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GENERAL

ACTIVE FILMS

Braga, L.R., et.al. 2018. Simple synthesis of **active films** based on PVC incorporated with silver nanoparticles: Evaluation of the thermal, structural and antimicrobial properties. Food Packag. & Shelf Life 15: 122-129.

Abstract

In this work, active antimicrobial films were synthetized with 1.0% to 8.0% silver ions incorporated into polyvinyl chloride (PVC), utilizing a simple solvent casting method was accomplished in a single step. The incorporation of silver in the PVC affected the thermal, structural and antimicrobial properties of the films, which were observed *via* different characterization techniques. The antimicrobial activity was evaluated through disk diffusion method against the following bacterial and fungi species: *Bacillus subtilis, Aspergillus niger* and *Fusarium solani*. In addition, a practical evaluation was performed in order to observe the shelf life extension of breads. $PVC_{Ag1\%}$ exhibited better antimicrobial activity for *Fusarium solani* with halos (13.5 ± 0.3 mm), and $PVC_{Ag2\%}$ for *Bacillus subtilis* (15.3 ± 0.7 mm). The resulting bread sample displayed an absence of micro-organisms to $PVC_{Ag1\%}$ after 15 days of storage. The results showed that the synthesis of the PVC-based films incorporated with silver nanoparticles (AgNPs) can be easily performed, resulting in films with antimicrobial activity, which may be applied to food storage at room temperature without use of a modified atmosphere.

Keywords: /Active Packaging/

ACTIVE PACKAGING

Selcuk Yildirim, et.al. 2018. **Active packaging** applications for food. Compr Rev Food Sci Food Saf 17: 165-199.

Abstract

The traditional role of food packaging is continuing to evolve in response to changing market needs. Current drivers such as consumer's demand for safer, "healthier," and higher-quality foods, ideally with a long shelf-life; the demand for convenient and transparent packaging, and the preference for more sustainable packaging materials, have led to the development of new packaging technologies, such as active packaging (AP). As defined in the European regulation (EC) No 450/2009, AP systems are designed to "*deliberately incorporate components that would release or absorb substances into or from*

the packaged food or the environment surrounding the food." Active packaging materials are thereby "*intended to extend the shelf-life or to maintain or improve the condition of packaged food.*" Although extensive research on AP technologies is being undertaken, many of these technologies have not yet been implemented successfully in commercial food packaging systems. Broad communication of their benefits in food product applications will facilitate the successful development and market introduction. In this review, an overview of AP technologies, such as antimicrobial, antioxidant or carbon dioxide-releasing systems, and systems absorbing oxygen, moisture or ethylene, is provided, and, in particular, scientific publications illustrating the benefits of such technologies for specific food products are reviewed. Furthermore, the challenges in applying such AP technologies to food systems and the anticipated direction of future developments are discussed. This review will provide food and packaging scientists with a thorough understanding of the benefits of AP technologies when applied to specific foods and hence can assist in accelerating commercial adoption.

Keywords: /Active Packaging/ /Antimicrobial Packaging/

FRESH CUT

Yaguang Luo, et.al. 2018. Association between bacterial survival and free chlorine concentration during commercial **fresh-cut** produce wash operation. Food Microbiol 70: 120-128.

Abstract

Determining the minimal effective free chlorine (FC) concentration for preventing pathogen survival and cross-contamination during produce washing is critical for developing science- and risk-based food safety practices. The correlation between dynamic FC concentrations and bacterial survival was investigated during commercial washing of chopped Romaine lettuce, shredded Iceberg lettuce, and diced cabbage as pathogen inoculation study during commercial operation is not feasible. Wash water was sampled every 30 min and assayed for organic loading, FC, and total aerobic mesophilic bacteria after chlorine neutralization. Water turbidity, chemical oxygen demand, and total dissolved solids increased significantly over time, with more rapid increases in diced cabbage water. Combined chlorine increased consistently while FC fluctuated in response to rates of chlorine dosing, product loading, and water replenishment. Total bacterial survival showed a strong correlation with real-time FC concentration. Under approximately 10 mg/L, increasing FC significantly reduced the frequency and population of surviving bacteria detected. Increasing FC further resulted in the reduction of the aerobic plate count to below the detection limit (50 CFU/100 mL), except for a few sporadic positive samples with low cell counts. This study confirms that maintaining at least 10 mg/L FC in wash water strongly reduced the likelihood of bacterial survival and thus potential cross contamination of washed produce.

