

**SELECTIVE DISSEMINATION OF INFORMATION  
AS OF APRIL 2018**

**APPLE**

**Carolina Fagundes Assumpcao, Vanessa Stahl Hermes, Carlos Pagno, Antonella Castagna, ... Alessandro de Oliveira Rios. (2018). Phenolic enrichment in apple skin following post-harvest fruit UV-B treatment. *Postharvest Biology and Technology*, 138: 37-45.**

Abstract

In apple fruit, phenolic compounds are the major sources of antioxidants, which are particularly concentrated in the skin. In the present experiment apples (cv. Red Delicious) were analyzed for their phenolic composition after the exposure to UV-B for 36 h (219 kJ m<sup>-2</sup>) and during storage (7, 14 and 21 d after the end of the treatment) in order to assess if UV-B treatment could improve marketability of the products as well as shelf-life. Since UV-B irradiation is also known to induce the generation of reactive oxygen species (ROS), the spin-trapping technique was applied to monitor the generation of free radicals under UV-B. The UV-B for 36 h treatment induced the generation of carbon-centered radicals in the skin, the tissue more exposed to radiation, but fruit quality parameters were not affected. Even if firmness progressively decreased and an increasing weight loss occurred during storage, differences between treated and control fruit were not observed. The different phenolic classes of apple skin reacted differently to the UV-B for 36 h irradiation, hydroxycinnamic acids increasing and flavonols decreasing. However, during storage, hydroxycinnamic acids and anthocyanins increased in UV-B-treated samples, as well as flavonols at the end of the storage period. As a consequence, the fruit skin showed a higher antioxidant activity in all the treated samples during storage, increasing the healthy properties of the fruit. This suggests that UV-B technique results in a valid strategy to induce antioxidant production in apple, increasing their nutraceutical value, thus allowing the attainment of phenolic-enriched fruit.

Keywords: /Apple skin/ /UV-B radiation/ /Phenolic compounds/ /Anthocyanin/ /UPLC–MS/

**Cyrellys Collazo, Jordi Gine-Bordonaba, Ingrid Aguilo-Aguayo, Ismael Povedano, ... Inmaculada Viñas Pseudomonas graminis strain. (2018). CPA-7 differentially modulates the oxidative response in fresh-cut ‘Golden delicious’ apple depending on the storage conditions. *Postharvest Biology and Technology*, 138: 46-55.**

## Abstract

The oxidative response in fresh-cut antioxidant-treated 'Golden delicious' apples during chilling storage was differentially modified by the biopreservative bacterium *Pseudomonas graminis* CPA-7 depending on the storage conditions (passive modified atmosphere packaging (MAP) or air). Results showed that inoculation with CPA-7 had no influence on fruit quality parameters in any of the conditions tested. During the first 24 h both in air and in MAP, ascorbate peroxidase (APX) activity triplicated the initial level in response to CPA-7, reaching up to 4-fold the activity of non-inoculated fruit (control). From 24 h of storage in MAP, polyphenol oxidase (PPO) activity was sharply enhanced in response to CPA-7 attaining values up to 8-fold higher than that of the control at the end of the experiment, yet it was not paired to an increase in browning incidence. Concomitantly, at 24 h of storage in MAP, CPA-7 suppressed peroxidase (POX) and catalase (CAT) activities. Subsequently, after 3 d in such conditions, superoxide dismutase (SOD) and PPO activities were almost duplicated in the presence of CPA-7 compared to the control. On the other hand, when stored in air, POX showed a biphasic induction in response to CPA-7 after 1 d and 6 d of incubation. On day 6, this enzyme duplicated its activity in inoculated samples compared to the control regardless of storage conditions. Inoculation with CPA-7 led to the slowdown of the decline of antioxidant capacity in air, which contrasted with the response upon MAP conditions. These results suggest that CPA-7 may trigger the activation of the fruit defense-response thereby mitigating its oxidative damage. Such activation may play a role as a putative biocontrol mechanism against foodborne pathogen infections.

Keywords: /Antioxidant enzymes/ /Oxidative stress/ /Antagonist/ /Fruit defense response/

## BANANA

**Vilaplana, Rosa , Lenin Pazmiño, Silvia Valencia-Chamorro. (2018). Control of anthracnose, caused by *Colletotrichum musae*, on postharvest organic banana by thyme oil. *Postharvest Biology and Technology*, 138: 56-63.**

## Abstract

Anthracnose in organic bananas is an aggressive, difficult to control postharvest disease. Essential oils have been studied in order incorporate them into integrated pest management, and to reduce synthetic fungicides during the postharvest period. In vitro assays showed that thyme oil was the best essential oil to control mycelial growth of *Colletotrichum musae*. This essential oil was tested in vivo because of its fungicidal effect. The results showed that, after storage and shelf life at 20 °C, severity inhibition of *C. musae* on fruit treated with 500 µL L<sup>-1</sup> of thyme oil (30.8%) was higher ( $p < 0.05$ ) than with other treatments. Moreover, 500 µL L<sup>-1</sup> of thyme oil reduced weight loss, retained color and firmness, and slowed the changes of chemical parameters in organic bananas during storage. After the postharvest period, panelists did not detect thyme oil odor, and overall appearance was also better, when using thyme oil, than in

non-treated fruit. These results suggest that thyme oil may be potentially used for controlling anthracnose in organic bananas during the postharvest period, without a negative effect on its physicochemical and sensory quality.

Keywords: /Essential oil/ /Severity/ /Musa acuminata/ /Physicochemical quality/ /Sensory quality/ /Shelf life/

## **BERRIES**

**Wang, S., Zhou, Q., Zhou, X., Wei, B., and Ji, S. (2018). The effect of ethylene absorbent treatment on the softening of blueberry fruit. *Food Chemistry*, 246: 286-294.**

Abstract

The potential of ethylene absorbent (EA) to delay softening of 'Lanfeng' blueberry (*Vaccinium* spp.) fruit in conjunction with cold storage was evaluated. The fruit quality was evaluated after 60 days of storage at 0 °C again kept at 20 °C, with or without EA. Changes in quality attributes and ethylene biosynthesis and fruit softening indicators were assessed. The results indicated that EA treatment inhibited fruit softening, reduced weight loss and decay, and prevented the loss of total phenolic content. It also decreased the fruit ethylene production by inhibiting 1-aminocyclopropane-1-carboxylic acid oxidase and 1-aminocyclopropane-1-carboxylic acid synthase activities, whilst maintaining firmness by hampering cell wall-degrading enzyme activities, especially after more than 30 days of cold storage. In conclusion, EA treatment can inhibit the softening of harvested blueberry fruit during storage at 0 °C and shelf life after cold storage. After being refrigerated for more than 30 days at 0 °C, the EA has a good effect on blueberries storage.

Keywords: /Blueberry/ /Ethylene absorbent/ /Softening/ /Storage/

## **BROCCOLI**

**Lu, Y., Dong, W., Alcazar, J., Yang, T., Luo, Y., and Wang, Q. (2018). Effect of preharvest CaCl<sub>2</sub> spray and postharvest UV-B radiation on storage. *Journal of Food Composition and Analysis*, 37: 55-62.**

Abstract

Glucosinolates (GLS), namely glucoraphanin (GLR) and glucoerucin (GLE), are a class of phytonutrients which are beneficial to human health. Broccoli flower buds (florets) have been known to be rich in GLS. The present study indicated that the florets, mature leaves and microgreen of broccoli varied in their GLR, GLE and total aliphatic GLS contents. GLE is the

unique glucosinolate in broccoli microgreens while GLR is primarily condensed in broccoli florets and mature leaves. Microgreens contained four-fold greater total aliphatic GLS content than mature broccoli leaves and florets. In addition, we investigated the effects of preharvest CaCl<sub>2</sub> and post-harvest UV-B applications on the levels of GLR and GLE. Total aliphatic GLS levels increased significantly after 10 mM CaCl<sub>2</sub> treatment, while postharvest UV-B radiation further boosted GLS levels in microgreens. Furthermore, preharvest calcium spray showed improved overall visual quality and longer storage life. Hence, CaCl<sub>2</sub> application is the major factor to increase GLS levels and postharvest quality. Our results indicated that broccoli microgreens are a better source of GLS intake than florets, and preharvest CaCl<sub>2</sub> and postharvest UV have positive influence on maintaining the health-beneficial compounds and extending the shelf life of broccoli microgreens.

