

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

**GENERAL**

**FRESH CUT**

Pinto, Loris et. al. 2015. Control of spoiler *Pseudomonas* spp. on fresh cut vegetables by neutral electrolyzed water. *Food Microbiol.* 50:102 - 108.

**Abstract**

In the present study, we evaluated the antimicrobial activity of neutral electrolyzed water (NEW) against 14 strains of spoilage *Pseudomonas* of fresh cut vegetables under cold storage. The NEW, produced from solutions of potassium and sodium chloride, and sodium bicarbonate developed up to 4000 mg/L of free chlorine, depending on the salt and relative concentration used. The antimicrobial effect of the NEW was evaluated against different bacterial strains at  $10^5$  cells/ml, with different combinations of free chlorine concentration/contact time; all concentrations above 100 mg/L, regardless of the salt used, were found to be bactericidal already after 2 min. When catalogna chicory and lettuce leaves were dipped for 5 min in diluted NEW, microbial loads of mesophilic bacteria and Enterobacteriaceae were reduced on average of 1.7 log cfu/g. In addition, when lettuce leaves were dipped in a cellular suspension of the spoiler *Pseudomonaschicorii*3C strain, diluted NEW was able to reduce *Pseudomonas* population of about 1.0 log cfu/ g. Thanks to its high antimicrobial activity against spoilage microorganisms, and low cost of operation, the application of cycles of electrolysis to the washing water looks as an effective tool in controlling fresh cut vegetable microbial spoilage contamination occurring during washing steps.

**Keywords:** /Fresh Cut/ /Vegetables/

**NANOTECHNOLOGY**

Handford, Caroline E., et. al. 2015. Awareness and attitudes towards the emerging use of nanotechnology in the agri-food sector. *Food Control.* 57: 24 - 34.

**Abstract**

Nanotechnology has relevance to applications in all areas of agri-food including agriculture, aquaculture, production, processing, packaging, safety and nutrition. Scientific literature indicates uncertainties in food safety aspects about using nano materials due to potential health risks. To date the agri-food industry's awareness and attitude towards nanotechnology have not been addressed. We surveyed the awareness and attitudes of agri-food organisations on the island of Ireland (Iol) with regards to nanotechnology. A total of 14 agri-food stakeholders were interviewed and 88 agri-food stakeholders responded to an on-line questionnaire. The findings indicate that the current awareness of nanotechnology applications in the agri-food sector on the Iol is low and respondents are neither positive nor negative towards agri-food applications of nanotechnology. Safer food, reduced waste and increased product shelf life were considered to be the most important benefits to the agri-food industry. Knowledge of practical examples of agri-food applications is limited however opportunities were identified in precision farming techniques, innovative packaging, functional ingredients and nutrition of

foods, processing equipment, and safety testing. Perceived impediments to nanotechnology adoption were potential unknown human health and environmental impacts, consumer acceptance and media framing. The need for a risk assessment framework, research into long term health and environmental effects, and better engagement between scientists, government bodies, the agri-food industry and the public were identified as important.

**Keywords:** /Nanotechnology/

## **STORAGE**

Pedreschi, Romina and Susan Lurie. 2015. Advances and current challenges in understanding postharvest abiotic stresses in perishables. *Postharvest Biol. & Technol.* 107: 77 – 89.

### **Abstract**

Postharvest abiotic stresses impact not only quality, eating and nutritional attributes of perishables but shelf life and susceptibility to physiological and pathological disorders and thus postharvest losses. Classical postharvest technologies involve applying stress conditions (cold, controlled atmosphere conditions, addition of chemicals) to extend storage and shelf-life. However, recent research has concerned itself with understanding the mechanisms by which abiotic stresses affect postharvest commodity quality. Thus, holistic approaches that incorporate the use of transcriptomic, proteomic, and metabolomic platforms, complemented with biochemical analysis as well as phenol typing are being used to understand stress physiology and its complex regulation at the different levels of cellular control (e.g., epigenetic control, post-transcriptional, post-translational) in order to develop and improve current technological processes. This review aims to highlight key methodological points that need to be addressed for further understanding of key postharvest abiotic stresses (cold/heat, low oxygen/high carbon dioxide and dehydration) and to review research over the last ten years dedicated to understanding postharvest abiotic stresses.

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

## **WEIGHT LOSS**

Nunes, M. Cecilia do Nascimento. 2015. Correlations between subjective quality and physicochemical attributes of fresh fruits and vegetables. *Postharvest Biol. & Technol.* 107: 43 – 54.

### **Abstract**

Color charts and rating scales have been developed for several fresh fruits and vegetables (FFVs) but limited information is available regarding the correlation between subjective evaluations and physicochemical attributes. The objective of this work was to correlate subjective quality data with quantitative analytical data collected for several fruits exposed to different environmental conditions. Avocados, blueberries, peppers, strawberries and tomatoes were exposed to a range of different temperatures and humidity conditions for varied periods of time, and quality evaluated using both rating scales and physicochemical analysis. The strength of the relationship between variables was measured using the Pearson correlation coefficient ( $r$ ) and the coefficient of determination ( $r^2$ ) and, the significance of the relationship was expressed by probability levels ( $p = 0.05$ ). Overall, there was a significant correlation between most of the subjective quality attributes evaluated and the

physicochemical analysis performed. Subjective color was significantly correlated with hue angle for all fruits evaluated except for blueberries for which subjective color had a stronger correlation with L\* values. Correlations between subjective color and anthocyanins, ascorbic acid or chlorophyll contents were also significant. Shrivelling or stem freshness was strongly correlated with weight loss whereas subjective firmness was significantly correlated with instrumental texture. Results from this work showed that subjective quality evaluations using rating scales can be a reliable and simple method to estimate changes in color, softening, water loss, and ultimately changes in specific chemical components when FFVs are exposed to different environmental conditions. A color chart is proposed for the visual evaluation of strawberry quality.

