

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

**FRESH CUT**

Finnegan, Elizabeth, David O' Beirne. 2015., Characterising and tracking deterioration patterns of **fresh-cut** fruit using principal component analysis. *Postharvest Biol. Technol.* 100: 73 – 83.

**Abstract**

Principal component analysis (PCA) was used to characterise quality deterioration patterns in fresh-cut pineapple, strawberry, kiwifruit and cantaloupe melon during storage. Twenty-seven physiological, biochemical, microbial and sensory attributes, reported as indices of quality, were used to successfully characterise and track deteriorative changes. Freshness for all fruit was characterised by PCA as excellent visual appearance, aroma and firmness. Deterioration was characterised, for the most part, by increased tissue breakdown (exudate and cell permeability levels), firmness loss, increased off-odour development, colour loss (browning and translucency) and high microbial counts. Effects of cultivar and geographic origin were apparent in some fruit. PCA has the potential to track the effects of intrinsic and extrinsic factors of deterioration during storage and could form the basis of future strategies to optimise quality.

**Keywords:** /Fresh Cut/ /Minimally Processed/ /Quality/ /Modified Atmosphere Packaging/

\_\_\_\_\_. 2015. Characterising deterioration patterns in **fresh-cut** fruit using principal component analysis. II: effects of ripeness stage, seasonality, processing and packaging. *Postharvest Biol. & Technol.* 100: 91 – 98.

**Abstract**

Previous work has demonstrated the benefits of principal component analysis (PCA) in characterising and tracking processes of deterioration in fresh-cut fruit, and illustrating differences due to growing region and cultivar. In this study, use of PCA showed significant effects of season, stage of ripeness ( $p < 0.05$ ), cut size, packaging materials, storage temperature and time ( $p < 0.01$ ) for a range of fresh-cut fruit. PCA plots were effective in characterising patterns of deterioration and in tracking differences in quality, in terms of the rates and extent of change. Some of the effects studied were large and may form the basis for optimising raw materials, processing and packaging of several fresh-cut fruit. Differences in shelf-life of up to three days could be attributed to seasonal variation. Reduced process severity increased shelf-life by up to four days, while optimal packaging increased shelf-life by about three days.

**Keywords:** /Fresh Cut/ /Quality/ /Firmness/

## **FRESH PRODUCE**

Bekhrdi, F. et.al. 2015. Effect of deficit irrigation on the postharvest quality of different genotypes of basil including purple and green Iranian cultivars and a Genovese variety. *Postharvest Biol. & Technol.* 100: 127 – 135.

### **Abstract**

Fresh basil (*Ocimum basilicum* L.) has become increasingly popular in recent years because of its superior flavour and good visual quality compared with the dry product. Water resources need to be used efficiently because of the limited water resources for agricultural uses, particularly in arid areas. In this study, the postharvest quality of different genotypes of basil including the purple and green Iranian cultivars and the Genovese variety grown under mild and severe deficit irrigation (25 DI and 50 DI, respectively) compared with a control (100% of the field capacity, FC) were evaluated. As expected, the highest yield was obtained for the control irrigation water while both DI decreased the yield. The respiration rate of the Iranian cultivars was double that of the Genovese variety, increasing with deficit irrigation but only significantly in the Genovese variety. Deficit irrigation did not preserve the sensory quality characteristics such as darkening, dehydration and aroma during storage better than the control irrigation water. Chlorophyll fluorescence did not show significant differences between irrigation water treatments. Antioxidant capacity increased when deficit irrigation was increased. These results show that basil as a fresh herb can be cultivated with less water without decreasing the quality characteristics. Deficit irrigation improves sustainability because of the water scarcity in many Mediterranean areas. However, the combination of adequate amounts of irrigation water applied and suitable cultivars is considered essential.

**Keywords:** /Basil/ /Postharvest/ /Quality/ /Respiration/

## **HORTICULTURAL RESEARCH**

Aldous, D.E. 2014. Research opportunities into horticulture and green open space management in the Middle East. *Acta Hort* 1051: 77 – 90.

### **Abstract**

Horticulture has long been recognized as a source of fresh and processed food and drink as well as a source of clothing, building materials, dyes, perfumes, medicines and pharmaceutical products. Horticulture also offers services associated with landscape restoration, landscape design, construction and maintenance, conserving plant biodiversity, vegetation regeneration, and the management of a number of green open space facilities, all of which provide a range of environmental, social, economic and health benefits that enhance the liveability and livelihood of a region and improve the quality of life of its residents and the wider community. Green open space has been the conduit in measuring and delivering many of these benefits with green open space management the means of managing these urban green open spaces. The modality of horticulture has been used to suggest some green research opportunities that should improve the environmental, economic, social and human health of these spaces through sustainable management.

**Keywords:** /Horticultural Research/

## **POSTHARVEST EDUCATION**

Hewett, E.W. 2014. Postharvest research for quality horticultural products. *Acta Hort.* 1051: 63 – 70.

### **Abstract**

More than 1.3 billion tonnes of food is lost or wasted annually. Of this 44% is wasted in developed countries (most in the production, distribution and consumption phases) while 40% is lost in developing countries (most in the production, postharvest and processing phases). Postharvest science and technology has been dramatically underfunded internationally compared production science, and funding for high value horticultural crops has received <5 of that used for traditional grain and legume crops. Recognition of the health and nutritional benefits of horticultural crops is well recognised. However fruit and vegetables are very perishable with a relatively short life. This means that great attention has to be given to growing the right crop in the right place, harvesting, handling, packaging, storing and transporting it right such that consumers needs are satisfied, they are confident that they are buying safe and nutritious products so that they will return for repeat purchases. A successful supply chain from the grower to the customer will ensure profits are made and consumer satisfaction is assured. A combination of key pre- and postharvest factors affects product quality including: appropriate cultivars for consumer acceptance and for performance in specific soil conditions; balanced nutrition and water management; creation of suitable architectural structures; harvesting at the correct maturity; handling to avoid physical damage; removing field heat and storing at an optimised temperature; grading and segregating product for sending to into different markets; packing for preservation, protection and promotion; preventing postharvest pathogens by relevant hygiene and sanitation processes; education and training of staff. Growers and other supply chain participants have to make a profit to survive so it essential to satisfy the customer at all times by providing high quality, nutritious and safe fruit and vegetables. Some key aspects of these factors will be discussed.

**Keywords:** /Postharvest Education/ /Preharvest Factors/ /Harvest Maturity/ /Ethylene/ /Packaging/

## **POSTHARVEST LOSSES**

Al-Harbi, A.R. 2014. Improving the performance of horticultural crops in the Gulf cooperation council countries through research. *Acta Hort.* 1051: 39 – 44.

### **Abstract**

Environmental stresses represent the most important limiting conditions for horticultural productivity and plant exploitation worldwide, particularly in arid and semi-arid areas. At this time we need to develop more of applied research from which new and innovative agriculture analysis and technologies will emerge. This article highlights and describes some of the problems facing the production of horticultural crops in the Gulf Cooperation Council (GCC) and how to overcome them through scientific research and applied research experiences. In this context, I will discuss several points, including water scarcity, environmental stress, postharvest losses, and the use of renewable energy in agriculture.

**Keywords:** /Postharvest Losses/

## MYCOTOXINS

Calado, Thalita, Armando Venancio and Luis Abrunhosa. 2014. Irradiation for mold and mycotoxin control: a review. *Comprehensive Rev. Food Sci. & Food Safety*. 13: 1049 – 1061.

### Abstract

The mycotoxin issue requires constant vigilance from economic, regulatory, and scientific agents to minimize its toxicological effects on human and animals. The implementation of good practices to avoid fungal growth and mycotoxin production on agricultural commodities is essential to achieve most restrictive safety standards; however, the contribution of novel technologies that may act on post harvesting and post storage situations may be equally important. Several methodologies, more or less technologically advanced, may be used for this purpose. In this work, we review the role, contribution, and impact of irradiation technology to control the presence of fungi and mycotoxins in food and in feed. The effect of this technology on the viability of mold spores and on the elimination of mycotoxins is reviewed. A critical evaluation of the advantages and disadvantages of irradiation in this context is presented.

**Keywords:** /Mycotoxins/ /Irradiation/

## PESTICIDE RESIDUES

Ewa Szpyrka, Ewa. 2015. Evaluation of pesticide residues in fruits and vegetables from the region of South-Eastern Poland. *Food Control*. 48: 137 – 142.

### Abstract

According to the World Health Organization, consumption of fruit and vegetables in Europe constituted over 30% of consumer diet. Fruits and vegetables are good sources of vitamins, minerals, fibre, and antioxidants. Besides their nutrient value, these products can be a source of toxic substances i.e. pesticide residues. The aim of this study was to determine the presence of pesticide residues in Polish fruits and vegetables and to assess if these residues pose a risk to the health of the consumer. Furthermore, compliance with legal regulations concerning the use of plant protection products in crop cultivation was ascertained. In 2010e2012, 1026 unprocessed samples of fruits and vegetables were analysed. Pesticide residues were found in 376 samples (36.6% of tested samples). In 18 samples (1.8%), residues exceeded Maximum Residue Limits. In 28 (2.7%) samples, substances not recommended for a given crop were detected. The highest values of long-term exposure were found for dimethoate residue in apples (1.7% ADI, adults; 6.8% ADI, children). For most detected pesticides, long-term exposures were below the values of 1% ADI for adults and 3% ADI for children. The highest values of short-term exposure were obtained in the case of consumption of apples with azoxystrobin (4.5% ARfD, adults; 13.3% ARfD, children).

**Keywords:** /Pesticide Residues/ /Fruits/ /Vegetables/

## **FRUITS**

### **BANANA**

Bazie Setu, Amare Ayalew, and Kebede Woldetsadik. 2014. Integrated management of postharvest **banana** anthracnose (*Colletotrichum musae*) through plant extracts and hot water treatment. Crop Prot. 66: 14 – 18.

#### **Abstract**

The aim of the present study was to determine the integrated effect of plant extracts and hot water treatment on postharvest anthracnose and banana fruit quality. Artificially inoculated banana fruit were dipped in 10% and 20% (w/v) extracts of four plant species, viz. *Acacia albida*, *Argemone mexicana*, *Dovalis abyssinica* and *Prosopis juliflora* at room temperature (20 °C), 45 °C and 50 °C. Fruit treated separately with 20% extracts of *A. albida* and *P. juliflora* at 50 °C had reduced anthracnose incidence and severity. These treatment combinations also had the highest percentage of marketable ripe banana fruits. In conclusion, applying aqueous plant extracts at 50 °C enhanced the antifungal activity of extracts without affecting the physico-chemical properties of banana.

