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**GENERAL**

**AGRICULTURAL FILMS**

Vulic, I., T. Steele, and S.B. Samuels. 2014. A new approach to enhancing pesticide resistance in the stabilization of **agricultural films**. Acta Hort. 1015: 251 – 258.

**Abstract**

In practice, agricultural films must withstand high solar radiation, high temperature in use, mechanical stresses on the film (e.g., film tension across supports, wind), and most importantly, the antagonistic effects of agro-chemicals (pesticides, insecticides, fumigants, soil disinfectants, etc.) on the performance of the UV light stabilizers protecting the film. With pesticide usage, especially sublimed sulphur, increasing worldwide, the demand for UV stabilizers with even greater resistance to pesticides is growing. Evaluation of the UV performance of a stabilized PE film on an actual greenhouse can take three years or more, so accelerated techniques which simulate field exposure would allow for more rapid identification of UV stabilizers with robust resistance. While accelerated UV exposure protocols are widely accepted in the industry for prediction of the service life of plastics, there is no agreement yet on the best methodology to use to simulate pesticide exposure during accelerated UV testing. In this paper, we report on the results of an investigation into the effects of different agro-chemical treatments on PE film life when the films undergo accelerated UV exposure with an agro-chemical treatment. We also report on the development of a new UV stabilizer for greenhouse film stabilization with superior resistance to agro-chemicals.

**Keywords:** /Agricultural Films/ /Pesticide/

**CHILLING INJURY**

Aghdam, M.S. and S. Bodbodak. 2014. Postharvest heat treatment for mitigation of **chilling injury** in fruits and vegetables. Food Bioprocess Technol. 7(1): 37 – 53.

**Abstract**

Abstract Low-temperature storage is widely used as a postharvest treatment applied for delaying senescence in vegetables and ornamentals and ripening in fruits, upholding their postharvest quality. But the refrigerated storage of tropical and subtropical crop plant species provokes a set of physiological alterations known as chilling injury (CI) that negatively affect their 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 on the use of heat treatments as an environment-friendly technology for CI mitigation. Membrane damage and reactive oxygen species production are multifarious adverse effects of chilling as oxidative stress in sensitive fruits and vegetables. Chilling mitigation in heat-treated fruits and vegetables could be attributed to (1) enhancement of membrane integrity by the increase of unsaturated fatty

acids/saturated fatty acids (unSFA/SFA) ratio; (2) enhancement of heat shock protein gene expression and accumulation; (3) enhancement of the antioxidant system activity; (4) enhancement of the arginine pathways which lead to the accumulation of signalling molecules with pivotal roles in improving chilling tolerance such as polyamines, nitric oxide, and proline; (5) alteration in phenylalanine ammonia lyase and polyphenol oxidase enzyme activities; and (6) enhancement of sugar metabolism. In the present review, we have focused on the impacts of heat treatments on postharvest chilling tolerance and the mechanisms activated by this environment-friendly technology in fruits and vegetables.

**Keywords:** /Chilling Injury/ /Postharvest Heat Treatment/ /Fruits/ /Vegetables/

## **COLD CHAIN**

Aung, M.M. and Y.S. Chang. 2014. Temperature management for the quality assurance of a perishable food supply chain. *Food Control*. 40: 198 – 207.

### **Abstract**

Compared to most product supply chains, food supply chains are often more complex and more difficult to manage because the food product is perishable and has a short shelf life. A cold chain or temperature controlled supply chain provides the essential facilities and methods required to maintain the quality and quantity of foods. Since foods can be time and temperature sensitive in nature, they need to be properly taken care of in terms of harvesting, preparation, packaging, transportation and handling e in other words, throughout the entire chain. Temperature is the most important factor in prolonging or maintaining the shelf life of perishables. Refrigeration is one of most widely used methods to date to slow the bacteria growth that leads to food deterioration. The proper control and management of temperature is crucial in delivering perishables to consumers and ensuring that those perishables are in good condition and safe to eat. This paper addresses the methods used to improve the ability to define an optimal target temperature for multi-commodity refrigerated storage. Simulation results support the fact that the presented methods provide more accurate results compared to the conventional method. In addition, an experiment with a Wireless Sensor Network (WSN) was conducted. As a result, the sensor-based methods for real time quality monitoring and assessment that consider product metabolism and Euclidean distance cost depending on temperature changes are found to be superior to the traditional visual assessment method.

**Keywords:** /Cold Chain/ /Temperature Management/ /Quality Assurance/

Fonseca, J.M. and D.N. Njie. 2014. Addressing losses of fresh produce grown in the Latin America and the Caribbean region due to non-compliance with quality and safety requirements in export markets. *Acta Hort*. 1016: 179 – 186.

### **Abstract**

An analysis for the non-compliance of fruits and vegetables grown in Latin America and the Caribbean (LAC) with state regulations and quality requirements in international markets was conducted. A review of United States Food and Drug Administration (FDA) data showed that the major reasons for rejection of the LAC fresh fruits and vegetables are dirtiness, pesticide residues and product/labels with insufficient information. Moreover, information from various private entities and literature was examined to determine the state of postharvest technology used in LAC to assure quality

of fresh produce. The study evidenced that LAC countries with few exceptions continue to use limited technology for reducing postharvest losses, which includes low cold chain capacity when compared to the industrialized countries. The diverse range of logistics limitations in export supply chain, such as cold chain breaks at sea ports pose a high risk to the quality of products reaching international buyers. Using a case study with export pineapples, the importance of identifying the cumulative impact of multiple handling failures is revealed. Solutions to reduce losses in export markets due to non-compliance with safety and quality requirements are provided.

**Keywords:** /Cold Chain/ /Fresh Produce/ /Safety/

## **MODIFIED ATMOSPHERE PACKAGING**

Nitzan, N. and G. Ward. 2014. Systems approach to reducing waste and carbon footprint in the fresh produce supply chain. *Acta Hort.* 1015: 131 – 136.

### **Abstract**

Excessive quantities of fresh produce are discarded annually due to poor handling and temperature management in the supply chain. The key to sustaining low wastage and high quality is a systems approach that combines different aspects of postharvest handling management and collaboration between different parties in the supply chain. Such an approach includes, but is not limited to modified atmosphere/modified humidity (MA/MH) packaging; sanitation/disinfection processes; pre-cooling procedures and processes; cold chain monitoring and management and shelf life prediction models. This systems approach, when implemented correctly not only reduces fresh produce wastage, enhances quality and consumption, but offers additional benefits. For instance, if the approach facilitates land or sea transport as an alternative to air freight, then not only are logistical costs decreased, but carbon emissions per kilo produce are also significantly reduced. Case studies are given to highlight the impact of such a systems approach on waste reduction and savings in CO<sub>2</sub> emissions for several major produce items.

**Keywords:** /Modified Atmosphere Packaging/ /Supply Chain/

## **MYCOTOXINS**

Yeni, F., et.al. 2014. Rapid and standardized methods for detection of food borne pathogens and mycotoxins on fresh produce. *Food Control.* 40: 359 – 367.

### **Abstract**

Due to the increase in consumption of fresh produce regarding to the health demand in the last decades, a considerable portion of foodborne outbreaks has been tracked back to contaminated fresh produce, which have appeared as highly possible vehicles for foodborne outbreaks nowadays. Delays in detection of pathogens and mycotoxins on fresh produce hindered the trace-back investigations in finding the source and revealed the urgent need of rapid and reliable methods. In the frame of this review, we summarized available fast, reliable and standardized methods (conventional, molecular, rapid and recently developed methods) used for detection of the most common foodborne pathogens and mycotoxins which are the most likely causative agents of outbreaks caused by contaminated fresh produce.

**Keywords:** /Mycotoxins/ /Pathogens/ /Fresh Produce/

## **PACKAGING**

Rudra, S.G., et.al. 2013. Mechanical properties and antimicrobial efficacy of active wrapping paper for primary **packaging** of fruits. Food BioSci. 3: 49 – 58.

### **Abstract**

The present study reports the effect of antimicrobial agents (potassium sorbate and potassium metabisulphite) and an ethylene scavenger (sodium permanganate) as coating material on wrapping paper for individual packing of fruits. The effect of these coatings on the paper's physical strength and antimicrobial efficacy was modelled using regression analysis ( $R^2=0.95$ ). Optimization of the composition of the coating solution was done such as to obtain maximum strength and antimicrobial efficacy of the paper. The inhibitory effect of sodium permanganate on growth of *Candida pelliculosa* (58%) was most evident; however it had a weakening effect on the physical strength of paper (tensile strength, percent stretch, tensile energy absorption and stiffness). Potassium sorbate exhibited lesser deleterious effect on the physical strength parameters while decreasing growth of *C. pelliculosa* and *Kloeckera apis* (418.8%). Paper coated with optimized combination of chemicals (degree of desirability: 0.835) was tested for its effect on the physicochemical changes of climacteric fruits like peach and plum during storage at room temperature (3272.1°C). Physiological changes were much less in active wrapped fruits after six days of storage as compared to unwrapped fruits. This was especially notable in case of puncture resistance (85% increase) and total soluble solids (4711 Brix increase) in control fruits, compared to 64% and 11 Brix increase respectively, in active wrapped fruits. Thus, use of active wrapping paper will be quite useful for extending the marketable period of climacteric fruits there by enhancing the marketability and profitability of retailer.

**Keywords:** /Packaging/ /Active Wrapping Paper/

## **POSTHARVEST**

Cid, A., et.al. 2014. Thermodynamics of sodium dodecyl sulphate-salicylic acid based micellar systems and their potential use in fruits **postharvest**. Food Chem. 151: 358 – 363.

### **Abstract**

Micellar systems have excellent food applications due to their capability to solubilise a large range of hydrophilic and hydrophobic substances. In this work, the mixed micelle formation between the ionic surfactant sodium dodecyl sulphate (SDS) and the phenolic acid salicylic acid have been studied at several temperatures in aqueous solution. The critical micelle concentration and the micellization degree were determined by conductometric techniques and the experimental data used to calculate several useful thermodynamic parameters, like standard free energy, enthalpy and entropy of micelle formation. Salicylic acid helps the micellization of SDS, both by increasing the additive concentration at a constant temperature and by increasing temperature at a constant concentration of additive. The formation of micelles of SDS in the presence of salicylic acid was a thermodynamically spontaneous process, and is also entropically controlled. Salicylic acid plays the role of a stabilizer, and gives a pathway to control the three-dimensional water matrix structure. The driving force of the micellization

process is provided by the hydrophobic interactions. The isostructural temperature was found to be 307.5 K for the mixed micellar system. This article explores the use of SDS-salicylic acid based micellar systems for their potential use in fruits postharvest.

**Keywords:** /Postharvest/ /Thermodynamics/

## POSTHARVEST CONTROL

Liu, Y.B. 2013. Nitric oxide as a potent fumigant for postharvest pest control. J. Econ. Entom. 106 (6): 2267 – 2274.

### Abstract

There is a great demand for safe and effective alternative fumigants to replace methyl bromide and other toxic fumigants for postharvest pest control. Nitric oxide, a common signal molecule in biological systems, was found to be effective and safe to control insects under ultralow oxygen conditions. Four insect species including western Bower thrips, *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae); aphid, *Nasonovia ribisnigri* (Mosley) (Homoptera: Aphididae); confused β our beetle, *Tribolium confusum* Jacquelin du Val (Coleoptera: Tenebrionidae); and rice weevil, *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae), at various life stages were fumigated with 0.1-2.0% nitric oxide under ultralow oxygen levels of 50 ppm in 1.9 liter glass jars at 2-25°C depending on insect species. Fumigations were effective against all four insect species. Efficacy of nitric oxide fumigation increased with nitric oxide concentration, treatment time, and temperature. There were also considerable variations among insect species as well as life stages in susceptibility to nitric oxide fumigation. Complete control of thrips was achieved in 2 and 8 h with 2.0 and 0.2% nitric oxide, respectively, at 2°C. At the same temperature, complete control of the aphid was achieved in 3, 9, and 12 h with 1.0, 0.5, and 0.2% nitric oxide, respectively. Larvae, pupae, and adults of confused β our beetle were effectively controlled in 24 h with 0.5% nitric oxide at 20°C. Complete mortality of confused β our beetle eggs was achieved in 24 h with 2.0% nitric oxide at 10°C. Rice weevil adults and eggs were effectively controlled with 1.0% nitric oxide in 24 and 48 h, respectively, at 25°C. These results indicate that nitric oxide has potential as a fumigant for postharvest pest control.

