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GENERAL

ACTIVE PACKAGING

Sui Chin, S., et.al. 2017. Effect of Aloe vera (*Aloe barbadensis* Miller) gel on the physical and functional properties of fish gelatin films as **active packaging**. *Food Packag. & Shelf Life* 12: 128–134.

Abstract

Present study was conducted to investigate the feasibility of the combination of fish gelatin and *Aloe gel* in producing composite films and to determine the effect of *Aloe gel* concentrations (1, 3, 5, 7 and 9% wt/wt) on the physical properties and antioxidant activity of the composite films. The moisture content of the composite films was proportional to the concentration of *Aloe gel*. Also, the water solubility and tensile strength of the films decreased with increasing *Aloe gel* concentration. However, *Aloe gel* did not cause any significant effect ($p \geq 0.05$) on thickness, water vapour permeability (WVP) and colour of the composite films. The gelatin/*Aloe* composite films exhibited smooth surface microstructures similar to non-composite gelatin film when observed under scanning electron microscope (SEM). The gelatin/*Aloe* composite films also showed concentration dependent ABTS and DPPH radical scavenging activities.

Keywords: /Active Packaging/ /Biodegradable Films/

CHITOSAN

Jin Liang, et.al. 2017. Encapsulation of epigallocatechin gallate in zein/ **chitosan** nanoparticles for controlled applications in food systems. *Food Chem* 231: 19-24.

Abstract

The objective of this study was to prepare chitosan nanoparticles (CS NPs) coated with zein as a promising encapsulation and delivery system for epigallocatechin gallate (EGCG). The factors influencing the nanoparticle fabrication, including zein concentration, zein/chitosan weight ratio and EGCG encapsulation percentage, were systematically investigated. The physicochemical and structural analysis showed that the electrostatic interactions and hydrogen bonds were the major forces responsible for nanoparticles formation. The transmission electron microscopy study revealed the spherical nature with smooth surface of obtained nanoparticles. The release profile of EGCG showed a burst effect, followed by slow release. EGCG release was relatively higher from zein/chitosan nanoparticles (zein/CS NPs) with higher DPPH scavenging activity, than that of NPs without zein coating in 95% ethanol fatty simulant. These results indicated that controlled-release of EGCG from zein/CS NPs and its corresponding

antioxidant activities in 95% ethanol fatty simulant may provide long-term protection against oxidation for fatty foods.

Keywords: /Chitosan/

EDIBLE FILMS

Cozmuta, A.M., A. Peter, C. Nicula and L.M. Cozmuta. 2017. Assessment of the effective antioxidant activity of **edible films** taking into account films-food simulants and films–environment interactions. *Packag. Technol. Sci.* 30: 3–20.

Abstract

Six gelatin films incorporating different ratios of sage oil (SO) and hemp oil (HO) were subjected to contact with food simulants and environmental exposure, respectively, for 3 months, at 15 000 lx light intensity, 40°C and 65% relative humidity. The migration and degradation, respectively, of the antioxidants into the simulants as well as their loss in the environment were mathematically modelled. The fastest release rate of antioxidants was noticed in the case of SO : HO 0 : 2 in 85% ethanol while the highest degradation rates were achieved after 18 days in the case of SO : HO 0 : 2 in water and 3% acetic acid and after 22 days in 85% ethanol. The antioxidants from SO : HO 0 : 2 were lost to the largest extent (5.37%) while those from SO : HO 1 : 1 to the lowest extent (3.49%). SO : HO 1 : 1 was selected as the most efficient film, by optimizing the amount of antioxidants available solely for food protection with the longest stability in the simulants. From industrial point of view, the mathematical modelling of the previously mentioned processes allows for the selection of the most effective film from a group with comparable physical–chemical–microbiological properties.

Keywords: /Edible films/ /Gelatin films/

EVAPORATIVE COOLING

Zorzeto, T.Q. and P.A.M. Leal. 2017. Wireless sensor network to map the meteorological variability in a greenhouse with **evaporative cooling**. *Acta Hortic.* 1154: 213-220.

Abstract

Despite the potential of a heterogeneous distribution of temperature and relative humidity (RH) of air along the greenhouse, the common practice is to install one sensor at a fixed point, assumed it to be representative of the entire environment, and that this information can be used for control of the greenhouse. Focusing on quantity and quality of data collected in the field, especially exploring spatial variations, is necessary to develop and validate system models in protected environments based on real conditions. This study aimed to characterize and map the horizontal and vertical variabilities of temperature and RH of air in a greenhouse with evaporative cooling. We carried out the experiment in a greenhouse with a wireless sensor network, at the College of Agricultural Engineering (FEAGRI/UNICAMP), in São Paulo (Brazil) (22°49'06''S 47°03'40''W, 635 m a.s.l.). Evaporative cooling

associated with fixed shading was more effective in reducing the temperature and increasing the RH of air (-7.55°C and 47%), and also featured the most heterogeneous vertical gradient (14.31°C and -58%) and horizontal variability (0.84°C near the fan and - 1.23°C and 5% close to the pad). The association of a zenithal window with evaporative cooling and mechanical ventilation affects the efficiency of the systems and, despite reducing thereby the vertical differences (2.86°C and -15%), maintains the horizontal heterogeneity (1.17°C and -7% near the exhauster).

Keywords: /Evaporative Cooling/ /Relative Humidity/

FRESH-CUT

Plazzotta, S., L. Manzocco and M.C. Nicoli. 2017. Fruit and vegetable waste management and the challenge of **fresh-cut salad**. Trends Food Sci. & Technol. 63: 51-59.

Abstract

Background: The fruit and vegetable sector generates large amounts of waste. In industrialized countries, fruit and vegetable waste (FVW) is mainly generated before reaching consumers, due to programmed overproduction and unfulfillment of retailer quality standards. FVW poses environmental problems due to its high biodegradability, represents a loss of valuable biomass and an economic cost for companies. Different reduction, reuse and recycle strategies to tackle FVW have been proposed. **Scope and approach:** This review paper summarizes these strategies, underlying their main advantages and pitfalls. In particular, fresh-cut salad waste was considered as a particularly challenging FVW, due to its low concentration of nutrients (e.g. polyphenols, pigments, fiber). **Key findings and conclusions:** Different management strategies can be successfully applied to FVW. Among them, the extraction of specific functional compounds was found to be one of the most studied in the last years. This suggests that FVW can be considered a source of valuable ingredients and products. To maximally exploit these FVW potentialities, a rational strategy is required. The latter should be developed using a step-procedure including waste characterization, output definition, process design and feasibility study. The application of this procedure to the case of fresh-cut salad waste was presented. Based on the review of currently applied and potential salad waste management strategies, an operational scheme for the development of alternative strategies was proposed. This scheme considers the exploitation of traditional and novel technologies, even applied in combination, for salad waste valorization.

Keywords: /Fresh-Cut/ /Fruits/ /Vegetables/

FRESH PRODUCE

KaWang Li, et.al. 2017. Microbiological quality and safety of **fresh produce** in West Virginia and Kentucky farmers' markets and validation of a post-harvest washing practice with antimicrobials to inactivate *Salmonella* and *Listeria monocytogenes*. Food Control 79: 101-108.

Abstract

This study aimed to evaluate the microbiological quality/safety of fresh produce from farmers' markets (FM) and assess the post-harvest washing practice with antimicrobials to inactivate *Salmonella* and *Listeria monocytogenes* on fresh produce. In study I, 212 produce samples were tested for the presence of *Salmonella* and *Listeria spp.* using modified FDA-BAM methods. Aerobic plate counts (APCs), total coliforms (TCCs), and yeast/molds were analyzed on petri-films. Among the 212 samples, the APCs, TCCs, and yeast/molds were 3.72-5.63, 3.67-5.47, and 3.07-4.13 log CFU/g, respectively, with spinach containing the highest ($P < 0.05$) populations. Among all tested samples, *Salmonella enterica spp. enterica* was detected on 18.6% of spinach, 10.9% of tomatoes, 18.5% of peppers, and 56.3% of cantaloupes, which is much higher than previously reported. Only 3.78% of the samples were confirmed for *Listeria spp.*, and 50% of them were identified as *L. monocytogenes*, based on multiplex PCR results. Due to the high percentage of pathogens detected on the farmers market produce an evaluation of post-harvest produce washing with various antimicrobials was conducted in study II. Specifically, spinach, tomatoes, green peppers and cucumbers were inoculated with *S. Typhimurium* and Tennessee or *L. monocytogenes* and washed in tap water, vinegar water (10%), lactic acid (5%), a lactic and citric acid blend (2.5%), and sodium hypochlorite (200 ppm) for 30 s or unwashed. Vinegar water (10%) showed better ($P < 0.05$) reduction of *S. Typhimurium* and Tennessee on tomatoes and cucumbers, and *L. monocytogenes* on tomatoes and peppers than tap water. The three antimicrobials reached an additional reduction level of 0.9-2.7 (*S. Typhimurium* and Tennessee) and 0.2 to 1.4 log CFU/g (*L. monocytogenes*) compared to tap water. Lactic acid indicated the best ($P < 0.05$) reduction of *S. Typhimurium* and Tennessee on spinach and green peppers, and sodium hypochlorite showed the best ($P < 0.05$) reduction of *L. monocytogenes* on cucumbers. The results supplied important information for FM vendors to develop post-harvest protocols to control foodborne pathogens.

Keywords: /Fresh Produce/ /Microbial Safety/

MYCOTOXINS

Fornal, Emilia, et. al. 2017. MILIA Fast and easy liquid chromatography–mass spectrometry method for evaluation of postharvest fruit safety by determination of **mycotoxins**: Fumitremorgin C and verruculogen. *Postharvest Biol. & Technol.* 131: 46 – 54.

Abstract

Fumitremorgin C and verruculogen are mycotoxins produced by heat-resistant *Neosartorya fischeri*. Easy and fast monitoring of their production by selective and sensitive analytical methods is crucial for ensuring postharvest quality of fruit, food safety, and thus human health and well-being. A six-minute liquid chromatography tandem mass spectrometry method (LC/MS/MS) was developed for quantification of fumitremorgin C and verruculogen in potato dextrose broth (PDB), strawberry juice, strawberry fruit, and soil. Mycotoxins were extracted from all media with the QuEChERS (Quick Easy Cheap Effective Rugged Safe) method. The lower limit of quantification (LLOQ) of the method for both mycotoxins was $1 \mu\text{g L}^{-1}$ for PDB and strawberry juice and $1 \mu\text{g kg}^{-1}$ for strawberry fruit and soil.

Collision-induced dissociation of protonated fumitremorgin C and verruculogen ions was also examined by high-resolution mass spectrometry to assist researchers in non-targeted screening for mycotoxins and in identification of these two toxins. The developed LC/MS/MS method was applied to examine mycotoxin production by 45 environmental *Neosartorya* strains: 5 well-known strains, included in the study as reference strains, and 40 strains that were newly isolated and identified by us.