**Keywords:** /Weight Loss/

## FRUITS

### BANANA

Zhu, Xiaoyang, et. al. 2015. Effects of the combination treatment of 1-MCP and ethylene on the ripening of harvested banana fruit. *Postharvest Biol. & Technol.* 107: 23 – 32.

#### Abstract

1-methylcyclopropene (1-MCP) has obvious effects on delaying the ripening of harvested banana fruit. However, improper concentration, treatment time and handling methods could affect normal ripening, yellowing, softening and formation of volatiles, which are important components of banana fruit quality. This study was performed to screen and test the effect of a combination of low concentration ethephon with 1-MCP on the ripening of banana fruit, as well as on physiological and biochemical changes. The results showed that a combination of 50  $\mu\text{L L}^{-1}$  ethephon with 400 nL  $\text{L}^{-1}$  1-MCP (16 h) was the most suitable treatment, which significantly delayed the ripening and maintained the commodity value of harvested banana fruit without detrimentally affecting normal ripening after ripening acceleration treatment. This treatment effectively delayed and decreased respiration rate and ethylene production, inhibited the activity of pectin lyase (PL), pectin methylesterase (PME), cellulase (CX) and polygalacturonase (PG), and delayed the peak activity of ACC synthase (ACS) and ACC oxidase (ACO). It also delayed the formation of volatile compounds, but did not detrimentally affect the amount of volatiles, especially the esters. The combined treatment significantly delayed the ripening and prolonged the shelf life of banana fruit with normal coloring and volatile development, which effectively maintained the commercial value of banana fruit.

**Keywords:** /1-Methylcyclopropene/ /Postharvest Ripening/ /Banana/

### BLUEBERRIES

Chen, Hangjun, et. al. 2015. Changes in fruit firmness, cell wall composition and cell wall degrading enzymes in postharvest blueberries during storage. *Scientia Hort.* 188: 44 – 48.

#### Abstract

Blueberries are now the second most economically important soft fruit. However, they are highly perishable and susceptible to rapid spoilage. One of the main factors limiting postharvest life of

blueberries is softening. The changes of fruit firmness, cell wall degrading enzymes and cell wall composition of 'Brilliant' blueberry (*Vaccinium ashei* cv. Brilliant) were investigated in this study. The results showed fruit firmness declined concomitantly with the increase of the content of water soluble pectin (WSP) during storage paralleled by a decreasing amount of sodium carbonate soluble pectin (SSP), cellulose and hemicellulose. Blueberries stored at low temperature (5°C) maintained higher fruit firmness than those stored at 10°C, which was due to the lower WSP content and higher contents of SSP, cellulose and hemicellulose. Meanwhile, the lower activities of cell wall degrading enzymes such as polygalacturonase, cellulase,  $\beta$ -galactosidase and  $\alpha$ -mannosidase in blueberries at 5°C were associated with greater fruit firmness and lower WSP content as compared to those in fruit stored at 10°C.

**Keywords:** /Postharvest/ /Blueberries/ /Storage/

## CITRUS

Defraeye, Thijs, et. al. 2015. Feasibility of ambient loading of **citrus** fruit into refrigerated containers for cooling during marine transport. *Biosystems Eng.* 34: 20 - 30.

### Abstract

As an alternative to forced-air precooling, warm loading of citrus fruit into refrigerated containers for cooling during marine transport was explored. This practice could provide several logistic and economic savings. Although successful for resilient citrus fruits, the cooling process and performance of ambient loading have not been explored in a systematic manner. There is still a considerable potential to optimise the implementation of the technique and to apply it to more sensitive citrus or other fruits. Calculations identified the required cooling capacity of a refrigerated container as a function of the envisaged fruit cooling time, and these were complemented by a full-scale experiment. Although a refrigerated container was theoretically able to cool the produce in less than 5 days, the experiment showed that these cooling rates are not currently achieved in practice, bearing in mind that step-down cooling was applied. Future improvements in the technique point towards an improved box design and better stacking on the pallet, and to reducing airflow short-circuits between pallets.

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

Ding, Yudian, et. al. 2015. Network analysis of postharvest senescence process in **citrus** fruits revealed by transcriptomic and metabolomic profiling. *Plant Physiol.* 168: 357 - 376.

### Abstract

Citrus (*Citrus* spp.), a nonclimacteric fruit, is one of the most important fruit crops in global fruit industry. However, the biological behaviour of citrus fruit ripening and postharvest senescence remains unclear. To better understand the senescence process of citrus fruit, we analyzed data sets from commercial microarrays, gas chromatography-mass spectrometry, and liquid chromatography-mass spectrometry and validated physiological quality detection of four main varieties in the genus *Citrus*. Network-based approaches of data mining and modelling were used to investigate complex molecular processes in citrus. The Citrus Metabolic Pathway Network and correlation networks were constructed to explore the modules and relationships of the functional genes/metabolites. We found that the different flesh-rind transport of nutrients and water due to the anatomic structural differences among

citrus varieties might be an important factor that influences fruit senescence behavior. We then modeled and verified the citrus senescence process. As fruit rind is exposed directly to the environment, which results in energy expenditure in response to biotic and abiotic stresses, nutrients are exported from flesh to rind to maintain the activity of the whole fruit. The depletion of internal substances causes abiotic stresses, which further induces phytohormone reactions, transcription factor regulation, and a series of physiological and biochemical reactions.

**Keywords:** /Citrus/ /Postharvest Senescence/

Erasmus, Arno, et. al. 2015. Imazalil resistance in *Penicillium digitatum* and *P. italicum* causing **citrus** postharvest green and blue mould: Impact and options. *Postharvest Biol. & Technol.* 107: 66 – 76.