**Keywords:** /Postharvest Pest Control/ /Fumigant/

## VEGETABLE PESTS

Dader, B., et.al. 2014. Insecticide-treated nets as a new approach to control vegetable pests in protected crops. Acta Hort. 1015: 103 – 112.

### Abstract

Vegetable crops suffer from a range of economically damaging insect pests and insect-transmitted virus diseases. Current control practice involves intensive spraying of insecticides, which may have undesirable effects on the environment, growers and consumers. Our goal is to develop a new physical-chemical barrier treated with fast acting insecticides to reduce the incidence of pests and insect transmitted virus diseases in protected crops. The new approach is based on a slow release insecticide-treated net with relatively large holes size to improve airflow and ventilation inside the protected environment while maintaining the protection from insect pests. Such net could be placed on an entire

net house or on the sides and ventilation openings of a conventional plastic film covered greenhouse, as a barrier against insect pests. A series of laboratory experiments using vertical glass tube chambers divided by insecticide-treated nets were conducted. The nets tested had various combinations of insecticides, mesh sizes, colours and UV blockers. One of laboratory-selected nets was tested under field conditions on a tunnel-type greenhouse under a very high pest infestation pressure. Cucumber plants previously infected with *Cucumber mosaic virus* and *Cucurbit aphid-borne yellow virus* were artificially infested with *Bemisia tabaci* and *Aphis gossypii* on the outer sides of the tunnel. The selected insecticide-treated nets effectively blocked the invasion of *A. gossypii* and reduced the incidence of virus-infected cucumber plants grown inside the tunnel compared to plants covered with similar nets of the same mesh size with no insecticide. However, the insecticide-treated nets failed to control *B. tabaci*.

**Keywords:** /Vegetable Pests/ /Virus Control/

## **FRUITS**

### **ASAI**

Diaz, R.O., et.al. 2014. Storage of **asai** (*Euterpe precatoria* Mart.) fruits harvested at different maturity stages. Acta Hort. 1016: 137 – 140.

#### **Abstract**

Asai is a tropical palm widely distributed in the Amazon and its fruits have a high antioxidant capacity and are also a source of dietary fibre and bioactive compounds. The generation of asai value chains demands the standardization of fresh fruit quality for processing and the establishment of a postharvest system that allows quality preservation and offers regulation. In order to evaluate fruit quality trait evolution during postharvest storage, asai fruits from the Guaviare Department (Colombia) were collected in three successive maturity stages: green, half-ripe and ripe; and stored at  $20 \pm 2^\circ\text{C}$ . Respiration rate, ethylene production, fresh weight loss and skin colour were measured daily. Weight loss increased as time passed, reaching more than 10% on day 6 of storage with no significant difference between the maturity stages. Ethylene production was not detected, nevertheless, skin colour changed from green to purple and the respiratory rate increased (lower production in green fruits), suggesting a climacteric pattern.

**Keywords:** /Asai/ /Maturity/ /Storage/

### **AVOCADO**

Villarroel, A.R., et.al. 2014. Bacterial inactivation and quality changes of fresh-cut **avocados** as affected by intense light pulses of specific spectra. Int. J. Food Sci. Technol. 49: 128 – 136.

#### **Abstract**

Intense light pulses (ILP) treatments have good prospects for becoming an alternative to traditional thermal methods for decontamination of food surfaces. The aim of this work was to evaluate which ranges of the light spectrum are responsible for bacterial inactivation and their effect on the quality of fresh-cut avocado. Results show that the effectiveness of ILP treatment decreases when the ultraviolet (UV) spectral region is blocked (particularly UV-C). ILP treatments without UV-C light (305–

1100 nm) and an overall fluence of 10.68 J/cm<sup>2</sup> caused reductions of 2.47 and 1.35 log CFU/g in the initial counts of inoculated Escherichia coli and Listeria inoculant, respectively, in comparison with those treated using only VIS–NIR light (0.83 and 0.68 log CFU/g, respectively). Treatments applying light of a wavelength between 305 and 1100 nm had a more pronounced impact on colour, texture and headspace gas composition than treatments that did not contain UV light (400–1100 nm).

**Keywords:** /Avocado/ /Fresh Cut/ /Quality Changes/

## **BANANA**

Abdul-Rahaman, A. and C. Bishop. 2013. Evaluating the effects of biodegradable and conventional modified atmosphere packaging on the shelf life of organic Cavendish **bananas**. J. Postharvest Technol. 1(1): 29 – 35.

### **Abstract**

The physiological disorders in banana fruits results in the reduction of fruit quality and the market value that can manifest as diseases in consumer packages. This study investigates the effects of the use of Biodegradable (Bio flex) Modified Atmosphere Packaging (MAP) and LDPE Conventional MAP on rate of ripening (colour changes) and overall consumer acceptance of Cavendish banana fruits at 20°C and 80% RH for eight days. Banana fruits stored in Biodegradable MAP showed quite lower weight loss as compared to others. Fruits stored in Conventional MAP and without Package ripened rapidly as compared with Biodegradable MAP. The CO<sub>2</sub> concentration for the Biodegradable MAP and Conventional MAP were 12% and 9.8% respectively. The O<sub>2</sub> Concentration decline gradually to 5.2% for Biodegradable MAP compared with 2% for the Conventional MAP. Moreover, fruits stored in Biodegradable MAP showed superior consumer acceptability.

**Keywords:** /Cavendish Banana/ /MAP/

Erdogdu, F., et.al. 2014. Experimental determination of thermal conductivity and thermal diffusivity of whole green (unripe) and yellow (ripe) Cavendish **bananas** under cooling conditions. J. Food Eng. 128: 46 – 52.

### **Abstract**

Bananas are cooled to 13°C after their harvest to extend their shelf life and prevent post-harvest losses. Since they are subjected to chilling injuries at temperatures below 11°C, thermal properties should be known to design a cooling process. For this purpose, thermal diffusivity and thermal conductivity of green and yellow Cavendish bananas were determined experimentally using analytical solution of heat transfer for an infinite cylinder. Experiments were carried out in cooling chambers, and temperature change of bananas was recorded using thermistors. Thermal conductivity–diffusivity values of the green and yellow bananas changed from 0.302 to 0.338 W/m-K and 1.442 x 10<sup>-7</sup> to 1.500 x 10<sup>-7</sup> m<sup>2</sup>/s, respectively. These values were validated by literature data and additional experiments where simulated and experimental data were compared while the effect of banana peel on the cooling rates was also explained. These comparisons demonstrated the significance of knowing thermal conductivity–diffusivity values separately for designing and optimizing a cooling process.

**Keywords:** /Banana/ /Cavendish Banana/ /Cooling/

## BLUEBERRY

Blaker, K.M. and J.W. Olmstead. 2014. Effects of preharvest applications of 1-methylcyclopropene on fruit firmness in southern highbush blueberry. Acta Hort. 1017: 71 – 76.

### Abstract

Fruit firmness was evaluated in southern high bush blueberry (*Vaccinium corymbosum* L.) cultivars after pre-harvest treatments with sprayable 1-methylcyclopropene (1-MCP). Two cultivars, 'Star' and 'Sweetcrisp', were sprayed with 1-MCP at a rate of 160 mg/L at five or nine days prior to harvest. Treatments were applied as a split plot cultivar × treatment design with three blocks. Berries were harvested when fully blue and measured for firmness using a Bioworks Firm Tech II firmness tester (Bioworks, Inc., Wamego, KS). There were significant differences in firmness for both cultivars and treatments ( $P < 0.05$ ) but not for the cultivar × treatment interaction ( $P = 0.089$ ). For all treatments, 'Sweetcrisp' fruit were significantly firmer than 'Star' fruit. The untreated control was not significantly different from the nine day pre-harvest 1-MCP treatment ( $P = 0.808$ ), and the two pre-harvest 1-MCP treatments were not statistically different from one another ( $P = 0.058$ ), but the untreated control had firmer berries than the five day pre-harvest 1-MCP treatment ( $P = 0.011$ ). Postharvest application of 1-MCP is commonly used to inhibit ethylene production and ripening and thus maintain firmness in other climacteric fruits such as apple, but has recently been found to increase ethylene production and fruit softening in rabbit eye (*Vaccinium virgatum* Aiton) blueberry. The results of this study suggest that 1-MCP application five days prior to harvest may decrease postharvest fruit firmness of southern high bush blueberries.

**Keywords:** /Blueberry/ /Ethylene/ /1-Methylcyclopropene/ /Firmness/

Cline, W.O. 2014. New and emerging diseases of blueberry. Acta Hort. 1017: 45 – 50.

### Abstract

A number of new diseases of blueberry have been reported in the last four years, and some existing diseases have increased in importance. Emerging diseases may be caused by new pathogens, or by previously described, sometimes well-known pathogens that are increasing in incidence and severity. Examples of new or emerging diseases in the US include *Blueberry necrotic ring blotch virus*, blueberry bacterial scorch caused by *Xylella fastidiosa*, Exobasidium fruit and leaf spot caused by the fungus *Exobasidium vaccinii*, Valdensinia leaf spot of low bush blueberry caused by the fungus *Valdensinia heterodoxa*, and *Blueberry red ringspot virus*. As blueberry production expands in the US and worldwide, disease incidence is being affected by changes in production practices, introduction of blueberries into new geographic areas, transmission via vegetative propagation from infected plants, and varying levels of resistance in new cultivars.

**Keywords:** /Blueberry/ /Disease/

Lobos, G.A., et.al. 2014. Effect of mechanized (automotive or shaker) vs. hand harvest on postharvest fruit quality of blueberries (*Vaccinium corymbosum* L.). Acta Hort. 1017: 135 – 140.

### Abstract

This research was carried out during the 2010/11 growing season to establish the effect of different types and times of harvest on the quality of fresh blueberries. The 6 treatments consisted of 3 harvest types (hand, automotive or shaker) and two harvest times (morning: 9-11 am; afternoon: 3-5 pm). Ten-year-old 'Brigitta' and 'O'Neal' plants, from a commercial planting in Linares (35°52' South and 71°37' West) were used. Measurements were made of: harvest duration, weight of fruit picked, and proportion, in weight, of fruit in the categories: fresh, discarded, IQF (individual quick frozen) and pre-size. Firmness was measured at harvest, and after 60 d at 0°C plus 1 d at 18°C (60+1). Mechanical damage was measured after 60+3 d. Highest fruit firmness, independent of cultivar and harvest type, was for am pickings. Firmness for both measuring dates and cultivars was lowest for automotive; while in 'O'Neal', hand and shaker had equivalent firmness; in 'Brigitta' shaker-harvested-fruit had intermediate firmness. Mechanical damage was greater for fruit picked with automotive equipment, and also in am pickings. Fruit picked by hand and with shaker had similar mechanical damage in 'Brigitta', but not in 'O'Neal', where shaking caused greater damage. After fruit sorting, 'Brigitta' had a greater proportion of fruit suitable for the fresh market. Averaging both cultivars, the proportion of fruit for the fresh market was 71.9, 76, and 82.9%, for automotive, shaker and hand harvest, respectively. These results indicate a positive potential for harvesting with shakers, but its effects on different cultivars and the cost/benefit ratio need to be studied.

**Keywords:** /Blueberry/ /Harvesting/ /Quality/

Moggia, C., G.A. Lobos and J.B. Retamales. 2014. Modified atmosphere packaging in **blueberries**: effect of harvest time and moment of bag sealing. Acta Hort. 1017: 153 – 158.

