

**SELECTIVE DESSIMINATION OF INFORMATION (SDI)  
PDF REPRINTS as of July – August 2014**

**GENERAL**

**HORTICULTURAL PRODUCE**

Pathare, Pankaj B., Umerzuruike Linus Opara. 2014. Structural design of corrugated boxes for horticultural: a review. Biosystems Eg. 125: 128 – 140.

**Abstract**

Corrugated boxes are used extensively for transporting and storing fresh produce in the horticultural industry. These boxes protect their contents from mechanical damage due to drops, impacts, vibration and compression loads. The analysis and prediction of the stacking compression load capacity of corrugated boxes is important to study the response of existing packaging to mechanical stress or to design new boxes to meet postharvest handling conditions. Good design of vented packaging is important in optimising the cooling and ventilation uniformity, minimising quality deterioration of packed produce and maintaining the mechanical integrity of the box. Various experimental and modelling tools are used to investigate the design and mechanical performance of packaging. Experimental studies on mechanical performance of packaging include compression, impact and vibration analysis. Finite element analysis and simulation is useful for study and structural design of ventilated corrugated packaging, considering the shape, location and size of the vent. Advances in information and communication technologies offer new prospects for development of user-friendly software toward integrated design and performance analysis of fresh produce packaging.

**Keywords:** /Horticultural Produce/ /Corrugated Packaging/

Gormley R., et.al. 2014. Managing the cold chain for intermediate and **minimally processed** fruit combination products. ACta Hort. 1040: 111 - 118.

**Abstract**

New generation fruit desserts were prepared from apple, peach and plum purees as part of the EU Framework Programme 6 Integrated Strategic Approach to Fruit (ISAFRUIT) project. The desserts contain a prebiotic (oligofructose) or antioxidant dietary fibre (apple pomace) and are accompanied by custard, cream or soy cream (4 parts puree: 1 part accompaniment). Thermal processing was by the mild sous vide method and shelf life was circa 10 d (2-4°C) and >6 mo (-20°C or below). Other potential fruit combination products include fruit purees with ham, cheese, barbequed salmon or other foods. This product range requires a top quality cold chain. This has key elements of (i) product-process-package (PPP) and time temperature tolerance (TTT) (shelf life) factors; (ii) hurdle technology; (iii) freezing and thawing; (iv) transport and retailing; (v) chill (2-4°C) and/or cold storage (-20°C); (vi) temperature monitoring; (vii) risk analysis. Recommendations for managing the cold chain are documented in the conclusions section; these will ensure quality and safety for the consumer.

**Keywords:** /Minimally Processed/ /Cold Chain/ /Shelf Life/

## MODIFIED ATMOSPHERE

Jo, Yun Hee, Duck Soon An, Dong Sun Lee. 2014. Active air flushing in a sensor-controlled fresh produce container system to maintain the desired modified atmosphere. Biosystems Eng. 125: 122 – 127.

### Abstract

Modified atmosphere (MA) containers equipped with an on/off-controlled perforation that can respond to real-time gas concentrations can contribute to maintaining the quality of fresh produce. In this study, an active flushing system was devised to flush the air promptly responding to the real-time O<sub>2</sub> concentration, and its capability to maintain the target O<sub>2</sub> level was compared to that of an O<sub>2</sub> switched passive diffusion tube system. A model container with dimensions of 32 x 23 x 18 cm was filled with 350 g spinach and submitted to storage testing under different control regimes and temperatures. The gas concentration in the spinach container was programmed to stay either exactly at 11% or in the range of 11e13%. While the O<sub>2</sub> switched passive diffusion tube system could properly control the O<sub>2</sub> concentration in the container at the desired level or range when the container was at the low temperature of 10 °C, it could not do so at 20 °C, resulting in O<sub>2</sub> concentrations that were too low and CO<sub>2</sub> concentrations that were too high. The active flushing system was effective and satisfactorily controlled the gas concentration in the container at the desired level or range at both 10 and 20 °C. Compared to the O<sub>2</sub> switched passive diffusion tube system, the active flushing system was more prompt in its response to deviating atmospheric conditions, which was more pronounced in the range control mode. The container with the controlled MA was better at preserving the quality of the produce compared to a perforated control package.

**Keywords:** /Modified Atmosphere/

## PACKINGHOUSE

Vasquez, D. et.al. 2014. Characterization of sensitivity of grove and packing house isolates of *Penicillium digitatum* to pyrimethanil. Postharvest Biol. & Technol. 98 : 1 – 6.

### Abstract

In most northeast Argentinean citrus packing houses, postharvest fungicide treatments are based on the use of thiabendazole and imazalil. However, these fungicides have been used in a manner highly conducive to the selection and proliferation of resistant biotypes of *Penicillium digitatum*, the main fruit decay fungus in the area. Recently, a new fungicide, pyrimethanil (PYR), was introduced to control molds. Aims of this study were to determine the baseline sensitivities for PYR against isolates of *P. digitatum* considering its use in the region is not yet widespread and to evaluate the control of the fungus in vivo. One hundred and nine (109) *P. digitatum* isolates were collected from diseased fruit within citrus groves (43 isolates) and packing houses (66 isolates). EC<sub>50</sub> was determined for each isolate by measuring colony diameters on different agar dilutions of the fungicide. The mean EC<sub>50</sub> value of the green mold isolates collected from the groves was 0.14 ± 0.03 mg L<sup>-1</sup> while the mean EC<sub>50</sub> of those collected from packinghouses was 0.13 ± 0.05 mg L<sup>-1</sup>. No resistant isolates were found in the field where the fungicide is not used, while one isolate originated from a packing house showed an EC<sub>50</sub> of 3.40 mg L<sup>-1</sup>, 26-fold higher than the mean level. This isolate was collected from lemons stored in cool rooms of a packing house where PYR had not been used. Fruit decay by sensitive isolates was reduced approximately 80% by PYR applied at 500–600 mg L<sup>-1</sup> by immersion for 60 s at room temperature to

inoculated oranges and mandarins. In contrast, the resistant isolate was not controlled by PYR applied at 1000 mg L<sup>-1</sup>. Thus, the introduction of PYR applied into packing houses should be done carefully and control strategies should be implemented in order to minimize the development of resistant isolates.

**Keywords:** /Packinghouse/ /Postharvest/ /Green Mold/ /Citrus/

## **POSTHARVEST PATHOGENS**

Sivakumar, Dharini, Silvia Bautista-Banos. 2014. A review on the use of essential oils for **postharvest decay** control and maintenance of fruit quality during storage. *Crop Protection*. 64: 27 - 37.

### **Abstract**

Postharvest diseases are one of the major causes for the postharvest loss of horticultural fresh produce during the supply chain. The incidence of postharvest diseases can affect the quality and restrict the shelf life of the horticultural fresh produce. At present strict regulations are enforced by the fresh produce importing countries regarding the minimum pesticide residue levels in the edible portion of the fresh produce. Some fungal pathogens were reported to develop resistance to synthetic fungicides. Waste disposal of fungicides has an impact on environmental footprint. All these above-mentioned reasons have necessitated the search for a natural novel fungicide to replace the synthetic fungicide application in the packing line as postharvest treatment. Consumer preference to organic fresh produce is increasingly becoming popular in the developed countries. Therefore, this review summarises the use of essential oils in the control of postharvest diseases of horticultural commodities, their mode of actions, effects on the defence mechanism and quality of fresh fruit. Future research must be focused on conducting large scale trials to prove the feasibility of combination treatments. The cost benefit analysis of the treatments needs to be carried out in order to implement their application and the commercial applications of essential oils and host pathogen infection must be investigated in detail in order to control latent infections during postharvest storage.

**Keywords:** /Postharvest Pathogens/ /Fruits/ /Decay Control/

## **FRUITS**

### **BANANA**

Chen, Jiao, et.al. 2014. Molecular characterization of a cold-responsive RING-H2 finger gene from **banana** fruit and its interaction with MaMYC2a. *Postharvest Biol. & Technol.* 98 : 48 – 55.

### **Abstract**

Many reports indicate that RING finger proteins play key roles in regulating plant defense responses against abiotic and biotic stresses, but few have thus far been investigated in economic fruit, such as bananas. In this study, a RING finger gene, designated MaRING1, was isolated and characterized from banana fruit. MaRING1 belonged to the ATL RING-H2 finger protein family, and localized preferentially to the nucleus. Gene expression profiles revealed that MaRING1 was cold-responsive and induced by methyl jasmonate (MeJA) treatment during cold storage. Moreover, yeast two-hybrid (Y2H) and bimolecular fluorescence complementation (BiFC) assays showed that MaRING1 physically interacted with MaMYC2a, a transcription factor (TF) related to MeJA-induced chilling tolerance of

banana fruit. Taken together, our results suggest that MaRING1 might functionally coordinate with MaMYC2a in response to cold stress of banana fruit, expanding our understanding of the possible involvement of RING finger proteins in the regulatory network of MeJA-induced chilling tolerance.

**Keywords:** /Banana/

## **BLUEBERRY**

Golding, Hhn B., et.al. 2014. Low dose gamma irradiation does not affect the quality, proximate or nutritional profile of 'Brigitta' **blueberry** and 'Maravilla' raspberry fruit. *Postharvest Biol. & Technol.* 96: 49 – 52.

### **Abstract**

Blueberry (Northern Highbush, cv 'Brigitta') and raspberry (cv 'Maravilla') fruit were subject to low dose gamma irradiation (0, 150, 400 and 1000 Gy) and stored at 0 °C for three or ten days (blueberry) and two or seven days (raspberry) to determine the effects of irradiation on fruit quality and nutritional and proximate contents. In general, none of the irradiation doses ( $\leq 1000$  Gy) significantly affected blueberry or raspberry fruit quality (overall fruit quality, colour, firmness, weight loss, TSS, TA levels or TSS/TA ratio), or the nutritional or proximate content (ash, carbohydrate, dietary fibre, energy, moisture, protein, sodium, potassium, total sugars, fructose, ascorbic acid, monomeric anthocyanin, citric and malic acids). The length of time in storage affected some fruit quality and nutritional and proximate content parameters (such as overall fruit quality, firmness, weight loss, TA levels, dietary fibre, potassium, ascorbic acid, citric and malic acids), with longer storage periods resulting in lower quality fruit, irrespective of irradiation treatment. No interaction was detected between the effects of irradiation treatment and storage time, indicating that the storage effect was consistent for all irradiation doses on both blueberry and raspberry fruit quality.

**Keywords:** /Blueberry/ /Raspberry/ /Quality/ /Irradiation/

Leiva- alenzuela Gabriel A., Renfu Lu, Jose Miguel Aguilera. 2014. Assessment of internal quality of blueberries using hyperspectral transmittance and reflectance images with whole spectra or selected wave-lengths. *Innov. Food Sci. & Emerg. Technol.* 24: 2 – 13.

### **Abstract**

Hyperspectral imaging has been used in previous studies for assessing firmness and soluble solids content of fresh fruit. To assess the applicability of this technique for automatic sorting and grading of blueberries, we investigated different sensing modes (i.e., reflectance and transmittance), evaluated the effect of fruit orientation on fruit quality prediction, and developed robust prediction models with fewer wavelengths. In this study, a hyperspectral imaging system was used to acquire reflectance and transmittance images from 420 blueberries in three fruit orientations (i.e., stem end, calyx end and equator) for the spectral region of 400–1000 nm. Mean spectra were extracted from the hyperspectral images of each blueberry. Calibration models for soluble solids content (SSC) and firmness index (FI) were developed using partial least squares regression for the reflectance and transmittance spectra as well as their combination. Further, interval partial least squares (iPLS) regression with 10 different intervals of nine wavelengths was used to reduce the spectral dimensionality. Overall, reflectance gave better results (the best correlation for prediction ( $R_p$ ) of 0.90 for SSC and 0.78 for FI) than transmittance

(Rp of 0.76 for SSC and 0.64 for FI). For reflectance, SSC and FI predictions for the stem end orientation were better than for the other two orientations, while fruit orientation had little or insignificant effect on transmittance predictions. Combination of reflectance and transmittance spectra did not yield improved prediction results for both SSC and FI. On average, the prediction errors for iPLS increased by only 5%, compared to PLS for the whole spectra. The research demonstrated that it is feasible to use hyperspectral imaging technique for prediction of internal quality of blueberries with a few selected wavelengths with results similar to that with whole spectral information. Industrial relevance: Because of the distance traveled from the South to the North hemisphere, it is especially important to perform internal and external quality determination for individual fresh blueberries to ensure their quality upon arrival at the destination. Soluble solids content and firmness are important fruit quality parameters. Hyperspectral imaging has emerged as a new technique for quality and safety inspection of food and agricultural products and could be useful for blueberry quality assessment. However, there are several limitations to be afforded before: technique implementation velocity since this method uses multiple images from contiguous wavelengths (increasing computational costs), fruit light interaction, and fruit orientation effect between others. Specifically, the submitted manuscript presents results in order to demonstrate the hyperspectral imaging technique feasibility with a few selected wavelengths to achieve acceptable results for the prediction of internal quality of blueberries, thus, this would make it possible to implement the technique in the near future for online commercial sorting and grading of blueberries.

**Keywords:** /Blueberry/ /Firmness/

## **CANTALOUPE**

Upadhyay, Abhinav, et.al. 2014. Efficacy of plant-derived compounds combined with hydrogen peroxide as antimicrobial wash and coating treatment for reducing *Listeria monocytogenes* on cantaloupes. Food Microbiol. 44: 47 - 53.