**Keywords:** /Banana / /Anthracnose/ /Fruit Quality/ /Hot Water Treatment/

Maia, Victor Martins, et.al. 2014. Physical and metabolic changes induced by mechanical damage in 'dwarf-prata' **banana** fruits kept under cold storage. Australian J. Crop Sci. 8(7): 1029 – 1037.

#### **Abstract**

The purpose of this work was to demonstrate the physical and metabolic alterations induced by mechanical damage on 'Dwarf-Prata' banana fruits kept under low temperature (15 °C and 89 % of RH). A split plots in time assay within a randomized complete block design with three replications was used, constituted of control and four mechanical injuries: cut, abrasion, impact and compression, with samplings along time. Evaluated characteristics were: percentage of accumulated weight loss, daily rate of weight loss, electrolyte leakage of the damaged peel region, soluble sugars and starch, respiration, ethylene production and enzymatic activity of polyphenol oxidase (PPO) and peroxidase (POD). The percentage of accumulated weight loss, the daily rate of weight loss, respiration and ethylene production were determined daily on duplicate samples, consisting of three fruits. Electrolyte leakage, soluble sugar levels and starch and the PPO and POD enzymes activities were determined at 1, 3, 5, 8 and 11 days after the mechanical injuries treatments. The results show that all fruits subjected to mechanical injury increase weight loss (%), electrolyte leakage (%) and PPO average activity, also showing accelerated peel color evolution rate and anticipated climacteric peak, compared to control. The damage caused by abrasion caused higher accumulated weight loss (%). The starch conversion to soluble sugars in the pulp was affected by impact damage. The impact and compression damages anticipated climacteric ethylene peak and, consequently, fruit ripening. The impact damage greatly increased PPO and POD activities.

**Keywords:** /Banana/ /Mechanical Damage/ /Cold Storage/

## **BAYBERRY**

Huan, Cheng, et al. 2015. Differentiation of the volatile profiles of Chinese **bayberry** cultivars during storage by HS-SPME–GC/MS combined with principal component analysis. *Postharvest Biol. & Technol.* 100: 59 – 72.

### **Abstract**

The changes of the volatiles in different Chinese bayberry (*Myrica rubra*) fruit ('Biqi', 'Dongkui' and 'Fen-hongzhong') in different storage conditions were observed and characterized using headspace solid phase micro extraction (HS-SPME) combined with gas chromatography–mass spectrometry (GC–MS). The volatile profiles at different storage conditions can be used for freshness evaluation during storage. 82 volatile compounds (including aldehydes, alcohols, acids, esters, terpenes and others) were identified and there were significant differences in the composition of volatiles among different cultivars. Principal component analysis (PCA) based on the GC–MS data was used to identify the important volatile compounds that contributed to the differentiation of the different bayberry cultivars under different storage conditions. On the basis of PCA, it has been possible to classify the bayberry fruit into several different groups according to the different cultivars and storage phases. The volatile compounds associated with flavor differentiation were also observed. The volatiles (A6, B9, and F11 for the 'Biqi' cultivar; D1 and E13 for the 'Dongkui' cultivar; E1, E2, and E6 for the 'Fenhongzhong' cultivar) could be of potential use for freshness evaluation.

**Keywords:** /Bayberry/ /Storage/

## **CITRUS**

Ma, Gang, et al. 2015. Effect of the combination of ethylene and red LED light irradiation on carotenoid accumulation and carotenogenic gene expression in the flavedo of **citrus** fruit. *Postharvest Biol. & Technol.* 99: 99 – 104.

### **Abstract**

The effects of ethylene and red light-emitting diode (LED) light (660 nm) on the accumulation of carotenoid and expression of genes related to carotenoid biosynthesis were investigated in the flavedo of Satsuma mandarin. The results showed that the contents of  $\beta$ -cryptoxanthin, all-trans-violaxanthin, 9-cis-violaxanthin and lutein were simultaneously increased along with the total carotenoid accumulation by the red LED light. With the ethylene treatment, the contents of  $\beta$ -carotene and  $\beta$ -cryptoxanthin were increased, while the content of lutein was decreased in the flavedo. The suppression of lutein accumulation by ethylene was inhibited when the ethylene treatment was performed under the red LED light. With the combination of ethylene and red LED light treatments, the contents of  $\beta$ -cryptoxanthin and lutein were simultaneously increased. Gene expression results showed that simultaneous increases in the expression of CitPSY, CitPDS, CitZDS, CitCRTISO, CitLCYb1, CitLCYb2, CitLCYe, CitHYb, and CitZEP contributed to the accumulation of  $\beta$ -cryptoxanthin and lutein in the treatment of ethylene combined with red LED light. The results presented might provide new strategies to enhance the commercial and nutritional value of citrus fruit.

**Keywords:** /Citrus/ /Irradiation/ /Ethylene

Shao, Xingfeng, et al. 2015. Effect of postharvest application of chitosan combined with clove oil against citrus green mold. *Postharvest Biol. & Technol.* 99: 37 – 43.

#### **Abstract**

The antifungal activity of chitosan combined with clove oil against *Penicillium digitatum*, the causal agent of citrus green mold, was tested in vitro and in vivo. Chitosan combined with clove oil inhibited mycelia growth more than individual treatments, which was related to the greater release of cellular material and the largest alterations in hyphal morphology of *P. digitatum*. However, compared to chitosan alone, 1% chitosan coatings combined with various amounts of clove oil (0.5, 1 or 2 mL/L) showed no greater ability in controlling decay development on artificially inoculated citrus fruit. 1% chitosan combined with 0.5 mL/L clove oil appeared to slightly reduce lesion diameter and enhanced the activities of defense enzymes, including chitinase and phenylalanine ammonia-lyase at the later stages of incubation. This study indicated that the synergistic antifungal activity of chitosan-clove oil observed in in vitro studies was not found in in vivo tests. Therefore, the data suggest that a coating of 1% chitosan alone, not combined with clove oil, can effectively contribute to the control of green mold on citrus fruit.

**Keywords:** /Citrus/ /Chitosan/ /Satsuma mandarin/ /Green mold/

Waewthongrak, Waewruedee, Supachai Pisuchpen, and Wichitra Leelasuphakul. 2015. Effect of *Bacillus subtilis* and chitosan applications on green mold (*Penicillium digitatum* Sacc.) decay in citrus fruit. *Postharvest Biol. & Technol.* 99: 44 – 49.

#### **Abstract**

The suppression of green mold postharvest caused by *Penicillium digitatum*, was evaluated in mandarin fruit after application of *Bacillus subtilis* ABS-S14 endospores, a crude extract from its culture medium, cyclic lipopeptide antibiotics (CLPs) and chitosan. Their abilities to elicit the accumulation of the plant defense related enzymes; peroxidase (POX) and l-phenylalanine ammonia-lyase (PAL) were also tested. Both *B. subtilis* ABS-S14 endospores and a crude extract from its growth medium showed strong antagonistic activities against *P. digitatum*. The HPLC profiles of the crude extract indicated that the antifungal compounds produced by this strain of *B. subtilis* consisted of three clusters of the iturin A, fengycin and surfactin families of CLPs. The in vitro and in vivo inhibitory effects of the partially purified iturins and fengycins on retardation of the growth of *P. digitatum* were demonstrated, whereas the surfactins had no direct effect. Efficacy tests, using bacterial endospores, the crude extract and chitosan showed a significant reduction of fruit decay compared to those found in the presence of individual CLPs, and it was clearly demonstrated that the *B. subtilis* ABS-S14, itself and its crude extract and chitosan each induced the activities of POX and PAL in the infected flavedo tissues of mandarin fruit. They also co-enhanced the protection of fruit from the green mold pathogen *P. digitatum*.

**Keywords:** /Citrus/ /Chitosan/ /Green Mold/

## GRAPES

Qin, Xiajie, et.al. 2015. Biocontrol of gray mold in grapes with the yeast *Hanseniaspora uvarum* alone and in combination with salicylic acid or sodium bicarbonate. *Postharvest Biol. & Technol.* 100: 160 – 167.

### Abstract

The yeast *Hanseniaspora uvarum* alone or in combination with salicylic acid or sodium bicarbonate was investigated for control of gray mold, postharvest quality and antioxidant enzymes of grapes. The results indicated that the treatment of *H. uvarum* suspension of  $1 \times 10^8$  CFU mL<sup>-1</sup> combined with either 2 mmol L<sup>-1</sup> SA or 2% SBC resulted in a remarkably improved control of *Botrytis cinerea* infections on grapes. Disease incidence and lesion diameter in treated fruit by *H. uvarum* alone or combined with SA or SBC were significantly lower than those of the control fruit ( $P < 0.05$ ) at 25°C, RH 90–95%. Integration of *H. uvarum* with SA and with SBC both significantly reduced the browning index, the decay incidence, weight loss while maintained the fruit appearance, firmness, total soluble solids (TSS) and titratable acidity (TA) of the grapes ( $P < 0.05$ ) at  $2 \pm 1^\circ\text{C}$ , RH 90–95%. Furthermore, the combination of yeast and afore mentioned chemicals led to increases of peroxidase (POD), superoxide dismutase (SOD), catalase (CAT), phenylalanine ammonia lyase (PAL), ascorbate peroxidase (APX) and polyphenoloxidase (PPO) activities. Enhanced control by SA or SBC could be due to either induced resistance or direct effects of these chemicals on *Botrytis*. The proper combination of *H. uvarum* and chemical reagent can thus provide an effective strategy to reduce postharvest decay of grape berries.

**Keywords:** /Grapes/ /Biocontrol/ /Gray Mold/ /*Botrytis Cinerea*/

## GRAPEFRUIT

Lado, Joanna, et.al. 2014. Involvement of lycopene in the induction of tolerance to chilling injury in grapefruit. *Postharvest Biol. & Technol.* 100: 176 – 186.

