

**SELECTIVE DESSIMINATION OF INFORMATION (SDI)  
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**GENERAL**

**CHILLING INJURY**

Aghdam., Morteza S., Samad Bodbodak. 2013. Physiological and biochemical mechanisms regulating chilling tolerance in fruits and vegetables under postharvest salicylates and jasmonates treatments. *Scientia Hort.* 156: 73 – 85.

**Abstract**

Low temperature storage has been the main strategy to increase the shelf life of fruits and vegetables by reducing the rate of respiration and minimizing fungal disease growth. However, tropical and subtropical fruits and vegetables stored below 10–12 °C develop chilling injury (CI) following storage beyond the CI threshold. CI as a physiological disorder greatly reduces fruits and vegetables quality and frequently renders the product not saleable. The increasing demand for consumption of fresh fruits and vegetables, along with restriction on the use of synthetic chemicals to reduce CI, has encouraged scientific research to develop new technologies based on natural product such as salicylates and jasmonates. Membrane damage and reactive oxygen species (ROS) production are multifarious adverse effects of chilling as oxidative stress in sensitive fruits and vegetables. Chilling alleviating in fruits and vegetables treated with salicylates and jasmonates could be attributed to (1) Enhancing membrane integrity by reducing phospholipase D and C (PLD and PLC) and lipoxygenase (LOX) enzymes activities, enhancing unsaturated fatty acids/saturated fatty acids (unSFA/SFA) ratio probably through increase of fatty acid desaturases (FAD) gene expression and maintaining energy status, ATP and adenylate energy charge (AEC). (2) Enhancing heat shock proteins (HSPs) gene expression and accumulation. (3) Enhancing antioxidant system activity. (4) Enhancing arginine pathways which led to accumulation of signaling molecules with pivotal roles in improving chilling tolerance such as polyamines, nitric oxide, proline and  $\gamma$ -aminobutyric acid (GABA). (5) Activation of C-repeat binding factor (CBF) pathway and (6) alteration in phenylalanine ammonia-lyase (PAL) and polyphenol oxidase (PPO) enzymes activities. In the present review, we have focused on impacts of exogenous salicylates and jasmonates treatments on postharvest chilling tolerance and mechanisms employed by these safe signaling molecules in fruits, vegetables and cut flowers have also been discussed.

**Keywords:** /Chilling Injury/ /Vegetables/ /Cutflowers/

**FRESH PRODUCE**

Baier, M. et.al. 2013. Direct non-thermal plasma treatment for the sanitation of fresh corn salad leaves: evaluation of physical and physiological effects and antimicrobial efficacy. *Postharvest Biol. & Technol.* 84: 81 – 87.

**Abstract**

Current problems with outbreaks of serious infections caused by human pathogens on fresh-cut greens highlight the need for new, optimized postharvest sanitation treatments to effectively meet recent food safety standards. In contrast to various chemical treatments, non-thermal plasma (NTP) has a high potential as a gentle target sanitation technique. However, possible interactions between NTP and the physiology of treated fresh products have not been investigated in detail. Here, chlorophyll fluorescence image analysis (CFIA) was used to study the potential impacts of non-thermal plasma on the photosynthetic activity of highly perishable corn salad leaves as a model produce. For this purpose, an atmospheric pressure plasma jet, driven at radio frequency, and transforming argon with flow rates of 20 L min<sup>-1</sup> in non-thermal plasma at 10, 20, 30, and 40 W generator power was applied for various times to the surface of corn salad leaves. Thermographic measurements indicated maximum temperatures of 39.0°C, 44.4°C, 60.1°C, and 66.0°C, respectively, on treated leaf surfaces. CFIA revealed that treatment at moderate generator power of 20 W for up to 1 min was the maximum setting for quality retention. Furthermore, the microbial inactivation efficiency of the plasma jet system at these operating parameters was successfully tested on *Escherichia coli* bacteria, inoculated on corn salad surface at 10<sup>7</sup> cfu cm<sup>-2</sup> and 10<sup>4</sup> cfu cm<sup>-2</sup>. At 20 W, bacteria with lower initial load could be inactivated by 3.6 (±0.6) log-cycles within 15 s of treatment duration; whereas at the higher initial load of 10<sup>7</sup> cfu cm<sup>-2</sup>, bacteria were reduced by 2.1 (±0.2) log-cycles after 30 s.

**Keywords:** /Fresh produce/ /Postharvest Quality/ /Noninvasive methods/

Bermudez-Aguirre, Daniela. 2013. Effect of atmospheric pressure cold plasma (APCP) on the inactivation *Escherichia coli* in fresh produce. *Food Control*. 34: 149 – 157.

## Abstract

Food borne outbreaks in the United States are often associated with fresh produce. Emerging pathogens are becoming more resistant to conventional disinfection methods, and thus consumers are looking for food that is free of chemicals. Atmospheric pressure cold plasma (APCP) appears to be an alternative for microbial inactivation without changes in the product. The aim of this work was to study the use of APCP in the inactivation of a surrogate microorganism of the pathogenic strain *Escherichia coli* inoculated on lettuce, carrots and tomatoes at 10<sup>5</sup> and 10<sup>7</sup> cfu/g. Vegetables were exposed to APCP discharges from a needle array from 3.95 kV up to 12.83 kV (60 Hz) in argon, from 30 s to 10 min. After processing, microbiological quality and Hunter's color parameters (L\*, a\*, b\*) were assessed. Electron microscopy was also used to study the effect of APCP in the cellular structure. Results showed that the inoculation level had an effect on the degree of inactivation; it was easier to inactivate the bacteria at lower counts. Also, the highest voltage and longest treatment time were more effective in microbial inactivation (1.6 log). Tomatoes, followed by lettuce, were easier to disinfect than carrots, maybe because of the surface structure. Color parameters did not show significant changes after processing. However, cell structure showed a high degree of electroporation, loss and disruption of membrane and deformation after treatment. Although APCP showed limited results for disinfection of produce with the tested conditions, plasma represents a potential technology for disinfection of fruits and vegetables without important changes in physical characteristics, and more research should be done to explore other options such as the use of other gases and more complex produce surfaces.

