enterocin AS-48 (50 µg/ml) and combinations of BC and enterocin AS-48. The single treatment with bacteriocin had no effect on viability of sessile bacteria. A high concentration of BC (1.0 g/l) was required to achieve 4.1 logs reduction of viable cell counts. The combination of BC (1.0 g/l) and enterocin AS-48 reduced viable cell counts below detectable levels. High-throughput sequencing analysis revealed that the formed biofilms were composed

mainly by *Proteobacteria* of the genera *Pseudomonas* and *Stenotrophomonas*. Treatments with enterocin AS-48 and BC at sub-inhibitory concentrations only induced minor changes in the relative abundance of the different bacterial groups associated with biofilms.

Keywords: /Fresh produce/ /Biofilms/

MODIFIED ATMOSPHERE PACKAGING

Han L., et al. 2016. Atmospheric cold plasma interactions with modified atmosphere packaging inducer gases for safe food preservation. *Innov. Food Sci. Emerg. Tech.* 38: 384-392.

Abstract

Diverse microbiological challenges and pervasive microbial resistance drive technological development in food processing, where increasing process complexity and consumer demand for less processed goods leads to strong demand for effective decontamination. Atmospheric cold plasma (ACP) has wide potential for decontamination application in the food sector. We investigated the effect of Modified Atmosphere Packaging (MAP) gas mixtures on reactive species generated, their efficacy and mechanism of inactivation against *Escherichia coli*, *Listeria monocytogenes* and *Staphylococcus aureus*. Oxygen levels in the applied working gas had positive interactive effects on ROS generation, in-package inactivation efficacy in conjunction with post-treatment storage time. *Listeria* populations were undetectable after 15 s treatment with high Oxygen MAP mix using 24 h post-treatment storage time. However, RNS generation and effect was dependent on the nitrogen content but also on the presence of oxygen. Different modes of interaction of ROS and RNS with Gram positive and Gram negative bacteria were observed.

Keywords: /Modified Atmosphere Packaging/ /Food safety/

ROCKET SALAD

Bell, Luke, Lisa Methven and Carol Wagstaff. 2017. The influence of phytochemical composition and resulting sensory attributes on preference for **salad rocket** (*Eruca sativa*) accessions by consumers of varying TAS2R38 diplotype. *Food Chem.* 222: 6-17.

Abstract

Seven accessions of *Eruca sativa* (“salad rocket”) were subjected to a randomized consumer assessment. Liking of appearance and taste attributes were analyzed, as well as perceptions of bitterness, hotness, pepperiness and sweetness. Consumers were genotyped for TAS2R38 status to determine if liking is influenced by perception of bitter compounds such as glucosinolates (GSLs) and isothiocyanates (ITCs). Responses were combined with previously published data relating to phytochemical content and sensory data in Principal Component Analysis to determine compounds influencing liking/perceptions. Hotness, not bitterness, is the main attribute on which consumers base their liking of rocket. Some consumers rejected rocket based on GSL/ITC concentrations, whereas some preferred hotness. Bitter perception did not significantly influence liking of accessions, despite PAV/PAV ‘supertasters’ scoring higher for this attribute. High sugar-GSL/ITC ratios significantly reduce perceptions of hotness and bitterness for some consumers. Importantly the GSL glucoraphanin does not impart significant influence on liking or perception traits.

Keywords: /Rocket salad/ /Leafy vegetables/ /Brassicaceae/
SHELF LIFE

Colas-Meda, Pilar, et al. 2017. Exposure to minimally processed pear and melon during **shelf life** could modify the pathogenic potential of *Listeria monocytogenes*. Food Microbiol. 62: 275-281.

Abstract

Survival and virulence of foodborne pathogens can be influenced by environmental factors such as the intrinsic properties of food as well as the extrinsic properties that contribute to food shelf life (e.g., temperature and gas atmosphere). The direct contribution of food matrix characteristics on the survival of *L. monocytogenes* during fresh-cut fruit shelf life is not very well understood. In addition, the gastrointestinal tract is the primary route of listeriosis infection and penetration of the intestinal epithelial cell barrier is the first step in the infection process. Hence, the pathogenic potential of *L. monocytogenes*, measured as the capability for the organism to survive a simulated gastrointestinal tract and the proportion of cells able to subsequently adhere to and invade differentiated Caco-2 cells, subjected to fresh-cut pear and melon shelf life, was investigated. Samples were inoculated, stored at 10 °C for 7 days and evaluated after inoculation and again after 2 and 7 days of storage. A decrease in *L. monocytogenes*' capacity to survive a simulated gastrointestinal tract was observed with increasing storage time, regardless of the fruit matrix evaluated. Furthermore, *L. monocytogenes* placed on fresh-cut pear and melon was subjected to an attachment and invasion assay after crossing the simulated gastrointestinal tract. After inoculation, pathogen on fresh-cut pear showed 5-fold more capacity to adhere to Caco-2 cells than pathogen on fresh-cut melon. After 2 days of storage, *L. monocytogenes* grown on fresh-cut melon showed similar adhesive capacity (1.11%) than cells grown on pear (1.83%), but cells grown on melon had the higher invasive capacity (0.0093%). We can conclude that minimally processed melon could represent a more important hazard than pear under the studied shelf life.

Keywords: /Shelf life/ /Fresh-cut fruit/

FRUITS

APRICOT

Salur-Can, Aysenur, Meltem Türkyılmaz and Mehmet Özkan. 2017. Effects of sulfur dioxide concentration on organic acids and b-carotene in dried **apricots** during storage. Food Chem. 221: 412-421.

Abstract

The effects of various sulfur dioxide (SO₂) concentrations (0, 451, 832, 1594, 2112 and 3241 mg/kg) on the profiles and contents of organic acids (OAs) and b-carotene in sulfured dried apricots (SDAs) were investigated during storage at 4, 20 and 30 °C for 379 days. In all samples, four OAs [malic acid (MA), citric acid (CA), succinic acid (SA) and oxalic acid (OXA)] were identified. SA (13.9–31.8 g/kg dw) was the major OA in SDAs containing SO₂ at lower than 1594 mg SO₂/kg, while MA (11.7–11.7 g/kg dw) was the major OA in SDAs containing SO₂ at higher than 1594 mg SO₂/kg. As SO₂ concentration increased, CA and OXA contents increased whereas MA contents decreased. Moreover, the highest stabilities of b-carotene, MA and SO₂ were determined in SDAs containing 1594 mg SO₂/kg at 4 °C. Therefore, we suggest using 1594 mg SO₂/kg and storing SDAs at 4 °C to protect OAs and b-carotene.

Keywords: /Apricots/ /Storage/

BLUEBERRIES

Jin, Tony Z., Yuanshan Yu and Joshua B. Gurtler. 2017. Effects of pulsed electric field processing on microbial survival, quality change and nutritional characteristics of blueberries. *LWT-Food Sci. Technol.* 77: 517-524.

Abstract

Whole fresh blueberries were treated using a parallel pulsed electric field (PEF) treatment chamber and asanitizer solution (60 ppm peracetic acid [PAA]) as PEF treatment medium with square wave bipolar pulses at 2 kV/cm electric field strength, 1ms pulse width, and 100 pulses per second for 2, 4, and 6 min. The effects of PEF on native microbiota and artificially-inoculated *Escherichia coli* K12 and *Listeria innocua* populations on blueberries were determined. Color, texture, anthocyanins and total phenolic compound concentrations were also evaluated. The combination of PEF and PAA was able to achieve up to 3 log reduction of *E. coli* and *Listeria* as well as 2 log/g reduction of native microbiota. PEF treatments did not cause any changes in color and appearance of the blueberries. The treatments did, however, cause the blueberries to soften in texture. Anthocyanins and phenolic compounds in blueberries increased by 10 and 25%, respectively, after PEF treatments. The results demonstrate the potential of PEF applications to enhance the safety and improve the quality and nutritional value of fruits and their derived products.

