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**GENERAL**

**COLD CHAIN**

Mercier, S., et.al. 2017. Time–temperature management along the food **cold chain**: A review of recent developments. *Compr Rev Food Sci Food Saf* 16: 647-667.

**Abstract**

The cold chain is responsible for the preservation and transportation of perishable foods in the proper temperature range to slow biological decay processes and deliver safe and high-quality foods to consumers. Studies show that the efficiency of the cold chain is often less than ideal, as temperature abuses above or below the optimal product-specific temperature range occur frequently, a situation that significantly increases food waste and endangers food safety. In this work, field studies on time–temperature conditions at each critical stage of the cold chain are reviewed to assess the current state of commercial cold chains. Precooling, ground operations during transportation, storage during display at retail and in domestic refrigerators, and commercial handling practices are identified and discussed as the major weaknesses in the modern cold chain. The improvement in efficiency achieved through the measurement, analysis, and management of time–temperature conditions is reviewed, along with the accompanying technical and practical challenges delaying the implementation of such methods. A combination of prospective experimental and modeling research on precooling uniformity, responsive food inventory management systems, and cold chains in developing countries is proposed for the improvement of the cold chain at the global scale.

**Keywords:** /Cold Chain/ /Shelf Life/ /Supply Chain/

**EDIBLE FILMS**

AL-Hassan, A.A. and M.H. Norziah. 2017. Effect of transglutaminase induced crosslinking on the properties of starch/ gelatin **films**. *Food Packag. & Shelf Life* 13: 15–19.

**Abstract**

This paper was to measure the effect of fish gelatin and Transglutaminase enzyme (TGs) on properties of sago starch and fish gelatin films. The concentration of glycerol was 30% of polymers (db) and the sago starch to fish gelatin ratios were (1:0 and 3:1) with TGs concentrations (1, 5 and 10 mg/g gelatin). The results were discussed in terms of ‘gelatin and TGs effect’. In a general manner, fish gelatin and TGs have an effect on both physicochemical and functional properties of the produced films. Addition of fish gelatin to sago starch films significantly reduced tensile strength (TS), water vapor permeability (WVP) but increased the percentage of elongation at break (%EAB). Positive effects of TGs addition on mechanical properties were observed. FTIR-ATR showed an evident of interaction between

polysaccharides and protein. Furthermore, the transmittance percentage of amide I and amide II bands in treated films reduced with increasing enzyme concentration as an evident of enzyme crosslinking.

**Keywords:** /Edible Films/

## FOOD PACKAGING

Villegas, C., et.al. 2017. Supercritical impregnation of cinnamaldehyde into polylactic acid as a route to develop antibacterial food packaging materials. Food Res. Int 99: 650-659.

### Abstract

Supercritical impregnation was used to incorporate a natural compound with antibacterial activity into biopolymer-based films to develop active food packaging materials. Impregnation tests were carried out under two pressure conditions (9 and 12 MPa), and three depressurization rates (0.1, 1 and 10 MPa min<sup>-1</sup>) in a high pressure cell at a constant temperature equal to 40 °C. Cinnamaldehyde (Ci), a natural compound with proven antimicrobial activity, was successfully incorporated into poly(lactic acid) films (PLA) using supercritical carbon dioxide (scCO<sub>2</sub>), with impregnation yields ranging from 8 to 13% w/w. Higher pressure and slower depressurization rate seem to favor the Ci impregnation. The incorporation of Ci improved thermal, structural and mechanical properties of the PLA films. Impregnated films were more flexible, less brittle and more resistant materials than neat PLA films. The tested samples showed strong antibacterial activity against the selected microorganisms.

In summary, this study provides an innovative route to the development of antibacterial biodegradable materials, which could be used in a wide range of applications of active food packaging.

**Keywords:** /Food Packaging/

## FRESH-CUT

Pilone, V., A. Stasi and A. Baselice. 2017. Quality preferences and pricing of fresh-cut salads in Italy: new evidence from market data. Brit Food J 119(7): 1473-1486.

### Abstract

**Purpose** – In Europe fresh-cut fruit and vegetables, is one of the major growing segments in agro-food sector. Current literature reports a limited number of studies about consumers' preferences towards these products. In particular, it lacks of studies focussed on fresh-cut salads and based on market data. In this paper, a study on consumer preferences towards the main attributes of Italian fresh-cut salads is proposed. More specifically the investigation is focussed on attributes assessable by consumers before purchase such as assortment, tenderness, product preparation and vegetable variety together with brand, size and type of packaging, presence of organic certification, promotion and product price. The purpose of this paper is to evaluate how much Italian consumers pay for those attributes with the aim to understand how much profitable could be different strategies in the sector.

**Design/methodology/approach** – The analysis is based on IRI-Infoscan scanner data, consisting of 881 fresh-cut products. The impact of each attributes on pricing is measured by means of a hedonic price model.

**Findings** – Main results show that, in Italy, fresh-cut salad price is greatly affected by tenderness, product preparation, assortment, brand, presence of organic certification, packaging attributes and vegetable variety.

**Practical implications** – Findings offer to producers the possibility to set up products by composing the mix of attributes that gives back the highest price. In addition, they provide some insights to define manufacturer's strategies.

**Originality/value** – This paper represents a novelty in economic literature because it can be considered an example of consumer preferences analysis towards the different attributes of fresh-cut vegetables based on real market data.

**Keywords:** /Fresh-cut/ /Consumer Preference/

## FRESH FRUITS

Tango, C.N., et.al. 2017. Slightly acidic electrolyzed water combined with chemical and physical treatments to decontaminate bacteria on **fresh fruits**. Food Microbiol 67: 97-105.

### Abstract

Effect of sequential combination of slightly acidic electrolyzed water (SAEW) with chemical and physical treatments on bacterial decontamination on fruits was investigated in this study. Effect of treatments on microbial and sensory quality was also analyzed after subsequent storage at 4 °C and room temperature (RT, 23 ± 0.15 °C). Whole apple and tomato fruits were inoculated with cocktail strains of *Escherichia coli* O157:H7 and *Listeria monocytogenes*. Uninoculated and inoculated fruits were washed first with distilled water (DW), calcium oxide (CaO), fumaric acid (FA), and SAEW at RT for 3 min. Combinations were performed by adding treatment one at a time to SAEW as following FA + SAEW, CaO + FA + SAEW, and CaO + FA + SAEW + ultrasonication (US) or microbubbles (MB). All the sanitizer treatments resulted in significant ( $p < 0.05$ ) bacterial reduction compared to DW used as control. Increasing the treatments in combination from FA + SAEW to CaO + FA + SAEW + US resulted in an increased bacterial decontamination. The cavitation induced by ultrasonication in FA + SAEW solution resulted in a higher additive effect in decontamination of *Escherichia coli* O157:H7 and *Listeria monocytogenes* compare to the agitation generated by microbubble generator in FA + SAEW solution. CaO + FA + SAEW and CaO + FA + SAEW + US were effective in improving the microbial safety and quality of apple fruits. However, additional treatment of US impacted on the quality of tomato fruits during storage at RT. Therefore, a combination of SAEW with sanitizers (CaO and FA) and mechanical force (Ultrasonication) has the potential to be used in postharvest sanitation processing in the fresh fruit industry.

**Keywords:** /Fresh Fruits/ /Quality/

## FRESH PRODUCE

Saade, C., et.al. 2017. System feasibility: Designing a chlorine dioxide self-generating package label to improve **fresh produce** safety part I: Extrusion approach. *Innov. Food Sci. & Emerg. Technol* 43: 102-111.

### Abstract

There is need for in-package anti-microbial technology to control microbial growth on packaged fresh food. This research evaluated the feasibility of delivering chlorine dioxide (ClO<sub>2</sub>) via package labels made of synthetic polymers extruded with citric acid (CA) and sprayed with sodium chlorite. Heat pressing facilitated ClO<sub>2</sub> generation and moisture triggered ClO<sub>2</sub> release. Of three synthetic polymers tested, only ethylene vinyl acetate (EVA) label withstood extrusion and storage conditions without structural changes.