### **Abstract**

Citrus green and blue mould, caused by *Penicillium digitatum*(PD) and *Penicillium italicum* (PI), respectively, are mostly controlled by means of postharvest fungicide applications. Currently, IMZ is regarded as the most effective fungicide in use. Effective IMZ concentrations that inhibit 50% (EC<sub>50</sub>) growth of nine PD and five PI isolates were assessed in vitro and the various isolates categorized according to their resistance (R) factors. Effective residue levels that provided 50% curative (ER<sub>50</sub>C) and protective (ER<sub>50</sub>P) control of these isolates were determined in vivo. All the PI isolates were sensitive, having EC<sub>50</sub> values of 0.005–0.050 µg mL<sup>-1</sup>. Three PD isolates were sensitive (0.027–0.038 µg mL<sup>-1</sup>), while one resistant isolate was categorized as low resistant (R-factor of 19), one as moderately resistant (R-factor of 33.2), three as resistant (R-factor of 50–57.6) and one as highly resistant (R-factor of 70.7). Sensitive PD isolates had mean ER<sub>50</sub>C and ER<sub>50</sub>P values on Valencia orange fruit of 0.29 and 0.20 µg g<sup>-1</sup>, and 0.33 and 0.32 µg g<sup>-1</sup> on navel fruit, respectively. ER<sub>50</sub> values for resistant isolates did not always correlate with EC<sub>50</sub> values and ranged from 1.22 to 4.56 µg g<sup>-1</sup> for ER<sub>50</sub>C and 1.00–6.62 µg g<sup>-1</sup> for ER<sub>50</sub>P values. ER<sub>50</sub>P values for resistant isolates could not be obtained on navel orange fruit, but ER<sub>50</sub>C values (1.42– 1.65 µg g<sup>-1</sup>) were similar to those obtained on Valencia fruit. The PI isolates all behaved similar to the sensitive PD isolates with ER<sub>50</sub>C and ER<sub>50</sub>P values on navel and Valencia fruit <0.38 µg g<sup>-1</sup>. Alternative fungicides were assessed for the control of an IMZ sensitive, resistant and highly resistant PD isolate; these included sodium ortho-phenylpenate (SOPP), thiabendazole (TBZ), guazatine (GZT), imazalil (IMZ), pyrimethanil (PYR) and Philabuster® (PLB; a combination of IMZ and PYR), fludioxonil (FLU), azoxystrobin (AZO), Graduate®A+ (GRA; a combination of FLU and AZO) and propiconazole (PPZ). Multiple fungicide resistance was shown to IMZ, GZT, TBZ and PPZ in both resistant isolates. For the sensitive isolates, IMZ, SOPP, TBZ, GZT and PLB provided best curative control, while IMZ, GZT and PLB provided best protective control. For the IMZ-resistant isolates, SOPP, PYR and PLB gave the best curative control, while none of the fungicides provided adequate protective control.

**Keywords:** /Citrus/

Lee, Tan-Cha, et. al. 2015. The effects of preharvest shading and postharvest storage temperatures on the quality of 'Ponkan' (**Citrus** *reticulata* Blanco) mandarin fruits. *Scientia Hort.* 188: 57 – 65.

### **Abstract**

A two-year trial was performed to investigate the effects of using preharvest white shade nets and postharvest storage at 13.5°C or 25°C on the physiological responses and quality of 'Ponkan'

mandarin fruits. A significant reduction in leaf and fruit surface temperatures, PPF, and sunburn was seen when using white shade nets in comparison with the control sample. Trees grown under white netting had a significantly higher juice percentage, less weight loss, lower granulation percentage, and lower percent-age decay than the control sample. However, there were no significant differences in peel color, total soluble solids (TSS), and titratable acid (TA) between the control and shading samples after postharvest storage at 13.5°C or 25°C. In summary, 'Ponkan' mandarin grown with white shading nets exhibited greater sunscald resistance, higher juice percentage, and less weight loss and granulation when stored at 13.5°C postharvest than the mandarin grown without shading and those stored at 25°C.

**Keywords:** /Postharvest Storage/ /Citrus/

## **GUAVA**

Antala, D. K., et. al. 2015. Modified atmosphere packaging of **guava** fruit. Packag. Technol. Sci. 28: 557-564.

### **Abstract**

Fully matured fresh guava fruits (Lucknow-49) were precooled at 10 °C for 1 h and pre-treated with 500-ppm benomyl for 5 min. The fruits were packed in 25-µm and 50-µm LDPE bags with active modified atmosphere packaging of 3% O<sub>2</sub>+5% CO<sub>2</sub>, 6% O<sub>2</sub>+5% CO<sub>2</sub> and 9% O<sub>2</sub>+5% CO<sub>2</sub> gas concentrations and stored at 5 ± 1 °C and 10 ± 1 °C temperatures as well as non-packaged as control. The shelf life of guava could be increased up to 42 days by packaging in 50-µm LDPE bags with a gas concentration of 9% O<sub>2</sub>+5% CO<sub>2</sub> and stored at 10 °C without much change in physical, biochemical and sensory characteristics. Physico-chemical changes viz., PLW, pulp to peel ratio, firmness, TSS, total sugar, ascorbic acid and titratable acidity were observed minimum for fruits packed in 50-µm LDPE bags at 3% O<sub>2</sub>+5% CO<sub>2</sub> gas concentration at 5 °C storage temperature, but sensory score decreased drastically after 21 days of storage. Chilling injury was observed for the fruits packed at 5 °C storage temperature after 21 days of storage, and it was severe in 25-µm LDPE bag at later stage. Control fruits over-ripened with the highest weight loss (12.47%) on 6 days of storage and discarded from the storage.