### Abstract

Grapefruit are among the more sensitive Citrus varieties likely to develop chilling injury (CI) symptoms during postharvest storage at low temperatures. Comparative observations of the incidence of CI in fruit of white Marsh (MSH) and red Star Ruby (SR) grapefruit during postharvest storage at 2 °C plus 7 days at 20 °C to simulate shelf-life revealed that (1) the former was consistently more sensitive to CI, developing cold damage uniformly throughout the whole rind surface, and (2) more strikingly, CI symptoms in fruit of SR grapefruit were restricted to the yellow areas of the rind and the red-colored zones were almost absent of cold damage. This tolerance to CI in red flavedo was associated with high carotenoid (x2) and lycopene (x14) contents, as compared with yellow-colored flavedo. Absence of chilling damage in red areas of SR grapefruit rind was confirmed by cellular ultrastructure observations, in which these epidermal cells were intact, with a well-defined structure and compact vacuoles filled with content. Cells of yellow-colored tissue developing CI, were collapsed, with a contracted vacuole and shrinking organelles. To explore whether the tolerance to CI in red areas of grapefruit rind was due to an elevated lycopene concentration, chemical and environmental stimulation of this carotenoid was performed in fruit of both grapefruit varieties. Application of the inhibitor of the lycopene cyclase activity, CPTA (2-(4-chlorophenylthio) triethylamine hydrochloride) induced red coloration, increased lycopene accumulation (x32) and significantly delayed development of CI symptoms in the rind the CI-

sensitive MSH. Bagging of SR grapefruit enhanced a homogenous red coloration and substantially induced lycopene accumulation (x75). CI symptoms in bagged fruit were notably delayed and reduced, as compared with non-bagged yellow fruit, upon subsequent storage at 2°C for up to 58 days and 7 days at 20 °C. Analysis of the expression of ethylene biosynthetic genes (ACS1, ACS2 and ACO) revealed a significant induction in chilling-damaged tissue of both varieties that was almost absent in red chilling-tolerant tissue. Similarly, accumulation of transcripts of the ethylene receptors ETR1 and ETR3 were also associated with chilling damage, but a cold factor appears to also mediate the expression of these genes. Taken together, our results indicate that high lycopene concentration appears to be responsible for the induction of tolerance to chilling in the red-colored areas of the flavedo of grapefruit during postharvest storage at low temperatures.

Keywords: /Grapefruit/ /Ethylene

## LIME

Kaewsuksaeng, Samak, et al. 2015. Postharvest heat treatment delays chlorophyll degradation and maintains quality in Thai **lime** (*Citrus aurantifolia* Swingle cv. Paan) fruit. *Postharvest Biol. & Technol.* 100: 1 – 7.

### Abstract

Postharvest heat treatments by using hot water were applied to Thai lime fruit (*Citrus aurantifolia* Swingle cv. Paan) to investigate their effect on chlorophyll (Chl)-degradation and postharvest quality during storage. Mature green lime fruit were treated with water at ambient temperature (control) or with hot water at 50°C for 3 and 5 min and then kept at 25°C in darkness. The results showed that hot water treatment at 50°C for 5 min efficiently delayed the decrease of hue angle values and the contents of Chl a. Activities of Chl-degrading enzymes including chlorophyllase, Chl-degrading peroxidase and pheophytinase as well as Mg-dechelation activity in lime fruit were reduced by hot water treatments. This reduction was more pronounced in fruit treated by hot water for 5 min than in those treated for 3 min. Moreover, heat treatments prolonged storage life by 5 days in fruit treated for 3 min and by 10 days in fruit treated for 5 min. Hot water treatment at 50°C for 5 min maintained the highest total acidity and delayed the increase of total soluble solids contents during storage. Respiration rate and ethylene production were also reduced by the heat treatments. In conclusion, these results suggest that hot water treatment at 50°C for 5 min could be a useful method to delay Chl degradation and to maintain postharvest quality in mature green lime during storage at 25°C.

Keywords: /Lime/ /Heat treatment/ /Postharvest/ /Quality/ /Chilling Injury/

## MANDARIN

Zhu, Feng et al. 2015. Effects of exogenous 24-epibrassinolide treatment on postharvest quality and resistance of Satsuma **mandarin** (*Citrus unshiu*). *Postharvest Biol. & Technol.* 100: 8 – 15.

### Abstract

To elucidate the effects of exogenous brassinosteroids (BRs) treatment on the postharvest behavior of citrus fruit, Satsuma mandarin (*Citrus unshiu*) fruit were treated with 5 mg L<sup>-1</sup> 24-epibrassinolide (EBR) and stored at 12–16°C with a relative humidity of 90–95%. After 50 d treatment,

the disease incidence of the control and EBR-treated fruit was 18.7% and 4%, respectively, suggesting that EBR treatment can significantly enhance the postharvest biotic stress tolerance of Satsuma mandarins. Moreover, the fruit quality analysis revealed that EBR treatment induced a rapid weight loss during the first 6 d after treatment, which was similar to the effect of a conditioning treatment, while it exhibited no negative effects on inner quality. Further, we measured the contents of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and the primary metabolites as well as the expression of the stress-related genes in the fruit pericarp. The results indicated that H<sub>2</sub>O<sub>2</sub> content was significantly increased by EBR treatment. In addition, analyses on the primary metabolites showed that some stress-related metabolites, such as ornithine, proline, GABA, d-xylose and d-galactose, were increased in the EBR-treated fruit. Expression of the stress-related genes was markedly up-regulated in EBR-treated fruit. These results suggest that the effects of EBR on reducing the postharvest disease incidence of citrus fruit may be associated with the accumulation of H<sub>2</sub>O<sub>2</sub> and stress-related metabolites and the induction of stress-related genes.

**Keywords:** /Mandarin/ /Fruit storage/ /Fruit Quality/ /Rot control/

## **MANGO**

Nordey, Thibault, et al. 2014. Spatial and temporal variations in **mango** colour, acidity, and sweetness in relation to temperature and ethylene gradients within the fruit. *J. Plant Physiol.* 171: 1555 – 1563.

### **Abstract**

Managing fruit quality is complex because many different attributes have to be taken into account, which are themselves subjected to spatial and temporal variations. Heterogeneous fruit quality has been assumed to be partly related to temperature and maturity gradients within the fruit. To test this assumption, we measured the spatial variability of certain mango fruit quality traits: colour of the peel and of the flesh, and sourness and sweetness, at different stages of fruit maturity using destructive methods as well as vis-NIR reflectance. The spatial variability of mango quality traits was compared to internal variations in thermal time, simulated by a physical model, and to internal variations in maturity, using ethylene content as an indicator. All the fruit quality indicators analysed showed significant spatial and temporal variations, regardless of the measurement method used. The heterogeneity of internal fruit quality traits was not correlated with the marked internal temperature gradient we modelled. However, variations in ethylene content revealed a strong internal maturity gradient which was correlated with the spatial variations in measured mango quality traits. Nonetheless, alone, the internal maturity gradient did not explain the variability of fruit quality traits, suggesting that other factors, such as gas, abscisic acid and water gradients, are also involved.

**Keywords:** /Mango/ /Temperature/ /Ethylene

## **MEDLAR FRUIT**

Selcuk, Nurten, Mustafa Erkan. 2015. The effects of modified and palliflex controlled atmosphere storage on postharvest quality and composition of 'Istanbul' **medlar fruit**. *Postharvest Biol. & Technol.* 99: 9 – 19.

### **Abstract**

Medlar (*Mespilus germanica* L. cv. Istanbul) fruit were stored in palliflex controlled atmosphere storages systems of 21% O<sub>2</sub>+ 0.03% CO<sub>2</sub>(PL-1, control), 2% O<sub>2</sub>+ 5% CO<sub>2</sub>(PL-2), 3% O<sub>2</sub>+ 10% CO<sub>2</sub>(PL-3) and modified atmosphere packaging (MAP) at 0°C for 60 days to determine the effects of different O<sub>2</sub> and CO<sub>2</sub> concentrations on physiological properties, quality attributes and storability. Every 15 days, three replicates of each treatment were evaluated for weight loss, fruit firmness, decay, external browning index, skin color, pH, titratable acidity, total soluble solids, total phenolics, total flavonoids, total condensed tannins, ascorbic acid, antioxidant activity and organic acid and sugar contents. Taste analysis of the fruit was performed after 30, 45 and 60 days of storage. The CO<sub>2</sub> and O<sub>2</sub> concentrations created by the MAP stabilized at 7% and 14%, respectively. Weight loss of fruit stored in MAP was lower (<0.4% at 60 days) than for other treatments. Off-flavors were not detected in any treatment. Storage of medlar fruit under PL-3 was the least effective treatment in delaying fruit ripening (flesh firmness). The incidence and severity of browning, loss of skin color (Ch<sup>o</sup>) and retaining acceptable taste during 60 days were found the most effective in PL-2 and PL-1 compared to other treatments. Fruit pH increased and titratable acidity decreased during the storage period. Total soluble solids and sugar contents first increased then decreased in all treatments by the end of storage. The fruit stored in PL-2 had higher titratable acidity, total soluble solids and sugar contents than fruit stored in PL-1, PL-3 and MAP at all evaluations. Concentrations of total phenolics, total flavonoids, total condensed tannins, ascorbic acid, associated antioxidant activity and organic acids were affected by the storage atmosphere, decreased during storage. The concentrations of total phenolics, total flavonoids, and antioxidant activity were found the highest in PL-2, PL-1 and MAP treatments, respectively. However, in terms of ascorbic acid and total condensed tannins retention, PL-2 was the most effective treatments. The results indicated that 60 days storage of medlar fruit in the palliflex storage system at 0°C maintained physiological and biochemical properties of medlar fruit.

**Keywords:** /Medlar fruit/ /Modified atmosphere/ /Antioxidant/ /Fruit Quality /

## MUSKMELON

Ge, Yonghong, et al. 2015. Postharvest ASM dipping and DPI pre-treatment regulated reactive oxygen species metabolism in muskmelon (*Cucumis melo* L.) fruit. *Postharvest Biol. & Technol.* 99: 160 – 167.

### Abstract

Pink rot caused by *Trichothecium roseum* is one of the most important postharvest diseases of muskmelon. The present study was to evaluate how disease resistance in muskmelon fruit (*Cucumis melo* L. cv. Yujingxiang) was affected by dipping with 100 mg/L acibenzolar-S-methyl (ASM) and 50 μM diphenylene iodonium (DPI), a NADPH oxidase specific inhibitor. Lesion diameters on the fruit inoculated with *T. roseum* were significantly decreased ( $P < 0.05$ ) by dipping with 100 mg/L ASM. Decreased lesion development was associated with the accumulation of H<sub>2</sub>O<sub>2</sub>, release of superoxide anion (O<sub>2</sub><sup>-</sup>), enhancement activities of NADPH oxidase (NOX), superoxide dismutase (SOD), ascorbate peroxidase (APX), and inhibition of catalase (CAT) activity. Antioxidant content including ascorbic acid (AsA) and reduced glutathione (GSH) was also induced by ASM treatment. Compared with ASM treated fruit, fruit treated with DPI prior to ASM treatment exhibited larger lesion diameter. Moreover, DPI treatment inhibited ASM-induced H<sub>2</sub>O<sub>2</sub> and O<sub>2</sub><sup>-</sup> accumulation, the increase of NOX, SOD, APX activities and content of ascorbic acid (AsA), and reduced glutathione (GSH). Cytochemical studies indicated that H<sub>2</sub>O<sub>2</sub> and O<sub>2</sub><sup>-</sup> were mainly deposited in the intercellular space and cell walls. These results suggest that

pre-treatment with DPI prevented accumulation of ROS induced by ASM and resulted in serious disease symptoms, highlighting the important role of ROS in ASM-induced resistance in muskmelon fruit.