### **Abstract**

The efficacy of four plant-derived antimicrobials (PDAs), namely carvacrol, thymol, b-resorcylic acid, and caprylic acid, with or without hydrogen peroxide (HP), as antimicrobial wash and chitosan based coating for reducing *Listeria monocytogenes* (LM) on cantaloupes was investigated. Cantaloupe rind plugs inoculated with LM (107 CFU/cm<sup>2</sup>) were washed for 3, 6, 10 min at 25 °C or 1, 3, 5 min at 55 or 65 °C in water, or water containing 2% PDAs with or without 2% HP. Additionally, inoculated cantaloupes (108 CFU/fruit) washed with 2% PDA-HP combinations at 55 or 65 °C (5 min) were cut into rindless cubical pieces, stored at 4 °C for 7 days and sampled for LM. Furthermore, inoculated plugs coated with 2% PDAs were stored for 7 days and sampled for surviving LM. Individual PDA washes reduced LM on rinds by  $\leq 2.5$  log CFU/ cm<sup>2</sup> by 3 min (P < 0.05). PDA-HP combinations decreased LM to undetectable levels by 5 min at 55, 65 °C, and 10 min at 25 °C (P < 0.05) and reduced LM transfer from cantaloupe surface to interior (P < 0.0001). All PDA coating treatments reduced LM on cantaloupe to undetectable levels by 5 days (P < 0.05). Results indicate that PDAs alone, or with HP could be used to reduce LM on cantaloupes.

**Keywords:** /Cantaloupe/ /Chitosan/

Kellermana, Mareli, et.al. 2014. Thiabendazole residue loading in dip, drench and wax coating application to control green mould and chilling injury on citrus fruit. Postharvest Biol. & Technol. 96: 78 – 87.

## Abstract

Green mould (caused by *Penicillium digitatum*) is a major cause of postharvest losses in citrus. Residue loading of thiabendazole (TBZ) with application methods typically used in South African pack houses and green mould control was studied. TBZ was applied curatively and protectively in dip, drench and wax coating treatments and fruit were inoculated with a TBZ-sensitive or a TBZ-resistant isolate of *P. digitatum*. The dip treatments consisted of TBZ concentrations of 0–2000  $\mu\text{g mL}^{-1}$ ; fruit were dipped for 60 s at 22°C at a pH of 7. Residues differed between fruit batches and ranged from 0.5 to 1.7  $\mu\text{g g}^{-1}$  at 1000  $\mu\text{g mL}^{-1}$  TBZ. Curative dip treatments almost completely controlled green mould (>96% at 1000  $\mu\text{g mL}^{-1}$  TBZ). The residue level needed for 75% curative control ranged from 0.06 to 0.22  $\mu\text{g g}^{-1}$ , depending on citrus type. Protective treatments were unreliable and control varied from 17% to 97.9% at 1000  $\mu\text{g mL}^{-1}$  TBZ between fruit batches. Drench treatments consisted of exposure times of 30, 60 and 90 s with 1000 or 2000  $\mu\text{g mL}^{-1}$  TBZ. Average TBZ residues were 2.14  $\mu\text{g g}^{-1}$  for Clementine mandarin fruit and 3.50  $\mu\text{g g}^{-1}$  for navel orange fruit. Green mould control on navel orange fruit resulted in 66–92%, 34–90% and 9–38% control for curative treatments after 6 and 24 h and protective treatments, respectively, depending on fruit batch. Wax with 4000  $\mu\text{g mL}^{-1}$  TBZ was applied at 0.6, 1.2 and 1.8 L wax ton<sup>-1</sup> fruit. Chilling injury was evaluated after fruit storage at –0.5°C for 40 days. Average TBZ residues loaded was 1.3, 1.3 and 2.7  $\mu\text{g g}^{-1}$  at the recommended 1.2 L ton<sup>-1</sup> for Satsuma mandarin, Clementine mandarin and Valencia orange fruit, respectively. Protective treatments showed lower infection levels (14–20%) than curative treatments (27–40%) for Valencia orange fruit. The same trend was observed with Satsuma (92–95% curative; 87–90% protective) and Clementine mandarin fruit (82–90% curative; 59–88% protective), but control was relatively poor. TBZ application in wax exceeded 5  $\mu\text{g g}^{-1}$  at higher wax loads (1.2 and 1.8 L ton<sup>-1</sup>). Wax treatments showed a significant reduction in chilling injury; TBZ had an additive effect. TBZ resistant isolates could not be controlled.

**Keywords:** /Citrus/ /Wax Coating/ /Chilling Injury/ /Green Mould/

Parra, Javier, Gabriela Ripoll, Benito Orihuel-Iranzo. 2014. Potassium sorbate effects on citrus weight loss and decay control. *Postharvest Biol. & Technol.* 96: 7 – 13.

## Abstract

Potassium sorbate (PS) is a well-known and widely used food preservative. Among other applications, it is used as a GRAS fungistatic postharvest treatment for citrus, although its use is not free of significant adverse effects. In this paper, we study in detail the efficacy of wax containing increasing concentrations of PS to control *Penicillium digitatum* decay in citrus fruit, and its effect on fruit weight loss. Decay control and weight loss increased with the concentration of PS in the wax. Wax with typical amounts of 2–5% PS showed poor decay reduction indices (DRI), between 26% and 32%, whereas fruit weight loss increased compared with non-waxed controls. Waxing of fruit reduced weight loss by up to 40%, depending on wax formulation, but the addition of just 2% PS to the wax caused an increase in fruit weight loss of up to 65% compared with the waxed fruit. Similar results were observed for all the types of wax formulations tested. The hygroscopic effects of PS are even more damaging for citrus fruit with leaves. The leaves lose weight very rapidly when PS is added to the wax and they become desiccated in 24 h. We also present the results of a similar study where PS was applied to citrus as an aqueous treatment. When applied in water, PS was far more effective for decay control than when applied in wax, but there was also a considerable increase in fruit weight loss. A treatment combining

aqueous PS with Fortisol® Ca Plus bio stimulant completely solved the problem of weight loss, these mixtures being commercially feasible treatments.

**Keywords:** /Citrus/ /Weight Loss/ /Decay Control/

Zhou, Yahan, Lili Deng, Kaifang Zeng. 2014. Enhancement of biocontrol efficacy of *Pichia membranaefaciens* by hot water treatment in postharvest diseases of **citrus** fruit. *Crop Protection*. 63: 89 – 96.

### **Abstract**

Effects of hot water treatment (HWT; 53 °C for 2 min) and *Pichia membranaefaciens*, either alone or in combination, on controlling *Penicillium italicum*, *Penicillium digitatum*, and natural infection in citrus fruit were investigated. Results showed that the combined treatment significantly reduced disease incidence and lesion diameters of blue and green molds in artificially inoculated fruit whether the pathogens were inoculated after or before the treatment compared with the treatment of *P. membranaefaciens* or HWT alone. The combination of *P. membranaefaciens* with HWT was as effective as the fungicide treatment in natural infection trials. Application of HWT did not affect the growth of *P. membranaefaciens* in the wounds of citrus fruit at 20 °C or 4 °C. *P. membranaefaciens* combined with HWT effectively enhanced the phenylalanine ammonia-lyase, peroxidase, polyphenoloxidase, chitinase, and  $\beta$ -1,3-glucanase activities and stimulated the synthesis of phenolic compounds. These results suggest that the use of HWT is a useful approach to improve the efficacy of *P. membranaefaciens* in postharvest diseases of citrus fruit.

**Keywords:** /Citrus/ /Hot Water Treatment/ /Biological Control/

### **DURIAN**

Amornputtia, Siriporn, Saichol Ketsa, Wouter G. van Doorn. 2014. Effect of 1-methylcyclopropene (1-MCP) on storage life of **durian** fruit. *Postharvest Biol. & Technol.* 97: 111 – 114.

### **Abstract**

Fruit of cv. Monthong durian (*Durio zibethinus*) were treated with 0 (control) or 500 nL L<sup>-1</sup> 1-MCP for 12 h at 25 °C. Fruit were then stored at 15 °C. To determine storage life, every 3 days a batch of fruit was transferred to 25 °C. The time to ripeness (adequate eating quality) at 25 °C in controls (no 1-MCP) decreased from 5 days in freshly harvested fruit to 3 days after 18 days of storage at 15 °C. Storage life was considered adequate if the time to ripeness was  $\geq 3$  days. The storage life at 15 °C of control fruit (no 1-MCP) was therefore 18 days. After the 1-MCP treatment the time to ripeness at 25 °C was 7 days in fresh fruit, while in fruit stored at 15 °C for 30 days it was about 3 days. The storage life at 15 °C of 1-MCP-treated fruit was therefore 30 days. Pulp firmness and pulp total soluble solids (TSS) were determined after 3 day storage intervals at 15 °C and when the fruit was ripe at 25 °C. These parameters were only slightly affected by the 1-MCP treatment. Furthermore, 1-MCP had no effect on pulp color, but delayed yellowing of the fruit exterior. It is concluded that treatment with 1-MCP before storage at 15 °C extended storage life from 18 to 30 days.

**Keywords:** /Durian/ /Ethylene/ / 1-MCP/ / Shelf life/ /Storage Life/

## GRAPES

Lorenzini, Marilinda, Giacomo Zapparoli . 2014. Characterization and pathogenicity of *Alternaria* spp. strains associated with **grape** bunch rot during post-harvest withering. *Int'l. J. Food Microbiol.* 186: 1 – 5.

### Abstract

*Alternaria* is a fungal agent of grape bunch rot which occurs during withering, a process which produces passito style wines. Seven isolates of *Alternaria* spp. were characterized using morphological examination, genotypic analysis and pathogenicity. Six of these isolates produced conidiophores and conidia displaying sporulation patterns typical of the *Alternaria alternata* species-group. Variability in colony morphology and growth on different media was observed. Phylogenetic analysis of internal transcribed spacer (ITS) sequences clustered all isolates within a monophyletic clade, while intergenic spacer region (IGS)-RFLP profiles were congruent with those of *A. alternata* and *Alternaria arborescens*. RAPD-PCR proved helpful in discriminating between strains. To assay strain pathogenicity, grape berries were infected while undergoing withering conditions at different temperatures. Disease capacity was found to be strain dependent and varied consistently between the most and least aggressive strains. This study has provided interesting information on polymorphism within *Alternaria* spp. populations in withered grapes and on understanding the saprophytic role of this fungus during the post-harvest dehydrating process.

**Keywords:** /Grape/ /Postharvest/ /Bunch Rot/

## JACKFRUIT

Adiani, Vanshika, et.al. 2014. SPME-GCMS integrated with chemometrics as a rapid on-destructive method for predicting microbial quality of minimally processed **jackfruit** (*Artocarpus heterophyllus*) bulbs. *Postharvest Biol. & Technol.* 98: 34 – 40.

### Abstract

SPME-GCMS in combination with chemometrics was employed to correlate volatile headspace composition with microbial quality of minimally processed jackfruit (*Artocarpus heterophyllus*) bulbs stored at 4°C and 10°C. Predictive models of the total viable count (TVC) and yeast and mold count (Y&M) were prepared by Partial Least Square Regression (PLS-R) using total ion current (TIC) and total mass spectral data as independent variables. All PLS-R models correlating microbial quality with GC spectral data and total mass spectral data demonstrated high regression coefficient ( $R > 0.93$ ). Models generated using TIC performed better in comparison with models prepared with total mass spectral data against test data. Ethanol, ethyl acetate and 3-methyl-1-butanol were identified as major compounds responsible for the observed correlations. The possibility of using GCMS as a non destructive method for rapid assessment of microbial quality of minimally processed fruits is demonstrated here for the first time

**Keywords:** /Jackfruit/ /Minimally Processed/

## KIWIFRUIT

Ma, Qiushi Ma. 2014. Effect of hot water treatments on chilling injury and expression of a new C-repeat binding factor (CBF) in 'Hongyang' **kiwifruit** during low temperature storage. *Postharvest Biol. & Technol.* 97: 102 – 110.

### Abstract

Kiwifruit is cold-sensitive and very susceptible to chilling injury (CI) during low temperature storage. In this study, kiwifruit (*Actinidia chinensis* cv. Hongyang) were pre-treated by water dip for 10 min at 20 (control) or 35, 45, or 55°C (heat pre treatments) and then stored at 0°C for 90 days to investigate the effect of hot water treatments (HWT) on chilling injury tolerance. Results showed that 35°C and 45°C HWT alleviated but did not completely prevent chilling injury development. By contrast, 55°C HWT increased symptoms of chilling injury. The 45°C HWT was the most effective at reducing chilling injury index and incidence. Compared with the other HWT, fruit treated at 45°C exhibited higher firmness and soluble solids content (SSC), and lower malondialdehyde (MDA) content, lipoxygenase (LOX) activity and ethylene production rate. C-repeat/dehydration-responsive element binding factors (CBFs) are key regulators in cold response. To investigate the molecular regulation of HWT on chilling tolerance of kiwifruit, a 637 bp CBF gene was identified and the relative expression of AcCBF was measured by RT-qPCR. In accordance with the effects of HWT on physiological parameters of chilling injury, AcCBF expression level was highest in the 45°C HWT. These results indicate that HWT at 45°C for 10 min prior to low temperature storage is effective for alleviating symptoms of chilling injury in 'Hongyang' kiwifruit.