Keywords: /Mycotoxin/ /Postharvest/ /Fruit Safety/

POSTHARVEST PATHOGENS

De Corato, Ugo, et.al. 2017. Antifungal activity of crude extracts from brown and red seaweeds by a supercritical carbon dioxide technique against fruit postharvest fungal diseases. *Postharvest Biol. & Technol.* 131: 16 – 20.

Abstract

Fungal infections are the main cause of decay on fresh fruit during postharvest phase determining severe losses. Postharvest control is performed by fungicides, but their intense use have aroused issue relating to environmental protection and human health prompting to search alternative control means. The use of biofuel-used seaweed extracts by a supercritical carbon dioxide technique could be a valid alternative during postharvest handling of fresh fruit. The aim of this work was to assess the in vitro and in vivo activity of extracts from two brown seaweeds (*Laminaria digitata* and *Undaria pinnatifida*) and three red seaweeds (*Porphyra umbilicalis*, *Euclima denticulatum* and *Gelidium pusillum*) against three postharvest pathogens (*Botrytis cinerea*, *Monilinia laxa* and *Penicillium digitatum*) using three concentrations of extract (10, 20 and 30 g L⁻¹). The total content of fatty acids of the extracts was determined by CG-MS, those of polysaccharides by HIC, and phenolic compounds (phlorotannins) by HPLC-DAD. Twenty fatty acids were quantified in the extracts, while three polysaccharides categories and three phlorotannins classes were identified only in brown seaweed extracts. *L. digitata*, *U. pinnatifida* and *P. umbilicalis* showed the highest antifungal efficacy on in vitro cultures of the pathogens. *L. digitata* and *U. pinnatifida* completely inhibited mycelia growing and conidial germination of *B. cinerea* and *M. laxa* at the highest dose tested and strongly reduced those of *P. digitatum*. *P. umbilicalis* extract strongly inhibited mycelia and conidia growth on all the fungi. *E. denticulatum* and *G. pusillum* showed a lower but still significant reduction of mycelia growing and conidia germination on all the pathogens. In trials performed in vivo on wounded fruit, *L. digitata*, *U. pinnatifida* and *P. umbilicalis* extracts strongly suppressed grey mould on strawberries, brown rot on peaches, and green mould on lemons at 30 g L⁻¹ dose both in preventive and curative treatments; *E. denticulatum* and *G. pusillum* poorly reduced disease development. In all cases, a dose effect of the treatments was observed with an increase of fruit decay inhibition and reduction of disease severity as the dose of extract applied over the wound increased. Moreover, an increased peroxidase activity in the strawberries/*B. cinerea* and peaches/*M. laxa* systems by preventive treatment with 30 g L⁻¹ extract was observed. The antifungal activity could be mainly ascribed to a direct toxicity of fatty acids found at the highest concentrations in *L. digitata*, *U. pinnatifida* and *P. umbilicalis* rather than to those of phenolic

compounds and phlorotannins; but it could be related to possible peroxidase-mediated systemic resistance mechanisms elicited by the polysaccharides.

Keywords: /Postharvest Pathogens/

QUALITY

Jiang, Y., et.al. 2017. Cold plasma-activated hydrogen peroxide aerosol inactivates *Escherichia coli* O157:H7, *Salmonella* Typhimurium, and *Listeria innocua* and maintains **quality** of grape tomato, spinach and cantaloupe. Int. J. Food Microbiol. 249: 53–60.

Abstract

The purpose of this study was to investigate the efficacy of aerosolized hydrogen peroxide in inactivating bacteria and maintaining quality of grape tomatoes, baby spinach leaves and cantaloupes. Stem scars and smooth surfaces of tomatoes, spinach leaves, and cantaloupe rinds, inoculated with *Escherichia coli* O157:H7, *Salmonella* Typhimurium and *Listeria innocua*, were treated for 45 s followed by additional 30 min dwell time with hydrogen peroxide (7.8%) aerosols activated by atmospheric cold plasma. Non-inoculated samples were used to study the effects on quality and native microflora populations. Results showed that two ranges of hydrogen peroxide droplets with mean diameters of 40 nm and 3.0 μ m were introduced into the treatment chamber. The aerosolized hydrogen peroxide treatment reduced *S. Typhimurium* populations by 5.0 log CFU/piece, and *E. coli* O157:H7 and *L. innocua* populations from initial levels of 2.9 and 6.3 log CFU/piece, respectively, to non-detectable levels (detection limit 0.6 log CFU/piece) on the smooth surface of tomatoes. However, on the stem scar area of tomatoes, the reductions of *E. coli* O157:H7, *S. Typhimurium*, and *L. innocua* were only 1.0, 1.3, and 1.3 log, respectively. On the cantaloupe rind, the treatment reduced populations of *E. coli* O157:H7, *S. Typhimurium* and *L. innocua* by 4.9, 1.3, and 3.0 log CFU/piece, respectively. Under the same conditions, reductions achieved on spinach leaves were 1.5, 4.2 and 4.0 log for *E. coli* O157:H7, *S. Typhimurium* and *L. innocua*, respectively. The treatments also significantly reduced native aerobic plate count, and yeasts and mold count of tomato fruits and spinach leaves. Furthermore, firmness and color of the samples were not significantly affected by the aerosolized hydrogen peroxide. Overall, our results showed that the efficacy of aerosolized hydrogen peroxide depended on type of inoculated bacteria, location of bacteria and type of produce items, and aerosolized hydrogen peroxide could potentially be used to sanitize fresh fruits and vegetables.

Keywords: /Quality/ /Grape Tomato/ /Spinach/ /Cantaloupe/

READY TO EAT

Pereira, M.J., et.al. 2017. Modeling the effect of oxygen pressure and temperature on respiration rate of **ready-to-eat** rocke t leaves. A probabilistic study of the Michaelis-Menten model. Postharvest Biol. & Technol. 131: 1 – 9.

Abstract

Effective and efficient design of modified atmosphere packaging (MAP) systems for ready-to-eat (RTE) products requires knowledge on produce respiration rate under various temperatures and oxygen levels. In order to model the respiratory behavior of RTE rocket leaves under different storage conditions, leaves respiration rate was measured during storage under four initial oxygen partial pressures (2.5; 5; 10 and 20 kPa O₂) and three temperatures (0, 5 and 10 °C), for 10 days. The respiratory quotient was determined and found to range between 0.6 and 1.3. Temperature showed a significant impact on respiration rate and the effect of oxygen partial pressures was found to be temperature-dependent. The oxygen pressure effect on respiration rate was accurately described using Michaelis–Menten kinetics, without inhibition by carbon dioxide, and the effect of temperature was well modeled by exponential functions. Monte Carlo simulation allowed quantification of the relative impact of the reduction of oxygen pressure and temperature on the decrease in respiration rate and the potential shelf life increase of RTE rocket leaves. Temperature contributed to more than 80% of the Michaelis–Menten model variance while oxygen pressure contributed only with 13%. The model obtained is a useful tool for defining packaging and storage conditions for a shelf-life extension of rocket leaves.

Keywords: /Ready-to-Eat/ /Modified Atmosphere Packaging/ /Temperature/

FRUITS

BANANA

Al-Qurashi, A.D., M.A., Awad, S.A. Mohamed and M.I. Elsayed. 2017. Postharvest chitosan, trans-resveratrol and glycine betaine dipping affect quality, antioxidant compounds, free radical scavenging capacity and enzymes activities of 'Sukkari' **bananas** during shelf life. *Sci. Hortic.* 219: 173–181.

Abstract

Effects of chitosan (0.5 and 1%), trans-resveratrol (1.6×10^{-5} M, 1.6×10^{-4} M and 1.6×10^{-3} M) and glycine betaine (GB) (10, 15 and 20 mM) dipping on quality and biochemical changes of 'Sukkari' bananas were studied during ripening at shelf life (SL) conditions for 13 days. Weight loss increased during shelf life but was not affected by treatments. Peel color index increased during SL and was lower at both resveratrol and GB treatments than control. Membrane stability index (MSI) of peel decreased during SL and was higher, especially after 6 days, at resveratrol and GB treatments than control. Firmness decreased during SL and was higher, especially after 6 days, at resveratrol and low and moderate rates of GB than control. TSS increased during SL and was lower at all treatments than control. Acidity concentration decreased during SL and was higher, especially after 6 days, at low rate of chitosan, resveratrol and high rate of GB than control. pH increased during SL and was higher at low rate of GB and lower at low and moderate rates of resveratrol than control. Vitamin C concentration decreased during SL but was not affected by treatments. Total phenols concentration decreased during SL and was higher at GB and moderate rate of resveratrol than control. Total flavonoids concentration decreased during SL and was lower at resveratrol and low and high rates of GB than control. FRSC (DPPH

IC50) increased during SL and was lower at GB and low and moderate rates of resveratrol than other treatments, especially after 6 days. The relations of such biochemical changes with α -amylase, xylanase, polygalacturonase, peroxidase and polyphenoloxidase activities were discussed. In conclusion, both postharvest trans-resveratrol and GB treatments retained quality of 'Sukkari' bananas during SL and being suggested as natural alternatives to synthetic chemicals.

Keywords: /Banana/ /Chitosan/ /Antioxidants/

Deng, Z., et.al. 2017. Cellulose nanomaterials emulsion coatings for controlling physiological activity, modifying surface morphology, and enhancing storability of postharvest **bananas** (*Musa acuminata*). Food Chem. 232: 359–368.

Abstract

Cellulose nanomaterials (CNs)-incorporated emulsion coatings with improved moisture barrier, wettability and surface adhesion onto fruit surfaces were developed for controlling postharvest physiological activity and enhancing storability of bananas during ambient storage. Cellulose nanofiber (CNF)-based emulsion coating (CNFC: 0.3% CNF/1% oleic acid/1% sucrose ester fatty acid (w/w wet base)) had low contact angle, high spread coefficient onto banana surfaces, and lower surface tension (ST, 25.4 mN/m) than the critical ST (35.2 mN/m) of banana peels, and exhibited good wettability onto banana surfaces. CNFC coating delayed the ethylene biosynthesis pathway and reduced ethylene and CO₂ production, thus delaying fruit ripening. As the result, CNFC coating minimized chlorophyll degradation, weight loss, and firmness of bananas while ensuring the properly fruit ripening during 10 d of ambient storage. This study demonstrated the effectiveness of CNF based emulsion coatings for improving the storability of postharvest bananas.

Keywords: /Banana/ /Ripening/ /Storage/

He, X., et.al. 2017. Adenylate quantitative method analyzing energy change in postharvest **banana** (*Musa acuminata* L.) fruits stored at different temperatures. Sci. Hortic. 219: 118–124.

