

**SELECTIVE DISSEMINATION OF INFORMATION (SDI)  
PDF REPRINTS as of June 2015**

**GENERAL**

**FRESH CUT**

Fan, Xutong, Kimberly J. Sokorai. 2015. Formation of trichloromethane in chlorinated water and **fresh-cut** produce and as a result of reaction with citric acid. *Postharvest Biol. & Technol.* 109: 65 – 72.

**Abstract**

Chlorine (sodium hypochlorite) is commonly used by the fresh produce industry in the U.S. to sanitize wash water, fresh and fresh-cut fruits and vegetables. However, possible formation of harmful chlorine by-products is a concern. The objectives of this study were to compare chlorine and chlorine dioxide in trichloromethane formation, determine trichloromethane levels in chlorinated wash water, cut-lettuce and diced onions, and evaluate the reaction of chlorine with citric acid, a chemical often used to adjust pH of chlorine solution. Results showed that little trichloromethane ( $\leq 3 \mu\text{g L}^{-1}$ ) was produced from chlorine dioxide solution even at concentrations up to  $200 \text{ mg L}^{-1}$  compared with the trichloromethane level ( $\sim 40 \text{ mg L}^{-1}$ ) in solutions of chlorine mixed with lettuce extract. The formation of trichloromethane in 1 L of  $100 \text{ mg L}^{-1}$  chlorine wash water increased from  $155$  to  $284 \mu\text{g L}^{-1}$  after repeated use of the wash water to wash six batches of 100 g cut lettuce. Levels of trichloromethane in the washed cut lettuce were in the range of  $14$ – $22 \text{ mg kg}^{-1}$ , and were reduced to less than  $8 \text{ mg kg}^{-1}$  after being rinsed with water. Chlorine solution used to wash diced onions produced much less trichloromethane ( $32 \mu\text{g L}^{-1}$ ) compared with that for washing cut lettuce despite higher chemical oxygen demand and turbidity in the wash water. Citric acid reacted with chlorine and produced trichloromethane. Over  $1000 \text{ mg L}^{-1}$  trichloromethane was produced after 30 min reaction with chlorine at  $22 \text{ }^\circ\text{C}$ , while less than  $35 \text{ mg L}^{-1}$  trichloromethane was produced when Na-phosphate was used to adjust pH of chlorine. The amount of trichloromethane increased with reaction time and concentration of citrate. Our results demonstrated that formation of trichloromethane in wash water depended on type of cut-vegetables, and citric acid contributed to a significant amount of trichloromethane formation.

**Keywords:** /Fresh-Cut/ /Lettuce/ /Onions/

**FRESH PRODUCE**

Ann De Keuckelaere, Ann, et.al. 2015. Zero risk does not exist: lessons learned from microbial risk assessment related to use of water and safety **fresh produce**. *Comprehensive Rev. Food Sci. & Food Safety.* 14: 387 – 410.

**Abstract**

Risk assessments related to use of water and safety of fresh produce originate from both water and food microbiology studies. Although the set-up and methodology of risk assessment in these 2 disciplines may differ, analysis of the current literature reveals some common outcomes. Most of these studies from the water perspective focus on enteric virus risks, largely because of their anticipated high

concentrations in untreated wastewater and their resistance to common wastewater treatments. Risk assessment studies from the food perspective, instead, focus mainly on bacterial pathogens such as *Salmonella* and pathogenic *Escherichia coli*. Few site-specific data points were available for most of these microbial risk assessments, meaning that many assumptions were necessary, which are repeated in many studies. Specific parameters lacking hard data included rates of pathogen transfer from irrigation water to crops, pathogen penetration, and survival in or on food crops. Data on these factors have been investigated over the last decade and this should improve the reliability of future microbial risk estimates. However, the sheer number of different foodstuffs and pathogens, combined with water sources and irrigation practices, means that developing risk models that can span the breadth of fresh produce safety will be a considerable challenge. The new approach using microbial risk assessment is objective and evidence-based and leads to more flexibility and enables more tailored risk management practices and guidelines. Drawbacks are, however, capacity and knowledge to perform the microbial risk assessment and the need for data and preferably data of the specific region.

**Keywords:** /Fresh Produce/ /Fruits/ /Vegetables/

## FUNGAL DECAY

Gabriela M. Saavedra, Gabriela M. et.al. 2015. Effects of preharvest applications of methyl jasmonate and chitosan on postharvest decay, quality and chemical attributes of *Fragaria chiloensis* fruit. Food Chem. 190: 448 – 453.

### Abstract

*Fragaria chiloensis* fruit has a short postharvest life mainly due to its rapid softening. In order to improve its postharvest life, preharvest applications of methyl jasmonate (MeJA) and chitosan were evaluated during postharvest storage at room temperature. The quality and chemical parameters, and protection against decay were evaluated at 0, 24, 48 and 72 h of storage from fruits of two subsequent picks (termed as first harvest and second harvest). In general, fruits treated with MeJA and chitosan maintained higher levels of fruit firmness, anthocyanin, and showed significant delays in decay incidence compared to control fruit. MeJA-treated fruits exhibited a greater lignin content and SSC/TA ratio, and delayed decay incidences. Instead, chitosan-treated fruits presented higher antioxidant capacity and total phenol content. In short, both the elicitors were able to increase the shelf life of fruits as evidenced by the increased levels of lignin and anthocyanin, especially of the second harvest.

**Keywords:** /Postharvest Decay/ /Strawberry/ /Shelf Life/ /Fungal Decay/ /Anthocyanin/

## IRRADIATION

Hsiang-Mei Lung, ET.AL. 2015. Microbial decontamination of food by electron beam irradiation. Food Sci. & Technol. 44: 66 – 78.

Electron-beam irradiation (EBI) is a novel food decontamination technology that uses low-dose ionizing radiation in the treatment of crops or food, to eliminate microbial contamination. Additionally, EBI inhibits the germination of crops and controls the ripening rate of vegetables and fruits, extending the shelf life of these products. EBI is a low cost, environment friendly, and time effective alternative to the traditional thermal decontamination technology. EBI, which has been approved by the USFDA, can be applied as an alternative to chemical fumigation of food. EBI inhibits a variety of foodborne

pathogens, and effectively maintains food quality, significantly extending the shelf life. Better food preservation can be achieved by using EBI as a hurdle technology, in combination with other traditional or non-traditional food processing technologies. EBI uses low-dose radiation for decontamination, which reduces the risk of microbial hazards in food. However, from the perspective of food safety, it must be proven that EBI exerts no adverse effect on the nutrition or residual radiation in the food, before it is applied in the food processing industry. Based on a previous literature review, this paper introduces the applications, and decontamination mechanism of EBI, and the radiation detection technology. Advances in EBI usage for a variety of fruits, vegetables, cereals, beans, poultry, meat, and seafood have been summarized. Emphasis is laid on a few important directions to be investigated in future research. EBI is expected to have wide commercial usage in the improvement of food and agricultural product quality, and in reducing the risk of microbial hazards in niche products.

**Keywords:** /Irradiation/

## **FRUITS**

### **AVOCADO**

Canto Pereira, Marcio Educarado, et.al. 2015. Delayed and prolonged ethylene treatment alleviates firmness asynchrony enhanced by 1-methylcyclopropene exposure in Guatemalan-West Indian **avocado**. *Postharvest Biol. & Technol.* 108: 54 – 60.

### **Abstract**

Studies were conducted to determine the efficacy of a delayed and prolonged ethylene treatment in alleviating firmness asynchrony enhanced by 1-methylcyclopropene (1-MCP) exposure in avocado. 'Booth 7' and 'Booth 8' avocados, mid-season cultivars in Florida, were harvested and immersed in water (control) or aqueous 1-MCP at 16.7 mmol L<sup>-1</sup> a.i. (900 mg L<sup>-1</sup>) for 1 min at 20 °C; all fruit were held at 20 °C/89 ±2% relative humidity until ripe, based on whole fruit firmness, respiration and ethylene evolution. The effect of delayed and prolonged ethylene treatment was investigated by exposing 1-MCP- treated fruit to ethylene (100 mL L<sup>-1</sup>) for 2 or 4 d at 20 °C upon reaching two progressive ripening stages (120 N or 80 N of whole fruit firmness, respectively). Ripe fruit (10–15 N) from all treatments were assessed for peel color, pulp firmness and polygalacturonase (PG) activity. 1-MCP significantly delayed ripening of 'Booth 7' and 'Booth 8' avocado. Firmness asynchrony was confirmed in control fruit of both cultivars, with a difference of more than 20% in pulp firmness between apical and distal end segments regardless of ripeness stage. 1-MCP-treated fruit showed pronounced firmness asynchrony, with pulp firmness for apical end 10-fold higher than for distal end. PG activity was not directly related to firmness asynchrony, since even when strong asynchrony was observed for 1-MCP-treated fruit, PG activity did not differ from control. A 2-d delayed exposure of fruit at either 120 N or 80 N whole fruit firmness to ethylene was not consistently sufficient to promote ripening recovery (in terms of whole fruit firmness). However, a prolonged, 4-d ethylene treatment of fruit at either progressive ripening stages from both 'Booth 7' and 'Booth 8' effectively overcame the pronounced firmness asynchrony caused by 1-MCP treatment.