**Keywords:** /Fresh Produce/ /*Escherichia coli*/ /Disinfection/

## **FRUITS**

### **AVOCADO**

Gudenschwager, et al. 2013. Identification and characterization of two putative genes encoding acetyl-coenzyme a carboxylase subunits that are possibly associated with internal browning during cold storage of 'Hass' **avocados** (*Persea Americana* Mill.) Postharvest Biol. & Technol. 84: 74 – 80.

#### **Abstract**

Cold storage is widely used to extend the postharvest life of 'Hass' avocados (*Persea americana* Mill.). However, prolonged low-temperature storage results in the development of chilling-induced physiological disorders. Additionally, the response of avocados to cold storage depends on their stage of maturity, as late-harvest avocados are more susceptible to developing physiological disorders than those that are harvested early in the season. To understand the molecular mechanisms that cause physiological disorders in cold-stored 'Hass' avocados, we sought to identify and characterize the lipid metabolism-related genes. In this work, we focused our analysis on the genes that encode a multi-subunit acetyl-CoA carboxylase enzyme (MS-ACCase), which is one of the key enzymes in fatty acid biosynthesis. Two avocado MS-ACCase subunits were identified by in silico analysis, a biotin carboxylase (BC) and a biotin carboxyl carrier protein (BCCP). Transcriptional qPCR analyses of both identified gene subunits were performed in avocados that had been harvested both early and late in the season after 40 d of storage at 0 and 5°C and subsequent ripening at 20°C. For both harvest dates, PamACCase-BC and PamACCase-BCCP transcripts increased in ripe fruit after cold storage at 5°C; this increase was significant for PamACCase-BCCP. A similar expression pattern was observed in ripe avocados from early-harvested fruit after cold storage at 0°C; however, significant down-regulation of PamACCase-BC and PamACCase-BCCP expression was observed in ripe late-harvested avocados, suggesting that these fruit have senesced. A control study involving late-harvested avocados demonstrated that the expression of these genes did not change through out ripening. Thus we suggest that the MS-ACCase BCCP subunit might be transcriptionally regulated during physiological disorder development in cold-stored 'Hass' avocados.

**Keywords:** /Avocado/ /Cold Storage/ /Internal Browning/

### **BANANA**

Bugaud, Christophe, et.al. 2013. Rheological and chemical predictors of texture and taste in dessert **banana** *Musa* spp. Postharvest Biol. & Technol. 84: 1 - 8.

#### **Abstract**

The feasibility of optical coherence tomography (OCT) for imaging histological changes associated with the development of a progressive rind breakdown (RBD) disorder of 'Nules Clementine' mandarin (*Citrus reticulata* Blanco.) was investigated. The investigation utilised fruit with different levels of the disorder, carefully selected from a batch of fruit stored for eight weeks at  $8 \pm 0.5^\circ\text{C}$ . Images of healthy and RBD-affected intact mandarin fruit were acquired using a Thorlabs OCT system based on a broadband 930 nm source. OCT provided high resolution 2D images of fruit rind to a depth of about 1.1 mm. Immediate and non-destructive acquisition of images showing histological and micro structural features in intact rind tissues was demonstrated. The oil glands stayed intact in unaffected fruit and

gradually collapsed in RBD affected fruit. At advanced stages of the disorder, the collapsed oil glands became increasingly deformed and flattened. The study showed that OCT is a promising technique for immediate, real-time and non-destructive acquisition of images showing histological and micro structural rind features of 'Nules Clementine' mandarin fruit.

**Keywords:** /Citrus/ /Fruit quality/

Huang, Hua, et.al. 2013. Effect of oxalic acid on ripening attributes of **banana** fruit during storage. *Postharvest Biol. & Technol.* 84: 22 - 27.

### **Abstract**

The effect of exogenous oxalic acid treatment on ripening attributes of banana fruit during storage was investigated. Banana fruit were dipped into solutions of 0 (control) or 20 mM oxalic acid for 10 min and then stored at room temperature ( $23 \pm 2^\circ\text{C}$ ) and 75–90% relative humidity. The application of oxalic acid reduced fruit deterioration during storage. The oxalic acid treatment also reduced the rates of respiration and ethylene production, and delayed the decreases in firmness, hue angle, and maximal chlorophyll fluorescence (Fv/Fm) of banana fruit during storage. Furthermore, fruit treated with oxalic acid exhibited higher superoxide dismutase activity and antioxidant capability with a lower production of reactive oxygen species at the late storage period compared with non-oxalic acid-treated fruit. Overall, the oxalic acid treatment was effective in inhibiting postharvest ripening of banana fruit and exhibited the potential for commercial application to store the bananas at room temperature. It can be concluded that the delay in banana fruit ripening associated with oxalic acid treatment could be due to inhibition of respiration and ethylene production rates, and reduction of oxidative injury caused by reactive oxygen species through increased antioxidant activity.