**Keywords:** /Muskmelon/ /Postharvest/

## ORANGE

Buron-Moles, G, et al. 2015. Characterisation of H<sub>2</sub>O<sub>2</sub> production to study compatible and non-host pathogen interactions in **orange** and apple fruit at different maturity stages. *Postharvest Biol. & Technol.* 99: 27 – 36.

### Abstract

*Penicillium digitatum* and *Penicillium expansum* are the main postharvest pathogens of orange and apple fruit, respectively. These wound pathogens can infect through injuries caused during harvest and postharvest handling, which lead to large economic losses. Susceptibility of fruit to mechanical damage or infection increases during ripening. However, few studies have been focussed on the fruit wound-induced defence responses, such as H<sub>2</sub>O<sub>2</sub> production. In this study, the characterisation of H<sub>2</sub>O<sub>2</sub> production in orange (*C. sinensis* cv Valencia) and apple (*M. domestica* L. cv Golden Smoothie) fruit in response to abiotic (wounding) and biotic (pathogen and non-host pathogen) stresses at different maturity stages was investigated. The effect of H<sub>2</sub>O<sub>2</sub> on the ecophysiology of *P. digitatum* and *P. expansum* at different temperatures was also studied. The potential antifungal effect of H<sub>2</sub>O<sub>2</sub> in both pathogens depends on the temperature. *P. expansum* was more susceptible to higher levels of H<sub>2</sub>O<sub>2</sub> than *P. digitatum*, especially at 25°C. The lesion diameter in compatible interactions increased significantly with fruit maturity in apples and oranges. Fruit maturity also increased susceptibility to non-host pathogen interactions, especially reducing apple resistance to *P. digitatum* in the over-mature stage. H<sub>2</sub>O<sub>2</sub> production showed different patterns depending on the fruit. In apples, the higher resistance of immature harvested fruit to pathogen infection correlated with an increase in H<sub>2</sub>O<sub>2</sub> production (biphasic oxidative burst), whereas in oranges, immature and commercial harvests exhibited a similar pattern of H<sub>2</sub>O<sub>2</sub> production among treatments. Production of H<sub>2</sub>O<sub>2</sub> in oranges and apples following abiotic (wounding) and biotic (pathogen and non-host pathogen) stresses depended on the harvest date.

**Keywords:** /Orange/ /Maturity/ /Wounding/

Perotti, Valeria E., et al. 2015. Biochemical characterization of the flavedo of heat-treated Valencia **orange** during postharvest cold storage. *Postharvest Biol. & Technol.* 99: 80 – 87.

### Abstract

Heat treatment is a powerful and eco-friendly method to prevent *Penicillium* infection in citrus fruit during the postharvest. Several studies have been dedicated to investigate the general chemical changes that justify the immediate reaction responsible for the induced tolerance; but just how primary metabolism and enzymology are affected by heat treatment and along a prolonged cold storage is still unclear. In this work, the main enzymes of carbon metabolism of Valencia orange flavedo were analyzed during the postharvest period after a heat treatment (HT) of 48 h at 37°C. Enzymatic activity measurements indicated that the NADPH producing enzymes glucose 6-phosphate dehydrogenase and non-phosphorylating glyceraldehyde 3-phosphate dehydrogenase have lower levels in HT fruit. In parallel, a higher synthesis of sucrose from organic acids was observed in HT epicarp. Sucrose-phosphate

synthase would have an important role in sucrose accumulation. The pathway of carbon through glycolysis was affected by cold storage, independently of HT, in a way that it favors the ATP-dependent phosphofructokinase over the PPI-dependent homologous enzyme and the use of phosphoenolpyruvate (PEP) by PEP carboxylase instead of pyruvate kinase. Similarly, phenylpropanoid compounds did not show major changes in response to HT, although some of them showed a marked descent along the cold storage. Proteomic studies revealed alterations in the abundance of ascorbate peroxidase, two germin-like proteins and small HSPs, completing the description of the main metabolic changes in this tissue.

**Keywords:** /Orange/ /Citrus fruit/ /Postharvest/ Cold Storage/

## PAPAYA

Narsaiah, K. et.al. 2014. Effect of bacteriocin-incorporated alginate coating on shelf life of minimally processed **papaya** (*Carica papaya* L.). PBT. 100: 212 – 218.

### Abstract

Alginate coatings can act as carriers of antimicrobials to prolong the shelf stability of minimally processed fruit. Different concentrations of alginate (1, 1.5, 2% (w/v)) incorporated with bacteriocin (0, 20% (v/v)) as a coating material of minimally processed papaya were evaluated for quality parameters viz. firmness, weight loss, colour, head space gas composition, acidity, total soluble solids and microbial load for a period of 21 days. After 21 days of incubation, coated and uncoated samples showed decreases in O<sub>2</sub> levels and acidity percentage which were 1.8 and 2.7 times more in uncoated as compared to the coated samples, respectively. The level of CO<sub>2</sub> increase was 1.7 times higher in uncoated samples as compared to the coated samples. High respiration rate in uncoated samples led to increases in TSS values, firmness and weight loss. On the other hand, the alginate coating (with or without bacteriocin) acted as a barrier to water vapour transmission and gas exchange, which hindered changes in TSS values, firmness and weight loss in coated samples, which were 3.8, 8.7 and 7.4 times less than for the uncoated samples, respectively. Decreases in 'b' and increases in 'a' values were more pronounced in the case of controls and became less prominent with the alginate coating. A decrease in 'b' values and concomitant increase in 'a' values was due to the change from yellow to red colour, indicating ripening of papaya. Microbial counts by the end of the storage period in the alginate coated sample incorporating bacteriocin were 103 CFU/g as compared to 107 CFU/g in the case of the control. Alginate (2% (w/w)) with bacteriocin could be used to store minimally processed papaya for 3 weeks without compromising physico-chemical qualities or microbial safety.

**Keywords:** /Papaya/ /Minimally Processed/ /Shelf Life/ /Microbial Quality/ /Physico-chemical Quality/

Ong, Mei Kying, Asgar Ali. 2015. Antifungal action of ozone against *Colletotrichum gloeosporioides* and control of **papaya** anthracnose. Postharvest Biol. & Technol. 100: 113 – 119.

### Abstract

To elucidate the antifungal action and possible responses of ozone on the fungus, the effect of gaseous ozone on the germination of conidia of *Colletotrichum gloeosporioides*, anthracnose control in papaya and mitochondrial degradation in spores was studied. Ozone treatment appeared to suppress the growth of *C. gloeosporioides* in the in vivo study. Ozone also induced the generation of reactive oxygen species (ROS) in the fungal spores as shown by the oxidant-sensitive stain 2,7-

dichlorodihydrofluorescein diacetate. Degradation of mitochondria in the spores was observed after 24 h of ozone treatment at 3.5 and 5.0  $\mu\text{L/L}$  using transmission electron microscopy. Abnormalities in the ultrastructure of spores treated with 5.0  $\mu\text{L/L}$  ozone included an increase in mitochondrial degradation, cytoplasmic disintegration and plasmolysis. These results suggest that mitochondria of the spores could be one of the mechanisms involved in the antifungal activity of ozone responses against *C. gloeosporioides*.

**Keywords:** /Papaya/ /Anthracnose/

Shadmani, N., et.al. 2015. Chilling injury incidence and antioxidant enzyme activities of *Carica papaya* L. Frangi as influenced by postharvest hot water treatment and storage temperature. Postharvest Biol. & Technol. 99: 114 – 119.

### **Abstract**

The effect of double-dip hot water treatment (42°C for 30 min and 49°C for 20 min) with two different storage temperatures (6 and 12°C, 85–90% RH) and storage durations (0–3 weeks) on peel and pulp chilling injury incidence and antioxidant enzyme (catalase, ascorbate peroxidase, superoxide dismutase) activities of Frangi papayas, were investigated, with untreated fruit as controls. Peel and pulp chilling injury (CI) incidence was reduced in the treated fruit, especially in fruit stored at 6°C, which was accompanied by increased ascorbate peroxidase activity. Thus, hot water dips followed by low storage temperature could prolong the storage life and reduce CI incidence of Frangi papaya.

**Keywords:** /Papaya/ /Chilling Injury/

### **PEACH**

Cai, Jianghua, et al. 2015. Control of brown rot on jujube and **peach** fruits by trisodiumphosphate. Postharvest Biol. & Technol. 99: 93 – 98.

### **Abstract**

Trisodium phosphate (TSP) has been shown to be effective for control of food-borne bacteria, but little is known about its activity against phytopathogenic fungi that cause plant diseases. Here we show that TSP application reduced disease development of brown rot caused by *Monilinia fructicola* on jujube and peach fruits. The efficiency of TSP was positively correlated with its concentrations. Analysis of the influence of pH on efficiency of TSP indicated that the inhibitory effect of TSP against *M. fructicola* was only partially influenced by its alkaline pH. TSP directly inhibited spore germination, germ tube elongation, and mycelia growth of *M. fructicola* in the culture medium. To further investigate the mechanisms by which TSP inhibited fungal growth, we detected the integrity of the plasma membrane of *M. fructicola*. Our result show that TSP treatment resulted in the loss of plasma membrane integrity, leading to the release of intracellular contents such as soluble proteins, carbohydrates, and nucleic acids. Taken together, our data suggest that TSP was effective for controlling postharvest disease caused by *M. fructicola* on jujube and peach fruits and this antifungal activity was directly related to the disruption of cell membrane of the fungal pathogen.

**Keywords:** /Peach/ /Jujube fruit/ /Crown Rot/

## PEAR

Kou, Xiaohong, et al. 2015. Effects of CaCl<sub>2</sub> dipping and pullulan coating on the development of brown spot on 'Huangguan' pears during cold storage. *Postharvest Biol. & Technol.* 99: 63 – 72.