Keywords: /Blueberry/ /Quality/

Lacombe, Alison, et al. 2017. Nonthermal inactivation of norovirus surrogates on **blueberries** using atmospheric cold plasma. *Food Microbiol.* 63: 1-5.

Abstract

Viruses are currently the leading cause of foodborne outbreaks, most of which are associated with foods consumed raw. Cold plasma (CP) is an emerging novel nonthermal technology that can be used to surface decontaminate foods. This study investigated CP technology for the nonthermal inactivation of human norovirus surrogates, Tulane virus (TV) and murine norovirus (MNV), on the surface of blueberries. Blueberries (5 g) were weighed into sterile 4 oz. glass jars and inoculated with TV, 5 log PFU/g. Samples were treated with atmospheric CP for 0, 15, 30, 45, and 60 s at a working distance of 7.5 cm with 4 cubic feet/minute (cfm) of CP jet. Temperature readings were taken with an infrared camera prior to, and immediately following, CP treatments. In order to establish the impact of air flow during CP treatment (4 cfm), an additional 7 cfm jet of room temperature air was introduced from a separate nozzle. The experiment was repeated with 90 and 120 s as additional treatment time points. Viral titers were measured immediately after each treatment with a plaque assay using LLC-MK2 cells (TV) or RAW264.7 cells (MNV). TV was significantly reduced 1.5 log PFU/g compared to the control after treatment time of 45s, which was achieved regardless of temperature conditions. With the addition of 7 cfm of ambient air, the maximum log reduction for TV was 3.5 log PFU/g after 120s of treatment. MNV was significantly reduced by 0.5 log PFU/g compared to the control at 15s, and further treatment of MNV with ambient air brought the log reduction to greater than 5 log PFU/g at 90 s of treatment (Fig. 3). These results demonstrate that CP viral inactivation does not rely on thermal inactivation, and is therefore

nonthermal in nature. With further optimization, CP may be used by food processors as a means of nonthermal inactivation of foodborne viruses.

Keywords: /Blueberries/ /Food safety/

CANTALOUPE

Mukhopadhyay, Sudarsan, et al. 2017. Effect of high hydrostatic pressure processing on the background microbial loads and quality of **cantaloupe** puree. Food Res. Int. 91: 55-62.

Abstract

The objective of this study was to investigate and evaluate the effects of high hydrostatic pressure (HHP) applied to cantaloupe puree (CP) on microbial loads and product quality during storage for 10 days at 4 °C. Freshly prepared, double sealed and double bagged CP (ca. 5 g) was pressure treated at 300, 400 and 500 MPa at 8 °C and 15 °C for 5 min. Microflora populations, soluble solid content, pH, color, antioxidant activity, appearance and aroma were measured at 1, 6, and 10 d of storage. Results showed that high pressure treatment of 300 MPa (8 °C and 15 °C) resulted in reduction of total aerobic plate count from 3.3 to 1.8 log CFU/g. The treatment reduced the populations of native aerobic plate count to non-detectable levels (detection limit 1 log CFU/g) at 400 MPa and 500 MPa pressures at 15 °C. Pressure treatment completely inactivated mold and yeast in puree below the limits of detection at day 1 and no regrowth was observed during 10 days of storage at 4 °C while mold and yeast in untreated puree survived during the storage. High pressure treatment did not show any adverse impact on physical properties as soluble solid content (SSC, 11.2 °Brix) and acidity (pH, 6.9). The instrumental color parameters (L*, a*, b*) were affected due to HHP treatment creating a slightly lighter product, compared to control, as indicated by higher L* and lower a* values. However the change was not detected by the sensory panel while evaluating appearance scores. Pressure treatment did not affect the antioxidant capacity of puree product compared to control. Visual appearance and sniffing aroma test by panel revealed no adverse changes in the sensory parameters as a result of HHP treatment. HHP method described in this study appears to be a promising way to inactivate spoilage microorganisms in the cantaloupe puree and maintain quality. This study provides a viable option for preservation and marketing this product.

Keywords: /Cantaloupe/ /Quality/

CITRUS

de Ramon-Carbonnel, Marta and Sanchez-Torres, Paloma. 2017. The transcription factor *PdSte12* contributes to *Penicillium digitatum* virulence during **citrus** fruit infection. Postharvest Biol. Tec. 125: 129-139.

Abstract

The postharvest pathogen *Penicillium digitatum* is responsible for green mold decay on citrus fruit causing important economic losses. To examine possible elements involved in fungal pathogenesis/virulence and fungicide resistance, identification and functional characterization of *PdSte12*, a particular type of C2H2 fungal transcription factor was carried out. *PdSte12* was functionally inactivated through homologous recombination. The deleted fungal strains ($\Delta PdSte12$) failed to cause green mold decay on citrus fruit. $\Delta PdSte12$ mutants exhibited reduced growth and impaired conidiation during fungal infection towards citrus fruit. Additionally, *PdSte12* was characterized via

overexpression transformants, showing higher infectivity rate in a low virulence *P. digitatum* strain, providing evidence of *PdSte12*'s role in virulence. Moreover, fungicide sensitivity evaluation showed that *PdSte12* was not involved in fungicide resistance as other transcription factors are. These results indicate that the *PdSte12* transcription factor controls invasive growth and asexual reproduction as the major virulence function.

Keywords: /Citrus/ /Postharvest/

Torres, Irina, et al. 2017. Developing universal models for the prediction of physical quality in **citrus** fruits analyzed on-tree using portable NIRS sensors. *Biosyst. Eng.* 153: 140-148.

Abstract

The citrus sector seeks rapid, economical, environmentally-friendly and non-destructive technologies for monitoring external and internal changes in physical quality taking place in fruit during on-tree growth, thus allowing fruit quality to be evaluated at any stage of fruit development. The use of portable near-infrared spectroscopy (NIRS) sensors based on micro-electro-mechanical system (MEMS) technology, in conjunction with chemometric data treatment models, has already been studied for quality-control purposes in two citrus species: oranges and mandarins. The critical challenge is to develop robust and accurate universal models based on hundreds of highly heterogeneous citrus samples in order to design quality prediction models applicable to all fruits belonging to the genus *Citrus*, rather than models that can only be applied successfully to a single citrus species. This study evaluated and compared the performance of Modified Partial Least Squares (MPLS) and LOCAL regression algorithms for the prediction of major physical-quality parameters in all citrus fruits. Results showed that, while models developed using both linear (MPLS) and non-linear regression techniques (LOCAL) yielded promising results for the on-tree quality evaluation of citrus fruits, the LOCAL algorithm additionally increased the predictive capacity of models constructed for all the main parameters tested. These findings confirm that NIRS technology, used in conjunction with large databases and local regression strategies, increases the robustness of models for the on-tree prediction of citrus fruit quality; this will undoubtedly be of benefit to the citrus industry.

Keywords: /Citrus/ /Physical quality/

CRANBERRIES

Jeszka-Skowron, Magdalena, et al. 2017. Potential health benefits and quality of dried fruits: Goji fruits, **cranberries** and raisins. *Food Chem.* 221: 228-236.

Abstract

Dried fruits are important snacks and additives to other foods due to their taste and nutritional advantages. Therefore there is an important goal to control the quality of the food on the market for consumer's safety. Antioxidant activity of goji fruits (*Lycium barbarum*), cranberries (*Vaccinium macrocarpon* and *oxycoccus*) and raisins (*Vitis vinifera*) were studied using the DPPH (2,2-diphenyl-1-picrylhydrazyl) and Folin-Ciocalteu assays. Cu, Mn and Ge influencing antioxidant activity were determined together with selected toxic metals (Cd, Ni and Pb). Contamination with fungi was studied by quantification of their marker ergosterol and important mycotoxins (aflatoxins B1, B2, G1 and G2, and ochratoxin A) were also determined. Antioxidant activity of all tested dried fruits was confirmed

with goji fruits being the most profitable for consumers. Contamination of the tested fruits with toxic metals and mycotoxins was low.