Abstract

Energy level is closely related to postharvest banana fruit senescence. In this study, high performance liquid chromatography (HPLC) method was developed to determine concentrations of adenylate, i.e. adenosine triphosphate (ATP), adenosine diphosphate (ADP) and adenosine monophosphate (AMP), in postharvest banana fruits. Boiling water extracting adenylate from banana fruits was suitable because of its high extraction rate and stability. HPLC method exhibited good repeatability (variation coefficients of 1.51%–3.42%) and recovery rate (93.9%–97.8%). The correlation coefficients of ATP, ADP and AMP with peak areas in a range of 1–120 mg/L were 0.999965, 0.999995 and 0.999996, respectively. Through analyzing adenylate concentrations and membrane hydrolysis-related enzyme activities (phospholipase D and lipoxygenase, ab. PLD and LOX, two key enzymes catalyzing membrane lipid degradation) in banana fruits stored at different temperatures (7 °C, 14 °C and 25 °C), it could be found that appropriate low temperature (14 °C) delayed fruit senescence by

maintaining high energy level. Chilly stress (7 ° C) accelerated fruit senescence by declining energy supply level, accompanying by activation of membrane hydrolysis-related enzymes such as PLD and LOX. These results were helpful for elucidating relationship between energy metabolism and senescence regulation during chilling injury in postharvest banana fruits.

Keywords: /Banana/ /Senescence/ /Chilling injury/

Jedermann, R. and W. Lang. 2017. Computational fluid dynamics modelling of deviating airflow and cooling conditions in **banana** containers. Acta Hort. 1154: 193-200.

Abstract

Temperature variations in reefer containers with fruits regularly occur due to deviating airflow and cooling conditions (DACCs). There is little knowledge about whether DACCs affect only a small area or the complete container load. In seven tests in containers from Costa Rica to Europe since 2009, we observed a high level of spatial temperature variation. Banana pallets are not a perfect rectangular shape and they do not completely fit the inward container dimension, resulting in large variations of gap widths. The effect is enhanced by the biological variance of respiration activity. We set up a computational fluid dynamics (CFD) simulation for the airflow and temperature in a container loaded with bananas to provide a better understanding of DACC effects, because detailed experimental evaluation was not feasible in a commercial cold chain. The complex geometrics of a container with 960 boxes had to be reduced to a two-dimensional model. Almost all DACCs had a predominant local effect. For the following DACCs, cooling was slower only in some affected boxes: (a) blocking of a horizontal channel in one pallet and (b) narrow vertical gaps. Double heat generation by higher respiration activity in part of one pallet also had a predominant local effect. The temperature was between 1.7 and 4.7°C higher than for the reference case with normal airflow conditions at 48 h after the start of cooling. Only circulation bypasses by packing mistakes and a reduction of inlet air speed had a significant effect on the average container temperature, of +0.6°C maximum. Quality problems and losses of full container loads, as regularly reported in ocean transport, cannot be explained by a single DACC according to our simulation results. A combination of at least two DACCs is necessary to cause severe quality problems.

Keywords: /Banana/ /Cold Chain/

BLUEBERRY

Wang, Chen, et.al. 2017. γ -Irradiation treatment decreased degradation of cell-wall polysaccharides in **blueberry** fruit during cold storage. Postharvest Biol. & Technol. 131: 21 – 38.

Abstract

The influence of irradiation treatment on the relevant indices of blueberry (*Vaccinium* spp.) softening during cold storage was studied by irradiating Bluecrop blueberries with 60 Co source at a dose of 2.5 kGy. The effect of irradiation treatment on the firmness and ultrastructure of the cell walls of blueberries and the variations of the content and molecular weight of cell wall polysaccharides were

investigated. γ -Irradiation postponed and delayed softening of fruit during cold storage. After 35 d of storage, the irradiated blueberry fruit 1.08 kg/cm² firmer than that of control group. In addition, cells were more intact and were more tightly arranged. The content of water-soluble pectin (WSP) increased more slowly, while the contents of EDTA (ethylene diamine tetra acetic acid)-soluble pectin (ESP) and 24% KOH-soluble fraction (24KSF) decreased at a lower rate in irradiated fruit compared with untreated fruit. The content of the total cell wall materials (CWMs) remained unchanged. High-molecular weight polymers in the fruit were less likely to be degraded. However, no significant influences were shown on the sodium carbonate-soluble polysaccharide (SCSP) and 4% KOH-soluble fractions (4KSF). Therefore, γ -irradiation maintained the intactness of cell walls through regulating the solubility and adhesion of polysaccharides in cell walls of the fruit, thereby reducing softening of blueberry fruit during cold storage.

Keywords: /Blueberry/ /Irradiation/

CHERRY

Belge, B., et.al. 2017. Refrigerated storage and calcium dips of ripe 'Celeste' sweet **cherry** fruit: combined effects on cell wall metabolism. *Sci. Hortic.* 219: 182–190.

Abstract

Ripening-related firmness loss shortens considerably the storage potential of sweet cherry (*Prunus avium* L.), thus limiting postharvest handling, transportation, and commercialisation. The biochemical mechanisms underlying this process in cherries are not fully understood, and the mechanisms operating in a given fruit may be not extrapolated to a different species. Cell wall materials obtained from untreated and calcium-treated 'Celeste' sweet cherries were fractionated and analysed after cold storage, and related enzyme activities and gene expression were assessed. Calcium-treated fruit were firmer, with lower weight loss and decay incidence than the controls. The accumulation of *Pa β Gal* and *PaEXP1* transcripts was strongly inhibited in cold-stored fruit, although expression levels recovered largely after three days of shelf life. Data suggest that pectin methylesterase, β -galactosidase and expansin activities may control the access of additional proteins to their substrates. A possible role for the apoplastic redox status in the modulation of the process is also discussed.

Keywords: /Cherry/ /Firmness/

CITRUS

Wu, Y., et.al. 2017. Cinnamaldehyde inhibits the mycelial growth of *Geotrichum citri-aurantii* and induces defense responses against sour rot in **citrus** fruit. *Postharvest Biol. & Technol.* 129:23-28.

Abstract

Sour rot is caused by *Geotrichum citri-aurantii* and is one of the devastating diseases in citrus fruit. This disease is difficult to control because of the lack of effective fungicides. In this study,

cinnamaldehyde, a common food preservative, was evaluated to control postharvest sour rot in citrus fruit through in vivo and in vitro experiments. Results showed that cinnamaldehyde with a minimum inhibitory concentration and fungicidal concentration of 0.50 mL L⁻¹ dose-dependently inhibited the mycelial growth of *G. citri-aurantii*. The application of wax with cinnamaldehyde (WCA; 0.50, 1.0, and 2.0 mL L⁻¹) significantly reduced the incidence of sour rot on citrus fruit inoculated with *G. citri-aurantii* during storage. After 8 d of storage, the decay incidences in the fruit treated with WCA (0.50, 1.0, and 2.0 mL L⁻¹) were only 80%, 77% and 50%, respectively. By contrast, the decay incidence in the control fruit was 100%. In addition, WCA treatment increased the activities of superoxide dismutase (SOD), polyphenol oxidase (PPO) and phenylalanine ammonia lyase (PAL), but did not affect the activities of catalase (CAT) and peroxidase (POD), and the total phenol content. Our results suggested that WCA might induce defense responses against sour rot in citrus fruit.

Keywords: /Citrus/ /Sour Rot/

GRAPES

Avenant, J.H. 2017. Effect of gibberellic acid, CPPU and harvest time on browning of *Vitis vinifera* L. 'Regal Seedless': pre-cold storage and post-cold storage quality factors. *Acta Hort.* 1157: 373-380.

Abstract

The aim of this study was to investigate gibberellic acid (GA₃) and N-(2-Chloro-4-pyridyl)-N-phenylurea (CPPU) treatments which can reduce or eliminate browning of white table grape cultivars. In this study the response of the bunches to the GA₃ and CPPU application had on the quality of the grapes was determined. Data with regard to pre-cold storage quality, as well as post-cold storage quality of the grapes, with the emphasis on berry quality, were collected. During two consecutive seasons (2008/09 and 2009/10), this study was conducted on mature 'Regal Seedless' with Ramsey as rootstock, on two commercial farms in the Berg River Valley. Twenty treatment combinations of GA₃ (no GA₃, 10, 20, 30 and 40 ppm) and CPPU (no CPPU, 1, 2 and 4 ppm) were applied and replicated eight times. Grapes from each treatment were harvested at 16 °Brix, 20 °Brix and 24 °Brix. After packing as for export, cartons were stored at -0.5°C for 8 weeks plus 4 days at 7.5°C, before browning and standard export quality evaluation. Pre-cold storage data with regard to berry size, juice quality and total phenol content were also collected. Berry mass was significantly improved by GA₃ and CPPU treatments, while berry mass decreased with harvest time. Increasing dosages of GA₃ and CPPU resulted in a further increase in berry mass. A delay in ripening was induced with an increased concentration of both GA₃ and CPPU treatments. CPPU treatment significantly increased TTA, while pH and sugar:acid ratio were decreased. Increasing dosages of GA₃ resulted in a further decrease in TTA and an increase in pH and sugar:acid ratio. Both GA₃ treatments and harvest time had a significant effect on grape quality after cold storage. Berry decay, berry abscission and SO₂ damage were significantly increased by GA₃ application. Delayed harvest time significantly increased the occurrence of decay and decreased berry split.

Keywords: /Grape/ /Quality/ /Cold Storage/

Bondada, B., et.al. 2017. Temporal extension of ripening beyond its physiological limits imposes physical and osmotic challenges perturbing metabolism in **grape** (*Vitis vinifera* L.) berries. *Sci. Hortic.* 219: 135–143.

Abstract

Fruit ripening can be delayed or hastened by chemical means to time harvest at desired dates; however, it is not clear if the ripening window can be extended merely by delaying harvest in nonclimacteric fruits such as grape to optimize fruit quality. In this study, we investigated the consequences of extending ripening known as “hang time” in viticultural parlance on primary and secondary metabolites typically sought for making wine. Field-grown grapevine cultivar Merlot was harvested at three different times to simulate extended ripening; the first date coincided with the commercial harvest and the latter two harvests 25 and 34 days after the first harvest constituted extended ripening. Berry growth measured at weekly intervals showed a double sigmoidal growth trajectory interrupted by a lag phase. Physiologically possible highest total soluble solids (24 Brix) was observed at first harvest and coincided with osmotic potential of -3 MPa, thereafter Brix increased during the extended ripening due to dehydration manifested as reductions in berry weight, volume, and a very negative osmotic potential (-6 to -7 MPa). The osmotic stress resulting from solute concentration increased the pH whereas the titratable acidity and malic acid first declined and then increased as the berries dehydrated during the extended ripening. While the tartaric and oxalic acids declined, citric acid increased throughout the whole ripening period. Among the secondary metabolites, the skin and seed phenolics and seed tannins remained unaffected whereas the skin tannins, small polymeric pigments (SPP) and large polymeric pigments (LPP) increased throughout the extended ripening period. The peduncle underwent secondary growth as well as periderm formation with extensive accumulation of callose in secondary phloem sieve tubes and starch in the xylem parenchyma cells. The mesocarp showed loss of cell integrity especially in berries with extended ripening. The study clearly demonstrated that vine holding of ripe fruit beyond the attainment of maximum sugar levels does not extend ripening rather instill negative osmotic challenges.