EVA labels containing 15 or 7.5% CA generated 3.2–4.2 and 0.5–1.0 mg ClO<sub>2</sub>/L air, respectively. Total inactivation of *Salmonella* cells on TSA plates (2.13 log CFU/plate) was achieved following exposure to 15% CA labels for 2 h; 7.5% CA labels gave partial inactivation (1.03 log CFU/plate) following up to 6 h of exposure.

Our findings demonstrate: 1) the practical feasibility of this synthetic package label design; 2) ClO<sub>2</sub> generation and release following activation; and 3) antimicrobial effectiveness against *Salmonella* growth.

*Industrial relevance:* Feasibility for synthesizing a package label to generate and deliver chlorine dioxide (ClO<sub>2</sub>) as an effective antimicrobial inside individual food packages has been demonstrated. The approach extrudes polymers with citric acid, then sprays the surface with sodium chlorite. Heat pressing the label just before application initiates reaction between these two agents to generate ClO<sub>2</sub>. Release of ClO<sub>2</sub> is stimulated and maintained by moisture in the film and emanating from fresh foods.

**Keywords:** /Fresh Produce/ /Packaging/

## ORNAMENTAL PLANTS

Kemp, O, et.al. 2017. Modification of ethylene sensitivity in ornamental plants using CRISPR/Cas9. *Acta Hort* 1166: 271-2800.

### Abstract

Ethylene sensitivity has for long been of interest in improving ornamental plants e.g., *Kalanchoë* and *Campanula*. We aim to investigate changes in ethylene sensitivity in economically important ornamental plants by targeting genes in the ethylene pathway using the novel precise genome editing tool; the Clustered Regularly Interspaced Palindromic Repeats (CRISPR) RNA guided Cas9 DNA nuclease (CRISPR/Cas9). CRISPR/Cas9 may be employed to introduce targeted double-stranded breaks (DSBs) at desired sites in the host genome. The DSBs will be repaired by the non-homologous end-joining (NHEJ) repair mechanism which often results in small indels and consequently gene knockout. The CRISPR/Cas9 system consists of a protein DNA nuclease (Cas9) which is guided to the target sequence by a small RNA

molecule (sgRNA) that recognizes a 20 bp target sequence in the genome situated immediately downstream of a 3 bp protospacer adjacent motif (PAM). The sgRNA confers the sequence specificity of the CRISPR/Cas9 complex and may thus be designed to target virtually any sequence, a feature that has made it the method of choice within precise genetic engineering. Although most research with CRISPR/Cas9 has been conducted in prokaryote and mammalian cells, steps have been taken to implement the system in plants. Proof of function has been obtained in various plant species e.g., *Arabidopsis*, wheat, soybean and orange which makes it plausible that this technique could be applied to ornamental plants as well. The CRISPR/Cas9 system will be delivered using *Agrobacterium tumefaciens* and explant regeneration of tissue cultures to create stable transformation and mutation events.

**Keywords:** /Ornamental Plant/ /*Kalanchoe*/ /Campanula/ /Senescence/

## FRUITS

### ATEMOYA

Jomngam, P., et.al. 2017. Effect of ripening and storage temperatures on quality of **atemoya** (*Annona cherimola* Mill. × *A. squamosa* L.) fruit. *Acta Horti* 1166: 161-166.

#### Abstract

Atemoya is a tropical fruit with short storage life at room temperature under which skin browning and softening rapidly develops. In order to prolong the shelf life of atemoya and expand the overseas markets, the optimal ripening temperature (15, 20, 25, and 30°C) and management temperature during storage (1, 3, 6, 9, 12, 15, and 18°C) was evaluated in this study. Results of ripening temperature showed that fruit lost more of its firmness as duration of ripening and temperature increased. Fruit starch content gradually decreased while the total soluble sugar increased rapidly at 20°C. In addition, the conversion of starch into sugar was inhibited and the fruit failed to reach full-ripening at 15°C. Results of storage temperature showed that fruit softening quickly occurred when ethylene production reached its maximum. The ethylene production peak was recorded at 6, 9, 12, 15, and 18°C. In contrast, the ethylene production at 1 and 3°C were low with no peak. Low temperature induced fruit deterioration was observed at 1 and 3°C as indicated by skin browning and pulp hardness. Interestingly, no deterioration was observed at 6°C. Results from this study indicated that 20°C was the best ripening temperature and the optimal storage condition was at 6°C for 12 days.

**Keywords:** /Atemoya/ /Storage/ /Ripening/

### BLUEBERRY

Mannozi, C., et.al. 2017. Study on the efficacy of edible coatings on quality of **blueberry** fruits during shelf-life. *LWT – Food Sci & Technol* 85:440 – 444.

## Abstract

Edible films or coatings could be used as an alternative way of conservation, because of their ability to reduce respiration and transpiration rate, maintain firmness and generally delay fruit senescence. The aim of this research was to evaluate the influence of different types of coating: sodium alginate (Al), pectin (Pe) and sodium alginate plus pectin (Al + Pe), on some blueberries quality characteristics, cell viability and microbial growth during 14 days of storage at 4 °C.

Blueberry samples differently coated did not show significant differences in weight loss, pH, soluble solid and dry matter content. However, the application of Al, Pe and Al + Pe improved the firmness of blueberry samples as compared to the uncoated one. Changes in the surface reflection properties in the coated blueberries induced a general lower lightness and a more intense blue hue colour than the control sample. The microbiological results indicated that the coating of blueberry, in particular with Al or Pe, significantly reduced the growth kinetics of yeasts and mesophilic aerobic bacteria.

**Keywords:** /Blueberry/ /Storage/ /Quality/ /Edible Coating/

## CHERRY

Diaz-Mula, H.M., et.al. 2017. Postharvest treatment with calcium delayed ripening and enhanced bioactive compounds and antioxidant activity of 'Cristalina' sweet **cherry**. Acta Horti 1161: 511-514.

## Abstract

Sweet cherry (*Prunus avium* L. 'Cristalina') fruits were harvested at commercial ripening and transferred immediately at laboratory. Fruits were selected for the following treatment: control (distilled water) and calcium chloride at 1 mM. Both treatments were performed under vacuum-infiltration and cherries stored for 21 days. On a weekly basis, samples were taken out from the cold chamber for analytical determinations. Evaluation of quality parameters (weight loss, total soluble solids, acidity, firmness, and colour) revealed that control cherries showed acceleration in the changes of these parameters while in those fruits treated with Ca<sup>2+</sup> retardation was observed. In addition, accumulation of total phenolics, total anthocyanins and total carotenoids was also delayed over storage, although final concentrations were always higher in treated than in control cherries. In conclusion, the application of calcium solutions could be a good tool for postharvest application with the aim to retard the postharvest ripening process of sweet cherry and in turn to extend the storability of this perishable fruit. Interestingly, at the end of storage treated cherries showed higher antioxidant activity, in both hydrophilic and lipophilic fractions than control fruits.

**Keywords:** /Cherry/ /Quality/ /Postharvest Storage/

Grandi, Mi., et.al. 2017. Effectiveness of new rain-protection systems on cracking, ripening date and fruit quality of sweet **cherry** cultivars. Acta Horti 1161: 213-220.

## Abstract

Since sweet cherry is a valuable cash crop, protection systems to limit rain-induced fruit cracking have grown in importance over the last few years. We tested the influence of new models of plastic film and netted sheets of varying specifications on cracking and changes in fruit quality parameters of selected sweet cherry cultivars widely grown in the Vignola area of Italy's Modena Province. Anisolar Plus, Anigold 200, Anisummer 200, Early Anigold 200, Politex 150 and Solution notably reduced damage rates. Given that they showed no significant differences between them, these models are capable of assuring good commercial yields even in seasons of heavy rainfall when unprotected orchards are at risk of losing their entire crop. These coverings also influenced the kind of cracking in several cultivars, reducing the incidence of basal splitting in favour of cheek cracking compared to unprotected crop. In addition, detection of quality parameters using destructive and such non-destructive techniques as the Cherry-Meter showed that the various covers induced differing results depending on cultivar and ripening date. For example, Early Anigold 200, Solution and Politex 150 seem to have affected the earliness of some cultivars while boosting greater soluble solids storage, whereas Anigold 200 and Anisummer 200 evinced a delay of ripening that may prove effective with late-season cultivars. Anisolar plus, on the other hand, elicited contrasting earliness and late-ripening effects depending on cultivar.