**Keywords:** /Kiwifruit/ /Chilling Injury/ /Hot water treatment (HWT)/ /Low-temperature Storage/

Huang, Zihua, et al. 2014. Energy status of **kiwifruit** stored under different temperatures or exposed to long-term anaerobic conditions or pure oxygen. *Postharvest Biol. & Technol.* 98: 56 – 64.

### Abstract

Energy status is a key factor switching on ripening and senescence of fruit. In this study, kiwifruit was stored at 15°C or 25°C or exposed to long-term N<sub>2</sub> and O<sub>2</sub>. Energy characteristics and transcript abundance of energy-related genes cloned from kiwifruit in relation to fruit quality, respiration rate and ethylene production rate were investigated. The concentrations of adenylylate triphosphate (ATP), adenylylate diphosphate (ADP) and adenylylate monophosphate (AMP) peaked during storage in the following order: AMP, ADP and ATP. The transcript abundances of ADP/ATP carrier 1 (AdAAC1), ATP synthase β subunit (AdAtpB) and sucrose non-fermenting-1-related kinase 1 (AdSnRK1) fluctuated during storage. Transcript abundance peaks of alternative oxidase 2 (AdAOX2) and uncoupling protein (AdUcp) appeared after 2 days of storage, consistent with the peak in respiratory rate. Low temperature (15°C) and long-term N<sub>2</sub> treatment maintained higher firmness, blocked respiration and energy production, and lowered the total soluble solids (TSS) content, ATP level, and ATP/AMP ratio, whilst these treatments increased the transcript abundance of AdAAC1 and AdSnRK1. Furthermore, low temperature storage increased the transcript abundance of AdAtpB, AdAOX2 and AdUcp. Long-term O<sub>2</sub> application dramatically elevated the transcript abundance of AdAOX2 and AdUcp, especially at the beginning of storage. It was suggested that ripening and senescence of kiwifruit was closely related to the energy level, which in turn was positively correlated with respiration activity and regulated in coordination with AdAAC1, AdAtpB, AdAOX2, AdUcp and AdSnRK1.

**Keywords:** /Kiwifruit/

## LITCHI

Singh Pal, Sukhvinder, et.al. 2014. Preharvest application of abscisic acid promotes anthocyanins accumulation in pericarp of **litchi** fruit without adversely affecting postharvest quality. *Postharvest & Technol.* 96: 14 – 22.

### Abstract

Pericarp colour of litchi fruit is an important quality attribute that determines its market value and consumer acceptance. Plant growth regulators (PGR) such as abscisic acid (ABA) and ethephon are known to play important roles in peel colour development during maturation and ripening of non-climacteric fruits (e.g. grape and litchi). Our aim was to investigate the effects of preharvest application of ABA, ethephon and their combination on pericarp colour and fruit quality of litchi (cv. Calcuttia) and also to assess the potential effects on postharvest performance of fruit. Exogenous application of ABA (150 or 300 mg L<sup>-1</sup>) at the colour-break stage significantly increased the concentration of total anthocyanins and cyanidin-3-O-rutinoside, the major anthocyanin contributing 71–96% of the total anthocyanins, in litchi pericarp compared to ethephon (500 μL L<sup>-1</sup>). Among different anthocyanins quantified, the relative contribution of cyanidin-3,5-diglucoside to the total anthocyanins was significantly higher in all PGR-treated fruit compared to the control, but the concentration of cyanidin-3-O-glucoside was specifically enhanced by ABA. No significant effect on the concentrations of epicatechin, and quercetin-3-O-rutinoside was observed in response to PGR treatments. Ethephon (500 μL L<sup>-1</sup>) treatment did not significantly increase the anthocyanin levels in pericarp, but it caused more degradation of chlorophyll pigments than control. Aril quality with regard to firmness, soluble solids and acidity was not significantly affected by PGR treatments, except that ethephon-treated fruit showed significant softening and lower acidity. Postharvest changes in fruit quality attributes including pericarp browning during cold storage at 5°C for 14 d were mainly related to the storage duration effect, rather than PGR treatment. In conclusion, ABA treatment (150 or 300 mg L<sup>-1</sup>) at the colour-break stage enhanced anthocyanins accumulation in litchi pericarp without adversely affecting postharvest quality and storage stability for 14 d.

**Keywords:** /Litchi/ /Pericarp Browning/ /Anthocyanins/ /Ethephon/

## LONGAN

Lin, YiFen, et.al. 2014. The role of active oxygen metabolism in hydrogen peroxide-induced pericarp browning of harvested **longan** fruit. *Postharvest Biol. & Technol.* 96: 42 – 48.

### Abstract

Effects of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), as exogenous reactive oxygen, on browning and active oxygen metabolism in pericarp of harvested 'Fuyan' longan fruit were investigated. The results showed that as compared with the control fruit, there was a higher browning index in pericarp of H<sub>2</sub>O<sub>2</sub>-treated fruit. The fruit treated with H<sub>2</sub>O<sub>2</sub> resulted in increased rate of superoxide anion (O<sub>2</sub><sup>•-</sup>) production, reduced activities of superoxide dismutase (SOD), catalase (CAT) and ascorbate peroxidase (APX), decreased amounts of ascorbic acid (AsA), glutathione (GSH) and carotenoid, and increased

malondialdehyde (MDA) content. These results indicated that H<sub>2</sub>O<sub>2</sub>-induced browning in pericarp of harvested longan fruit might be due to a reducing capacity of active oxygen scavenging and an increase of accumulation of O<sub>2</sub>•<sup>-</sup>, which might stimulate membrane lipid peroxidation, disrupt cellular membrane structure, and cause the loss of cellular compartmentalization, in turn, resulting in the contact of polyphenol oxidase (PPO) and peroxidase(POD) with phenolic substrates and subsequently oxidation phenolics to form brown polymers.

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

## **MANGO**

Cantre, Dennis, et. al. 2014. Characterization of the 3-D microstructure of **mango** (*Mangifera indica* L. cv. Carabao) during ripening using X-ray computed microtomography. *Innov. Food Sci. & Emerg. Technol.* 24: 28 – 39.

### **Abstract**

In this study, X-ray computed microtomography (X-ray  $\mu$ CT) was applied to investigate the changes in the 3-D microstructure of mango during ripening at 20 °C. X-ray  $\mu$ CT provided a unique insight of the undamaged tissue and pore network during ripening. Analysis of the pore and tissue network revealed differences in the microstructure along the radial axis of the fruit and microstructural changes during ripening. Multivariate statistical analysis unveiled that ripening was associated with a decrease in pore size, and increase in pore fragmentation and pore specific surface area. These structural parameters have the highest discriminating ability, correctly classifying unripe from ripe fruit samples. The study concludes that ripening can be successfully characterized on the basis of its 3-D microstructure using X-ray microtomography. Industrial relevance: This study identified important parameters to describe the ripening process on the basis of microstructure. As today's microtomography technology allows for scanning only a small tissue sample from the fruit, the pace at which tomography technology is advancing will allow for scanning whole fruit with sufficient resolution and without any need for sample preparation. Results from this study could be applied for non-destructive determination of fruit microstructure for assessing fruit quality in relation to the ripening process.

**Keywords:** /Mango/ /Ripening/

Hu, Maijiao, et.al. 2014. Reduction of postharvest anthracnose and enhancement of disease resistance in ripening **mango** fruit by nitric oxide treatment. *Postharvest Biol. & Technol.* 97 : 115 – 122.

### **Abstract**

Nitric oxide (NO) acts as an important signal molecule with diverse physiological functions in plants. In this study we investigated the effects and possible mechanisms of exogenous NO on anthracnose caused by *Colletotrichum gloeosporioides* in mango fruit. 'Guifei' mango fruit were treated with NO donor (sodium nitroprusside of 0.1 mM) at 25°C for 5 min, inoculated with spore suspension of *C. gloeosporioides* after 24 h of NO treatment, and stored at ambient temperature (25°C). NO treatment effectively suppressed lesion development on mango fruit inoculated with *C. gloeosporioides*, and lesion diameters at 2 through 8 d in NO-treated fruit averaged 30% lower than those in control fruit. Additionally, NO treatment reduced natural anthracnose incidence and severity of mango fruit ripened at ambient temperature, and the values of both parameters from 4 to 10 d of storage in NO-treated fruit

averaged 40 and 45% lower, respectively, than those for control fruit. NO did not exhibit in vitro antifungal activity against *C. gloeosporioides*. NO treatment enhanced the activities of defense related enzymes including phenylalanine ammonia-lyase (PAL), cinnamate-hydroxylase (C4H), 4-coumarate: CoA ligase (4CL), peroxidase (POD),  $\beta$ 1,3-glucanase (GLU) and chitinase (CHT). NO treatment also promoted the accumulation of total phenolics, flavonoids and lignin that might contribute to inhibition of the pathogen. In addition to antifungal efficacy, NO treatment delayed flesh softening, yellowing, and changes in soluble solids content (SSC) and titratable acidity (TA), and peaks of respiration rate and ethylene production during ripening. These results suggest that the resistance of NO-treated mango to anthracnose may be attributed to activation of defense responses as well as delay of ripening.

**Keywords:** /Mango/ /Anthracnose/ /Fruit Ripening/

Nasir, Muhammad, et.al. 2014. Powdery mildew of **mango**: A review of ecology, biology, epidemiology and management. *Crop Protection* 64: 19 – 26.

### **Abstract**

Powdery mildew of mango, incited by the fungus *Pseudoidium anacardii* (F. Noack) U. Braun & R.T.A. Cook 2012 (formerly known as *Oidium mangiferae* Berthet), is one of the most common, widespread and serious diseases throughout the world and causes significant yield losses. Symptomatology, biology, and etiology of powdery mildew and its control through fungicides have not been widely studied, and substantial information is still required on the inoculum potential, growth models and epidemiological parameters of powdery mildew, influence of changing climate, impact of extensive use of fungicides and disease resistance. These critical factors may influence the development and emergence of diverse isolates of *O. mangiferae* including fungicide-resistant strains. Mango varieties differ slightly in their reaction to powdery mildew but a source of resistance has not been identified. In view of the increasing demands of mangoes in the world, control of powdery mildew is gaining importance. The present review treats briefly different aspects of powdery mildew disease with major emphasis on its ecology, pathology, epidemiology and management. Some new approaches such as biological control, integrated management strategies and some other aspects which have not been highlighted in former reviews, are also discussed.

**Keywords:** /Mango/ /Powdery Mildew/

Kashif Razzaqa, et.al. Role of putrescine in regulating fruit softening and antioxidative enzyme systems in 'Samar Bahisht Chaunsa' **mango**. *Postharvest Biol. & Technol.* 96: 23 – 32.

### **Abstract**

The role of putrescine (PUT) in regulating fruit softening, antioxidative enzymes and biochemical changes in fruit quality was investigated during ripening and cold storage of mango (*Mangifera indica* cv. Samar Bahisht Chaunsa). Fruit were treated with various PUT concentrations (0.0, 0.1, 1.0 and 2.0 mM) and were allowed to ripen at  $32 \pm 2^\circ\text{C}$  for 7 days, or stored at  $11 \pm 1^\circ\text{C}$  for up to 28 days. Respiration rate and ethylene production were measured daily during ripening and cold storage. Cell wall degrading enzymes such as exo-polygalacturonase (exo-PG), endo-polygalacturonase (endo-PG), pectin esterase (PE), endo-1,4- $\beta$ -D-glucanase (EGase), antioxidative enzymes including superoxide dismutase (SOD), peroxidase (POX), and catalase (CAT), fruit firmness as well as biochemical fruit quality characteristics were estimated during ripening and cold storage at 2 and 7 day intervals, respectively. PUT treatments

reduced respiration rate, ethylene production and maintained higher fruit firmness during ripening as well as cold storage. PUT-treated fruit exhibited significantly suppressed activities of cell wall enzymes (exo-, endo-PG and EGase), but retained higher PE activity during ripening and cold storage. Total phenolic and antioxidant contents were significantly higher in PUT-treated fruit during ripening as well in the cold storage period than in the controls. Activities of antioxidative enzymes (CAT, POX and SOD) were also significantly higher in PUT-treated fruit during ripening as well as cold storage. SSC and SSC:TA were lower in PUT-treated fruit, while TA and ascorbic acid content showed the reverse trend. In conclusion, pre-storage 2.0 mM PUT treatment inhibited ethylene production and suppressed the activities of cell wall enzymes, while resulting in higher activities of antioxidative enzymes and maintaining better fruit quality during ripening and cold storage.

**Keywords:** /Mango/ /Ripening/

## **MANGOSTEEN**

Kamdee, Chantika, et.al. 2015. Regulation of lignin biosynthesis in fruit pericarp hardening of mangosteen (*Garcinia mangostana* L.) after impact. *Postharvest Biol. & Technol.* 97: 68 – 76.

### **Abstract**

Pericarp hardening in fresh mangosteen (*Garcinia mangostana* L.) fruit is a rapid response to mishandling during and after harvest. Firmness, lignin content and lignin composition (G and S lignin) increased rapidly, while total free phenolic content decreased in damaged mangosteen pericarp following impact. Application of nitrogen to the fruit after impact reduced these effects, compared with fruit kept in ambient air. The majority of the genes encoding the mangosteen lignin biosynthetic pathway, and a full length MYB transcription factor (R2R3 MYB), were isolated. Expression analysis using qPCR showed that of the genes encoding enzymes in lignin biosynthesis, only GmCCoAMT and GmF5H increased after impact and correlated with increases in firmness and lignin content. The transcript level of a stress-related R2R3 MYB transcription factor was significantly increased by impact, and delayed by elevated nitrogen. These results suggest that pericarp hardening of mangosteen after impact is due to rapid transcriptional activation of late steps of the lignin biosynthetic pathway, potentially via up-regulation of transcription factors such as R2R3 MYBs.