**Keywords:** /Modified Atmosphere Packaging/ /Guava/ /Shelf Life/

## **KIWIFRUIT**

Ramazzina, Ileana, et. al. 2015. Effect of cold plasma treatment on physico-chemical parameters and antioxidant activity of minimally processed **kiwifruit**. Postharvest Biol. & Technol. 107: 55 – 65.

### **Abstract**

The efficacy of atmospheric plasma treatment on microbial decontamination of different kinds of food products is already known. Recently, new applications of this innovative technology have been proposed, in order to test the improvement of quality maintenance of minimally processed fruit and vegetables. Nevertheless, the knowledge on the modifications of functional and nutritional properties of minimally processed fruit is still scarce. The objective of this study was to evaluate the effect of atmospheric double barrier discharge (DBD) plasma treatment on the quality maintenance of fresh-cut kiwifruit. Treatments of 10 and 20 min per side were performed and their consequences were evaluated during four days of storage in controlled conditions by monitoring parameters related to visual quality,

texture, chlorophyll, carotenoids and polyphenols. The in vitro antioxidant activity was evaluated through a multimodal approach, combining different assays for the analysis of antiradical activity and reducing activity of antioxidants. According to the obtained results, plasma treatments positively influenced the quality maintenance of the product, by improving colour retention and reducing the darkened area formation during storage, not inducing any textural change compared with the control. Plasma treatments caused an immediate slight loss of pigments, but a better retention during storage. No significant changes in antioxidants content and antioxidant activity were observed among treated samples and control ones.

**Keywords:** /Antioxidant/ /Minimally Processed/ /Kiwifruit/

## LOQUAT

Wang, Kaituo, et. al. 2015. Effect of ethanol treatment on disease resistance against anthracnose rot in postharvest loquat fruit. *Scientia Hort.* 188: 115 – 121.

### Abstract

The effect of ethanol treatment on disease resistance against anthracnose rot in postharvest loquat fruit and its possible mechanism were investigated. Our data implied that treatment of loquat fruit with ethanol at 300 µl/l significantly inhibited the anthracnose rot caused by *Colletotrichum acutatum* and maintained the overall quality. Ethanol treatment suppressed activities of catalase and ascorbate peroxidase while increased superoxide dismutase activity in *C. acutatum*-inoculated loquat fruit, thus resulting in a higher level of H<sub>2</sub>O<sub>2</sub>, which might serve as a crucial role to activate disease resistance. Meanwhile, the activities of defense-related enzymes including phenylalanine ammonia-lyase, peroxidase, polyphenoloxidase, chitinase and β-1,3-glucanase were significantly enhanced by the ethanol treatment. In addition, 300 µl/l ethanol exhibited an effective antifungal activity against spore germination and mycelia growth of *C. acutatum* in vitro. Therefore, these results suggest that ethanol can inhibit anthracnose rot in postharvest loquat fruit, possibly via inhibiting pathogen growth directly and inducing disease resistance indirectly.

**Keywords:** /Postharvest/ /Loquat/Quality/

## MANGO

Khaliq, Ghulam, et.al. 2015. Effect of gum arabic coating combined with calcium chloride on physico-chemical and qualitative properties of mango (*Mangifera indica* L.) fruit during low temperature storage. *Scientia Hort.* 190: 187 – 194.

### Abstract

Effect of gum arabic (GA) 10% and calcium chloride (CA) 3% on the physiological and biochemical proper-ties of mango (*Mangifera indica* L. CV. Choke Anan) fruits stored at 6 ± 1°C and 90 ± 3% relative humidity for 28 days and then transferred to 25 ± 2°C for 5 days shelf life were investigated. Significant ( $P \leq 0.05$ ) differences were observed in fruits treated with GA 10% and CA 3% as compared to control. The combined treatment of CA 3% + GA 10% significantly alleviated the increase in decay incidence. Furthermore, GA 10%alone or combined with CA 3% effectively reduced weight loss, color changes, soluble solid concentration, respiration rate, ethylene production and maintained high

firmness, titratable acidity and ascorbic acid. The result of transmission electron microscopy revealed that these treatments also protected the ultra-structure of mitochondria. These results suggest that application of GA 10% coating combined with CA 3% might be a simple and effective technique for preserving mango fruit quality during low temperature storage.

**Keywords:** /Mango/ /Postharvest Qualities/

## MUSKMELON

Deng, Jianjun, et. al. 2015. Postharvest oxalic acid treatment induces resistance against pink rot by priming in **muskmelon** (*Cucumis melo* L.) fruit. *Postharvest Biol. & Technol.* 106: 53 – 61.

### Abstract

The effect of postharvest oxalic acid (OA) treatment on pink rot caused by *Trichothecium roseum* and its possible mechanisms of action in muskmelon (*Cucumis melo* L. cv. Yindi) fruit were investigated. Dosage of OA treatment at 25–100 mM was effective to reduce disease severity on fruit inoculated with *T. roseum*, with the greatest efficacy being achieved using 50 mM OA. Higher concentration (200 mM) failed to promote better control of the decay-causing agent and caused phytotoxicity. OA treatment at 50 mM increased the activities of peroxidase (POD), polyphenoloxidase (PPO), phenylalanine ammonia-lyase (PAL),  $\beta$ -1,3-glucanase (GLU), and superoxide dismutase (SOD), while inhibiting the reduction in the activity of catalase (CAT). OA treatment also promoted the accumulation of total phenolic, flavanoid, and lignin. Microscopic and ultrastructural observation revealed that histological structure as preventive barrier was markedly strengthened by OA. Furthermore, the above-mentioned enzymes activity, metabolites content, and histological structure were more profoundly enhanced or reinforced in OA-treated fruit after inoculation with *T. roseum*, compared to those with OA treatment alone. The results suggest that the priming of defense responses is involved in OA-induced disease resistance for more effective resistance in harvested muskmelon fruit.