Keywords: /Fresh Cut/

Yousuf, B., et.al. 2018. Recent developments in shelf-life extension of **fresh-cut** fruits and vegetables by application of different edible coatings: A review. LWT – Food Sci & Technol 89: 198-209.

Abstract

Intake of fruits and vegetables has been linked with various health benefits. Fruits and vegetables can be consumed either fresh or processed. Production and consumption of minimally processed foods is gaining popularity. Fresh-cut fruits and vegetables are being welcomed by the consumers due to the desire for new and natural products coupled with change in life style of the consumers. However, challenge for fresh-cut industry is to maintain fresh like characteristics of fresh-cut produce for a prolonged storage time.

Fresh-cut produce has a much larger cut surface and consequently much shorter shelf-life. Loss of quality parameters such as color, firmness, juiciness, flavor and excessive moisture loss results in limited shelf-life and increased chances of rejection of the produce by the consumers. Developments in packaging technology and edible coatings for foods have shown promising results in extending the shelf-life of fresh-cut fruits and vegetables. Therefore, this article reviews the scope of fresh-cut fruits and vegetables and shelf-life extension by means of coating. Application of innovative packaging techniques and novel food coatings would make it possible to meet the ever growing consumer demands and to approach the distant markets with comparatively high quality fresh produce.

Keywords: /Fresh Cut/ /Edible Coatings/ /Fruits/ /Vegetables/

TRANSPORT

Patemoster, A., et.al. 2018. Vibration and shock analysis of specific events during truck and train **transport** of food products. Food Packag & Shelf Life 15: 95-104.

Abstract

In international test standards and literature averaged vibration spectra of truck and train transports are re ported. However, cargo is exposed to extreme levels of vibrations and shocks for which the averaged vibration data are not representative. The objective of this study is to report evidence of the extreme vibrations and shocks during truck and train transport, and help food scientists design relevant vibration and shock simulation experiments. Results indicate that trains and trucks experience transient phenomena when traveling over train switches, accelerating and stopping the train, respectively road unevenness (e.g. potholes). The damping ratio (β) of shocks measured on the railcar is on average 0.05 ± 0.02, while on the truck 0.08 ± 0.02. Furthermore, the measured spectra of this study diverge from the spectra of international standards. A time-domain analysis

indicates that traveling over cobblestones, and concrete pavement generates the most severe vibrations and shocks (dependency on truck velocity).

Keywords: /Transport/

VEGETABLE SALADS

Mir, S.A., et.al. 2018. Microbiological contamination of ready-to-eat **vegetable salads** in developing countries and potential solutions in the supply chain to control microbial pathogens. Food Control 85: 235-244.

Abstract

The consumption of ready to eat vegetable salads among consumers in developing countries has increased with the change in life style pattern. However, food borne disease linked to these salads poses safety threats. Studies have shown the occurrence of various microbial pathogens which includes *Escherichia coli, Listeria monocytogenes*, *coliforms, Salmonella* etc. in these types of ready to eat vegetable salads. In order to overcome these safety threats, to control the microbial pathogens and to enhance the shelf life, different techniques like modified atmospheric conditions, refrigeration, innovative technologies etc. are exploited. This review insight on pathogenic prevalence of ready to eat vegetable salads in developing countries and technological advances used to counter these pathogens.

Keywords: /Vegetable Salad/ /Shelf Life/

Ssemanda, J.N., et.al. 2018. Reduction of microbial counts during kitchen scale washing and sanitization of **salad vegetables**. Food Control 85:495-503.