Keywords: /Grapes/ /Ripening/

Davies, C., et.al. 2017. Understanding the control of **grape** berry ripening and developing opportunities for its manipulation. *Acta Hortic.* 1157: 1-10.

Abstract

Fruit ripening is a complex process and experimental evidence suggests it is regulated by plant growth regulators (PGRs). In contrast to climacteric fruit, the ripening of non-climacteric grape (*Vitis vinifera*) berries is less dependent on ethylene and appears to be controlled by several other PGRs. While the application of some PGRs, for example abscisic acid and brassinosteroids can advance the onset of grape berry ripening others, like auxins, delay it. PGRs are therefore important for two main reasons. First, endogenous PGRs play important roles in the control of berry development and a greater knowledge of their action is crucial to understanding processes that affect fruit composition at harvest. Second, this knowledge can be used to develop methods to alter berry development in useful ways. For

example, exogenous PGRs provide potential tools with which to manipulate the timing of harvest and could be used to overcome a variety of problems associated with the increased season compression and higher temperatures during ripening caused by changing climatic conditions. Of particular interest is the effect of synthetic auxins like 1-naphthalene acetic acid (NAA) on sugar accumulation, skin colouration, acid metabolism, ripening synchronicity and wine aroma. The family of indole-3-acetic acid (IAA)-amido synthetases, important to the maintenance of IAA levels, appears to be a critical factor in the effectiveness of different auxins in controlling ripening. The 3-D structure for one of the grape IAA-amido synthetases has recently been elucidated and provides insights at the molecular level into an important mechanism involved in auxin homeostasis.

Keywords: /Grape/ /Ethylene/ /Ripening/

KIWIFRUIT

Li, M., et.al. 2017. Applying visible-near infrared (Vis-NIR) spectroscopy to classify 'Hayward' **kiwifruit** firmness after storage. *Acta Hort.* 1154: 1-8.

Abstract

A significant proportion of New Zealand's kiwifruit production is held as stock in local cool-stores for extended periods of time before being exported to global markets. The variability in fruit quality at harvest contributes to a wide range in fruit storage potential. The development of soft fruit (flesh firmness <9.81 N) during storage and the difficulty in identifying and segregating them prior to distribution cause the industry financial loss. This study aimed to evaluate the feasibility of applying visible-near infrared (Vis-NIR) spectroscopy after cool storage, to segregate kiwifruit on their flesh firmness values so as to reduce the proportion of soft fruit for subsequent distribution in the supply chain. 'Hayward' kiwifruit (*Actinidia deliciosa*) from 51 growers were sourced from commercial orchards in New Zealand and stored in trays at 0°C. At the end of storage (after 75, 100 or 125 days), fruit were scanned non-destructively using an NIR spectroradiometer in the reflectance mode before flesh firmness assessment. A global calibration model for all storage times was developed based on the spectral data using a support vector machine to categorise the fruit into two groups; 'Soft' (<9.81 N) or 'Good' (≥9.81 N). The validation model was able to accurately classify approximately 48% of soft fruit and 80% of good fruit irrespective of storage time. Applying the developed model for segregation before distribution would reduce the proportion of soft fruit from 25.4% in the original population to 17.9% in the remaining population after removal of 27% of the population (predicted as soft fruit). Sorting fruit by NIR after storage may enable reduction of the effort and cost to segregate poor fruit from good fruit throughout the supply chain.

Keywords: /Kiwifruit/ /Non-destructive/ /Sorting/ /Storage/

LOQUAT

Song, H., et.al. 2017. A cold-induced phytosulfokine peptide is related to the improvement of **loquat** fruit chilling tolerance. *Food Chem.* 232: 434–442.

Abstract

A novel peptidomics approach was used to discover cold-induced peptides in loquat fruit. Twenty unique peptides derived from 18 proproteins were identified, and they were involved in sugar signalling, protein metabolism and stress response. The quantitative analysis revealed 7 peptides with more than 2-fold upregulation, especially a 4.96-fold increase detected in the phytoalkylamine (PSK) peptide. To further evaluate effects of PSK1 on fruit chilling tolerance, weight loss, firmness and internal browning were investigated in PSK1-treated loquat fruit at 0 °C. By contrast, these chilling injury symptoms were effectively reduced by PSK1. PSK1 markedly delayed decreases of ATP content and energy charge. The PSK1-treated fruit exhibited significantly lower activities of cell-wall degrading enzymes and transcripts of genes related to lignin synthesis. Our results demonstrated that PSK1 improves chilling tolerance of loquat fruit by maintaining high energy status and cell integrity. Peptidomics analysis provides a promising tool to discover some key peptides.

Keywords: /Loquat/ /Chilling Injury/

MANDARIN

Ornelas-Paz, J.D.J., et.al. 2017. Effect of phytosanitary irradiation on the postharvest quality of Seedless Kishu mandarins (*Citrus kinokuni mukakukishu*). Food Chem 230: 712–720.

Abstract

Transnational trade of 'Seedless Kishu' mandarins (*Citrus kinokuni mukakukishu*) would require them to be subjected to a suitable phytosanitary treatment. Irradiation is used as an effective treatment for many fruit, but the effect on quality of kishu mandarins is unknown. 'Seedless Kishu' mandarins were treated with gamma irradiation (150, 400, and 1000 Gy) and stored for three weeks at 6 °C and then for one week at 20 °C. Irradiation at 400 and 1000 Gy promoted browning of the calyx end and fungal infection. Irradiation caused immediate reductions in pulp firmness, vitamin E, individual sugars and carotenoids but increased the content of organic acids, except ascorbic acid, and phenolic compounds. The volatile profile of tested fruit was also differentially altered by irradiation. Most of these initial changes were dose dependent. 'Seedless Kishu' mandarins are significantly sensitive to irradiation and are not suitable for treatment at the studied doses.

Keywords: /Mandarin/ /Postharvest/ /Storage/ /Citrus/ /Phytochemicals/

MANGO

Penchaiya, P. and L.M.M. Tijssens. 2017. Assessing the peel colour behaviour of mango 'Nam Dok Mai See Thong' during cool storage. Acta Hort. 1154: 207-212.

Abstract

Mango 'Nam Dok Mai See Thong' recently became the number-one exported mango of Thailand. It has an attractive appearance, with a golden-yellow peel colour at harvest and slight colour development during ripening. Its peel colour could possibly be used as an indicator for ripeness. Assessing the behaviour of peel colour during storage is the main objective of this research. Mangoes were kept at cool temperature (13°C) for 2 weeks prior moving to ambient temperature in Thailand (28°C). The data set was separated into two groups for non-destructive and destructive tests. In the non-destructive set, peel colour of 108 fruits was measured repeatedly until the quality became unacceptable. In the destructive set, 60 fruits were sampled at random to measure the peel colour and other quality attributes, each time on different fruit. Mangoes from two growing locations were compared. The results showed that peel colour (L^* , a^* , b^* and Hue) developed gradually during cool storage, but changed drastically after relocation to higher temperatures. The L^* , a^* and b^* values and hue angle behaved according to a logistic function. a^* and b^* showed an increase, L^* and hue a decrease. The variation is clearly high at the beginning and decreased gradually during the storage period. Fruit from both the non-destructive and destructive sets showed similar behaviour during storage. The obtained results allow prediction of the behaviour of peel colour during cool storage.

Keywords: /Mango/ /Cold Storage/

NECTARINE

Reig, G., et.al. 2017. Tree ripening and postharvest firmness loss of eleven commercial nectarine cultivars under Mediterranean conditions. *Sci. Hortic.* 219: 335–343.

Abstract

On-tree and postharvest softening of 11 yellow flesh nectarine cultivars with different commercial harvest seasons (early, mid and late) were studied under Mediterranean conditions (Lleida, NE-Spain). Fruit were harvested weekly at five consecutive harvest dates (from H1 to H5) over three consecutive years (2009–2011). Diameter, percentage of skin overcolor (SC), flesh firmness (FF), I_{AD} index (the difference in absorbance between 670 and 720 nm), visible reflectance spectra, soluble solids content (SSC), titratable acidity (TA), ethylene synthesis, objective skin color and postharvest softening rate were measured. The decline in flesh firmness and the I_{AD} were both significantly affected by cultivar and ripening season. Low acid ($TA < 6$ g of malic acid L^{-1}) cultivars such as 'Big Top', 'Nectareine', 'Honey Royale', 'Big Nectared' and 'Nectalady', had a lower firmness decline than acid ones ($TA \geq 6$ g of malic acid L^{-1}), both on-tree and during postharvest, resulting in a better commercial and postharvest performance. A high and significant positive correlation was found between I_{AD} and flesh firmness ($r = 0.72$, $P \leq 0.01$). Early cultivars tended to lose flesh firmness and I_{AD} faster than mid and late cultivars. The softening rate during the postharvest period was mainly dependent on ripening season. Early ripening nectarines soften faster than mid and late ones.

Keywords: /Nectarine/ /Ethylene/ /Firmness/ /Fruit Quality/

PEACH

Stefaneli, D., et.al. 2017. Modelling peach and nectarine ripening during storage using the IAD maturity index. Acta Hort. 1154: 17-24.

Abstract

Consumer dissatisfaction due to poor and variable eating quality of peaches and nectarines can severely limit sales growth in domestic and export markets. The effect of fruit maturity at harvest on subsequent ripening behaviour and eating quality during storage is extremely important, but not fully understood. A recent technology, the index of absorbance difference (I_{AD}), provides a non-destructive index of fruit physiological maturity and enables accurate monitoring of fruit ripening behaviour before and after harvest. *Prunus persica* L. 'Summer Flare 34' and 'Summer Bright' nectarine and 'September Sun' peach were segregated at harvest into classes based on ethylene production rate and then monitored during storage. 'Summer Bright' and 'September Sun' were monitored with a DA-meter and the I_{AD} was measured twice weekly for up to 42 days during storage at both 0 and 7°C, whilst the effect of ambient temperature on ripening was determined by monitoring 'Summer Flare 34' at 3-day intervals for up to 10 days at 18°C. Changes in the I_{AD} ripening index were best described by a logistic sigmoidal curve. Storage temperature, cultivar and maturity class at harvest affected the magnitude of single curve parameters but not the type of relationship between ripening and storage time. A series of sigmoidal curves were identified and differences in the y-intercept (i.e., I_{AD} value at harvest) were mainly explained by cultivar and maturity stage at harvest, while differences in the slope and inflection point were mostly due to storage temperature. Adjusted correlation coefficients were cultivar dependent and decreased with storage temperature, with weaker correlations found for fruit at 0°C, due to a lower rate of ripening during storage. In this study, a common postharvest ripening trend was identified among the peach and nectarine cultivars studied with a logistic sigmoidal curve best describing the change in I_{AD} during storage.