**Keywords:** /Banana/ /Fruit/ /Oxalic acid/ /Ripening/ /Antioxidant Activity/

Castelan, F.P. et.al. 2013. Relation between the severity of Sigatoka disease and **banana** quality characterized by pomological traits and fruit green life. *Crop Protection* 50: 61- 65.

### **Abstract**

Banana fruit are typically harvested at a green preclimacteric stage prior to sale. The green life (GL), which is defined as the number of days between harvesting and initiation of the natural ripening process, is important for harvesting, shipping and marketing. Sigatoka disease (SD) has previously been shown to influence the postharvest quality of banana fruit. The present study was conducted to determine (1) whether there is a relationship between the level of SD severity and the banana quality as characterized by several pomological traits and fruit green life, and (2) whether there is a level of SD severity that is acceptable for fruit exporting. In an experiment conducted with fruit harvested at a constant physiological age, our results showed that the disease decreases fruit GL. Based on the relationship established between SD severity and GL, it is possible to define an acceptable disease level threshold corresponding to a specified GL. Additionally, we found that high SD infections caused a reduction in fruit weight but did not affect fruit size. Possible explanations are discussed.

**Keywords:** /Banana/ /Quality/ /Sigatoka Disease/

## CITRUS

Defraeye, Thijs, et.al. 2013. Forced-convective cooling of citrus fruit package design. J. Food Eng. 118: 8 - 18.

### **Abstract**

Optimisation of package design for citrus fruit is required to increase the throughput, by reducing the pre cooling time, and to enhance fruit quality by providing fast and uniform cooling without inducing chilling injury. The cooling performance of an existing container and of two new containers (Supervent and Ecopack), as stacked on a pallet, was evaluated experimentally and numerically with computational fluid dynamics (CFD). The accuracy of the CFD simulations was confirmed by a good agreement with experiments. The best cooling performance was found for Ecopack, but removing airflow short circuits in this container may enhance the cooling performance even more. Also with respect to uniformity of cooling of the fruit and the magnitude of the convective heat transfer coefficients, in a specific container and between different containers on the pallet, the Ecopack container performed best, followed by the Supervent and the standard container. The new container designs thus clearly showed significant improvements in cooling performance.

**Keywords:** /Citrus/ /Precooling/ /Packaging/

## GRAPE

Agudelo-Romero, et.al. 2013. Study of polyamines during grape ripening indicate an important role of polyamine catabolism. Plant Physiol. & Biochem. 67: 105 - 119.

### **Abstract**

Grapevine (*Vitis* species) is the most economically important fruit crop worldwide. Ripening of non climacteric fruits such as grapes has been the subject of intense research. Despite this interest, little is known on the role played by polyamines in the onset of ripening of non-climacteric fruits. These growth regulators have been involved in plant development and stress responses. Molecular and biochemical studies were developed in three important Portuguese cultivars (Trincadeira, Touriga Nacional and Aragonês) during the year 2008 and in Trincadeira during 2007 in order to gather insights on the role of polyamines in grape ripening. Microarray and real-time qPCR studies revealed up-regulation of a gene coding for arginine decarboxylase (ADC) during grape ripening in all the varieties. This increase was not accompanied by an increase in free and conjugated polyamines that presented a strong decrease. Putrescine and Spermidine levels were higher at earlier stages of development, while Spermine level remained constant. Berries of Trincadeira cultivar presented the highest content in total free and conjugated polyamines at earlier stages of fruit development in particular in the year 2007. The decrease in polyamines content during grape ripening was accompanied by up-regulation of genes coding for diamine oxidase (CuAO) and polyamine oxidase (PAO), together with a significant increase in their enzymatic activity and in the hydrogen peroxide content. These results provide, for the first time, strong evidence of a role of polyamine catabolism in grape ripening possibly through interaction with other growth regulators.

**Keywords:** /Grape/ /Ripening/

## **LONGAN**

Shi, Shengyou, et.al. 2013. Effect of chitosan nano silica coating on the physicochemical characteristics of longan fruit under ambient temperature. J. Food Eng. 118: 125 – 131.

### **Abstract**

A novel chitosan/nano-silica hybrid film was prepared using tetraethoxysilane as precursor by in situ sol-gel process, and characterized by transmission electron microscopy. Its effect on preservation quality of longan fruits (*Dimocarpus longan* Lour. cv Shijia) was investigated under ambient temperature. The present study revealed that the excellent semi-permeable film of chitosan/nano-silica markedly extended shelf life, reduced browning index, retarded weight loss and inhibited the increase of malondialdehyde amount and polyphenoloxidase activity in fresh longan fruit. In addition, the peroxidase activity of longan fruit coated with hybrid film was lower than that in other treatment fruits. Decreases in the contents of total soluble solids, titratable acidity and ascorbic acid were also significantly inhibited by hybrid films. These data indicated that the chitosan/nano-silica coating might provide an attractive alternative to improve preservation quality of fresh longan fruits during extended storage.

**Keywords:** /Longan/ /Postharvest Life/ /Chitosan/

## **MANDARIN**

Magwaza, Lembe Samukelo, et.al. 2013. Application of optical coherence tomography to non destructive characterize rind break down disorder of Nules Clementine mandarins. Postharvest Biol. & Technol. 84: 16 - 21.