### **Abstract**

The use of modified atmosphere in the packaging of fresh blueberries (*Vaccinium corymbosum* L. 'Brigitta') was studied as a function of harvest time and moment of bag sealing. In trial 1, four treatments were established considering harvest time (morning: am or afternoon: pm), and moment of bag sealing: before or after cooling at 0°C. In trial 2, the packaging system was compared to a control treatment, without bag, for am- and pm-harvested fruit. After harvest fruit were placed under shading and subjected to 6 h delay before sorting. Berries were stored for 30 and 45 d at 0°C and evaluated after 1 and 3 d at 18°C (30+1, 30+3, 45+1, and 45+3). Evaluations included: %O<sub>2</sub> and %CO<sub>2</sub> evolution within the bags, berry firmness (g/mm) and fruit quality (% sound, rotten, dehydrated or mechanically damaged fruit). Results show that the use of bags increased the proportion of sound fruit (80-90%) with regards to controls (<60%), especially in the evaluations at 30+3, 45+1 and 45+3. Bagging increased the % of sound fruit in the am vs. pm; however, there was no effect of time of bag sealing. The main effect of bagging was a lower proportion of dehydrated fruit; which amounted to 4-10% in bag treatments vs. 20- 30% for control fruit. Additionally bagging retained fruit firmness, both for AM and PM-harvested fruit. Since bagging had little effect on gas composition, its effect must be studied further. These results evidence a high potential for the use of modified atmosphere packaging for boat shipping of blueberries for distant markets.

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

Remberg, S.F., et.al. 2014. Effects of preharvest factors on **berry** quality. Acta Hort. 1017: 181 – 188.

### **Abstract**

Investigations on preharvest factors influencing postharvest quality in berries has mainly focused on the effects of temperature and light as well as inherent genetic relations. A short review of some prominent examples of such research is presented. We also present results from a series of perennial field trials in which berry quality attributes are related to annual variation in important climatic factors. Cultivars of red raspberry (*Rubus idaeus* L.), highbush blueberry (*Vaccinium corymbosum* L.), and black currant (*Ribes nigrum* L.) have been grown under field conditions in Norway over the years 2002-2008. Berries were analysed for the content of important quality factors, and the contents related to important climatic factors during fruit ripening in the various years. Statistically significant differences were found for all studied quality attributes both among species and cultivars. Black currants were higher in soluble solids, L-ascorbic acid and antioxidant activity, but had smaller berries than red raspberries and blueberries. Correlation analyses revealed contrasting relations between quality traits and climatic conditions during fruit ripening in the various berry crops. Global radiation was positively related to the content of soluble solids in red raspberries and blueberries, while antioxidant activity and global radiation was positively related in raspberries, but negatively related in blueberries. Precipitation was negatively related to soluble solids in red raspberries and black currants, and to L-ascorbic acid in blueberries, while it was positively related to antioxidant activity in blueberries. Temperature was positively related to the content of soluble solids in red raspberries, but was not significant related to any other quality parameters in any of the studied berry crops. However, highly significant co-variation between temperature and global radiation and precipitation (positive and negative, respectively), suggest that, under field conditions, the effects of temperature may be masked by these other environmental parameters.

**Keywords:** /Blueberry/ /Temperature/ /Quality/

## CITRUS

Fan, F., et.al. 2014. Use of citral incorporated in postharvest wax of **citrus** fruit as a botanical fungicide against *Penicillium digitatum*. Postharvest Biol. Technol. 90: 52 – 55.

## Abstract

The antifungal activity of citral against *Penicillium digitatum*, the causal agent of citrus green mold, was tested by in vitro and in vivo experiments. In vitro assays showed that the minimum inhibitory concentration and the minimum fungicidal concentration (MFC) were both 4000 L<sup>-1</sup>. Results of in vivo tests demonstrated that wax + citral (1× MFC) treatment did not effectively inhibit the growth of *P. digitatum* in Ponkan mandarin fruit, whereas wax + citral (10× MFC) treatment significantly decreased the incidence of green mold after 6 days of storage at 25 ± 2 °C. Wax + citral (10× MFC) treatment remarkably increased the content of vitamin C and antioxidant enzyme activities such as catalase, superoxidase dismutase, and peroxidase but decreased the activities of phenylalanine ammonia lyase, polyphenol oxidase, and malonaldehyde. The treatment had minor effects on the pH, coloration index, and total soluble solids. This study provided theoretical data for the practical application of citral on citrus fruit quality during postharvest storage.

**Keywords:** /Citrus/ /Postharvest/ / Waxing/

## GRAPEFRUIT

Chaudhary, P.R., et.al. 2014. Low temperature conditioning reduces chilling injury while maintaining quality and certain bioactive compounds of 'Star Ruby' grapefruit. Food Chem. 153: 243 – 249.

### Abstract

In the current study, influence of storage temperature (11 and 2 °C) and low temperature conditioning (7 days at 16 °C before cold storage at 2 °C) on the bioactive compounds in 'Star Ruby' grapefruit (*Citrus paradisi* Macf.) were examined. Fruits stored at 11 °C showed no CI; while fruits stored at 2 °C showed highest CI. Conditioning treatment (CD) reduced the incidence of CI. Carotenoids and flavonoids were significantly higher after 16 weeks in fruits stored at 11 °C. Low temperature storage (2 °C and CD) helped to retain ascorbic acid for a longer period (12 weeks). Higher furocoumarins and taste scores along with less decay development were observed in CD fruits. Conditioning treatment can be utilized to reduce CI and to maintain taste and certain bioactive compounds of grapefruits during prolonged storage at low temperature. However, for a short storage period, 11 °C temperature is more effective.

**Keywords:** /Grapefruit/ /Chilling injury/ /Bioactive compounds/

## GRAPES

Harindra Champa, W.A., et.al. 2014. Postharvest treatment of polyamines maintains quality and extends shelf-life of table grapes (*Vitis vinifera* L.) cv. Flame Seedless. Postharvest Biol. Technol. 91: 57 – 63.

### Abstract

Investigations were carried out to verify the potential of putrescine and spermidine as a postharvest dip treatment for maintaining quality and extending storage life of table grapes (*Vitis vinifera* L.) cv. Flame Seedless during the 2012 and 2013 seasons. Grape clusters were manually harvested at the commercial mature stage and were dipped in different concentrations (0.0, 0.5, 1.0 and 1.5 mM) of putrescine and spermidine, and then stored at 3–4°C, and 90–95% RH. Evaluation of physicochemical parameters and other fruit quality attributes were made at 0 day (before treatment) and at 30, 45, 60 and 75 days of storage. Putrescine and spermidine at the lowest dose (0.5 mM) effectively maintained berry firmness, peel colour ( $L^*$ ,  $C^*$ ,  $h^\circ$ ) and stabilized anthocyanin as well as suppressing the activity of pectin methyl esterase and reducing the rate of electrolyte leakage. The polyamines also retarded the degradation of TSS and TA while maintaining higher total phenol content and reduced decay incidence. Putrescine and spermidine at 1.0 mM exhibited almost similar effects with a 0.5 mM dose. The highest doses (1.5 mM) of both polyamines showed detrimental effects, especially on weight loss, decay incidence, rachis browning and organoleptic properties, as found in the control group, which was commercially acceptable only up to 45days. Furthermore, analysis of linear regressions and correlations showed that many quality parameters were interdependent. The postharvest dip treatment of spermidine or putrescine at a dose of 0.5 mM for 5 min could be an effective means for prolonging storage and increasing shelf-life of 'Flame Seedless' grapes.

**Keywords:** /Grapes/ /Shelf-life/ /Postharvest Treatment/

## **GUAVA**

Wijewardane, R.M.N.A. 2013. Application of polysaccharide based composite film wax coating for shelf life extension of **guava** (var. Bangkok Giant). J. Postharvest Technol. 1(1): 16 – 21.

### **Abstract**

The application of wax coating helps to extend the shelf life of picked guava by minimizing the weight loss due to natural migration process of moisture and gases. The present investigation relates to find out the applicability of different concentrations of edible coating (wax) for shelf life extension of guava, which include palm oil (3%), glycerol (30%), Sorbitan monooleate (tween 80) (2%) and guar gum (2%). The medium size fruits were harvested at correct maturity (green to yellow) and only disease and damage fruits were selected. The treatment solution was prepared by mixing wax formula with distilled water in 1:1 (T1) and 1:2 (T2) ratios and (T3) kept as control without any treatment. The fruits were analysed for physiological weight loss, fruit firmness, titratable acidity, pectin content, pH, total soluble solid content and rate of respiration for 09 days storage. The consumer acceptability was evaluated by 30-panellist using 5 point hedonic scale. Among the treatments tested, wax solution mixed with water in 1:1 ratio (T1) showed significantly higher performances ( $p < 0.05$ ) compared to the other treatments tested. The selected treatment appeared to extend the shelf life of guava up to 09 days under ambient condition (29-32°C and 65%- 70% RH) with appreciable retention of all quality parameters tested.

**Keywords:** /Guava/ /Film Wax Coating/ Shelf Life/

## **JUJUBE**

Zozio, S., et.al. 2014. Changes in antioxidant activity during the ripening of **jujube** (*Ziziphus mauritiana* Lamk). Food Chem. 150: 448 – 456.

### **Abstract**

Phenolic compounds from jujube fruits and related antioxidant activities were investigated during the ripening stages. Three different antioxidant assays, including ORAC, FRAP and DPPH, were monitored on crude jujube extract (CJE). Jujube fruits were additionally fractionated into three selective fractions F1, F2, and F3. However, only the FRAP assay gave the relative antioxidant activity for the three fractions. Furthermore, HPLC–ESI-MS/MS (Q-T of) and GC–MS were used to identify the compounds in each purified fraction. Using FRAP, F1 mainly composed of lipids, exhibited the lowest antioxidant activity ( $0.080 \pm 0.015$  mmol trolox/100 g,  $p < 0.05$ ). F2, rich in flavanols and flavonols, displayed 50-fold higher activity ( $4.27 \pm 0.11$  mmol trolox/100 g). Remarkably, F3 with an elevated content of condensed tannins (polymeric proanthodelphinidins), exhibited the highest antioxidant activity ( $25.4 \pm 0.35$  mmol trolox/ 100 g). The presented results showed that the phenolic profiles of the fruits were influenced by their developmental stage. Furthermore, during ripening, the antioxidant activity may be more impacted by the flavanols and condensed tannins. The purified condensed tannins of jujube fruits may be used as natural antioxidant extracts.

**Keywords:** /Jujube/ /Ripening/ Antioxidant/

## KIWIFRUIT

Jabbar, A., et.al. 2014. Modelling batch variability in softening of 'Hayward' **kiwifruit** from at-harvest maturity measures. *Postharvest Biol. Technol.* 90: 7 – 14.

### Abstract

Firmness of kiwifruit (*Actinidia deliciosa* (A. Chev) C.F. Liang et A.R. Ferguson cv. Hayward) is an important determinant of quality. Batches of fruit vary not only in firmness at time of harvest but also in time to reach eating ripeness (0.5–1.0 kgf). Failure to identify batches with rapid rate of firmness breakdown results in economic loss to the industry. Understanding variability in softening rate and its relation with at-harvest measures may lead to opportunities for industry to segregate batches for storage potential. The objective of this paper was to model batch-specific softening behaviour of kiwifruit and investigate if predictive models could be determined from at-harvest maturity measures. Data for 'Hayward' kiwifruit softening at 20°C were collected over 21 d for 108 batches across two seasons (2011 and 2012). In model creation, application of both Complementary Gompertz (CG) equation and a time shift (TSCG) alternative version resulted in a mean absolute error (MAE) of 0.11–1.55 kgf and 0.14–1.44 kgf respectively for 54 batches. Model parameters were fitted using a non-linear mixed effects procedure. The resulting batch-dependent softening description parameters ( $B$ ,  $\alpha$  and  $\beta$ ) were best associated with at-harvest firmness and the SSC: firmness ratio. For prediction validation, at-harvest quality indicators of an alternative set of 54 batches were used to predict softening descriptive model parameters and subsequent batch-dependent softening behaviour at 20°C. When  $B$  and  $\alpha$  were predicted from firmness and the SSC: firmness ratio respectively in the validation batches, MAE of firmness prediction by CG ranged from 0.17 to 2.75 kgf with 46% of the batches having MAE of less than 0.5 kgf. Likewise, when  $\beta$  was predicted from firmness, MAE of firmness prediction by TSCG ranged from 0.17 to 2.78 kgf and approximately 30% of batches had MAE less than 0.5 kgf. This paper demonstrates the potential for predicting softening variability of kiwifruit batches from at-harvest fruit maturity measures. Future work is required to ascertain if a similar modelling protocol may enable prediction of kiwifruit softening at commercial storage conditions (0°C).

**Keywords:** /Kiwifruit/ /Softening/ /Maturity/

## LONGAN

Saengnil, K., et.al. 2014. Use of chlorine dioxide fumigation to alleviate enzymatic browning of harvested 'Daw' **longan** pericarp during storage under ambient conditions. *Postharvest Biol. Technol.* 91: 49 – 56.