**Keywords:** /Cherry/ /Ripening/

Tapia Garcia, M.I. 2017. Effect of modified atmosphere on postharvest quality of 'Sweetheart' cherries. Acta Hort 1161: 653-660.

## Abstract

Sweet cherry (*Prunus avium* L.) is a very valued fruit and consumers appreciate its colour intensity, flavour characteristics and healthy properties. Sweet cherries are extremely perishable and their physicochemical quality and stem fresh appearance rapidly decrease. In order to extend the storage period and to reach distant markets, different postharvest technologies have been used. Among these procedures, modified atmosphere packaging (MAP) has been proved to result suitable and easy to apply. The aim of this work was to assess the effect of MAP, using polypropylene Pplus® plastic film, on 'Sweetheart' sweet cherry cultivar stored during 21 days, under 1.5°C and 85-90% relative humidity. The quality parameters measured were: weight loss, firmness, total soluble solids (TSS), titratable acidity (TA), TSS/TA, external colour, stem browning and visual assessment. Weight loss was reduced by using MAP. As compared with control cherries, those fruits packed in MA had higher firmness, better colour maintenance and overall appearance. Stem browning was reduced after 2-3 weeks of cold storage in MAP fruits. In conclusion, the MAP in Pplus® plastic film maintains postharvest quality of cherries for distant markets.

**Keywords:** /Cherry/ /Storage/ /Film/ /Browning/ /Quality/

Valero, D. 2017. Maintenance of sweet **cherry** quality attributes as affected by innovative postharvest treatments. Acta Horti 1161: 475-482.

### **Abstract**

The sweet cherry (*Prunus avium* L.) horticultural production chain consists of several parts: production, picking, cooling, selection, grading, packaging, transport, distribution and consumption. From the consumer point of view, storage quality is probably the most important factor affecting eating quality, especially for overseas marketing. Sweet cherry fruit is a very perishable commodity, since both the edible part and the stem lose water rapidly as well as decay incidence, which constitutes the main problem for successful transport and marketing. The concept of "quality" depends on the product itself and the consumer's preferences, and for sweet cherry it is widely accepted that the main characteristics related to fruit quality are fruit weight, colour, firmness, sweetness, sourness, flavour and aroma. For this reason producers use a number of parameters to establish the optimum time for harvesting, the most reliable being skin colour. Red colour development in sweet cherry is used as indicator of quality and ripening, and is due to accumulation and profile of anthocyanins. However, these quality parameters change during postharvest storage leading to reduced shelf life. In this work the current knowledge about some innovative postharvest treatments with the aim to reduce the postharvest quality losses is shown. These treatments include the use of dip treatments (oxalic acid, salicylic acid, acetyl salicylic acid), edible coatings (alginate and *Aloe vera* gel), and active packaging (modified atmosphere packaging in combination with essential oils).

**Keywords:** /Cherry/ /Modified Atmosphere Packaging/ /Quality/

Zapta, P.J. 2017. The combination of alginate coating and essential oils delayed postharvest ripening and increased the antioxidant potential of two sweet **cherries**. Acta Horti 1161: 633-638.

### **Abstract**

Sweet cherry (*Prunus avium* L. 'Sonata' and 'Sweetheart') fruits were harvested at commercial ripening and transferred immediately to the laboratory. Fruits were selected for the following treatment: a) control (distilled water); b) alginate at 3%; and c) alginate at 3% plus a mixture of essential oils (thymol, carvacrol and eugenol at 25  $\mu\text{L}$  each 100  $\text{mL}^{-1}$ ). All treatments were performed by dipping the fruit in the corresponding solution for 2 min and then stored for 16 days at 2°C. Samples were taken out from chamber every 4 days and left 2 days at 20°C for analytical determinations. Results showed that parameters related to postharvest ripening, such as colour and firmness were significantly delayed in 'Sonata' and 'Sweetheart' coated cherries, as well as respiration rate and weight loss. Interestingly, the addition of the essential oils led to greater delays on the above parameters for both cultivars. The analysis on the evolution of bioactive compounds with antioxidant activity, such as total phenolics and anthocyanins, revealed that concentrations were significantly higher in treated than in control cherries. The incorporation of the essential oils led to higher values of total antioxidant activity in the lipophilic fraction, while did not affect the hydrophilic fraction. Finally, no occurrence on fruit decay was observed for any treatment. In conclusion, the combination of alginate coating with essential oils is considered as

a good postharvest tool to increase the shelf life of sweet cherry cultivars with beneficial effects in terms of increasing the antioxidant potential.

**Keywords:** /Cherry/ /Edible Coating/ /Storage/

## **GUAVA**

Kuo-En Chen., et.al. 2017. 'Jen-Ju Bar' **guava** exhibited a non-climacteric ripening behavior resulting from a defect in the expression of System-2 ACC synthase *PgACS1*. *Acta Horti* 1166: 63-70.

### **Abstract**

The non-climacteric ripening characteristics, including delayed peel coloration and pulp softening, of 'Jen-Ju Bar' ('JJB') guava (*Psidium guajava* L.) is a result of a reduction in the usually massive amount of ethylene produced during the ripening stage. To elucidate the underlying physiological mechanism, four cDNA clones of ACC synthase (*PgACS1* and *PgACS2*) and ACC oxidase (*PgACO1* and *PgACO2*), the key enzymes in the ethylene biosynthetic pathway, from guava pericarp were isolated and were analyzed for their expression patterns in the fruit. The expressions of *PgACS1*, *PgACO1*, and *PgACO2* increased with the advance of fruit ripening in 'Li-Tzy Bar' ('LTB'), a climacteric cultivar of guava, at 20°C. On the other hand, all three genes, especially *PgACS1*, displayed a low and steady pattern of gene expression in 'JJB' fruit over 12-day storage. The fact that exogenous ethylene treatment up-regulated the gene expression as well as 1-methylcyclopropene, an ethylene action inhibitor, suppressed the transcript accumulation in mature-green 'LTB' fruit revealed an autocatalysis or System-2 property of *PgACS1* expression. Because not enough ACC is produced by *PgACS1* to support massive ethylene synthesis at ripening, 'JJB' fruit behaved in a non-climacteric manner.

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

## **KIWIFRUIT**

Xueyuan Han, et.al. 2017. Stimulatory involvement of abscisic acid in wound suberization of postharvest **kiwifruit**. *Scientia Horti* 224: 244-250.

### **Abstract**

Wound-induced suberization is an essentially protective healing process for fruit to reduce water loss and avoid infecting. However, cognate mechanisms that regulate this process are little known. To expand our knowledge of suberization induced by wounding, a wound-healing investigation together with metabolite profiling study was conducted in postharvest kiwifruit (*Actinidia deliciosa*). The development of suberization in wounded fruit was demonstrated by autofluorescence observation and toluidine blue staining at 1–4 day (d) after wounding. Activities of phenylalanine ammonia-lyase (PAL), cinnamyl-alcohol dehydrogenase (CAD) and peroxidase (POD) in wound-healing tissue were enhanced by abscisic acid (ABA). The constituent analysis of suberin including polyphenolics (SPP) and polyaliphatics (SPA) proved that exogenous ABA increased the content levels of total phenols, total

flavonoids and alkanes, alkenes, alcohols, alkane acids, olefine acids, esters, glycerides and vitamin E in wound-healing tissue. Results suggested that ABA stimulated suberization through the activation of PAL, CAD and POD to accelerate wound-healing of wounded kiwifruit.