### **Abstract**

The feasibility of optical coherence tomography (OCT) for imaging histological changes associated with the development of a progressive rind breakdown (RBD) disorder of 'Nules Clementine' mandarin (*Citrus reticulata* Blanco.) was investigated. The investigation utilised fruit with different levels of the disorder, carefully selected from a batch of fruit stored for eight weeks at  $8 \pm 0.5^\circ\text{C}$ . Images of healthy and RBD-affected intact mandarin fruit were acquired using a Thorlabs OCT system based on a broadband 930 nm source. OCT provided high resolution 2D images of fruit rind to a depth of about 1.1 mm. Immediate and non-destructive acquisition of images showing histological and micro structural features in intact rind tissues was demonstrated. The oil glands stayed intact in unaffected fruit and gradually collapsed in RBD affected fruit. At advanced stages of the disorder, the collapsed oil glands became increasingly deformed and flattened. The study showed that OCT is a promising technique for immediate, real-time and non-destructive acquisition of images showing histological and microstructural rind features of 'Nules Clementine' mandarin fruit.

**Keywords:** /Citrus/ /Fruit Quality/

## **MANGO**

Ansari, Mohammad Wahid. 2013. Low temperature stress ethylene and not Fusarium, might be responsible for mango malformation. Plant Physiol. & Biochem. 69: 34 – 38.

## Abstract

Malformation is arguably the most crucial disease of mango (*Mangifera indica* L.). The etiology of the disease has not yet been successfully resolved. Here, we quantified the endogenous ethylene content in malformed and healthy vegetative and floral tissues of mango cultivars viz., Amrapali, Bombay green, Chausa, Dushehri and Mallika. Levels of ethylene were higher in malformed vegetative and floral tissues as compared with that of healthy tissues at both prior to full bloom and full bloom stages. The study also revealed that isolates of *Fusarium* dissected from mango exhibited most morphological similarities to the accepted standard features of *Fusarium mangiferae*. The growth dynamic of *F. mangiferae* were evaluated with varying temperatures ranging from 5 to 40 C. Temperatures of 25 C, 30 C and 35 C were better suited for growth of *F. mangiferae* than temperatures of 20 C or 40 C. Conidium germination of *F. mangiferae* was maximum at 30 C and minimum at <15 C. World-wide occurrence of mango malformation showed its most severity at 10e15 C temperature range. Stress ethylene level is higher in diseased tissue at the same temperature range where growth of *Fusaria* is found to be completely restricted. The present study provides direct evidence that low temperature induced 'stress ethylene' is potentially responsible for the disease while on the other hand *Fusarium* role in the disease either through toxic principle or malformation inducing principle is not conclusive at <15 C and is rather out of question.

**Keywords:** /Mango/ /Ethylene/ /Low Temperature Stress/

Siddiq, D.S.Sogi, K.D. Dolan. 2013. Antioxidant properties, total phenolics, and quality of fresh cut Tommy Atkins mangoes as affected by different pre-treatments. LWT- Food Sci. & Technol. 53: 156 - 162.

## Abstract

Fresh-cut processing of mangoes have not been explored on a scale similar to other tropical fruits. This study assessed the effect of different pre-treatments and storage on total phenolics, antioxidant properties, and selected quality characteristics of mango cubes treated with: ascorbic acid þ citric acid þ CaCl<sub>2</sub> (AAeCAeCa), sodium acid sulfate (SAS), and 5-min infrared heat (IR-5). Phenolics content of the untreated cubes was 21.16 mg GAE/100 g on day-0, whereas treated samples had higher contents e 70.82, 40.58, and 25.98 mg GAE/100 g in AAeCAeCa, SAS, and IR-5 samples, respectively. Similarly, antioxidant activities (ABTS, DPPH, FRAP, ORAC) generally increased with all treatments, this effect was more pronounced with AAeCAeCa. Total phenolics and antioxidant activities were stable during 12-day storage at 4 \_C. Cubes treated with AAeCAeCa showed consistently better color and firmness than the control and other two treatments. Storage time and treatments showed a mixed trend on pH, soluble solids, acidity, and sugar-acid ratio.

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

## MANGOSTEEN

Lerslerwonga, Ladawan, et.al. 2013. The harvest period of mangosteen fruit can be extended by chemical control of ripening—a proof of concept study. Scientia Hort. 157: 13 –18.

## Abstract

Mangosteen is an economically important crop in Southeast Asia. However, the harvest period of mangosteen fruit is rather short and effective methods to expand the harvest period and lessen the peak workload are desirable. We investigated the preharvest applications of ethephon or 1-methylcyclopropene (1-MCP) for their effects on harvest date, ethylene production, and mangosteen fruit quality. 1-MCP is available as tablets that we applied on fruit as a sprayed solution as well as by fumigation, respectively. The ripening of mangosteen fruit was significantly affected by the treatments, so that harvest date was advanced to an earlier time with ethephon and delayed to a later time by 1-MCP when using color development to guide harvest (at stage 0, pericarp uniformly yellowish-white or with a light green tinge or grayish spotting). The induced changes of harvest time are each of the order one to two weeks. The effectiveness of these chemicals is associated with the maturity stage of intact fruit. The increase period of ethylene production occurs concomitantly with unchanged fruit weight at its stationary phase of development. However, the ethylene production of harvested fruit was not affected by the treatments. The preharvest application of ethephon or 1-MCP, at climacteric maturity of fruit, has potential use in altering the harvest period of mangosteen products to earlier or later dates.

**Keywords:** /Mangosteen/ /Ripening/ /1-MCP/ /Ethephon/

## **PERSIMMON**

Choi, Seong-Jin. 2013. Effects of 2-alkyl-2-cyclopropene-1-carboxylic acid ethyl ester on ethylene production and flesh softening of non-astringent persimmon fruit. *Postharvest Biol. & Technol.* 84: 96 – 98.