### Abstract

Pericarp browning reduces both the shelf-life and market value of harvested longan fruit stored at room temperature. Our study investigated the efficiency of chlorine dioxide ( $\text{ClO}_2$ ) fumigation at reducing pericarp browning of longan (*Dimocarpus longan* Lour.) cv. Daw. Fresh longan fruit were fumigated with 0 (control), 2.5, 5, 10 and 25 mg/L  $\text{ClO}_2$  for 10 min, before being packed in cardboard boxes, and stored at  $25 \pm 1^\circ\text{C}$ , RH  $82 \pm 5\%$  for 7 days. Fruit treated with  $\text{ClO}_2$  had a lower browning index, but higher hue angle (true colour),  $L^*$  (lightness) and  $b^*$  (yellowness) values than non-treated fruit. The 10 and 25 mg/L  $\text{ClO}_2$  treatments were the most effective at extending shelf-life from 1 to 5 days,

compared with the control, by reducing pericarp browning, the activities of polyphenol oxidase (PPO) and peroxidase (POD), disease development and by maintaining the highest total phenolic content. However, quality acceptance of fruit treated with 10 mg/L ClO<sub>2</sub> was higher than fruits treated with 25 mg/L, as determined by odour and flavour. Consequently, ClO<sub>2</sub> fumigation at a concentration of 10 mg/L was considered to be the most effective treatment to reduce pericarp browning of longan, whilst maintaining fruit quality.

**Keywords:** /Longan/ /Enzymatic Browning/

## MANDARIN

Mahajan, B.V.C., W.S. Dhillon and M. Kumar. 2013. Effect of surface coatings on the shelf life and quality of kinnow fruits during storage. J. Postharvest Technol. 1 (1): 8 – 15.

### Abstract

The Kinnow mandarin (*Citrus nobilis* x *Citrus deliciosa*) fruits of uniform size, disease and bruise free were picked randomly from all the four directions of the plants with the help of secateur. The fruits were sorted and washed with chlorine solution (100 ppm). Thereafter, the fruits were coated with 'Nipro Fresh SS 40T and SS 50' formulations. The fruits were air dried and packed in corrugated fibre board boxes (10 Kg capacity). The coated and control (uncoated) fruits were stored under cold storage conditions (5-7°C and 80-85% RH) and under ambient conditions (11-19°C and 80-85% RH). The various physicochemical attributes of fruits were recorded in 30, 45 and 60 days in cold stored fruits and at 5, 10 and 15 days in fruits stored at ambient conditions. The results of the study indicated that Kinnow fruits coated with 'Nipro Fresh SS 40T or SS 50' showed significant delay in the change of weight loss, firmness, TSS, titratable acidity and vitamin-C content of Kinnow fruits. The present study envisaged that Kinnow fruit wax coated with these formulations can be successfully stored for 45 days under cold storage conditions (5-7°C and 90-95% RH) and for 10 days under ambient conditions (11-19°C and 65-70% RH) with highly acceptable sensory quality. The uncoated fruits, on the other hand, maintained postharvest shelf life of 30 days in cold storage and 5 days at ambient conditions.

**Keywords:** /Mandarin/ /Shelf Life/ /Surface Coatings/

## MANGO

Kienzle, S., et.al. 2014. Occurrence of alk(en)ylresorcinols in the fruits of two **mango** (*Mangifera indica* L.) cultivars during on-tree maturation and postharvest storage. J. Agric. Food Chem. 62: 28 – 40.

### Abstract

Regarding their relevance for the fungal resistance of mangoes in long supply chains, the alk(en)ylresorcinols (AR) were quantitated in peel and mesocarp throughout storage (27 days, 14°C, ethylene absorption). The 12 'Chok Anan' and 11 'Nam Dokmai #4' lots picked between 83 and 115 days after full bloom (DAFB) had different harvest maturity indices. The development of dry matter and fruit growth indicated physiological maturity ~100 DAFB. During storage, all fruits ripened slowly, mostly until over-ripeness and visible decay. The total AR contents always ranged at 73 ± 4.5 and 6.4 ± 0.7 mg hg<sup>-1</sup> of 'Chok Anan' and 'Nam Dokmai #4' peel dry weight, respectively, but only at 6.7 ± 0.7 and 0.9 ±

0.1 mg hg<sup>-1</sup> for the corresponding mesocarp ( $P \leq 0.05$ ). These narrow concentration ranges were contradictory to the decreasing fungal resistance. Accordingly, the alk(en)ylresorcinols have not been a deciding factor for the fungal resistance.

**Keywords:** /Mango/ /Postharvest Handling/ /Storage/

## MELON

Poverenov, E. et.al. 2014. Effects of polysaccharide-based edible coatings on fresh-cut melon quality. Acta Hort. 1015: 145 – 152.

### Abstract

Active edible coating is a novel promising approach for extending shelf life of fresh agricultural products. This method is based on the use of natural components without artificial supplements that is currently a subject of high interest. Active edible coatings are especially attractive for fresh cut ready to eat products. Such products represent an expanding area of the food industry that suffers from fast quality deterioration and microbial spoilage. Methods that enhance quality of fresh cut products and prolong their shelf life are highly desired. The aim of this research was to enhance the quality of fresh cut Galia-type melons utilizing polysaccharides as coating materials. Alginate was used as a primary coating component. The effect of different alginate concentrations on coating thickness and physiological properties of fresh cut melons was studied. The most successful coating was obtained using 1.5% alginate solution. To provide antimicrobial protection to the fresh cut melons, modifications of the alginate coating were performed. In the first case, an antimicrobial additive, citral, was added to the alginate coating solution. However, no significant antimicrobial properties were noticed. In the second case, an antimicrobial polysaccharide chitosan was added as a component of the coating matrix. Chitosan integration resulted in significant antimicrobial protection of the fresh cut melons.

**Keywords:** /Melon/ /Edible Coating/ /Quality/ /Fresh Cut/

## ORANGE

Jafari, A., A. Fazayeli and M.R. Zarezadeh. 2014. Estimation of orange skin thickness based on visual texture coarseness. Biosystems Eng. 117: 73 – 82.

### Abstract

Much research has been carried out on grading citrus fruits using machine vision. Citrus grading is normally achieved based on external visible criteria including size, shape, and colour of the fruits. However, identification of the internal characteristics of the fruits is almost impossible by computer vision which uses visible spectral imaging. Thickness of the fruit skin is one of the important factors for consumers which can be considered as a grading criterion. Citrus fruits with thin skins are more desirable but it calls for spectral solutions. However, internal quality of the fruits can be evaluated if there is a correlation between the internal and visible external characteristics. It is normally seen that oranges with coarser surfaces have thicker skin and vice versa. Such correlation between the surface coarseness and thickness of the skin was investigated in this research. Coarseness of the skin could be verified by normal visible imaging. An innovative approach is described for fast description of texture while retaining the accuracy of high resolution images. Three strips having a width of one pixel were

selected from the images. A coarseness factor was devised that utilized successive moving average filters. A correlation was achieved between the coarseness factors and thickness of the oranges which showed a good agreement between these two factors ( $R^2 = 0.944$ ). The experiments demonstrated that this method could be used for non-destructive grading of orange or other citrus fruits to evaluate skin ratio of the fruit by using a simple and inexpensive machine vision system.

**Keywords:** /Orange/

Velasquez, M.A., et.al. 2014. Effect of an edible, fungistatic coating on the quality of the 'Valencia' orange during storage and marketing. Acta Hort. 1016: 163 – 170.

### **Abstract**

Generally, citrus fruits are waxed in the postharvest stage to restore the natural wax removed in the washing procedure and to improve the appearance of the fruit, providing luster. Nowadays, in Colombia, the waxes employed in this step of citrus fruits are imported, which represents a high cost for producers and marketers. On the other hand, the citrus industry generates about 50,000 tons of waste annually just in the coffee region of Colombia, which is undervalued and put to limited use. In this regard, an edible coating, based on pectin and essential oils, would be a solution to the under-utilization of the waste and the import of waxes and would also provide a safe product for consumers and reduce the impact on the environment. In this study, the effect of an edible coating (EC) made of pectin and essential oils on the postharvest quality of 'Valencia' oranges was evaluated. The fungistatic activity of the coat was evaluated at 0.5, 1.0, and 1.5% of essential oils (EO) in fruits inoculated with *Penicillium* sp. in three conditions of storage: direct marketing, cold storage and USA quarantine simulation. The EC at 1% of EO was also applied in a commercial packing line of citrus and studied after different storage conditions. The EC with 1.5% of EO extended the shelf life of the fruits at 23°C with a controlled decay of 83%. Nevertheless, at low temperatures, there was no control of the fungus, as with the other commercial waxes studied. The EC did not affect the internal fruit quality in a detrimental way, although the control of weight loss must be improved. In general, the EC could be applied in a commercial packing line and the fruits could be stored for 1 week at 25°C with an acceptable weight loss and for 2 weeks at 7°C plus 7 days at 25°C with a weight loss control of 0.9%.

**Keywords:** /Orange/ /Valencia Orange/ /Storage/ /Quality/ /Marketing/

### **PEACH**

Tosetti, R., et.al. 2014. Molecular and biochemical responses to wounding in mesocarp of ripe peach (*Prunus persica* L. Batsch) fruit. Postharvest Biol. Technol. 90: 40 – 51.

### **Abstract**

The physiological and molecular responses of ripe fruit to wounding were evaluated in two peach (*Prunus persica*) varieties ('Glohaven', GH, melting and 'BigTop', BT, slow melting nectarine) by comparing mesocarp samples from wedges (as in minimal processing) and whole fruit as the control. Slight differences between the two varieties were detected in terms of ethylene production, whereas total phenol and flavonoid concentrations, and PPO and POD enzyme activities showed a general increase in wounded GH but not in BT. This was associated with the better appearance of the BT wedges at the end of the experimental period (72 h). Microarray (genome-wide \_PEACH3.0) analysis revealed

that a total number of 2218 genes were differentially expressed ( $p < 0.01$ , log2fold change expression ratio  $>1$  or  $<-1$ ) in GH 24 h after wounding compared to the control. This number was much lower (1208) in BT. According to the enrichment analysis, cell wall, plasma membrane, response to stress, secondary metabolic processes, oxygen binding were the GO categories over-represented among the GH up-regulated genes, whereas plasma membrane and response to endogenous stimulus were the categories over-represented among the down-regulated genes. Only 32 genes showed a common expression trend in the two varieties 24 h after wounding, whereas a total of 512 genes (with highly represented transcription factors), displayed opposite behaviour. Quantitative RT-PCR analysis confirmed the microarray data for 18 out of a total of 20 genes selected. Specific WRKY, AP2/ERF and HSP20 genes were markedly up-regulated in wounded GH, indicating the activation of regulatory and signalling mechanisms probably related to different hormone categories. Compared to BT, the expression of specific genes involved in phenylpropanoid and triterpenoid biosynthetic pathways showed a more pronounced induction in GH, highlighting the difference between the two peach varieties in terms of molecular responses to wounding in the mesocarp tissue.

**Keywords:** /Peach/ /Ripening/

## PEAR

Cefola, M., M. Renna and B. Pace. 2014. Marketability of ready-to-eat cactus **pear** as affected by temperature and modified atmosphere. *J. Food Sci. Technol.* 51(1): 25 – 33.

## Abstract

In order to increase the diffusion of cactus pear fruits, in this study, the proper maturity index for peeling and processing them as ready-to-eat product was evaluated and characterized. Thereafter, the effects of different storage temperatures and modified atmosphere conditions on the marketability of ready-to-eat cactus pear were studied. The storage of ready-to-eat fruits at 4°C in both passive (air) and semi-active (10 kPa O<sub>2</sub> and 10 kPa CO<sub>2</sub>) modified atmosphere improved the marketability by 30%, whereas the storage at 8°C caused a dangerous reduction in O<sub>2</sub> partial pressure inside modified atmosphere packages, due to fruits' increased metabolic activity. A very low level of initial microbial growth was detected, while a severe increase in mesophilic and psychrophilic bacteria was shown in control samples at both temperatures during storage; an inhibitory effect of modified atmosphere on microbial growth was also observed. In conclusion, modified atmosphere improved only the marketability of fruits stored at 4°C; whereas the storage at 8 °C resulted in deleterious effects on the ready-to eat fruits, whether stored in air or in modified atmosphere.