Abstract

Washing with or without sanitizers is one of the important steps designated to reduce or eliminate microbial hazards in fresh vegetables but the settings, conditions and effectiveness of this step remain contentious. In this study, we investigated kitchen scale salad preparation practices in a field study in Rwandan food service establishments (FSEs) and conducted laboratory trials to identify treatments that can improve reduction of microbial counts during washing and sanitization. In the field study, vegetable samples (n = 112) were taken from 56 FSEs before and after washing with or without sanitizer(s) to determine reduction of counts of *Enterobacteriaceae, Listeria* spp., and coagulase positive (CP)-staphylococci coupled with observation of the salad preparation practices from start to end. Based on the results obtained during the field study, 8 sanitizers were evaluated in the laboratory to optimize the efficacy of washing of leafy vegetables (corn salad, *Valerianella locusta*). Findings in the field study revealed that about 61% of the visited FSEs used sanitizers during washing of fresh vegetables, in particular, potassium permanganate ($KMnO_4$) in 39% of FSEs, sanitizing powder (a mixture of polyphosphate, sodium hydrogen

carbonate and active chlorine), 13%; sodium hypochlorite (NaClO), 7%; and sodium dichloroisocyanurate (NaDCC) in 2%. Average inactivation ranged from 1.0 log ($KMnO_4$) to 3.1 log (NaDCC). In the laboratory study, average inactivation observed with *Listeria spp., Escherichia coli* and Aerobic plate count (APC) ranged from 0.7 log (water alone) to 3.0 log (NaDCC). Out of the 8 sanitizers that were evaluated, 5 sanitizers (NaDCC [90 ppm], NaClO [200 ppm], lemon juice [98%], acetic acid [2%] and sanitizing powder [4 g/L]) resulted in significantly higher inactivation compared to water alone. A contact time of 5 min and salad-sanitizer ratio of 1: 20 were considered optimal for kitchen based washing of the studied leafy vegetables with NaDCC and NaClO sanitizers.

Keywords: /Vegetable Salad/ /Fresh Vegetables/

FRUITS

AVOCADO

Gwanpua, S.G., et.al. 2018. Modelling ethylene regulated changes in 'Hass' **avocado** quality. Postharvest Biol & Technol 136: 12-22.

Abstract

Temperature and exogenous ethylene are two important factors that determine the rate of quality change in 'Hass' avocado. The aim of this study was to quantify this effect and to build a mathematical model that will assist in predicting the effect of temperature, exogenous ethylene, and time on quality outcomes of 'Hass' avocado. A mathematical model was developed to describe autocatalytic ethylene production, and coupled to models describing softening and colour changes via ethylene. The effect of exogenous ethylene was incorporated by addition of a diffusion term, while temperature effect was modelled by expressing rate constants as a function of temperature using the Arrhenius equation. The model was calibrated using data on ethylene efflux rate, firmness and skin hue collected on 'Hass' avocado fruit stored at 5, 10, or 20 °C, in atmospheres containing < 0.05 µL L^{-1} (air), 1 µL L^{-1} or 10 µL L^{-1} ethylene in air. Effect of ethylene on softening was greater than on colour change, with clear firmness separation of the different ethylene treated fruit evident even during ripening at 20 °C. The high dependency of softening on ethylene was revealed in the Michaelis-Menten constant for the regulation of the softening enzyme by ethylene, which was about 15 times larger than that for the colour degrading enzymes. The model was successfully validated on a sub-dataset.

Keywords: /Avocado/ /Ripening/ /Firmness/

BANANA

Chuanqi Xie, et.al. 2018. Prediction of **banana** color and firmness using a novel wavelengths selection method of hyperspectral imaging. Food Chem 245: 132-140.

Abstract

This study investigated the feasibility of using hyperspectral imaging for determining banana color (L*, a* and b*) and firmness as well as classifying ripe and unripe samples. The hyperspectral images at wavelengths 380–1023 nm were acquired. Partial least squares (PLS) models were built to predict color and firmness. Two wavelength combination method $\left(\frac{\lambda i-\lambda j}{\lambda i+\lambda j}, \frac{\lambda i^2-\lambda j^2}{\lambda i^2+\lambda j^2}, \frac{\lambda i}{\lambda i} \text{ and } \lambda i-\lambda j\right)$ was used to identify the effective wavelengths. Based on the selected wavelengths, PLS models obtained good results with the coefficient of determination in prediction (Rp^2) of 0.795 for L*, 0.972 for a*, 0.773 for b* and 0.760 for firmness. The corresponding residual predictive deviation (*RPD*) values were 2.234, 6.098, 2.119 and 2.062, respectively. The classification results of ripe and unripe samples were excellent in two different principal components spaces (PC1 + PC2 and PC1 + PC3). It indicated hyperspectral imaging can be used to non-destructively determine banana color and firmness as well as classify ripe and unripe samples.