### **Abstract**

The effects of 2-alkyl derivatives of 2-cyclopropene-1-carboxylic acid ethyl ester (CPE) with various lengths of alkyl side chains were examined on ethylene production and flesh softening of 'Taishuu' and 'Fuyu' persimmon (*Diospyros kaki* L.) fruit. When the 'Taishuu' fruit were treated with gaseous forms of the CPEs with short alkyl chains, the increased ethylene production and decreased flesh firmness of fruit were not inhibited. However, ripening parameters were inhibited by the CPEs with long alkyl chains in proportion to the carbon number. Decyl CPE (DCPE) is relatively stable and sprayable and inhibited postharvest flesh softening of 'Fuyu' fruit when sprayed before harvest. Thus, DCPE appears to be a valuable agent for delaying flesh softening of persimmon fruit.

**Keywords:** /Persimmon/ /Ethylene/ /Softening/

## **POMEGRANATE**

Fawole, Olaniyi A., Umezuruike L. Opara. 2013. Fruit growth dynamics, respiration rate and physico-textural properties during pomegranate development and ripening. *Scientia Hort.* 157: 90 – 98.

### **Abstract**

The time course and pattern of fruit growth and changes in physical, physiological properties and texture dynamics of pomegranate fruit (cvs. 'Bhagwa' and 'Ruby') along the days after full bloom (DAFB) were studied over two different year seasons. Significant variations in fruit growth, respiration rate and physico-textural properties of the fruit were found at five maturity stages (S1–S5). Fruit lineal

dimensions (length and diameter) exhibited a linear growth pattern and the fruit weight followed a similar pattern. Both fruit cultivars showed a decline in respiration rate during fruit development, with the highest respiration rate measured in immature fruits ('Bhagwa', 66.83 mL CO<sub>2</sub> kg<sup>-1</sup> h<sup>-1</sup>; 'Ruby', 51.17 mL CO<sub>2</sub> kg<sup>-1</sup> h<sup>-1</sup>) and declining with maturity to minimum rates in fully ripe fruit (stage 5) (S5) ('Bhagwa', 23.84 mL CO<sub>2</sub> kg<sup>-1</sup> h<sup>-1</sup>; 'Ruby', 19.16 mL CO<sub>2</sub> kg<sup>-1</sup> h<sup>-1</sup>). No ethylene gas was detected throughout fruit development. Fruit pigmentation increased with advancing maturity and the lowest total colour difference (TCD) between fruit peel and arils was noted in immature fruit. Textural dynamics of aril revealed increasing trend in bio yield force and elasticity with advancing maturity. Overall, the study indicated that fruit reached mature stage between the 132–139 DAFB for 'Ruby' and 140–165 DAFB for 'Bhagwa'. This period could be regarded as the physiological mature stage of the fruits that would present the optimum values of harvesting properties desirable in the investigated cultivars. This information could be used as a tool to assist growers in assessing fruit readiness for harvest.

**Keywords:** /Pomegranate/ /Ripening/

## **SWEET CHERRY**

Salato, Gloria S. et.al. 2013. Developmental changes in cell wall polysaccharides from sweet cherry *Prunus avium* L. cultivars with contrasting firmness. *Postharvest Biol. & Technol.* 84: 66 - 73.

### **Abstract**

Firmness is a major quality attribute of fresh cherries, and is also a main factor affecting susceptibility to bruising and postharvest rots. In order to identify the factors determining the textural differences between genotypes, we evaluated the solubilization, depolymerization and monosaccharide composition of pectin and hemicelluloses from two cultivars with contrasting firmness ('Sweetheart', firm and 'Newstar', soft) at our different developmental stages. Firm 'Sweetheart' cherries had higher contents of cell wall material than soft 'Newstar' fruit. Moderate depolymerization of hemicellulose and tightly bound pectins was detected irrespective of cultivar firmness. The general pattern and extent of uronic acid solubilisation was quite similar in both cultivars. Rhamnogalacturonan I (RG-I) seemed to be preferentially solubilised in firm 'Sweetheart' fruit as opposed to tightly bound homogalacturonans (HG) in soft cherries. Pectic polymers with higher neutral sugar to uronic acids ratio were found from early development in soft 'Newstar' fruit. Overall, soft 'Newstar' fruit had reduced wall content and higher branching of tightly bound pectins than firm 'Sweetheart' fruit. These factors may be associated with the varietal differences in cherry firmness.

**Keywords:** /Cherry/ /Softening/ /Firmness/

## **TABLE GRAPES**

Rabana, Eyal, et.al. 2013. Rachis browning in four table grape cultivars as affected by growth regulators packaging. *Postharvest Biol. & Technol.* 84: 88 – 95.

### **Abstract**

Plant growth regulators (PGRs) are used to increase berry size in table grapes. The objective in this study was to determine if the levels of PGRs used commercially affected rachis postharvest quality. Three seedless table grape cultivars, •'Mystery', •'Superior', and 'Crimson'• were treated with

gibberellin (GA), cytokinin (CPPU), or both at berry diameter of 6.8 mm, while a seeded cultivar, 'Red globe' was treated at 13 mm. The fruits were harvested at commercial maturity and held for 7 days shelf-life either immediately after harvest or after 2 weeks storage at 0°C. The combination of GA and CPPU increased berry weight and diameter, and rachis diameter in all three seedless cultivars, but had minor or no effect on TSS and acidity. Rachis quality was measured by a browning scale derived from image analysis. Browning was lower after storage for rachis of 'Mystery' treated with GA, while the other three cultivars showed no difference between PGR treated and control rachis. Reduction of water loss by covering punnets of control clusters with micro perforated film had a significant positive effect on decreasing weight loss in all cases and a positive effect on slowing rachis browning. Calculation of the shelf-life required to reach 50% rachis browning found that shelf-life was longer for the micro perforated packaging as compared to open packages in all the cultivars, with stronger influence during shelf-life after storage than shelf-life after harvest. However, the data also indicated that rachis browning cannot only be attributed to weight loss, either from the whole cluster or from the rachis.