**Keywords:** /Avocado/ /Softening/ /1-MCP/ /Ethylene/ /Ripening/

## **BANANA**

Wang, Yansheng, et.al. 2015. Effect of nitric oxide on energy metabolism in postharvest banana fruit in response to chilling stress. *Postharvest Biol. & Technol.* 108: 21 – 27.

### **Abstract**

Effects of postharvest nitric oxide (NO) treatment on energy metabolism and chilling injury in cold-stored banana fruit were investigated. Banana fruit were treated with 0.05 mM NO donor sodium nitroprusside, and then stored at 7 °C for up to twenty days. NO treatment apparently inhibited the development of chilling injury. The contents of adenosine triphosphate (ATP) and energy charge in the NO-treated fruit were significantly higher than control fruit. Meanwhile, the activities of enzymes involved in energy metabolism, including H<sup>+</sup>-ATPase, Ca<sup>2+</sup>-ATPase, succinic dehydrogenase and cytochrome C oxidase were markedly enhanced by NO treatment. In addition, notably elevated activities of fructokinase, glucokinase, glucose-6-phosphate dehydrogenase and 6-phosphogluconate dehydrogenase were observed in NO-treated banana fruit. These results indicated that NO could enhance chilling tolerance of banana fruit through maintaining high levels of energy status and inducing enzyme activities involved in energy metabolism during cold storage.

**Keywords:** /Banana/ /Chilling Injury/

## **BAYBERRY**

Chen, Yi-Yong, et.al. 2015. Functional analysis of differentially expressed proteins in Chinese bayberry (*Myrica rubra* Sieb. et Zucc.) fruits during ripening. *Food Chem.* 190: 763 – 770.

### **Abstract**

This study developed a proteome reference map of *Myrica rubra* fruits at the green, pink and red stages during ripening using two-dimensional gel electrophoresis (2-DE). Forty-six differentially expressed proteins were detected in the gel, of which 43 were successfully identified by matrix-assisted laser desorption ionization time-of-flight/time-of-flight mass spectrometry and protein database searching. We found that malic enzyme related to the decrease of organic acid acidity was up-regulated. The high abundance of pyruvate decarboxylase and alcohol dehydrogenase may contribute to fruit peculiar fragrant characteristics. Phenylalanine ammonia-lyase, chalcone synthase 11, UDP-glucose:flavonoid 3-O-glucosyltransferase, and anthocyanidin synthase, enzymes involved in the anthocyanin metabolic pathway, were all up-regulated. The physiological data agree with fruit proteome results. These findings provided insights into the metabolic processes and regulatory mechanisms during Chinese bayberry fruit ripening.

**Keywords:** /Chinese Bayberry/ /Fruit Ripening/

## **GRAPEFRUIT**

Chaudhary, Priyanka R., et.al. 2015. Ethylene degreening modulates health promoting phytochemicals in Rio red grapefruit. *Food Chem.* 188: 77 – 83.

## Abstract

In the current study, we examined the effects of postharvest degreening and storage on phytochemicals in Rio Red grapefruit. Grapefruits were degreened with 3.5 l/l of ethylene at 21 °C and 80% relative humidity for 72 h, while non-degreened fruits were used as the control. Furthermore, the grapefruits were stored at 11 °C for 3 weeks and then at 21 °C for 2 weeks. Degreening improved the peel colour of the grapefruit without affecting total soluble solids or acidity of the juice. Degreened fruits had significantly more ascorbic acid after 35 days of storage. Degreening had no significant effect on the levels of carotenoids, limonoids and flavonoids as compared to the non-degreened fruits, after 35 days of storage. However, after 7 days, degreened fruits had more limonin and flavonoids and less furocoumarin, namely 60,70-dihydroxybergamottin. Overall, ethylene treatment had a significant effect on the phytochemical contents of Rio Red grapefruit, especially after 7 days of storage.

**Keywords:** /Grapefruit/ /Ethylene/ /Phytochemicals/

## GRAPE

Matta Fakhouria, Farayde, et.al. Edible films and coatings based on starch/gelatin: Film properties and effect of coatings on quality of refrigerated Red Crimson grapes. Postharvest Biol. & Technol. 109: 57 – 64.

## Abstract

Edible films have been studied as potential substitutes for conventional plastics in food packaging. Their development provides a new alternative for the application of hydrocolloids, following global trends of environmental preservation. Taking this into account, the aim of this study was to develop and evaluate physicochemical properties (thickness, solubility in water and acid, water vapor permeability, opacity, tensile strength and elongation at break) of composite films based on corn starch (native, modified waxy or waxy) and gelatin, plasticized with glycerol or sorbitol. After this initial screening, the formulation presenting the physicochemical properties more appropriate was applied as an edible composite coating onto Red Crimson grapes to extend the shelf-life. The addition of gelatin significantly increased mechanical strength, solubility in water, permeability to water vapor, and thickness of the biofilms, while also decreasing the opacity. Composite films prepared with sorbitol had significantly lower permeability to water vapor and higher tensile strength than the films plasticized with glycerol. Improved appearance was observed in coated grapes after 21 days storage under refrigerated conditions, which had lower weight loss than the control group. Sensory evaluation showed that all the coatings did not affect acceptability scores.

**Keywords:** /Grapes/ /Edible Films/

## KIWIFRUIT

Lim, Sooyeon, et.al. 2015. Inhibition of hardy kiwifruit (*Actinidia arguta*) ripening by 1-methylcyclopropene during cold storage and anticancer properties of the fruit extract. Food Chem. 190: 150 – 157.

## Abstract

Hardy kiwifruits (*Actinidia arguta*) were treated with 20 l/l 1-methylcyclopropene (1-MCP) for 16 h at 10 °C and subsequently stored at 1 ± 0.5 °C. Anticancer properties of the fruit extracts were tested against five different human cancer cells. The hardy kiwifruits, without 1-MCP treatment, showed increases in both respiration and ethylene production rates during fruit storage. The 1-MCP treatment remarkably inhibited fruit ripening by reducing respiration and ethylene production. Fruits with the 1-MCP treatment could be stored for up to 5 weeks by maintaining higher fruit firmness, ascorbic acid and total phenolic contents compared to the control. The hardy kiwifruit extracts showed anti-proliferative effects to Hep3B and HeLa cells but not to HT29, HepG2 and LoVo cells. These results suggest that the application of 1-MCP at harvest effectively delayed the ripening process of the fruits, and the fruit extract had beneficial effects for the prevention of human cancer growth.

**Keywords:** /Kiwifruit/ /Fruit Quality/ /Postharvest/

Yuyan Zhu, Yuyan, et.al. 2015. Pre-harvest application of oxalic acid increases quality and resistance to *Penicillium expansum* in **kiwifruit** during postharvest storage. *Food Chem.* 190: 537 – 543.

### **Abstract**

Kiwifruit (*Actinidia deliciosa* cv. Bruno) fruits were sprayed with 5 mM oxalic acid (OA) at 130, 137, and 144 days after full blossom, and then harvested at commercial maturity [soluble solid content (SSC) around 10.0%] and stored at room temperature (20 ± 1 °C). Pre-harvest application of OA led to fruit with higher ascorbic acid content at harvest, slowed the decreases in fruit firmness and ascorbic acid content and increase in SSC during storage, and also decreased the natural disease incidence, lesion diameter, and patulin accumulation in fruit inoculated with *Penicillium expansum*, indicating that the OA treatment increased quality and induced disease resistance in kiwifruit. It was suggested that the increase in activities of defense-related enzymes and in levels of substances related to disease resistance might collectively contribute to resistance in kiwifruit against fungi such as *P. expansum* in storage.