### Abstract

Brown spot disorder is a disorder that limits the storage life of the 'Huangguan' pear (*Pyrus pyrifolia*, Nakai). This study aimed to evaluate the effects of postharvest dipping with 2% CaCl<sub>2</sub> and coating with 1% pullulan on the development of brown spots during eight months of cold storage at 0°C. Analysis of calcium extracted using different solvents indicated that fruit dipped with CaCl<sub>2</sub> had the highest concentrations of total calcium, water-soluble calcium, calcium pectin and calcium oxalate. Fruit coated with pullulan also had higher concentrations of water-soluble calcium, calcium pectin and calcium oxalate than control fruit, although the total calcium and calcium phosphate concentrations were similar to those of control fruit. Both treatments reduced the incidence of brown spots, inhibited the activities of PPO (polyphenoloxidase) and POD (peroxidase), increased the activities of CAT (catalase) and SOD (superoxide dismutase), and delayed the loss of phenolic compounds, compared with untreated controls. Concomitantly, concentrations of  $\alpha$ -farnesene, CTs (conjugated trienes), and MDA (malondialdehyde) were maintained at lower levels in most tissues of treated fruit compared with those of control fruit. These results suggest that both CaCl<sub>2</sub> and pullulan treatments inhibited the development of brown spots on 'Huangguan' pear by delaying the loss of the polyphenol substances and maintaining the structural integrity of cell membrane.

**Keywords:** /Pear/ /Brown Spot Disorder/ /Coating/

Lopez, Luisa, et al. 2015. The detection of fungal diseases in the 'Golden Smoother' apple and 'Blanquilla' pear based on the volatile profile. *Postharvest Biol. & Technol.* 99: 120 – 130.

### Abstract

Blue mould caused by *Penicillium expansum* is one of the major pathogens causing serious losses during the postharvest and storage periods of apples and pears. *Rhizopus stolonifer* has also been identified as the causative agent of important rot losses in these fruit in packinghouses after humid spring seasons. An early disease detection system could help to reduce such losses. Biotic interactions affect the emission of volatile compounds during infection, and this changed the volatile profile of 'Golden Smoother' apples and 'Blanquilla' pears inoculated with *P. expansum* and *R. stolonifer* throughout their shelf-life at 20°C for up to 7 days. Dynamic headspace-gas chromatography was used to determine if infected fruit emitted distinct volatile compounds different from those of non-infected fruit and if volatile emissions could be detected before the infection was visible in the fruit. According to the results obtained in 'Golden Smoother' apples inoculated with both pathogens, Z-3-hexenyl 2-methylbutanoate could be a potential biomarker because it was quantified before these diseases were visible and was not detected in non-inoculated control fruit. Similar results were obtained for 2-butanone and  $\alpha$ -pinene in 'Blanquilla' pears inoculated with *R. stolonifer*.

**Keywords:** /Pear/ /Apple/ /Fungal Diseases/

## PINEAPPLE

Nukuntomprakit, Om-arun, et al. 2015. Chilling injury in **pineapple** fruit: fatty acid composition and antioxidant metabolism. *Postharvest Biol. & Technol.* 99: 20 – 26.

### Abstract

Chilling injury (CI) was investigated in fruit of pineapple (*Ananas comosus*) cv. Pattavia (Smooth Cayenne-type) and cv. Trad-See-Thong (Queen-type) stored at 10°C for 21 days. We hypothesized that CI would be due to inadequate antioxidant response and/or membrane lipid composition. CI symptoms were only found in cv. Trad-See-Thong. Symptoms were correlated with an increase in ion leakage, with lower pulp total antioxidant capacity, determined by the FRAP method, and with lower ascorbate peroxidase (APX) activity. No correlation was found between CI symptoms and the concentrations of hydrogen peroxide or ascorbic acid. Additionally, no correlation was found between symptoms and the activities of superoxidedismutase (SOD) or catalase (CAT). Thiobarbituric acid-reactive substances (TBARS; indicative of fatty acid peroxidation), the membrane fatty acid composition, and the ratio of membrane saturated to unsaturated fatty acid also showed no correlation. It is concluded that the development of CI symptoms was correlated with reactive oxygen species metabolism, as reflected in total antioxidant capacity and APX activity, while no evidence was found for a correlation with membrane fatty acid composition or fatty acid oxidation.

**Keywords:** /Pineapple/ /Chilling Injury/

## PLUM

Kucuker, Emine, et al. 2014. Pre-harvest spray application of methyl jasmonate plays an important role in fruit ripening, fruit quality and bioactive compounds of Japanese **plums**. *Sci. Hort.* 176: 162 – 169.

### Abstract

The effects of pre-harvest methyl jasmonate (MeJA) treatment on ethylene production, respiration rate, bioactive compounds and physico-chemical parameters of plum fruits (*Prunus salicina* Lindell cvs. 'Black Beauty' and 'Black Amber') were investigated in this study. Whole trees were sprayed once with an aqueous solution containing MeJA (0 and 2240 mg L<sup>-1</sup>) two weeks before the anticipated commercial harvest for each cultivar separately. Compared to control treatment, MeJA-treated trees had higher yields. However, fruit mass and geometric mean diameters of MeJA-treated fruits were lower than the fruits of control. Ethylene production and respiration rate were significantly increased with MeJA. MeJA-treated fruits significantly maintained higher flesh firmness, except for initial harvest date. MeJA treatment significantly decreased L\* and hue angle of plum fruits. Soluble solids content significantly increased with MeJA treatment and but MeJA treatment reduced titratable acidity. MeJA-treated fruits exhibited higher levels of total antioxidant activity and total phenolics. In all harvest dates, MeJA treatment resulted insignificant increases in chlorogenic acid, caffeic acid, rutin, naringenin and kaempferol of 'Black Beauty' and chlorogenic acid, caffeic acid, p-coumaric acid, ferulic acid, quercetin and kaempferol of 'Black Amber' plums.

**Keywords:** /Plum/ /Fruit Ripening/ /Antioxidant/ /Fruit Quality/ /Ethylene/ /Firmness/

Liu, Kaidong, et al. 2014. Combined effects of ascorbic acid and chitosan on the quality maintenance and shelf life of plums. *Sci. Hort.* 176: 45 – 53.

### **Abstract**

The combined effects of chitosan (CTS) and ascorbic acid (AsA) on the quality maintenance and shelf life of harvested plums (*Prunus salicina* Lindley. cv. 'Sanhuali') were investigated. The fruits were treated with aqueous solutions including water (control), 40.0 mM AsA, 1.0% CTS, and 40.0 mM AsA combined with 1.0% CTS; all samples were stored at  $5 \pm 1^\circ\text{C}$  and  $90 \pm 5\%$  relative humidity for 20 days. Fruit firmness, weight loss, respiration rate, soluble solids content, titratable acidity, ascorbic acid, color characteristics ( $L^*$ ,  $C^*$ , and  $h^\circ$ ), and anthocyanin contents were measured, along with the specific activities for superoxidodismutase (SOD), peroxidase (POD), catalase (CAT), polyphenol oxidase (PPO), polygalacturonase (PG), pectin methylesterase (PME), and phenylalanine ammonia lyase (PAL). The results showed that AsA and CTS combined maintained tissue firmness, inhibited an increased respiration rate, and decreased color changes, as compared with the control. The efficiency was better for the combined AsA and CTS treatment than AsA or CTS alone. The inhibition of softening was associated with decreased PME and PG activities. Furthermore, plums treated with the AsA and CTS combination also exhibited a significantly lower PPO activity and significantly higher SOD, POD, and CAT activities throughout the storage period. During postharvest storage, anthocyanin synthesis was significantly inhibited with the combination of AsA and CTS and was accompanied by decreased PAL activity. Moreover, the production of superoxide free radicals ( $\text{O}_2^{\bullet-}$ ) and malondialdehyde (MDA) was significantly decreased in the treated fruits. These results clearly indicated that the 40.0 mM AsA and 1.0% CTS treatment could be an effective means to contribute to the shelf-life extension and quality maintenance of plums during storage.

**Keywords:** /Plum/ /Chitosan/ /Coating/ /Ascorbic acid/ /Postharvest Storage/ /Shelf life/

### **STRAWBERRY**

Cai, Zikang, et al. 2015. Effect of preharvest application of *Hanseniaspora uvarum* on postharvest diseases in strawberries. *Postharvest Biol. & Technol.* 100: 52 – 58.

### **Abstract**

This study was conducted to evaluate the efficacy of preharvest applications of *Hanseniaspora uvarum* against postharvest mold decay of strawberry (*Fragaria ananassa*) fruit and quality maintenance during storage at  $2 \pm 1^\circ\text{C}$  and 90–95% RH. Results showed that the treatment significantly reduced postharvest mold decay ( $P < 0.05$ ), maintained fruit firmness and total soluble solids content, and did not impair pH and surface color during postharvest storage. Moreover, it was found that the activities of some defense-related enzymes, peroxidase, superoxide dismutase, catalase, polyphenoloxidase, phenylalanine ammonia-lyase,  $\beta$ -1,3-glucanase and ascorbate peroxidase, increased and malondialdehyde content, a decomposition product of polyunsaturated fatty acid hydroperoxides, was reduced, in response to preharvest application of *H. uvarum*. Overall, preharvest application of *H. uvarum* has potential for controlling postharvest decay of strawberry.

**Keywords:** /Strawberry/ /Postharvest Diseases/

Eroglu, Emrah, et al. 2014. Influence of pullulan-based edible coating on some quality properties of **strawberry** during cold storage. *Packaging Technol. & Sci.* 27: 831 – 838.

### **Abstract**

Pullulan-based edible coatings were used to extend the shelf life of strawberries (*Fragaria ananassa* cv. Camarosa) under cold storage conditions in perforated package. Some physicochemical properties of the strawberry fruits such as weight loss, firmness, colour, ascorbic acid, total carotenoids and fungal decay were determined during the storage. The coatings delayed mould formation and decreased weight loss, softening and degradation of ascorbic acid and carotenoids in the fruits. The most marked difference was recorded in the firmness value of the fruits coated with a 10% pullulan-based emulsion. Coating with a 10% pullulan-based emulsion successfully extended the shelf life of the strawberries for 5 days longer under cold storage conditions.

**Keywords:** /Strawberry/ /Edible coating/ /Cold Storage/ /Weight loss/ /Firmness/

### **SUGAR APPLE**

Pereira, Marlon C.T., et al. 2014. Effects of storage length and flowering stage of pollen influence its viability, fruit set and fruit quality in 'Red' and 'Lessard Thai' **sugar apple** (*Annona squamosa*) and 'Gefner' atemoya (*A. cherimola* × *A. squamosa*). *Sci. Hort.* 178: 55 – 60.