**Keywords:** /Cactus Pear/ /Modified Atmosphere/

Helena Gomes, M., et.al. 2014. Polyphenoloxidase activity and browning in fresh-cut 'Rocha' **pear** as affected by pH, phenolic substrates, and antibrowning additives. *Postharvest Biol. Technol.* 91: 32 – 38.

## Abstract

The effect of pH, phenolic substrates, and food additives on polyphenoloxidase (PPO) activity and on tissue browning was studied in fresh-cut 'Rocha' pear. Substrates 4-methylcatechol, caffeic acid, (+)-catechin hydrate, catechol, chlorogenic acid, dopamine hydrochloride, and pyrogallol, were prepared

in citric acid-phosphate buffer at pHs ranging from 3.0 to 8.0. pH optima for PPO activity depended on the phenolic substrate. Activity was optimal at pH 5.0 for catechol and 4-methylcatechol; pH 6.0 for chlorogenic acid; pH 7.0 for dopamine, caffeic acid, and catechin; and pH 8.0 for pyrogallol. Discrepancies were observed between the pH dependency of PPO activity and browning, as assessed by objective colour measurement. Significant correlations were obtained between enzyme activity and metric-hue difference ( $\Delta H^*$ ) over the pH range 3.0–8.0 for four of the eight phenolics. Chlorogenic acid, the main PPO substrate in 'Rocha' pear, induced high tissue browning but very low PPO activity at pH 3.0–4.0. Chemical inhibition of PPO was tested using catechol as substrate, and buffer solutions containing 250 mM Ca<sup>2+</sup> in four salts (ascorbate, chloride, lactate and propionate), 57 mM ascorbic acid, 61 mM N-acetyl-L-cysteine and 3 mM 4-hexyl resorcinol. PPO inhibition by additives was affected by the pH of the buffer, and was more effective with ascorbic acid, N-acetyl-L-cysteine and calcium ascorbate. It was concluded that inferences on tissue browning based on PPO activity can be misleading. Measurement of tissue colour is proposed as a reliable means to assess the antibrowning effectiveness of additives and the pH of additives for cut pear should be corrected to reduce the browning potential.

**Keywords:** /Pear/ /Fresh-cut/ /Browning/

Sun, Y., et.al. 2014. Postharvest pigmentation in red Chinese sand **pears** (*Pyrus pyrifolia* Nakai) in response to optimum light and temperature. *Postharvest Biol. Technol.* 91: 64 – 71.

## **Abstract**

The development of red colour in the peel of red Chinese sand pears (*Pyrus pyrifolia* Nakai) is influenced by temperature and light; however, the response patterns vary among different cultivars. In this study, we systematically investigated the influence of postharvest treatment with various temperatures (low, high, variant and constant) on detached mature fruit of red Chinese sand pear 'Mantianhong' and 'Meirensu'. Fruit of red apple (*Malus domestica* Borkh.) 'Royal Gala' and red European pear (*P. communis* L.) 'Cascade' received the same treatments for comparison. Furthermore, the effects of light quality and irradiance level on 'Mantianhong' pears were evaluated at the optimum temperature for anthocyanin accumulation. Fruit firmness and concentrations of total soluble sugars and organic acids were measured to determine fruit quality. The effect of temperature on red Chinese sand pear fruit colour was similar to that of apples, but not European pear. Moreover, low temperature more effectively induced red coloration in 'Mantianhong' and 'Meirensu' pears than high temperature; anthocyanin levels increased with increasing irradiance level from 0 to 532 mol m<sup>-2</sup>s<sup>-1</sup>, and UV-B and visible light synergistically improved the red colour of the fruit. Therefore, a combination of low temperature and high intensity of UV-B/visible light could improve the postharvest coloration of red sand pear fruit. The results will contribute to an improved understanding of the mechanism responsible for the coloration of red Chinese sand pears and will aid development of new techniques to improve colour in postharvest fruit.

**Keywords:** /Pears/ /Postharvest/

## **POMEGRANATE**

Maghoubi, M. et.al. 2014. Influence of hot-air treatment, superatmospheric O<sub>2</sub> and elevated CO<sub>2</sub> on bioactive compounds and storage properties of fresh-cut **pomegranate** arils. *Int'l. J. Food Sci. Technol.* 49: 153 – 159.

## Abstract

The impact of heat treatment using hot air (HT 45 °C and 55 °C for 1 h) and two active modified atmosphere packaging (MAP) conditions of high oxygen atmosphere (HOA: 80 kPa O<sub>2</sub>, 20 kPa N<sub>2</sub>) and high CO<sub>2</sub> atmosphere (HCA: 20 kPa CO<sub>2</sub>, 80 kPa N<sub>2</sub>), individually or combined, on the antioxidant capacity, polyphenols, vitamin C content, total anthocyanins, polyphenoloxidase (PPO) activity and shelf life of fresh-cut (FC) pomegranate arils stored for 14 days at 4 °C was studied. The results indicate that HT 45 °C along with HOA inhibited PPO activity and prevented loss of antioxidant capacity, vitamin C and phenolic compounds in arils, in comparison with control and HT 55 °C. All treatments reduced the accumulation of anthocyanins, but HCA-treated arils lost more anthocyanins besides having worse a\* colour parameter values. No significant differences in titrable acidity (TA) and total soluble solids (TSS) were observed between treatments. The combination of HOA and HT 45 °C enhanced the benefits of applying each treatment separately and could be useful to improve and extend postharvest life of pomegranate FC arils.

**Keywords:** /Pomegranate/ /Storage/

## STRAWBERRY

de Velde, D.R. Guemes and M.E. Pirovani. 2013. Optimisation of the peracetic acid washing disinfection of fresh-cut **strawberries** based on microbial load reduction and bioactive compounds retention. Int'l. J. Food Sci. Technol. 1 – 8.

## Abstract

Total microbial count reduction (TMR), total anthocyanins (TAR), and ascorbic acid retention (AAR) after the operation at different PAA concentrations (0–100 mg L<sup>-1</sup>), contact times (10–120 s), and temperatures (4–40°C) were used for multiple optimisation using Derringer's desirability function. Two optimization scenarios (OP 1 and OP 2) were studied. OP 1 was proposed with the goal to maximize TMR with 90% TAR and AAR; and OP 2 maximizing TAR and AAR with TMR of 2 log UFC g<sup>-1</sup>. The optimized variable levels obtained were the following: 100 mg L<sup>-1</sup> PAA, 24 °C and 50 s for OP 1 and 20 mg L<sup>-1</sup> PAA, 18°C and 52 s for OP 2. Additional validation experiments showed agreement between predicted and experimental results. OP 2 conditions are recommended to fresh-cut strawberries washing disinfection because of an acceptable TMR, higher TAR and AAR, better sensory attributes, and the economic convenience of lesser PAA consumption.

**Keywords:** /Strawberry/ Fresh Cut/

Jouki, M. and N. Khzaei. 2014. Effect of low-dose gamma radiation and active equilibrium modified atmosphere packaging on shelf life extension of fresh **strawberry** fruits. Food Packaging Shelf Life. 1 – 7.

## Abstract

The effect of low-dose gamma irradiation (1 kGy) and active equilibrium modified atmosphere packaging (EMAP1: CO<sub>2</sub> 10%: O<sub>2</sub> 5%; N<sub>2</sub> 85% and EMAP2: CO<sub>2</sub> 5%: O<sub>2</sub> 10%; N<sub>2</sub> 85%) on quality of strawberry fruits stored at 4 °C was investigated. Several quality parameters were monitored during the storage period. Fruit firmness, fungal decay and sensory evaluation were analyzed on days 1, 7, 14 and

21. Strawberries kept in active EMAP1 maintained their texture and appearance better than those packaged under air and EMAP2. Strawberries stored in active EMAP were firmer than those stored in air during the storage time (21 days). The irradiated strawberry samples were not attacked by *Botrytis cinerea* during 7 days. Irradiation and EMAP1 increased the postharvest life of strawberries to 14 days, without any attack of fungus or any change in their external appearance. Low-dose gamma irradiation in combination with EMAP will enable food processors to deliver larger amounts of high quality strawberry with extended shelf life.

**Keywords:** /Strawberry/ /Gamma Radiation/ /Packaging/

Li, D., et.al. 2014. ABA and UV-C effects on quality, antioxidant capacity and anthocyanin contents of **strawberry** fruit (*Fragaria ananassa* Duch.). Postharvest Biol. Technol. 90: 56 – 62.

### Abstract

Effects of 1 mM abscisic acid (ABA) and 4.1 kJ/m<sup>2</sup> UV-C radiation on quality, antioxidant capacity, anthocyanin contents, and anthocyanin biosynthetic enzyme activities of large green strawberry fruit stored at 20°C were evaluated. Results showed that ABA promoted colour formation, firmness decrease, soluble solids content and anthocyanin accumulation while UV-C inhibited these processes. Activities of phenyl-alanine ammonia-lyase, tyrosine ammonia-lyase and p-coumarate ligase were immediately up regulated by approximately 50% with UV-C radiation but were inhibited, including dihydroflavonol 4-reductase especially on day 3 or 4. UV-C radiation had little effect on activity of cinnamate 4-hydroxylase (C<sub>4</sub>H). ABA enhanced activities of anthocyanin biosynthetic enzymes except C<sub>4</sub>H. These data indicated that the stimulatory effect of ABA on strawberry anthocyanin accumulation was related to enhancement of biosynthetic enzyme activities, while the effects of UV-C were more transient. In addition, it appeared that C<sub>4</sub>H was not a rate-limiting enzyme in the strawberry anthocyanin biosynthesis pathway.

**Keywords:** /Strawberry/ /Quality/ /Anthocyanin/

Ugolini, L., et.al. 2014. Control of postharvest grey mould (*Botrytis cinerea* Per.: Fr.) on **strawberries** by glucosinolate-derived allyl-isothiocyanate treatments. Acta Hort. 90: 34 – 39.

### Abstract

The vapours of allyl-isothiocyanate (AITC) were evaluated in in vitro and in vivo trials against *Botrytis cinerea*, a severe pathogen of strawberries. In in vitro trials AITC activity was assayed on conidial germination and mycelial growth of the fungus. The mycelium appeared less sensitive to AITC than conidia (EC50 values of 1.35 mg L<sup>-1</sup> and 0.62 mg L<sup>-1</sup>, respectively). In addition, AITC had a fungi static effect against the pathogen, since the values of EC50, for both parameters, increased by around 30% after AITC removal. In in vivo trials, 'Tecla' and 'Monterey' strawberries (spring-bearing and day-neutral cultivars, respectively) obtained from organic production and naturally infected by *B. cinerea*, were exposed for 4 h in an atmosphere enriched by pure AITC or derived from defatted seed meals of *Brassica carinata* (0.1 mg L<sup>-1</sup>, in a 0.1 m<sup>3</sup> treatment cabinet). After 2 days at 0°C and another 3–4 days at 20°C, the fruit were evaluated for grey mould infections. The AITC treatment reduced the decay caused by the pathogen by over 47.4% up to 91.5%, significantly different from the untreated fruit. No significant differences were found between synthetic and glucosinolate-derived AITC. Residue analysis performed on fruit at the end of storage (7 d after treatment) showed values lower than 1 mg kg<sup>-1</sup>. Total

phenolic content and antioxidant capacity estimated in treated and untreated strawberries showed no significant difference between control and AITC treated fruit. Our results show it is possible to reduce the incidence of postharvest grey mould on strawberries with a treatment of AITC ( $0.1 \text{ mg L}^{-1}$ ) for 4 h, opening a potential application of bio fumigation in the postharvest control of *B. cinerea* in strawberry.

**Keywords:** /Strawberry/ /Grey Mold/

## **TAMARIND**

Mohammed, M. 2014. Quality indices of ripe Spanish **tamarind** (*Vangueria edulis* [Vahl] Vahl) fruits. Acta Hort. 1016: 131 – 134.