Keywords: /Banana/ /Quality/

Tattiyakul, T. and U. Siripatrawan. 2017. Shelf-life extension of **banana** fruit using a chitosan-containing photocatalyst. Acta Hortic 1179: 111-118.

Abstract

This research aimed to prolong the shelf-life of cultivated banana (*Musa acuminata* subsp. *siamea*) by using a chitosan coating containing a photocatalyst. Banana fruits at matured green stage were separated into three subgroups: (i) uncoated, (ii) coated with chitosan (CS), and (iii) coated with chitosan containing photocatalyst (CS+Ti). All samples were stored at room temperature (28±2°C). Changes in qualities of bananas including pH, color as determined by hue angle, total soluble solids (TSS), firmness, and sensory evaluation (including color, odor and firmness) were examined consecutively throughout the storage. Changes in pH, color, TSS, and firmness of uncoated banana were significantly faster ($p>0.05$) than those of CS and CS+Ti, respectively. The bananas coated with CS+Ti had a slower ripening process than those coated with CS and the control. The CS+Ti coating outperformed CS coating, and was proven to be able to maintain qualities and extend shelf-life of banana. These results were possibly due to the good oxygen-barrier property of chitosan and the ability to decompose ethylene of the photocatalyst incorporated into the chitosan coating, thus delaying the ripening process of the fruit.

Keywords: /Banana/ /Composite Film/ /Shelf Life/

CANTALOUPE

Nyarko, E., et.al. 2018. Listeria monocytogenes persistence and transfer to **cantaloupes** in the packing environment is affected by surface type and cleanliness. Food Control 85: 177-185.

Abstract

Investigation of the 2011 U.S. listeriosis outbreak associated with consumption of contaminated cantaloupes (*Cucumis melo* L) revealed that transfer of *Listeria monocytogenes* from equipment surfaces to melons in the packing facility was a potential route of contamination. The study presented here examined *L. monocytogenes* attachment and persistence on soiled materials and different types of equipment surfaces, and transfer to melons in a simulated-packing environment. Attachment involved the exposure of roller conveyors (polyvinyl chloride), conveyor belts (polyvinyl chloride, polyurethane, and nitrile rubber), and brush filaments (nylon and polyethylene) to ca. 7 $\log_{10}$ CFU/mL of a *L. monocytogenes* multi-strain inoculum for 10 and 60 min. *L. monocytogenes* showed similar ($p > 0.05$) attachment to all types of surfaces, and populations attached to surfaces following exposure for 10 min were not significantly different ($p > 0.05$) from that attached to surfaces after 60 min. Clean and soiled surfaces of nylon-brush filaments, conveyor belts, and foam pads were each inoculated with a *L. monocytogenes* multi-strain mixture (4.5 $\log_{10}$ CFU/mL) and subsequently stored at 25 ° C, and *L. monocytogenes* populations on the surfaces were recovered for up to 15 days. L. monocytogenes populations on clean surfaces decreased from 4.5 $\log_{10}$ CFU/surface on day 0 to the detection limit by day 14; *L. monocytogenes* was still present on clean surfaces following enrichment on day 21. However, *L. monocytogenes* populations remained unchanged on soiled surfaces from day 0-14. Multivariate ANOVA revealed that soiled surfaces significantly ($p < 0.05$) promoted *L. monocytogenes* persistence compared to clean surfaces. Comparison of clean surfaces revealed that foam pads and brushes significantly ($p < 0.05$) promoted *L. monocytogenes* persistence compared to conveyor belt materials. Conveyor belts and foam pads were spot-inoculated (2.5 $\log_{10}$ CFU/surface), and 15 consecutive wet melons were manually rolled over each spot (n = 6 replicates), and melons were tested for the presence/absence of *L. monocytogenes*. Foam pads were found to contaminate significantly ($p < 0.05$) more melons than conveyor belts (polyvinyl chloride, polyurethane, and nitrile rubber). Soiled surfaces supported the survival of higher populations of *L. monocytogenes*, and surface type affected *L. monocytogenes* contamination transferred to specific melons.