### **Abstract**

The fruit set of commercial Annonaceae pollinated by natural pollinators is generally insufficient to produce commercially acceptable yields. In addition, several studies have reported that both the pollen source and age affect the potential percent fruit set of sugar apple and atemoya. *Annona* flowers are hermaphrodite; however, the female part mature before the male, which is known as dichogamy of the protogynous type. The objectives of the present study were to determine the effect of pollen storage duration on pollen viability; the percent fruit set by hand pollination of 'Red' sugar apple, 'Lessard Thai' green sugar apple and 'Gefner' atemoya; and resulting fruit characteristics as a result of pollen source in South Florida. Hand pollination and in vitro pollen germination tests were arranged in a 3 × 5 factorial design, with three cultivars, five treatments, and five replicates per treatment. The percentage of in vitro pollen germination was the highest for 'Red' sugar apple pollen (26.5%) collected from male stage flowers and for pollen collected from female stage flowers collected late afternoon and germinated 18 h later (23%). Percent pollen germination was higher for 'Lessard Thai' (33%) than for 'Red' sugar apple and pollen storage for up to 24 h was not significantly different than male stage pollen used immediately and pollen collected from female stage flowers and used 18 h later. 'Gefner' atemoya pollen did not germinate when pollen grains were collected from male stage flowers and when using female stage flowers collected late afternoon and stored for 72 h. Fruit set and fruit quality varied significantly as a result of pollen storage treatments. Hand pollination promoted high percentages of fruit set, greater than 80% when female stage flowers were collected late afternoon and hand pollination performed 18 h after collection. Fruit harvested as a result of the various pollen storage treatments varied significantly in weight, diameter, and the number of seeds per fruit. The pollen from 'Lessard Thai' sugar apple and 'Gefner' atemoya may be stored up to 24 and 48 h, respectively.

**Keywords:** /Sugar Apple/ /Fruit Quality/

## **WATERMELON**

Everts, Kathryn L., et al. 2014. Chemical management of Fusarium wilt of watermelon. Crop Prot. 66: 114 – 199.

### **Abstract**

Watermelon yield loss due to Fusarium wilt is increasing in the U.S., due in part to the emergence of the virulent race 2 of *Fusarium oxysporum* f. sp. *niveum*, and to the shift in production to triploid cultivars, which generally have less host resistance than previously grown diploid cultivars. One potential management strategy is the use of soil-applied fungicides to reduce Fusarium wilt. The U.S. national program, interregional project 4 (IR-4) supported multistate trials of soil-applied chemicals to manage Fusarium wilt of watermelon. Greenhouse trials were conducted in Maryland, Indiana and Georgia to test the efficacy of 14 chemicals on Fusarium wilt. Based on the performance of these chemicals in the greenhouse, six in Maryland and Delaware and eight in Indiana were selected for subsequent field evaluations. These chemicals were applied once, as a drench at planting, in field trials in Maryland, Indiana, and Delaware in 2008. The fungicides prothioconazole, acibenzolar-S-methyl, and thiophanate-methyl resulted in the greatest reduction in Fusarium wilt, and caused no phytotoxicity. In Maryland and Indiana in 2009, these chemicals were applied through the drip irrigation line alone and in combination, at 0, 2 and 4 weeks after planting. The experiment was repeated in 2010 in Maryland. Prothioconazole alone and in combination with acibenzolar-S-methyl or/and thiophanate-methyl resulted in the greatest decrease in the area under the disease progress curve (AUDPC) of Fusarium wilt of watermelon in Maryland in 2009. The same trend was observed in 2010 in Maryland where three of the prothioconazole treatments ranked the lowest of all treatments and prothioconazole in combination with thiophanatemethyl had significantly lower Fusarium wilt AUDPC compared to the non-treated control. All chemical applications except for acibenzolar-S-methyl in combination with prothioconazole reduced Fusarium wilt AUDPC in Indiana in 2009. Prothioconazole alone and prothioconazole in combination with thiophanate-methyl ranked lowest in Fusarium wilt AUDPC, although not significantly lower than most other treatments. These studies are the first to demonstrate that the soil-applied fungicides prothioconazole and thiophanate-methyl may provide an additional field management option for Fusarium wilt of watermelon.

**Keywords:** /Watermelon/ /Fungicide/ /Fusarium Wilt/

## **VEGETABLES**

### **CARROTS**

Lecete, I., et al. 2015. Quality attributes of map packaged ready-to-eat baby carrots by using chitosan-based coatings. Postharvest Biol. & Technol. 100: 142 – 150.

### **Abstract**

Chitosan-based coatings were developed and their efficacy in maintaining the quality of baby carrots was studied over time. Coatings were applied through the use of spraying and dipping techniques. Baby carrots were packaged under modified atmosphere packaging (MAP) and stored at 4°C. Different coating types were compared against untreated controls and were evaluated by monitoring parameters such as headspace gas composition, weight loss, pH, colour, texture and

microbiological stability. The microbiological status of all stored products were determined through assessment of *Bacillus cereus*, total coliforms, *Pseudomonas* spp., *Staphylococcus aureus*, total viable counts, and yeast and moulds. Additionally, sensory evaluation was performed to study the effects of coatings in relation to customer acceptance. Results showed that chitosan based coatings delayed microbial spoilage without causing adverse impacts on the quality attributes of baby carrots. Coatings exhibited positive effects on product colour and texture. Sensory analysis showed that overall acceptability of coated baby carrots were similar to uncoated samples. The very positive findings derived from this study could be expanded to investigate and apply other similar bioactive compounds to horticultural-based products in order to maintain product quality over longer shelf life periods.

**Keywords:** /Carrots/ /Shelf Life/ /Microbial Analysis/ /Sensory Evaluation/

## LETTUCE

Jensen, Dane A., et al. 2015. Cross contamination of *Escherichia coli* O157:H7 between **lettuce** and wash water during home-scale washing. *Food Microbiol.* 46: 428 – 433.

### Abstract

Lettuce and leafy greens have been implicated in multiple foodborne disease outbreaks. This study quantifies cross contamination between lettuce pieces in a small-scale home environment. A five-strain cocktail of relevant *Escherichia coli* O157:H7 strains was used. Bacterial transfer between single inoculated lettuce leaf pieces to 10 non-inoculated lettuce leaf pieces that were washed in a stainless steel bowl of water for 30 s, 1 min, 2 min, and 5 min was quantified. Regardless of washing time, the wash water became contaminated with 90e99% of bacteria originally present on the inoculated lettuce leaf piece. The *E. coli* O157:H7 concentration on initially inoculated leaf pieces was reduced ~2 log CFU. Each initially uncontaminated lettuce leaf piece had ~1% of the *E. coli* O157:H7 from the inoculated lettuce piece transferred to it after washing, with more transfer occurring during the shortest (30 s) and longest (5 min) wash times. In all cases the log percent transfer rates were essentially normally distributed. In all scenarios, most of the *E. coli* O157:H7 (90e99%) transferred from the inoculated lettuce pieces to the wash water. Washing with plain tap water reduces levels of *E. coli* O157:H7 on the inoculated lettuce leaf pieces, but also spreads contamination to previously uncontaminated leaf pieces.

**Keywords:** /Lettuce/ /Washing/ /*Escherichia coli* O157:H7/

## MUSHROOM

Qin, Yuyue, et al. 2015. Effect of PLA/PCL/cinnamaldehyde antimicrobial packaging on physicochemical and microbial quality of button **mushroom** (*Agaricus bisporus*). *Postharvest Biol. & Technol.* 99: 73 – 79.

### Abstract

The effect of biobased poly(lactic acid) (PLA)/poly( $\epsilon$ -caprolactone) (PCL) blend films with different cinnamaldehyde contents (0, 3, and 9 wt%) on the physicochemical and microbial quality of button mushrooms (*Agaricus bisporus*) stored at  $4 \pm 1^\circ\text{C}$  for 16 days was investigated. The low-density polyethylene (LDPE) film was used as the control. The microbial levels and physicochemical properties such as weight loss, firmness, total soluble solids, O<sub>2</sub> and CO<sub>2</sub> concentrations, microbiological quality, color, and sensory quality of mushrooms were measured. Although the highest weight loss (3.08%) was

observed in the PLA/PCL/C9 treatment at the end of storage, it was still lower than 5%. Mushrooms packaged in the PLA/PCL/cinnamaldehyde blend films were significantly ( $p < 0.05$ ) firmer than those packaged in the control and PLA/PCL film. The CO<sub>2</sub> level inside the PLA/PCL film with cinnamaldehyde was lower than those inside the control and PLA/PCL film, but the O<sub>2</sub> level was similar in all packages. The PLA/PCL/C9 film was more effective in reducing microbial counts and preserving the color of mushrooms than the other three films. The overall acceptability of mushrooms packaged in the PLA/PCL/C9 film still remained good and within limit of marketability after 12 d of storage. The results suggested that the PLA/PCL/C9 film with higher water vapor permeability could be used to maintain the quality of fresh button mushroom and extend its postharvest life.

**Keywords:** /Mushroom/ /Microbial Quality/ /Physicochemical Quality/

## **BABY SPINACH**

Omac, Basri, et.al. 2015. Growth of *Listeria monocytogenes* and *Listeria innocua* on fresh **baby spinach** leaves: effect of storage temperature and natural microflora. *Postharvest Biol. & Technol.* 100: 41 – 51.

Leafy greens such as spinach may be contaminated with *Listeria monocytogenes* during pre-harvest and postharvest handling. Recent recalls issued for *Listeria*-contaminated leafy greens are driving the need for technologies to minimize safety issues in fresh and fresh-cut produce. This study assessed the effectiveness of washing treatments as a postharvest practice to minimize the growth of the pathogen and *L. innocua* on fresh baby spinach leaves under different storage temperatures and to evaluate the feasibility of using *L. innocua* as a surrogate when access to BL2 facilities is difficult. Each microorganism had a different ( $P < 0.05$ ) response to the type of washing treatment at room temperature (~22°C) and the pathogen was harder to remove from the leaves than the surrogate was. Growth data for *L. monocytogenes* and *L. innocua* on fresh baby spinach leaves at 5–36°C were modeled using the Baranyi and Ratkowsky (secondary) models which were validated by comparing the root mean square error (RMSEs) and biases between the growth data and model predictions. The secondary models showed good agreement between observed and predicted values. These models can provide useful input to quantitative risk assessment tools to evaluate the growth of pathogens in baby spinach during several stages of processing and distribution such as washing and cold storage. Although the natural microflora on fresh baby spinach leaves affected the growth parameters for both bacteria, the effect was not significant. Thus, in the specific case of spinach leaves, the study shows that *L. innocua* may be a suitable surrogate in growth studies of *L. monocytogenes*.