### **Abstract**

Studies were conducted from 2008-2010 to investigate the physical and chemical attributes of Spanish tamarind fruits that were ripened at 20 and 30°C. Ripe fruits had a yellowish brown skin colour accompanied with a soft spongy pulp which had a similar colour. The typical acidic flavour of the fruit pulp was associated with a relatively low total soluble solid (TSS) of 3.0-3.1%, total titratable acidity (TTA) of 2.24-2.48 g/100 g, TSS: TTA of 1:1.3, pH of 3.4 and vitamin C content of 1.84 mg/100g. Visible evidence of fruit senescence was noticeable as sporadic white masses of fungal growth on the fruit skin which seldom penetrated the skin to affect the pulp.

**Keywords:** /Tamarind/ /Quality/

## **WATERMELON**

Abbaszadeh, R., et.al. 2014. Application of modal analysis to the **watermelon** through finite element modelling for use in ripeness assessment. J. Food Eng. 127: 80 – 84.

It is very difficult to judge watermelon ripeness by external characteristics. The laser Doppler vibrometer (LDV) is a new approach to determination of fruit quality. This optical-mechanical technique was utilized for non-destructive detection of the vibration response of watermelons to predict ripeness. Finite element modelling (FEM) was used to find the optimum location for excitation and response measurement and to analyse the mode shapes. The model was considered based on red, white, and green tissues and included individual properties such as density and elasticity modulus. Modal analysis of the finite element model showed acceptable agreement between experimental results and finite element simulation. According to the mode shapes of watermelon, optimum locations for applying input vibrations and detecting output vibrations were suggested. Then watermelons were excited and their responses were recorded by LDV at the determined locations. The phase shift between input and output signals were extracted over a wide regression model was developed to predict the internal texture firmness using phase shifts at statistically selected frequencies. The determination coefficients ( $R^2$ ) of the calibration and cross validation models were 0.9998 and 0.994 respectively.

**Keywords:** /Watermelon/ /Ripeness/

Jie, D., et.al. 2014. Using visible and near infrared diffuse transmittance technique to predict soluble solids content of **watermelon** in an on-line detection system. Postharvest Biol. Technol. 90: 1 – 6.

Sugar content is one of the most important factors determining the eating quality of watermelon fruit. In order to detect the fruit soluble solids content (SSC) on-line, this work develops a non-destructive online detection prototype system using visible and near-infrared (Vis/NIR) technology. For the acquisition of the diffuse transmittance spectrum of watermelon, the conveyor was set at a speed of 0.3 m/s and ten 150 W tungsten halogen lamps were used as the light source. The crucial model for SSC value prediction was optimized by chemometrics. Partial least squares regression (PLSR), stepwise multiple linear regressions (SMLR), Monte-Carlo uninformative variable elimination (MC-UVE) and genetic algorithms (GA) were applied to the spectra in the range of 687–920 nm. The data pre-processing methods were optimized to transmittance spectra with baseline offset correction (BOC), and the BOC-MC-UVE-SMLR calibration model was the best with a correlation coefficient (rpre) of 0.70, root mean square error of prediction (RMSEP) of 0.33°Brix for the prediction set. In online testing of 30 samples, the rpre was 0.66 and RMSEP was 0.39°Brix. The results showed that a non-destructive on-line SSC value determination prototype based on Vis/NIR technology was feasible.

**Keywords:** /Watermelon/

## **VEGETABLES**

### **BROCCOLI**

Raseetha, S., et.al. 2013. Monitoring colour, volatiles in the headspace and enzyme activity to assess the quality of **broccoli** florets (*Brassica oleracea* L. *italica* cv. *Bellstar* and *Legacy*) during postharvest storage. Int'l. J. Food Sci. Technol. 49(1): 280 - 287

#### **Abstract**

The research objective was to study whether volatile organic compounds released in the headspace could be used to assess the broccoli quality (*Brassica oleracea* L. *italica* cv. *Bellstar* and *Legacy*) during postharvest storage (23°C for 7 days) and correlated with colour change and the activity of peroxidase/POD, ascorbic acid oxidase/AAO and lipoxygenase/LOX. Volatile organic compounds were monitored using PTR-MS. Methanol had the highest concentration compared with other volatiles released in the headspace that significantly increased during senescence. The methanol concentration was approximately 500 ppbv before the broccoli colour began to change from green to yellow. The concentration of methanol in the headspace increased to 1000–1100 ppbv for *Bellstar* and *Legacy* when the colour became yellowish. LOX had high correlation (0.91 and 0.83 for *Bellstar* and *Legacy*, respectively) with volatiles for both cultivars, but not for POD. Methanol production is proposed as the best volatile marker to assess the broccoli quality.

**Keywords:** /Broccoli/ /Postharvest Storage/

### **LETTUCE**

Braidot, E., et.al. 2014. Low-intensity light cycles improve the quality of lamb's **lettuce** (*Valerianella olitoria* [L.] Pollich) during storage at low temperature. Postharvest Biol. Technol. 90: 15 – 23.

#### **Abstract**

The influence of light on fresh-cut vegetables during storage is controversial, since both positive and negative effects on shelf-life and quality of such products have been observed. In this work, the effect of low-intensity light treatments on lamb's lettuce, a fresh-cut leafy and ready-to-eat vegetable, was investigated during storage at low temperature (6°C), in comparison with conventional storage (in the dark at 4°C). Although continuous light treatment (1 cycle of 8 h per day) was deleterious, cycles of light treatments (8 cycles of 1 h per day; 16 cycles of 0.5 h per day) showed positive effects, assessed by evaluating the content of chlorophylls, carotenoids, ATP, glucose and ascorbate. These analyses were performed at the beginning and after 6 days of storage, in comparison with samples stored in the dark at 4°C. Under low-intensity light treatments, even if performed at a higher temperature (6°C), the content of such bioactive compounds increased or was at least similar to that found in samples stored in the dark at the same temperature. We suggest that continuous low-intensity light treatments during cold storage of lamb's lettuce are able to promote photosynthesis but, at the same time, induce photo-damage. On the contrary, under intermittent low-intensity light cycles, photosynthesis is only partially activated, while the metabolism of the green tissues is still able to provide carbon moieties for the synthesis of bioactive molecules involved in delaying senescence. Therefore, low-intensity light cycles at 6°C could contribute to maintain quality of lamb's lettuce, with respect to samples stored in the dark at both 6 and 4°C. Finally, setting the temperature at 6°C allows reduction of refrigerator energy consumption during storage.

**Keywords:** /Lettuce//Storage/ /Temperature/

Witkowska, I.M. and E.J. Woltering. 2014. Storage of intact heads prior to processing limits the shelf-life of fresh-cut *Lactuca sativa* L. *Postharvest Biol. Technol.* 91: 25 – 31.

## **Abstract**

Harvested lettuce heads are usually transported and stored for some period of time under a variety of conditions prior to processing. During storage, especially under suboptimal conditions, nutritional composition of the harvested produce continues to change. The possible impact of prior storage of the heads on the performance of the fresh-cut product has not been quantified, and was the aim of this study. The experiments were performed with three related genotypes of *Lactuca sativa* L. (butterhead lettuce): two green varieties and one red variety. The effect of prior storage on quality parameters in the stored whole heads and on subsequent fresh-cut quality performance was investigated. In addition, the effect of prior storage of heads with and without their root system and the application of light during storage were investigated. The changes in visual quality, the levels of energy reserves, and some selected senescence markers, i.e. chlorophyll content and electrolyte leakage were evaluated. Despite the relatively high storage temperature of 12°C, the intact heads still looked fresh even after 17 days of storage. However, a decline in the soluble sugars, a decrease in chlorophyll, and an increase in electrolyte leakage were observed with advancing storage duration. Prior storage of intact heads greatly decreased the shelf-life of the fresh-cut product prepared from these heads. Storage of rooted heads and the continuous application of light (above the light compensation point) did not alter the effect of prior storage of the heads on the quality of the fresh-cut product.

**Keywords:** /Lettuce/ /Storage/ Shelf Life/

## **PEPPER**

Schmilovitch, Z., et.al. 2014. Hyperspectral imaging of intact bell **peppers**. *Biosystems Eng.* 117: 83 – 93.

## Abstract

Agricultural engineering technologies have successfully addressed certain challenges by the use of advanced sensors and machine vision technologies. The objective of this study was to develop a non-destructive method to evaluate and to map quality indices in bell pepper. Three cultivars of bell pepper ('Ever Green', 'No. 117' and 'Celica') were studied during maturation by using hyperspectral imaging in the visible and near-infrared (550 e850 nm) region. Peppers were marked in the flowering stage and 20 samples from each variety were collected weekly, along a growing period of seven weeks, until full growth. Quality parameters like total soluble solids, total chlorophyll, carotenoid and ascorbic acid content were determined and correlated with the spectral data. Images of intact peppers were collected by an acousto-optic-tuneable-filter (AOTF) hyperspectral charged-coupled device (CCD) camera, in spectral resolution of 5 nm. Spectral information of the hyper cubes was analysed by chemometric procedures. Partial least squares regression was used for model development. Comparisons were made between the PLS regression analysis of the reflectance spectra (R), and the pre-processed spectra such as the first derivative (D1R), log (1/R), D1 (log(1/R)) and D2 (log(1/R)). Models were established to predict the quality attributes creating the basis for multiple sampling of a particular fruit or individual peppers from many fruits in the same time. High correlations were obtained by the established models with coefficients of determination of 0.95, 0.95, 0.97, and 0.72 for total soluble solids, total chlorophyll, carotenoid and ascorbic acid content, respectively.

**Keywords:** /Pepper/

## RADISH

Xiao, Z., et.al. 2014. Effect of light exposure on sensorial quality, concentrations of bioactive compounds and antioxidant capacity of **radish** microgreens during low temperature storage. Food Chem. 151: 472 – 479.

## Abstract

Radish microgreens constitute a good source of bioactive compounds; however, they are very delicate and have a short shelf life. In this study, we investigated the impact of light exposure and modified atmosphere packaging on sensorial quality, bioactive compound concentrations and antioxidant capacity of radish microgreens during storage. Results showed that light exposure during storage increased the amount of ascorbic acid and had no effect on a-tocopherol or total phenolic concentrations. Dark storage resulted in higher hydroxyl radical scavenging capacity and carotenoid retention. No significant differences were found for relative 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging capacity between light and dark treatments. Radish microgreens in bags of 29.5 pmol s<sup>-1</sup> m<sup>-2</sup> Pa<sup>-1</sup> oxygen transmission rate (OTR) maintained better quality than those within laser micro perforated bags. In conclusion, light exposure accelerated deterioration of radish microgreens, while dark storage maintained quality; and application of OTR bags was beneficial in extending shelf life.

**Keywords:** /Radish/ /Low Temperature Storage/

## **SPINACH**

Romero, J.F., L.J. Bernal-Roa and C. Diaz-Moreno. 2014. Influence of heating processes on the antioxidant capacity of **spinach** (*Spinacia oleracea* L.). Acta Hort. 1016: 109 – 112.

### **Abstract**

Spinach is a vegetable noted for its substantial content of antioxidants. It has been found that these substances contribute to various biological functions, for example protection against mutagenesis, carcinogenesis and aging. Vegetables account for a small part of our daily caloric intake; however, their benefits to health surpass their caloric contribution. The contributory factors are due to the presence of vitamins and provitamins, such as ascorbic acid, tocopherols and carotenoids; and, in addition to that, vegetables are also rich in a wide variety of phenolic substances. Phenolic substances are a category of phytonutrients that exert strong antioxidant properties. They can be classified into: simple phenols, phenolic acids, hydroxycinnamic acid derivatives and flavonoids. The ability of some of the phenolic substances to act as potent antioxidant components has been reported. However, due to conservation, safety and sensory aspects, spinach is usually submitted to thermal processes that can affect the composition and availability of these substances. The objective of this study was to evaluate the effects of two common thermal operations: blanching and pasteurization on the antioxidant activity of a commercial sample. In the blanching step, the cleaned and disinfected samples were subjected to steam at 100°C for 3 min. and immediately subjected to cold water. In the pasteurization operation, the blanched material was heated to 75°C for 13 min. in closed, stainless steel container. Then, the vegetable was packaged and submerged in cold water. At each stage, the total phenol content was analyzed by the Folin-Ciocalteu method total antioxidant capacity was measured by means of TEAC and FRAP assays. The results indicate differences among the evaluated thermal operations: blanching did not significantly alter the antioxidant properties and pasteurization increased the values of both antioxidant capacity and total phenol content.