**Keywords:** /Mangosteen/ /Pericarp Hardening/

## **MELON**

Abadias, Maribel, et.al. 2014. Biopreservation of fresh-cut melon using the strain *Pseudomonas graminis* CPA-7. *Postharvest Biol. & Technol.* 96: 69 – 77.

### **Abstract**

The use of biopreservation is a promising technique to ensure microbial safety of fresh-cut produce. The objective of this work was to test the effectiveness of the strain CPA-7 of *Pseudomonas graminis* against a cocktail of *Salmonella* spp. and *Listeria monocytogenes* on fresh-cut melon, and evaluate its effect on its quality during shelf-life when tested in conditions simulating commercial application. Fresh-cut melon was artificially inoculated with *Salmonella* spp. and *L. monocytogenes* and with or without the biopreservative strain at different concentrations and stored at 20, 10 and 5°C.

Moreover, the effect of the strain was tested in conditions simulating commercial application. Fresh-cut melon was packaged using passive modified atmosphere (MAP) and AIR conditions and stored at 5 and 10°C. Quality of fresh-cut melon was evaluated in CPA-7 treated and untreated samples. At laboratory scale trials, *P. graminis* reduced *Salmonella* and *L. monocytogenes* growth on fresh-cut melon stored at 5, 10 and 20°C. Effectiveness depended on their concentration and on storage temperature. At low pathogen concentration and 20°C, *L. monocytogenes* growth was reduced between 2.1 and 5.3 log cfu g<sup>-1</sup> after 2 days of storage and *Salmonella* growth between 2.0 and 7.3 log cfu g<sup>-1</sup> depending on CPA-7 dose. At 10°C, similar reductions of pathogens were observed after 5 days of storage. In studies simulating commercial conditions, packaging atmosphere and temperature influenced *P. graminis* effectiveness, with better results in samples packaged under AIR conditions and 10°C. Reduction of pathogen growth was <1-log unit in fresh-cut melon stored in MAP whilst it was >4-log units in AIR. Soluble solids content, titratable acidity, pH and firmness of fresh-cut melon were not significantly different in CPA-7 treated and untreated (control) melon. In general, lightness, chroma and hue values of fresh-cut melon stored in AIR decreased faster in CPA-7 samples than on control ones. At 5°C, CPA-7 treated melon was visually scored lower than untreated melon. *P. graminis* has demonstrated promising results at 10°C, which is a temperature more compromised for safety. Nevertheless more detailed studies on the modified atmosphere are required because AIR packaging is not recommended due to the rapid loss of quality.

**Keywords:** /Melon/ /Foodborne Pathogens/ /Microbial Safety/

## PAPAYA

Tapia, M.S., et.al. 2014. A novel functional fresh-cut product of papaya (*Carica papaya* L. Maradol) using vacuum Impregnation and edible coatings. *Acta Hort.* 1040: 315 – 322.

### Abstract

Fruit matrixes, like papaya (*Carica papaya* L. 'Maradol') may serve as a vehicle for micronutrients and bioactive components to obtain "functional fruits". In this work, a functional fresh-cut papaya product was elaborated by pulsed vacuum impregnation with isotonic solutions containing calcium, zinc, ascorbic and folic acid, bifidobacteria and oligofructose. Vacuum impregnated fruit cylinders were coated with alginate or gellan-based edible films, which could also transport bifidobacteria. The shelf life of the fresh-cut fruit was 12 days at 4°C. Flavor-related parameters (total soluble solids, pH, and titratable acidity) remained stable during storage and overall quality and sensory attributes of treated fruit improved significantly. Results of sensory test (trained panel and consumers) showed a high degree of acceptance.

**Keywords:** /Papaya/ /Edible Films/

## PASSION FRUIT

Maniwara, Phonkrit, et.al. 2014. The use of visible and near infrared spectroscopy for evaluating passion fruit postharvest quality. *J. Food Eng.* 143: 33 – 43.

### Abstract

Visible and short-wave near infrared spectroscopy (Vis/SWNIRS) was investigated using a non-destructive method for evaluating passion fruit quality. In this study, interactance and transmission measurements were performed and their competences were compared. Prediction models of soluble solids content (SSC), titratable acidity (TA), ascorbic acid content (ASC), ethanol concentration (EtOH), peel firmness (PF) and pulp percentage (PP) were developed based on multivariate methods of partial least square regression (PLSR) analysis. The PLS models from interactance measurements provided better prediction results than the transmission technique. The best model was obtained from interactance SSC calibration with a correlation coefficient between measured and predicted values (R) of 0.923. Furthermore, the PLS models generated from interactance and transmission spectra also provided satisfactorily prediction results for EtOH, PF and PP. However, all calibrations failed to predict ASC by providing low correlations and high root mean square errors of prediction (RMSEP).

**Keywords:** /Passion Fruit/ /Postharvest Quality/

## PEACH

Perez-Lopez, A. , et.al. 2014. Respiration rate and mechanical properties of peach fruit during storage at three maturity stages. J. Food Eng. 142: 111 – 117.

## Abstract

Knowledge of the physical, physiological and mechanical properties of fruits is important for its later harvest handling. The physical properties of peach fruit cv. Diamante harvested at physiological maturity stage were evaluated, obtaining the following values: sphericity (0.98), density (0.998 g cm<sup>-3</sup>), bulk density (0.61 g cm<sup>-3</sup>), porosity (0.38), and packing coefficient (0.70). The respiration rate and mechanical properties (compression load, strain and apparent elasticity modulus) of the peach fruit during storage at room temperature, as a function of its maturity stage (green, middle yellow and yellow) were also evaluated. Middle yellow fruits exhibited higher respiration rate than those corresponding to green and yellow ones. The peach fruit tissue showed anisotropic behavior, varying its mechanical properties with the orientation (tangential or radial) of the compressive load. The mechanical properties of peach exhibited a strong dependence on the degree of maturity at harvest and the rate of senescence progression.

Keywords: /Peach/ /Maturity Stage/ /Respiration Rate/

## PEAR

Makkumrai, Warangkana, et.al. 2014. Effect of ethylene and temperature conditioning on sensory attributes and chemical composition of 'Bartlett' pears. Postharvest Biol. & Technol. 97: 44 – 61.

## Abstract

'Bartlett' pears are resistant to ripening after harvest. Ethylene and temperature conditioning have been successfully used to stimulate fruit ripening with improved eating quality over non-conditioned fruit. However, few studies have evaluated the effect of different conditioning treatments on the sensory attributes of the fruit. In this study, we compared a descriptive sensory evaluation with the chemical composition of 'Bartlett' pears after the fruit were exposed to the following conditioning treatments: 2 d 100 µl L<sup>-1</sup> ethylene, 14 or 7 d at 0°C, 7 or 3 d at 10°C, or untreated control at 20°C. Fruit

were softened to 27, 18 and 9 N firmness before evaluation. At 9 N, fruit conditioned at 0°C produced high levels of esters, and fruit conditioned at 0°C for 14 d also were high in sweet taste and fruity flavor attributes. Fruit treated at 10°C had lower concentrations of esters, but fruit treated at 10°C for 3 d was high in sweet taste perception. Ethylene treated fruit produced low levels of esters and high levels of aldehydes and were associated with apple aroma, similar to the untreated control fruit. Water soluble pectin levels were highly and positively correlated with juiciness and sweetness and negatively correlated with firmness, crunchiness, and grittiness. Future studies should determine whether consumer liking of 'Bartlett' pear fruit is also influenced by conditioning treatment.

**Keywords:** /Pear/ /Ethylene/

Xie, Xingbin, et.al. 2014. Ethylene synthesis, ripening capacity, and superficial scald inhibition in 1-MCP treated 'd'Anjou' pears are affected by storage temperature. *Postharvest Biol. & Technol.* 97: 1 – 10.

### **Abstract**

A continuing challenge for commercializing 1-methylcyclopropene (1-MCP) to extend the storage life and control superficial scald of 'd'Anjou' pear (*Pyrus communis* L.) is how to initiate ripening in 1-MCPTreated fruit. 'D'Anjou' pears harvested at commercial and late maturity were treated with 1-MCP at 0.15 μL L<sup>-1</sup> and stored either at the commercial storage temperature -1.1°C (1-MCP@-1.1°C), or at 1.1°C (1-MCP@1.1°C) or 2.2°C (1-MCP@2.2°C) for 8 months. Control fruit stored at -1.1°C ripened and developed significant scald within 7 d at 20°C following 3–5 months of storage. While 1-MCP@-1.1°C fruit did not develop ripening capacity due to extremely low internal ethylene concentration (IEC) and ethylene production rate for 8 months, 1-MCP@1.1°C fruit produced significant amounts of IEC during storage and developed ripening capacity with relatively low levels of scald within 7 d at 20°C following 6–8 months of storage. 1-MCP@2.2°C fruit lost quality quickly during storage. Compared to the control, the expression of ethylene synthesis (*PcACS1*, *PcACO1*) and signal (*PcETR1*, *PcETR2*) genes was stable at extremely low levels in 1-MCP@-1.1°C fruit. In contrast, they increased expression after 4 or 5 months of storage in 1-MCP@1.1°C fruit. Other genes (*PcCTR1*, *PcACS2*, *PcACS4* and *PcACS5*) remained at very low expression regardless of fruit capacity to ripen. A storage temperature of 1.1°C can facilitate initiation of ripening capacity in 1-MCP treated 'd'Anjou' pears with relatively low scald incidence following 6–8 months storage through recovering the expression of certain ethylene synthesis and signal genes.

**Keywords:** /Pear/ /1-MCP/ /Ripening/ /Ethylene/

Zhang, Wen, Di Cui, Ybin Ying. 2014. Nondestructive measurement of pear texture by acoustic vibration method. *Postharvest Biol. & Technol.* 96: 99 – 105.

### **Abstract**

Texture is a key attribute for the assessment of pear quality, and a non-destructive texture detection method was investigated. Each pear fruit was excited by a swept sine wave signal (*x*<sub>in</sub>), and the response signal from the top of the pear (*x*<sub>out</sub>) was detected by a laser Doppler vibrometer (LDV). The vibration spectrum was acquired after a fast Fourier transform was applied to the *x*<sub>in</sub> and *x*<sub>out</sub> data. Six vibration parameters, including the second resonance (*f*<sub>2</sub>), the amplitude at *f*<sub>2</sub> (*A*<sub>2</sub>), and the phase shifts at 400, 800, 1200 and 1600 Hz (*P*<sub>400</sub>, *P*<sub>800</sub>, *P*<sub>1200</sub> and *P*<sub>1600</sub>) were extracted from the

vibration spectrum, and the elasticity index (EI) was determined by the formula  $EI = f22m2/3$ . The fruit texture was then measured by a puncture test. Three texture indices were extracted from the force–deformation curve, in which the stiffness (Stif) was found to be more suitable for representing fruit quality. The multiple linear regression (MLR) method was applied to evaluate the importance of each vibration parameter for predicting Stif, and the following order of importance was found: EI, f2, P400, P1600, P800, P1200, and A2. A texture prediction model was built by the stepwise multiple linear regression (SMLR) method and modified through the introduction of the pear shape index (SI). The performance of the prediction model was improved after modification; the value of the correlation coefficient for the calibration and validation sample sets (rc and rp) increased by 0.4% and 2.1%, respectively, while the root mean square errors of calibration and prediction (RMSEC and RMSEP) decreased by 0.6% and 3.3%, respectively. Highly significant results ( $P < 0.01$ ) for both the initial and modified prediction models proved that the evaluation of pear texture by a combination of the LDV method and the proposed approach was feasible.

**Keywords:** /Pear/ /Texture/ /Non-Destructive/

## PERSIMMON

Chung, Hun-Sik, et.al. 2014. Effect of deastringency treatment of intact persimmon fruits on the quality of fresh-cut persimmons. Food Chem. 166: 192 – 197.

### Abstract

The changes in the quality characteristics of the fresh-cut products prepared from intact ‘Cheongdobansi’ persimmons treated with different deastringency methods (nontreated, carbon dioxide gas, warm water, ethanol vapour) have been investigated for 6 days at 10 °C. Flesh firmness of the persimmons decreased after ethanol vapour treatment. The decrease in L\* value and flesh firmness in the slices prepared from persimmons treated with warm water was retarded. Soluble solids content and titratable acidity of the persimmons decreased after all deastringency treatments. Soluble tannins and radical scavenging activity of the slices from untreated persimmons were maintained at higher concentrations, unlike slices from astringency-removed persimmons. These results suggest that pre-slicing deastringency treatments affect the characteristics of fresh-cut persimmons, and that warm-water treatment could be a useful method to control the browning and softening of fresh-cut persimmons.

**Keywords:** /Persimmon/ /Fresh Cut/ /Browning/ /Softening/ /Deastringency/

## PLUM

Alejandra Martínez-Esplá, Alejandra, et.al. 2014. a Preharvest application of methyl jasmonate (MeJA) in two plum cultivars. 1. Improvement of fruit growth and quality attributes at harvest. Postharvest Biol. & Technol. 98: 98 – 105.