Keywords: /Peach/ /Nectarine/ /Fruit Quality/ /Maturity/ /Non-destructive/ /Storage/

PEAR

Iglesias, M.B., et.al. 2017. Antagonistic effect of probiotic bacteria against foodborne pathogens on fresh-cut pear. LWT - Food Sci. & Technol. 81: 243-249

Abstract

The use of probiotics as biopreservation agents of foodborne pathogens in food is becoming increasingly known. The aim of this work was to investigate the effectiveness of *Lactobacillus rhamnosus* GG (*L. rham.* GG) and *Lactobacillus acidophilus* LA-5 (*L. acidophilus* LA-5) against *Salmonella* and *Listeria monocytogenes* in minimally processed pears during storage at 5, 10 and 20 ° C at conditions simulating commercial application. Pear wedges were artificially inoculated with a suspension containing *Salmonella*, *L. monocytogenes* and/or the probiotic strains *L. rham.* GG or *L. acidophilus* LA-5, packaged and stored at 5, 10 and 20° C. Microorganisms were periodically enumerated. *L. acidophilus* LA-5 did not

shown any effect against pathogens. *Salmonella* was affected by coinoculation with *L. rham.* GG at 10 and 20 ° C, which reduced the population approximately 2-log units. Moreover, *L. monocytogenes* population was reduced approximately 3-log units at each temperature in presence of *L. rham.* GG. Probiotic populations were maintained throughout the experiment around 10^7 - 10^8 CFU g⁻¹, which is in the range known to develop its probiotic role (10^6 - 10^9 CFU g⁻¹). Our results demonstrated that *L. rham.* GG is able to control *Salmonella* and *L. monocytogenes* growth on fresh-cut pear.

Keywords: /Pear/ /Fresh-Cut/

Li, D., et.al. 2017. Effects of low temperature conditioning on fruit quality and peel browning spot in ‘Huangguan’ pears during cold storage. *Postharvest Biol. & Technol.* 131: 68-73.

Abstract

‘Huangguan’ pears are susceptible to peel browning spots (PBS) during cold storage. In this study, the effects of low temperature conditioning (LTC) on fruit firmness, soluble solids content (SSC) and PBS incidence in ‘Huangguan’ pears were investigated. Fruit were directly stored at 0 °C (control) and conditioned at 10 °C for 3 d (LTC), respectively. Afterwards, all fruit were stored at 0 °C. Fruit firmness was unaffected by the LTC treatment. However, SSC was higher in the LTC-treated fruit than in control fruit on days 30 and 60. Compared with the control, LTC treatment effectively inhibited the development of PBS, reduced the activities of lipoxygenase (LOX) and polyphenol oxidase (PPO), reduced malondialdehyde (MDA) content in peel tissue, the decline in the phenolic content, and it showed higher proline content before the appearance of PBS. In addition, LTC treatment decreased the expression levels of *LOX1*, *PPO1* and *PPO5* genes, while it up-regulated the expression of the *PPO4* gene in peel tissue. These results indicate that the alleviation effect of LTC on the development of PBS was closely related to reduced membrane lipid peroxidation, activities of LOX and PPO, and the expression of *LOX1*, *PPO1* and *PPO5* genes in peel tissue in ‘Huangguan’ pears.

Keywords: /Pears/ /Browning/ /Fruit Quality/ /Cold Storage/

Lum, G.B., et.al. 2017. 1-Methylcyclopropene and controlled atmosphere modulate oxidative stress metabolism and reduce senescence-related disorders in stored pear fruit. *Postharvest Biol. & Technol.* 129: 52–63.

Abstract

European pears (*Pyrus communis* L.) are stored under low temperatures to extend postharvest life. Unfortunately, senescent scald and internal breakdown are likely to occur with prolonged exposure to storage. Both disorders can be reduced by controlled atmosphere (CA) and/or the ripening inhibitor, 1-methylcyclopropene (1-MCP). The principal aim of this study was to investigate the effect of 1-MCP and CA on fruit quality, including physiological disorders, and oxidative stress metabolites in stored ‘Cold

Snap' and 'Swiss Bartlett' pears. Freshly harvested pears were treated with or without 1-MCP, and then stored at 0 ° C under refrigerated air or CA (18 kPa or 2.5 kPa O₂, and 2 kPa CO₂) for at least 167 d. 1-MCP and CA delayed and/or reduced the rates of ethylene production in stored fruit of both cultivars. 1-MCP and CA delayed fruit softening and peel yellowing in 'Swiss Bartlett' pears, but had negligible to slight effects with 'Cold Snap'. In both cultivars, high incidences of senescent scald and internal breakdown occurred in non-1-MCP-treated pears during refrigerated air storage. For the most part these symptoms were reduced by CA and 1-MCP, resulting in minimal to negligible incidence in 1-MCP-treated pears stored at 2.5 kPa O₂. γ -Aminobutyrate accumulated in stored pears, although 1-MCP and CA slightly reduced the levels in 'Cold Snap' fruit and 1-MCP increased levels in 'Swiss Bartlett' fruit. Ascorbate (total and reduced) levels were rapidly depleted in 'Cold Snap' fruit, regardless of treatment; these levels were better maintained in 1-MCP-treated 'Swiss Bartlett' fruit than control fruit across all storage atmospheres. In both cultivars, glutathione (total and reduced) concentrations and redox status fluctuated during storage, although these levels were generally higher in 1-MCP-treated fruit. Moreover, glutathione depletion occurred in advance of the development of senescence disorders in stored pear fruit.

Keywords: /Pear/ /Controlled Atmosphere/ /1-MCP/

Wang, J., et.al. 2017. Development of multi-cultivar models for predicting the soluble solid content and firmness of European **pear** (*Pyrus communis* L.) using portable vis–NIR spectroscopy. *Postharvest Biol. & Technol.* 129: 143-151.

Abstract:

The feasibility of a multi-cultivar model's development for the on-site determination of the internal qualities of European pear (*Pyrus communis* L.) cv. 'Abate', 'Cascade', 'Conference', 'Red Comice' and 'Wujiuxiang' was investigated. In total, 240 pear samples, 48 for each cultivar, were collected during fruit post-ripening period under retail stage conditions to explore the performance of a technique for developing soluble solid content and firmness models with partial least squares (PLS) and multiple linear regression (MLR) methods. A commercially available portable visible and near-infrared spectrometer was used to collect the absorbance spectra (500–1010 nm) of pears. A hybrid method, orthogonal signal correction (OSC) combined with other spectral pre-process methods, such as standardization, second-order derivation and Savitzky–Golay smoothing, was employed to filter out the variations in signals caused by different pear cultivars. Compared with the routine PLS and MLR models, the performances of the OSC–PLS and OSC–MLR models resulted in higher ratios of prediction to deviation. A new external sample set obtained at the retail stage was used to assess the performances of the best multi-cultivar models of soluble solid content and firmness, which resulted in greater coefficients of determination for prediction of 0.87 and 0.66, respectively, and lower root mean square errors of prediction of 0.45% and 8.11 N, respectively. The results highlighted the potential of portable Vis–NIR instruments for the on-site testing of internal quality indices of European pears. The development of a multi-cultivar model for fruit is necessary and significant, in particular for improving the performance of the firmness model.

Keywords: /Pear/ /Firmness/

Wang, Junwei, et.al. 2017. Low temperature conditioning alleviates peel browning by modulating energy and lipid metabolisms of 'Nanguo' pears during shelf life after cold storage. *Postharvest Biol. & Technol.* 131: 10 – 15.

Abstract

Refrigeration is a common technique for impeding the postharvest ripening of the 'Nanguo' pear (*Pyrus ussuriensis* Maxim.). However, peel of pears gradually become brown when the fruit are returned to room temperature after cold storage. Low temperature conditioning (LTC), in which fruit were initially stored at 10 °C and then cooled during a 20 day period, delayed the incidence of peel browning (PB) of pears in our study. LTC treated fruit showed a decrease in the content of malondialdehyde (MDA) and the relative leakage rate of the peel. The ATP content and energy charge (EC) were higher in LTC-treated pears. Gene expression levels of transcripts for NADH dehydrogenase (NDA), ATP synthase (ATPase) and vacuolar proton-inorganic pyrophosphatase (VPP), which were involved in oxidative phosphorylation, were all up-regulated by LTC treatment. Gene expression levels of phospholipase D (PLD) involved in glycerophospholipid metabolism were lower in LTC-treated fruit during the shelf-life. These results indicate that LTC treatment can effectively alleviate the PB of 'Nanguo' pear and the possible mechanisms are discussed.

Keywords: /Pear/ /Peel Browning/ /

PINEAPPLE

Chuan-He, Liu and Yan Liu. 2017. Fruit quality and differentially expressed genes of winter-harvested pineapple in response to elevated temperature over a short postharvest period. *Postharvest Biol. & Technol.* 130: 21–27.

Abstract

The aim of this work was to investigate the influences of elevated postharvest temperature (EPT) for 1 d and 2 d on the physicochemical quality of pineapple fruit and the differentially expressed genes (DEGs) underlying this process by RNA-seq. The results suggested that EPT increased the L*, a*, b* of pineapple fruit skin. EPT decreased the L* and increased the a* and b* of pineapple pulp. EPT increased the total soluble solid (TSS), sucrose content and TSS/titratable acidity (TA) ratio and decreased the TA. EPT decreased the firmness of pineapple fruit. At 1 d, EPT improved the production of aromatic alkenes. At 2 d, EPT improved the production of aromatic esters and decreased the alkenes. A differential gene expression analysis suggested that a total of 6725 and 5845 DEGs were identified by comparing EPT and control at 1 d and 2 d, respectively. A number of DEGs were screened for their involvement in the EPT process effects on pineapple fruit, including those associated with coloration, sugar/acid metabolism, texture softening and aroma biosynthesis. A subset of these DEGs was validated by qPCR, which was consistent with the corresponding Reads Per Kilo bases per Million reads (RPKM values) from RNA-seq. The findings of this study contribute to our understanding of how EPT regulates the quality of pineapple fruit over different durations and the molecular mechanisms underlying this process.

Keywords: /Pineapple/ /Postharvest/ /Temperature/ /Fruit/ /Quality/

PITAYA

Li, X., et.al. 2017. Increased temperature elicits higher phenolic accumulation in fresh-cut **pitaya** fruit. *Postharvest Biol. & Technol.* 129: 90–96.

Abstract

The effect of temperature on phenolic accumulation in fresh-cut pitaya fruit was reported during storage at 5, 10 and 15 °C. Fresh-cut pitaya fruit were treated with ROS production inhibitor (diphenyliodonium iodide, DPI) or elicitor (glucose/glucose oxidase, G/GO) and the total soluble phenolics (TSP) content, antioxidant activity (AOX), phenylalanine ammonia lyase (PAL) activity, as well as ROS production and antioxidant enzymes activity were determined. Results showed that higher storage temperature promoted the production of ROS, enhanced the accumulation of TSP and improved the AOX of fresh-cut pitaya fruit. Moreover, treatment with DPI dramatically inhibited ROS generation, PAL activity and TSP accumulation, while G/GO treatment significantly increased ROS level, PAL activity and TSP accumulation. These results demonstrate that phenolics accumulate with increasing temperature and confirm previous report of ROS effects on wound induced phenolic accumulation in pitaya fruit.