**Keywords:** /Kiwifruit/

## LIME

Teerachaichayut, S. and H.T. Ho. 2017. Non-destructive prediction of total soluble solids, titratable acidity and maturity index of limes by near infrared hyperspectral imaging. *Postharvest Biol & Technol* 133: 20-25.

### Abstract

This study was implemented for non-destructive prediction of total soluble solids (TSS), titratable acidity (TA) and calculation of TSS/TA as a measure of maturity index in intact limes using laboratory-based push-broom hyperspectral imaging (HSI) in reflectance mode in the range of 929–1671 nm. Limes were scanned by the HSI system in order to develop calibration models for predicting TSS, TA and TSS/TA using partial least square regression (PLSR). Original spectra obtained optimal conditions for establishing the models for TSS and TA while smoothing spectra for TSS/TA. The accuracy of the models for TSS, TA and TSS/TA provided coefficient of determination of prediction ( $R_p^2$ ) of 0.838, 0.694 and 0.775, respectively and root mean square errors of prediction (RMSEP) of 0.237%, 0.288% and 0.049, respectively. Image processing algorithms were then built up by interpreting predictive values, from the models, to colors in each pixel of the images. The predictive visualization of TSS, TA and TSS/TA in all portions of the limes based on a color scale was presented. The results showed that the HSI technique has the capability of predicting TSS, TA and TSS/TA of intact limes non-destructively and the results could be visualized by different colors of the predictive images.

**Keywords:** /Lime/ /Quality/ /Maturity/

## LITCHI

Shah, H.M.S., et.al. 2017. Pre-storage kojic acid application delays pericarp browning and maintains antioxidant activities of litchi fruit. *Postharvest Biol & Technol* 132: 154-161.

### Abstract

Pericarp browning is known as one of the leading problems during the supply chains of litchi fruit. The effects of pre-storage kojic acid (KA) application on pericarp browning, activities of antioxidative enzymes in the pericarp tissues, and the quality attributes, soluble solid concentrations, titratable acidity and ascorbic acid concentrations of the flesh of 'Gola' litchis have been investigated. Fruit were treated with 2, 4 or 6 mmol L<sup>-1</sup> KA and stored at 5 ± 1 °C with 90 ± 5% relative humidity for 20 d. Fruit treated with 4 mmol L<sup>-1</sup> KA had reduced fruit weight loss and fruit decay; while, 6 mmol L<sup>-1</sup> KA delayed pericarp browning by maintaining higher total anthocyanin and phenolic concentrations, and 2,

2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity. Reduced malondialdehyde, and hydrogen peroxide concentrations, and activities of oxidative enzymes such as peroxidase and polyphenol oxidase were also observed in 6 mmol L<sup>-1</sup> KA-treated fruit. In contrast, activities of ascorbate peroxidase, catalase and superoxide dismutase enzymes were found to be higher in pericarp tissues of fruit subjected to 6 mmol L<sup>-1</sup> KA application. Moreover, soluble solid concentrations, titratable acidity, ascorbic acid concentrations and sensory characteristics were also higher in 6 mmol L<sup>-1</sup> KA-treated litchi fruit. In conclusion, pre-storage application of 6 mmol L<sup>-1</sup> KA to litchi fruit delayed pericarp browning and maintained activities of antioxidative enzymes

**Keywords:** /Litchi/ /Cold Storage/ /Browning/

## MANGO

Bonneau, A., et.al. 2018. Impact of fruit texture on the release and perception of aroma compounds during in vivo consumption using fresh and processed mango fruits. Food Chem 239: 806-815.

### Abstract

Two fresh (fresh cubic pieces, fresh puree) and two dried (dried cubic pieces, dried powder) products were prepared from a homogenous mango fruit batch to obtain four samples differing in texture. The aromatic profiles were determined by SAFE extraction technique and GC–MS analysis. VOCs released during consumption were trapped by a retronasal aroma-trapping device (RATD) and analysed by GC–MS. Twenty-one terpenes and one ester were identified from the exhaled nose-space. They were amongst the major mango volatile compounds, 10 of which were already reported as being potential key flavour compounds in mango. The in vivo release of aroma compounds was affected by the matrix texture. The intact samples (fresh and dried cubic pieces) released significantly more aroma compounds than disintegrated samples (fresh puree, dried powder). The sensory descriptive analysis findings were in close agreement with the in vivo aroma release data regarding fresh products, in contrast to the dried products.

**Keywords:** /Mango/ /Sensory Analysis/

Jongsri, P., et.al. 2017. Influence of chitosan coating combined with spermidine on anthracnose disease and qualities of 'Nam Dok Mai' mango after harvest. Scientia Hortic 224: 180-187.

### Abstract

Chitosan (CTS) combined with spermidine (SPD) was applied as fruit coating for 'Nam Dok Mai' mango (*Mangifera indica* L.) compared with CTS and SPD treatments after harvest and stored at 25 ± 2 °C for 9 days. Influence of all treatments on anthracnose disease and qualities of mango fruit was investigated after inoculation fruit with *Colletotrichum gloeosporioides*. Inoculated fruit coated with 1% CTS combined with 0.1 ppm SPD exhibited the smallest area of lesion development (0–1 cm); while non-coating inoculated fruit presented the most severe fungal decay (4–5 cm). Furthermore, inoculated fruit coated with 1% CTS combined with 0.1 ppm SPD showed higher plant defense mechanisms than control

and other treated fruits. These phenomena were represented by the production of high levels of H<sub>2</sub>O<sub>2</sub> and phenolic compounds during storage and the induction of defense enzyme activities including chitinase,  $\beta$ -1,3-glucanase and peroxidase whereas fruit treated with only CMS or SPD expressed lower effect on induction of plant defense mechanisms. Therefore, synergistic effect of chitosan and spermidine combination can increase the ability to inhibit anthracnose disease development on 'Nam Dok Mai' mango fruit. Delayed mango fruit softening by 1% CTS combined with 0.1 ppm SPD was in correlation with reduced soluble pectin content during ripening stage. The results obtained suggested that 1% CTS combined with 0.1 ppm SPD had potential to improve firmness and delay deterioration processes of 'Nam Dok Mai' mango fruit after harvest.

**Keywords:** /Mango/ /Coating/ /Postharvest Storage/

## ORANGE

Terao, D., et.al. 2017. Physical postharvest treatments combined with antagonistic yeast on the control of **orange** green mold. *Scientia Horti* 224: 317-323.

### Abstract

In order to control the green mold on orange, the effect of physical postharvest treatments, using hot water brushing (HWB) and ultraviolet C irradiation (UVC), alone or in combination with antagonistic yeast (*Candida membranifaciens* CMAA-1112) was studied. The mechanisms involved in the biocontrol and the effects of these treatments on postharvest quality of fruit were also investigated. The results showed that HWB at 55 °C for 30 s and UVC at 2 kJ m<sup>-2</sup> stand-alone were capable of reducing the decay progress in around 70%. *C.membranifaciens* was effective in reducing the disease severity, and the main mechanism of control was by inducing systemic resistance on fruit peel. The combination of physical treatments and *C. membranifaciens* presented an additive effect increasing the efficacy in controlling the disease, and extended the fruit shelf-life. Our data suggest that the integration of physical treatments combined with *C. membranifaciens* could be an alternative to fungicides use in postharvest treatment for the control of the green mold on orange.

**Keywords:** /Orange/ /Postharvest Pathology/

## PEACH

Bianchi, T., et.al. 2017. Investigation of the aroma of commercial **peach** (*Prunus persica* L. Batsch) types by Proton Transfer Reaction–Mass Spectrometry (PTR-MS) and sensory analysis. *Food Res Int.* 99: 133-146.