### Abstract

Two plum (*Prunus salicina* Lindl.) cultivars ‘Black Splendor’ (BS) and ‘Royal Rosa’ (RR) were treated with methyl jasmonate (MeJA) at 3 concentrations (0.5, 1.0 and 2.0 mM) along the on-tree fruit development: 63, 77 and 98 days after full blossom (DAFB). On a weekly basis, fruit samples were taken

for measuring fruit size and weight and parameters related to quality. Results revealed that MeJA was effective in increasing fruit size and weight, the 0.5 mM being the most effective for BS cultivar and 2.0 mM for RR. At harvest, those fruit treated with 0.5 mM MeJA had the highest firmness and colour Hue values. Total acidity was also generally higher in MeJA-treated fruit than in controls, while the content of total soluble solids remained unaffected. In addition, total phenolics and total antioxidant activity were found at higher concentrations in 0.5 and 2.0 mM MeJA-treated than in control fruit over at last 3 weeks of fruit development for BS and RR cultivars, respectively. Overall results suggest that MeJA could be a promising preharvest tool to increase plum size and quality with enhanced bioactive compounds and antioxidant activity, although the optimum concentration is cultivar dependent.

**Keywords:** /Plum/ /Preharvest treatment/ /Fruit Size/ /Firmness/ /Antioxidant/

Pedro J. Zapata, Pedro J. et al. 2014. Preharvest application of methyl jasmonate (MeJA) in two plum cultivars. 2. improvement of fruit quality and antioxidant systems during postharvest storage. *Postharvest Biol. & Technol.* 98: 115 – 122.

### **Abstract**

'Black Splendor' (BS) and 'Royal Rosa' (RR) plums were treated preharvest with methyl jasmonate (MeJA) at three concentrations (0.5, 1.0 and 2.0 mM) along the on-tree fruit development: 63, 77 and 98 days after full blossom (DAFB). Both control and treated fruit were harvested at the commercial ripening stage and stored in two temperature conditions: 9 days at 20°C or at 2°C + 1 day at 20°C for 50 days. Preharvest MeJA at 2.0 mM significantly accelerated whereas 0.5 mM delayed the postharvest ripening process for both cultivars, since ethylene production, respiration rate and softening were reduced significantly at the two storage conditions for 0.5 mM. In these fruit, total phenolics, total antioxidant activity (hydrophilic fraction, HTAA) and the antioxidant enzymes peroxidase (POD), catalase (CAT) and ascorbate peroxidase (APX) were found at higher levels in treated than control plums during postharvest storage, which could account for the delay of the postharvest ripening process and the extension of shelf-life.

**Keywords:** /Plum/ /Pre Harvest Treatment/ /Firmness/ /Antioxidant/

### **RASPBERRY**

Flores, Gema, et al. 2014. Influence of preharvest and postharvest methyl jasmonate treatments on flavonoid content and metabolomic enzymes in red raspberry. *Postharvest Biol. & Technol.* 97: 77 – 82.

### **Abstract**

The effect of preharvest and postharvest treatments with methyl jasmonate on the concentrations of myricetin, ellagic acid and quercetin in red raspberry was investigated. Different raspberry varieties and different MJ concentrations were included in the study. The preharvest MJ application to raspberry plants resulted in a significant increase of the flavonoids in all varieties. Increases from 90.32 to 336.95 µg/g of myricetin, from 103.15 to 218.91 µg/g of ellagic acid and from 65.22 to 163.15 µg/g of quercetin were obtained in Glen Lyon variety after pre-harvest treatment with 0.1 mM MJ. Postharvest MJ treatment did not lead to such a significant increase in the concentrations but enabled natural decline during storage to be avoided. Contents of myricetin, ellagic acid and quercetin were maintained.

Concentrations in postharvest MJ treated raspberries were constant between 60 and 100 µg/g. Enzyme studies reflected increase in PAL activity after preharvest MJ treatment. No MJ promoting effect and even an inhibitory effect was however observed in FHT and FLS enzymes, respectively. The results found in the present work help get an insight into the mechanisms of MJ action in phenylpropanoid metabolism in raspberries. Preharvest MJ treatment of raspberries can be useful for obtaining fruit with enhanced healthy promoting properties.

**Keywords:** /Raspberry/ /Methyl Jasmonate/ /Postharvest Treatment/ /Preharvest Treatment /

Morales, M.I., et. al. 2014. Effect of storage time at low temperature on the volatile compound composition of Sevillana and Maravilla raspberries. Postharvest Biol. & Technol. 96: 128 – 134.

### **Abstract**

In this study, the effect of storage time at low temperature on volatile compounds in two cultivars of raspberry, *Rubus idaeus* L. cv. Sevillana and Maravilla, was determined. A total of 28 compounds were identified in both cultivars and showed quantitative differences between the cultivars. The Sevillana cultivar was richer in volatile compounds than the Maravilla cultivar.  $\alpha$ -Ionone had the highest concentration in both cultivars. We observed opposing trends in the volatile compound composition for the cultivars during storage at low temperature, in which 'Sevillana' lost compounds and 'Maravilla' was enriched. Therefore, storage at low temperature causes important changes in the volatile compound profile of raspberry, particularly the Sevillana cultivar, with significant decreases in C13-norisoprenoids and increases in terpenes. These changes are most likely responsible for the aromatic differences between the cultivars because of the presence of terpenes in 'Sevillana' and C13-norisoprenoids in 'Maravilla'.

**Keywords:** /Raspberry/ /Storage/

### **STRAWBERRIES**

Lopes, Ueder Pedro. 2014. Potassium silicate and chitosan application for gray mold management in strawberry during storage. Crop Protection. 63: 103 - 106.

### **Abstract**

The objective of this study was to investigate the effect of silicon and chitosan as alternative controls for postharvest rot of strawberries (gray mold) caused by *Botrytis cinerea*. Chitosan and potassium silicate applications were performed at the preharvest stage using the following treatments: chitosan once a week; potassium silicate once a week; potassium silicate once a week þ chitosan once a week; and without application. An additional variable was introduced at postharvest, with one-half of the total fruit harvested from each plot dipped in chitosan and the other half not dipped in chitosan. Potassium silicate alone was not effective for rot control. Fruits from plants that received the chitosan application showed 64% less area under the rot progress curve (AURPC) than fruits from plants that were not treated with chitosan. Harvested fruits that were chitosan dipped showed 48% less AURPC than fruits that were not treated at postharvest. Chitosan application in the field and at postharvest is a promising strategy for the management of postharvest strawberry rot.

**Keywords:** / Strawberry/ /Preharvest/ /Postharvest/ /Gray Mold/ /Botrytis rot

Pan, Leiqing, et.al. 2014. Early detection and classification of pathogenic fungal disease in post-harvest **strawberry** fruit by electronic nose and gas chromatography–mass spectrometry. Food Res. Int'l. 62: 162–168.

### **Abstract**

Strawberry fruit decay caused by fungal infection usually results in considerable losses during post-harvest storage; thus, discerning the decay and infection type in the early stage is necessary and helpful for reducing the losses. In this study, three common pathogenic fungi belonging to *Botrytis* sp., *Penicillium* sp. and *Rhizopus* sp. were individually inoculated into ripe strawberry fruits; non-inoculated fruits were used as controls. The strawberry fruits were stored at  $5 \pm 1$  °C for 10 days. During storage, inoculated fruits began rotting on day 2, while control fruits began rotting on day 4. The volatile compounds emitted by the fruits were analysed by an electronic nose (E-nose) and gas chromatography–mass spectrometry (GC–MS). Principal component analysis (PCA) showed a clear discrimination in decay on day 0, day 2 and day 4 and the infection type on day 2 after fungal inoculation based on 5 selected sensors of E-nose. The discrimination accuracy of the fungal infection type of strawberry fruits for the four groups reached 96.6% by using multilayer perceptions neural network model. GC–MS results of the four strawberry fruit groups on day 2 identified several key characteristic volatile compounds for each infection treatment, compared with the control. Therefore, E-nose was able to realise the early diagnosis of fungal disease, in addition to an accurate classification of the pathogenic fungal type in the fruits during post-harvest storage.

**Keywords:** /Strawberry/ /Pathogenic Fungal Disease/ /Gas Chromatography/

### **SWEET CHERRIES**

Oro, Lucia, et. al. 2014. Biocontrol of postharvest brown rot of **sweet cherries** by *Saccharomyces cerevisiae* Disva 599, *Metschnikowia pulcherrima* Disva 267 and *Wickerhamomyces anomalus* Disva 2 strains. Postharvest Biol. & Technol. 96: 64 – 68.

### **Abstract**

In this work, *Metschnikowia pulcherrima* Disva 267, *Wickerhamomyces anomalus* Disva 2, and *Saccharomyces cerevisiae* Disva 599 yeast strains were evaluated for their biocontrol activity on postharvest decay brown rot, mainly caused by *Monilinia laxa* on sweet cherries, using three increasing concentrations (106, 107 and 108 CFU/mL). *M. pulcherrima* significantly reduced brown rot incidence, severity and McKinney index at all three concentrations, *W. anomalus* was effective at the concentration of 107 CFU/mL, and *S. cerevisiae* reduced brown rot only at 108 CFU/mL. *M. pulcherrima* and *W. anomalus* survived on the surface of sweet cherries during 2 weeks cold storage. When the three yeasts were sprayed on the canopy of sweet cherry trees at 107 CFU/mL, *M. pulcherrima* and *W. anomalus* showed good survival and colonization. In contrast, under the same conditions, *S. cerevisiae* strain did not survive. None of the yeasts produced phytotoxic substances, both on intact and on wound-inoculated fruit. Therefore, *M. pulcherrima* Disva 267 and *W. anomalus* Disva 2 could be promising biocontrol agents, able to survive in field and storage environments, providing a clear decrease in postharvest decay. However, further investigations with large scale trials are needed to lead to a possible formulation and commercial use.

**Keywords:** /Sweet Cherries/ /Storage Decay/ /Brown Rot/

Zhou, Jianfeng. 2014. Effect of excitation position of a handheld shaker on fruit removal efficiency and damage in mechanical harvesting of sweet cherry. *Biosystem Eng.* 125: 36 – 44.

### **Abstract**

As labour cost keeps rising and labour availability remains increasingly uncertain, growers are seeking mechanical harvesting solutions for fresh-market tree fruit production. To fulfil this need, this research aimed at assessing the effect of excitation position on fruit removal efficiency and fruit damage using a hand-held limb shaker for harvesting sweet cherry. In this study, four excitation positions were selected on each randomly selected limb of “Y” trellis cherry trees. The total number of fruit being removed from five fruiting zones of each limb and those remaining on the tree after harvesting was counted, and harvest-induced damage was assessed. Results showed that fruit removal efficiency from each zone was highly affected by the distance of the zone to the excitation position. The overall fruit removal efficiency was 84% when shaken at the lowest excitation position, and 77%, 51% and 72% respectively as the excitation position moved up the limbs. The fruit damage rates from low to high excitation positions were 20%, 28%, 20% and 23%, which was approximately 10% higher than that of handpicked fruit. No significant difference was found in the fruit damage rate when comparing different excitation positions. It was observed that the fruit removal efficiency may reach up to 97% when the limbs were excited at both the lowest and the highest excitation positions, and adopting such an excitation method could lead to a high fruit removal efficiency with not much increase in fruit damage.

**Keywords:** /Sweet Cherry/ /Mechanical Harvesting/ /Fruit Damage/

### **Table Grapes**

De Oliviera, Carlos Eduard Vasconslos, et.al. 2014. Effects of post-harvest treatment using chitosan from *Mucor circinelloides* on fungal pathogenicity and quality of table grapes during storage. *Food Microbiol.* 44: 211 – 219.

### **Abstract**

The aim of this study was to extract chitosan (CHI) from *Mucor circinelloides* UCP 050 grown in a corn steep liquor (CSL)-based medium under optimized conditions and to assess the efficacy of the obtained CHI to inhibit the post-harvest pathogenic fungi *Aspergillus niger* URM 5162 and *Rhizopus stolonifer* URM 3482 in laboratory media and as a coating on table grapes (*Vitis labrusca* L.). The effect of CHI coating on some physical, physicochemical and sensory characteristics of the fruits during storage was assessed. The greatest amount of CHI was extracted from *M. circinelloides* UCP 050 grown in medium containing 7 g of CSL per 100 mL at pH 5.5 with rotation at 180 rpm. CHI from *M. circinelloides* UCP 050 caused morphological changes in the spores of the fungal strains tested and inhibited mycelial growth and spore germination. CHI coating delayed the growth of the assayed fungal strains in artificially infected grapes, as well as autochthonous mycoflora during storage. CHI coating preserved the quality of grapes during storage, as measured by their physical, physicochemical and sensory attributes. These results demonstrate that edible coatings derived from *M. circinelloides* CHI could be a useful alternative for controlling pathogenic fungi and maintaining the post-harvest quality of table grapes.

**Keywords:** /Table Grapes/ /Quality/ /Edible Coating/ /Chitosan/ /Postharvest Decay/

Leesch, J.G. et.al. 2014. Effects of box liner perforation area on methyl bromide diffusion into table grape packages during fumigation. *Crop Protection*. 63: 36 - 40.