**Keywords:** /Table grape/ /Packaging/ /Weight Loss/

## **ORNAMENTALS**

### **RED BORONIA**

Williamson, Virginia G, Daryl C. Joyce. 2013. *Boronia heterophylla* vase life is influenced more by ethylene than by bacterial numbers or vase solution pH. *Postharvest Biol. & Technol.* 84: 28 – 35.

#### **Abstract**

Bacterial proliferation in both vase solutions and in cut flower stems has been implicated in reducing the vase life of numerous genera. *Boronia heterophylla* F. Muell. (Red Boronia) vase life was assessed at two stages of floral maturity for nine vase solution treatments covering a pH range of 2.5–5.7. Vase life for advanced harvest maturity stems ranged from 4.2 d in 10 mM citric acid + 50 mg L<sup>-1</sup> chlorine (pH 2.5) to 12.9 d after STS pulsing (pH 5.7). For normal harvest maturity stems, the corresponding range was 5.8–19.0 d, respectively. Vase solutions containing 50 mg L<sup>-1</sup> chlorine biocide resulted in decreased longevity. In contrast, pulsing with the ethylene-binding inhibitor, STS, significantly increased vase life. The number of bacteria in the vase solutions after 11 d was determined in stems of advanced maturity. The solution with the greatest number of bacteria,  $4.0 \times 10^{10}$  cfu mL<sup>-1</sup>, was water used after STS pulsing and in which the flowers lasted longest. Vase solution bacteria were enumerated on days 0, 3, 6, 9 and 12 of the vase period with stems of normal harvest maturity. There was no relationship between vase life and vase solution bacterial numbers ( $r^2 = 0.000$ ). Moreover, there was a negative relationship between numbers of bacteria in basal 0–5 cm stem segments and vase life. As no correlations were evident between longevity and either the pH or vase solution bacterial numbers, *B. heterophylla* vase life was evidently limited principally by ethylene action.

**Keywords:** /Red Boronia/ /Silver thiosulphate/ /Vase Life/

### **ZANTEDESCHIA**

Chen, Jianyu, et al. 2013. Cytokinin and gibberellin delay greening of spathe tissue *Zantedeschia* 'Best Gold'. *Postharvest Biol. & Technol.* 84: 61 - 65.

## **Abstract**

Spathe regreening is a primary determinant limiting the postharvest quality for most hybrids of *Zantedeschia*, e.g. 'Best Gold', wherein the spathe commences regreening approximately two days after it is fully open. To identify an effective method to postpone the regreening, several synthetic plant hormones were evaluated for their influence on changes in color during regreening of discs excised from the spathe of 'Best Gold'. The tested synthetic plant hormones included 6-benzylaminopurine (BAP), zeatin, N1-(2-chloro-4-pyridyl)-N3-phenylurea (CPPU) and GA3 at concentrations up to 0.1 mM. A concentration of BAP at 0.5 mM resulted in phytotoxicity symptoms on discs. Subsequently, the effect of a combination of BAP and GA3 on the regreening was examined. Application of the cytokinins (in particular BAP at 0.1 mM) or GA3 alone resulted in a one to five day delay in regreening on the spathe tissue. The most effective treatment in delaying regreening was from the simultaneous application of GA3 and BAP in a ratio of 1:1 (v:v) at 0.1 mM, wherein regreening was delayed for more than ten days. This treatment was then tested on the entire inflorescence, resulting in a delay in regreening for between seven and eight days.

**Keywords:** /*Zantedeschia*/ /Vase life/

## **VEGETABLES**

### **BROCCOLI**

Fernandez-Leon, M.F. et al. 2013. Different postharvest strategies to preserve **broccoli** quality during storage and shelf life controlled atmosphere and 1-MCP. *Food Chem.* 18: 564 - 573

## **Abstract**

Broccoli (*Brassica oleracea* var. *italica*) is a vegetable that requires the application of postharvest techniques to extend its marketability. Controlled atmosphere and 1-MCP treatments are most used to extend the shelf life of broccoli and reduce post-harvest deterioration. The aim of this study was to evaluate the visual, physicochemical and functional changes of broccoli head samples stored at 1–2 °C and 85–90% relative humidity (RH) in air (Control samples), under controlled atmospheres (10% O<sub>2</sub> and 5% CO<sub>2</sub>) (CA samples) and treated with 1-MCP (0.6 l/L). After storage all samples were maintained at 20 °C for 2 and 4 days, in order to assess their shelf life. The most suitable postharvest treatment to extend broccoli quality during storage and shelf life, in terms of maintaining the visual quality and reducing loss of health promoting compounds, was achieved by storage under controlled atmosphere conditions. The use of 1-MCP reduced the loss of green colour and chlorophyll pigments, but only during cold storage not during shelf life at 20 °C.

**Keywords:** /Broccoli/ /Quality/ /Shelf Life/ /

### **CAPSICUM ANNUUM**

Tundis, Rosa, et al. 2013. Antioxidant and hypoglycemic activities and their relationship to phytochemicals in **capsicum annuum** cultivars during fruit development. *LWT- Food Sci. & Technol.* 53: 370 - 377.