Keywords: /Cranberries/ /Dried fruits/ /Quality/

GRAPES

KonukTakma, Dilara and FigenKorel. 2017. Impact of preharvest and postharvest alginate treatments enriched with vanillin on postharvest decay, biochemical properties, quality and sensory attributes of table **grapes**. Food Chem. 221: 187-195.

Abstract

Alginate solution enriched with vanillin as a bioactive compound was investigated for improving preharvest and postharvest quality and safety of table grapes. Alginate treatments with or without vanillin as preharvest spray and postharvest coating were implemented on table grapes of Alphonse Lavallée and Razaki cultivars. Fungal decay, biochemical properties, quality and sensory attributes were evaluated at day of preharvest treatment, at harvesting and during 35 days of storage at 4 ± 2 °C. Alginate treatments with or without vanillin were effective in preventing weight and firmness losses. Total soluble solids, titratable acidity, and color of grapes coated with alginate coatings with or without vanillin showed minor changes compared to control grapes. Alginate coating incorporating vanillin provided significant reduction (1.73 log CFU/g) in yeast-mold growth. Moreover, the coatings maintained greater total phenolic content and antioxidant activity compared to others during postharvest storage. In terms of sensory attributes, appearance was ranked as the highest for alginate coating without vanillin due to glossiness of alginate.

Keywords: /Grapes/ /Postharvest quality/

Venditti, Tullio, et al. 2017. Repeated treatments with acetic acid vapors during storage preserve table **grapes** fruit quality. Postharvest Biol. Tec. 125: 91-98.

Abstract

Postharvest losses on table grapes caused by *Botrytis cinerea*, are controlled with SO₂ fumigations carried out every 7 or 10 d. The use of this gas is becoming more difficult to justify because of undesirable effects on the fruit and the increasing concern for human health. Objectives of the paper were to evaluate if repeated treatments with acetic acid (AC) during storage, were effective in preserving table grapes quality, comparing in addition the effects of AC and SO₂ treatments. Experiments carried out in vitro on *B. cinerea* proved that the effect of AC on mycelia growth and conidia germination was related not only to the dose and exposure period, but also to the elapsed time between fungal inoculation and treatment. The reinoculum test demonstrated that a treatment with 20 µL⁻¹ of AC for 15 min had a fungicidal effect. A laboratory test was performed, to evaluate in vivo the effectiveness of AC on *B. cinerea*. Results suggested that higher doses were needed to control the pathogen. On naturally infected table grapes two storage experiments were carried out: in the first trial a single AC concentration of 50 µL⁻¹ was used to perform one or two fumigations after 4 or 8 weeks (w), while three different AC concentrations (30, 50 and 75 µL⁻¹) were used in the second trial and fumigations were repeated 5, 3 and 2 times respectively. Treatments lasted 15 min and fruit was stored for 8 w at 5 °C and 90% RH, followed by 3 d of a simulated marketing period. All treatments reduced gray mold incidence, with respect to untreated fruit, after 8 w of storage, but repeated treatments resulted the most effective. Two fumigations

at 50 μLL^{-1} or 5 fumigations at 30 μLL^{-1} reduced gray mold incidence by 63.6 or 57.1% respectively. Fruit weight loss was significantly reduced by all treatments, while quality parameters resulted not to be affected by any of the treatments.

Keywords: /Grapes/ /Postharvest/

JACKFRUIT

Vargas-Torresa, Apolonio, et al. 2017. Combined effect of the application of 1-MCP and different edible coatings on the fruit quality of **jackfruit** bulbs (*Artocarpusheterophyllus* Lam) during cold storage. *Sci. Hortic-Amsterdam*. 214: 221-227.

Abstract

The aim of this study was to investigate the effect of pretreatment with 1-methylcyclopropene (1-MCP) and the application of edible coatings (xanthan, sodium alginate or gellan) on the ripening rate, quality parameters and shelf life of pre-cut jackfruit. The jackfruit bulbs dipped in potassium sorbate/calcium chloride "PS/CC" (T1) and PS/CC/1-MCP (T2) showed a more rapid ripening and greater microbial growth at 7 and 12 days of storage. However, jackfruit bulbs with PS/CC/1-MCP and covered with xanthan, sodium alginate or gellan (T3, T4, and T5, respectively), showed a decrease in the ripening rate; thus weight loss and respiration rate were lower and the higher quality values as color ($^{\circ}\text{Hue}$), total soluble solids (TSS), titratable acidity (TA) as well as pH were achieved until 12 days of storage. Firmness values were higher in bulbs under T3, T4, and T5 compared to bulbs under T1 and T2. Microbial growth was delayed until the 12th day of storage in jackfruit bulbs with T3, T4, and T5. In general, manually peeled jackfruit stored at 5 °C and coated with 1-MCP/edible coatings, maintained the quality and sensory acceptability of fresh-cut jackfruit and with a longer shelf life than previously reported.

Keywords: /Jackfruit/ /Edible coating/ /1-methylcyclopropene/

KIWIFRUIT

Hu, Weihong, Da-Wen Sun and Jose Blasco. 2017. Rapid monitoring 1-MCP-induced modulation of sugars accumulation in ripening 'Hayward' **kiwifruit** by Vis/NIR hyperspectral imaging. *Postharvest Biol. Tec.* 125: 168-180.

Abstract

This study aimed to rapidly and nondestructively monitor 1-methylcyclopropene (1-MCP)-induced modulation of sugars accumulation in ripening 'Hayward' kiwifruit by hyperspectral imaging (HSI). Kiwifruit (*Actinidiadeliciosa* var. *Hayward*) were treated with 0.5 μLL^{-1} 1-MCP for 24 h at 23 °C and then stored for 20 d at room temperature for ripening. Hyperspectral images of 1-MCP treated and control fruit were recorded using a visible/near infrared (Vis/NIR) HSI system (400–1000 nm). The mean reflectance spectra of the inner cortex and the core were combined together to build a robust model for sugar contents in sliced samples. The best prediction accuracy for glucose, fructose, and sucrose in control fruit based on less than 10 selected features were: R^2_p of 0.934, 0.867, and 0.705, respectively. Moreover, the visualization maps showed a different sugar accumulation between treated and control fruit, with the sugar contents in the 1-MCP treated kiwifruit being significantly inhibited and the inhibitions were more effective in inner cortex than the core. The current study presented a rapid method

for glucose, fructose, and sucrose detection in intact and fresh-cut kiwifruit as well as provided some insights for the effects of 1-MCP action on sugar accumulation through visualizing their distributions.

Keywords: /Kiwifruit/ /1-MCP/

Mack, Carina, et al. 2017. Untargeted multi-platform analysis of the metabolome and the non-starch polysaccharides of **kiwifruit** during postharvest ripening. *Postharvest Biol. Tec.* 125: 65-76.

Abstract

The popularity of kiwifruit (*Actinidiadeliciosa*) is steadily rising among consumers since their introduction in the global market 60 years ago. Kiwifruit are ripened postharvest for marketing. A good technique to follow the complex changes throughout postharvest ripening is metabolomics. So far research on the kiwifruit metabolome has been performed on kiwifruit development or on-vine ripening. This study aimed at a comprehensive description of processes during postharvest ripening of kiwifruit. Metabolic changes in kiwifruit during six well-defined stages of postharvest ripening and two non-marketable stages due to water loss were monitored using an untargeted multi-platform approach consisting of GC x GC-MS, GC-MS and NMR. In addition, postharvest cell wall polysaccharide modifications were followed using multiple chromatographic approaches. Using the multi-platform approach, it was possible to follow the process of postharvest ripening kiwifruit. Investigation of soluble metabolites in kiwifruit yielded mainly sugars, sugar-related substances and organic acids as well as other known and unknown metabolites. Sugars predominantly increased during ripening while organic acids predominantly decreased. In addition, unexpected changes in the concentration of some known and unknown metabolites were observed. Changes of the non-starch polysaccharides were dominated by a continuous loss of neutral pectic side chains, whereas minor changes were observed for homogalacturonan and hemicellulosic polysaccharides only. Overall the three applied platforms and the cell wall characterization were complementary and allowed a comprehensive description of the kiwifruit metabolome during postharvest ripening.