Keyword: /Pitaya/ /Fresh-Cut/ /Storage/

POMEGRANATE

Saba, M.K. and R. Amini. 2017. Nano-ZnO/carboxymethyl cellulose-based active coating impact on ready-to-use **pomegranate** during cold storage. *Food Chem* 232: 721–726.

Abstract

Minimally processed pomegranate rapidly loses its overall quality because of high water loss and microbial contamination. Nano-ZnO in combination with carboxymethyl cellulose (CMC) coating was used on pomegranate arils. Arils were dipped for 4 min in distilled water (control), 0.1 or 0.2% (w/v) nano-ZnO suspension and then ZnO treated arils were coated with 0.5% (w/v) CMC and stored for 12 days at 4 °C. Coatings decreased total yeast + mold during 12 days of storage while total mesophilic bacteria was decreased during 6 days of storage. Coatings decreased weight loss and also the greatest juice percent was in coated arils. Soluble solids content decreased during storage with no significant difference between treatments. CMC + 0.2% nano-ZnO suppressed total phenol changes. Total anthocyanin, vitamin C, and antioxidant capacity were higher in coated arils. These findings suggest that nano-ZnO + CMC coating has the potential to extend minimally processed pomegranate storage life.

Keywords: /Pomegranate/ /Edible Coating/ /Wight Loss/ /Minimally Processed/

STRAWBERRY

Blanch, M., et.al. 2017. Trisaccharides isomers, galactinol and osmotic imbalance associated with CO₂ stress in strawberries. *Postharvest Biol. & Technol.* 131: 84-91.

Abstract

Treatment with high CO₂ atmospheres is effective in preventing strawberry decay and increasing firmness. Nevertheless, CO₂ stress generates energy disturbances associated with a high rate of fermentation. This study was designed to measure the impact of high CO₂ stress (3 d, 40 kPa CO₂) and its subsequent removal on fruit quality, osmotic balance and water relations. Fructo-trisaccharides isomers and raffinose were characterized and quantified by mass spectrometry (MS and MS²). CO₂ stress removal was marked by both a rapid upsurge in the ratio of unfreezable water to total water and an osmotic adjustment prompted by the accumulation of soluble sugars, 1-kestose, raffinose and galactinol. Due to strong increase in galactinol concentrations, we propose it as a suitable biomarker for fruit having undergone stresses associated with osmotic imbalance.

Keywords: /Strawberry/ /Firmness/

Campos-Requena, V.H., et.al. 2017. Thermoplastic starch/clay nanocomposites loaded with essential oil constituents as packaging for strawberries: *À In vivo* antimicrobial synergy over *Botrytis cinerea*. *Postharvest Biol. & Technol.* 129: 29–36.

Abstract

Nanocomposite films based on thermoplastic starch/montmorillonite containing essential oil constituents (TPS/MMT/EOCs) carvacrol (CRV) and thymol (TML) were prepared by extrusion method to produce an antimicrobial material for a potential use as fresh fruit packaging. X-ray diffraction and transmission electron microscopy analysis of the nanocomposites showed intercalated/exfoliated morphology which resulted an increasing of mechanical and thermal resistance properties (9- and 2-fold respectively) respect to the neat TPS. An approximately 43% decrease in EOCs release parameters compared to the neat TPS was observed, that could indicate a potential material to function as a controlled-release active food packaging. *In vivo* additive/synergistic antimicrobial effect over *Botrytis cinerea*-inoculated strawberries was observed when the association of CRV and TML was included in the nanocomposite formulation respect the nanocomposites containing only CRV. A drastic reduction of 2.4-fold of inhibitory concentration IC₅₀ from 14.16 g kg⁻¹ of total EOCs (nanocomposites containing only CRV) to 5.90 g kg⁻¹ of total EOCs for nanocomposites containing the association CRV:TML (50:50) was achieved by storing *Botrytis cinerea*-inoculated strawberries for five days at room conditions in indirect contact with nanocomposite films. By reducing almost one third of the total EOCs in the film, a material with antimicrobial effectiveness over *Botrytis cinerea* was obtained but without altering neither strawberry fruit quality parameters such as weight loss, firmness, external color and chemical properties, nor organoleptic properties (p > 0.05) confirmed after discriminant sensory analysis.

Keywords: /Strawberry/ /Packaging/

Petriccione, M., et.al. 2017. Effect of chitosan treatment on **strawberry** allergen-related gene expression during ripening stage. J Food Sci Technol 54(5):1340-1345.

Abstract

The effectiveness of a chitosan coating treatment on the allergen-related genes expression of three strawberry cultivars (*Fragaria x ananassa* Duch., namely cvs. “Sabrina”, “Candonga” and “Jonica”) harvested at three ripening stages was evaluated. Fruits were treated with a 1% chitosan coating and stored at 20 °C for 48 h. Three genes, encoding Fra a1, Fra a3 and Fra a4 allergens, were evaluated by real-time qPCR. The transcript levels of several genes showed different patterns during ripening stages in strawberry cultivars but were up-regulated by chitosan treatment.

Keywords: /Strawberry/ /Chitosan/

Randrianarison, R., et.al. 2017. Smallholder farmers’ logic to promote **strawberry** value chain in the rural commune of Tsiafahy, Analamanga Régions, Antananarivo. Acta Hort. 1156: 929-936.

Abstract

The production of fruits and vegetables offers substantial benefits for smallholder farmers generally. It plays a large role not only on the households’ food security but also on their source of income. As the leading producer of strawberry with an annual production of 1300-1500 t in the Analamanga Region, the Commune of Tsiafahy within the District of Atsimondrano is the study area. This research aims to analyse the socio-economic structure of the strawberry and the dynamism of the farmers. The methods adopted have followed three independent steps: the system approach which studies the farming system of the small scale farmers, the finance analysis enabling to highlight the economic importance of the strawberry compared mainly to rice production, and the diagnosis of the strawberry value chain. The results show the existence of three types of producers: landowner vegetable producers, organic strawberry producers, and the producers associating the production of vegetable, horticulture and food crop. The strawberry remains the important production (88% of the surveyed population), followed by rice and maize (66%). Strawberry production is entirely for selling, income main source. The organic producer’s yields are important (13 t ha⁻¹) compared to the first and to the third type. They are respectively 9.5 and 11 t ha⁻¹. The added value of strawberry is around ten times more important from than rice. Its economic contribution for the smallholder farmers remains significantly low; the main reasons are the still rudimentary farming technique and the difficulty in access to inputs, worsened by the adverse impacts of climate changes. Smallholder farmers’ strategies facing the hazards of strawberry production and its economic role compared to the potential speculations in the area have been assessed. The bottlenecks of the value chain have been highlighted and some appropriate recommendations suggested.

Keywords: /Strawberry/ /Value Chain/

Samadi, S., A. Ghasemnezhad and J. Imani. 2017. Extending shelf life of **strawberry** using some pre-storage treatments. Acta Hort. 1156. 643-652.

Abstract

Strawberry fruits are consumed and beloved all over the world due to their taste, aroma, soft texture, nutritional and curative values. The fruit has high anthocyanin, phenol and vitamin C content and are imperative for their free radical scavenging activity and control of melanoma cells. Strawberry fruits are highly susceptible to fungal pathogens. In the past, the use of fungicides for their preservation and longer shelf life was common. But nowadays WHO prevents use of chemicals for preservation and warns about their effect on public health and the environment. In the present study, we demonstrate an effective and healthy method to increase strawberry shelf life. We investigated the effect of ascorbic acid, salicylic acid, UV-C radiation and VEG'LYS a natural antimicrobial compound, on strawberry shelf life. Among used treatments, VEG'LYS significantly increased the shelf life and maintained the quality of fruits at low concentrations. Our results showed that even 18 days after storage, nearly 80% of fruits treated with VEG'LYS were still non-infected by fungi and marketable. Surprisingly, besides showing lower infection levels and better fruit appearance, VEG'LYS treated fruits showed acceptable taste. Among used treatments the lowest variation of total phenolic content, anthocyanin, and antioxidant activity was found in VEG'LYS treated samples compared to controls. Here we show a new, safe and acceptable way of pre-storage treatment for strawberry production and trade.

Keywords: /Strawberry/ /Postharvest/ /Pre-Storage/

VEGETABLES

BROCCOLI

Li, D., et.al. 2017. Effects of hydrogen sulfide on yellowing and energy metabolism in **broccoli**. Postharvest Biol. & Technol. 129: 136-142.

Abstract

The effects of H₂S on yellowing and energy metabolism of broccoli florets treated with hydrogen sulfide (H₂S) or DL-propargylglycine (PAG) were investigated after four days of storage at 20 °C. Our study showed that H₂S treatment enhanced endogenous H₂S content by 28.19% and 49.78% in comparison to the control and PAG-treated group respectively. This result might be related to the increase of L-cysteine desulfhydrase (LCD) and D-cysteine desulfhydrase (DCD) activities. Meanwhile, H₂S treatment can maintain chlorophyll content at 0.329 g kg⁻¹, whereas the control at 0.298 g kg⁻¹ and PAG-treated group at 0.275 g kg⁻¹. This led to an alleviation of the yellowing in broccoli florets. In addition, high endogenous H₂S content also activated the key enzymes, involved in energy metabolism, including ATPases, cytochrome C oxidase (CCO), succinate dehydrogenase (SDH), glucokinase, fructokinase, glucose-6-phosphate dehydrogenase (G6PDH) and 6-phosphogluconate dehydrogenase (6PGDH). As a result, significantly higher energy charge was observed in H₂S-treated group (p < 0.05). These results

suggest that H₂S can effectively inhibit the yellowing and maintain high energy charge, therefore prolong the shelf life of postharvest broccoli.

Keywords: /Broccoli/ /Yellowing/

CARROTS

Ojaghian, M.R., et.al. 2017. Efficacy of UV-C radiation in inducing systemic acquired resistance against storage carrot rot caused by *Sclerotinia sclerotiorum*. *Postharvest Biol. & Technol.* 130: 94-102.

Abstract

This research was carried out to assess inhibitory effect of UV-C (0.88 kJ m⁻²) against four isolates of *Sclerotinia sclerotiorum*, causal agent of carrot rot, *in vitro* and *in vivo*. A bank of seven germicidal tubes was used to produce UV-C radiation with peak emission at 254 nm. The carrot roots were subjected to UV-C irradiation for five min. The tubes were located 40 cm above the roots. In order to be exposed to UV radiation on all sides, the carrot roots were rotated five times at the interval of one min. Based on the results, UV radiation was able to significantly increase levels of pathogenesis-related proteins (chitinases, peroxidases, β -1,3-glucanases) as well as polyphenoloxidase, phenylalanine ammonia-lyase and 6-methoxymellein (6-m) in carrot roots. The levels of enzymes and 6-m were found to be higher in the whole treated carrots than half treated carrots in most of treatments. Despite increase of systemic acquired resistance (SAR) related enzymes in half treated carrots, the results of *in vivo* tests showed that UV-C irradiation can not reduce severity of carrot rot after 15 d. In addition, UV-C radiation for 5 min markedly decreased myceliogenic and carpogenic germination of sclerotia in four isolates. This study showed that UV-C cannot be considered as abiotic inducer of SAR.