### **Abstract**

Plastic liners are used inside boxes of table grapes to retard moisture loss from the grapes and to contain sulfur dioxide gas released inside the packages to control postharvest decay. However, to control organisms of quarantine concern, regulators specify exported packages must be fumigated with methyl bromide (MB), and to enable adequate diffusion of the fumigant into the packages they specify the liners must be perforated. The percentage of the area of the liner that is perforated, formerly stipulated to be not less than 0.3%, was recently increased to not less than 0.9%. Two MB fumigation schedules specified for control of the Chilean mite, *Brevipalpus chilensis*, were applied to grape packages with a high-density polyethylene liners with perforated areas of 0.9% or with a SO<sub>2</sub>-releasing liners with perforated areas of 0.3, 0.6, or 0.9%. Package and chamber concentrations were measured repeatedly for up to three hours during MB fumigation at 4.4 or 6.0 °C with a dosage 64 mg L<sup>-1</sup> or at 26.7 °C with a dosage 56 mg L<sup>-1</sup>. Diffusion was similar and rapid into the packages among all perforated areas. MB concentrations inside the packages were not less than 95% of those of the chamber atmosphere within 15 min. After fumigation with an MB dosage 64 mg L<sup>-1</sup> at 4.4 °C and subsequent storage at 2.0 °C, mean MB residue content in grapes from most packages 48 h after MB fumigation was below the limit of quantitation of 0.002 mg kg<sup>-1</sup>. After fumigation with an MB dosage 56 mg L<sup>-1</sup> at 26.7 °C and subsequent storage at 2.0 °C, mean MB residue content in grapes from most packages 24 h after MB fumigation was below the limit of quantitation.

**Keywords:** /Table Grapes/ /Methyl Bromide/

### **WATERMELON**

Soteriou, G. A. , et. al. 2014. Evolution of watermelon fruit physicochemical and phytochemical composition during ripening as affected by grafting. *Food Chem*. 165: 282 – 289.

### **Abstract**

Flesh reflectance colorimetry, mechanical texture analysis, pH, titratable acidity (TA), and soluble solid (SS), soluble carbohydrate, lycopene and citrulline content of watermelon fruit were assessed throughout ripening (30–50 days post-anthesis; dpa) in grafted and self-rooted plants. Grafting increased firmness, TA, and lycopene content though it delayed its peak. Lycopene content was mostly ripening-dependant, highly correlated and synchronous with changes in pulp chroma (C) and colour a/. The sweetness was affected only by ripening. However, total sugars and SS peaked later in fruit of grafted plants than in non-grafted ones, and significant interaction of ripening with grafting was observed. Citrulline content increased with ripening in fruit of grafted plants, reaching a peak at 45 dpa; whereas in non-grafted ones it was unchanged between 30 and 45 dpa and declined at 50 dpa. As ripening overall was retarded by grafting, fruit quality of grafted watermelon may benefit from belated harvest.

**Keywords:** /Watermelon/ /Ripening/

## **VEGETABLES**

### **BROCCOLI**

Eason, R. et.al. 2014. Over expression of the protease inhibitor BoCPI-1 in **broccoli** delays chlorophyll loss after harvest and causes down-regulation of cysteine protease gene expression. *Postharvest Biol. & Technol. Technol.* 97: 23 – 31.

#### **Abstract**

Papain-like cysteine proteases are involved in many physiological processes in vascular plants, including senescence and programmed cell death. Here we report the isolation of a cysteine protease inhibitor (BoCPI-1) from broccoli (*Brassica oleracea* var. *italica*), and characterise its role in regulating protease activity. Biochemical analysis showed BoCPI-1 had inhibitory activity against papain. Broccoli was genetically modified to over express BoCPI-1, and both azocasein assays (which provide a relatively crude measure of total protease activity), together with DCG-04 assays (which allow more targeted analysis of cysteine protease activity), were used to examine the function of the inhibitor during postharvest senescence. In broccoli heads, over expression of BoCPI-1 reduced total protease activity, retained cellular soluble protein content and delayed the onset of postharvest senescence as measured by chlorophyll loss. Up-regulating the expression of BoCPI-1 resulted in a lower mRNA accumulation of five different senescence-associated cysteine protease genes (BoCP1, BoCP2, BoCP3, BoCP4, BoCP5). The link between the transcription of a cysteine protease inhibitor (a phytocystatin) and the transcription of the structurally unrelated cysteine proteases suggests that the changed cysteine protease mRNA accumulation patterns are the result of a feedback loop that is regulated by cellular protease activity.

**Keywords:** /Broccoli/ /Harvesting/

Aiama-or, Sukanya, et.al. 2014. Involvement of chloroplast peroxidase on chlorophyll degradation in postharvest **broccoli** florets and its control by UV-B treatment. *Food Chem.* 165: 224– 231.

#### **Abstract**

Chlorophyll (Chl)-degrading peroxidase (POX) was purified from green and green-yellow broccoli florets to elucidate the physiological role and cell localisation of Chl-degrading POX. Effect of UV-B treatment on Chl-degrading POX activity was also determined. The Chl-degrading POX activity was separated by an ion exchange chromatography into 3 fractions, Chl-POX1, Chl-POX2 and Chl-POX3. The activities of Chl-POX2 and Chl-POX3, but especially that of Chl-POX3, were found in green-yellow florets and were clearly suppressed by UV-B irradiation. The protein molecular sizes of cPOX1 and cPOX3 purified from Chl-POX1 and POX3 were 43 and 34 kDa, respectively. The cPOX1 was not located within chloroplast fraction, whereas the cPOX3 was found in intact chloroplasts extracted from senescing broccoli florets. We propose that cPOX3 is a chloroplast POX and the activity was suppressed by UV-B treatment, suggesting that cPOX3 might be involved in Chl degradation in stored broccoli florets.

**Keywords:** /Broccoli/ /Postharvest/ /UV-Irradiation/

Cogo, Sarah, L.P. et.al. 2014. Low soil water content during growth contributes to preservation of green colour and bioactive compounds of cold-stored **broccoli** (*Brassica oleracea* L.) florets. *Postharvest Biol. & Technol.* 60: 158 – 163.

### **Abstract**

Broccoli, cultivated under low (0.40 MPa) and normal (0.04 MPa, equivalent to field capacity) soil water content, and stored under low (1 °C) and room (23 °C) temperature, was assessed for changes in colour, bioactive compounds, and antioxidant activity. Results demonstrated a significant interaction between cultivation and storage conditions. Low soil water content during plant growth and postharvest cold storage were the conditions that, combined, gave the best preservation of colour, antioxidant activity, and l-ascorbic acid and 5-methyl-tetrahydrofolate contents. Carotenoid preservation was dependent on postharvest storage conditions while the contents of phenolic compounds were reduced over time, independent of cultivation and postharvest storage conditions.

**Keywords:** /Broccoli/ /Cold Storage/

Rybarczyk-Plonska Plonska, Plonska. 2014. Vitamin C in **broccoli** (*Brassica oleracea* L. var. *italica*) flower buds as affected by postharvest light, UV-B irradiation and temperature. *Postharvest Biol. & Technol.* 98: 82 – 89.

### **Abstract**

In this study, the changes in vitamin C, l-ascorbic acid (AA) and l-dehydro ascorbic acid (DHA) levels in broccoli flower buds were examined during pre-storage and storage periods, simulating refrigerated transport with wholesale distribution and retail, respectively. Broccoli heads were pre-stored for 4 or 7 days at 0°C or 4°C in the dark and then stored for 3 days at 10°C or 18°C. During storage the broccoli heads were exposed for 12 h per day to three different levels of visible light (13, 19 or 25  $\mu\text{mol m}^{-2}\text{s}^{-1}$ ) or a combination of visible light (19  $\mu\text{mol m}^{-2}\text{s}^{-1}$ ) and UV-B irradiation (20  $\text{kJ m}^{-2}\text{d}^{-1}$ ), or they were stored in the dark. The vitamin C content in broccoli flower buds during storage was significantly affected by pre-storage period and temperature. Higher vitamin C levels in flower buds after storage were observed for broccoli heads pre-stored for 4 days or at 0°C as compared to those pre-stored for 7 days or at 4°C. Storage temperature also affected vitamin C in broccoli flower buds, with higher levels observed for broccoli stored at 10°C than at 18°C. Hence, vitamin C in broccoli flower buds was demonstrated to decrease together with increasing pre-storage period, pre-storage temperature and storage temperature. AA in broccoli flower buds was influenced mainly by storage temperature and to a minor extent by pre-storage temperature. The DHA level and DHA/AA ratio were stable in flower buds of broccoli pre-stored for 7 days, whereas increasing tendencies for both DHA level and ratio were observed after pre-storage for 4 days. These results indicate a shift in the ascorbate metabolism in broccoli flower buds during storage at low temperatures, with its higher rate observed for broccoli pre-stored for shorter time. There were no effects of the light and UV-B irradiation treatments on vitamin C, AA and DHA levels in broccoli flower buds.

**Keywords:** /Broccoli/ /Storage/UV-B Irradiation/

## **CABBAGE**

Thammawong, Manasikan, et.al. 2014. Modeling of the respiration rate and gene expression patterns of **cabbage** in response to mechanical impact stress using a modified Weibull distribution. Post-harvest Biol. & Technol. 96: 118 – 127.

### **Abstract**

We previously found that respiration rate changes of postharvest cabbage heads are influenced by the mechanical (impact) stress level and the time since the stress application. In this study, the effect of impact stress (dropping treatment) on the expression of genes related to respiratory by products and ethylene synthesis of the cabbage was investigated. Quantitative reverse transcription PCR (qRT-PCR) analysis revealed that cabbage leaf wounds caused by dropping treatment significantly increased the expression of genes (BoAPX2, BoPAL, BoSAMS, and BoACS2) in the wounded area and the surrounding leaf area within 1 h after the treatment. Additionally, we proposed a novel mathematical model based on a modified Weibull distribution (MWD) to describe the stress response characteristics of the cabbage. Using a non-linear least square method, the proposed prediction model fitted the respiration rate and relative gene expression experimental data very well. The model parameters are also clearly defined and discussed. The results, therefore, suggest possible uses of the model for predicting the stress-responsive cellular metabolisms and quality changes of postharvest fresh produce. Furthermore, this model has potential to become valuable tool for developing the postharvest techniques to minimize quality loss and to extend the shelf-life of fresh produce.

**Keywords:** /Cabbage/ /Postharvest/ /Mechanical Stress/

## **EGGPLANT**

Zaro, Maria J., et.al. 2014. Changes in bioactive compounds and response to postharvest storage conditions in purple **eggplants** as affected by fruit developmental stage. Postharvest Biol. & Technol. 96: 110 – 117.

### **Abstract**

Fruit maturity stage at harvest influences the response to postharvest storage conditions and bioactive compounds content. In this work fruit from two purple eggplant cultivars (Monarca and Perla Negra) were harvested at 12, 15, 18, 20 and 23 d after fruit set (designated as stages I through V) and changes in size, dry weight, calyx area, cell wall material (AIR, alcohol insoluble residue), firmness, respiration, and antioxidants (peel anthocyanins and pulp carotenoids, ascorbic acid, phenolics and chlorogenic acid) were determined. In a second set of experiments the postharvest performance of fruit harvested at stages I ("baby" eggplants), III and IV (traditional harvest stages) during storage at 0 or 10°C was assessed. Fruit growth continued until late ripening in contrast to calyx expansion and peel anthocyanin accumulation, which were relatively earlier events. Fruit dry weight decreased between stages I and III, remaining constant afterwards. "Baby" eggplants had higher antioxidant capacity, chlorogenic acid (ChA), carotenoids and ascorbic acid contents than late-harvested fruit. ChA predominated in pulp placental tissues at stage I, spreading throughout the fruit core as ripening progressed. No marked differences in dry mass, antioxidant capacity or responses to postharvest storage regimes were found between fruit harvested at stages III and IV. Late pickings increased yields and led to less dense fruit, which had lower respiration rates. Within this harvest window, storage at

10°C maximized quality maintenance. In contrast “baby” eggplants stored better at 0°C. Understanding the developmental changes in bioactive compounds and postharvest performance may help in the maximization of fruit antioxidant properties as well as in the selection of the optimal handling conditions for each ontogenic stage.

**Keywords:** /Eggplant/ /Postharvest/ /Storage/ /Chilling Injury/ /Quality/

## LETTUCE

Deza-Durand, Karla M., et.al. 2014. Volatile compounds of modified atmosphere packaged cut iceberg lettuce: effect of extremely low O<sub>2</sub>, season, cultivar and storage time. Food Res. Int'l. 62: 254 – 261.

### Abstract

This study investigates the changes in volatile compounds in minimally processed iceberg lettuce as a function of season, cultivar, packaging and time. In order to achieve this, iceberg lettuce cultivars Platinas, Diamantinas and Morinas were harvested from June to September 2009. Lettuces were minimally processed and stored under three different treatments: two passive modified atmosphere packaging's using films of different permeabilities, F1 (OPALEN 65 AF) and F2 (OPP/PE-L 2040 AF), and storage in air. All packages were stored at 5 °C. Gas composition and volatile compounds were assessed at 1, 5, 8 and 11 days of storage in packaged lettuce, whereas in air stored samples volatiles were analyzed only at 1 and 5 days of storage. Twenty one potent odorants were identified by GC–O. Among the months, August presented a notary increase of elemene, β-selinene and 2,3- butanedione, which likely contribute to off-odor of packaged cut lettuce. The content of O<sub>2</sub> and CO<sub>2</sub> was demonstrated to influence the formation of odorants as storage time increased. Higher amount of cis-3-hexenol was related to aerobic conditions found in the modified atmosphere packages and air stored samples after 1 day of storage, whereas levels of odorants such as 2,3-butanedione, elemene and β-selinene were significantly enhanced under anaerobic conditions after 11 days of storage. Film F2 seems to be the most promising because it kept the concentration of elemene and β-selinene lower than film F1. No clear differences were seen between the cultivars Morinas, Diamantinas and Platinas with regard to production of objectionable odorants under anaerobic conditions.