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

## NECTARINES

Echeverría, G., et. al. 2015. The impact of maturity, storage temperature and storage duration on sensory quality and consumer satisfaction of 'Big Top<sup>®</sup>' nectarines. *Scientia Hort.* 190: 179 - 186.

### Abstract

This research focuses on the effect of maturity stage and storage conditions on quality and consumer satisfaction of 'Big Top<sup>®</sup>' nectarines. At harvest time, fruit were graded in three categories according to the IAD index (index of absorbance difference =  $A_{670} - A_{720}$ ) based on Vis spectroscopy. Physicochemical parameters (soluble solids concentration, titratable acidity and flesh firmness) were measured for the three maturity categories at harvest time and after up to 49 days of storage at 20, 10, 4 or  $-1^{\circ}\text{C}$ . Consumer satisfaction and sensory attributes were also measured on fruit from all three categories at harvest time, as well as on fruit from the intermediate maturity class after storage at the different tested temperatures for up to 49 days. At harvest time, consumer's satisfaction increased significantly with maturity stage at harvest, mainly due to an upper sweetness and flavour perception

and higher SSC value detected in the most mature class. For short storage periods, 'Big Top®' nectarines kept at 20°C received the highest scores for peach flavour intensity and overall acceptance. For longer storage periods, no significant differences among temperatures were observed on sensory quality or consumer satisfaction, except for fruit stored for the longest period (7 weeks), for which higher consumer acceptance was found for fruit stored at -1°C than at 4°C. Results also suggested that higher acceptance scores were associated mainly to more intense perception of flavour.

**Keywords:** /Nectarines/

## ORANGE

Gündüz, GültenTiryaki, et. al. 2015. Application of ultraviolet-C light on oranges for the inactivation of postharvest wound pathogens. Food Control. 57: 9 - 13.

### Abstract

Germicidal effects of ultraviolet-C (UV-C) light on the postharvest wound pathogens of citrus fruits namely *Penicillium digitatum* and *Penicillium italicum* were investigated. *P. Digitatum* and *P. Italicum* spores were inoculated (4.00-4.50 log cfu/orange) onto Washington navel oranges (*Citrus sinensis*L. Osbeck cv Washington navel) by using wound and spot inoculation methods and subjected to eight different UV-C doses in the range of 0.26-15.84 kJ/m<sup>2</sup>. Maximum reductions of 2.75 and 3.33 log cfu/orange of *P. Digitatum* were obtained at the UV-C dose of 3.17 kJ/m<sup>2</sup> for spot and wound inoculation methods, respectively. *P. Italicum* was more resistant than *P. Digitatum* to UV-C treatments. The results suggest that UV-C treatments designed to reduce *P. Italicum* spores will provide an adequate degree of protection against *P. Digitatum* spores. UV-C light could be an alternative technique for the use of synthetic chemicals to reduce the development of postharvest pathogens of oranges.

**Keywords:** /Orange/ /Postharvest/ /Pathogens/

## PEAR

Choi, Jin-Ho, et. al. 2015. Fruit quality and core breakdown of 'Wonhwang' pears in relation to harvest date and pre-storage cooling. Scientia Hort. 188: 1 – 5.

### Abstract

'Wonhwang' Asian pear (*Pyruspyrifolia* Nakai) is an early ripening pear cultivar, therefore requiring cultural and postharvest practices to retain commercial marketability. The present study included two experiments. The first was to investigate fruit characteristics and physiological disorder of 'Wonhwang' pears harvested at 120, 125, 130, and 135 days after full bloom (DAFB) and stored at room temperature for 21 days. The second was to evaluate the effects of 24 h of pre-storage cooling at 0°C, 10°C, and 23°C followed by three weeks of room temperature storage on fruit storability and taste. Early fruit harvest increased fruit firmness, titratable acidity, and starch, with light fruit weight and low soluble solids content. Fruits harvested at 130 DAFB were in mid-climacteric phase. Free sugar composition was not consistently affected by DAFB. Harvesting at 125 DAFB retained fruit storability and suppressed occurrence of core breakdown compared to 130 DAFB or 135 DAFB at room temperature for 21 days. Pre-cooling at 10°C produced firmer fruits, lower core breakdown, and better taste compared to pre-cooling at 0°C and 23°C or untreated control (no pre-cooling).

**Keywords:** /Fruit Quality/ /Pear/

Zhang, Wen, et. al. 2015. Orthogonal test design to optimize the acoustic vibration method for pear texture measurement. *Postharvest Biol. & Technol.* 107: 33 – 42.

### **Abstract**

The test parameters for pear texture measurement using a laser Doppler vibrometer (LDV) were optimized. The pear was placed in the middle of the vibration stage and excited by swept sine wave signals with a constant frequency sweeping rate and acceleration amplitude. The response signals from the tops of the pears were measured using an LDV. First, 10 pear samples were tested under different test conditions in the single-factor experiment. The test parameters included the frequency sweeping mode and rate, acceleration amplitude, pear laying style, and LDV detection point. The results show that the frequency–response curves at the same detection point have good repeatability under all tested frequency sweeping rates (regardless of the linear or logarithmic frequency sweeping mode) and acceleration amplitudes. However, the frequency–response curves at different detection points have poor repeatability for each laying style. To find a better combination of test parameters, an L27(3<sup>13</sup>) orthogonal test probing the frequency sweeping rate, acceleration amplitude, pear laying style, and their 2-way interactions was designed according to the results of the single-factor experiments. No significant 2-way interaction is found among the frequency sweeping rate, acceleration amplitude, and pear laying style on the repeatability of the frequency–response curves. The test parameter values required to obtain a better repeatability are as follows: frequency sweeping rate of 23.33 Hz/s with the linear frequency sweeping mode, acceleration amplitude of 1 g ( $g = 9.8 \text{ m/s}^2$ ), and laying style that the pear is placed with its stem upward. After the optimization of the LDV method, a total of 118 pear samples were used to compare the LDV method with the destructive puncture test. The results show that the elasticity index (EI) is well correlated with the stiffness (Stif) of pears and that the correlation is not significantly affected by the pear laying style. In addition, the LDV method is superior to the puncture test in terms of repeatability and sensitivity.