**Keywords:** /Spinach/ /Antioxidant/

## **TOMATO**

Liplap, P., et.al. 2013. **Tomato** shelf-life extension at room temperature by hyperbaric pressure treatment. Postharvest Biol. Technol. 86: 45 – 52.

### **Abstract**

The effect of hyperbaric treatments on major hydrophilic and lipophilic antioxidants and antioxidant activity in tomato fruit, using ORAC and TEAC assays, was studied. Early breaker stage greenhouse grown tomatoes were subjected to different pressure and temperature conditions, including 0.1 (ambient atmospheric pressure, control), 0.3, 0.5, 0.7 and 0.9 MPa at 20°C, and 0.1 MPa at 13°C (cold treatment) for 4 days, followed by ripening at 20°C for 5 and 10 days. Hyperbaric treatment significantly affected lycopene content by inhibiting, then enhancing its accumulation during treatment and ripening, respectively. In general, ascorbic acid and total phenolic contents increased as time progressed but generally were not affected by hyperbaric pressure treatment. All antioxidants were found in lower concentrations in tomatoes treated at 13°C. The trend in antioxidant activity obtained from both ORAC and TEAC assays was generally similar. No significant effect of hyperbaric treatment on lipophilic antioxidant (LAA) and hydrophilic antioxidant (HAA) was observed compared with control

tomatoes at 13 and 20°C. However, the ORAC assay showed that hyperbaric treated tomatoes had significantly higher HAA than 13°C treated tomatoes. Overall, hyperbaric treatment at 20°C has potential to extend tomato shelf-life during short treatment durations without adverse impact on quality during ripening.

**Keywords:** /Tomato/ /Shelf Life/ /Hyperbaric Pressure Treatment/

Perez, C.P., et.al. 2104. Influence of climatic factors on the carotenoid concentration of **tomato** fruits and their protective mechanism when exposed to moderate UV-B before harvest. *Acta Hort.* 1016: 69 – 76.

### **Abstract**

With the purpose of increasing the concentration of bioactive compounds and evaluating the influence of climatic factors on the tomato, cultivar 'Liberto', fruits were exposed to physical stress in a glasshouse in Berlin before harvesting through the application of moderate doses of UV-B radiation in November, 2007 and in May, 2008. The objective was to investigate whether its use had an eliciting effect on the secondary metabolism that resulted in a change in the concentration of bioactive compounds. Two UV-B radiation doses were used: a) range between 0.075 and 0.105 Wh m<sup>-2</sup> and b) 0.15 Wh m<sup>-2</sup>. The mean photosynthetic photon flux density (PPDF) was 18.8 mol/m<sup>2</sup> d in May and 5.9 mol m<sup>-2</sup>/d in November. After 22 hours of adaptation time, the ripe tomato fruits were harvested to determine the lycopene and β-carotene contents. The results showed that the exposure of ripe fruits to UV-B caused β-carotene accumulation in the November-treatment. Temperature and PPDF showed a strong influence on β-carotene and lycopene accumulation, as well as on the dry matter content. The May- and November-treatments differed significantly with respect to carotenoid content between the non-treated fruits and those treated with UV-B radiation.

**Keywords:** /Tomato/ /Harvesting/

Salamanca, F.A., H.E. Balaguera-Lopez and A.O. Herrera. 2014. Effect of potassium permanganate on some postharvest characteristics of **tomato** 'chonto' fruits (*Solanum lycopersicum* L.). *Acta Hort.* 1016: b 171 – 176.

### **Abstract**

The tomato is a highly perishable climacteric fruit whose ripening processes are fast. Ethylene absorbers composed of a mixture of clay and potassium permanganate (KMnO<sub>4</sub>) are a good alternative to eliminate ambient ethylene during the storage of fruits and vegetables. For KMnO<sub>4</sub> to be effective, it must be adsorbed to a vehicle (or carrier) that forms a solid absorber, easily manageable and which increase the effective contact area. The objective was to evaluate the effect of KMnO<sub>4</sub> on the behaviour of some postharvest physical characteristics of the 'Chonto' tomato. We used a completely randomized design to evaluate three doses of zeolite (0.5, 1.0 and 1.5% based on fresh weight) and three concentrations of KMnO<sub>4</sub> (0.5, 1 and 1.5% based on fresh weight), plus one control treatment. The fruits were selected in the field and harvested at maturity 1 (100% green) with an average firmness of 50.93 Newton (N), 4.47 of °Brix, and total titratable acidity (TTA) of 1.11%; and therefore a maturity index of 4.01. Then, the fruits were stored in the postharvest laboratory at the National University of Colombia at room temperature (18°C and 85% relative humidity) for 28 days in commercial TPT packaging (Thermoformed polyethylene terephthalate); physicochemical variables were evaluated. The treatment

with zeolite clay 1% + KMnO<sub>4</sub> 1% showed the lowest fresh weight loss, meanwhile in the zeolite 1.5% + KMnO<sub>4</sub> 0.5% treatment, the fruits exhibited greater firmness values. The lowest value of total soluble solids was presented with zeolite 1% + KMnO<sub>4</sub> 1.5%, while the highest acidity was seen in the zeolite 1% + KMnO<sub>4</sub> 0.5% treatment. Ethylene absorbers composed of zeolite and KMnO<sub>4</sub> retard the ripening of 'Chonto' tomato fruits.

**Keywords:** /Tomato/ /Postharvest Quality/

Sugri, I., et.al. 2014. Improving marketable quality of **tomato**: a simulation of shipping conditions in Ghana. Am. J. Exp. Agr. 3(2): 392 – 402.

### **Abstract**

**Aim:** The study assessed the influence of a sequence of anticipated hazard elements (impact, compression, vibration) and shipment conditions on marketable quality under varying temperatures and ripeness stages. **Study Design:** The vibration test simulates a truck operating at highway speed and determines the ability of shipping units to withstand vertical and compression forces resulting from stacking during transport. Storage at 30°C depicted ambient conditions; 15 and 20°C are optimum temperatures for ripening; and pink and light-red ripeness depict typical harvest maturity in Ghana. **Place and Duration of Study:** The study was conducted at the Postharvest Science Laboratory of the Horticultural Sciences Department of the University of Florida from September to December 2011. **Methodology:** Round-type tomato at pink and light-red ripeness were subjected to a vibration test and incubated in ripening chambers set at 15, 20 and 30°C. Critical data was taken on days to red-ripe, CO<sub>2</sub>, ethylene production, colour, firmness, weight loss, pH, titratable acidity and soluble solids content. **Results:** Overall, the influence of vibration and ripeness on marketable shelf life was marginal; however temperature significantly ( $P \leq 0.05$ ) influenced shelf life. Vibration increased weight loss, respiration and ethylene production, which were plummeted at lower temperature. Days to red-ripe indicated that tomato should preferably be marketed by 2-4, 8-12 and 10-15 days at 30, 20 and 15°C respectively, at pink to light-red ripeness under current distribution conditions. Best chemical properties were maintained at 15 and 20°C; vibration and ripeness did not influence chemical properties, but increasing temperature affected all physicochemical properties. **Conclusion:** The study concludes that despite the cumbersome shipping conditions, tomatoes could be marketed at premium quality if lower storage temperatures were accessible. These facilities are beyond the purchasing power of small-holder traders, thus the involvement of the State and/or Private Sector to providing these facilities would be beneficial; particularly in urban markets where retail prices will merit such investments.

### **HERBS AND SPICES**

Khue, B.B., et.al. 2013. Total phenolic content and anti-oxidant capacity of some **spices and herbs** grown in Vietnam. J. Postharvest Technol. 1(1): 22 – 28.

### **Abstract**

In recent years, the obesity and oxidative stress are the most common factors affecting the human health. Especially, the rancid foods are plentiful with free radicals, which trigger chronic diseases such colon cancer, breast cancer, heart diseases and so on. Therefore, this study focuses on the determination of the levels and activities of polyphenols extracted from some spices and herbs applied to traditional Vietnamese foods. The results categorized these plant materials into 3 sub-categories

including one group shows the high total phenolic content and antioxidative ability (green tea leaves, green guavas and buffalo spinach leaves). The second group has low total phenolic content, but high in antioxidant capacity (tungho leaves, onion, elsholtzia leaves, green mangoes, basil leaves, lemongrass leaves, coriander leaves, green amberella, turmeric roots, ginger roots, galangal roots) and the last group possessed the lowest total phenolic content and antioxidant activity (lemon leaves).

**Keywords:** /Herbs/ /Spices/

## **BLACK PEPPER**

Song, W.J., et.al. 2014. Inactivation of *Escherichia coli* O157:H7 and *Salmonella* Typhimurium in **black pepper** and red pepper by gamma irradiation. Int'l. J. Food Microbiol. 172: 125 – 129.

### **Abstract**

This study evaluated the efficacy of gamma irradiation to inactivate food borne pathogens in black pepper (*Piper nigrum*) and red pepper (dried *Capsicum annuum*). Black pepper and red pepper inoculated with *Escherichia coli* O157:H7 and *Salmonella* Typhimurium were subjected to gamma irradiation in the range of 0, 1, 2, 3 and 5 kGy, and colour change was evaluated after treatment. Pathogen populations decreased with increasing treatment doses. A gamma irradiation dose of 5 kGy decreased *E. coli* O157:H7 and *S. Typhimurium* populations N4.4 to N5.2 log CFU/g in black pepper without causing colour change. Similarly, 5 kGy of gamma irradiation yielded reduction of 3.8 to N5.2 log CFU/g for *E. coli* O157:H7 and *S. Typhimurium* in red pepper. During gamma irradiation treatment, L, a and b values of red pepper were not significantly changed except for 297 µm to 420 µm size red pepper treated with 5 kGy of gamma irradiation. Based on the D-value of pathogens in black pepper and red pepper, *S. Typhimurium* showed more resistant to gamma irradiation than did *E. coli* O157:H7. These results show that gamma irradiation has potential as a non-thermal process for inactivating food borne pathogens in spices with minimal colour changes.

**Keywords:** /Black Pepper/ Red Pepper/ /Gamma Irradiation/

## **CAYENNE PEPPER**

Barbero, G.F., et.al. 2014. Evolution of total and individual capsaicinoids in peppers during ripening of the **Cayenne pepper** plant (*Capsicum annuum* L.). Food Chem. 153: 200 – 106.

### **Abstract**

The evolution of total capsaicinoids and the individual contents of the five major capsaicinoids: nordihydrocapsaicin, capsaicin, dihydrocapsaicin, homocapsaicin and homodihydrocapsaicin present in the Cayenne pepper (*Capsicum annuum* L.), during fruit ripening, has been established. Capsaicinoids begin to accumulate gradually in the peppers from the beginning of its development up to a maximum concentration (1789 µmol/Kg FW). From this time there is initially a sharp decrease in the total capsaicinoid content (32%), followed by a gradual decrease until day 80 of ripening. The two major capsaicinoids present in the Cayenne pepper are capsaicin and dihydrocapsaicin, which represent between 79% and 90%, respectively, of total capsaicinoids depending on fruit ripening. The relative content of capsaicin differs from the evolution of the other four capsaicinoids studied.

**Keywords:** /Cayenne Pepper/ /Ripening/

## **GARLIC**

Diriba-Shiferaw, G., et.al. 2013. Postharvest quality and shelf life of **garlic** bulb as influenced by storage season, soil type and different compound fertilizers. J. Postharvest Technol. 1(1): 69 – 83.

### **Abstract**

The experiment was conducted twice during rainy (2011/12) and dry (2012/13) seasons at Debre Zeit Agricultural Research Centre, Ethiopia, to evaluate effects of pre-harvest fertilizer application, soil type and storage season on postharvest quality and storability of garlic bulb. The treatments comprised twelve different fertilizer types and doses i.e. control, recommended N and P (92 and 40 kg ha<sup>-1</sup>), three rates of Azofertil (100, 200 and 300 kgha<sup>-1</sup>), four rates of Basic (100, 200, 400 and 600 kgha<sup>-1</sup>) and three rates of D-coder (100, 200 and 400 kgha<sup>-1</sup>) evaluated in two soil types (Andosol and Vertisol) and replicated thrice using Complete Randomized Block Design. Two storage seasons (dry and Rainy) were used for bulbs storage. Significant variations in storability and quality of bulbs were recorded to the fertilizers, soil type and storage season. Higher rates of fertilizers improved storability and quality of bulb whereas higher weight and diameter losses were observed in bulbs from control plot and plots treated with lower levels of each fertilizer. Garlic grown on Andosol and subsequent storage during the rainy season recorded better bulb qualities with long storability. D-coder at the rates of 200 and 400 kgha<sup>-1</sup>, followed by Azofertil at 200 and 300 kgha<sup>-1</sup>, recorded higher percent of dry matter, total soluble solids and pungency of bulbs and lower percent in weight and diameter losses. Thus application of these fertilizers on Andosol is a better compromise for post harvest quality and shelf life of garlic bulbs under ambient storage conditions.