## **Abstract**

Four *Capsicum annuum* L. cultivars (Fiesta, Acuminatum, Orange Thai, and Cayenne Golden) were studied at two stages of fruits ripening (immature and mature) for total phenols, flavonoids, carotenoids, capsaicin and dihydrocapsaicin content and for their antioxidant and hypoglycaemic activities. Phenols content reached their maximum concentration in immature fruits and then declined, while carotenoids and capsaicinoids concentration increased as the peppers reached maturity. The antioxidant activity was elucidated by DPPH and b-carotene bleaching tests. Except for Cayenne Golden cultivar, the immature fruits showed the highest radical scavenging activity. On the contrary, the antioxidant activity evaluated by the b-carotene bleaching test showed a significant activity for mature peppers. The Cayenne Golden cultivar showed an IC50 value of 2.5 mg/ml after 30 min of incubation. Hypoglycaemic effects were examined in vitro via the inhibition of  $\alpha$ -amylase and  $\alpha$ -glucosidase enzymes. Fiesta, Orange Thai, and Cayenne Golden cultivars showed the highest inhibitory activity on  $\alpha$ -amylase in the immature stage. The lipophilic fraction exhibited a selective inhibitory activity against  $\alpha$ -amylase with IC50 values ranging from 9.1 mg/ml to 28.6 mg/ml in the immature stage. The study proposes the nutritional significance of consuming *C. annuum* raw peppers at both maturity stages because of interesting properties.

**Keywords:** /*Capsicum annuum*/ /Phytochemicals/ /Antioxidant Activity/

## CARROT

Ojaghian, Mohammad Reza, et.al. 2013. Application of acetyl salicylic acid and chemically different **chitosans** against storage carrot rot. *Postharvest Biol. & Technol.* 84: 51 - 60.

## Abstract

This study was conducted to evaluate antifungal activity of three chemically different chitosans named as A, B and C at different concentrations against three isolates of *Sclerotinia sclerotiorum*, the causal agent of storage carrot rot, by in vitro and in vivo tests. In addition, potential of SAR (systemic acquired resistance) induced by the chitosans and acetyl salicylic acid (ASA) was assessed against the disease. The degree of N-deacetylation (DN) and the molecular weight of chitosans A, B and C were 85%–1129 kDa, 95%–521 kDa and 75%–607 kDa, respectively. The concentrations 2 g/L and 5 g/L of all chitosans were significantly able to decrease mycelial growth, sclerotia formation and carpogenic germination of the pathogen. Four hours and three days before inoculation with the pathogen, application of chitosans and ASA reduced severity of carrot rot in all isolates. However, mycelial growth and sclerotia formation of isolate 2 was more reduced than other isolates. In accordance with in vitro tests, chitosan B showed the highest inhibitory efficacy against the disease. The fungicidal effect of chitosan increased when the DN decreased and there was a negative correlation between the mycelial growth inhibition and the molecular weight of chitosans. The enzyme analysis showed that the activity of phenylalanine ammonia lyase, polyphenoloxidase and peroxidase increase in the inoculated carrots after application of different chitosans and ASA.

**Keywords:** /Chitosan/ /Storage/

## LETTUCE

Bonasia, Anna. 2013. Pre-harvest nitrogen and azoxystrobin application postharvest shelf-life in butter head **lettuce**. *Postharvest Biol. & Technol.* 85: 67 – 76.

## Abstract

Two trials were carried out on Butterhead lettuce (March-May 2008 and April-June 2009) to investigate the effect of the application of nitrogen fertilizer (0, 50 and 100 kg ha<sup>-1</sup> of N) and of strobilurin (Azoxystrobin, methyl (E)-2-[2-[6-(2-cyanophenoxy)pyrimidin-4-yl]oxy]phenyl)-3-methoxyacrylate) on (i) yield and morphological traits at harvest, (ii) physical (weight loss and dry matter), visual (chlorophyll content and main colour indices), physiological (relative water content, osmotic potential, and electrolytic leakage), and nutritional (ascorbic acid, nitrate, and polyphenol content) quality of raw material and their changes after storage of fresh-cut leaves. Cool storage lasted 7 and 12 days in the first and second experiment, respectively. In the first cycle, under early-spring conditions, lettuce yield was lower by 38% and, even if the product was lighter coloured [higher L\* (+6%) and lower CHL (-21%)], it had lower dry matter content (.32%), higher electrolyte leakage (EL) (+14%) and WL Trans(+8%) compared with the raw product from the second cycle. In both years, the increase of N supply and the application of Azoxystrobin improved yield (by 8.5% and 10%, respectively). The response in N fertilization was more evident under early-spring (2008) compared to late-spring (2009) conditions (12.3% vs. 4.8%), and when (2008) the highest N rate interacted with the application of Azoxystrobin (+12.9% compared with the other treatments). The nitrate content in leaves was always reduced by Azoxystrobin application (-43%) and increased with the N supply (+53%). In the second experiment, when storage was prolonged for 12 days, strobilurin improved postharvest shelf-life by reducing chlorophyll degradation (-27%), senescence (.19%, measured as EL), and browning (-53%, measured as h index decrease). Azoxystrobin lowered also the total polyphenol content of raw material (-12.5%), which can be linked to less browning during storage. During postharvest storage, irrespective to the preharvest dose, N supply kept the visual quality and physiological senescence indices constant (L\*, h and EL). The suitability of the Butterhead lettuce to fresh-cut processing depends on climatic growing conditions. Preharvest Azoxystrobin supply improves the nutritional quality of the raw material, reducing leaf nitrate content, and the shelf-life in prolonged storage. The N rate of 100 kg ha<sup>-1</sup> of N is suitable under less favourable growing conditions, while the rate of 50 kg ha<sup>-1</sup> is better for more favourable climatic conditions, especially if a moderate contribution in available N from soil organic matter mineralization and no leaching from heavy rains is expected.