Keywords: /Kiwifruit/ /Postharvest ripening/

LITCHI

Reichel, Mareike, et al. 2017. Postharvest control of **litchi** (*Litchi chinensis*Sonn.) pericarp browning by cold storage at high relative humidity after enzyme-inhibiting treatments. *Postharvest Biol. Tec.* 125: 77-90.

Abstract

Enzyme inhibitors were studied as adjuvant treatments in the control of litchi pericarp browning by protection against desiccation during reefer transport. Various organic acids (acetic, malic, citric, and oxalic acid) and inorganic salts (NaCl, CaCl₂) were investigated for in vitro inhibitory effects on the peroxidases (POD) and phenol oxidases (including laccase) extracted from litchi pericarp. Promising inhibitors were tested on 'Hong Huey' litchi fruit for their capability to prevent pericarp browning during cold storage (21 d, 5 °C, 90% relative humidity) with and without foil wrapping. An enzyme assay had been optimized for measuring the in vitro activities of phenol oxidases toward (-)-epicatechin, being the natural phenolic key substrate in litchi. Phenol oxidase activities were chiefly pH-dependent and completely inactivated at pH ≤ 3.5 by the organic acids used for buffering, whereby chelating agents performed best, especially oxalic acid. POD activity was stable over wider pH and ionic strength ranges,

with inhibition being maximal (84%) in 0.25 M oxalic acid buffer (pH 3.5). CaCl_2 (0.25 molL^{-1}) decreased POD activity by 68%, while rising doses increased the initial lag phase up to 2.5 min. In contrast to these in vitro enzyme-inhibiting effects, postharvest fruit treatments with these phenol oxidase and peroxidase inhibitors did not improve color retention during cold fruit storage, but proved ineffective or even favored pericarp browning compared to the control fruit. Pericarp color retention was maximal (96–97%) throughout cold storage of fruit in gas-permeable but moisture-retaining foil bags for at least two weeks, whether the fruit had been dipped into cold water (control) or into citrate (25 mmol L^{-1}) solution. Consequently, pericarp color retention only required an intact pericarp at harvest and postharvest protection against desiccation. Preventing water loss through preservation of cell compartmentation thus proved to be crucial and sufficient for the control of enzymatic browning under reefer conditions.

Keywords: /Litchi/ /Enzymatic browning/ /Humidity/

MANGO

Cantre, Dennis, et al. 2017. Tissue breakdown of **mango** (*Mangifera indica* L. cv. Carabao) due to chilling injury. *Postharvest Biol. Tec.* 125: 99-111.

Abstract

Chilling injury (CI) presents a major problem in postharvest preservation and marketing potential of mango. In this study, tissue breakdown caused by chilling injury was investigated using X-ray computed microtomography (X-ray μCT). This provided a unique insight in 3-D changes in tissue structure and pore networks during chilling injury development. Evidence of cell collapse and cavity formation in severely chill injured fruit was apparent. In addition, microstructural evidence supporting the occurrence of intracellular water leakage was found. Quantitative analysis revealed that chilling injury was associated with, first, a decrease in porosity, pore size and pore connectivity due to cell leakage and tissue breakdown, which was followed by an increase in pore size due to cavity formation. Multivariate statistics identified pore connectivity and Euler number as the most important parameter in relation to chilling injury. The results support the hypothesis that changes in tissue and pore structure in mango fruit contribute significantly to the development of postharvest tissue disorders by drastic changes in tissue aeration and water movement, identical to what has been observed in other fruit species.

Keywords: /Mango/ /Chilling injury/

ORANGE

Talens, Clara, et al. 2017. Effect of microwave power coupled with hot air drying on process efficiency and physico-chemical properties of a new dietary fibre ingredient obtained from **orange** peel. *LWT-Food Sci. Technol.* 77: 110-118.

Abstract

Orange by-products are an excellent source of dietary fibre. The main objective of this work was to compare the physico-chemical and technological properties of fibres obtained from orange by-products by applying two different drying methods: hot air (HAD) and hot air coupled with microwave drying (HAD + MW). Process efficiency was also compared. 92% reduction in processing time and 77% reduction in energy consumption was achieved with HAD + MW. The drying treatment did not affect the physicochemical properties of the fibres; however, the shrinkage-swelling phenomena that occurred

during drying changed the rehydration properties of the fibre. HAD mainly affected the mechanical energy whereas HAD + MW affected the surface tension. An increase in particle size due to an increase in porosity during HAD + MW improved the fibre swelling capacity. HAD + MW can reduce drying time resulting in a more efficient drying process that positively affects the orange fibre's technological properties.

Keywords: /Orange/ /Microwave drying/

PEAR

Larrigaudiere, Christian, et al. 2016. Unravelling the physiological basis of superficial scald in **pears** based on cultivar differences. *Sci. Hort.-Amsterdam*. 213: 340-345.

Abstract

Superficial scald is an important physiological disorder affecting both apple and pear fruit during postharvest storage. To date, superficial scald has been associated to many different preharvest and postharvest factors which are ultimately affected by the genetic characteristics of each cultivar. Accordingly, this work investigated differences in scald susceptibility during cold storage in two different pear cultivars 'Beurré d'Anjou' and 'Packham Triumph' and its relation to the changes in ethylene production, accumulation of α -farnesene and in its oxidation products (CTols), and finally changes in the fruit antioxidant potential and ascorbate levels. Collectively the results from this study indicate that superficial scald in pear develops differently than in apples. The highest sensitivity observed in 'Beurré d'Anjou' pears was not related to ethylene and/or to the capacity of the fruit to accumulate α -farnesene, but rather to its capacity to prevent the accumulation of CTols. Although presenting similar values in global antioxidant potential, the higher resistance of 'Packham Triumph' pears to superficial scald was positively associated to higher ascorbate levels. The potential involvement of ascorbate in preventing superficial scald development is further discussed.

Keywords: /Pear/ /Storage/

Saquet, Adriano A. and Domingos P.F. Almeida. 2017. Ripening physiology and biochemistry of 'Rocha' **pear**s affected by ethylene inhibition. *Postharvest Biol. Tec.* 125: 161-167.

Abstract

Pear (*Pyrus communis* L.) is a climacteric fruit whose ripening behavior is highly cultivar-dependent. This study investigates the postharvest ripening physiology and biochemistry of 'Rocha' pear treated with 1-methylcyclopropene (1-MCP). Fruit from a single orchard harvested at the mature-green stage were treated with 0 (control), 150, and 300 nL L⁻¹ 1-MCP, and allowed to ripen in air at 20 °C. 'Rocha' pear without exposure to chilling ripened with a typical pattern of ethylene production and respiration rates. Inhibition of ethylene action by 1-MCP delayed the ethylene production peak and reduced its intensity by 60%. ATP concentration in control fruit was maximum after 7 d and declined toward the end of the ripening period. 1-MCP induced a transient reduction of ATP concentrations and adenylate energy charge (AEC) during ripening. AEC of control fruit increased slightly during the first week and decreased to a stable value of 0.7 toward the end of ripening. Skin color and firmness of control fruit changed faster during the first week of ripening. 1-MCP induced a delaying in softening, in yellowing and in electrolyte efflux changes, but not impaired the ripening progress. In conclusion, 'Rocha' pear ripened immediately after harvest without chilling treatment or exogenous ethylene application and adjusted the AEC during ripening even with lower respiration rates induced by 1-MCP.

Keywords: /Pear/ /Ethylene/

PERSIMMON

Munera, Sandra, et al. 2017. Non-destructive assessment of the internal quality of intact **persimmon** using colour and VIS/NIR hyperspectral imaging. LWT-Food Sci. Technol. 77: 241-248.