**Keywords:** /Pear/

### **POMEGRANATE**

Caleb, Oluwafemi, et. al. 2015. Impact of preharvest and postharvest factors on changes in volatile compounds of pomegranate fruit and minimally processed arils – Review. *Scientia Hort.* 188: 106 – 114.

### **Abstract**

Composition, concentration and combination of volatile fractions in fresh and fresh-cut fruit and vegetables are essential in conferring the unique aroma characteristics of the product. The volatile organic compounds (VOCs) present are directly responsible for the taste and odour and, hence, the unique identities of fresh and fresh-cut produce. Flavour quality plays a crucial role in consumer preference and liking of pomegranate cultivars and products. This review discusses the volatile composition of pomegranate fruit, including a critical evaluation of the role played by various preharvest and postharvest factors on the flavour life of pomegranates. Future prospects and potential application of VOCs in smart/intelligent packaging and storage of horticultural crops are highlighted. This review provides some critical information for the entire role players along pomegranate value chain.

**Keywords:** /Postharvest/ /Pomegranate/ /Minimally Processed/

## **STRAWBERRIES**

Filho, Tarcísio Lima, et. al. 2015. Conjoint analysis as a tool to identify improvements in the packaging for irradiated strawberries. Food Res. Int'l 72: 126 – 132.

### **Abstract**

Consumers have shown aversion for the term “irradiation”, obligatorily present in packages of irradiated food. Through ratings based conjoint analysis (RBCA) and modified-choice based conjoint analysis (MCBCA) we quantified the effect of characteristics of packages of irradiated strawberries on purchase intent and likelihood of choosing this product. The factors “explanatory information” and “radura symbol” affected consumer assessment. The factor called “preservation method information” showed no significant effect ( $p = 0.405$ ). Thus, the best packaging should present the information “food treated by ionisation process” or “food treated by irradiation process”, “to ensure the freshness and quality for a longer time” and should have the presence of radura symbol. Brazilian and U.S. laws require the use of the term “irradiation”. Therefore, changes in legislation may not be necessary. These results assist in the production of packaging for irradiated strawberries, providing important information for assessing the primary factors that result in a greater intent to select and purchase this product.

**Keywords:** /Packaging/ /Strawberries/

## **SWEET CHERRY**

Wang, Lei, et.al. 2015. Hot air treatment induces resistance against blue mold decay caused by *Penicillium expansum* in sweet cherry (*Prunus cerasus* L.) fruit. Scientia Hort. 189: 74 – 80.

### **Abstract**

Effect of hot air (HA) treatment (44°C, 114 min) on reducing blue mold decay caused by *Penicillium expansum* in sweet cherry fruit was investigated. The results indicated that fruit treated with HA had significantly lower disease incidence and smaller lesion diameter than the control fruit did. HA treatment significantly enhanced activities of chitinase (CHI) and  $\beta$ -1, 3-glucanase (GLU). The activities of poly-galacturonase (PG) and pectin methylesterase (PME) were significantly inhibited by HA treatment. Fruit treated with HA exhibited remarkably higher activities of superoxide dismutase (SOD), catalase (CAT), peroxidase (POD), and polyphenoloxidase (PPO) and lower activity of ascorbate peroxidase (APX) than control. Expression of defense related genes such as PaGLU, PaCAT, and PaNPR1-like was greatly induced in HA-treated fruit during storage, while the expression of expansins (EXP) was down-regulated by HA treatment. These results suggest that HA can effectively inhibit blue mold decay caused by *P. expansum* in harvested cherry fruit possibly by directly inducing disease resistance and delaying fruit tissue softening that helps to ward off the spread of pathogens.

**Keywords:** /Postharvest Disease/ /Sweet Cherry/

## TABLE GRAPES

Li, L., et. al. 2015. The effects of 1-methylcyclopropane and ethylene on postharvest rachis browning in table grapes. Postharvest Biol. & Technol. 107: 16 – 22.

### Abstract

The green rachis in clusters of table grapes provide an important indication of the freshness of the produce after storage. In the past rachis browning was associated mainly with dehydration but results of the current study suggest the involvement of ethylene in the process. We show that 1-methylcyclopropane (1-MCP) delayed rachis browning in three table-grape varieties whereas ethylene tended to enhance it. Respiration was reduced in 1-MCP-treated-rachis and ethylene production was reduced in one of the varieties. Berry respiration and ethylene production were not affected by the treatments. Interestingly, respiration and ethylene production in rachis of 'Thompson Seedless' were much lower than in the other two tested varieties. Significant differences were observed between the auto-fluorescence properties of the treated rachis and those of the untreated ones—differences that were consistent with the lower accumulation of flavonoids in the former. Berry auto-fluorescence was also affected by the treatments: ethylene enhanced auto-fluorescence associated with flavonoids in the two green varieties and 1-MCP reduced it in the black variety. Although it was shown that 1-MCP affected rachis browning, applicability of this approach requires further study.