Keywords: /Food analysis/ /Food composition/ /Brassica oleracea L. var. italica/ /Microgreens/ /Glucoraphanin/ /lucoerucin/ /Calcium/ /UV-B radiation/ /Food quality/ /Antioxidant/

**Paulsen, Erika, Sofía Barrios, Nieves Baenas, Diego A. Moreno, ... Patricia Lema. (2018). Effect of temperature on glucosinolate content and shelf life of ready-to-eat broccoli florets packaged in passive modified atmosphere. *Postharvest Biology and Technology*, 138: 125-133.**

Abstract

Ready-to-eat fruit and vegetables comprise a group of increasingly demanded value-added products. Broccoli is a highly perishable vegetable with unique nutritional characteristics. Development of minimally processed broccoli products demands varietal-specific knowledge as to which are the packaging conditions that preserve quality throughout shelf life. 'Legacy' cultivar broccoli florets were washed, disinfected, packaged in polypropylene and stored at 4, 8 and 15 °C for 21 d. Weight loss, internal atmosphere composition, respiration rate, color, texture, glucosinolate content, antioxidant capacity (AOC) and sensory attributes were evaluated throughout storage time. Results showed that 4 °C helped preserve sensory quality, texture, total glucosinolate content and AOC for 21 d. Temperature fluctuations reaching 15 °C resulted in loss of total glucosinolate content and unacceptable sensory quality. MAP helped mitigate temperature effects, especially at 8 °C. MAP is therefore an appropriate technology which can be applied to extend the shelf-life of ready-to-eat broccoli florets.

Keywords: /Storage/ /Fresh Cut/ /Minimally Processed Glucosinolates Antioxidant Capacity/

## **CARROT**

**Souza, L., Faroni, L., Heleno, F., Cecon, P., Gonçalves, T.; Silva, G.; Prates, L. (2018). Effects of ozone treatment on postharvest carrot quality. *LWT - Food Science & Technology*, 90: 53-60.**

## Abstract

Ozone (O<sub>3</sub>) is a powerful oxidant and is used in water treatment, pest disinfection and the removal of pesticides, mycotoxins and other contaminants from fruits and vegetables. However, the treatment conditions should be specifically determined for all types of products for the effective and safe use of ozone. The aim of this study was to evaluate the effect of ozone applied as gas (0–5 mg L<sup>-1</sup>) and dissolved in water (0–10 mg L<sup>-1</sup>) on the quality of carrots. The exposure of carrots to ozone as gas and dissolved in water did not alter the weight loss percentage, firmness and the color of the vegetable. The O<sub>3</sub> treatments as gas also did not affect the pH of the carrots. However, in treatments with O<sub>3</sub> dissolved in water, the ozone concentrations and its interaction with temperature temporarily affected the pH of carrots. Moreover, O<sub>3</sub> as gas prevented the sharp increase in soluble solids during storage for five days (18 ± 2 °C, 80 ± 5% RH), thereby increasing the shelf-life of carrots.

Keywords: /*Daucus carota* L./ /Storage/ /Ozonation/ /Soluble solids/ /Shelf-life/

## CITRUS

**Niu, Y., Yuan, Y., Mao, J., Yang, Z., Cao, Q., Zhang, T., Wang, S., and Liu, D., 2018. Characterization of two novel mycoviruses from *Penicillium digitatum* and the related fungicide resistance analysis. *Scientific Reports*, 1-12.**

## Abstract

Pathogenic fungi including *Penicillium digitatum* and *Penicillium italicum* are the main destructive pathogens in the citrus industry, causing great losses during postharvest process. To our knowledge, only one mycovirus from *P. digitatum* has been reported, and the prevalence of such mycoviruses against citrus postharvest pathogenic fungi and their genotyping were still under investigation. In the present study, we showed that 39 of 152 *Penicillium* isolates from main citrus-growing areas in China were infected with various mycoviruses belonging to polycoviruses, Narna-like viruses, and families Totiviridae, Partitiviridae and Chrysoviriidae. The next generation sequencing (NGS) towards virus genome library and the following molecular analysis revealed two novel mycoviruses *Penicillium digitatum* polycovirus 1 (PdPmV1) and *Penicillium digitatum* Narna-like virus 1 (PdNLV1), coexisting in *P. digitatum* strain HS-RH2. The fungicide-resistant *P. digitatum* strains HS-F6 and HS-E9 coinfecting by PdPmV1 and PdNLV1 exhibited obvious reduction in triazole drug prochloraz resistance by mycelial growth analysis on both PDA plates and citrus fruit epidermis with given prochloraz concentration. This report at the first time characterized two novel mycoviruses from *P. digitatum* and revealed the mycovirus-induced reduction of fungicide resistance .

Keyword: /Postharvest disease/*Penicillium digitatum*/*Penicillium italicum*/

**Technavio releases report on the key findings of the global citrus fruit coatings market. Food and Beverage Close-Up, 2018: 1-3.**

Abstract

According to a release, the report segments the global citrus fruit coatings market by product, including wax, shellac, and wax and shellac and by geography, including the Americas, EMEA, and APAC. According to a senior analyst at Technavio for research on food, "The increasing health hazards and environmental pollution owing to chemical usage have demanded the development of alternative strategies for the control of postharvest citrus diseases.

Keywords: /Citrus fruit/Postharvest diseases/

**CUCUMBER**

**Ibrahim N. Nasef. (2018). Short hot water as safe treatment induces chilling tolerance and antioxidant enzymes, prevents decay and maintains quality of cold-stored cucumbers. Postharvest Biology and Technology, 138: 1-10.**

Abstract

This study investigated the effects of treating cucumbers with short hot water dipping at 45 (SHW45) and 55 °C (SHW55) for 5 min compared to fruit dipped in 25 °C water (C). The purpose was to alleviate chilling injury, prevent decay, maintain sensory quality and induce antioxidant enzymes during storage. The cucumbers were held at 4 °C for 7, 14 and 21 d and shelf life at 20 °C for 2 and 4 d. Weight loss, appearance, decay, color, firmness, taste, soluble solids content (SSC), chilling injury (CI), total, reducing and non-reducing sugars, phenolics, electrolyte leakage (EL), peroxidase (POD) and catalase (CAT) activity were measured. The results revealed that SHW55 treatment had the lowest weight loss, CI, EL and POD activity, and had the best appearance, color, taste, and the highest CAT activity during cold storage and shelf life compared with C and SHW45. However, no significant effects were found between C, SHW45 and SHW55 on total, reducing sugars and SSC. No decay appeared on cucumber fruit with SHW55 treatment during the storage period. It may be possible to use SHW55 in a packinghouse as a safe commercial treatment to maintain quality, prevent decay and mitigate chilling injury, prolong storage period and possibility to store cucumber fruit at a non-optimal low temperature.

Keywords: /Cucumbers quality/ /Low temperature storage/ /Chilling injury/ /Shelf life/ /Short hot water/ /Peroxidase and catalase/

## **GERBERA**

**Shabanian, S., Esfahani, M.N., Karamian, R., Tran, L.P. (2018). Physiological and biochemical modifications by postharvest treatment with sodium nitroprusside extend vase life of cut flowers of two gerbera cultivars. Postharvest Biology and Technology, 137: 1-8.**

### **Abstract**

Senescence is a major problem of gerbera (*Gerbera jamesonii*) cut flowers limiting their long-distance transportation and subsequent marketing. This study was designed to evaluate whether external application of nitric oxide (NO), provided through 150  $\mu$ M sodium nitroprusside (SNP), could extend the vase life of gerbera cut flowers, as well as the potential physiological and biochemical mechanisms involved. We used two gerbera cultivars 'Bayadère' and 'Sunway'; watered 'Bayadère' cut flowers have a better performance than watered 'Sunway' cut flowers. NO extended the vase life of cut flowers of both cultivars as compared with their respective control treated with water alone, with 'Sunway' showing better postharvest performance than 'Bayadère'. Application of SNP in vase solution resulted in a decrease in proline content in the stems of cut flowers of both cultivars, providing evidence for alleviation of water deficit in SNP-supplied cut flowers. Improved postharvest performance of SNP-treated gerbera cultivars could be attributed to increases in total phenol and flavonoid contents, which resulted from decreased polyphenol oxidase activity and increased phenylalanine ammonia-lyase activity. A decline in malondialdehyde accumulation in the stems of SNP-treated cut flowers was greater in 'Sunway' flowers than in 'Bayadère' flowers, which was ascribed to the better performance of antioxidant systems in SNP-treated 'Sunway' flowers to reduce the adverse effect of oxidative stress. Taken together, exogenous NO might be promising approaches to improve postharvest performance of flowers.