**Keywords:** /Lettuce/ /Minimally Processed/ /Modified Atmosphere Packaging/

Srey, Sokunrotana, et.al. 2014. Reduction effect of the selected chemical and physical treatments to reduce *L. monocytogenes* biofilms formed on lettuce and cabbage. Food Res. Int'l. 62: 484 – 491.

### Abstract

As people shift their attention away from unhealthy foods, healthy fresh produce has become popular. However, fresh produce has contributed to many outbreaks of *Listeria monocytogenes*, which can form a mature biofilm within 24 h. Recent control strategies have proved ineffective in ensuring safe food production. This study focuses on *L. monocytogenes* biofilms formed on lettuces and cabbages using a viable plate count method and field emission electron microscopy. We investigated the reduction efficacy of treatment with 200 parts per million (ppm) chlorine, 2% each of citric, lactic, and malic acids, 32 Hz ultrasonication (US), 390 mJ/cm<sup>2</sup> ultraviolet-C (UV-C), or 750 mJ/cm<sup>2</sup> cold oxygen plasma (COP) on *L. monocytogenes* biofilms. Following treatment, the quality of the vegetables was

analyzed with standard procedures. UV-C and COP showed the best CFU reduction, regardless of the nature of the vegetable surface, while US failed to produce any significant reduction ( $P > 0.05$ ). Furthermore, chemical treatments reduced count by 1 log colony forming unit (CFU)/cm<sup>2</sup> on lettuces, whereas a 2 log reduction was observed on cabbages. The effect of chemical treatment largely depended on the particular vegetable, while UV-C and COP achieved high reduction regardless of the vegetable, and had no effect on quality. We, therefore, speculate that UV-C and COP show promise in overcoming *L. monocytogenes* biofilms on food produce.

**Keywords:** /Lettuce/ /Cabbage/ /Biofilm/ /Chemical Control/ /Listeria Monocytogenes/

## ONION

Wang, Weilin, Changying Li. 2014. Measurement of the light absorption and scattering properties of onion skin and flesh at 633 nm \*. *Postharvest Biol. & Technol.* 86: 494 – 501.

### Abstract

Understanding the optical properties of onion tissues is essential to applying optical methods for onion quality inspection. This study estimated the optical properties of dry skin, wet skin, and flesh of red, Vidalia sweet, white, and yellow onions at the wave length of 633 nm. The total diffuse reflectance, total transmittance, and collimated transmittance of single-layer onion tissues were measured by spectroscopic systems. Based on the measured data, the absorption coefficient  $\mu_a$  and the reduced scattering coefficient  $\mu'_s$  of onion tissues were calculated using the inverse adding-doubling method. The results indicated that the dry and wet skins had significantly higher  $\mu_a$  and  $\mu'_s$  than the flesh at 633 nm. For both skins and flesh, the  $\mu_a$  varied between cultivars, while the difference  $\mu'_s$  of the  $\mu'_s$  between cultivars were less profound. All types of onion tissues were high-albedo materials at 633 nm. Using the calculated optical properties, Monte Carlo simulations were performed to model the light propagation in 25 different scenarios of multi-layer onion tissues for four cultivars, respectively. The results showed that the incident light at 633 nm would lose 99% of its energy within 6 layers in any of the simulated scenarios, and the light penetrated more layers in the sweet onions than in the other three cultivars. This work provided fundamental understanding of the optical properties of onion tissues and the light propagation in onion bulbs at 633 nm. The investigation of the onion optical properties will be extended to a broader spectrum in the future.

**Keywords:** /Onion/ /Absorption/

Wang, Weilin, Changying Li. 2014. Size estimation of sweet onions using consumer-grade RGB-depth sensor. *J. Food Eng.* 142: 153 – 162.

### Abstract

Size estimation is an important aspect of the postharvest handling of onions. This study applied the RGB depth (RGB-D) sensor to measure the maximum diameter and volume of sweet onions, and estimated the density of onions using measured parameters. RGB-D images were acquired when onions were placed at six different orientations. The maximum diameter was calculated using both the color and depth images. The volume was estimated using the depth images. The onion diameter estimated by depth images achieved a higher average accuracy and robustness (RMSE = 2 mm) than those calculated by color images (RMSE = 3.4 mm). The predicted volume of onions showed a RMSE of 18.5 cm<sup>3</sup> and an

accuracy of 96.3%. Results also demonstrated that it is promising to non destructively estimate the onion density based on its depth image. The proposed methods can be applied to improve the efficacy and efficiency of size estimation in onion phenol typing and postharvest sorting/grading.

**Keywords:** /Onion/ /Machine Vision/

## **TOMATO**

Reddy, Gadi, V.P., Ross H. Miller. 2014. Biorational versus conventional insecticides e Comparative field Study for managing red spider mite and fruit borer on tomato. Crop Protection. 64: 88 – 92.

### **Abstract**

Tomato, *Lycopersicon esculentum* L. (Solanaceae), is an important crop worldwide that is grown both outdoors and under protected structures, for fresh market consumption and for processing. In the Mariana Islands, tomato is grown as an outdoor crop throughout the year. Tomatoes are attacked by a variety of pests, including the tomato fruitworm, *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae), and, in Pacific islands, the red spider mite *Tetranychus marianae* McGregor. These pests cause scarring, tissue damage, and aberrations in fruit shape or color, making the tomatoes undesirable for fresh market. Also, insect bodies, excretia or parts in fruits reduce their market suitability. Field trials aimed at improving management of these pests were undertaken at two locations in Guam (Yigo and Inarajan), USA in 2012 and 2013, assessing the efficacy of different biorational and conventional insecticides against *T. marianae* and *H. armigera* on tomato. At both locations, the mean percentage of mite infested leaves and the population density of *T. marianae* were higher in control than in treated plots. An integrated pest management (IPM) program comprising sprays of selective insecticides (Petroleum spray oil, *Beauveria bassiana*, azadirachtin, and *Bacillus thuringiensis*), evaluated at 15, 30, 45 and 60 days after transplantation of tomato seedlings, significantly reduced the number of *T. marianae*-infested leaves and the density of *T. marianae* over plots treated with carbaryl, malathion, six applications of *B. bassiana* or *B. thuringiensis* and over both controls at both locations. Similarly, significantly lower fruit damage by *H. armigera* was recorded in the plots treated with the IPM program than in plots treated with carbaryl, malathion, or the control treatments at both locations. Marketable tomato yields from the plots which received with the IPM program were significantly greater at both locations than were those in the other treatments.

**Keywords:** /Tomato/ /Pest Management/

Schoputen, Rob E., et.al. 2014. Quantifying lycopene synthesis and chlorophyll breakdown in tomato fruit using remittance VIS spectroscopy. Postharvest Biol. I. & Technol. 96: 53 – 63.

### **Abstract**

The aim of this study was to increase the understanding of chlorophyll breakdown and lycopene synthesis at a quantitative level in *Solanum lycopersicum* fruit. To accomplish this, a kinetic model is proposed describing the transition from chloro- to chromoplast. Remittance VIS spectroscopy was used to assess chlorophyll and lycopene levels non-destructively in cocktail and round type tomatoes. Tomatoes were stored at constant temperatures between 4 and 24°C, or at a stepwise changing temperature between 4 and 16°C. Chlorophyll and lycopene levels were measured repeatedly over time and used to calibrate a kinetic model that describes how an autocatalytic enzyme system links

chlorophyll breakdown to lycopene synthesis, including breakdown of lycopene precursor and lycopene itself. Increasing storage temperatures increased the reaction constant for lycopene synthesis more than that of chlorophyll breakdown for both tomato types. The reaction constants describing chlorophyll breakdown and lycopene synthesis were considerably larger, and the estimated enzyme levels lower for the round type. This allows round tomatoes to quickly resume lycopene synthesis after a cold storage period when enzyme levels are low. Lycopene breakdown was established for the round type while the cocktail type showed lycopene precursor breakdown. Chlorophyll breakdown and lycopene synthesis, as affected by storage temperature and tomato type, is covered well by the model for both tomato types. We hypothesise that the postulated enzyme system, responsible for the direct link between chlorophyll breakdown and lycopene synthesis, is due to STAY-GREEN proteins. Remittance VIS spectroscopy is, in combination with a parameter estimation tool, suited to screen tomato genotypes for intended colour transformation performance, or as tool in chloroplast to chromoplast transition studies.

**Keywords:** /Tomato/ /Solanum lycopersicum/

Schouten, Rob E. 2014. Quantifying lycopene synthesis and chlorophyll breakdown in **tomato** fruit using remittance VIS spectroscopy. *Postharvest Biol. & Technol.* 96: 51 – 63.

### **Abstract**

The aim of this study was to increase the understanding of chlorophyll breakdown and lycopene synthesis at a quantitative level in *Solanum lycopersicum* fruit. To accomplish this, a kinetic model is proposed describing the transition from chloro- to chromoplast. Remittance VIS spectroscopy was used to assess chlorophyll and lycopene levels non-destructively in cocktail and round type tomatoes. Tomatoes were stored at constant temperatures between 4 and 24°C, or at a stepwise changing temperature between 4 and 16°C. Chlorophyll and lycopene levels were measured repeatedly over time and used to calibrate a kinetic model that describes how an autocatalytic enzyme system links chlorophyll breakdown to lycopene synthesis, including breakdown of lycopene precursor and lycopene itself. Increasing storage temperatures increased the reaction constant for lycopene synthesis more than that of chlorophyll breakdown for both tomato types. The reaction constants describing chlorophyll breakdown and lycopene synthesis were considerably larger, and the estimated enzyme levels lower for the round type. This allows round tomatoes to quickly resume lycopene synthesis after a cold storage period when enzyme levels are low. Lycopene breakdown was established for the round type while the cocktail type showed lycopene precursor breakdown. Chlorophyll breakdown and lycopene synthesis, as affected by storage temperature and tomato type, is covered well by the model for both tomato types. We hypothesise that the postulated enzyme system, responsible for the direct link between chlorophyll breakdown and lycopene synthesis, is due to STAY-GREEN proteins. Remittance VIS spectroscopy is, in combination with a parameter estimation tool, suited to screen tomato genotypes for intended colour transformation performance, or as tool in chloroplast to chromoplast transition studies.

**Keywords:** /Tomato/ /Solanum lycopersicum/

Tao, Fei, et al. 2014. Magnetic resonance imaging provides spatial resolution of chilling injury in micro-Tom **tomato** (*Solanum lycopersicum* L.) fruit. *Postharvest Biol. & Technol.* 97: 62 – 67.

### **Abstract**

Magnetic resonance imaging (MRI) was used to monitor internal changes in harvested tomato (*Solanum lycopersicum* L. cv. Micro-Tom) fruit. Measurements of ethylene evolution, respiration, and ion leakage indicated that the fruit developed chilling injury (CI) after storage at 0°C. Unlike these measurements, MRI provided spatially resolved data. The apparent diffusion coefficient (ADC), which is an indication of water mobility in tissues, was calculated from MRIs of the different parts of the fruit. Storage for 1 or 2 weeks at 0°C caused no difference in the ADCs (D-values) in the pericarp, but it did lead to higher values in the inner tissues i.e., the columella and locular region compared to non-chilled fruit ( $P < 0.05$ ). Changes in inner fruit D-values after 1 and 2 weeks of chilling at 0°C were similar to changes in respiration, ethylene production and ion leakage which increased ( $P < 0.05$ ) compared to the non-chilled controls. Most CI studies of tomato fruit used pericarp tissue. Our data indicate that columella tissue changes occur in response to chilling injury in tomato fruit and suggest that more caution is needed when interpreting data from experiments commonly used to study this phenomenon.

**Keywords:** /Tomato/ /Chilling Injury/ /Magnetic Resonance Imaging (MRI)/

Wu, Guifang, Chunguang Wang. 2014. Investigating the effects of simulated transport vibration on tomato tissue damage based on vis/NIR spectroscopy. *Postharvest Biol. & Technol.* 98: 41 – 47.

### **Abstract**

Visible and near infrared (vis/NIR) spectroscopy combined with chemometrics were investigated to evaluate the effects of simulated transport vibration levels on damage of tomato fruit. A total of 280 tomato samples were randomly divided into 5 groups; each group was subjected to vibration at different acceleration levels. A total of 230 samples (46 from each group) were selected as a calibration set; whereas 50 samples (10 from each group) were selected as a prediction set. Raw spectra, differentiation (the first derivative) spectra, extended multiplicative scatter correction (EMSC) processed spectra and standard normal variant combined with detrending (SNV-DT) processed spectra were used for calibration models. SNV-DT processed spectra had the best performance using for partial least squares (PLS) analysis. The PLS analysis was implemented to calibrate models with different wavelength bands including visible, short-wave near infrared (SWNIR) and long-wave near infrared (LWNIR) regions. The best PLS model was obtained in the vis/NIR (600–1600 nm) region. Using a grid search technique and radial basis function (RBF) kernel, four least squares support vector machine (LS-SVM) models with different latent variables (7, 8, 9, and 10 LVs) were compared. The optimal model was obtained with 9 LVs and the correlation coefficient ( $r$ ), root mean square error of prediction (RMSEP) and bias for the best prediction by LS-SVM were 0.984, 0.137 and 0.003, respectively. The results showed that vis/NIR spectroscopy could be applied as a reliable and rapid method for predicting the effect of vibration levels on tissue damage of tomato fruit.