**Keywords:** /Garlic/ Shelf Life/ /Storage/

## **HOT PAPRIKA**

Ordenez-Santos, L.E., et.al. 2014. Colour of **hot paprika** from the La Vera and Murcia regions packaged in different atmospheres during storage. Int'l. J. Food Sci. Technol. 49: 217 – 223.

### **Abstract**

This study compared the behaviour of hot paprika (*Capsicum annuum* L.) samples from the district of La Vera and the region of Murcia packaged in five different conditions during storage. The following five different packaging conditions were used in this study: modified atmosphere packaging with three different conditions (100% N<sub>2</sub>; 50% N<sub>2</sub> and 50% CO<sub>2</sub>; and 100% CO<sub>2</sub>), vacuum packaging and traditional packaging (product packaging system without modifying the atmosphere). After the samples were packaged, they were stored for 8 months at room temperature (normal storage conditions). The following parameters were used to indicate the quality of the samples: Aw, ASTA colour, CIEL\*a\*b\* colour parameters, and the composition of red and yellow compounds. The results indicate that the modified atmosphere packaging and vacuum packaging exerted a protective effect on the paprika quality characteristics regardless of the paprika origin. However, no clear differences were detected between the effect of vacuum packaging and the different modified atmosphere packaging conditions.

**Keywords:** /Hot Paprika/ /Storage/

## HOT PEPPER

Mohammed, M., L. Wilson and P. Gomes. 2014. Occurrence, manifestation and alleviation of chilling injury of **hot peppers** (*Capsicum chinense* L.). Acta Hort. 1016: 89 – 94.

### Abstract

Hot pepper fruits were sealed-packaged in 0.035 mm thick micro-perforated and sealed high density polyethylene bags (HDPE) at 5, 10, 20 and 30°C in separate storage rooms and examined at 5, 10, 15, 20 and 25-day intervals for marketable quality, chilling injury, bioelectrical resistance (BER), electrolyte leakage (EL), in package and in-fruit carbon dioxide and ethylene concentrations and percentage decay-free fruits. Fruits packaged in micro-perforated bags stored best at 10°C with the level of decay-free fruits at 96.1% after 25 days. Incipient chilling injury without visible symptoms after short storage periods at 5°C was detected both by reduced BER and increased EL but the former measurement was more sensitive in detecting chilling injury than the latter. Changes in both measurements reflected changes in membrane permeability.

**Keywords:** /Hot Pepper/ /Chilling Injury/

## KALE

Mansur, A.R., et.al. 2014. Growth model of *Escherichia coli* O157:H7 at various storage temperatures on **kale** treated by thermosonication combined with slightly acidic electrolyzed water. J. Food Prot. 77(1): 23 – 31.

### Abstract

This study was conducted to investigate the disinfection efficacy of hurdle treatments (thermosonication plus slightly acidic electrolyzed water [SA c EW]) and to develop a model for describing the effect of storage temperatures (4, 10, 15, 20, 25, 30, and 35 uC) on the growth of *Escherichia coli* O157:H7 on fresh-cut kale treated with or without (control) thermosonication combined with SA c EW. The hurdle treatments of thermosonication plus SA c EW had strong bactericidal effects against *E. coli* O157:H7 on kale, with approximately 3.3-log reductions. A modified Gompertz model was used to describe growth parameters such as specific growth rate (SGR) and lag time (LT) as a function of storage temperature, with high coefficients of determination ( $R^2 = 0.98$ ). SGR increased and LT declined with rising temperatures in all samples. A significant difference was found between the SGR values obtained from treated and untreated samples. Secondary models were established for SGR and LT to evaluate the effects of storage temperature on the growth kinetics of *E. coli* O157:H7 in treated and untreated kale. Statistical evaluation was carried out to validate the performance of the developed models, based on the additional experimental data not used for the model development. The validation step indicated that the overall predictions were inside the acceptable prediction zone and had lower standard errors, indicating that this new growth model can be used to assess the risk of *E. coli* O157:H7 contamination on kale.

**Keywords:** /Kale/ /Storage/

## **ROCKET SALAD LEAVES**

Al-Nabulsi, A., et.al. 2014. Inactivation of stressed *Escherichia coli* O157:H7 Cells on the surfaces of rocket salad leaves by chlorine and peroxyacetic acid. J. Food Prot. 77(1): 32 – 39.

### **Abstract**

Because *Escherichia coli* O157:H7 has been frequently associated with many foodborne outbreaks caused by consumption of leafy greens (lettuce, spinach, and celery), this study investigated the ability of deionized water, chlorine, and peroxyacetic acid to detach or inactivate stressed and unstressed cells of *E. coli* O157:H7 contaminating the surfaces of rocket salad leaves. *E. coli* O157:H7 cells stressed by acid, cold, starvation, or NaCl exposure, as well as unstressed cells, were inoculated on the surfaces of rocket salad leaves at 4 uC. The effectiveness of two sanitizers (200 ppm of chlorine and 80 ppm of peroxyacetic acid) and deionized water for decontaminating the leaves treated with stressed and unstressed *E. coli* O157:H7 were evaluated during storage at 10 or 25 uC for 0.5, 1, 3, and 7 days. It was found that washing with 80 ppm of peroxyacetic acid was more effective and reduced unstressed and stressed cells of *E. coli* O157:H7 by about 1 log CFU per leaf on the leaves. There was no apparent difference in the ability of stressed and unstressed cells to survive surface disinfection with the tested agents. Treatments to reduce viable *E. coli* O157:H7 cells on rocket leaves stored at 25 uC were more effective than when used on those stored at 10 uC. Washing with peroxyacetic acid or chlorine solution did not ensure the safety of rocket leaves, but such treatments could reduce the likelihood of water-mediated transfer of *E. coli* O157:H7 during washing and subsequent processing.

**Keywords:** /Rocket Salad Leaves/ /E. coli/

## **TUBERS AND ROOTCROPS**

### **CASSAVA**

Oriola, K.O. and A.O Raji. 2013. Trends at mechanizing cassava postharvest processing operations. Int'l. J. Eng. Technol. 3(9): 879 – 887.

### **Abstract**

The recent transfiguration of cassava from a low profile into an industrial raw material, coupled with the new cassava revolutionary policies of the Federal Government of Nigeria have resulted in a serious surge in the demand for cassava and cassava-based products locally and the world over. However, cassava processors are currently finding it extremely difficult to respond positively to this increase in demand due to the prevalence of the traditional processing methods employed in the processing operations. This has made the review of the current processing technologies imperative in order to address the areas requiring technical improvement and further research efforts towards the evolution of cost effective technologies with improved efficiencies which would enhance the capacity to exploit the cassava market potential the world over. Therefore, this paper reviews the presents status of knowledge as regards cassava processing technology and a critical appraisal of the existing cassava processing technologies available to cassava processors and highlights the research need towards the evolution of better and improved cassava processing equipment.

**Keywords:** /Cassava/ /Postharvest Processing/

## **ORNAMENTALS**

### **CHRYSANTHEMUM**

Da Silva Vieira, M.R., et.al. 2013. Effect of low temperature storage on conservation varieties of **chrysanthemum** cutting. J. Stored Prod. Postharvest Res. 4(4): 51 – 54.

#### **Abstract**

The objective of this research was to evaluate postharvest quality of 'Lona' and 'Garfield' varieties chrysanthemums, stored at different temperatures. The experiment was carried out in a plastic greenhouse at Pouso Alegre, Minas Gerais State, Brazil (22° 13'48" S, 45° 56'11" W and 832 m in height). The inflorescences were kept at 1.5, 2.5 and 5.0°C. The evaluated parameters were senescent flowers and necrosed ligules. The evaluations were performed in the open storage room at 4, 8, and 12 days, at room temperature. It was observed that chrysanthemum 'Lona' flower senescence was accelerated at 2.5 and 5.0°C; while for 'Garfield', the senescence was larger at 1.5°C. For 'Lona' and 'Garfield' chrysanthemums, the temperature of 1.5°C favored the development of necrosis.

**Keywords:** /Chrysanthemum/ /Storage/

### **GERBERA**

Soad, Khenizy, A.M., et.al. 2013. Effect of humic acid on vase life of **gerbera** flowers after cutting. J Hortic . Sci. Ornam. Plants. 5(2): 127 – 136.

#### **Abstract**

Gerbera or Transvaal daisy (*Gerbera jamesonii* Hook) is one of 10 most important cut flowers in the world. One of the most problems faced the flowers is the short-life after harvest and neck bending. Producers want to increase longevity of these flowers with using chemical solutions. The aim of this experiment was to study the effect of some holding solutions, viz. distilled water (control), humic acid at 25 and 50 ml/l and solution (A) [Silver nitrate (150 mg/l) + Salicylic acid (150 mg/l) + sucrose (2%) + 8-Hydroxyquinoline citrate (8- HQC 200 mg/l)] and different storage periods and their interaction to identify the best treatments to increase flower vase life and other related characters of cut gerbera. The obtained data exhibited that all preservatives solutions caused a marked increment in the studied characters compared to that registered from distilled water (control). In this respect, the individual treatments with either solution (A) or humic acid at 25 and 50 ml/l significantly prolonged vase life, increased the number of open disk florets and water uptake of cut flowers. Moreover, the combined treatments of solution (A) plus humic acid at 25 or 50 ml/l had a superior effect on extending life of flowers, increasing flower diameter (cm) and flowers fresh weight percentage. Control treatment (distilled water) gave the highest percentage of stem curvature after 8 days with recording values higher than 88%, whereas the combination between solution (A) and humic acid either at 25 or 50 ml/l recorded the highest delay for bending neck symptoms. Concerning the effect of storage period, the export conditioning (dry cool storage for 10 days) has shown favourable results on vase life and the other studied characters but 0 days (unstored flowers) surpassed significantly the storage for 10 days. The results of interaction showed that all holding solutions with storage for 0 days (unstored flowers) had the highest effect on reducing the depletion of sugars content, increasing anthocyanin content in

flowers and in turn extending vase life. In this respect, the utmost high values of this character was the treatment of holding flowers in solution (A) plus 25 ml/l humic acid x storage at 0 days (unstored flowers). Treatment of the combination of solution (A) plus humic acid at 50 ml/l x storage at 0 days was occupied the second rank in improving studied characters.

**Keywords:** /Gerbera/ /Vase Life/

## **ROSE**

Seyf, M., et.al 2012. Effect of sodium nitroprusside on vase life and postharvest quality of a cut rose cultivar (*Rosa hybrida* 'Utopia'). J. Agr. Sci. 4(12): 174 – 181.

### **Abstract**

This experiment was carried out to investigate the effect of sodium nitroprusside (SNP) as a nitric oxide (NO) donor compound on postharvest life of a cut rose cultivar (*Rosa hybrida* 'Utopia'). At laboratory with  $21 \pm 2^\circ\text{C}$  temperature, 70% relative humidity, and 12h photoperiod, flowers were treated with SNP (0 (Control = Distilled water), (50 and 100  $\mu\text{Molar}$ ) solutions for 24 hours and then were transferred to distilled water and were held in distilled water until the end of the vase life. Soluble protein content, solution uptake rate, relative fresh weight, total chlorophyll (a+b) content, and vase life of flowers were determined. Results showed that flowers treated with 50  $\mu\text{Molar}$  SNP had more soluble protein content compared to control. SNP (50  $\mu\text{Molar}$ ) application increased solution uptake rate of flower stems. Also flowers treated with 50  $\mu\text{Molar}$  SNP had more relative fresh weight compared to control significantly. SNP (50  $\mu\text{Molar}$ ) increased vase life of cut rose 'Utopia' from 11 days (control) to 13.3 days.

**Keywords:** /Rose/ /Postharvest/ /Quality/ /Vase Life/