### Abstract

The aim of this study was to investigate the aroma and sensory profiles of various types of peaches (*Prunus persica* L. Batsch.). Forty-three commercial cultivars comprising peaches, flat peaches, nectarines, and canning peaches (pavías) were grown over two consecutive harvest years. Fruits were

assessed for chemical aroma and sensory profiles. Chemical aroma profile was obtained by proton transfer reaction-mass spectrometry (PTR-MS) and spectral masses were tentatively identified with PTR-Time of Flight-MS (PTR-Tof-MS). Sensory analysis was performed at commercial maturity considering seven aroma/flavor attributes. The four types of peaches showed both distinct chemical aroma and sensory profiles. Flat peaches and canning peaches showed most distinct patterns according to discriminant analysis. The sensory data were related to the volatile compounds by partial least square regression.  $\gamma$ -Hexalactone,  $\gamma$ -octalactone, hotrienol, acetic acid and ethyl acetate correlated positively, and benzeneacetaldehyde, trimethylbenzene and acetaldehyde negatively to the intensities of aroma and ripe fruit sensory scores.

**Keywords:** /Peach/ /Sensory Analysis/

## PEAR

Nikkhah, M., et.al. 2017. Synergistic effects of some essential oils against fungal spoilage on **pear** fruit. Acta Horti 1166: 25-34.

## Abstract

The development of natural protective agents as alternatives to chemical fungicides is currently in the spotlight. In the present investigation, chemical composition and antifungal activities of thyme, cinnamon, rosemary and marjoram essential oils (EO), as well as synergism of their possible double and triple combinations were investigated. The compositions of the oils were determined by GC/MS. For determination of antifungal activity against *Penicillium expansum* and *Botrytis cinerea*, a broth microdilution method was used. The possible interactions of some essential oil combinations were performed by the two and three-dimensional checkerboard assay and isobologram construction. An in vivo antifungal assay was performed by artificial wounding of pear fruits. The maximum antifungal activity was demonstrated by thyme and cinnamon oils which displayed lower MIC values whereas rosemary and marjoram oils with MIC range between 2500 and 10,000  $\mu\text{g}/\text{mL}$  exhibited weak antifungal activities against tested fungi. In synergy testing, some double combinations (thyme/cinnamon, thyme/rosemary, cinnamon/rosemary) were found to be synergistic ( $\text{FICI} \leq 0.5$ ). The triple combination of thyme, cinnamon and rosemary was synergistic for *B. cinerea* and *P. expansum* ( $\text{FICI}$  values of 0.5 and 0.375, respectively); while combination of cinnamon, marjoram and thyme exhibited additive and synergistic effect against *P. expansum* ( $\text{FIC} = 0.625$ ) and *B. cinerea* ( $\text{FIC} = 0.375$ ) respectively. The usage of a mathematical Gompertz model in relation to fungal kinetics, showed that the model could be used to predict growth curves ( $R^2 = 0.993 \pm 0.05$ ). For *B. cinerea*, Gompertz parameters for double and triple combination treatments showed significant increase in lag phase (1.92 and 2.92 days, respectively) compared to single treatments. Increase lag time up to 2.82 days ( $P < 0.05$ ) also observed in *P. expansum* treated by triple combination of EOs. Based on the results, the lowest maximum growth rate (0.37 mm/day) was observed in *B. cinerea* treated by triple combination of thyme, cinnamon and rosemary. The in vivo test also demonstrated considerable inhibitory effects of EO combination treatments. Average lesion diameter of pears treated with triple combination of cinnamon/rosemary/thyme (78, 1250, 39  $\mu\text{g}/\text{mL}$ ) was 6 mm and 8 mm against *B. cinerea* and *P.*

*expansum* respectively, in 10 days at 25 °C. Results also showed that double combination of thyme/cinnamon (78, 156 µg/ mL) has more inhibitory effect than single EO treatments.

**Keywords:** /Pear/ /Spoilage/

## **PINEAPPLE**

Chen, N.J. and R.E. Paull. 2017. Production and postharvest handling of low acid hybrid pineapple. *Acta Hort* 1166: 25-34.

### **Abstract**

The development of pineapple cultivars more suited for fresh fruit consumption has led to new hybrids that have been widely introduced in Hawaii, Australia, Malaysia and Taiwan. These low acid types have become the preferred types and have expanded rapidly to supply the fresh fruit markets of the USA, Japan and Europe. The newer cultivars present new challenges for producers trying to ensure consistent production and quality. In Hawaii, plant establishment, natural flowering, translucency and too low acid levels are quality issues all tied to production practices. Production practices and experience gained over decades with the older canning types does not always readily apply to these low acid hybrids. Differences are seen between the two preferred low acid clones '73-050' and '73-114' in rooting. The clone '73-050' is slow to become established that delays crop growth upwards of a month. Natural flowering increases harvest costs and production losses, and disrupts the marketing of a consistent supply of high quality fruit. This event is a serious problem for the new low acid hybrids. The problem is more severe in regions with a cool season having temperatures below 20°C and shorter day length. Aviglycine (Retain©), an ethylene biosynthesis inhibitor, and methylcyclopropene (1-MCP), an ethylene receptor inhibitor, can control natural flowering. However, both are very costly and further studies are needed to reduce costs while maintaining efficacy. Alternatively, plants have been genetically engineered to be less sensitive to natural flowering conditions. All approaches have been tried in Hawaii. Fruit with flesh translucency increases the fruit's susceptibility to mechanical injury, fermentation and non-pathogenic fungal growth on the broken peduncle, all are of concern with packers, marketers and consumers. Translucency is possibly due to high photosynthetate levels in the fruit during the later part of fruit growth. Other possible factors include insufficient calcium uptake during early fruit growth and higher fruit temperatures in the field. Another issue is the inconsistency in fruit quality throughout the year due to variation in the sugar to acid balance, the major fruit flavor component. In the warm season, Hawaii's fruit have high sugars and too low acids. A more desirable balance of acids and sugars occurs in the cool season. The low acid hybrids accumulate high levels of titratable acidity during fruit growth. This acidity peaks at a higher level than in the older canning cultivars and declines rapidly as the fruit approach maturity and ripens. Field management, such as fertilization, irrigation practices and harvest scheduling developed for the canning cultivars may not be the most appropriate for the production of low acid hybrids' fresh fruit. This difference in varietal responses highlights the need for new field and handling approaches to meet the consumer desire for a consistent supply of high quality fruit.

**Keywords:** /Pineapple/ /Fruit Quality/

Raiputta, J., et.al. 2017. Application of acidic electrolyzed water combined with packaging to maintain quality and storage life of fresh-cut 'Phulae' pineapple. Acta Horti 1166: 183-190.

### **Abstract**

'Phulae' pineapple (*Ananas comosus* (L.) Merr.) is one of Geographical Indications of Chiang Rai Province, Thailand. It is a good source of soluble dietary fiber, beta carotene and bromelain. The demand of fresh-cut 'Phulae' pineapple becomes increasing due to its small size and difficulty in peeling. Therefore this work aims to study the effect of acidic electrolyzed water (AEW) combined with packaging on quality and prolonging storage life of fresh-cut 'Phulae' pineapple. Treatment of AEW at 80 mg L<sup>-1</sup> available chlorine for 2 min was selected to combine with 4 types of packaging: polypropylene (PP) bag, PP-antifog (PP-AF) bag, PP-AF film and M-wrap. Non-treated samples were controls. Quality in terms of pH, total soluble solids (TSS), titratable acidity (TA), vitamin C content, color, firmness, juice leakage (JL), total plate count (TPC), coliform, yeast and mold and sensory evaluation were determined during 0-14 days of storage at 5±1°C, 95% RH. The pH, TSS and TA values did not significantly change over the time of storage ( $P>0.05$ ). Treated samples packed in PP-AF bag (oxygen transmission rate (OTR): 3,685 mL m<sup>-2</sup> d<sup>-1</sup>) obtained the highest vitamin C content as 17.03 mg 100 g<sup>-1</sup> fresh weight at 14 days storage. Juice leakage was observed after 2 days storage in all treatments. Moreover, TPC and yeast and mold in treated samples packed in PP-AF bag were lower than other treatments (4.13 log colony forming unit (CFU) g<sup>-1</sup> and 1.3×10<sup>3</sup> CFU g<sup>-1</sup>, respectively). The combination of AEW and PP-AF bag increased the storage life from 10 days to about 14 days at 5±1°C, 95% RH.