**Keywords:** /Kiwifruit/ /Storage/ /Patulin/

### **LIME**

Caron, Vanessa Cristina, et.al. 2015. Carnauba wax and modified atmosphere in refrigerated preservation of 'Tahiti' acid **limes**. *Packaging Technol. & Sci.* 28: 647 – 656.

### **Abstract**

Peel yellowing and loss of fruit mass reduce the useful life of acid limes and limit their commercialization. The goal of the present study was to prolong the post-harvest preservation of acid limes using wax and packaging. Fruits were harvested, selected, disinfected, treated with fungicide, coated with Carnauba wax and placed in cardboard boxes wrapped with different plastic packaging. A fruit lot treated only with wax coating was used as a control. The fruits were stored at 10°C for 24 days followed by 6 days at 20°C. The gas atmosphere inside the packages was analysed during storage. The loss of mass, color index, titratable acidity, and total chlorophyll, ascorbic acid, soluble solids, acetaldehyde and ethanol concentrations of the fruits were measured. The combined use of wax coating and plastic Cryovac® D-955 (Cryovac Brasil Ltda, São Paulo, Brazil) and Vegetal Pack® (Eletropolimeros

do Brasil Ltda, São Paulo, Brazil) films resulted in better post-harvest preservation of acid limes compared with only wax coating because the combined treatment maintained the green peel color following 30 days of storage in addition to resulting in lower loss of mass and maintaining chemical characteristics adequate for commercialization. The LDPE (low density polyethylene) and Xtend® packaging (Stepac Brasil Ltda, São Paulo, Brazil), although they prevented peel degreening, did not result in an adequate atmosphere to maintain the quality of limes due to the accumulation of high concentrations of acetaldehyde and ethanol, especially for the LDPE packaging. LDPE drastically changed the atmosphere surrounding the fruit, resulting in loss of the characteristic pulp color, in addition to conferring an alcohol odor.

**Keywords:** /Lime/ /Degreening/ /Postharvest/

## LONGAN

Shi, Shengyou, et.al. 2015. Comprehensive evaluation of fruit quality traits in longan 'Fengliduo' × 'D'Dawuyuan' sexual progenies. *Scientia Hort.* 192: 54 – 59.

### Abstract

In this study, the fruit quality traits of the 'Fengliduo' × 'Dawuyuan' F1progenies were assessed over three consecutive years and evaluated using variance analysis, correlation analysis and principal component analysis. The analyses indicated that 24 fruit quality traits showed extreme differences but also interdependence, with coefficient of variation (CV) ranging from 5.52% to 61.99% and Shannon–Weiner diversity index (H') ranging from 0.40 to 1.90. These fruit quality traits were evaluated by principal component analysis (PCA) of 8 aggregate indicators derived from the 24 single indicators. The results of these aggregate indicators analysis were highly consistent with the actual observations. Our analyses identified two hybrid individuals with superior traits that will be of value for further study.

**Keywords:** /Longan/ /Fruit Quality/

## MANDARIN

Nittaya Ummarata, Nittaya, et.al. 2015. Physiological, biochemical and sensory characterization of the response to waxing and storage of two mandarin varieties differing in postharvest ethanol accumulation. *Postharvest Biol. & Technol.* 109: 82 – 96.

### Abstract

A loss of flavor quality often occurs with some varieties of mandarins (*Citrus reticulata* Blanco) following waxing and storage. This is thought to be due to the synthesis of ethyl esters which is stimulated by an accumulation of ethanol in the fruit as a result of anaerobic metabolism. The goal of this study was to determine the importance of postharvest ethyl ester accumulation to mandarin flavor in two important commercial mandarin varieties that differ in ethanol accumulation patterns. This study also aimed to enhance knowledge regarding the importance of ethanol accumulation to ethyl ester synthesis and overall flavor. In order to do this, comparisons were made between 'Pixie' (P) and 'Gold Nugget' (GN), mandarins that were previously identified as accumulating high and low amounts of ethanol, respectively, after waxing. In three of four harvests (H) at two different locations, P accumulated much higher concentrations of ethanol than GN after waxing and storage for 3 weeks at 5

°C and 1 week at 20 °C. Sensory panel analysis indicated that off-flavor development during storage was more pronounced in P than GN as were declines in overall acceptability. Flavor in fruit from Ojai, California (H4) was less negatively impacted by storage than fruit from the San Joaquin Valley of California (H1, H2, H3), for both varieties. Consistent with prior research, alcohols, esters and aldehydes were greatly altered in amount as a result of waxing and storage, with ethanol and the ethyl esters being the most prominent compounds, although ethyl ester concentration did not consistently relate to the amount of ethanol present. In H1 P had higher ethanol following storage than GN and correspondingly higher ethyl esters, while in H2 and H3 GN had significantly higher ethyl ester concentrations than P but did not have higher ethanol. Fruit from H4 had similar volatile concentrations between the varieties but ethanol was higher in P than GN. Internal oxygen concentrations in Pixie after waxing were lower than those in GN and likely were largely responsible for the greater ethanol accumulation observed in P. Following storage P tended to have higher pyruvate concentration and alcohol dehydrogenase (ADH) activity, while differences in pyruvate decarboxylase (PDC) activity were not consistent across harvests. Although the impact of waxing and storage on flavor was more negative for P than GN, the cause of this could not be simply ascribed to the greater tendency of P than GN to produce ethanol that in turn led to greater ethyl ester accumulation.

**Keywords:** /Mandarin/ /Storage/ /|Postharvest/

## **MANGO**

Santos, Jessika Goncalves, et.al. 2015. Influence of ultrasound on fresh-cut mango quality through evaluation of enzymatic and oxidative metabolism. *Food Bioprocess Technol.* 8: 1532 – 1542.

### **Abstract**

Ultrasound (US) was applied as a post-processing treatment on fresh-cut mangoes as a means to preserve quality and to further understand its possible physiological effects. Processed fruits were sonicated at 25 kHz for 30 min and stored for 7 days under refrigeration at 4 °C. Fruits were analyzed on treatment day (day 0) and after storage (day 7) for quality through physicochemical and chemical variables, while color and firmness were evaluated in association to physiological variables, at last, variables of oxidative/ antioxidant were also analyzed. Initially (day 0), US significantly reduced soluble solids and sugar content in 15 %, although after storage (day 7), there was no difference between treatments. After storage (day 7), US-treated mango was softer, 139.34 N, than control, 241.15 N, and firmness loss was not associated to cell membrane integrity, as determined by lipid peroxidation degree, but to cell wall integrity as hydrolases pectin methylesterase and polygalacturonase were stimulated. The color attribute °Hue was affected by US and declined significantly after the storage (day 7) to 80.79, indicating darkening of tissue. Results indicate that guaiacol peroxidase was the primary cause of darkening while polyphenol oxidase activity, carotenoids, and total flavonoids could not be associated to changes in color. Constant levels of hydrogen peroxide indicate that sonication did not induce an oxidative imbalance in mangoes, and thereby, the non-enzymatic antioxidants, total antioxidant activity, and activity of antioxidant enzymes superoxide dismutase and catalase were not influenced by the US. Therefore, US affected negatively fresh cut mangoes' quality through deteriorating changes, and further work should be carried on to explore ultrasound under different conditions as to ensure this technology could be appropriately used at mango postharvest.

**Keywords:** /Mango/ /Fresh Cut/ /Quality/

## MULBERRY

Chen, Hang jun, et.al. 2015. Effects of allyl isothiocyanate treatment on postharvest quality and the activities of antioxidant enzymes of mulberry fruit . Postharvest Biol. & Technol. 108: 61 – 67.

### Abstract

The effects of allyl isothiocyanate (AITC) treatment on fruit quality, anthocyanin and phenolic contents, and the activities of antioxidant enzymes of mulberries var. Dashi (*Morus alba* L.) were evaluated. Freshly harvested mulberry fruit were placed in plastic sealed containers and treated with AITC at 5 and 15  $\mu\text{L}^{-1}$  for 15 d, respectively. Samples were randomly selected initially and at 3 d intervals during storage. The fruit treated with AITC were resistant to decay, and had high levels of total soluble solids as well as titratable acidity. The application of AITC in mulberry fruit was effective in decreasing malondialdehyde (MDA) accumulation and lipoxygenase (LOX) activity, inhibiting respiration, maintaining surface color and firmness, and suppressing total phenolic and anthocyanin contents. However, AITC treatment had no discernible effect on the activities of antioxidant enzymes. The results from this study indicated that AITC treatment improved the metabolism and postharvest quality of mulberry fruit and provided an effective method for prolonging the storage life of the fruit.