Keywords: /Carrot/ /Storage/ /Carrot Rot/

CUCUMBER

Wang, B. and S. Zhu. 2017. Pre-storage cold acclimation maintained quality of cold-stored **cucumber** through differentially and orderly activating ROS scavengers. *Postharvest Biol. & Technol.* 129: 1-8

Abstract

Cucumber fruit are susceptible to chilling injury (CI) during storage and shipping at temperatures below 7–10 ° C. Pre-storage cold acclimation (PsCA) is a promising postharvest method for reducing CI and maintaining quality, but the reported duration of PsCA varies greatly, partly because no method so far has been developed for evaluating the chilling tolerance induced by PsCA at an early time. Following PsCA at 10 ° C for 6 h, 12 h, 24 h, 48 h and 72 h, CI, secondary diseases and relative electrolyte leakage of cucumbers stored at 5 ° C decreased with PsCA duration, indicating PsCA-induced chilling tolerance in cucumber was positively correlated with the length of exposure to PsCA. Meanwhile, PsCA increased soluble solids and ascorbic acid, and reduced malondialdehyde, O₂^{•-} and H₂O₂, suggesting that PsCA

improved quality by inhibiting reactive oxygen species (ROS) and maintaining cell membrane integrity. In addition, PsCA enhanced gene expression and activities of four enzymatic ROS scavengers, superoxide dismutase, peroxidase, ascorbate peroxidase, catalase and two non-enzymatic ROS scavengers, AsA and glutathione. However, different ROS scavengers had variable transition points before they were consistently activated, suggesting that ROS scavengers were differentially activated in an orderly way and that the chilling tolerance is positively correlated with the number of activated ROS scavengers, but require enough number of ROS scavengers to be effective. This study provides possibility for early evaluation of PsCA-induced chilling tolerance and for timely arrangement of marketing and processing to reduce losses.

Keywords: /Cucumber/ /Cold Storage/ /Quality/

LEAFY VEGETABLE

Gogo, E.O., A.M. Opiyo, Ch. Ulrichs and S. Huyskens-Keil. 2017. Nutritional and economic postharvest loss analysis of African indigenous leafy vegetables along the supply chain in Kenya. *Postharvest Biol. & Technol.* 130: 39–47.

Abstract

Over the last decade, African indigenous leafy vegetables (AIVs) such as African nightshade (*Solanum scabrum* Mill.) have featured increasingly in both formal and informal markets in the peri-urban and urban centres of Africa, due to the increasing awareness of their nutritive and medicinal as well as expanding economic value. AIVs are rich in nutritional and health promoting plant compounds such as vitamins, minerals, proteins, dietary fibre and antioxidant compounds. However, the crop is highly perishable and more than half of it is lost before it reaches the consumer. In Kenya, appropriate postharvest handling and treatments, storage or refrigeration facilities are lacking. More so, the information on postharvest losses of the AIVs is limited, making the management of such losses along the supply chain very difficult. The objective of the study was to determine nutritional and economic losses of African nightshade plants along the supply chain, i.e. from producer until marketing. The study was conducted in the three main commercial AIVs producing counties in Kenya, i.e. Nakuru, Kisii and Kakamega, where three farmers from each county were randomly selected. The farmers were allowed to carry out their normal routine AIVs handling procedure right from harvesting to selling; and samples were collected at each supply chain stage (at harvest, before transport, after transport and at the market). Dry matter, selected macro-nutrients (N, P, K, Ca and Mg) and micro-nutrients (Fe and Zn), protein, carotenoids and chlorophyll content, cumulative produce and economic losses as well as the causes of losses were evaluated. The results obtained revealed significant quantitative, nutritive, and economic losses of African nightshade along the supply chain. The dry matter content was reduced by between 32.8–45.5%, depending on the county, along the supply chain. The mineral elements and protein were reduced by between 3.2–29.4%, while chlorophylls and carotenoids were reduced by between 70.9–90.9% and 70.4–91.9%, respectively. Cumulative produce loss was between 71.8–292.4% while the economic loss was between 12.6–34.4%. The findings indicate the immense losses of nutritional, quantitative and economic values of African nightshade along the supply chain. Lack of certified seed varieties, unfavourable weather, inadequate postharvest handling practices and

technologies as well as insect pest and diseases are the main causes of losses during the supply chain. Therefore, maintaining quality attributes and managing postharvest losses in AIVs could be among the key issues to improving food security in developing countries

Keywords: /Leafy Vegetables/ /Shelf-life/ /Postharvest/ /Quality/

Gombas, D., et.al. 2017. Guidelines to validate control of cross-contamination during washing of fresh-cut **leafy vegetables**. J. Food Prot. 80(2): 312-330.

Abstract

The U.S. Food and Drug Administration requires food processors to implement and validate processes that will result in significantly minimizing or preventing the occurrence of hazards that are reasonably foreseeable in food production. During production of fresh-cut leafy vegetables, microbial contamination that may be present on the product can spread throughout the production batch when the product is washed, thus increasing the risk of illnesses. The use of antimicrobials in the wash water is a critical step in preventing such water-mediated cross-contamination; however, many factors can affect antimicrobial efficacy in the production of fresh-cut leafy vegetables, and the procedures for validating this key preventive control have not been articulated. Producers may consider three options for validating antimicrobial washing as a preventive control for cross-contamination. Option 1 involves the use of a surrogate for the microbial hazard and the demonstration that cross-contamination is prevented by the antimicrobial wash. Option 2 involves the use of antimicrobial sensors and the demonstration that a critical antimicrobial level is maintained during worst-case operating conditions. Option 3 validates the placement of the sensors in the processing equipment with the demonstration that a critical antimicrobial level is maintained at all locations, regardless of operating conditions. These validation options developed for fresh-cut leafy vegetables may serve as examples for validating processes that prevent cross-contamination during washing of other fresh produce commodities.

Keywords: /Leafy Vegetables/ /Fresh-Cut/

LETTUCE

Yoonjee Chang, Inyoung Choi, Ah Reum Cho and Jaejoon Han. 2017. Reduction of *Dickeya chrysanthemi* on fresh-cut iceberg **lettuce** using antimicrobial sachet containing microencapsulated oregano essential oil. LWT – Food Sci. & Technol. 82: 361-368.

Abstract

An antimicrobial sachet releasing vapor of oregano essential oil (EO) was developed and its effectiveness as an antimicrobial packaging system for fresh-cut iceberg lettuce was evaluated. Oregano EO was microencapsulated with polyvinyl alcohol (oregano EO/PVA ratio: 3/5 (w/w)) using a spray-drying technique. The sachet containing oregano microcapsules was incubated with iceberg lettuce at 20°C and 85% RH for five days. During this storage, the reduction efficiency against growth of *Dickeya chrysanthemi*, molds and yeasts (MY), and total mesophilic aerobic bacteria (MAB) on the surface of

iceberg lettuce was investigated. Oregano EO released from the sachet inhibited the growth of *D. chrysanthemi*, resulting in 3.9 log CFU/5 pieces reduction over five days storage at 20°C. The volatile oregano EO also showed significant growth inhibitory effects against MY and total MAB that each was significantly reduced by 2.1 log CFU/5 pieces and 1.5 log CFU/5 pieces, respectively. The texture and color characteristics of the iceberg lettuce were not affected by the release of oregano EO vapor. These results may be useful for the development of antimicrobial packaging systems that are intended to increase the microbiological safety and to extend the shelf life of fresh products.

Keywords: /Lettuce/ /Fresh-Cut/ /Packaging/

PUMPKIN

Xu, Y., et.al. 2017. Construction of a genetic linkage map of rootstock-used pumpkin using SSR markers and QTL analysis for cold tolerance. *Scientia Horti* 220: 107–113.

Abstract

In China, cucumber plants suffer chilling stress during the winter and early spring, and grafting would help the plants adapt to chilling stress. Pumpkin (*Cucurbita moschata*; $2n = 40$) is an important root stock for cucumber (*Cucumis sativus* L.) grafting. However, there are no published molecular genetic studies of chilling tolerance in pumpkins used as rootstock. An F_2 population with 166 individuals was derived from a cross between a chilling-stress-susceptible high-generation inbred line ('5-5-6') and a chilling-stress-tolerant high-generation inbred line ('8-3-7'). The chilling index (CI) was used to evaluate the cold tolerance of the parental lines and the F_2 population. The continuous and normal distribution of the CI in the F_2 population suggested that the trait of chilling tolerance was a typically quantitative trait controlled by multiple genes and was suitable for quantitative trait loci (QTL) mapping. A molecular linkage map was constructed using 95 simple-sequence repeat (SSR) markers, resulting in 15 linkage groups (LGs) covering a total distance of 830.7 cM with an average interval of 8.74 cM. Three QTLs were detected for CI, explaining 0.30%, 1.22% and 20.88% of the phenotypic variation. The genetic map and QTLs will serve as a framework for future molecular breeding studies.

Keywords: /Pumpkin/ /Chilling injury/

SPINACH

Finten, G., M.V. Aguero and R.J. Jagus. 2017. Citric acid as alternative to sodium hypochlorite for washing and disinfection of experimentally-infected **spinach** leaves. *LWT – Food Sci. & Technol.* 82: 318-325.

Abstract

This research aims to investigate citric acid (CA) 0.5% as alternative to sodium hypochlorite (SH) 200 ppm for washing and disinfecting spinach leaves (*Spinacia oleracea* L.). The initial disinfection achieved in leaves spot-inoculated with *Escherichia coli* and *Listeria innocua*, pathogen surrogates, was

investigated along with the effects of time and temperature conditions before processing on the performance of CA and SH. Next, the effectiveness of CA and SH was evaluated throughout refrigerated storage (6.5 ° C, 9 days) at a low and high contamination load, 5-6 and 8-9 log CFU.g⁻¹, respectively. And lastly, sensory impact was assessed through a trained panel and instrumental color. Results indicated that there were not significant differences between the initial disinfection achieved by CA and SH. Storing infected spinach under refrigeration, between harvest and processing, played a key role not only in reducing their deterioration but also in assuring their safety by maintaining CA and SH effectiveness against the inoculated surrogates. Citric acid performance was better in controlling surrogates' regrowth along refrigerated storage. And there were not significant differences between CA and SH treated samples with respect to their sensory quality. Therefore, CA could constitute an alternative washing and disinfection method for spinach leaves.

Keywords: /Spinach/ /Minimally Processed/ /Microbial Safety/ /Quality/

TOMATO

Li, Jiayin, et.al. 2017. Effects of exogenous auxin on pigments and primary metabolite profile of postharvest tomato fruit during ripening. *Sci. Hortic.* 219: 90–97.