**Keywords:** /Floral senescence /*Gerbera jamesonii*/Nitric oxide/Oxidative stress/Postharvest life /Water relation/

## **GRAPES**

**Sheng, Kangliang. 2018. Comparison of postharvest UV-B and UV-C treatments on table grape: Changes in phenolic compounds and their transcription of biosynthetic genes during storage. Postharvest Biology and Technology, 138: 74-81.**

### **Abstract**

The aim of this study was to evaluate the effects of UV-B or UV-C radiation on phenolic compounds and their transcription of biosynthetic genes in table grapes during storage. The table grapes were exposed to each UV treatment at same dose of 3.6 kJ m<sup>-2</sup> and then storage

at 4 °C for 28 d. The chemical characteristics of grapes, such as total soluble solids, total titratable acidity and pH during storage, were not greatly affected by each UV treatment. The phenolic content and antioxidant activities of grapes after UV-C treatment were always higher than those of the control and UV-B treatment. Individual phenolic compounds were greatly increased during 14 d of storage after UV-B and UV-C treatment especially in UV-C treatment. Several key genes involved in phenylpropanoid, flavonoid and stilbenoid pathways, such as PAL, CHS, F3H, LAR, ANS, STS, were more expressed in response to the UV treatment, particularly in UV-C treatment. It was induced that the postharvest UV-B or UV-C treatments increased the phenolic compounds accumulation of grapes during storage.

Keywords: /Grape/ /Postharvest/ /UV irradiation/ /Antioxidants/ /Storage

**Takma, Dilara Konuk and Korel, Figen. 2018. Impact of preharvest and postharvest alginate treatments enriched with vanillin on postharvest decay, biochemical properties, quality and sensory attributes of table grapes. Food Chemistry, 221: 187-195.**

Abstract

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

Keywords: /Alginate /Postharvest quality /Table grapes /Vanillin/

**Vazquez-Hernandez, M., Navarro, S., Sanchez-Ballesta, M., Merodio, C., and Escribano, M. 2018. Short-term high CO<sub>2</sub> treatment reduces water loss and decay by modulating defense proteins and organic osmolytes in cardinal table grape after cold storage and shelf-life. Scientia Horticulturae, 234: 27-35.**

Abstract

Shelf-life quality was improved when Cardinal table grapes (*Vitis vinifera* L.) were pretreated with 20 kPa of CO<sub>2</sub> for three days at the beginning of a long-term cold storage. This pretreatment was effective in avoiding postharvest losses of cv. Cardinal grapes in terms of water loss, oxidative damage and disease prevention. To elucidate those physiological and biochemical factors involved in preserving the postharvest shelf-life quality of table grapes, we studied the expression pattern of defense proteins such as pathogenesis-related proteins (PRs) and dehydrins, as well as the profile of protective osmolytes. The efficacy of a short-term high CO<sub>2</sub> pretreatment in reducing fungal disease could be mediated by the increase in the low molecular mass chitinase isoform of 16 kDa, which is up-regulated in the skin of CO<sub>2</sub>-treated grapes in parallel with the shelf-life fungal decay control. In addition, the increasing accumulation of a 22 kDa dehydrin isoform and the endogenous levels of organic osmolytes proline and glycine betaine in fruit stored at 20 °C (mainly in CO<sub>2</sub>-treated fruit) revealed that these protective biomolecules might play a more effective role in maintaining the structural and cellular homeostasis of table grapes after the shelf-life period, helping to reduce water loss and membrane oxidative damage (malondialdehyde accumulation) associated with the senescence-related disorders of postharvest table grapes.

Keywords: /High CO<sub>2</sub>/Skin/Pathogenesis-related protein/Dehydrin/Nitrogenous osmolyte/Trehalose/

## **GUAVA**

**Murmu, Sanchita Biswas and Mishra, Hari Niwas. (2018). The effect of edible coating based on Arabic gum, sodium caseinate and essential oil of cinnamon and lemon grass on guava. Food Chemistry, 245: 820-828.**

### **Abstract**

The effect of five coating formulations viz.: (A) 5% Arabic gum (AG) + 1% sodium caseinate (SC) + 1% cinnamon oil (CE); (B) 5% AG + 1% SC + 2% CE; (C) 5% AG + 1% SC + 1% lemongrass oil (LG); (D) 5% AG + 1% SC + 2% LG; and (E) 5% AG + 1% SC + 2% CE + 2% LG on guava during 35 days storage at 4–7 °C was investigated. Thereafter samples were allowed to ripen for five days at 25 ± 2 °C. The quality of guava was analyzed at an interval of 7, 21, 35 and 40 days. The coating applications resulted in lower activity of PPO & POD, higher DPPH radical scavenging activity, higher retention of ascorbic acid, phenol & flavonoid content, exhibited slower rise of reducing and total sugar in guava pulp. Samples in treatment B and D were the best formulations for extending shelf-life of guava up to 40 days versus seven days of uncoated samples.

Keywords: /Edible coating/Cinnamon oil/Lemongrass oil /Guava/Shelf-life/

## **HAWTHORN FRUIT**

**Razavi, F., Mahmoudi, R., Rabiei, V., Aghdam, M. S., Soleimani, A. 2018. Glycine betaine treatment attenuates chilling injury and maintains nutritional quality of hawthorn fruit during storage at low temperature. Scientia Horticulturae, 233: 188-194.**

### **Abstract**

Low-temperature storage delays senescence and helps to maintain nutritional quality, which is recommended for extending the postharvest life of fruit and vegetable. But, under low temperature storage, hawthorn fruit pitting as a physiological manifestation of chilling injury (CI) symptom can develop visually. In this study, the effects of glycine betaine (GB) treatment applied by immersion (0, 2.5, 5 and 10 mM, for 15 min at 20 °C) on chilling injury and nutritional quality of hawthorn fruit during storage at 1 °C for 20 days was investigated. The results showed that GB treatment, especially at 10 mM, significantly delayed fruit pitting development. Also, GB treated hawthorn fruit exhibited significantly higher endogenous GB and proline accumulation, which was concurrent with higher antioxidant enzymes superoxide dismutase (SOD), catalase (CAT), and ascorbate peroxidase (APX) activity leading to lower H<sub>2</sub>O<sub>2</sub> accumulation. Also, hawthorn fruit treated with GB exhibited significantly higher phenols, flavonoids and anthocyanins accumulation resulting from higher phenylalanine ammonia lyase (PAL) enzyme activity, which concomitant with higher ascorbic acid accumulation leading to higher DPPH scavenging capacity during storage at 1 °C for 20 days. These results suggested that GB treatment not only can be used as a useful strategy for attenuating chilling injury of hawthorn fruit by enhancing antioxidant enzymes activity leading to lower reactive oxygen species (ROS) accumulation, but also is useful for maintaining nutritional quality of hawthorn fruit by triggering antioxidant molecules accumulation which is beneficial for human health.

**Keywords:** /Antioxidant system activity/Bioactive molecules/DPPH scavenging capacity/Phenylalanine ammonia lyase/Proline/

## **HERBS**

**Srivastava, J.N., Yadav, A.K., Shanker, K., Gupta, M.M., Lal, R.K. (2018). Impact of postharvest processes on major phenolic constituents and antioxidant potentials of different Ocimum species. Journal of Applied Research on Medicinal and Aromatic Plants, 1-7.**

Tulsi (*Ocimum sanctum* Linn.) is one of the preferred herbs used as tea blended beverage in India. *Ocimum* is a rich source of antioxidants. The present study demonstrates the effect of post-harvest processes and blanching treatment on antioxidant potential of *O. sanctum* and seven other *Ocimum* species/cultivars. An optimized high performance liquid chromatographic method was applied to study the distribution of caffeic acid (CA) and rosmarinic acid (RA), and

rutin (RU) in shed dried and blanched *Ocimum* leaves. Blanching treatments included thermal (Deep freeze- liq. N<sub>2</sub>, dry-hot air, and wet heat-boil H<sub>2</sub>O) and chemical methods (NaCl, NaHCO<sub>3</sub>, and CaOCl<sub>2</sub>). In general, blanching treatments have severely degraded the phenolic content of all *Ocimum* species. Only 77% increase in CA content of *O. kilimandscharicum* (OK) when treated with CaOCl<sub>2</sub> was observed. Similarly, 14%, 18%, and 19% increase in RA content in the OK leaves were also observed when treated with boiling water, hot air, and CaOCl<sub>2</sub>, respectively. Shed drying process was found to be most appropriate to hold the antioxidant potential but compromised appearance. Blanching through a quick dip in wet-heat followed by indirect dry-heat drying reduced the loss of green colour. The present findings are useful to adopt the appropriate postharvest handling and pre-treatment of *Ocimum* for optimum retention of green colour appearance and their antioxidant potential.

Keywords: /Processing/ /Blanching/ /Herbal tea/ /Rutin/ /Caffeic acid/ /Rosmarinic acid/

## **KIWIFRUIT**

**Lim, Y.J., and Eom, S.H. (2018). Kiwifruit cultivar 'Halla gold' functional component changes during preharvest fruit maturation and postharvest storage. *Scientia Horticulturae*, 234: 134-139.**

### **Abstract**

There is an increasing interest in the use of immature fruit for its health benefits; however, little is known about changes in the molecular composition of functional compounds during the stages of fruit maturation and over their postharvest ripening process. This study investigates the changing content levels of key functional molecules in the golden kiwifruit cultivar harvested between 70 and 160 days after full blooming (DAFB) and stored at 4 °C for 9 weeks. We found that mature fruit contained higher levels of total phenolics, total flavonoids, and vitamin C, while having lower levels of pigments such as lutein,  $\beta$ -carotene, 9'-cis-neoxanthin, and pheophytins. Lutein and  $\beta$ -carotene content was maintained during postharvest storage regardless maturity at harvest, with the notable exception of  $\beta$ -carotene which increased dramatically between 3 and 6 weeks of storage in fruit harvested 160 DAFB. Other pigments tended to decrease during ripening and maturation. Overall these results suggest that less mature kiwifruits are likely to be a better source health-beneficial pigment molecules like lutein and  $\beta$ -carotene.