**Keywords:** /Mulberry/ /Postharvest Quality/

## PAPAYA

Dotto, Guilherme, et.al. 2015. Use of chitosan solutions for the microbiological shelf life extension of papaya fruits during storage at room temperature. LWT – Food Sci. Technol. 64: 126 – 130.

### Abstract

Chitosan solutions were used to extend the microbiological shelf life of papaya fruits during storage at room temperature. The fruits were coated using different chitosans (molecular weights of 150 or 300 kDa) and, stored for 20 days under ambient conditions. Evolution curves of mesophilic bacteria, yeasts and molds on papaya fruits during the storage period were constructed for coated and uncoated samples. These curves were represented by the Gompertz model, in order to estimate the shelf life of papaya fruits. The results showed that the 150 kDa chitosan solution was more adequate to preserve the papaya fruits. After 10 days of storage, the Log (CFU/g) of mesophilic bacteria and yeasts and molds were, respectively, 1.3 and 2 times lowest for coated fruits. The use of 150 kDa chitosan solutions extended in about 4e7 days the shelf life of papaya fruits, during the storage at room temperature.

**Keywords:** /Papaya/ /Chitosan/ /Storage/ /Shelf Life/

## PEACH

Mahajan, B.V.C., et. al. 2015. Effect of different packaging films on shelf life and quality of peach under super and ordinary market conditions. J Food Sci. Technol. 52(6): 3756 – 3762.

## Abstract

Peach (*Prunus persica* L. Batsch) fruits of cultivar 'Shan-i-Punjab' were harvested at colour break stage and packed in paper moulded trays followed by wrapping with different packaging films viz. cryovac heat shrinkable RD- 106, cling and low density polyethylene (LDPE) film. After packaging, the fruits were stored under two different conditions i.e. super-market conditions (18–20 °C; 90–95 % RH) and ordinary market conditions (28–30 °C; 60–65 % RH). The fruits were evaluated for various quality attributes periodically. The shrink film helped in reducing the loss in weight, firmness, decay incidence and maintained the various qualities attributes like total soluble solids, sugars, acidity and ascorbic acid content of the fruits during shelf-life better than unwrapped control fruits. The pectin methyl esterase enzyme activity was also found to be lower in shrink film packed fruits over the unwrapped control fruits. The in-package gaseous composition (O<sub>2</sub> and CO<sub>2</sub>) in shrink film packed fruits was found to be at desired level which resulted in maintenance of pleasant flavour of the fruits. On the other hand LDPE film accumulated very high level of CO<sub>2</sub>, which led to formation of fermenting odour and decay of fruits in the package. The data revealed that RD-106 film proved quite effective in prolonging the shelf-life and maintaining the quality of peach fruits for 9 and 4 days under super market conditions (SMC) and ordinary market conditions (OMC), respectively as against 6 and 2 days only in case of unpacked control fruits under both the marketing conditions. The results suggest that shrink film could be used in packaging of peach without negative effects on quality.

**Keywords:** /Peach/ /Packaging films/ /Storage/ /Quality/

## PEARS

Chen, Yihui, et. all. 2015. Effects of a feasible 1-methylcyclopropene postharvest treatment on senescence and quality maintenance of harvested Huanghua pears during storage at ambient temperature. *LWT – Food Sci. & Technol.* 64: 6 – 13.

## Abstract

The effects of paper containing 1-methylcyclopropene (1-MCP) on senescence and quality of harvested Huanghua pears during storage at (25 ± 1) °C and 90% relative humidity were investigated. As compared to the control fruit, the fruit treated with different doses (0.45, 0.9 or 1.35 mL/L) of 1-MCP displayed the decreased rates of respiration and ethylene production, had lower cellular membrane relative leakage rate and lower weight loss, maintained higher value of hue angle ( $h_u$ ) in fruit surface and had less change of color in peel, had higher content of chlorophyll in peel and higher content of titratable acidity in pulp, and kept higher fruit firmness. Among the different doses of 1-MCP treatment, the fruit treated with 0.9 mL/L 1-MCP for 12 h exhibited the most effectiveness for increasing storability and delaying senescence, which maintained higher activities of superoxide dismutase, catalase and ascorbate peroxidase, higher contents of ascorbic acid and glutathione, had lower rate of superoxide anion production and lower malondialdehyde content. The postharvest treatment with paper containing 1-MCP at 0.9 mL/L for 12 h could effectively delay fruit senescence, maintain higher quality and exhibit better storage behaviour which might suggest a feasible technique for keeping quality of harvested Huanghua pears.

**Keywords:** /Pears/ /1- MCP/ /Postharvest Physiology/ /Storage/

Rizzolo, Anna, et.al. 2015. Influence of storage (time, temperature, atmosphere) on ripening, ethylene production and texture of 1-MCP treated 'Abbé Fétel' pears. Postharvest Bioil. & Technol. 109: 20 - 29.

### **Abstract**

'Abbé Fétel' is the most important pear cultivar in Italy but is susceptible to superficial scald and soft scald during storage, the former effectively prevented by 1-methylcyclopropene (1-MCP) treatment at harvest and by dynamic controlled atmosphere (DCA). However, 1-MCP at  $-0.5\text{ }^{\circ}\text{C}$  prevents pear ripening, and DCA can favor the appearance of soft scald, especially after long storage. The aim of this research was to study how postharvest treatments (storage atmosphere, temperature and time) can modulate the ripening ability in storage of 1-MCP treated 'Abbé Fétel' pears. To this aim, control and 1-MCP treated (SmartFresh<sup>TM</sup>,  $300\text{ nL L}^{-1}$ ) pears stored in air (NA), controlled atmosphere (CA) and DCA at either  $-0.5\text{ }^{\circ}\text{C}$  or  $1\text{ }^{\circ}\text{C}$  for 20 and 28 weeks were evaluated for ripening in storage by relating the spectral maturity indices IAD (index of absorbance difference), bound to chlorophyll, and Icarot (carotenoids index), bound to carotenoids, to ethylene production, background skin color, mechanical properties of the pulp (firmness, stiffness and energy-to-rupture) and sugar (soluble solid content) and organic acid (titratable acidity) contents. The 1-MCP treatment drastically reduced ethylene production, impaired skin yellowing and fruit softening during storage of fruit kept at  $-0.5\text{ }^{\circ}\text{C}$ , regardless of storage atmosphere and length of storage. The 1-MCP treatment coupled to  $1\text{ }^{\circ}\text{C}$  storage in NA succeeded in maintaining firmness and green color in storage but without blocking them, as indicated by the significant decrease in texture parameters and background skin hue achieved already in storage. 1-MCP treated samples which did not ripen in storage (DCA@  $-0.5\text{ }^{\circ}\text{C}$ , DCA@  $1\text{ }^{\circ}\text{C}$ , CA@  $-0.5\text{ }^{\circ}\text{C}$  of both storage times and CA@  $1\text{ }^{\circ}\text{C}$  at 20 weeks) were distinguished from the 1-MCP treated pears which began to ripen at different times in storage, i.e. NA@  $-0.5\text{ }^{\circ}\text{C}$ , showing the least marked changes, and NA@  $1\text{ }^{\circ}\text{C}$  after 28 weeks, having the highest changes in ripeness in storage. In control fruit, IAD index better correlated to TA and ethylene production, while Icarot index better correlated to pulp mechanical properties and allowed the differentiation of control samples according to the ripeness degree reached already in storage, with NA@  $1\text{ }^{\circ}\text{C}$  fruit after 28 weeks being the ripest and DCA@  $-0.5\text{ }^{\circ}\text{C}$  pears after 20 weeks, the least ripe.

**Keywords:** /Pears/ /Storage/ /Ripening/ /Ethylene/

### **POMEGANATE**

Palma, Amedeo, et. al. 2015. Overall quality of ready-to-eat pomegranate arils processed from cold stored fruit. Postharvest Biol. & Technol. 109: 1 – 9.