**Keywords:** /Tomato/ /Tissue Damage/ /Transport/

Xanthopoulos, Georgios. 2014. Modelling of transpiration rate of grape tomatoes semi-empirical and analytical approach. *Biosystems Eng.* 124: 16 – 13.

### **Abstract**

Transpiration is a well known physiological process of water loss from fresh products, associated with visual and texture degradation and loss of market value. A loss of 3e5% of the initial mass may cause in fresh products loss of freshness and visual attractiveness. Grape tomato has been increasingly

accepted by consumers as “snacking tomato” and as an ingredient in mixed salads of fresh-cut vegetables. An experimental procedure was developed to record the associated with transpiration, water loss in grape tomatoes (*Solanum lycopersicum*, Lobello F1), at temperatures 10, 15 and 20 °C and relative humidity 70, 80 and 92%. Water activity was calculated and correlated with the respective mass loss; its average value was found  $0.988 \pm 0.01$ . The mean transpiration rates ranged between 0.012 and 0.058 mg cm<sup>-2</sup> h<sup>-1</sup> for water vapour pressure deficit range of 0.061e0.662 kPa. A semi empirical and an analytical model were developed to correlate the mass loss of grape tomatoes with the storage conditions (temperature and relative humidity) and storage time. Both provided satisfactory fit to the experimental data. Finally, the air-film mass transfer coefficient ( $k_a$ ) and skin mass transfer coefficient ( $k_s$ ) were calculated and the  $k_s$  coefficient correlated efficiently with an exponential equation with the respective water vapour pressure deficit.

**Keywords:** / Tomatoes/ /Grape Tomato/ /Cold Storage/

Yan, Fujie, et.al. 2014. Effect of rhamnolipids on *Rhodotorula glutinis* biocontrol of *Alternaria alternata* infection in cherry **tomato** fruit. *Postharvest Biol. & Technol.* 97: 32 – 35.

### **Abstract**

This study was conducted to evaluate the efficacy of the biocontrol yeast, *Rhodotorula glutinis* with a surfactant produced by *Pseudomonas aeruginosa*, rhamnolipids, on the inhibition of *Alternaria alternata* on cherry tomato fruit. A combination of *R. glutinis* with rhamnolipids at 500 µg/mL was more effective in suppressing *A. alternata* infection than application of *R. glutinis* or rhamnolipids alone. Moreover, integration of *R. glutinis* with rhamnolipids significantly stimulated peroxidase, polyphenoloxidase and phenylalanine ammonia-lyase activities of cherry tomato fruit, which were stronger than the single treatments. Rhamnolipids with reduced concentrations did not affect the growth of *R. glutinis* in vitro, but were utilized as carbon sources by yeasts under conditions of limited carbon sources. Moreover, rhamnolipids themselves reduced decay incidence of *A. alternata* on cherry tomato fruit and promoted the population growth of *R. glutinis* in vivo. This combined treatment could induce natural resistance as well as accelerate colonization of yeasts on the fruit surface, providing an effective and safe strategy to control postharvest diseases.

**Keywords:** /Tomato/ / Cherry Tomatoes/ / Postharvest/ /Biological Control/

## **HERBS AND SPICES**

### **RED BELL PEPPERS**

Poverenov, Elena, et.al. 2014. Effects of a composite chitosan–gelatin edible coating on postharvest quality and storability of **red bell peppers**. *Postharvest Biol. & Technol.* 96: 106 – 109.

### **Abstract**

For the first time, a composite chitosan–gelatin (CH–GL) coating was applied to peppers and its effects on fruit quality and storability were examined. Pure chitosan (CH) and gelatin (GL) coatings were studied for comparison. The CH coating inhibited microbial spoilage and prolonged the possible storage period. The GL coating contributed to fruit firmness, but did not allow for prolonged storage. The composite CH–GL coating was associated with a two-fold decrease in microbial decay; significantly ( $p \leq$

0.05) enhanced fruit texture and prolonged the possible period of cold storage up to 21 days and fruit shelf-life up to 14 days, without affecting the respiration or nutritional content of the fruit.

**Keywords:** /Red Bell Pepper/ /Edible Coating/ /Firmness/ /Storability/

## **SWEET BASIL**

Elad, Yigal, et.al. 2014. Conditions influencing the development of **sweet basil** grey mould and cultural measures for disease management. *Crop Protection*. 64: 67 – 77.

### **Abstract**

Sweet basil (*Ocimum basilicum*) is an annual herb crop that is harvested several times each season. *Botrytis cinerea* infects the fresh wounds that are created at harvest and grey mould also develops on harvested shoots. The aim was to characterize grey mould epidemics and to develop cultural means of controlling sweet basil grey mould in commercial plantings and postharvest. Two annual surveys at 82 sites revealed that grey mould epidemics are polycyclic in nature. The incidence of grey mould was found to be unaffected by the planting date or crop age, but related to weather conditions (i.e., rain events outside the greenhouse) and the limiting factor for grey mould development was the need for a high level of humidity in the greenhouse. Higher planting density, restricted aeration and the use of narrower walk-in tunnels or greenhouse structures with lower ceilings all contribute to epidemics. Latent infection was found in the leaves of harvested shoots as determined by *B. cinerea*-specific molecular probes. The effectiveness of plant spacing, soil mulch, thermal screens, greenhouse aeration, floating covers and combinations of some of these practices was tested under semi-commercial conditions for four years. A planting density that was half that of the common practice suppressed grey mould incidence in the field experiments with no significant yield losses. This effect can be attributed to the reduced amount of receptive host tissue and better aeration within the canopy at the initial stages of growth. The shoots harvested from the lower-density plots were less susceptible to *B. cinerea* infection. Floating covers and thermal screens were ineffective in reducing the incidence of grey mould in the field experiments and increased the susceptibility of harvested shoots of sweet basil to rot development. Polyethylene soil cover reduced grey mould in sweet basil planted in soil whereas the same mulch failed to control the disease on plants growing in a detached medium. The combination of increased plant spacing and the use of a polyethylene soil cover synergistically improved the yield of sweet basil shoots. Aeration of the tunnels decreased grey mould intensity and this positive effect was enhanced when the aeration treatment was applied in combination with lower planting density. In conclusion, cultural measures are capable of grey mould suppression in sweet basil and result in reduced susceptibility of the host tissues.

**Keywords:**/Sweet Basil/

## **ORNAMENTALS**

### **CUTFLOWERS**

Scariot, Valentina, et.al. 2014. Ethylene control in **cut flowers**: classical and innovative approaches *Postharvest Biol. & Technol.* 97: 83 – 92.

### **Abstract**

Ethylene-mediated premature floral senescence and petal or flower abscission affect postharvest longevity of several species used as cut flowers. Exposure to exogenous or endogenously produced ethylene can be controlled in several ways. These include the use of ethylene biosynthesis inhibitors or ethylene action inhibitors, and ethylene removal technologies. In addition, genetic modification can be very effective in controlling ethylene synthesis and perception. We review here the potential for applications of nanotechnology to control ethylene levels and postharvest management in the flower industry. Already, nano sponges have been shown to enhance efficacy of the ethylene inhibitor 1-MCP in several flower species. In carnation, 1-MCP included in nano sponges also allowed better control of *Botrytis cinerea* damage. However other applications are also considered based on successes in the use of this technology to increase agricultural production and decrease postharvest waste. Nano-metal based sensors could be used for detection of ethylene in the store and to label the product along the distribution chain. Further-more, nano composites could be included as scavengers for ethylene removal in active packaging, and nanocatalysts could promote ethylene catalytic degradation in the warehouse. Nanoparticles could also be introduced into a new generation of packaging to control effects of gases and UV, and increase strength, quality and packaging appearance. This review highlights recent results on the use of nanotechnology *sensu lato* and potential application for cut flower vase life improvement, focusing on ethylene control strategies.

**Keywords:** /Cutflowers/ /Postharvest/

## **CARNATION**

Puna, Umed K., et.al. 2014. Effect of ethanol on ethylene biosynthesis and sensitivity in cut carnation flowers. *Postharvest Biol. & Technol.* 98: 30 – 33.

The vase life of cut carnation (*Dianthus caryophyllus* cv. Barbara) flowers was significantly extended by continuous treatment with 1% (v/v) ethanol. To investigate effects of ethanol on sensitivity to ethylene, flowers were pre-treated with aminoethoxyvinylglycine (AVG) prior to placement in ethanol solution and exposed to ethylene at 0.2 and 2  $\mu\text{L L}^{-1}$ . AVG treatment delayed petal senescence for the 0.2 but not the 2  $\mu\text{L L}^{-1}$  ethylene treated flowers. Petal senescence was similarly accelerated by ethylene exposure, irrespective of ethanol treatment, suggesting that the effect of ethanol on sensitivity to ethylene is negligible. 1-Aminocyclopropane-1-carboxylic acid (ACC) levels, along with ACC synthase (ACS) and ACC oxidase (ACO) activities and the transcript levels of the corresponding genes in petals, *DcACS1* and *DcACO*, increased with flower senescence, and this increase was suppressed by ethanol treatment. These findings suggest that extension of vase life by ethanol treatment is attributable to the suppression of ethylene biosynthesis through the suppression of ACS and ACO at the transcriptional level.

**Keywords:** /Carnation/ /Ethylene Biosynthesis/ /Ethanol/

## **GERBERA**

Perik, Rene R. et.al. 2014. Stem bending in cut gerbera jamesonii flowers: effects of a pulse treatment with sucrose and calcium ions. *Postharvest Biol. & Technol.* 98: 7 – 13.

## **Abstract**

The vase life of cut Gerbera flowers (*Gerbera jamesonii* cv. Tamara) is often short due to stem bending. The purpose of this study was to find a pulse treatment, to be applied directly after harvest, which would delay this bending. Bending was hypothesized to be due, at least in part, to a xylem blockage by bacteria (leading to early turgor loss), to lack of osmotic pressure, and to lack of cell wall stiffness. Chemicals tested included antimicrobial compounds, surfactants (to bypass xylem occlusion), sugars, inorganic ions, and chemicals affecting cell wall rigidity. When used as a pulse treatment, antimicrobial compounds such as chlorine and silver ions had no effect. Only a buffer at pH 3.0–3.5, which inhibits bacterial growth, delayed bending. A range of surfactants tested, many of which had antimicrobial activity, had no effect. Sugars delayed the time to bending, if accompanied by an efficient antimicrobial compound. Cell wall rigidity can be affected by calcium ions and H<sup>+</sup> concentration. Treatment with calcium chloride delayed bending. Vanadate, an inhibitor of H<sup>+</sup> transport to the cell wall, almost completely prevented stem bending, but resulted in unwanted petal discoloration. By contrast, fusaric acid, a promoter of H<sup>+</sup> transport to cell walls, drastically hastened bending. A mixture of chemicals (50 mM calcium chloride, 25 g L<sup>-1</sup> sucrose, buffered at pH 3.5 by citric acid and K<sub>2</sub>HPO<sub>4</sub>) was satisfactory as a 24 h pulse treatment, prior to 24 h of dry storage at 20°C and vase life at 20°C. It delayed the time to bending during vase life in cv. Tamara and six other cultivars tested which are prone to stem bending.

**Keywords:** /Gerbera/ /Cutflower/

## ROOTS AND TUBERCROPS

Cools, Katherine, et al. 2014. Controlling sprouting in potato tubers using ultraviolet-C irradiance. Post-harvest Biol. & Technol. 98: 106 – 114.

### Abstract

Legislation limiting the use of chlorpropham (CIPC), the major potato sprout suppressant, has led to a need for new technologies to extend storage life of tubers. Ultra violet C (UV-C) has been used postharvest to reduce disease incidence on many crops, yet its use and efficacy as a sprout suppressant has not been investigated. The aim of this project was to identify the optimum dose and treatment timing of UV-C treatment on potato tubers as an alternative method of sprout suppression to reduce the dependence on chemical sprout suppressants. Up to six potato cultivars over two seasons were treated with varying doses of UV-C ranging from 0 to 30 kJ m<sup>-2</sup> either at harvest or at first indication of dormancy break. The tubers were stored at 9°C and sprout growth and incidence assessed. Treatment with moderate UV-C doses (5–20 kJ m<sup>-2</sup>) suppressed sprout length and sprout incidence in a range of cultivars. Periderm DNA damage and programmed cell death were not detected in response to any of the UV-C doses. The inactive ABA metabolite, ABA-GE, increased in response to 10 or 20 kJ m<sup>-2</sup> within 72 h of treatment. Multivariate analysis showed a negative relationship between ABA metabolites and sprout growth/incidence during storage. This study found that UV-C reduced sprout growth in potato with no deleterious effects on tuber quality. This suggests potential for further development as an alternative or supplement to conventional sprout suppressant technologies.

**Keywords:** /Potato/ /*Solanum tuberosum* L. /