Keywords: Carotenoids/ /Climacteric fruit/ /Maturation/ /Ripening/ /Pigments/

## **LEMON**

**Baruah, S.R. and Kotoky, U. (2018) Studies on storage behavior of Assam Lemon (*Citrus Limon* Burm). *Indian J. Agric Res.*, 52: 177-181.**

## Abstract

Assam lemon is one of the most important fruit of Assam and it is used for culinary purpose due to its fragrance and acidic content. Though Citrus fruits are non-climacteric in nature, depending on the temperature and storage duration, chemical composition of fruits may change. In this experiment different treatments viz T0: Control, T1: Chlorination (4%), T2: Chlorination (4%) + Polyethylene (300 gauge thickness), T3: Chlorination (4%) + perforated polythene (with pinholes), T4: Chlorination (4%) + individual shrink wrapping, T5: Chlorination (4%) + tray packaging used to study the storage life and post harvest quality of Assam Lemon fruits. The effect of these treatments on citric acid, respiration, fruit texture and colour were studied. Among all the treatments, individual shrink wrapping (T4) of Assam Lemon fruit stored at ambient temperature (30-32°C and 80–85% RH) was found to be beneficial because it helped to extend the shelf life without deterioration in quality of fruit. Shrink wrap packaging retained the freshness, colour and firmness of the fruit up to 1 month without any decay.

Keywords: /Assam Lemon/Chroma/Hue angle/Respiration/Shrink wrapping/

## LETTUCE

**Simko, I., Hayes, R.J., Truco, M.J., Michelmore, R.W., Antonise, R., and Massoudi, M. 2018. Molecular markers reliably predict postharvest deterioration of fresh-cut lettuce in modified atmosphere packaging. Horticulture Research, 5: 1-13.**

## Abstract

Fresh-cut lettuce is popular, but highly perishable product. Genetic studies of two bi-parental populations derived from crossing parents with rapid and slow rates of deterioration showed that the deterioration rate is a heritable trait (broad spectrum heritability,  $H^2$  of 0.56–0.87). The major genetic determinant of the deterioration rate in both populations was the quantitative trait locus (QTL), qSL4, located on linkage group 4. This QTL explained 40–74% of the total phenotypic variation of the trait in the two populations. Saturating the qSL4 region with single-nucleotide (SNP) markers allowed detection of six haplotypes in a set of 16 lettuce accessions with different rates of deterioration. Three of the haplotypes were always associated with very rapid rates of deterioration, while the other three haplotypes were associated with slow rates of deterioration. Two SNPs located 53 bp apart were sufficient to separate the 16 accessions into two groups with different rates of deterioration. The accuracy of markers-trait association was subsequently tested on 350 plants from seven F2 families that originated from crossing parents with different rates of deterioration. The  $H^2$  of deterioration rate in these seven families ranged from 0.64 to 0.90. The SNP-based analysis accurately identified individuals with rapid, intermediate, and slow rates of deterioration in each family. Intermediate rate of deterioration was found in individuals having heterozygous alleles at qSL4, indicating an additive effect of the

alleles. The assay can be used for fast, accurate, and reliable identification of deterioration rate after processing for salad.

Keywords: /Lettuce/Postharvest deterioration/

## LONGAN

**Suwanamornlert, P., Sangchote, S., Chinsirikul, W., Sane, A., Chonchenchob, V. (2018). Antifungal activity of plant-derived compounds and their synergism against major postharvest pathogens of longan fruit in vitro. International Journal of Food Microbiology, 271: 8-14.**

### Abstract

The aim of this study was to find alternatives to conventional synthetic fungicides to control postharvest decay of longan fruit. The antifungal potential of thymol, carvacrol and trans-cinnamaldehyde was evaluated against four major longan pathogens, *Lasiodiplodia* spp., *Phomopsis* spp., *Pestalotiopsis* spp. and *Geotrichum candidum*, using vapor phase and direct contact methods. The vapor phase of all active compounds was more effective on fungal growth than direct contact. A volatile vapor of thymol and carvacrol had strong antifungal activity against the tested fungi, exhibiting minimum inhibitory concentration (MIC) in the range of 40 to 80 mg/L air; trans-cinnamaldehyde showed the least efficiency, with MIC ranging from 80 to 160 mg/L air for *G. candidum* and *Phomopsis* spp., while it could not inhibit *Lasiodiplodia* spp. and *Pestalotiopsis* spp. at 160 mg/L air. The minimum fungicidal concentration (MFC) of thymol and carvacrol varied from 40 to 80 mg/L air, while trans-cinnamaldehyde completely inhibited the mycelial growth of the tested fungi at higher concentrations. Mycelial growth of all tested fungi decreased with increasing active compound concentration, except for trans-cinnamaldehyde. Thymol proved to be the most effective compound against the four tested fungi, with effective concentration 50 (EC<sub>50</sub>) of  $5.68 \pm 0.59$ ,  $6.86 \pm 0.52$ ,  $8.27 \pm 0.22$  and  $9.99 \pm 1.28$  mg/L air for *Lasiodiplodia* spp., *Phomopsis* spp., *Pestalotiopsis* spp. and *G. candidum*, respectively. Fungal growth curves were adequately fitted ( $0.958 < R^2 < 0.996$ ) by a modified Gompertz model. For all tested fungi, the lag phase ( $\lambda$ ) of fungal mycelia exposed to thymol and carvacrol increased, while the maximum colony diameter (A) and maximum growth rate ( $v_m$ ) decreased. A combination of thymol and carvacrol exhibited an antagonistic effect against *G. candidum* but an indifferent effect against *Lasiodiplodia* spp., *Phomopsis* spp. and *Pestalotiopsis* spp.

Keywords: /Antifungal activity/ /Postharvest decay/ /Thymol/ /Carvacrol/trans-Cinnamaldehyde/ /Longan/

**Zhang, S., Lin, y., Lin, H., Lin, Y., Chen, Y., Wang, H. Shi, J., Lin, Y. (2018). *Lasiodiplodia theobromae* (Pat.) Griff. & Maubl.-Induced disease development and pericarp browning of**

**harvested longan fruit in association with membrane lipids metabolism. Food Chemistry, 244: 93-101.**

Abstract

Effects of *Lasiodiplodia theobromae* inoculation on disease development, pericarp browning and membrane lipids metabolism of harvested "Fuyan" longan fruit were studied. Compared with control fruit, *L. theobromae*-in-oculated longans showed higher fruit disease index, pericarp browning index and cell membrane permeability, as well as higher activities of phospholipase D, lipase and lipoxygenase. Additionally, there were lower contents of membrane phospholipids but higher content of phosphatidic acid, and lower level of unsaturated fatty acids but higher level of saturated ones with lower ratio of unsaturated fatty acid to saturated fatty acid and lower index of unsaturated fatty acids in pericarp of *L. theobromae*-inoculated longans. These results suggested that *L. theobromae*-induced disease development and pericarp browning of harvested longans might be attributed to the damaged cellular membrane structural integrity, induced by the activated membrane lipids-degrading enzymes increasing the degradation of membrane phospholipids and unsaturated fatty acids in pericarp of harvested longan fruit.

Keywords: /Longan (*Dimocarpus longan* Lour.) fruit/Postharvest disease/ Pericarp browning/*Lasiodiplodia theobromae* (Pat.) Griff. & Maubl./Cellular membrane permeability Membrane lipids metabolism/Membrane phospholipids/Membrane lipids-degrading enzymes/

## LOTUS

**Li, S., Li, X., He, X., Liu, Z., Yi, Y., Wang, H., and Lamikanra, O. (2018). Effect of mild heat treatment on shelf life of fresh lotus root. LWT - Food Science and Technology, 90: 83-89.**

Abstract

Heat treatments of fresh lotus root (*Nelumbo nucifera* G.) at 40, 50 and 60 °C effectively prevented moisture loss, browning and microbial growth but increased soluble solids, total volatile compounds and firmness during storage at 25 °C for 15 d ( $p < 0.05$ ). Polyphenol oxidase (PPO) and peroxidase (POD) activities and PPO electrophoretic band intensities (100 kDa) were minimally affected by the treatments. Results indicate that enzyme deactivation is not the dominant factor in the inhibition of browning that occurred during the storage of heat treated tubers and that other factors such as heat-induced substrate modifications could significantly contribute to this effect. Peroxidase heat shock proteins (Hsp) were detected at 60, 70 and 120 kDa in treated samples. The enhanced Hsp protective response and firmness retention in 60 °C treated samples indicate that this is the optimum treatment temperature for improving lotus root postharvest storage quality and shelf life.