**Keywords:** /Pineapple/ /Fresh-cut/

### **STRAWBERRY**

Turemis, N., et.al. 2017. Fruit quality characteristics of organically grown strawberries. Acta Horti 1164: 519 – 526.

### **Abstract**

Strawberries are moderately amenable to organic production. Recently organically strawberry cultivation has become important due the having less residual pesticides compared the conventional fruits. In this study, it was aimed to identify and quantify individual sugars such as fructose, glucose and sucrose, carboxylic acids such as malic and citric acid and L-ascorbic acid using HPLC (high performance liquid chromatography) techniques. Total anthocyanin and antioxidant capacity of organically cultivated 'Albion' and 'Benicia' strawberry fruits were also compared.

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

## TABLE GRAPES

Bo Zhang, et.al. 2017. Peptides derived from tryptic hydrolysate of *Bacillus subtilis* culture suppress fungal spoilage of table grapes. Food Chem 239: 520–528.

### Abstract

This study confirmed the anti-fungal effect of trypsin-treated *Bacillus subtilis* culture (BC) (tryptic hydrolysate, TH) on mold growth on Kyoho grapes. We examined the anti-fungal activity of TH by identifying TH peptides and performing a computational docking analysis. TH was more potent than untreated BC in suppressing fungal growth on grapes. Specifically, TH maintained grape freshness by inhibiting respiration and rachis browning, maintaining firmness, and preventing weight loss. Thirty-six inhibitory peptides against  $\beta$ -1,3-glucan synthase (GS) were screened from 126 TH peptides identified through proteomic analysis. Among them, 13 peptides bound tightly to GS active pockets with lower binding energies than that of GppNHp. The most potent peptides, LFEIDEELNEK and FATSDLNDLYR, were synthesized, and further experiments showed that these peptides had a highly suppressive effect on GS activity and *Aspergillus niger* and *Penicillium chrysogenum* growth. Our results confirm that tryptic treatment is effective for improving the anti-fungal activity of BC.

**Keywords:** /TableGrapes/ /Browning/

## VEGETABLES

### BROCCOLI

Formica-Oliveira, A.C., et.al. 2017. Use of postharvest UV-B and UV-C radiation treatments to revalorize broccoli byproducts and edible florets. Innov. Food Sci. & Emerg. Technol 43: 77-83.

### Abstract

UV-B radiation (5, 10 and 15 kJ m<sup>-2</sup>) treatments, single or combined with UV-C (9 kJ m<sup>-2</sup>), were hereby firstly studied as bioprocessing tools to enhance bioactive compounds of broccoli byproducts (leaves and stalks) compared to edible florets during storage (72 h/15 °C). Leaves showed similar total phenolic content (TPC) and antioxidant capacity (TAC) than florets, and 2.5/14.5 higher glucoraphanin/glucobrassicin contents than florets. UV increased initial TPC and TAC of leaves/stalks up to 31–97/30–75 and 20–120/170–420%, respectively. UV-B10 + C induced the highest TPC increase (110%) in leaves while UV-B10 and UV-B10 + C led to the highest TPC of stalks after 48 h. UV-B10 + C increased (34%) glucobrassicin levels of leaves while UV-B15 and UV-B15 + C induced the highest glucoraphanin levels (131 and 117 mg kg<sup>-1</sup>) in florets after 72 h. Conclusively, single or combined postharvest UV-B and UV-C treatments can revalorize such agricultural byproducts and also add value to edible broccoli parts.

**Industrial relevance:** This work demonstrates the high potential of the use of postharvest treatments with UV-B and UV-C, optimized as single or combined treatments, to be used as

bioprocessing tools to enhance the bioactive compounds of broccoli byproducts (leaves and stalks) being compared to edible florets. Thought this innovative application of this technology such agricultural wastes may be highly revalorized with a cheap technology leading to high production of health-promoting compounds with such eco-sustainable technology whose benefits can be even reach to the pharmaceutical industry.

**Keywords:** /Broccoli/

Yanan Sun and Wenxiang Li. 2017. Effects the mechanism of micro-vacuum storage on **broccoli** chlorophyll degradation and builds prediction model of chlorophyll content based on the color parameter changes. *Scientia Horti* 224: 206-214.

### **Abstract**

The objective of this study was to investigate the mechanism of micro-vacuum (MV) storage on broccoli chlorophyll degradation and builds prediction model of chlorophyll content based on the color parameter changes. The freshly harvested broccoli were subjected to MV storage ( $70 \pm 5$  kPa) and atmospheric pressure storage at  $3 \pm 1$  °C for 49 d; The relationship between broccoli chlorophyll content and its surface color parameters (-a/b value) was studied to build broccoli chlorophyll content prediction model based on the color parameter changes under MV conditions. The results showed the degradation of chlorophyll could be inhibited, activities of CAT, SOD, POD could be improved, superoxide anion ( $O_2\%$ ) release rate, hydrogen peroxide ( $H_2O_2$ ) content, malondiadehyde (MDA) content and the increase of membrane permeability could be decreased significantly in MV storage conditions; the correlation analysis showed that relationship between chlorophyll degradation rate and activities of CAT, SOD, POD, the relationship between chlorophyll content and  $O_2\bullet$  release rate,  $H_2O_2$  content, MDA content, membrane permeability showed a significant negative correlation; The changes of chloroplast ultrastructure could be inhibited and degradation of chlorophyll could be delayed in MV conditions, yellowing mechanisms of broccoli was revealed by the cellular level in MV conditions. Validation showed that the prediction model could reflect the changes of chlorophyll content during storage, provide theoretical basis for the further application of non-destructive testing technology.

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

### **LEAFY VEGETABLES**

Al Ubeed, H.M.S., et.al. 2017. Interaction of exogenous hydrogen sulphide and ethylene on senescence of green **leafy vegetables**. *Postharvest Biol & Technol* 133: 81-87.

### **Abstract**

Hydrogen sulphide ( $H_2S$ ) gas has been found to delay the appearance of many characteristics associated with senescence of horticultural produce but little attention has been given to its physiological role or its interaction with ethylene. This study used the green leafy vegetable, pak choy (*Brassica rapa* subsp. *Chinensis*) as the principal test commodity and examined the interaction of

fumigation with hydrogen sulphide and storage at 10 °C in the presence of controlled levels of ethylene on endogenous ethylene production and a range of factors associated with postharvest deterioration. It was found that hydrogen sulphide inhibited ethylene production, chlorophyll loss, respiration, weight loss, various antioxidant factors and ion leakage. Hydrogen sulphide also inhibited chlorophyll loss and respiration of other green leafy vegetables/herbs, sweet Italian basil (*Ocimum basilicum*) and green curly kale (*Brassica oleracea* var. *sabellica*). The results suggest that the mode of action of hydrogen sulphide in delaying senescence could be by inhibiting both the production of ethylene and the action of ethylene. The substantial reduction in the rate of loss of chlorophyll following short-term treatment with hydrogen sulphide may have potential commercial benefit for extension in market life of green leafy vegetables.

**Keywords:** /Leafy Vegetables/ /Pak Choy/ /Ethylene/

## LETTUCE

Paul-Francois Kounkeu Ngnitcho, et.al. 2017. Inactivation of bacterial pathogens on lettuce, sprouts, and spinach using hurdle technology. *Innov. Food Sci. & Emerg. Technol* 43: 68-76.