### **Abstract**

The overall quality, titratable acidity, total solid soluble, total polyphenol, anthocyanin content, antioxidant activity, sugar content and juice color of ready-to-eat arils of 'Primosole' pomegranate processed at harvest and after 30 or 60 days of storage of whole fruit at  $5^{\circ}\text{C}$  and 90% RH was assessed. Minimally processed arils were packaged in polypropylene trays (150 g each), wrapped with a polypropylene film to generate a passive modified atmosphere and stored at  $5^{\circ}\text{C}$  and 90% RH for 10 days. In-package  $\text{CO}_2$  was lower for those arils obtained from fruit with longer storage time while  $\text{O}_2$  concentrations increased. Slight or not significant changes were detected in chemical and physical parameters during the 10 days of shelf-life of packaged arils, regardless the storage time of whole fruit,

even when physiological disorders of the peel significantly reduced the commercial value of whole fruit along storage. Similarly, changes in sensory analysis were negligible and did not affect the eating quality.

**Keywords:** /Pomegranate/ /Modified Atmosphere/ /Quality/ /Ready-to-eat/

Selcuk, Nurten, Mustafa Erkan. 2015. Changes in phenolic compounds and antioxidant activity of sour–Sweet **pomegranates** cv. ‘Hicaznar’ during long-term storage under modified atmosphere packaging. *Postharvest Biol. & Technol.* 109: 30 – 39.

### **Abstract**

This study was carried out to evaluate the effects of modified atmosphere packaging (MAP) on phenolic compounds and antioxidant activity of sour–sweet pomegranates cv. Hicaznar during long-term storage. Pomegranate fruit were harvested at commercial harvest maturity and packed in two different commercial types of MAP (MAP1, sealed in packages made of Xtend1 film; MAP2, sealed in bags made of ZOEpac). Unpacked fruit stored in plastic boxes were used as control. After packaging, all fruit samples were stored at  $6 \pm 0.5$  °C at  $90 \pm 5\%$  relative humidity for up to 210 days, and removed from storage at 60 days intervals for assessing phenolic compounds and antioxidant activity, as well as other quality parameters. After each storage period, fruit were removed and kept at 20 °C for 3 days to simulate a period of shelf life. Total phenolic, total anthocyanin contents and antioxidant activity increased slightly until the first 120 days of storage, and then decreased during the rest of the storage. Ascorbic acid, titratable acidity and total soluble solids decreased after cold storage and shelf life, and no significant differences were found among treatments except for total soluble solids. Contents of organic acids were decreased in all treatments during storage, and no significant differences were found among treatments except for tartaric acid. During long-term storage, CO<sub>2</sub> levels increased and O<sub>2</sub> levels decreased inside both MAPs systems. MAPs significantly reduced weight loss, maintained visual appearance, retarded skin discoloration compared to control fruit. There was no statistical difference in decay incidence between MAPs and control fruit at 210 days of cold storage, while more decay developed on fruit packed in MAPs than on control fruit at 210 + 3 days SL period. The results indicated that 180 days storage of fruit in the modified atmosphere packaging at 6 °C maintained physiological and biochemical properties of pomegranate fruit.

**Keywords:** /Pomegranates/ /Modified Atmosphere Packaging/ / Storage/

### **STRAWBERRY**

Xu, Xiangbin, et. al. 2015. Micro RNAs play an important role in the regulation of **strawberry** fruit senescence in low temperature. *Postharvest Bio l. & Technol.* 108: 39 – 47.

### **Abstract**

To understand the microRNAs (miRNAs)-mediated mechanism of low temperature delaying non-climacteric strawberry fruit senescence during postharvest period, two small RNA (sRNA) libraries from strawberry fruit stored at low temperature for 24 and 48 h were constructed. A total of 88 known and 1224 novel potential candidate miRNAs were obtained and analyzed. Compared with the expression of miRNAs in strawberry fruit stored for 0 h, 108 miRNAs were up-regulated and 113 were down-regulated in fruit stored at 24 h, and 139 miRNAs were up-regulated and 114 were down-regulated in fruit stored at 48 h. In the process of fruit storage under low temperature, PC-5p-176409\_20 repressed abscisic acid

(ABA) signaling transduction via the PYR1/PYL1-PP2C-SnRK2 network, miR167 reduced the jasmonic acid (JA) biosynthesis by targeting auxin response factor 8 (ARF8), and by which they were involved in delaying fruit senescence. MiR164, miR172, PC-5p-67794\_53 and PC-5p-1004\_3092 up- or down-regulated the expression of their target genes, NAC transcription factors, APETALA2.7 (AP2.7) transcription factor, alpha/beta-hydrolases super family protein and glycosyl hydrolase 9B1, respectively, and also involved in delaying fruit senescence under low temperature. These results give valuable information for understanding the role of miRNA in mediating the fruit senescence at low temperature.

**Keywords:** /Strawberry/ /Temperature/

## **SWEET CHERRY**

Colgencen, Ibrahim, Mehmet Seckin Aday. 2015. The efficacy of the combined use of chlorine dioxide and passive modified atmosphere packaging on **sweet cherry** quality. *Postharvest Biol. & Technol.* 109: 10 – 19.

### **Abstract**

The efficacy of the combined use of passive modified atmosphere and aqueous chlorine dioxide at various concentrations of 4, 8, 12, 16, 20 and 25 mg/L on physical and chemical quality attributes of sweet cherry was evaluated during a five weeks storage period at 4 °C. The results showed that ClO<sub>2</sub> treatments at concentrations of 16 and 20 mg/L maintained pH, total soluble solid contents and firmness better than other samples at the end of the storage. Untreated samples and samples treated with 25 mg/L ClO<sub>2</sub>, had higher weight loss and respiration rate than other treated fruit during storage. Steady-state equilibrium was achieved in the passive modified atmosphere packages of ClO<sub>2</sub> treated cherries between the second and the fifth weeks of storage. No significant differences were found between untreated and treated samples except for 25 mg ClO<sub>2</sub> treated fruit regarding electrolyte leakage. The L\* values of ClO<sub>2</sub> treated samples ascended with increasing concentrations of ClO<sub>2</sub> at each sampling day. ClO<sub>2</sub> treatments significantly affected the redness (a\*) values of fruit during storage. ClO<sub>2</sub> treatment at the concentration of 25 mg/L had a deleterious effect on cherry color and anthocyanins. The cherries treated with 16 and 20 mg/L ClO<sub>2</sub> tended to have higher scores than other treated and untreated samples in all sensory attributes. No mold growth was visually observed during the first two weeks of storage in treated cherries except 4 and 8 mg/L ClO<sub>2</sub> treated samples. In summary, our work has led us to conclude that combined use of passive modified atmosphere and ClO<sub>2</sub> treatments at a concentrations of 16 and 20 mg/L has potential to maintain the quality of sweet cherry.

**Keywords:** /Sweet Cherry/ /Quality/ /Modified Atmosphere Packaging/

Pasquariello, Maria Silvia, et.al. 2015. Influence of postharvest chitosan treatment on enzymatic browning and antioxidant enzyme activity in **sweet cherry** fruit. *Postharvest Biol. & Technol.* 109: 45 – 56.

### **Abstract**

The effectiveness of chitosan fruit coating to delay the onset of senescence in three sweet cherry (*Prunus avium* L.) cultivars “Ferrovia”, “Lapins”, and “Della Recca” as well as its effect on antioxidant enzymes involved in the balancing of the reactive oxygen system (ROS), were evaluated. Fruit were

dipped for 60 s into a 0.5% chitosan solution, stored at 2 °C for 14 days and sampled at harvest, 7 and 14 days of cold storage. At each sampling date, subsamples were maintained for 3 days at 24 °C to assess the shelf life of the fruit. Malondialdehyde content and some enzymatic activities such as superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX), polyphenol oxidase (PPO), guaiacol peroxidase (POD) and lipoxygenase (LOX) were evaluated. Chitosan treatment enhanced the activity of some antioxidant enzymes, including SOD and APX. The treatment inhibited PPO and POD activities, preventing flesh-browning and extending storage life of sweet cherry fruit. In addition, chitosan treatment also maintained membrane integrity by delaying LOX activity LOX and malondialdehyde accumulation. A multivariate statistical approach including a principal component analysis provided a global view of the response of the three sweet cherry cultivars to chitosan coating and storage temperature. Chitosan- coated fruit showed a lower decay both at 2 °C and 24 °C than the uncoated fruit. In “Della Recca” fruit, membrane preservation and antioxidant enzyme system resulted higher than in “Ferrovia” and “Lapins”.

**Keywords:** /Sweet Cherry/ /Chitosan/ /Enzymatic Browning/

## **TABLE GRAPES**

Harindra Champa, W. A., et.al. 2015. Preharvest salicylic acid treatments to improve quality and Postharvest life of table grapes (*Vitis vinifera* L.) cv. Flame Seedless. J. Food Sci. Technol. 52(6): 3607 – 3616.