Keywords: /Lotus root/ /Physical treatment/ /Texture/ /Protein/ /Postharvest life/

## **MANGO**

**Grihalakshmi Kakani, T. Matthew Taylor, Nanci E. Martínez-González, M. Ofelia Rodríguez-García, ...Alejandro Castillo. (2018). Using antimicrobials as a food safety measure during phytosanitary treatments in mangoes. *Postharvest Biology and Technology*, 138: 114-124.**

### **Abstract**

Prevention of plant-borne pest infestation necessitates use of phytosanitary procedures, as in the case of U.S.-imported mangoes. Supplementation of hydrothermal disinfestation and/or post-process cooling waters with chemical sanitizers could provide mango packers with antimicrobial interventions reduce or prevent microbial pathogen transmission on mangoes. The current study determined: i) the effectiveness of chlorine (CL) or lactic acid (LA) addition to water used for hydrothermal and cooling treatments to reduce *Salmonella* survival on mangoes during disinfestation treatment, and; ii) *Salmonella* internalization into stem scars following hydrothermal and cooling treatments in sanitizer-supplemented water. *Salmonella* survival during post-treatment storage and effects of treatments on mango color and firmness were also determined. A 2.0 log-cycle reduction was obtained on stem scars subjected to hydrothermal treatment; reductions of 2.2 and 1.3 log-cycles were obtained on stem scars with LA and OCl<sup>-</sup> treatment, respectively. An additional 1.0 log-cycle reduction during cooling was observed for OCl<sup>-</sup>-treated mangos; *Salmonella* were not detected (<2.0 log CFU/10 cm<sup>2</sup>) on LA-treated mangos. On hydrothermal-treated rinds, a 0.5 log cycle reduction was obtained for control fruit; a reduction of 1.7 log cycles was obtained for both LA- and OCl<sup>-</sup>-treated fruit. Internalized *Salmonella* were detected in stem scar tissues obtained following hydrothermal treatment and cooling by enrichment, and survived storage at 10 °C for 12 days. In general, there were no differences in the reduction of *Salmonella* between CL and LA, although in two occasions CL was less effective. However, mango color was compromised by use of LA. Chlorine use both in hot and cool dips is recommended for minimizing *Salmonella* transmission on mango surfaces.

Keywords: /Sanitizers/ /Mangoes/ /Phytosanitary/ /*Salmonella*/ /Internalization/ /Storage/ /Antimicrobials/

**Hashim, Norhashila, Daniel I. Onwude, and Muhamad Syafiq Osman. 2018. Evaluation of Chilling Injury in Mangoes Using Multispectral Imaging. *Journal of Food Science*, 83 (5): 1271-1279.**

### **Abstract**

Commodities originating from tropical and subtropical climates are prone to chilling injury (CI). This injury could affect the quality and marketing potential of mango after harvest. This will later affect the quality of the produce and subsequent consumer acceptance. In this study, the appearance of CI symptoms in mango was evaluated nondestructively using multispectral imaging. The fruit were stored at 4 °C to induce CI and 12 °C to preserve the quality of the control samples for 4 days before they were taken out and stored at ambient temperature for 24 hr. Measurements using multispectral imaging and standard reference methods were conducted before and after storage. The performance of multispectral imaging was compared using standard reference properties including moisture content (MC), total soluble solids (TSS) content, firmness, pH, and color. Least square support vector machine (LS-SVM) combined with principal component analysis (PCA) were used to discriminate CI samples with those of control and before storage, respectively. The statistical results demonstrated significant changes in the reference quality properties of samples before and after storage. The results also revealed that multispectral parameters have a strong correlation with the reference parameters of L\*, a\*, TSS, and MC. The MC and L\* were found to be the best reference parameters in identifying the severity of CI in mangoes. PCA and LS-SVM analysis indicated that the fruit were successfully classified into their categories, that is, before storage, control, and CI. This indicated that the multispectral imaging technique is feasible for detecting CI in mangoes during postharvest storage and processing.

Keywords: chilling injury, fruit quality, mango, multispectral imaging, postharvest storage

**Kour, Ramandeep, Mandeep Singh, P. P. S. Gill, S. K. Jawandha. 2018. Ripening quality of Dusehri mango in relation to harvest time. Journal of Food Science and Technology. <https://doi.org/10.1007/s13197-018-3156-4>, 1-6.**

Abstract

The effect of different harvesting time on ripening quality of mango cv. Dusehri was investigated under sub-tropics of northwestern India. Fruits were harvested at 101, 106 and 111 days after fruit set (DAFS) and kept at 25 C in temperature controlled chamber for ripening. Fruits were analyzed periodically for physicochemical characteristics at the time of harvest (0 h) and after 72, 96 and 120 h of ripening period. With advancement in ripening period, an increase in physiological loss in weight, soluble solids content (SSC), sensory quality rating, b-carotene and pulp colour development of mango fruits was recorded. While a decline in fruit firmness and titratable acidity (TA) was observed with ripening period. Fruits picked at 111 DAFS recorded highest SSC (8.01%), sensory rating (4.67), b-carotene (0.427 mg/100 g) vis-a-vis lowest fruit firmness (15.3 lbf) and TA content (1.56%). The luminosity of fruit pulp decreased with the storage period. The redness and yellowness of the fruit pulp represented by a\* and b\* values, respectively increased with delay in harvesting period. The rate of ripening was rapid in late harvested fruits as compared to early harvested fruits. After 96 h of ripening period, fruits harvested at 111DAFS showed very much desirable quality whereas fruits harvested at 101

DAFS showed moderately desirable quality. Results showed that harvesting of mango fruits can be extended to 111 days and such fruits attained optimum ripening quality after 96 h at 25 C.

Keywords: /Colour Changes/ /Harvest Date/ /Mangifera Indica/ /Fruit quality/

**Ma, Xiaowei, Bin Zheng, Yongli Ma, Wentian Xu, Hongxia Wu, Songbiao Wang. 2018. Carotenoid accumulation and expression of carotenoid biosynthesis genes in mango flesh during fruit development and ripening. Scientia Horticulturae, 237: 201–206.**

Abstract

In order to investigate the regulation mechanisms of carotenoid biosynthesis in mango flesh, carotenoid content and the expression patterns of 15 carotenogenic gene in flesh of two mango cultivars 'Tainong1' and 'Hongyu' were analysed during fruit development and ripening. Carotenoid were increasingly accumulated during fruit growth and sharply increased during postharvest ripening in both cultivars. In ripe fruit, total carotenoid content in the flesh of 'Tainong1' was 177.16 ug/g (Fresh weight) FW, and for 'Hongyu' 36.24 ug/gFW. The major carotenoids in the flesh were  $\beta$ -Carotene and  $\alpha$ -carotene, with minor carotenoids being  $\beta$ -cryptoxanthin, zeaxanthin, lutein and neoxanthin. RT-PCR analysis revealed that the expression of carotenogenic genes CRTISO, PSY, ZDS, BCH and ZEP were up-regulated in flesh, whereas the transcript levels of LCYB, LCYE and NCED were downregulated in two cultivars and during fruit development and ripening. CRTISO, PSY, ZDS, BCH and ZEP transcripts were significantly positively correlated with the total carotenoids content, while no differences were detected for CRTISO expression between cultivars. These results suggested that PSY, ZDS, BCH and ZEP coordinately contribute to carotenoid accumulation during mango fruit development and ripening.

Keywords: Mango Carotenoid Gene expression Development Ripening

**Singh, Ranjeet and S K Giri. 2018. Active Packaging Techniques to Reduce Post-Harvest Loss in Perishables with Special Reference to Mango (cv. Dushari). International Journal of Current Engineering and Technology, 8 (2): 250-253.**

Abstract

All horticultural produce continue their metabolic activities soon after harvest and during storage period. Modified atmospheric packaging is a common practice to minimize postharvest losses and extend shelf life of the produce. Even under modified atmosphere the control of respiration rate of the produce is limited. Optimal packaging micro environment can be adversely affected by dynamic changes in temperature and relative humidity throughout the storage period and under transportation. As an alternative, active packaging technologies provide interactive

controls between the produce, package and surrounding environment to achieve and retain optimal atmospheric conditions inside the packages. Various active packaging technologies have been developed and are commercially available for a range of food products including horticultural produce and the combination of these with other postharvest management strategies offers benefits to extend shelf life. This paper reviews the recent active packaging technologies and their applications focused on horticultural produce such as Mango.