Abstract

The internal quality of intact persimmon cv. 'RojoBrillante' was assessed through visible and near infrared hyperspectral imaging. Fruits at three stages of commercial maturity were exposed to different treatments with CO₂ to obtain fruit with different ripeness and level of astringency (soluble tannin content). Spectral and spatial information were used for building classification models to predict ripeness and astringency through multivariate analysis techniques like linear and quadratic discriminant analysis (LDA and QDA) and support vector machine (SVM). Additionally, flesh firmness was predicted by partial least square regression (PLSR). The full spectrum was used to determine the internal properties and later principal component analysis (PCA) was used to select optimal wavelengths (580, 680 and 1050 nm). The correct classification was above 92% for the three classifiers in the case of ripeness and 95% for QDA in the case of astringency. A value of R² = 0.80 and a ratio of prediction deviation (RPD) of 1.86 were obtained with the selected wavelengths for the prediction of firmness which demonstrated the potential of hyperspectral imaging as a non-destructive tool in the assessment of the firmness, ripeness state and astringency level of 'RojoBrillante' persimmon.

Keywords: /Persimmon/ /Internal fruit quality/

PINEAPPLE

Sari, Lupita Kemala, Sutthiwal SETHA and Matchima Naradisorn. 2017. Effect of UV-C irradiation on postharvest quality of 'Phulae' **pineapple**. Sci. Horticulture-Amsterdam. 213: 314-320.

Abstract

The effect of UV-C radiation on postharvest quality of pineapple cv. 'Phulae' was investigated. The pineapples were divided into 4 treatments: 10-min UV-C irradiation (13.2 kJ m⁻²), 20-min UV-C irradiation (26.4 kJ m⁻²), 30-min UV-C irradiation (39.6 kJ m⁻²) and no UV-C irradiation as a control. Quality properties including disease incidence, internal browning, colour, total soluble solid (TSS), titratable acidity (TA), vitamin C content, total phenolic compound, total flavonoid content and antioxidant activity were measured every 7 days up to 28 days after irradiation. The results showed that UV-C radiation significantly reduced (P < 0.05) disease incidence and internal browning in pineapple during storage at 10°C for 28 days. The lower disease incidence was observed in the higher dose of UV-C radiation. No significant differences among treatments were found on colour, TSS and TA. The UV-C irradiation significantly increased (P < 0.05) total phenolic compound, total flavonoid and antioxidant capacity in peel; however, UV-C enhanced vitamin C content in pulp.

Keywords: /Pineapple/ /Irradiation/

PLUM

Velardo-Micharet, Belén, et al. 2017. Effect of ripening stage, 1-MCP treatment and different temperature regimes on long term storage of ‘Songold’ Japanese plum. *Sci. Hort. Amsterdam*. 214: 233-241.

Abstract

In order for the Japanese Plum to reach distant markets with adequate consumption quality, it is necessary to determine not only the best harvesting time but also the most appropriate postharvest technologies that allow the correct ripeness after the distribution process. This paper addresses the combined effect of the harvesting time (H1, H2 and H3) with or without 1-MCP (T and C) treatment and the postharvest storage in different temperature regimes (0 °C, 8 °C and dual temperature regime, 0/8 °C). The ‘Songold’ plum was kept for 30 and 50 days in cold storage and at 20 °C for 5 days after that (shelf-life, SL). For each analysis date, physical and chemical quality parameters were established (weight loss, firmness, color, total soluble solids and acidity), together with postharvest damage (chilling injuries and decay). In general, the 1-MCP reduced the firmness loss and color changes (L^* and b^*), maintaining the acidity of the fruit at rates close to those of the ones at harvest. The use of 1-MCP allows us to market the fruit at a more advanced ripening stage and to store it at a higher temperature without quality loss. Chilling injuries (CI) were the most relevant damages, mainly in H2 at 8 °C after 50 + 5 days. 1-MCP appears to reduce the impact of CI but not decay.

Keywords: /Plum/ /Chilling injuries/ /Fruit quality/

POMEGRANATE

Marathe, R.A., et al. 2017. Response of nutrient supplementation through organics on growth, yield and quality of pomegranate. *Sci. Hort. Amsterdam*. 214: 114-121.

Abstract

The study was carried out on pomegranate (*Punicagranatum* L.) cv. ‘Bhagwa’ to investigate efficacy of organics on plant nutrient uptake, growth behaviour, fruit yield and quality attributes, disease incidence and soil health. Organic nutrient sources, namely, farm yard manure (FYM), vermicompost (VC), poultry manure (PM), and *in situ* green manuring (GM) through sun hemp (*Crotalaria juncea* L.), *ex situ* GM through *Glyricidia* (*Gliricidia sepium*), Karanj (*Pongamia pinnata*) and neem (*Azadirachta indica*), and recommended dose of inorganic fertilizers against control were evaluated. The results revealed significant decrease in soil pH and electrical conductivity and substantial increase in soil organic carbon content in all organic manuring treatments over control. Application of FYM had the highest availability of most of the nutrients (P: 64.4 and K: 578.7 kg ha⁻¹; Cu: 15.1, Zn: 2.30 and Mn: 8.4 ppm) in the soil. Three years pooled data showed that the highest P (0.182%), K (1.06%) and Fe (176.7 ppm) contents in the leaves were supplied by PM, while N (2.33%) was by FYM. Although, during first year, vegetative growth of the plants was better in inorganic fertilizers than other treatments, second year onwards it was increased significantly in FYM, VC and GM with sun hemp treatments. Maximum fruit yield was obtained with the application of PM (3.96 kg tree⁻¹) followed by FYM (3.86 kg tree⁻¹). All of the organic manuring treatments resulted in improved fruit quality characteristics viz. fruit juice content, juice acidity, TSS and TSS: acid ratios compared to inorganic fertilizers. Organic manuring with neem recorded the lowest disease index (5.84) on plants. Similarly, increased microbial load in the rhizosphere soil in terms of *P. fluorescens* (20.3×10^{-4} cfu g⁻¹) and *Azotobacter chroococcum* (17.4×10^{-3} cfu g⁻¹) population was recorded in FYM. *A. niger* (13.6×10^{-4} cfu g⁻¹) and PSM (15.6×10^{-5} cfu g⁻¹) activity was higher in GM with Karanj and Sunhemp, respectively.

Keywords: /Pomegranate/ /Quality/

STRAWBERRY

Amodio, Maria Luisa, et al. 2017. Potential of NIR spectroscopy for predicting internal quality and discriminating among **strawberry** fruits from different production systems. *Postharvest Biol. Tec.* 125: 112-121.

Abstract

The suitability of near-infrared (NIR) spectroscopy was assessed for predicting the initial internal quality of strawberries, and for discriminating between different classes of fruits produced by three different fertility management systems: conventional (C), organic based on input substitution (S), and organic based on manure and cover crop amendment (M). Reflectance spectra were acquired using a Fourier Transform (FT)-NIR spectrometer for 219 'Festival' strawberries (93 M, 96 S, and 30 C). Relevant wavelength ranges were identified by Bruker's OPUS software and elaborated in MATLAB. The partial least squares (PLS) SIMPLS algorithm was tested in prediction models for total soluble solids content (TSS), pH, titratable acidity (TA), ascorbic acid content, and phenolic content, while PLS-DA (DA = discriminant analysis) was used in the classification models. The intact strawberry spectra resulted in good predictions of TSS content ($R^2 = 0.85$; RMSEP = 0.58), pH ($R^2 = 0.86$; RMSEP = 0.09), and TA ($R^2 = 0.58$; RMSEP = 0.15). For the classification models, both sensitivity and specificity were >0.97 for external sample classes. In addition to being a valid approach for the selection of superior quality strawberries, the presented NIR methodology is expected to be a promising support for the traceability and authentication of organic produce.

Keywords: /Strawberry/ /Classification/ /Quality/

Fu, Xiumin, et al. 2017. Differential responses of four biosynthetic pathways of aroma compounds in postharvest **strawberry** (*Fragaria x ananassa* Duch.) under interaction of light and temperature. *Food Chem.* 221: 356-364.