### **Abstract**

Significance of preharvest salicylic acid (SA) treatments on maturity, quality and postharvest life of grape cv. Flame Seedless were studied during two years. The experiment was performed on 12-year old own rooted, grapevines planted at 3 m×3 m spacing trained on overhead system. Vines were treated with aqueous solutions of SA (0.0, 1.0, 1.5 and 2.0mM) at pea stage and at veraison. After harvesting, clusters were divided into two lots in which one was subjected to initial quality evaluation, while the other was stored in cold room (3–4 °C, 90-95 % RH) for evaluation of postharvest quality. SA at the dose of 1.5 and 2.0 mM hastened berry maturity by 3 to 5 days, produced less compact bunches alongside larger berries in contrast to control and the lowest dose. The same doses effectively maintained peel colour, higher firmness, lower pectin methyl esterase activity and electrolyte leakage alongside suppressing degradation of TSS and TA during cold storage. These two doses also exhibited higher efficacy on maintaining anthocyanins, phenols and organoleptic properties while reducing weight loss, rachis browning and decay incidence. Correlation analysis demonstrated that many quality parameters are interdependent. In conclusion, preharvest spray of 1.5 mM SA proved to be an effective means of improving quality and extending postharvest life of grape cv. Flame Seedless.

**Keywords:** / Table Grapes/ /Quality / /Salicylic Acid / /Shelf Life/

## **VEGETABLES**

### **ASPARAGUS**

Herppich, Wenner B. & Susanne Huyskens-Keil & Karin Hassenberg. 2015. Impact of ethanol treatment on the chemical properties of cell walls and their influence on toughness of white asparagus (*Asparagus officinalis* L.) spears. Food Bioprocess Technol . 8: 1476 – 1484.

## Abstract

Toughening is the most important postharvest factor that negatively affects quality of fresh white asparagus (*Asparagus officinalis* L.) spears. It is assumed to result from wounding-induced or developmentally regulated cell wall thickening and increased lignification of sclerenchyma sheath cells and of vascular bundle elements. Postharvest application of ethanol has been shown to be an effective disinfectant of white asparagus spears; it is also known to delay or inhibit plant development. The latter was tested for its potential efficacy to reduce undesired spear toughening. In this context, effects of ethanol treatment on changes in cell wall properties were investigated. Practically relevant short-term washing of spears in 50 % ethanol solution (v/v) at 10 °C for 30 and 90 s reduced toughening of fresh white asparagus spears during 4 days of storage at approx. 20 °C. The treatment inhibited the biosynthesis of secondary cell wall structural carbohydrates (hemicellulose and cellulose) and of lignins, although to a lesser extent. Cell wall contents of pectic substances were also less affected, while the content of cell wall proteins was pronouncedly reduced by ethanol exposure. As a conclusion, practically relevant short-term washing with ethanol solution seems to be a promising approach to improve quality maintenance and safety of fresh white asparagus spears.

**Keywords:** /Asparagus/ /Quality/ /Texture/

## BROCCOLI

Bachiega, Patricia, et. al. 2015. Antioxidant and anti proliferative activities in different maturation stages of **broccoli** (*Brassica oleracea* Italica) bio fortified with selenium. *Food Chem.* 190: 771–776.

## Abstract

In this work, three different broccoli maturity stages subjected to biofortification with selenium were evaluated for antioxidant and antiproliferative activities. Antioxidant trials have shown that the maturation stages biofortified with selenium had significantly higher amounts of phenolic compounds and antioxidant activity, especially seedlings. Although non-polar extracts of all samples show anti proliferative activity, the extract of broccoli seedlings biofortified with selenium stood out, presenting cytotoxic activity for a glioma line (U251, GI50 28.5 mg L<sup>-1</sup>).

**Keywords:** /Broccoli/ /Antioxidant/

Yasin Topcu, Yasin, et.al. 2015. The effects of UV radiation during the vegetative period on antioxidant compounds and postharvest quality of **broccoli** (*Brassica oleracea* L.). *Plant Physiol. & Biochem.* 93: 56 – 65.

## Abstract

In this study, the effects of supplementary UV radiation during the vegetative period on antioxidant compounds, antioxidant activity and postharvest quality of broccoli heads during long term storage was studied. The broccolis were grown under three different doses of supplementary UV radiation (2.2, 8.8 and 16.4 kJ/m<sup>2</sup>/day) in a soilless system in a glasshouse. Harvested broccoli heads were stored at 0 °C in modified atmosphere packaging for 60 days. The supplementary UV radiation

(280e315 nm) during the vegetative period significantly decreased total carotenoid, the chlorophyll a and chlorophyll b content but increased the ascorbic acid, total phenolic and flavonoid contents of broccolis. All supplementary UV treatments slightly reduced the antioxidant activity of the broccolis, however, no remarkable change was observed between 2.2 and 8.8 kJ/m<sup>2</sup> radiation levels. The sinigrin and glucotropaeolin contents of the broccolis were substantially increased by UV treatments. The prolonged storage period resulted in decreased ascorbic acid, total phenolic and flavonoid contents, as well as antioxidant activity. Discoloration of the heads, due to decreased chlorophyll and carotenoid contents, was also observed with prolonged storage duration. Glucosinolates levels showed an increasing tendency till the 45th day of storage, and then their levels started to decline. The weight loss of broccoli heads during storage progressively increased with storage time in all treatments. Total soluble solids, solids content and titratable acidity decreased continuously during storage. Titratable acidity was not affected by UV radiation doses during the storage time whereas soluble solids and solids content (dry matter) were significantly affected by UV doses. Supplementary UV radiation increased the lightness (L\*) and chroma (C\*) values of the broccoli heads. Pre-harvest UV radiation during vegetative period seems to be a promising tool for increasing the beneficial health components of broccolis.

**Keywords:** /Broccoli/ /Radiation/ /MAP/ /Storage/ /Quality/

## **CABBAGE**

Lee, Hanna, et.al. 2015. Cold plasma treatment for the microbiological safety of cabbage, lettuce, and dried figs. Food Microbiol. 51: 74 – 80.

## **Abstract**

Microwave-powered cold plasma treatment (CPT) was evaluated as a means to improve the microbiological safety of fresh vegetables and dried fruits. The CPT at 900 W, conducted for 10 min using nitrogen as a plasma-forming gas, inactivated Salmonella Typhimurium inoculated on cabbage and lettuce by approximately 1.5 log CFU/g. The CPT at 400e900 Wand 667 Pa, conducted for 1e10 min using a helium eoxygen gas mixture, inactivated Listeria monocytogenes on cabbage by 0.3e2.1 log CFU/g in a time dependent manner (P < 0.05). The Weibull model adequately described the inactivation of L. monocytogenes on cabbage by CPT. The CPT at the optimum conditions of treatment power (400 W) and time (10 min) inactivated L. monocytogenes on lettuce by 1.8 ± 0.2 log CFU/g. As the water activity of the dried figs increased from 0.70 to 0.93, the reductions in numbers of Escherichia coli O157:H7 and L. monocytogenes on figs increased from 0.5 to 1.3 log CFU/g and from 1.0 to 1.6 log CFU/g, respectively. The microbial inactivation by CPT increased synergistically when the pH of the figs was reduced from 6 to 4. CTPs have potential application to increase the microbiological safety of vegetables and dried fruits.

**Keywords:** /Cabbage/ /Lettuce/ /Food Safety/

## EGGPLANT

Gao, Hui, et. al. 2015. Effect of 24-epibrassinolide treatment on the metabolism of eggplant fruits in relation to development of pulp browning under chilling stress. J.Food Sci. Technol. 52(6): 3394 – 3401.

### Abstract

This study aims to investigate the effect of 24- epibrassinolide (EBR) on the metabolism in relation to development of chilling injury-induced pulp browning of eggplant fruit. The fruits were dipped for 10 min in solutions containing 10  $\mu\text{M}$  EBR and then stored at 1 °C for 15 days. Chilling injury index, weight loss, electrolyte leakage and malondialdehyde (MDA) content of control fruit increased during storage. Chilling injury improved phenylalanine ammonia-lyase (PAL), polyphenol oxidase (PPO), and peroxidase (POD) activities, which are correlated with the increase of total phenolic content and pulp browning of eggplant fruit. The inhibition of pulp browning by EBR treatment was possibly attributed to preserving the cell membrane integrity, reducing total phenolic content, and decreasing PAL, PPO, and POD activities. These results suggest that EBR may inhibit chilling injury and pulp browning in eggplant fruit during cold storage.