### Abstract

Effects of chemical treatment using slightly acidic electrolyzed water (SAEW), fumaric acid (FA), or calcium oxide (CaO) and physical treatment using ultrasonication (US), micro-bubbles (MB), or ultraviolet (UV) to inactivate bacterial pathogens *Listeria monocytogenes*, *Escherichia coli* O157:H7, *Staphylococcus aureus*, and *Salmonella* spp. on lettuce, spinach, and sprouts were determined. Fresh produce inoculated with bacterial pathogens (~9 log CFU/mL) was immersed in distilled water (DW), SAEW, FA (0.5%), or CaO (0.2%) alone or in combination at 23 ± 2 °C for 3 min followed by treatment with US, MB for 3 min, or UV for 10 min. Effects of combined treatment on shelf-life of lettuce at 4 °C and 23 ± 2 °C were also determined in this study. Results revealed that the use of a combination of CaO + SAEW + FA + US exhibited significant reduction ( $p < 0.05$ ) for bacterial pathogen on fresh produce compared to individual treatment or other combinations. CaO + SAEW + FA + US treatment exhibited highest reduction of *E. coli* O157:H7, *S. aureus*, *L. monocytogenes* and *Salmonella* spp. by 4.7, 4.9, 4.84 and 5.08 log CFU/g, respectively on lettuce as compared to spinach and sprouts. Microbial count reducing capability for combined treatment methods were ranked in the following order: SAEW + FA < CaO + SAEW + FA < CaO + SAEW + FA + US. However, introduction of US to CaO + SAEW + FA treatment resulted in little detrimental effect on the overall quality of lettuce. Moreover, CaO + SAEW + FA treatment effectively enhanced the shelf-life of lettuce stored at 4 °C and 23 ± 2 °C by about 6 days and 3 days, respectively as compared to control (DW treatment), with longer lag time (23.11 h on lettuce) for naturally occurring bacteria on fresh produce. These findings suggest that significant synergistic benefit could be obtained from combined sanitizer treatment to eliminate bacterial pathogens from fresh produce.

**Keywords:** /Lettuce/ /Sprouts/ /Spinach/ /Fresh Produce/ /Shelf Life/

## MUNGBEAN SPROUT

Sikora, M and M. Swieca. 2018. Effect of ascorbic acid postharvest treatment on enzymatic browning, phenolics and antioxidant capacity of stored mung bean sprouts. Food Chem 239: 1160 – 1166.

### Abstract

Enzymatic browning limits the postharvest life of minimally processed foods, thus the study selected the optimal inhibitors of polyphenol oxidase (PPO) and evaluated their effect on enzymatic browning, phenolics and antioxidant capacity of stored mung bean sprouts. The sprouts treated with 2 mM and 20 mM ascorbic acid had a lowered PPO activity; compared to the control by 51% and 60%, respectively. The inhibition was reflected in a significant decrease in enzymatic browning. The sprouts treated with 20 mM ascorbic acid had 22% and 23% higher phenolic content after 3 and 7 days of storage, respectively. Both storage and ascorbic acid treatment increased potential bioaccessibility of phenolics. Generally, there was no effect of the treatments on the antioxidant capacity; however, a significant increase in the reducing potential was determined for the sprouts washed with 20 mM ascorbic acid. In conclusion, ascorbic acid treatments may improve consumer quality of stored sprouts.

**Keywords:** /Mungbean Sprout/ /Browning/

## SPINACH

Allende, A., et.al. 2017. Quantitative contamination assessment of *Escherichia coli* in baby spinach primary production in Spain: Effects of weather conditions and agricultural practices. Int. J. Food Microbiol. 257: 238-246.

### Abstract

A quantitative microbial contamination model of *Escherichia coli* during primary production of baby spinach was developed. The model included only systematic contamination routes (e.g. soil and irrigation water) and it was used to evaluate the potential impact of weather conditions, agricultural practices as well as bacterial fitness in soil on the *E. coli* levels present in the crop at harvest. The model can be used to estimate *E. coli* contamination of baby spinach via irrigation water, via soil splashing due to irrigation water or rain events, and also including the inactivation of *E. coli* on plants due to solar radiation during a variable time of culturing before harvest. Seasonality, solar radiation and rainfall were predicted to have an important impact on the *E. coli* contamination. Winter conditions increased *E. coli* prevalence and levels when compared to spring conditions. As regards agricultural practices, both water quality and irrigation system slightly influenced *E. coli* levels on baby spinach. The good microbiological quality of the irrigation water (average *E. coli* counts in positive water samples below 1 log/100 mL) could have influenced the differences observed among the tested agricultural practices (water treatment and irrigation system). This quantitative microbial contamination model represents a preliminary framework that assesses the potential impact of different factors and intervention strategies affecting *E. coli* concentrations at field level. Taking into account that *E. coli* strains may serve as a

surrogate organism for enteric bacterial pathogens, obtained results on *E. coli* levels on baby spinach may be indicative of the potential behaviour of these pathogens under defined conditions.

**Keywords:** /Spinach/

## **TOMATO**

Bender, I. and P. Poldma. 2017. Cracking of **tomato** fruits in organic greenhouse trial. Acta Hortic 1164: 527-534.

### **Abstract**

The objective of the research was to study how the Estonian weather conditions influence the cracking of tomato fruits of different weight and origin. Three new for Estonian conditions tomato cultivars from The Netherlands ('Auris' F<sub>1</sub>, 'Minaret' F<sub>1</sub> and 'Tolstoi' F<sub>1</sub>), two cherry type cultivars ('Gartenfreude' and 'Sun Baby') and five local widely cultivated cultivars ('Erk', 'Maike', 'Malle' F<sub>1</sub>, 'Valve', and 'Visa' F<sub>1</sub>) were included in the study. Four cultivars belong to the large (>90 g), four to medium (45-90 g) and two to small fruits group (<20 g). The trial was carried out in organic conditions at Estonian Crop Research Institute in 2014 and 2015. An unheated polyethylene greenhouse was used for cultivation in soil fertilized with bovine manure at the rate of 6 kg m<sup>-2</sup> as the main source of fertilization. Chicken manure and seaweed solution was used three times during the growing period as additional fertilization. The number of cracked and regular fruits was counted 24 times during the vegetation period (from July to September). The weight of marketable yield and cracked fruits was determined. According to the results, it can be concluded that the percentage of cracked fruits was higher in 2014 because of higher fluctuations in daily temperatures and during the whole vegetation period. The most cracking resistant were the two small fruit cultivars and medium fruit 'Maike' showing minimal influence of the weather condition of the trial year. The cultivars 'Minaret' F<sub>1</sub>, 'Maike', 'Valve', 'Visa' F<sub>1</sub>, 'Sun Baby' and 'Gartenfreude' produced quite high and stabile marketable yield in unheated organic greenhouse. The yield stability of the last five cultivars was good over the both years. From the Dutch cultivars large fruited 'Minaret' F<sub>1</sub> had the best resistance to cracking in 2014 and medium fruited 'Tolstoi' F<sub>1</sub> in 2015. Both mentioned cultivars can be recommended for Estonian organic growers for cultivation in unheated greenhouses.

**Keywords:** /Tomato/

## **ZUCCHINI**

Carvajal, F., et.al. 2017. Unravelling the role of abscisic acid in chilling tolerance of **zucchini** during postharvest cold storage. Postharvest Biol & Technol 133: 26-35

### **Abstract**

Abscisic acid (ABA) is a key phytohormone in the regulation of most stress responses, which especially involve dehydration such as drought, high salinity, and low temperature. Under these stress

conditions, plants accumulate ABA that triggers a response to cope with the adverse environment. In this study, we investigated the implication of ABA in the acquisition of chilling tolerance in zucchini during fruit postharvest. For that, we have analyzed ABA biosynthesis and response in fruit of two varieties with different chilling tolerance, 'Natura' (cold tolerant) and 'Sinatra' (cold sensitive). The results have showed that the biosynthesis of ABA was induced in 'Natura' fruit, with an increase of the abscisic aldehyde oxidase activity (AAO), and consequently an accumulation of ABA during the first day of exposition to cold. The levels of ABA showed a significant negative correlation with weight loss and chilling damage, and a positive correlation with firmness. Transcriptional analysis of some genes involved in ABA signaling and response, such as the ABA receptors PYL1 and PYL4, the transcription factors AI5L2/ABF3, NAC072/RD26, ATHB7, bHLH112, and the enzymes KAT2 as well as HDA6, a deacetylase involved in histone modification, presented different expression levels between varieties, showing 'Natura' the highest expression in most cases at least at short-term storage. Finally, to corroborate the role of ABA in cold tolerance, 5 mM of sodium tungstate (an inhibitor of ABA biosynthesis) was applied to 'Natura' fruit and 0.5 mM of ABA was applied to 'Sinatra' fruit and their postharvest behaviour at low temperature was followed. The treatment with tungstate induced cold-sensitivity in 'Natura' fruit, whereas ABA-treated 'Sinatra' fruit improved their quality during the storage at 4 °C. The results obtained point to ABA as a phytohormone responsible for the acquisition of postharvest cold tolerance.