Abstract

Light and temperature are two of the most important factors regulating postharvest strawberry aroma. To date the majority of research has been concentrated on the contribution of either light or temperature factors in isolation. In the present study, we investigated integrated effects of light and temperature on the formation of characteristic aromas during postharvest strawberry ripening process. Most volatiles including volatile esters, volatile furanones, and volatile terpenes showed increasing trends, whereas volatile benzenoids showed decreasing trends during postharvest ripening. Biosynthesis of volatile esters and volatile benzenoids were mainly affected by interaction of temperature and dark, whereas formation of volatile furanones and volatile terpenes were mostly influenced by temperature and dark, respectively. This study provided evidence of regulation of strawberry aroma by dual factors for the first time, and characterized a comprehensive profile of formations of strawberry aromas in response to light and temperature during postharvest ripening.

Keywords: /Strawberry/ /Postharvest/

Oregel-Zamudio, Ernesto, et al. 2017. Effect of candelilla wax edible coatings combined with biocontrol bacteria on **strawberry** quality during the shelf-life. *Sci. Hortic-Amsterdam.* 214: 273-279.

Abstract

The effect of edible films of candelilla wax alone or in combination with a *Bacillus subtilis* HFC103 strain on shelf life of strawberry, has been assayed. Treatments were: control, film (edible coating), bacteria (inoculated with *B. subtilis* HFC103) and film + bacteria (edible coating + *B. subtilis* HFC103). Fruits were treated and stored at 25 °C for six d. Decay percentage and weight loss were assayed daily, while pH and total soluble solids (TSS) were determined at the end of the assay. The film, bacteria and film + bacteria treatments significantly reduced the decay percentage and weight loss with respect to control since day 3. Film + bacteria treatment reduced decay around 100% with respect to control on day 6. Film treatment kept a low weight loss during the assay. There were no changes of pH and TSS as effect of the treatments. Additionally, the effects of the treatments described on the severity of the damage caused by *Rhizopus stolonifer* were assayed. All the treatments were inoculated with a spore suspension of such pathogen, stored at 25 °C for 6 d, and the severity index was recorded every 24 h. Film, bacteria and film + bacteria treatments significantly reduced the severity index with respect to control since day 2. The bacteria treatment was the most effective to control *R. stolonifer*. However, it did not show the same efficacy to control weight loss or to prolong shelf life of strawberry. Results showed that the combination of candelilla wax edible films and the inoculation with *B. subtilis* HFC103 is an innovative strategy with the potential to prolong shelf life of strawberry.

Keywords: /Strawberry/ /Postharvest/ /Shelf life/

Qin, Xiaojie, et al. 2017. *Hanseniaspora uvarum* prolongs shelf life of **strawberry** via volatile production. Food Microbiol. 63: 205-212.

Abstract

Gray mold caused by *Botrytis cinerea* led to severe postharvest losses for strawberry industry. In recent years, some studies have shown that postharvest diseases of strawberry can be controlled by using bacterial, fungal and yeast strains. The yeast strain *Hanseniaspora uvarum* was shown as an effective antagonist against *B. cinerea* growth. Here, we further investigated the volatile organic compounds (VOCs) production of *H. uvarum* and how this could impact on postharvest gray mold control of strawberry. A total of 28 VOCs were detected by GC-MS in the headspace of *H. uvarum* and strawberry with/without *B. cinerea* (SI and RSI \geq 800). Among these VOCs, 15 VOCs were detected in both conditions, 4 VOCs were *H. uvarum* and strawberry without *B. cinerea* and the other 9 VOCs were only detected when *B. cinerea* was inoculated. Two VOCs, ethyl acetate and 1,3,5,7-cyclooctatetraene, enhanced by inoculation of *B. cinerea*. In in vitro assay, *H. uvarum* significantly inhibited mycelial growth and spore germination of *B. cinerea* via VOCs production. Moreover, in vivo assay showed that *H. uvarum* reduced *B. cinerea* infection of strawberry and maintained fruit appearance, firmness and total soluble solids via VOCs production. Collectively, our results showed that *H. uvarum* VOCs significantly controlled postharvest gray mold of strawberry and prolonged the storage time and shelf life.

Keywords: /Strawberry/ /Shelf-life/

VEGETABLES BROCCOLI

Perini, Mauro A., et al. 2017. Hot water treatments performed in the base of the broccoli stem reduce postharvest senescence of **broccoli** (*Brassica oleracea* L. Varitalic) heads stored at 20 °C. LWT-Food Sci. Technol. 77: 314-322.

Abstract

Heat treatments cause a moderate and reversible stress that interrupts the normal metabolism (senescence or fruit ripening) of the product. Although there is a large number of reports about heat treatments on broccoli heads, the effect of subjecting only the stems to thermal treatments has not been studied yet. One of the main reasons to analyze this approach is that the hormone ethylene is actively produced in the stem cutting area. Different hot water treatments were performed on the first 5 cm of broccoli stems with various combinations of time-temperature. Treatment carried out at 50 °C for 3 min was chosen for further analysis of different quality and senescence parameters, taking into account that broccoli heads presented a delayed change in Hue and L values when compared with controls during storage. While control heads looked yellow, heat-treated samples retained most of their green colour. Furthermore, control heads presented higher weight loss, lower total and soluble protein, and lower total soluble sugar after 3 or 5 storage days, giving evidence of the fact that a heat treatment just on the stem contributes to the delay of broccoli senescence and to the maintenance of the overall quality of the product during storage.

Keywords: /Broccoli/ /Postharvest/ /Heat treatment/

CUCUMBER

Skupien, Joanna, et al. 2017. Dark-chilling induces substantial structural changes and modifies galactolipid and carotenoid composition during chloroplast biogenesis in cucumber (*Cucumis sativus* L.) cotyledons. Plant Physiol. Bioch. 111: 107-118.

Abstract

Plants in a temperate climate are often subject to different environmental factors, chilling stress among them, which influence the growth especially during early stages of plant development. Chloroplasts are one of the first organelles affected by the chilling stress. Therefore the proper biogenesis of chloroplasts in early stages of plant growth is crucial for undertaking the photosynthetic activity. In this paper, the analysis of the cotyledon chloroplast biogenesis at different levels of plastid organization was performed in cucumber, one of the most popular chilling sensitive crops. Influence of low temperature on the ultrastructure was manifested by partial recrystallization of the prolamellar body, the formation of elongated grana thylakoids and a change of the prolamellar body structure from the compacted “closed” type to a more loose “open” type. Structural changes are strongly correlated with galactolipid and carotenoid content. Substantial changes in the galactolipid and the carotenoid composition in dark-chilled plants, especially a decrease of the monogalactosyldiacylglycerol to digalactosyldiacylglycerol ratio (MGDG/DGDG) and an increased level of lutein, responsible for a decrease in membrane fluidity, were registered together with a slower adaptation to higher light intensity and an increased level of non-photochemical reactions. Changes in the grana thylakoid fluidity, of their structure and photosynthetic efficiency in developing chloroplasts of dark-chilled plants, without significant changes in the PSI/PSII ratio, could distort the balance of photosystem rearrangements and be one of the reasons of cucumber sensitivity to chilling.

Keywords: /Cucumber/ /Chilling stress/

LETTUCE

Fu, Yuming, et al. 2017. Interaction effects of light intensity and nitrogen concentration on growth, photosynthetic characteristics and quality of lettuce (*Lactuca sativa* L. Var. youmaicai). *Sci. Hortic-Amsterdam*. 214: 51-57.

Abstract

Light intensity and nitrogen concentration of nutrient solution are considered crucial for the contents of vitamin C and nitrate in cultivated leaf vegetables. We here investigated the effects of various combinations of light intensity (60, 140 and 220 $\mu\text{mol m}^{-2}\text{s}^{-1}$) and nitrogen concentration (7, 15 and 23 $\mu\text{mol L}^{-1}$) of the solution on the growth, photosynthetic characteristics, vitamin C and nitrate content of lettuce. Our results demonstrate that the lettuce had the largest dry biomass at the high illumination of 220 $\mu\text{mol m}^{-2}\text{s}^{-1}$ and low nitrogen of 7 $\mu\text{mol L}^{-1}$. The higher light and low nitrogen also contributed to the accumulation of vitamin C and decrease of nitrate in lettuce leaves. The effect of nitrogen supply on chlorophyll concentrations was more efficient under low light than high illumination. Our results reveal that there was an obvious interaction between light intensity and nitrogen available for the photosynthesis, yield and quality of lettuce. This study provides valuable insights into the combinational regulation of light intensity and nitrogen supply for improving growth and nutritional quality of vegetables grown in greenhouse and plant factory.