**Keywords:** /1-Methylcyclopropene/ /Postharvest/ /Table Grapes/

## WATERMELON

Ikeda, Takashi, et. al. 2015. Firmness evaluation of watermelon flesh by using surface elastic waves. J. Food Eng. 160: 28 – 33.

### Abstract

We measured the velocity of surface elastic waves on watermelon flesh for firmness evaluation. The Rayleigh waves at frequencies ranging from 800 to 2400 Hz propagate on the flesh and are detected by a piezo-bimorph sensor in contact with the flesh. We determined the shear elasticity from the velocity for two types of Japanese watermelons, Maturibayashi777 and Wasenissho, to be 1.18 and 0.74 MPa, respectively. These correlated well with a sensory firmness evaluation. The values of Young modulus obtained by the surface-wave measurements were nine times larger than those by the compression tests performed, which can be explained by the differences in measurement displacement and frequency. We also investigated the effect of storage on the surface-wave velocity for Maturibayashi777. The velocity decreased by about 10% after ten days of storage. The present results suggest that this technique can be applied to estimating the elastic properties of various fruits.

**Keywords:** /Watermelon/

## VEGETABLES

### GREEN PEA

Świeca, Michał and Urszula Gawlik-Dziki. 2015. Effects of sprouting and postharvest storage under cool temperature conditions on starch content and antioxidant capacity of green pea, lentil and young mung bean sprouts. Food Chem. 185: 99 – 105.

## **Abstract**

The effects of germination of selected legumes and further storage of sprouts under cool conditions on the phenolics, antioxidant activity and starch content and their potential bio accessibility were elucidated. In green pea and mungbean sprouts a slight increase of chemically extractable phenolics (including flavonoids) during the first 4 days of sprouting was observed. Digestion in vitro released phenolics; however, flavonoids were poorly bio accessible. Storage of green pea sprouts decreased reducing power and increased the antiradical ability. Reducing potential of potentially bio accessible fraction of stored lentil sprouts was elevated of 40%, 31% and 23% in 3-, 4- and 5-day-old sprouts, respectively. Postharvest storage significantly increases the starch digestibility and values of expected glycemic index (eGI) – the highest eGIs were determined for 5-day-old stored sprouts; 75.17-green pea, 83.18-lentil and 89.87-mung bean. Bioactivity and nutritional quality of legumes is affected by sprouting and further storage at low temperatures

**Keywords:** /Postharvest Storage/ /Antioxidant/ /Green Pea/

## **LETTUCE**

Simko, Ivan, et. al. 2015. Detection of decay in fresh-cut **lettuce** using hyperspectral imaging and chlorophyll fluorescence imaging. *Postharvest Biol. & Technol.* 106: 44 – 52.

## **Abstract**

Fresh-cut lettuce sold in modified atmosphere packaging (MAP) is a desirable, but highly perishable product. Decay of tissue can start a few days after processing and may be difficult to detect by quick visual observation. A system for early detection of decay and gradual evaluation of its progress is important both for lettuce processing industry and for breeding companies and institutions assessing quality of new cultivars and breeding lines. We have developed two lettuce decay indices (LEDI) that can be used to detect decay of leaf tissue. One of the indices (LEDI4) is based on three wavelengths identified from hyperspectral imaging, while the second index (LEDICF) is based on chlorophyll fluorescence imaging. In addition to detecting lettuce decay, the indices identified tissue damaged by freezing temperatures. LEDI4 and LEDICF showed almost 97% accuracy in classifying tissue as being fresh or decayed when tested on red, dark green, green, light green, and yellow leaves. Specificity of the indices decreased when tested on fresh tissue with a very limited amount of chlorophyll that visually appeared to be almost white. Both indices detected lettuce decay without opening plastic MAP bags. The non-destructive nature of the methods thus allows rapid and repeated evaluation of samples over time and presents the opportunity for development of a commercial, high throughput scanner for evaluation of bagged, fresh-cut lettuce quality.

**Keywords:** /Fresh Cut/ /Lettuce/ /Modified Atmosphere Packaging/

## **MUSHROOM**

Dhalsamant, Kshanaprava, et.al. 2015. Effect of perforation mediated MAP on shelf life of **mushroom** (*Volvarella volvacea*). *Scientia Hort.* 189: 41 – 50.

## **Abstract**

The feasibility of perforation mediated packaging was studied for extending the shelf life of paddy straw mushroom. Mushrooms were kept in packages both as untreated and treated with CaCl<sub>2</sub> to

see the effect of CaCl<sub>2</sub> on mushroom in the MAP. The area of perforations were kept as 0,  $3.4 \times 10^{-4}$ ,  $6.8 \times 10^{-4}$  and  $1.02 \times 10^{-3}$ % (0, 20, 40 and 60 perforations) in a package size of 175 mm × 110 mm. In addition, mushroom samples were also kept in similar packages with large holes so as to maintain atmospheric air composition in the packages, which served as control. It was observed that perforation mediated MAP effectively increased the shelf life of paddy straw mushroom to 6 days at 12(±1)°C as compared to 1–2 days for control. The firmness of both the cap and stem was better maintained with the pre-treated as well as untreated samples in 20 and 40 perforation packs. In terms of final total phenolics and antioxidants, the CaCl<sub>2</sub> treated sample stored in 40 perforation packs would be preferred. In terms of final total protein content, even though the CaCl<sub>2</sub> treated samples in 40 perforation packs were the best, still there was no significant difference between any of the samples kept in either 20 or 40 perforation packages. In terms of total bacterial count, the treated samples in 40 perforation packs were the best with a TBC of  $278.00(\pm 24.76) \times 10^5$ cfu/g on the 8th day, which was acceptable. The untreated samples in general showed higher TBC than the CaCl<sub>2</sub> treated samples. It is recommended that the paddy straw mushroom should be treated with CaCl<sub>2</sub>(0.5%) and stored in 40 perforation packages in the specific package size at 12(±1)°C for extending the shelf life up to 6 days. Furthermore, this developed technology will solve some of the limitations that mushroom producers and processors find nowadays for processing and distribution to maintain stable quality throughout the storage period.