Keywords: /Active Packaging/ /Respiration Rate/ /Package Design/ /Shelf Life/

## **MUSHROOM**

**Shi, C., Wu, Y., Fang, D., Pei, F., Mariga, A.M. Yang, W., and Hu, Q. (2018). Effect of nanocomposite packaging on postharvest senescence of flammulina velutipes. Food Chemistry, 246: 414-421.**

### Abstracts

A polyethylene based packaging material containing nano-Ag, nano-TiO<sub>2</sub>, nano-SiO<sub>2</sub>, and attapulgite has been prepared. The effect of nanocomposite packaging material (Nano-PM) on the senescence of *Flammulina velutipes* during 15 days of postharvest storage at 4 °C and a relative humidity of 90% were analyzed. The results showed that compared with normal packaging material (Normal-PM) and no packaging (No-PM), Nano-PM improved the appearance quality, reduced weight loss and cap opening. The degree of maturity and increase in molecular weight of *F. velutipes* polysaccharides (FVP) were delayed. The content loss of proteoglycan protein was less and degree of oxidation was lower. The storage with Nano-PM reduced the fibrosis of texture, cellulase activity, the accumulation of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and superoxide radical (O<sub>2</sub><sup>-</sup>) by 18.9%, 48.3%, 26.6% and 27.8%, respectively (P < .05). The Nano-PM effectively delayed the postharvest senescence of *F. velutipes*, hence pro- longed its shelf life and increased its preservation quality.

Keywords: /*Flammulina velutipes*/ /Nanocomposite packaging/ /Postharvest quality/ /Senescence/ /Antioxidant capacity/

## **ONION**

**Díaz-Perez, Juan Carlos , Jesus Bautista, Gunawati Gunawan, and Anthony Bateman. (2018). Sweet Onion (*Allium cepa* L.) as Influenced by Organic Fertilization Rate: 2. Bulb Yield and Quality before and after Storage. HortScience, 53: 459-464.**

### Abstract

There is a growing interest in organic fertilizers because of increased demand for organic sweet onions and other vegetables. There are, however, limited studies on sweet onion bulb yield and quality in response to organic fertilization. The objective of this study was to evaluate the effects of organic fertilizer rate on sweet onion bulb yield and bulb quality before and after storage. Experiments were conducted at the Horticulture Farm, Tifton Campus, University of Georgia, in the Winters of 2012–13 and 2013–14. There were five organic fertilization treatments (organic fertilizer 3–2–3 equivalent to 0, 60, 120, 180, and 240 kg·ha<sup>-1</sup> N). Total and marketable yields and individual bulb weight increased quadratically with increasing organic fertilization rate and responses failed to reach a plateau. The fraction of extra-large bulb increased with increasing organic fertilization rate. Incidence of onion bolting was maximal at 60 kg·ha<sup>-1</sup> N and decreased with increasing organic fertilization rate. The percentage of bulb dry weight was highest in the unfertilized control and decreased with increasing organic fertilization rate. Organic fertilization rate had no consistent impact on bulb soluble solids content (SCC) and pungency (measured as pyruvate concentration) in the two seasons. Total antioxidant capacity (measured as gallic acid equivalents) values were among the lowest at 60 and 120 kg·ha<sup>-1</sup> N. In conclusion, onion bulb yields increased with increasing organic fertilization rate, whereas incidences of bulb diseases responded differently to N rate. Botrytis rot was the main cause of postharvest bulb decay in all organic fertilization rates.

Keywords: /Chicken Manure/ /Soil Fertility/ /Soil Nutrition/ /Sustainable Agriculture/ /Organic Agriculture/

## PEANUTS

**Darko, C., Mallikarjunan, P.K., Celiker, H.K., Frimpong, E.A., Dizisi, K. (2018) .Effects of packaging and pre-storage treatments on aflatoxin production in peanut storage under controlled conditions. Journal of Food Science and Technology, 55 (4): 1366-1375.**

### Abstract

This study reports on aflatoxin production and peanut (Bailey's variety) quality, for four peanut pre-storage treatments; [(Raw clean (Raw-CI), Raw inoculated with *Aspergillus flavus* NRRL 3357 (Raw-Inf), inoculated partially roasted but not-blanched (PRN-blanch); and inoculated partially roasted, blanched with discolored nuts sorted out (PR-blanched)]. All four treated samples were packaged in four different packaging systems [polypropylene woven sacks (PS), hermetic packs (HP), hermetic packs with oxygen absorbers (HPO), and vacuumed hermetic packs (HPV)] and stored under controlled conditions at a temperature of  $30 \pm 1$  °C and water activity of  $0.85 \pm 0.02$ , for 14 weeks. Raw-Inf samples in PS had a higher fungal growth with a mean value of  $8.01 \times 10^4$  CFU/g, compared to the mean values of samples in hermetic packs:  $1.07 \times 10^3$  CFU/g for HP, 14.55 CFU/g for HPO, and 57.82 CFU/g for HPV. Similarly, the hermetic bags were able to reduce aflatoxin level of the Raw-Inf samples by 50.6% (HP), 63.0% (HPV), and 66.8% (HPO). Partial roasting and blanching in PS also reduced aflatoxin level by

about 74.6%. Quality maintenance was the best for peanuts in HPO, recording peroxide value (PV) of 10.16 meq/kg and p-Anisidine (p-Av) of 3.95 meq/kg compared to samples in polypropylene woven sacks which had PV of 19.25 meq/kg and p-Av of 6.48 meq/kg. These results indicate that using zero-oxygen hermetic packaging, instead of the conventional polypropylene woven sacks, helped to suppress aflatoxin production and quality deterioration. Also, partially roasted, blanched and sorted peanuts showed a potential for reducing aflatoxin presence during storage.

Keywords: /Peanuts/Aspergillus flavus/Aflatoxin/Lipid oxidation/Hermetic storage/

## PEARS

**Hui Zhang, Jie Wu, Zhengqiang Zhao, Zhipeng Wang. (2018). Nondestructive firmness measurement of differently shaped pears with a dual-frequency index based on acoustic vibration. *Postharvest Biology and Technology*, 138: 11-18.**

### Abstract

An acoustic setup was developed to simultaneously detect the resonant frequencies  $f_1$  from equator and  $f_2$  from calyx shoulder of pear (*Pyrus bretschneideri* Rehd.). A proposed index based on these two frequencies was used for firmness evaluation of non-spherical pear. We confirmed the stability of this setup by repeatability analysis of acoustic response signal. When predicting the firmness of pears with large difference in fruit shape, the dual frequency index was highly correlated with Magness-Taylor (MT) penetration firmness ( $r = 0.951$ ). Compared with two types of single frequency-based indices, the firmness sensitivity of the dual-frequency index is mostly close to that of MT penetration test. The firmness index can classify pears with a high total accuracy (93.4%), making it suitable for nondestructive detection of firmness of differently shaped pears.

Keywords: /Firmness evaluation/ /Pear/ /Fruit shape/ /Frequency-based index/ /Piezoelectric transducers/ /Acoustic technique/

**Shi, F., Zhou, X., Zhou, Q., Tan, Z., Yao, M., Wei, B., Ji, S. (2018). Membrane lipid metabolism changes and aroma ester loss in low-temperature stored Nanguo pears. *Food Chemistry*, 245: 446-453.**

### Abstract

Cold storage is an effective method used to retard the senescence of Nanguo pears after harvest. However, this causes aroma loss in the fruit. To elucidate the role of membrane lipid metabolism in aroma reduction, we investigated the contents of total aroma esters and major

fatty acid components, the membrane permeability, and the activity and gene expression of key enzymes in membrane lipid metabolism and aroma formation. The results showed that the contents of total aroma esters, oleic acid and linoleic acid, and alcohol dehydrogenase activity were at a lower level in cold stored fruit than that in control fruit. However, the palmitic acid content, membrane permeability, and the activities and gene expression of alcohol acyltransferase, lipoxygenase, phospholipase D, and lipase were higher. In conclusion, the loss of aroma esters may be caused by membrane lipid metabolism disruption during cold storage.

Keywords: /Esters/Nanguo pears/Cold storage/Membrane lipids metabolism/

**Sun, C., Fu, D., Lu, H., Zhang, J., Zheng, X., and Yu, T. 2018. Autoclaved yeast enhances the resistance against *Penicillium expansum* in postharvest pear fruit and its possible mechanism of action. *Biological Control*, 119: 51-58.**

Abstract

The study investigated the effect of autoclaved yeast on the control of blue mold in pear fruit and the possible mechanisms involved. The results demonstrated that autoclaved yeast *Rhodosporidium paludigenum* could stimulate remarkable resistance to the blue mold caused by *Penicillium expansum* in pear fruit. Autoclaved yeast had no direct antifungal activity against *P. expansum* *in vitro* and *in vivo* while it reduced germination of *P. expansum* in fruit wounds after 24 h of treatment. Moreover, the activities of four defense-related enzymes (including superoxide dismutase, catalase, peroxidase and phenylalanine ammonia-lyase) and the four pathogenesis-related protein genes (including *PR1-like*, *endoglucanase9*, *endochitinase-like* and *PR4*) were significantly enhanced and the lipid peroxidation was highly inhibited in the treatment with autoclaved yeast, which was closely related to the mechanism by which autoclaved yeast reduce the blue mold rot in pear fruit. The results from this study provides the basis for further research on the antagonistic mechanism of biocontrol yeasts in induced resistance of harvested fruit.