Keywords: /Lettuce/ /Vegetable quality/

MUSHROOM

Falandysz, Jerzy, et al. 2017. Rare earth elements in parasol mushroom *Macrolepiota procera*. *Food Chem*. 221: 24-28.

Abstract

This study aimed to investigate occurrence and distribution of 16 rare earth elements (REEs) in edible saprobic mushroom *Macrolepiota procera*, and to estimate possible intake and risk to human consumer. Mushroom samples were collected from sixteen geographically diverse sites in the northern regions of Poland. The results showed that for Ce as the most abundant among the REEs in edible caps, the mean concentration was at $0.18 \pm 0.29 \text{ mg kg}^{-1}$ dry biomass. The mean concentration for 16 REEs determined in caps of fungus was 0.50 mg kg^{-1} dry biomass and in whole fruiting bodies was 0.75 mg kg^{-1} dry biomass. From a point of view by consumer, the amounts of REEs contained in edible caps of *M. procera* could be considered small. Hence, eating tasty caps of this fungus would not result in a health risk for consumer because of exposure to the REEs.

Keywords: /Mushroom/ /Organic Food/

PAPAYA

Pan, Yong-Gui, et al. 2017. Effect of low temperatures on chilling injury in relation to energy status in papaya fruit during storage. *Postharvest Biol. Tec*. 125: 181-187.

Abstract

Papaya (*Carica papaya* L.), a typical tropical fruit, is susceptible to chilling injury (CI). In the present study, CI index, energy level, and energy metabolism-related enzymes activity in papaya fruit stored at 16, 11, 6, and 1 °C were investigated to evaluate the relationship between CI and energy metabolism of papaya fruit during cold storage. Results showed that there were no symptoms of CI in papaya fruit stored at 16 °C, while some typical CI symptoms including skin pitting, scald and flesh water soaking were appeared in papaya fruit stored 11°C and 6°C. Furthermore, we observed that papaya fruit did not appear obvious symptoms of CI during most duration of storage at 1 °C with the exception of slight CI at end of storage. ATP, ADP and the total content of AXP (=ATP + ADP + AMP) contents, EC and energy metabolism-related enzymes activity (H⁺-ATPase, Ca²⁺-ATPase, succinic dehydrogenase (SDH), and cytochrome c oxidase (CCO)) in papaya fruit stored at 1°C were higher than those in fruit stored at 11 and 6°C. The results suggest that higher energy status in papaya fruit during cold storage could contribute to the alleviation of CI.

Keywords: /Papaya/ /Chilling injury/

SQUASH

Sánchez, María-Teresa, et al. 2017. Use of NIRS technology for on-vine measurement of nitrate content and other internal quality parameters in intact summer **squash** for baby food production. *Postharvest Biol. Tec.* 125: 122-128.

Abstract

This study sought to assess the feasibility of using NIR spectroscopy to predict the physicochemical composition of summer squash during on-vine ripening, with a view to deciding on its possible use in baby food production depending on nitrate content at harvesting. NIR calibration models were developed using a set of 157 samples scanned in situ in the 1600–2400 nm region, using a portable handheld MEMS-NIR spectrophotometer working in reflectance mode. Modified partial least squares (MPLS) regression was used to interpret spectra and develop calibrations for summer squash composition. Results ($R^2_{cv} = 0.83$; $SECV = 112.44 \text{ mg L}^{-1}$) showed that NIRS technology has great potential for measuring nitrate content and also other quality parameters in intact summer squashes during on-vine ripening. In addition, suitable wavelengths for nitrate content determination were identified by x-loading weights and regression coefficients. These findings suggest that NIRS may be a valuable tool for the rapid, accurate and non-destructive measurement of nitrate content, with a view to ascertaining the suitability of individual fruits for use in the production of baby foods.

Keywords: /Squash/ /Quality

TOMATO

Khan, Shamim A.K.U., et al. 1-Hexylcyclopropene in retarding **tomato** (*Lycopersicon esculentum* Mill.) fruit ripening and its mode of action. *Sci. Hort.-Amsterdam.* 213: 410-417.

Abstract

Modulation of climacteric ripening in ‘Kommeet’ tomato fruit with 1-hexylcyclopropene (1-HCP) fumigation and its mode of action was investigated. Fumigation of 1-HCP (1000 nLL⁻¹) significantly delayed (6 d) and suppressed climacteric ethylene production (0.92-fold) and respiration rate

(0.71-fold) as compared to the control fruit. Fruit treated with 1-HCP (1000 nLL⁻¹) showed delayed colour development (6 d), reduced weight loss, soluble solids concentration (SSC), and SSC:TA (titratable acidity) ratio, and higher TA (0.67) than the control fruit. 1-HCP treated fruit exhibited higher concentration of citric, malic, fumaric, succinic and total organic acids and no significant effects on the concentration of sugars compared to control fruit. In conclusion, 1-HCP (1000 nLL⁻¹) fumigation delayed and suppressed ethylene production, respiration rate, colour development and ripening in 'Kommeet' tomato fruit. 1-HCP is an effective anti-ethylene compound but its mode of action is similar to 1-methylcyclopropene (1-MCP).

Keywords: /Tomato/ /Fruit ripening/ /Ethylene production/

HERBS AND SPICES

BASIL

Jordan, Maria, J. et al. 2017. Influence of water stress and storage time on preservation of the fresh volatile profile of three **basil** genotypes. Food Chem. 221: 169-177.

Abstract

The main goal of the present study was to describe the volatile profile of three different basil genotypes (Genovese and Green and Purple Iranian), and the impact that water stress (75% and 50% field capacity) and storage time (up to 7 days) have under mild refrigerated conditions. The chromatographic profile pointed to three different chemotypes: linalool/eugenol, nerol/geraniol, and estragol, for Genovese, Green, and Purple genotypes, respectively. Water stress depleted the volatile profile of these three landraces, due to a reduction in the absolute concentrations of some of the components related to fresh aroma (linalool, nerol, geraniol and eugenol). The stability of the basil volatile profile during storage varied depending on the water stress that had been applied. Concentration reductions of close to 50% were quantified for most of the components identified in the Purple genotype.

Keywords: /Basil/ /Storage time/

BELL PEPPER

Tan, Chung Keat, Zainon Mohd Ali and Zamri Zainal. 2016. *MnSOD* and *9-LOX* gene expression along with antioxidant changes of *Capsicum annuum* cv. Kulai during postharvest treatment. Sci. Horticulture-Amsterdam. 213: 403-409.

Abstract

There is increased interest in the consumption of hot pepper (*Capsicum annuum* cv. Kulai) due to its high antioxidant content; however, pepper is also highly susceptible to postharvest losses. The goal of this study was to evaluate the combined effect of 1-methylcyclopropene (1-MCP) and modified-atmosphere packaging (MAP) compared to MAP alone in maintaining the quality and antioxidant activity of Kulai pepper during low-temperature storage. The enzymatic activities and expression levels of superoxide dismutase (SOD) and lipoxygenase (LOX) were determined to evaluate the changes in their molecular levels in response to the postharvest treatment. The concentrations of total antioxidants as well as hydrogen peroxide (H₂O₂) and thiobarbituric acid reactive substances (TBARS) were also

determined to evaluate the changes in the antioxidant status during storage. The study revealed that a combination treatment (1-MCP and MAP) had a pronounced effect, extending the shelf life of the fruit up to 25 days over MAP treatment alone with the retention of high antioxidant content. The combined treatment greatly suppressed the production of H₂O₂ and TBARS by 29.3% and 57.6% concomitant with an 8-fold increase in SOD activity and a decrease in LOX activity up to 75.4% relative to the control. The total antioxidant level increased consistently throughout the storage period. The overall results indicated that the combination treatment of MAP and 1-MCP provided a sustained protective effect for Kulai peppers stored at low temperature, with the quality of the pepper maintained throughout handling.