Abstract

Auxin is an important plant hormone and plays crucial roles in regulating fruit ripening. The delay of ripening after auxin treatment has been found in tomato and other fleshy fruit. However, the influence of auxin on metabolites alteration during tomato ripening period has not been extensively studied. To investigate the impact of exogenous auxin on tomato fruit quality, pigment metabolism, primary metabolite profiling, and the expression of selected ripening-related transcription factor genes were analyzed. The results showed that exogenous auxin significantly interfered the accumulation and conversion of pigments, total phenolics and flavonoids but did not largely influence the final content of these compounds in full ripe tomato fruit. Dramatic changes on the content of primary metabolites were induced by auxin during tomato ripening period and the alterations were not able to be completely restored at the end of ripening. The contents of citric acid, threonic acid and succinic acid were increased whereas alanine and aspartic acid accumulation was repressed in auxin-treated fruit. The expression patterns of transcription factor genes related to ripening were also disturbed by exogenous auxin. The present study provided an overall insight on how auxin regulates pigment and primary metabolite accumulation during ripening stage and offered useful information for further investigation of auxin impact on fruit quality.

Keywords: /Tomato/ /Ripening/

Tilahun, S., et.al. 2017. Effect of ripening conditions on the physicochemical and antioxidant properties of tomato (*Lycopersicon esculentum* Mill.). *Food Sci. Biotechnol.* 26(2): 473-479.

Abstract

This study was conducted to assess the physicochemical changes and overall nutritional implications of greenhouse-grown “TY Megaton” and “Yureka” tomato cultivars under on-vine and postharvest ripening conditions. In the first group, tomatoes were harvested from a vine at the breaker, pink, and red ripening stages and sampled immediately. The second group was harvested at the breaker stage and allowed to ripen under room conditions to the pink and red stages based on color values, similar to the vine-ripened samples. The results of the present study revealed that fresh weight loss was below the maximum acceptable weight loss and firmness was above the minimum limit of marketing after postharvest ripening to the pink and red stages; moreover, this process did not have any deleterious effect on the antioxidant properties or antioxidant activity of the tomatoes. Hence, the results clearly indicate that breaker-stage tomatoes can be postharvest-ripened under room conditions without affecting their marketability and nutritional components.

Keywords: /Tomato/ /Storage/

HERBS AND SPICES

CAPSICUM STEMS

Franca, C.deF.M., et.al. 2017. Effect of postharvest handling procedures on cut *Capsicum stems*. Scientia Horti 220: 310–316.

Abstract

‘Rio Light Orange’ and ‘Cappa Round Red’ ornamental peppers (*Capsicum annuum* L.) are attractive cultivars used as cut stems, but postharvest handling protocols need to be optimized. ‘Rio Light Orange’ stems harvested when most of the fruits were pale orange had the longest vase life, while harvest stage had no effect on vase life of ‘Cappa Round Red’. Stems of both cultivars showed less incidence of wilted foliage during postharvest when stored in water. Cold storage was tolerated for up to 1 week for ‘Rio Light Orange’ and for up to 2 weeks for ‘Cappa Round Red’ for stems kept in water. These cultivars do not appear to be sensitive to ethylene and antiethylene agents had a minimal effect on postharvest characteristics of cut stems. Of nine *Capsicum* cultivars tested, the use of a holding solution had a positive effect on the vase life of ‘Black Pearl’, ‘Rooster’ and ‘Stromboli’ ornamental peppers and increased the number of days foliage remained acceptable for eight of the cultivars. However, use of a commercial hydrator either reduced (one cultivars) or had no effect (eight cultivars) on vase life. Vase life and quality of ‘Rio Light Orange’ and ‘Cappa Round Red’ ornamental peppers stems can be extended by following appropriate postharvest handling procedures and the use of a holding solution can have a beneficial effect on vase life and foliage quality of many additional cultivars of peppers tested in this study.

Keywords: /*Capsicum* stems/ /Ornamental peppers/ /Vase Life/ /Cold Storage/

GARLIC

Naheed, Zobia, et.al. 2017. Total polyphenols, total flavonoids, allicin and antioxidant capacities in garlic scape cultivars during controlled atmosphere storage. *Postharvest Biol. & Technol.* 131: 39 – 45.

Abstract

Five commercial cultivars of garlic scapes were subjected to a controlled atmosphere ($O_2 = 2-5\%$, $CO_2 = 3-6\%$) at temperature = 0 ± 0.5 °C, RH=85-95%, for 140–224 d to document the quality and related changes in components during storage in two consecutive years. Polyphenols, flavonoids, allicin, and 2,2-diphenyl-1-picrylhydrazyl (DPPH) as well as the ferric ion reducing antioxidant power (FRAP), metal chelating capacity (MCC), and hydroxyl radical scavenging activity (HRSC) were analyzed to study overall antioxidant properties of garlic scapes in storage. The storage life was 224, 196, 196, 168, and 140 days for G025, G107, G2011-04, G110, and G064. G025 had the highest total polyphenol concentrations at 140 and 168 days in 2014 and 2015, respectively, whereas G2011-4 had the lowest concentrations of total polyphenols. The highest total polyphenols, total flavonoids and allicin concentrations were observed in G025, whereas G2011-04 displayed the lowest concentrations of total polyphenols and allicin in both years. For all cultivars, total flavonoid concentrations decreased with time. The highest weight loss was observed in G064 both in 2014 and 2015. The antioxidant capacity of G025 and G110 was higher than that of the other cultivars. DPPH and HRSC were highest in G025, and MCC and FRAP were high in G110 and G107 in both years. These results demonstrate that cultivar influences the rate of garlic scape deterioration, chemical composition properties and antioxidant activities.

Keywords: /Garlic/ /Quality/ /Antioxidant/

ONION

Islam, Md.N., A. Wang and M. Edelenbos. 2017. Microclimate tools to monitor quality changes in stored onions. *Acta Hortic.* 1154: 229-234.

Abstract

Losses of onion are caused by spoilage from microbial infection, sprouting and mass loss. Pre-harvest factors such as cultivar, climate and growing conditions, as well as harvesting, curing, storage duration, temperature and relative humidity during storage, influence losses. The optimal storage conditions for onions are 0°C and 65-75% relative humidity (RH); however, it is costly to store onions at this low temperature for long periods. It can also be challenging to maintain low RH at low storage temperature. The aims of the present study were: 1) to test the applicability of a HortiSens® sensor to monitor temperature and RH under experimental conditions and to evaluate the effects of 2) conventional and pulse cooling, and 3) low and high RH during storage on the quality of conventionally and organically grown onions. We found that online microclimate monitoring using the novel wireless HortiSens® sensor gave similar results as data from other sensors. Onions had higher basal root sprouting with pulse cooling and after storage in high RH. There was a higher incidence of disease at high

RH, but lower mass losses. Organically grown onions had higher incidence of root sprouting and diseases than conventionally grown onions, especially during storage at high RH.

Keywords: /Onion/ /Relative Humidity/ /Temperature/

Zudaire, L., et.al. 2017. Quality and bioaccessibility of total phenols and antioxidant activity of calçots (*Allium cepa* L.) stored under controlled atmosphere conditions. *Postharvest Biol. & Technol.* 129: 118–128.

Abstract

Calçots are the floral stems of the second-year onion (*Allium cepa* L.) resprouts with economic importance in Spain, where they are usually consumed roasted. The effect of two controlled atmospheres (CA) of 2.0% O₂ + 3.5% CO₂ (CA1), 1.0% O₂ + 2.0% CO₂ (CA2) and air at 1 °C for 60 d on the physicochemical, nutritional and sensory quality of *calçots* were studied. In addition, the total phenolic content (TPC) and the antioxidant activity (AA) of roasted *calçots* were evaluated after an in vitro gastrointestinal (GI) digestion. Both CA regimes reduced the respiration rate of the stored product without causing physiological disorders. The TPC and AA of *calçots* increased during storage. Storage for 60 d in CA2 resulted in the highest AA by DPPH% assay, whereas *calçots* stored in air for 60 d showed the highest TPC and AA by FRAP assay. *Calçots* stored in air for 30 d and fresh harvested sample presented the highest total flavonoids values. After 30 d of storage, *calçots* stored in CA had a higher liking degree than *calçots* stored in air. The AA of digested *calçots* decreased drastically after in vitro GI digestion in comparison to the non-digested samples. However, TPC increased after digestion. Roasted *calçots* stored in CA1 for 30 d showed the highest TPC and AA retention in the intestinal phase. CA could be apostharvest strategy for the storage of *calçots*.

Keywords: /Onion/ /Controlled Atmosphere/

ORNAMENTALS

CARNATION

Diaz, J.M.S., S. Jimenez-Becker and M. Jamilena. 2017. A screening test for the determination of cut flower longevity and ethylene sensitivity of carnation. *Hort. Sci. (Prague)* 44: 14-20.

Abstract

Strategies to prevent postharvest losses include the use of genotypes that have a longer life. The objective of this study was to develop a screening test for the estimation of cut flower postharvest life and the response to exogenous ethylene of different carnation cultivars at an early stage of plant growth. Ethylene sensitivity and production in different cut flower cultivars was evaluated, and a similar response in the vegetative stage was studied. Also, the possible relationship between the morphological parameters of cuttings and flower postharvest life was studied. Ethylene production of cuttings may be a useful tool for estimating ethylene production of cut flowers. There is a strong relationship between cut

flower vase life and the root length of cuttings, as well as cut flower ethylene sensitivity and the number of internodes the cuttings have. Applications of exogenous ethylene to cutting cultivars have an effect on the growth parameters of the cuttings, but the response to ethylene in cut flowers does not behave in the same way in the vegetative stage.

Keywords: /Carnation/ /Postharvest/

ROSES

Byung-Chun In, et.al. 2017. Relationships between the longevity, water relations, ethylene sensitivity, and gene expression of cut roses. *Postharvest Biol. & Technol.* 131: 74-83.

Abstract

Cut roses (*Rosa hybrida* L.) have been classified as ethylene-sensitive, but the nature of the ethylene sensitivity changes in these flowers has not been well characterized. In the present study, the relationships between vase life, ethylene sensitivity, and expression of ethylene biosynthetic genes were determined in 33 cultivars. Despite the same growing season and identical postharvest environments, the vase life of cultivars ranged from 5.5 to 15.5 d. Ethylene primarily accelerated petal wilting, which is the main factor shortening the longevity in long vase life cultivars. qRT-PCR analysis revealed that among five ethylene synthesis genes, *RhACO1* showed the most distinct expression patterns in response to ethylene. ACS genes were differentially expressed in response to ethylene, and only *RhACS2* and *RhACS4* are induced by ethylene and during flower senescence. Correlation analysis revealed that the major factors that terminate vase life vary depending on flower sensitivity to ethylene. The vase life of ethylene-sensitive cultivars was strongly related to *RhACO1* transcript level, which was induced by ethylene exposure. In contrast, the vase life of ethylene-insensitive cultivars was mostly reduced due to an early failure of water relations, as a consequence of the decreased hydraulic conductance of stems and water loss via transpiration. The current study revealed that postharvest treatments to improve the vase life should be differently applied based on the ethylene sensitivity of each cultivar.

Keywords: /Roses/ /Ethylene/ /Postharvest/ /Vase Life/