**Keywords:** /Eggplant/ /Chilling Injury/ /Browning/

## LETTUCE

Kozukia, Ayako, et.al. 2015. Effect of postharvest short-term radiation of near infrared light on transpiration of lettuce leaf. Postharvest Biol. & Technol. 108: 78 – 85.

### Abstract

We investigated the physiological effects of short-term postharvest near infrared (NIR) radiation on relative transpiration rates, stomatal apertures, and reactive oxygen species (ROS) levels in guard cells on excised young lettuce leaves and on transpiration of leaf lettuce at commercial maturity. When the young leaves were radiated by NIR of wavelengths longer than 850 nm at  $100 \text{ mmol m}^{-2} \text{ s}^{-1}$  for short duration (10–60) min, relative transpiration rates during subsequent storage were reduced, but not by visible light radiation and by longer radiation (180 min) of NIR. The reduction in transpiration rates by the short-term NIR radiation was greater at 10 °C than at 25 °C under both dark and light conditions during subsequent storage. The short-term NIR radiation enhanced stomatal closure and ROS accumulation in guard cells of young lettuce leaves. These results indicate that the suppression of transpiration by short-term NIR radiation is likely to be mediated through stomatal closure due to NIR-induced ROS accumulation. The reduction of transpiration by short-term NIR radiation was obtained not only in excised young leaves but also in leaf lettuce at commercial maturity, resulting in keeping freshness. The short-term NIR radiation could be an additional means to extend shelf life of leaf vegetables.

**Keywords:** /Lettuce/ /Postharvest/

## MUSHROOM

Akata, Ilgaz, Emrah Torlakb, Fatih Erci. 2015. Efficacy of gaseous ozone for reducing microflora and foodborne pathogens on button mushroom. *Postharvest Biol. & Technol.* 109: 40 – 44.

### Abstract

During growth, mushrooms can be contaminated with both saprophytic and pathogenic microorganisms derived from various points of contamination. This study was performed to evaluate the efficacy of gaseous ozone for reduction of microbial load and elimination of *Salmonella*, *Listeria monocytogenes* and *Escherichia coli* O157:H7 on white button mushroom (*Agaricus bisporus* (J.E. Lange) Imbach). Whole mushroom samples were exposed to gaseous ozone up to 60 min at concentrations of 2.8 and 5.3 mg L<sup>-1</sup>. The level of yeast and mold population naturally present on mushrooms was reduced more than 1.43 log after ozonation at 5.3 mg L<sup>-1</sup> for 45 min. Exposure to ozone at 2.8 and 5.3 mg L<sup>-1</sup> for 60 min yielded 2.44 and 3.07 log reductions in aerobic plate counts, respectively. Initial levels of *Salmonella*, *L. monocytogenes* and *E. coli* O157:H7 populations on inoculated mushrooms reduced by ranging 2.10 and 2.76 log after 60 min of treatment performed at concentration of 2.8 mg L<sup>-1</sup>, respectively. Ozonation at 5.3 mg L<sup>-1</sup> for 60 min reduced the initial counts of *Salmonella*, *L. monocytogenes* and *E. coli* O157:H7 by 3.61, 2.80 and over 3.41 log, respectively. These results suggest that gaseous ozone treatment can improve the microbial safety and postharvest quality of mushrooms.

**Keywords:** /Mushroom/

## ONION

Southwood, Michael J., Altus Viljoen, Adele McLeod . 2015. Inoculum sources of *Fusarium oxysporum* f.sp. *cepae* on onion in the Western Cape Province of South Africa. *Crop Prot.* 75: 88 – 95.

### Abstract

*Fusarium* basal rot of onion, caused by *Fusarium oxysporum* f.sp. *cepae*, is one of the leading causes of post-harvest and storage losses within the Western Cape region in South Africa. Several vegetative compatibility groups (VCGs) of *F. oxysporum* f.sp. *cepae* have been associated with bulb rot in mature onions in South Africa, of which VCG 0425 predominates. Our study investigated seed and seedling transplants as potential sources of inoculum of *F. oxysporum* f.sp. *cepae*, and whether VCG 0425 is associated with these materials. *Fusarium* isolation studies from 13 seed lots showed that seven of the seed lots were infected with either moderately or highly virulent *F. oxysporum* f.sp. *cepae* isolates. The infection frequency of seed lots was between 0.17 and 0.50%, and only two of the seed lots were infected with VCG 0425. The seedborne nature of *F. oxysporum* f.sp. *cepae* was confirmed by showing that a green fluorescent protein (GFP)-labelled *F. oxysporum* f.sp. *cepae* VCG 0425 transformant could be transmitted from infected soil to bulbs, and from there to the seed stalks and seeds. Onion seedling transplants from nurseries were also implicated as a source of inoculum. The incidence of *F. oxysporum* f.sp. *cepae* in nurseries increased as the season progressed from 2.7% at the 6-week-old growth stage to 5.7% at the 14-week-old stage. The *F. oxysporum* f.sp. *cepae* isolates from transplants were highly to moderately virulent. However, none of the isolates proved to be VCG 0425. Most (>86%) of the *F. oxysporum* isolates from seed and seedlings were not *F. oxysporum* f.sp. *cepae* and were not pathogenic to onion. Altogether, the results indicate that onion seed and seedlings are

inoculum sources of *F. oxysporum* f.sp. *cepae* in the Western Cape Province, but that VCG 0425 is rarely associated with these sources.

**Keywords:** /Onions/ / Fusarium Basal Rot/

## **SPINACH**

Hu, Huali, et al. 2015. Hydrogen sulfide delays leaf yellowing of stored water **spinach** (*Ipomoea aquatica*) during dark-induced senescence by delaying chlorophyll breakdown, maintaining energy status and increasing antioxidative capacity. *Postharvest Biol. & Technol.* 108: 8 – 20.

### **Abstract**

During dark-induced senescence at 12–14 °C, changes of endogenous hydrogen sulfide (H<sub>2</sub>S) metabolism, chlorophyll degradation, energy status, and antioxidant capacity of *Ipomoea aquatica* fumigated with or without exogenously applied H<sub>2</sub>S donor sodium hydrosulfide (NaHS) were assessed. Compared to the control, NaHS treatment brought about higher contents of endogenous H<sub>2</sub>S and chlorophyll, both of which were matched with increased activities of H<sub>2</sub>S synthetic enzymes and decreased activities of chlorophyll-degrading enzyme. Electron microscopy confirmed that the breakdown of chloroplasts was reduced by NaHS. H<sub>2</sub>S not only sustained the energy status, but also decreased the respiration rate and increased antioxidant capacity. The inhibition of H<sub>2</sub>S production caused by the application of its synthetic inhibitor (DL-propargylglucine) aggravated the yellowing of *I. aquatica*, and this response could be rescued by exogenously applied NaHS. Nevertheless, no obvious differences were observed between treatment of hypotaurine (a scavenger of H<sub>2</sub>S) and control. These results suggest that NaHS fumigation-induced endogenous H<sub>2</sub>S might improve the energy status, leading to enhancement of antioxidant capacity and inhibition of the respiration rate, and consequently, reducing the senescence of *I. aquatica*.

**Keywords:** /Spinach/

## **TOMATO**

Farneti, Brian, et al. 2015. Chilling-induced changes in aroma volatile profiles in **tomato**. *Food Bio-process Technol.* 8: 1442 – 1454.

### **Abstract**

Fruit and vegetables are regularly stored by consumers in the refrigerator at temperatures that may be well below the recommended storage temperatures. Apart from causing visible symptoms such as watery, sunken areas on the skin, chilling may also induce changes in fruit textural properties and flavour. The aim of this research was to investigate the effect of low temperature storage on tomato flavour and off-flavour production. To more closely mimic the real consumer aroma perception while eating, in addition to the standard solid-phase micro extraction gas chromatography– mass spectrometry (SPME/GC-MS) analysis, volatiles were also measured using a chewing device connected to a proton-transfer reaction–mass spectrometer (PTR-MS). Aroma volatiles were assessed in red ripe tomatoes of the cvs Cappricia RZ (round truss) and Amoroso RZ (cocktail truss) stored at refrigerator temperature (4 °C) and at higher temperatures (16 and 22 °C) for 20 days. The changes in aroma production were also monitored when the fruit was brought from room to refrigerator temperature and

vice versa. After bringing the fruit from room to refrigerator temperature, the abundance of most volatiles was greatly reduced within 3 to 5 h, closely following the decrease in fruit temperature. When temperature was restored to room temperature following varying times of cold storage, the abundance of most volatiles increased again, but generally not to the original levels. Overall, the effects of low temperature storage on the decrease in volatile abundance were more pronounced in cv Cappricia RZ than in cv Amoroso RZ. On the contrary, the production of off flavours following prolonged cold storage was more pronounced in cv Amoroso RZ than in cv Cappricia RZ. Apart from changes in the overall abundance of the volatiles, marked changes in the volatile profile were observed in fruit stored for longer times in the cold and this may at least in part explain the negative effect of cold storage on overall tomato flavour.