**Keywords:** /Baby Spinach/ /Storage/ /Temperature/

## **BROCCOLI**

Peng, Jin, et.al. 2015. Effect of light on quality and bioactive compounds in postharvest **broccoli** florets *Food Chem.* 172: 705 – 709.

### **Abstract**

The effect of light treatment (fluorescent and light-emitting diode (LED) green light) on shelf life, visual quality and bioactive compounds in broccoli florets was investigated. The results showed that light treatment extended shelf life and inhibited the decrease of H value and chlorophyll contents in

broccoli florets stored at 25 °C. The content of total phenols and glucosinolates were markedly increased by LED green light, but no effect on sulforaphane. Fluorescent and LED green light treatment significantly increased DPPH radical scavenging activity in broccoli, but little effect was found between the two light treatments. These results indicated that LED green light could be a useful technique for extending shelf life, maintaining visual quality and preventing decrease of bioactive compounds in broccoli florets.

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

## LETTUCE

Jensen, Dane A., et.al. 2015. Cross contamination of Escherichia coli O157:H7 between lettuce and wash water during home-scale washing. Food Microbiol. 46: 428 – 433.

### Abstract

Lettuce and leafy greens have been implicated in multiple foodborne disease outbreaks. This study quantifies cross contamination between lettuce pieces in a small-scale home environment. A five-strain cocktail of relevant Escherichia coli O157:H7 strains was used. Bacterial transfer between single inoculated lettuce leaf pieces to 10 non-inoculated lettuce leaf pieces that were washed in a stainless steel bowl of water for 30 s, 1 min, 2 min, and 5 min was quantified. Regardless of washing time, the wash water became contaminated with 90e99% of bacteria originally present on the inoculated lettuce leaf piece. The E. coli O157:H7 concentration on initially inoculated leaf pieces was reduced ~2 log CFU. Each initially uncontaminated lettuce leaf piece had ~1% of the E. coli O157:H7 from the inoculated lettuce piece transferred to it after washing, with more transfer occurring during the shortest (30 s) and longest (5 min) wash times. In all cases the log percent transfer rates were essentially normally distributed. In all scenarios, most of the E. coli O157:H7 (90e99%) transferred from the inoculated lettuce pieces to the wash water. Washing with plain tap water reduces levels of E. coli O157:H7 on the inoculated lettuce leaf pieces, but also spreads contamination to previously uncontaminated leaf pieces.

**Keywords:** /Lettuce/ /Washing/

Lopez-Galvez, Francisco, et.al. 2014. High oxygen atmospheres can induce russet spotting development in minimally processed iceberg lettuce. Postharvest Biol. & Technol. 100: 168 – 175.

### Abstract

High oxygen modified atmospheres have been suggested as an alternative preservation technique to classical low O<sub>2</sub> modified atmosphere packaging (MAP) for fresh-cut lettuce. The advantages of high O<sub>2</sub> storage would be a strong reduction of browning, avoidance of low O<sub>2</sub> levels linked to off-odors, and the inhibition of microbial growth. However, storage under high O<sub>2</sub> potentially could increase both production of ethylene and sensitivity to this hormone in lettuce tissue, leading to the development of quality problems linked to ethylene. In this study, different quality parameters (sensory quality, microbiological load, electrolyte leakage, volatile metabolites) were studied on fresh-cut iceberg lettuce stored under different gas conditions at 7°C: (low O<sub>2</sub> MAP (3% O<sub>2</sub> compensated with N<sub>2</sub>), atmospheric conditions, high O<sub>2</sub> MAP (50 or 90% O<sub>2</sub> compensated with N<sub>2</sub>)). Furthermore, additional experiments using ethylene absorbers were performed in order to assess the link between high O<sub>2</sub> storage, ethylene

accumulation, and russet spotting. There was no significant difference between storage conditions regarding growth of mesophilic bacteria and yeasts, electrolyte leakage, or ethanol production. On the other hand, high O<sub>2</sub> atmospheres reduced browning but promoted russet spotting development compared with low O<sub>2</sub> and atmospheric conditions. In further specific experiments the relationship between high O<sub>2</sub> storage, ethylene production, and russet spotting in fresh-cut iceberg lettuce were made evident.

**Keywords:** /Lettuce/ /Ethylene/ /Fresh Cut/

## **SNAP BEANS**

Elwan, Mohammed M.W., et.al. 2014. Storability, shelf life and quality assurance of sugar **snap peas** (cv. super snap) using modified atmosphere packaging. *Postharvest Biol. & Technol.* 100: 2015 – 211.

### **Abstract**

This investigation was aimed at selecting the most suitable package to maintain quality of sugar snap peas pods. The effectiveness of five types of polypropylene packages: highly perforated (HPPP), non-perforated (NPPP) and micro-perforated with 6, 12 and 24 holes (MPPP6, MPPP12 and MPPP24) on storability of pods was studied during cold storage at 0 °C with 90–95% RH for 7, 14, 21 days and simulating shelf-life conditions at 10 °C with 80–85% RH for 2 or 4 days after 21 days at 0 °C. O<sub>2</sub> and CO<sub>2</sub> concentrations, weight loss, visual quality, off odors, decay, color, firmness, crispness, taste, total chlorophyll, vitamin C, SSC, and total sugar contents were measured. Results revealed that O<sub>2</sub> decreased and CO<sub>2</sub> increased slowly inside MPPP6, MPPP12 and MPPP24 bags, however, the reduction in O<sub>2</sub> and the increments in CO<sub>2</sub> in NPPP bags were very sharp and accompanied with high levels of off odors. HPPP had the highest weight loss compared with other bags. MPPP12 bags maintained quality during storage and simulated shelf-life, in terms of higher scores for visual quality, firmness, crispness and taste as well as highest contents of chlorophyll, vitamin C and sugars. NPPP bags had the worst values for quality. At the end of storage and shelf-life, an increment in h\* was observed in samples stored in MPPP6, MPPP12 and MPPP24 bags (more green color) in comparison with those in NPPP bags.

**Keywords:** /Snap Pea/ /Modified Atmosphere Packaging/ /Cold Storage/ /Quality/

## **TOMATO**

Codron, Jean-Marie, et.al 2014. The role of market forces and food safety institutions in the adoption of sustainable farming practices: The case of the fresh **tomato** export sector in Morocco and Turkey. *Food Policy.* 49: 268 – 280.

### **Abstract**

Fresh produce growers are the main source of food contamination by chemical pesticides. In their choice of farming practices, producers are influenced by market forces as well as public and private safety regulations – or “macro-drivers” – as opposed to farm-level micro-drivers. Growers respond to their business and regulatory environment by implementing integrated pest management (IPM) and other good agricultural practices (GAP), where profitable through certification schemes. Our paper attempts to analyse the adoption of sustainable farming practices beyond farm and farmer

characteristics, focusing on the role of structural and institutional macro-drivers. The empirical research is based on the comparison between Turkey and Morocco, two Mediterranean countries with high export activity in the fresh tomato sector but with contrasting features in terms of both sustainable farming practices and micro/macrodrivers. With regard to the latter, we simultaneously consider supply-side and demand-side aspects (i.e. the requirements of buyers in importing countries). The analysis draws on the literature examining both IPM/GAP adoption and the impact of food safety regulation on firms' strategies. We call on face-to-face interviews with a relatively large number of tomato growers in the main production areas (N = 86 in Morocco and N = 186 in Turkey). Our findings show that the average level of sustainable practices is greatly affected by national market and institutional particularities, in particular on the demand side. Moreover the surveys confirm the initial assumption of the major role played by private actors in managing safety risk when there are high business stakes, as in export chains oriented towards rich Western countries.

**Keywords:** /Tomato/ /Food Safety/ /Integrated Pest Management (IPM)/ /Good Agricultural Practices (GAP/ /Pesticides/ /Fruits/ /Vegetables/

Cruz-Mendivila, Abraham, et.al. 2015. Transcriptional changes associated with chilling tolerance and susceptibility in 'Micro-Tom' **tomato** fruit using RNA-Seq. *Postharvest Biol. & Technol.* 99: 141 – 151.

### **Abstract**

Tomato fruit are horticultural products of great economic and nutritional value, whose transportation and marketing at low temperature are limited due to their susceptibility to develop chilling injury (CI). Hot water (HW) pre-treatments have been shown to reduce the CI symptoms in tomato fruit, but the molecular mechanisms involved in the acquisition of CI tolerance remain unclear. In the present work, a comparative transcriptomic analysis between HW treated and non-treated fruit before and after cold storage was carried out. RNA-Seq analysis detected a large number of differentially expressed genes that ranged from 2235 (heat shock) to 5433 (cold storage). Three clusters of genes were identified after 2 weeks of cold storage: the chilling-response included the down-regulation of genes involved in photo-synthesis, metabolism of cell wall, lipid and ethylene, as well as the up-regulation of genes for trehalose synthesis and transcription factors (DOF and MYB); the chilling-susceptibility was associated with the down-regulation of genes involved in carotenoid biosynthesis, which correlates with the main CI symptom of uneven ripening; meanwhile, the chilling-tolerance was related to the up-regulation of genes for heat stress (heat shock proteins and heat shock transcription factors) and detoxification (glutathione S-transferases). The induced tolerance to CI in tomato fruit seems to be related first with the protection of cell wall and membranes integrity, and second with the restoration of ethylene biosynthesis and signalling.

**Keywords:** /Tomato/ /Chilling Injury/ /Postharvest/

Tsaniklidis, Georgios, et.al. 2014. Low temperature storage affects the ascorbic acid metabolism of cherry **tomato** fruits. *Plant Physiol. & Biochem.* 84: 149 – 157.

### **Abstract**

Tomato fruits are an important source of L-Ascorbic acid, which is an essential compound of human diet. The effect of the widespread practice of cold storing (5 - 10 °C) tomato fruits was monitored

to determine its impact on the concentration and redox status of L-Ascorbic acid. Total L-Ascorbic acid levels were well maintained in both attached fruits and cold treated fruits, while in other treatments its levels were considerably reduced. However, low temperature storage conditions enhanced the expression of most genes coding for enzymes involved in L-Ascorbic acid biosynthesis and redox reactions. The findings suggest that the transcriptional up-regulation under chilling stress conditions of most genes coding for L-Ascorbic acid biosynthetic genes galactono-1,4-lactone dehydrogenase, GDP-D-mannose 3,5-epimerase but also for the isoenzymes of ascorbate peroxidase, monodehydroascorbate reductase, dehydroascorbate reductase enzyme, glutathione reductase that are strongly correlated to the L-Ascorbic redox status. Moreover, fruits stored at 10 °C exhibited higher levels of transcript accumulation of MDHAR2, DHAR1, DHAR2, GR1 and GR2 genes, pointing to a better ability to manage chilling stress in comparison to fruits stored at 5 °C.