Keywords: /Autoclaved yeast/ /*Rhodosporidium paludigenum*/ /Pear fruit/ /Induced resistance/ /Blue Mold/

## **PERSIMMON**

**Naser, F., Rabiei, V., Razavi, F., and Khademi, O. (2018). Effect of calcium lactate in combination with hot water treatment on the nutritional quality of persimmon fruit during cold storage. *Scientia Horticulturae*, 233: 114-123.**

Abstract

Quality reduction and quick softening, occurring after harvest, limit shelf-life of persimmon fruit. In the present research, the effects of hot water and calcium lactate treatments on maintaining the firmness and preserving the quality of persimmon fruit during cold storage were investigated. 'Karaj' persimmon was harvested at commercial maturity stage and treated with hot water at three levels of 25 °C for 25 min, 45 °C for 30 min and 50 °C for 20 min, and calcium lactate at three levels of 0, 0.5 and 1%, and their combinations. The treated fruits were then stored at 1 °C with a relative humidity of  $\geq 80\%$ . At 20 and 40 days of the storage, fruits were removed from the refrigerator and some traits were evaluated three days after storage under shelf-life conditions. The evaluated traits were calcium content, firmness, weight loss, soluble tannin content, carotenoid, ascorbic acid, antioxidant capacity, total soluble solids and titratable acidity. The results showed that the amount of calcium in fruit tissue increased only in calcium lactate treatment, and hot water treatment showed a small effect on the trait. The combination of calcium lactate and hot water treatments caused higher effect on maintaining the firmness, controlling weight loss and preserving the quality of fruit when compared to applying each treatment alone. Furthermore, the treatments maintained antioxidant properties of the fruits during cold storage by maintaining the amount of soluble tannin, carotenoid and ascorbic acid contents. Thus, combined treatment of hot water and calcium lactate can be used to enhance antioxidant properties and preserve nutritional quality of persimmon fruits during postharvest storage.

Keywords: /Antioxidant/ /Combined treatment/ /Firmness/ /Persimmon/ /Storability

## POTATO

**Grudzińska M., and Mańkowski DDariusz. (2018). Losses during storage of potato varieties in relation to weather conditions during the vegetation period and temperatures during long-term storage. American Journal of Potato Research, 95 (2), 130-138.**

### Abstract

Degradation of harvested tubers due to water loss, sprouting, and disease can cause severe economic difficulties in the cultivation of potatoes (*Solanum tuberosum*). This study evaluated the storage losses of new varieties of potato and determined the sprouting dates of potatoes stored at different temperatures. Additionally, this study evaluated the influence of weather conditions during the vegetative growth period on the date of sprouting in storage. After storage at three different temperatures (3, 5, and 8 °C), we estimated natural losses and losses caused by sprouting or the development of disease. The potato varieties stored at 3 °C, and 5 °C had similar weight losses (8.8% and 9.3%, respectively), but the potatoes stored at 8 °C had higher losses (10.8%). The average potato losses caused by disease ranged from 0.6% to 10%. The onset of sprouting of potatoes stored at 8 °C depended on the variety and began in the 20 day of December. Storage at 5 °C delayed sprouting by about 50 days compared with storage at 8 °C. Weather conditions (hot and rainy) during vegetative growth of the plants also influenced

sprouting date, natural losses, and the amount of disease during storage. Our data showed a significant correlation between the hydrothermal coefficient during the vegetative period and the date of sprouting of potatoes during storage.

Keywords: /Temperature/ /Weight losses/ /Potato/ /Storage/ /Weather condition/ /Sprouting/

## **RADDISH**

**Chandra, D., Lee, J.S., Choi, H.J., Kim, J.G. (2018). Effects of packaging on shelf life and postharvest qualities of radish roots during storage at low temperature for an extended period. Journal of Food Quality, 2018: 1-12.**

### **Abstract**

To investigate the effects of packaging on the quality aspects of radish, Korean radish roots (*Raphanus sativus* L. var. Kwandong) were stored at 0°C after different packaging treatments such as keeping in paper carton box (control), keeping in plastic crates (PC), packaging with micro perforated HDPE film in PC (HDPE + PC), curing followed by keeping in PC (Curing + PC), and curing followed by packaging with micro perforated HDPE film in PC (Curing + HDPE + PC). Weight losses of radish roots were remarkably lower (<3%) in both HDPE film packaged samples compared to that of control (10%) or without film ( $\approx$ 18%). values, whiteness index, total soluble solids, and flesh and skin firmness were better maintained in Curing + HDPE + PC treatment compared to other treatments. Lower color difference values were also found in this treatment. Both film packaged samples had lower scores of black spot, surface shrinkage, and fungal infection incidence which revealed significantly longer marketable periods. HDPE film packaged samples exhibited longer shelf life more than one and two months compared to control and unpacked samples, respectively. Results suggest that HDPE film packaging can extend postharvest life of radish while curing might have little but beneficial effects in maintaining the quality characteristics. To our knowledge, this is the first report on quality evaluation of Korean radish during an extended storage period simulating the Korean industrial practices.

Keywords: /Radish/ /Postharvest Qualities/ /Storage/

## **STRAWBERRY**

**Oviedo, V., Cabral, Moises, Garay C., and Arredondo, G. (2018). Postharvest quality of strawberry (*Fragaria x ananassa* (Duchesne ex Weston) Duchesne ex Rozier) genotypes according to vernalization. Acta Agron., 67 (2) : 208-214.**

### **Abstract**

Strawberry production in Paraguay is carried out by small producers, using minimal technology and obtaining low productivity, with the need to expand strawberry genotypes and production techniques. The aim of this study was to evaluate fruit quality of strawberry genotypes according to vernalization. A randomized block design with factorial arrangement 14x2 was performed; factors were genotypes and chilling using 15 plants per treatment and three replicates. Plants were kept in cold room at 5°C, with 8 hours of artificial light and 16 of darkness for a period of 25 days. Five fruits were used per treatment and were evaluated as follows: the amount of total soluble solids, titratable acidity and ratio of total soluble solids to titratable acidity, length/diameter ratio, calyx diameter/fruit diameter ratio, peduncle length and mass loss in postharvest. Data obtained were subjected to analysis of variance simple factorial scheme and averages compared by Tukey test at 5% probability. Vernalization of strawberry plants did not affect fruit shape or total soluble solids content, but increased the percentage of citric acid. Length of peduncle and calix extension had achieved an increasing due to vernalization and decreased postharvest loss of fresh mass, but did not affect fruit preservation at 5°C. Festival and Florida Eliane genotypes may be recommended for in natura consumption and Dover and Oso Grande genotypes for industry.

Keywords: /Citric acid/ /Mass loss/ /Temperature/ /Total soluble solids/ /Titratable acidity/

## **TOMATO**

**De, J., Li, Y., Sreedharan, A., Scheneider, R.G., Gutierrez, A., Juabair, M., Danyluk, M.D., Schneider, K.R. 2018 A three-year survey of Florida packinghouses to determine microbial loads on pre- and post- processed tomatoes. Food Control, 86: 383-388.**

### **Abstract**

Prevention of microbial cross-contamination during postharvest handling is an important step to minimize microbial food safety hazards of produce. Dump tanks and flume systems are widely used in many states (e.g., Florida) to transfer/wash tomatoes, and are one of the most critical points where cross- contamination may occur. This study presents data gathered over three years (2013, 2014, and 2015) on tomatoes collected from five growing regions in Florida to evaluate the risk associated with postharvest processing of tomatoes in commercial packinghouses. A total of 840 and 839 composite samples, from pre- and post-processed tomatoes, respectively, were analyzed for aerobic plate count (APC), and total coliforms (TC) and generic E. coli (EC). The least square mean (LSM) value of APC for all samples (both pre- and post-processed) was 6.0 log CFU/tomato (n 1/4 840), whereas the LSM for TC counts was 4.1 log CFU/tomato (n 1/4 839). Ninety-one (10.8%) and 820 (97.7%) out of 839 samples of post-processed samples had TC and generic EC counts below the detection limit of 1.3 log CFU/tomato, respectively. APC and TC counts in post-processed samples were significantly lower ( $p < 0.0001$ ) than those in the pre-processed samples. There was no significant difference

( $p < 0.1011$ ) in the occurrence of generic EC pre- and post-process. APC and TC were significantly higher ( $p < 0.0001$ ) on samples collected in 2014 than 2013 and 2015, while the generic EC levels were not significantly different between 2013 and 2014. All samples collected in 2015 were negative for generic EC. TC counts varied significantly ( $p < 0.0001$ ) by season, with highest counts in summer and lowest in the winter, over the three-year period. APC were significantly ( $p < 0.0001$ ) higher in summer and fall seasons as compare to winter and spring. Microbial loads were significantly higher in the northern sites compared to the southern sites. Tomatoes from site 5 (southernmost) had significantly lower APC and TC ( $p < 0.0001$ ) than recorded from other four sites. Data from this research demonstrated that the postharvest wash treatments used at the packinghouse surveyed in this study effectively reduced the overall microbial load and prevented cross-contamination.