**Keywords:** /Lettuce/ /Postharvest/ /Shelf Life/

Pereira, E.L. A. Rodrigues, E. Ramalhosa. 2013. Influence of working conditions and practices on fresh cut **lettuce** salads quality. Food Control. 33. 406 - 412.

## Abstract

The main aim of the present work was to study the influence of working conditions and practices of food handlers on physico-chemical and microbiological quality of fresh-cut lettuce salads produced in a catering unit. Twenty one visits were performed, checking all steps from lettuce reception until fresh-cut lettuce salad preparation. Even though the catering unit has implemented an HACCP plan, some non-conformities were detected on personal hygiene practices of the food handlers that should be corrected. Regarding green salad preparation two sanitizing treatments, diluted solutions of acetic acid (vinegar) and chlorine-based tablets, were applied. However, the former treatment should not be used because it did not guarantee food safety of the final product. On the other hand, the recommendations of chlorine-based tablets' supplier must be followed strictly. Regarding chlorine species, only free chlorine was detected. Furthermore, no free chlorine and chloramines were detected in the final

product. In conclusion, this work allowed us to establish several practical recommendations to improve the efficacy of the washing  $\beta$  sanitizing steps followed on the preparation of fresh-cut lettuce salads.

**Keywords:** /Lettuce/ /Quality/

## **MUSHROOM**

Bruno, Giovanni, Luigi, et.al. 2013. Control of bacterial yellowing of cardoncello mushroom pleurotus eryngii using acetic or hydrochloric acid solutions. Crop Protection. 50 : 24 – 29.

### **Abstract**

Yellowing or bacteriosis is the most severe disease of Pleurotus eryngii, the mushroom commonly called “cardoncello” or “Ferula mushroom” in Italy. Two cropping cycles were performed with five commercial strains, to find out how acetic acid or hydrochloric acid solutions can be used to prevent or stop the disease. Pseudomonas “reactans” and other fluorescent Pseudomonads were consistently isolated from symptomatic basidiomata. The Colony-Forming-Units of total bacteria, fluorescent Pseudomonads and fungi, found in casing soil at the end of both experiments, were significantly lower in substrate bags treated with either of the two acidic solutions. This research showed that treatments with acetic acid - and to a lesser extent hydrochloric acid solutions e can reduce the spread and severity of P. eryngii yellowing.

**Keywords:** /Mushroom/

## **TOMATO**

da Costa Javier Hernan Pereira, et.al. 2013. QTL detection for fruit shelf life and quality traits across segregating populations of tomato. Scientia Hort. 156. 47 - 53.

### **Abstract**

The aim of this work was to detect QTLs associated with fruit shelf life and quality traits across different segregating populations derived from an inter specific cross. The first backcross generation (BC1) of an inter specific tomato cross was analyzed to detect genomic regions from Solanum pimpinellifolium accession LA722 that could improve fruit quality and prolonging fruit shelf life in an Argentinean cultivar. Families derived from five BC1 self-plant and BC2 were used to validate the detected QTL in the BC1 as well as to identify regions with wild type recessive alleles of QTLs controlling these traits. Thirty polymorphic markers (SSR) in parental genotypes and F1 were used to analyze the segregating populations. The comparison among QTLs detected in the BC1 and BC2 generations and the families BC1S1 allowed assessing the consistency of six QTLs for length, shape, weight, pH, soluble solids content and fruit shelflife. QTLs with recessive effects from wild parent prolonging fruit shelf life were found and it was possible to detect QTLs for quality traits that have not been previously reported. This finding provides alternative genes for breeding programs that attempt to improve the color, soluble solids content and fruit shelf life

**Keywords:** /Tomato/ /Quality Traits/ /Shelf Life/

## **TUBERS AND ROOTCROPS**

### **POTATO**

Bojanowska, Angelique. 2013. Review management of **potato** dry rot. Postharvest Biol. & Technol. 84: 99 – 109.

#### **Abstract**

Dry rot is a postharvest fungal disease affecting potato (*Solanum tuberosum* L.) tubers. The disease, caused by several species of *Fusarium* such as *F. solani* var. *coeruleum*, *F. sambucinum*, *F. oxysporum*, *F. avenaceum*, *F. culmorum*, results in significant yield losses. Some *Fusarium* species associated with the disease produce toxins, which are implicated in mycotoxicoses of humans and animals. The pathogens cannot penetrate the tuber through the lenticels or in the absence of wounds and cause infection only if the potato skin is ruptured. The seed tuber is considered as the main source of inoculum although soil infested by *Fusarium* spp. also constitutes a source of inoculum. Control of the disease, once provided by the fungicide thiabendazole, is now difficult due to the appearance of thiabendazole resistant strains and the lack of potato cultivars with high levels of resistance to dry rot. An integrated disease management program including detection strategies, appropriate cultural practices and storage conditions (including a wound healing period) along with the use of synthetic chemical fungicides as seed tuber and/or postharvest treatment is recommended to reduce incidence and severity of dry rot. Recent studies also indicate the possibility that generally recognized as safe (GRAS) compounds and microbial antagonists could eventually be integrated into dry rot management strategies.

**Keywords:** /Potato/ /Dry Rot/ /Fungicides/ /Mycotoxins/