**Keywords:** /Tomato/ /Storage/

## **ZUCCHINI**

Palama, Francisco, et.al. 2015. Effect of putrescine application on maintenance of zucchini fruit quality during cold storage: contribution of GABA shunt and other related nitrogen. *Postharvest Biol. & Technol.* 99: 131 – 140.

### **Abstract**

Polyamine metabolism has been suggested to be a crucial factor in the response of plants to several abiotic stresses, including low temperature. Zucchini fruit is susceptible to develop chilling injury when stored at low temperature. In this study, the effects of putrescine, spermidine and spermine treatment (1 mM) on the physiological behavior of zucchini fruit during cold storage were investigated, focusing on the changes in polyamine metabolism and in alterations of polyamine-related nitrogen metabolites and hormones. Among the polyamines used, exogenous application of putrescine was found to be the best treatment to improve postharvest cold tolerance. Treated fruit were of better quality, and in general after cold storage they showed reduced weight loss, chilling injury, and malondialdehyde and hydrogen peroxide contents. Putrescine treatment induced betaine and proline accumulation, fatty acid desaturase expression, and also changes in the biochemical GABA shunt pathway during cold storage. These responses may contribute to increased energy production in fruit treated with putrescine. In general, the putrescine treatment induced different pathways that are considered stress defense mechanisms, and we hypothesize that they could contribute to improve postharvest quality of zucchini fruit after storage at 4°C.

**Keywords:** /Zucchini/ /Cold Storage/ /Fruit Quality/ /Chilling Injury/

## **HERBS & SPICES**

### **ARTICHOKE**

Ghidelli, Christian, et.al. 2015. Novel approaches to control browning of fresh-cut artichoke: effect of a soy protein-based coating and modified atmosphere packaging. *Postharvest Biol. & Technol.* 99: 105 – 113.

### **Abstract**

A soy protein isolate (SPI): beeswax (BW) edible coating was optimized based on BW and L-cysteine (Cys) content to reduce the enzymatic browning of fresh-cut artichoke. The effect of this optimized coating, combined with different modified atmospheres (MA) to extend the shelf-life of cut artichokes, was studied during storage at 5°C. MAs were obtained by fluxing two gas mixtures (MA-A: 5 kPa O<sub>2</sub>+ 15 kPa CO<sub>2</sub>; MA-B: 80 kPa O<sub>2</sub>) or by conventional passive MA (MA-P). Atmospheric conditions were used as the control. The use of 0.3 g/100 mL Cys combined with a SPI-BW edible coating (40 g/100 g BW, dry basis) helped control enzymatic browning and extended the commercial shelf-life of fresh-cut artichokes to 4 days without providing off-odors. The combination of the coating with MAs did not extend the shelf-life of artichoke slices, but helped maintain the product's antioxidant capacity as compared to the control packaging conditions. Given the high degree of perishability of untreated fresh-cut artichoke, a 4-day commercial period can be considered adequate to distribute sliced artichokes to local markets. However, more studies are required to further extend shelf-life.

**Keywords:** /Artichoke/ /Fresh Cut/ /Browning/ /Modified Atmosphere Packaging/

## **GARLIC**

Park, Me-Hea, Ji-Gang Kim. 2015. Low-dose UV-C irradiation reduces the microbial population and preserves antioxidant levels in peeled **garlic** (*Allium sativum* L.) during storage. *Postharvest Biol. & Technol.* 100: 109 – 112.

### **Abstract**

Ultraviolet (UV) irradiation is used to control postharvest diseases and delays deterioration related to the ripening of fresh produce. Here, we investigated the effect of UV-C on the quality and functional properties of peeled garlic during storage. UV-C-treated garlic cloves remained firmer than the controls during storage. After 15 days at room temperature, hue values were lower for UV-C-treated garlic cloves than for the controls, which developed a yellow coloration. We also found that aerobic microbial populations were lower in 2 kJ m<sup>-2</sup> UV-C-treated garlic than in untreated controls when stored at room temperature for 15 days (6.78 log CFU vs. 6.10 log CFU); however, treated garlic stored at 0 °C showed a one-log reduction in the microbial population after 30 days. In addition, total polyphenol and flavonoid content was high in 2 kJ m<sup>-2</sup> UV-C-treated garlic after 15 days storage at 0 °C and total flavonoid content was significantly higher in UV-treated cloves than in the control cloves up to 10 days storage at room temperature. Apigenin and quercetin levels also increased in UV-C treated garlic under cold storage. Thus, UV-C irradiation could be used to reduce the microbial population and maintain or increase antioxidant levels in peeled garlic cloves.

**Keywords:** /Garlic/ /Irradiation/

## **RED BELL PEPPER**

Glowacs, Marcin, Richard Colgan, Deborah Rees. 2014. Influence of continuous exposure to gaseous ozone on the quality of **red bell peppers**, cucumbers and zucchini. *Postharvest Biol. & Technol.*

### **Abstract**

The effect of continuous exposure to ozone on quality changes during the storage of red bell peppers, cucumbers and zucchini was investigated. Peppers were stored at 14°C and were exposed to ozone at 0.1 and 0.3  $\mu\text{mol mol}^{-1}$ , while cucumbers and zucchini were stored at 12 and 8°C, respectively, and exposed to ozone at 0.1  $\mu\text{mol mol}^{-1}$ . The content of fructose (2.75 g/100 g FW) and glucose (2.00 g/100 gFW) in red bell peppers exposed to ozone at 0.1  $\mu\text{mol mol}^{-1}$  was increased by 8 and 7%, respectively, when compared to controls. Continuous exposure to ozone at 0.3  $\mu\text{mol mol}^{-1}$ , on the other hand, had no effect on fructose (2.52 g/100 g FW) and glucose (1.88 g/100 g FW) content. The content of vitamin C was significantly enhanced in red bell peppers exposed to ozone at 0.1 and 0.3  $\mu\text{mol mol}^{-1}$  after 7 d of storage, however, this effect was not maintained. After 14 d, vitamin C content in peppers exposed to ozone at 0.1  $\mu\text{mol mol}^{-1}$  was not significantly different from the control, whereas it was reduced at 0.3  $\mu\text{mol mol}^{-1}$ . Total phenolics content was increased in peppers exposed to ozone at 0.1  $\mu\text{mol mol}^{-1}$ , but was unaffected at 0.3  $\mu\text{mol mol}^{-1}$ . Continuous exposure of red bell peppers to ozone at 0.1 and 0.3  $\mu\text{mol mol}^{-1}$  had no significant effect on weight loss, texture and colour. In cucumbers and zucchini, continuous exposure to ozone at 0.1  $\mu\text{mol mol}^{-1}$  reduced weight loss by more than 40% and improved texture maintenance, while having no significant effect on their biochemistry. The findings from this study suggest that continuous exposure to ozone at 0.1  $\mu\text{mol mol}^{-1}$  is a promising method for shelf-life extension of cucumbers and zucchini. Even though in red bell peppers continuously exposed to ozone at 0.1  $\mu\text{mol mol}^{-1}$  sugars and phenolics content was increased, further work is still needed to better understand the exact mechanism of ozone action and its potential for the industrial use.

**Keywords:** /Red Bell Peppers/ /Cucumber/ /Zucchini/ /Fresh Produce/ /Quality Evaluation/ /Storage/

## **ORNAMENTALS**

### **POTTED PLANTS**

Ferrante, Antonio, et al. 2015. Post-production physiology and handling of ornamental **potted plants**.  
Postharvest Biol. & Technol. 100: 99 – 108.

### **Abstract**

Flowering or foliage potted plants are ornamental items usually grown in greenhouses under optimal growing conditions. Cultivation in protected environments allows for rapid growth and high quality characteristics. When plants reach the desired commercial size they can be transferred to hardening greenhouses or directly sent to the distribution chain. The growing and post-production conditions such as storage and transportation can have very deleterious effects on the ornamental quality of plants. The major post-production disorders are bud and flower abscission in flowering potted plants or leaf abscission or yellowing in foliage potted plants. On the other hand, the ornamental quality of potted plants is extremely important and depends on the number and colour of flowers or leaves, flower, leaf and plant longevity. The presence of flowers on flowering potted plants depends on flower longevity and turnover. The colour and size of leaves of foliage potted plants is linked to pre- and post-production environmental conditions. The post-production quality losses of flowering potted plants can be mainly ascribed to natural flower senescence. This phenomenon is highly regulated by plant hormones such as ethylene and abscisic acid, but the post-production environment can dramatically influence plant hormone equilibrium. Quality losses of foliage potted plants are mainly due to leaf senescence usually associated with inadequate acclimatization from the production area to the post-production chain.

**Keywords:** /Potted Plants/ /Flower Life/ /Senescence/

## **TUBERS & ROOTCROPS**

Salda, Erick, et.al. 2014. Measurement parameter of color on **yacon** (*Smallanthus sonchifolius*) slices using a computer vision system. *LWT – Food Sci. & Technol.* 50: 120 – 126.

### **Abstract**

The aim of this research was to design, implement and calibrate a Computer Vision System (CVS), for use in real-time, in order to measure the color on minimally processed yacon slices. For this purpose, a device (software and hardware) was designed and implemented which consisted of two steps: a) image acquisition and b) image processing and analysis. For both, an algorithm and a graphical user interface (GUI) were developed in MatLab. CVS calibration was performed with a conventional colorimeter (Model CIE L\*a\*b\*). Minimally processed yacon slices were obtained and stored at 5 °C. Color changes were estimated every 2 h, for 26 h, obtaining its color parameters. L\* decreased from 65.9 to 60.8, with a tendency to a black color; a\* increased from 7.3 to 17.7, approaching a red color; b\* increased from 35.1 to 41.5, presenting a tendency to a yellow color. Moreover, C\* increased from 35.9 to 40.1, H\* decreased from 78.2 to 66.9 and DE\* increased from 2.6 to 13.2. Low errors calculated ( $eL^* \frac{1}{4} 5.001\%$ , and  $ea^* \frac{1}{4} 2.287\%$ , and  $eb^* \frac{1}{4} 4.314\%$ ) ensure suitable and efficient application in industrial process automation and quality control in the food industry.

**Keywords:** /Yacon/ /Minimally Processed/