Keywords: /Tomato /Dump tank /Processing /Microbial load /Florida packinghouse/

**Lee, Taehoon, Puligundla, Pradeep, Mok, Chulkyoon. 2018. Intermittent corona discharge plasma jet for improving tomato quality. Journal of Food Engineering, 223: 168-174.**

Abstract

The effectiveness of intermittent corona discharge plasma jet (ICDPJ) treatment over continuous mode for the decontamination of cherry tomatoes was evaluated. Microbial contaminants, namely aerobic bacteria, yeasts and molds and coliform bacteria, were detected in tomatoes in the range of  $2.49 \times 10^5$  log CFU/g. Tomatoes were treated with corona plasmas generated using 8 kV DC power supply and at 2.0 e4.0 A currents. A distance of 60 mm was maintained between the discharge electrode and the sample surface during plasma treatment, with a maximum treatment time of 2 min. In contrast to CDPJ-treated tomatoes in continuous mode, a maximum surface temperature of 33.7 °C and no plasma-induced alterations in tomato color and firmness were observed in ICDPJ-treated tomatoes. The ICDPJ treatment decreased the contaminants loads by  $0.68 \times 10^2$  log CFU/g at 2.0 A, by  $1.42 \times 10^1$  log CFU/g at 3.0 A, and by 2.00 log CFU/g to non-detectable level at 4.0 A. There were no significant differences in terms of taste, flavor, color, texture, and total acceptance scores between the untreated and ICDPJ-treated samples for 2 min at 2.0, 3.0, and 4.0 A. During storage at 25 °C for 15 days, the samples treated using the ICDPJ at 3.0 and 4.0 A currents exhibited significant extension of shelf life for up to 10 e15 days, in contrast to untreated controls (6 days).

Keywords: /Corona discharge plasma/ /Intermittent mode/ /Cherry tomato/ /Decontamination/ /Kinetic modeling/ /Storage quality/

**Pieczywek, P.M., Nowacka, M., Dadan, M., Wiktor, A., Rybak, K., Rajchert, D.W., and Zdunek, A. (2018). Postharvest monitoring of tomato ripening using the dynamic laser speckle. Sensors, 18 (4) : 1-20.**

## Abstract

The dynamic laser speckle (biospeckle) method was tested as a potential tool for the assessment and monitoring of the maturity stage of tomatoes. Two tomato cultivars—Admiro and Starbuck—were tested. The process of climacteric maturation of tomatoes was monitored during a shelf life storage experiment. The biospeckle phenomena were captured using 640 nm and 830 nm laser light wavelength, and analysed using two activity descriptors based on biospeckle pattern decorrelation— $C4$  and  $\epsilon$ . The well-established optical parameters of tomatoes skin were used as a reference method (luminosity,  $a^*/b^*$ , chroma). Both methods were tested with respect to their prediction capabilities of the maturity and destructive indicators of tomatoes—firmness, chlorophyll and carotenoids content. The statistical significance of the tested relationships were investigated by means of linear regression models. The climacteric maturation of tomato fruit was associated with an increase in biospeckle activity. Compared to the 830 nm laser wavelength the biospeckle activity measured at 640 nm enabled more accurate predictions of firmness, chlorophyll and carotenoids content. At 640 nm laser wavelength both activity descriptors ( $C4$  and  $\epsilon$ ) provided similar results, while at 830 nm the  $\epsilon$  showed slightly better performance. The linear regression models showed that biospeckle activity descriptors had a higher correlation with chlorophyll and carotenoids content than the  $a^*/b^*$  ratio and luminosity. The results for chroma were comparable with the results for both biospeckle activity indicators. The biospeckle method showed very good results in terms of maturation monitoring and the prediction of the maturity indices of tomatoes, proving the possibility of practical implementation of this method for the determination of the maturity stage of tomatoes.

Keywords: /Biospeckle/ /Optical sensor/ /Video processing/ /Tomato/ /Maturation/ /Shelf life/ /Postharvest quality/

## FRUITS AND VEGETABLES

**Cao, S., Yang, Z., Pareek, S., 2018. Tropical and subtropical fruits: postharvest biology and storage. *Journal of Food Quality*, 2018: 1-2.**

## Abstract

Li et al. clone one PLD $\alpha$  gene from banana fruit, which shows an increasing trend during fruit ripening, thereby leading to the damage of cell-membrane integrity and senescence of postharvest bananas. [...]due to cell-membrane lipid peroxidation and polyphenol oxidation, the inherent perishability of these fruit has been considered as a serious problem, resulting in fruit browning or fungal infection in the first week after harvested from orchard, which greatly impairs economic chain of fruit agriculture. Low temperature storage is an effective method to retard ripening and senescence; however, many tropical and subtropical fruit will develop chilling injury

and be sensitive to fungal invasion. [...]better understanding of postharvest physiology of tropical and subtropical fruit and the development of adequate postharvest technologies are vital for successful handling and long distance transport.

Keywords: /Tropical and subtropical fruits/Postharvest technologies/Storage

**Kyriacou, Marios C., and Roupael, Youssef. (2018). Towards a new definition of quality for fresh fruits and vegetables. *Scientia Horticulturae*, 234: 463-469.**

Abstract

The quality of fruits and vegetables constitutes a dynamic composite of their physicochemical properties and consumer perception. Attempts at defining quality often discriminate between intrinsic characteristics inherent to the nature of the products, dictated by genotypic, agro environmental and postharvest factors, and extrinsic characteristics influenced by socioeconomic and marketing factors which condition consumer perception of the products and formulate quality standards. The current regulatory context for fruit and vegetable quality comprises crop-specific class standards based on key visual and limited compositional criteria and lays primary emphasis on visual attributes at the expense of flavour, nutritional and functional attributes related to phytonutrient content. The potential quality of fresh fruits and vegetables in the horticultural supply chain is defined in the period preceding harvest, however the full development of quality characteristics can be optimized through the use of appropriate postharvest technology. The current review provides a discourse on the relative significance of the various factors configuring quality in fruits and vegetables, with emphasis on intrinsic factors pertaining to the preharvest period, and also on extrinsic factors shaping quality for supply chain stakeholders and consumers. Preharvest factors discussed include: 1) optimization of stage-specific production inputs, 2) biofortification through targeted plant nutrition, 3) application of accurate crop- and cultivar-specific harvest maturity indices, 4) optimized application of controlled stress conditions that increase primary and secondary metabolites and improve organoleptic and functional aspects of quality, and 5) redirection of horticultural breeding towards improving flavour in horticultural products.

Keywords: /Biofortification/Functional quality/Genetic improvement/Phytochemicals/Positive stress/ Postharvest/Quality standards /Sensory perception

**Pershakova, T.V., Kupin, G.A., Kabalina, D.V., Mikhaylyuta, L.V., Gorlov, S.M., Babakina, M.V. 2018. Studying the antagonistic properties of *Bacillus subtilis* bacteria to pathogens of fruits in in vitro and in vivo experiments. *Journal of Pharmaceutical Sciences and Research*, 10: 920-925.**

Abstract

The antagonistic properties of bacterial strains *Bacillus subtilis* to apple phytopathogens *Phytophthora cactorum*, *Botrytis cinerea*, *Penicillium glaucoma*, *Erwinia carotovora* have been studied in in vitro and in vivo experiments. The antagonistic properties of bacteria strains *Bacillus subtilis* were assessed using the method of agar blocks based on measuring the zone of tested pathogens' growth inhibition. It has been established that strain *Bacillus subtilis* IPM 215 is more efficient against the studied pathogens. Dependence of the dynamics of the population of *Bacillus subtilis* strain IPM 215 on the temperature of the phytopathogen species, and the influence of *Bacillus subtilis* concentration and storage temperature on the incidence and the diameter of lesion caused by *Phytophthora cactorum* and *Botrytis cinerea* have been established. The research substantiates the use of strain *Bacillus subtilis* IPM 215 for obtaining preparations for biological monitoring of diseases caused by phytopathogenic microorganisms during apples' storage.

Keywords: /Biological monitoring/ phytopathogens/fruit disease occurrence rate/ storage/