Keywords: /Bell pepper/ /Shelf life/ /Postharvest treatment/

Li, Rui, et al. 2017. Enhancing iodine content and fruit quality of **pepper** (*Capsicum annuum* L.) through biofortification. *Sci. Hort. Amsterdam*. 214: 165-173.

Abstract

Iodine is an essential trace element for human health. Its deficiency in biogeochemical environments affects about two billion people worldwide. Besides universal salt iodization, the biofortification of crops with iodine has been proposed as a strategy for improving human nutrition. This study aims at exploring the effects of iodine biofortification on the fruit quality of the pepper plants. The contents of iodine, ascorbic acid, soluble sugar and total acidity of the pepper fruits grown in solution at various iodide concentration levels were measured. Furthermore, in order to reveal the mechanism of fruit quality change, the variations in Chl-a, malondialdehyde (MDA), catalase (CAT), peroxidase (POD), and superoxide dismutase (SOD) of the pepper leaves at various growth periods in response to various iodine treatments were determined. The results indicated that the iodine content of the pepper fruits grown in 0.25–5.0 mg L⁻¹ KI solutions can amount to 350–1330 µg kg⁻¹ FW, matching the 150 µg d⁻¹ dietary iodine allowance recommended by WHO. Thus, the pepper can be used as a candidate crop for iodine biofortification. In addition, low-moderate levels (0.25–1.0 mg L⁻¹) of iodine application improved the fruit quality by enhancing the ascorbic acid and soluble sugar contents, and by reducing the total acidity of pepper fruits as well. Generally, after iodine treatments, the Chl-a concentration, and CAT, POD, SOD activities of the pepper leaves increased, while the MDA concentration decreased. The changes in photosynthetic and antioxidant capacities of the plants promoted the improvement of the pepper fruit quality.

Keywords: /Pepper/ /Fruit quality/

RED BELL PEPPER

Wang, Jun, et al. 2017. Effects of various blanching methods on weight loss, enzymes inactivation, phytochemical contents, antioxidant capacity, ultrastructure and drying kinetics of **red bell pepper** (*Capsicum annuum* L.). *LWT- Food Sci. Technol.* 77: 337-347.

Abstract

The effects of hot water blanching (HWB), microwave blanching (MWB), infrared blanching (IRB) and high-humidity hot air impingement blanching (HHAIB) on weight loss, enzyme inactivation (peroxidase, POD and polyphenol oxidase, PPO), characteristic bioactive component contents (red pigments and ascorbic acid), antioxidant capacity (total antioxidant activity and 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging capacity), ultrastructure and drying kinetics of red bell peppers

under different blanching conditions were investigated. Results showed that the MWB and IRB treatment yielded lower weight loss than HWB and HHAIB. The inactivation of both PPO and POD enzymes was strongly dependent on blanching temperature and duration and microwave power for microwave blanching. The peppers treated by MWB, IRB, and HHAIB obtained higher red pigments and ascorbic acid retention, total antioxidant activity and DPPH values compared with the samples blanched by HWB. Ultrastructure analysis verified the difference in phytochemical contents among four treatments. All four blanching treatments enhanced the drying kinetics relative to unblanched peppers. The Weibull distribution model was employed to calculate the moisture effective diffusivity (D_{eff}), which ranged from 1.2688×10^{-10} to 2.8754×10^{-10} m²/s. The current findings not only contribute to a better understanding of different blanching methods but also provide more data and information for selecting blanching technologies.

Keywords: /Red bell pepper/ /Thermal blanching/ /Ultrastructure/

TUBERS AND ROOTCROPS

ARTICHOKE

Venditti, Alessandro, et al. 2017. Polar constituents, protection against reactive oxygen species, and nutritional value of Chinese artichoke (*Stachys affinis* Bunge). Food Chem. 221: 473-481.

Abstract

In the present work, we studied the chemical composition of Chinese artichoke (*S. affinis* tubers) by analyzing its polar constituents and its macro- and micro-nutrients. A total of nine compounds were isolated from the tuber ethanolic extract and structurally elucidated by Nuclear Magnetic Resonance (NMR) spectroscopy and mass spectrometry (MS). The marker compounds identified were oligosaccharide stachyose and the organic acid, succinic acid, as well as phenylethanoid and iridoid glycosides. The macronutrient profile was dominated by carbohydrates (36.9% dw), whereas potassium (2.36%) was the most abundant micro-nutrient. The tuber ethanolic extract was able to efficiently protect human cells (Caco-2, SHSY-5Y and K562) against t-BHP-induced oxidative damage.

Keywords: /Artichoke/ /Nutrients/

Sinha, Rajeev, et al. 2017. Rapid and non-destructive detection of *Pectobacterium carotovorum* causing soft rot in stored potatoes through volatile biomarkers sensing. Crop Prot. 93: 122-131.

Abstract

Early disease detection plays a significant role in the pre- and post-production management of specialty crops that often are stored for several months prior to consumption. Potato is one of the most important specialty crops of the United States. However, soft rot in potatoes due to pathogenic infections during bulk storage, accounts for substantial losses to the industry. This study was aimed at assessing the applicability of an emerging technology, portable field asymmetric ion mobility spectrometry (FAIMS), towards early detection of soft rot in potatoes during bulk storage. The FAIMS senses mobility of ions pertinent to volatile organic compounds (VOCs) released from inoculated tubers. In this study, potato tubers, inoculated with *Pectobacterium carotovorum* causing soft rot, were analyzed using FAIMS over a 30-day period in storage. Sterile water inoculated tubers were considered as healthy controls. Results suggest that FAIMS can detect soft rot as early as two days after inoculation (DAI) by effectively

capturing VOCs associated with rot progression. The activity of pathogen and associated VOCs release was maximum during the second week after inoculation. A principal component analysis showed a clear distinction between the healthy and *P. carotovorum* inoculated tubers. Classification models, quadratic discriminant analysis and Naïve Bayes with leave-one-out cross validation confirmed the validity of FAIMS response with accuracies between 83 and 100% for both healthy and *P. carotovorum* inoculated tubers.

Keywords: /Potato/ /Potato bulk storage/ /Bulk storage management/

SWEET POTATO

Esatbeyoglu, Tuba, et al. 2017. Fractionation, enzyme inhibitory and cellular antioxidant activity of bioactives from purple **sweet potato** (*Ipomoea batatas*). Food Chem. 221: 447-456.

Abstract

Sweet potato (*Ipomoea batatas* L.) is mainly cultivated in Asia. The deep purple color of purple sweet potato (PSP) is due to the high content of acylated anthocyanins. In the present study, PSP-derived polyphenols were identified using HPLC-PDA and HPLC-ESI-MSn analyses. After concentration of the polyphenols from PSP, preparative separation into two fractions, designated anthocyanins (AF) and copigments (CF), was carried out using adsorptive membrane chromatography. In enzyme inhibitory assays, all PSP samples inhibited the enzymes α -amylase, α -glucosidase and xanthine oxidase. Additionally, the cell signaling cellular antioxidant properties of the PSP extracts were investigated in cultured cells. PSP induced the transcription factor Nrf2, which regulates the expression of genes encoding heme oxygenase 1 (*Hmox1*), glutamate-cysteine ligase catalytic subunit (Gclc) and paraoxonase 1 (PON1). Furthermore, PSP enhanced cellular glutathione concentrations and decreased lipid peroxidation in cultured hepatocytes. Overall, these results suggest that PSP extracts exhibit enzyme inhibitory and cellular antioxidant properties, especially PSP CF.

Keywords: /Sweet potato/ /Anthocyanins/