**Keywords:** /Zucchini/ /Cold Storage/

## POTATO AND TUBERS

### POTATO

Amaral, R.D.A, et.al. 2017. The influence of edible coatings, blanching and ultrasound treatments on quality attributes and shelf-life of vacuum packaged potato strips. *LWT – Food Sci. & Technol.* 85: 449-455.

#### Abstract

The aim of this work was to investigate the effect of using ultrasound or edible coating as a possible alternative to blanching on the quality of vacuum-packaged potato strips. The treatments assessed were blanching (85 °C, 3.5 min), coating with 20 g L<sup>-1</sup> alginate and sonicating (40 kHz, 5 min) in an ultrasonic bath containing a 20 g L<sup>-1</sup> citric acid solution. Vacuum-packaged samples were stored up to 12 days at 3 ± 1 °C. The pH, polyphenol oxidase (PPO) activity, sugars and microbial load were assessed. Also, the colour, shear-force and dry matter of the treated and fried potato strips as well as the oil adsorption and acrylamide after frying were evaluated. The PPO activity of the treated samples was not significantly different over time ( $p > 0.05$ ). The treatments applied did not affect the attributes of the fried potato strips over time; there were no significant changes in oil absorption, acrylamide content or colour ( $p > 0.05$ ). However, the visual quality of sonicated packaged potato strips was significantly better than that of the other treatments after storage. The loss of the texture of blanched potatoes was

remarkable ( $p < 0.05$ ) before and after frying. Sonicated samples maintained mesophilic bacteria counts better than blanched and alginate coated vacuum-packaged potato strips.

**Keywords:** /Potato/ /Shelf Life/ /Packaging/ /Edible Coating/

## ORNAMENTALS

### CATTLEYA

Burana, C. and Yamane, K. 2017. Responses of cut *Cattleya* orchid 'Lc. Spring Clima × Christina' flowers to high carbon dioxide as related to controlled atmosphere. Acta Horti 1167: 407-412.

#### Abstract

A substantial portion of commercially produced *Cattleya* is sold as cut flowers that often require shipment to distant markets. Cut flowers of *Cattleya* are sensitive to ethylene, and exposure to ethylene is known to accelerate flower senescence. The negative effects of ethylene can be significantly reduced by treatments with inhibitors of ethylene perception and/or ethylene production. In this study, the effect of high carbon dioxide (CO<sub>2</sub>) (50%), pre-cooling temperature (5°C) and ethylene (0.2 ppm) on longevity of *Cattleya* 'Lc. Spring Clima × Christina' were investigated. The flowers treated with ethylene increased ethylene production to 4.72 nL g<sup>-1</sup> h<sup>-1</sup>, 2 day after harvest (DAH), while low levels of ethylene production were detected in other treatments throughout the experimental period. High CO<sub>2</sub> with and without pre-cooling treatments increased the respiration of flowers 2 DAH. Flowers treated with high CO<sub>2</sub> in combination with pre-cooling showed the lowest respiration rate 4 DAH. The vase life was increased by high CO<sub>2</sub> in combination with pre-cooling from 10 days to 14 days. These results suggest that high CO<sub>2</sub> and combination with pre-cooling has commercial potential in enhancing the vase life of cut *Cattleya* orchid.

**Keywords:** /Cattleya/ /Controlled Atmosphere/ /Ethylene/ /Vase Life/

### DENDROBIUM

Habiba, S.U., et.al. 2017. Effect of ethylene precursor 1-aminocyclopropane-1-carboxylic acid and ethylene inhibitor, silver thiosulfate on organogenesis of PLBs in *Dendrobium kingianum* cultured in vitro. Acta Horti 1167: 133-138.

#### Abstract

This study attempted to clarify the effects of 1-aminocyclopropane-1-carboxylic acid (ACC) and silver thiosulfate (STS) on organogenesis of PLBs in *Dendrobium kingianum* under white fluorescent lamps in vitro. PLBs were cultured in modified Murashige and Skoog (MS) medium supplemented with ACC at 0, 0.1, 1 and 10 mg L<sup>-1</sup> for two days then transferred and combined with STS at 0, 0.01, 0.1 and 10 mM. The highest number of PLBs (12.9) was recorded in the media containing 0.1 mg L<sup>-1</sup> ACC

combined with 0.01 mM STS. Increase in fresh weight showed higher values in the same combination. Whereas, the highest number of developing shoots (2.7) was recorded in the medium containing 0.1 mg L<sup>-1</sup> ACC combined with 0.1mM STS. Low concentration of STS alone increased the number of PLBs but showed inhibitory effects on shoot formation. On the other hand, low concentration of ACC alone increased both number of PLBs and shoots after 4 weeks of culture. In this study, the efficiency of ACC at low concentration was observed only in PLB formation but no satisfactory enhancement on shoot formation.

**Keywords:** /Dendrobium/

## **ORCHID**

Chaisrichonlathan P. and C. Chavapradit. 2017. Prototype of forced air cooling system for dehumidifying of orchid cut-flowers. Acta Horti 1167: 387-392.

### **Abstract**

Dehumidification of surplus moisture in orchid cut-flowers is essential before packaging for export. Low efficient conventional dehumidifying system including axial flow fans and moveable screen-rack shelves were generally utilized with lengthy processing time and flower injury. A prototype of forced cooling air system with high volume of cool air to rapidly reduce excess moisture from orchid cut-flowers was designed and developed. The prototype is a tunnel type cabinet in which two screen-rack shelves can be deposited in one side and taken out from the other. One cross flow fan of 30 cm in diameter and 35,000 BTU cooling system were sited above the orchid rack cart tunnel. As a closed system, cool air is forced to circulate from the cross flow fan to detach orchid moisture, and thereby condensation of circulated wet air attains at cooling coil of air-conditioning system. Samples of 1,200 orchid bundles with 600 g in weight of each were dipped in water and dehumidified by the forced cooling air system, and their weight was measured at 10-min intervals until stable weight was attained or predipped weight. The prototype dehumidified them within only 60 min, half of conventional dehumidifying system. The prototype of force cooling air system was proved to be able to decrease dehumidifying time of orchid cut-flowers without flower injury. Prototype of forced air cooling system ought to be developed for higher capability.

**Keywords:** /Orchid/

## **ZINGIBER**

Dum-ampai, N. and P. Chaisrichonlathant. 2017. Characteristics of zingibers for cut-flowers. Acta Horti 1167: 181-186.

### **Abstract**

The aim of this study was to evaluate the horticultural traits of the *Zingiber* plants for cut-flower production. A total of 11 samples of 6 *Zingiber* species were collected and planted at Trang Horticultural

Research Centre, during the year 2011-2014. There were 5 samples of *Zingiber zerumbet*, 2 samples of *Zingiber ottensii*, and each of *Zingiber montanum*, *Zingiber chrysostachys*, *Zingiber spectabile* and *Zingiber niveum*. It was found that *Zingiber zerumbet* sampled from Trang province produced the longest inflorescences, 60.5 cm long; while, *Zingiber chrysostachys* had the smallest inflorescences, 13.0 cm long. Flowering periods were from early May for *Zingiber zerumbet* sampled from Chantaburi Province, to September for *Zingiber ottensii*. Their vase-life; for example, those of *Zingiber zerumbet* were 6-21 days depending on blooming stage.

**Keywords:** /Zingiber/ /Vase-Life/