**Keyword:** /Tomato/ /Chilling injury/

Hoffmann, Anna M., Georg Noga, Mauricio Hunsche. 2015. Fluorescence indices for monitoring of **tomatoes** in pre-and postharvest phases. *Scientia Hort.* 191: 74 – 81.

### **Abstract**

Greenhouse and climate chamber experiments were carried out to evaluate the ability of a portable multiparametric fluorescence sensor to monitor the ripening of tomato fruits (cultivar Cappricia) in pre- and postharvest phases. Fluorescence recordings were validated against established non-invasive optical methods based on reflection and remittance and against a visual colour classification scheme. Fruit ripening, as influenced by water supply (pre-harvest) and light quality (postharvest), was monitored by chlorophyll fluorescence indices (red and far-red fluorescence) after red and UV, red and green, or green and UV excitation. Chlorophyll breakdown was indicated by the fluorescence index NBI R, which showed a negative and strong correlation with the reflection index  $a^*/b^*$  ( $R^2=-0.798$ ) and the remittance based stage-index ( $R^2=-0.754$ ). Characteristic curve patterns of the indices NBI G, FLAV and Anth RG enabled the pink (NBI G, FLAV) and light red (Anth RG) ripening stages to be defined and were well suited to detecting time-shifts in the ripening process. The potential of this technique for improved ripening monitoring and quality attribute determination in tomatoes is discussed.

**Keywords:** /Tomatoes/ /Ripening/ /Fruit Quality/

Wang, Libin, et.al. 2015. Effect of methyl salicylate and methyl jasmonate pre-treatment on the volatile profile in **tomato** fruit subjected to chilling temperature. *Postharvest Biol. & Technol.* 108: 28 – 38.

### **Abstract**

Tomato fruits exposed to chilling temperatures suffer aroma loss prior to visual chilling injury (CI) symptoms. Methyl salicylate (MeSA) and methyl jasmonate (MeJA) treatments were reported to alleviate the development of visual CI; however, it is unknown if the treatments alleviate internal CI in the form of aroma loss. In this research, 'FL 47' tomatoes at breaker stage were treated with MeSA or MeJA vapor prior exposure to chilling temperature. The chilling treatment did not result in visual CI; however, for internal CI it generally suppressed production of oxygen-containing heterocyclic compounds, ketones, sulfur- and nitrogen-containing heterocyclic compounds, alcohols, and aldehydes, including 13 important aroma contributors to tomato fruit. MeJA had no impact on sensory evaluation

in spite of resulting in slightly altered volatile profile; however, MeSA alleviated the CI-induced reduction of a number of volatile compounds, and thereby enhanced tomato aroma.

**Keywords:** /Tomato/ /Ripening/ /Chilling Injury/

## **ZUCCHINI**

Carvajal, Fatima, et.al. 2015. Cell wall metabolism and chilling injury during postharvest cold storage in zucchini fruit. *Postharvest Biol. & Technol.* 108: 68 – 77.

### **Abstract**

Postharvest cold storage in zucchini fruit extends the commercial life but causes the appearance of chilling injury (CI), characterized by the development of pits and damaged areas at the surface of the fruit. This physiological disorder has been related to alterations of the cell wall metabolism in several fruit. We have analyzed the relationship between the development of CI and the changes that take place at the cell wall due to cold storage in zucchini fruit, as well as the effect of a preconditioning treatment on these changes. Microscopical observations have shown that the surface depressions detected in chilling injured fruit were caused by cell death and cell collapse. Low temperature induced the solubilization of the more soluble pectins, as evidenced by the highest levels of neutral sugars and uronic acids found in control fruit after the cold storage in water-soluble fraction (WSF) and CDTA-soluble fraction (CSF). The results obtained in Na<sub>2</sub>CO<sub>3</sub>-soluble fraction (NSF) for both parameters was opposite; higher levels were detected in preconditioned fruit and lower in more damaged fruit. The same behaviour was found in the base soluble hemicelluloses, 1 M KOH- and 4 M KOH-soluble fractions (1KSF and 4KSF), and in the insoluble cellulose content. Zucchini fruit stored at low temperature showed an increase of the enzymatic activities pectin methylesterase (PME), polygalacturonase (PG), and cellulase (CEL), and an accumulation of mRNA corresponding to a expansin (EXP) gene. Preconditioned fruit showed the lowest levels of these enzymatic activities. Microscopic analysis of CI fruit correlated with the biochemical changes observed in cell wall. Lignin content was higher in control than preconditioned fruit, suggesting a possible role of the lignification process in CI development in zucchini.

**Keywords:** /Zucchini/ /Chilling Injury/

## **HERBS & SPICES**

### **PARSLEY**

Brilhante, Jacline Freitas de Sao Jose, Maria Cristina Dantas Vaneti. 2015. Application of ultrasound and chemical sanitizers to watercress, parsley and strawberry: microbiological and physicochemical quality. *LWT - Food Sci. & Technol.* 63: 946 – 952.

### **Abstract**

This study aimed to evaluate the effectiveness of the use of ultrasound combined with chemical sanitizers for the decontamination of watercress, parsley and strawberries. Samples were treated with ultrasound (45 kHz) for 10 min in the presence of 20 and 200 mg/L sodium dichloroisocyanurate, 5% hydrogen peroxide, 10 mg/L chlorine dioxide or 40 mg/L peracetic acid. The treatment effects on physicochemical parameters and natural contaminant microbiota were evaluated. Sanitizing watercress

with different treatments, such as hydrogen peroxide, chlorine dioxide, ultrasound in association with sodium dichloroisocyanurate, peracetic acid and chlorine dioxide, caused it to blacken. Sanitization caused watercress and parsley to darken, particularly the use of ultrasound in association with peracetic acid. All treatments with ultrasound promoted a reduction in strawberry firmness. All evaluated treatments of watercress, parsley and strawberries reduced aerobic mesophiles from 0.9 to 6.5 log CFU/g, 0.9 to 6.3 log CFU/g, and 0.7 to 4.0 log cycles, respectively. The combined treatment with ultrasound and 40 mg/L peracetic acid resulted in the highest reduction in the natural contaminant population. This finding indicates that ultrasound treatment can be an alternative to the vegetable sanitization step; however, more research is necessary to determine the best conditions for application of the proposed treatments.

**Keywords:** /Parsley/ /Strawberry/ /Microbial Quality/

## **ORNAMENTALS**

### **DENDROBIUM**

Sirikesorn, Laongsri, et. al. 2015. Ethylene-induced water soaking in **dendrobium** floral buds, accompanied by increased lipoxygenase and phospholipase D (PLD) activity and expression of a PLD gene. *Postharvest Biol. & Technol.* 108: 48 – 53.

#### **Abstract**

After a short exposure to exogenous ethylene, the tepals of floral buds on *Dendrobium* cv. Juree Red inflorescences exhibited water-soaking, preceded by an increased in electrolyte leakage. Phospholipase D (PLD; EC 3.1.4.4) and lipoxygenase (LOX; EC 1.13.11.12) activities in the tepals showed a large increase after ethylene exposure, prior to the increase in electrolyte leakage. Ethylene also increased expression of a DenPLD gene in tepals. However, this was too late to account for the early rise in PLD activity. 1-Methylcyclopropene (1-MCP, which is an antagonist of ethylene perception) reduced the increase in DenPLD expression. The expression of a DenLOX gene was down-regulated by ethylene and up-regulated by 1-MCP, thus did not account for the increase in LOX activity. It was previously found that exposure to 5 °C resulted in water soaking and PLD activation, for which endogenous ethylene was required. The present data strongly suggest that these chilling effects are caused by endogenous ethylene. Chilling-induced ethylene apparently resulted in plasma membrane damage, possibly due to PLD and LOX activity.

**Keywords:** /Dendrobium/