**Keywords:** /MAP/ /Shelf Life/ /Mushroom/

Han, Linlei, et. al. 2015. Evaluation of biodegradable film packaging to improve the shelf-life of *Boletus edulis* wild edible mushrooms. *Innovative Food Sci. & Emerging Technol.* 29: 288 – 294.

### **Abstract**

The objective of this work was to evaluate the effect of poly(lactic acid) (PLA) based biodegradable film packaging combining 0.5% nisin antimicrobial polypeptide on the physicochemical and microbial quality of *Boletus edulis* wild edible mushrooms stored at  $4 \pm 1$  °C. The experiment was set up by packaging mushrooms with extruded PLA films containing 0, 7.5, and 15wt.%triethyl citrate plasticizer. The low-density polyethylene (LDPE) film was used as the control. Mushrooms stored in PLA films containing 7.5 and 15 wt.% plasticizer provided better retention of quality characteristics and received higher sensory ratings compared to mushrooms stored in pure PLA film and LDPE film. Samples with these two treatments underwent minimal changes in texture, PPO activity, total bacteria count, and sensory attributes. Results suggest that nisin in combination with plasticized PLA film has the potential to maintain *B. Edulis* wild edible mushroom quality and extend its postharvest life to 18 days. Industrial relevance: *B. edulis* is one of the most commercialized mushrooms worldwide. However, as with all fresh mushrooms, there are severe preservation problems. Extruded PLA films containing triethyl citrate plasticizer plus antimicrobial agent nisin proved to be a suitable technology for mushroom conservation. This material exhibits an environmental-friendliness potential and a high versatility in food packaging.

**Keywords:** /Packaging/ /Shelf Life/ /Mushrooms/

### **TOMATOES**

Torres, Irina, et. al. 2015. Fast and accurate quality assessment of Raf tomatoes using NIRS technology. *Postharvest Biol. & Technol.* 107: 9 – 15.

### **Abstract**

Near infrared reflectance (NIR) spectroscopy was used as a fast and accurate technology for the simultaneous measurement of color, sugar and organic acid content in intact Raf tomatoes. The potential of this method coupled with chemometric techniques based on modified partial least squares regression was assessed by comparison with the currently-used traditional method for determining color, dry matter, soluble solid content, glucose, fructose, titratable acidity, malic acid and citric acid. At the same time, the performance of two spectrophotometers, differing primarily in terms of measurement principle and wavelength range, was evaluated. A total of 165 tomatoes (cv. "Raf") were used in the construction of calibration models for all the parameters previously cited, testing various spectral signal pre-treatment's. The technology was well suited to sorting Raf tomatoes on the basis of color parameters ( $a^*$  and  $a^*/b^*$  ( $r^2 = 0.76-0.75$ ; SEP = 2.58-0.09, respectively), soluble solid content ( $r^2 = 0.75$ ; SEP = 0.65%) and titratable acidity ( $r^2 = 0.69$ ; SEP = 0.06%), and useful, though less accurate ( $r^2 < 0.60$ ), for the sorting of fruits by the rest of the color parameters tested ( $b^*$ ,  $L^*$ ), as well as by sugar content (glucose and fructose), dry matter and citric and malic content, particularly when the diode array instrument was used.

**Keywords:** /Quality/ /Tomatoes/

## ORNAMENTALS

### CHRYSANTHEMUM

Kim, Sang Hoon, et.al. 2015. Isolation and characterization of differentially expressed genes in petals of chrysanthemum mutant cultivars developed by irradiation. *Scientia Hort.* 189: 132 – 138.

#### Abstract

Chrysanthemum is one of the most popular ornamental plants, whose petal colors are primarily determined by pigments including flavonoids/anthocyanins and carotenoids. To develop chrysanthemum cultivars with various petal colors, mutation breeding targeting alteration of pigmentation pattern has been performed. A radiation-induced mutant line, 'ARTI-purple', showed a flower color altered from the original bright pink to purple. In this study, we used suppression subtractive hybridization to analyze transcripts and characterize the differential gene expression of chrysanthemum petals between the mutant 'ARTI-purple' and its wild-type Chrysanthemum × morifolium cultivar 'Argus'. One hundred and seventy-six genes were identified ( $e\text{-value} \leq 1e - 5$ ) and classified based on sequence homology to genes with known or putative functions. The genes were categorized functionally by gene ontology analysis and their tentative pathways were confirmed using the TAIR database. The analyses revealed that these genes were related to carbohydrate metabolism, biosynthesis of secondary metabolites, and lipid metabolism. Six genes in a Kyoto encyclopedia of genes and genomes (KEGG) pathway which included the largest number of differentially expressed genes were selected for validation by quantitative PCR, and most of them showed higher expression levels compared with the wild-type. In addition, we isolated two novel clones(PC06E06 and PC08C09) having glutathione S-transferase (GST) family conserved domains and one clone(PC02G08) having a Multidrug and toxic compound extrusion (MATE) family conserved domain based on analysis using conserved domain database (CDD). The expressions of PC08C09 and PC02G08 were upregulated in 'ARTI-purple', which implies that anthocyanin accumulation pattern might be altered in mutant. In this study, we identified several differentially expressed genes between 'Argus' and 'ARTI-purple'. The analysis suggested that several metabolic genes as well as glutathione S-transferases and MATEs might be involved in the control of flower pigmentation in chrysanthemum.

**Keywords:** /Chrysanthemum/