Keywords: /Cantaloupe/

CHERRY

Feng Dong and Xiaolin Wang. 2018. Guar gum and ginseng extract coatings maintain the quality of sweet **cherry**. LWT – Food Sci & Technol 89: 117-122.

Abstract

The present study was carried out to maintain the quality of sweet cherry by using the guar gum (GG) and ginseng extract (GSE) coatings during storage at 20 °C and 70–75% RH for 8 days. Coatings with 0.15% (m/v) GG + 0.1% (m/v) calcium chloride + 0.1% (m/v) glycerol + 1% (m/v) GSE presented the best characteristics to uniformly coat sweet cherry surface. Quality (weight loss, decay percentage, firmness), respiration rate, nutrient components (total soluble solids, titratable acid, ascorbic acid, total phenols, anthocyanins) and malondialdehyde evaluations were performed. Coatings with GG-GSE controlled water loss and delayed loss of firmness and of titratable acid, ascorbic acid and total phenols, compared with untreated fruit. Overall, coatings developed in this study extend sweet cherries' shelf life for about 8 days, demonstrating for the first time that the combination of guar gum and ginseng extract as edible coating materials has great potential in expanding the shelf life of fruits.

Keywords: /Cherry/ /Coatings/ /Quality/

CITRUS

Wenjun Wang, et.al. 2018. Control of green and blue mold and sour rot in **citrus** fruits by the cationic antimicrobial peptide PAF56. Postharvest Biol & Technol 136: 132-138.

Abstract

The ability of the short cationic antimicrobial peptide PAF56 (amino acid sequence GHRKKWFW) to control postharvest infectious diseases of citrus fruits was evaluated. PAF56 inhibited the growth of *Penicillium digitatum*, *Penicillium italicum* and *Geotrichum candidum*. The minimum inhibitory concentrations (MICs) of PAF56 for the control of *P. digitatum*, *P. italicum* and *G. candidum* were 8, 16, and 8 μM, respectively. The conidia of *P. digitatum*, *P. italicum* and *G. candidum* were also highly sensitive to PAF56. The peptide PAF56 could effectively control green mold, blue mold and sour rot on inoculated citrus fruits. Fluorescence microscopy with the fluorescent stains SYTOX Green (SG) and Calcofluor White (CFW) was used to characterize the modes of action and interaction of PAF56 with the mycelia of *P. digitatum*, *P. italicum* and *G. candidum*. SG and CFW signals indicated that PAF56 could inhibit the formation of spores and change the cell membrane permeability and cell wall structure. A range of concentrations of PAF56 (from 16 to 128 μM) showed no hemolysis or toxicity to human red blood cells (erythrocytes).

Keywords: /Citrus/

FIGS

Villalobos, M.C., et.al. 2018. Influence of modified atmosphere packaging (MAP) on aroma quality of **figs** (Ficus *carica* L.). Postharvest Biol & Technol 136: 145-151.

Abstract

The effect of passive modified atmosphere packaging (MAP) on the volatile compound profile of fig cultivars 'Cuello Dama Negro' (CDN) and 'San Antonio' (SA) during post-harvest storage was evaluated, to determine its impact on flavour and overall acceptability. Fruit was packaged using three types of microperforated films (ø = 100 μm): M10 (16 holes), M30 (five holes) and M50 (three holes); and a control macroperforated film (ø = 9 mm; five holes). The fruit were stored at 0 °C for 14 d. Fruit were also analysed after a period of shelf life at 20 °C for 2 d after cold storage. The volatile profile and its evolution during cold storage depended strongly on the fig cultivar. CDN displayed only moderate changes in the overall volatile profile for both, control and micro-perforated batches, during storage at 0 °C. In contrast, the volatile compound profile of SA was largely influenced by the duration of the cold storage and the shelf-life. Under refrigeration conditions, the micro-perforated M50 films allowed to delay changes in the volatile profile of SA, without negative influence on the fig flavour

Keywords: /Fig/ /Modified Atmosphere Packaging/

GRAPES

Constantinou, S, et.al. 2018. The impact of postharvest dehydration methods on qualitative attributes and chemical composition of 'Xynisteri' **grape** (*Vitis vinifera*) must. Postharvest Biol & Technol 135: 114-122.

Abstract

The objective of this study was to compare the effect of traditional sun-drying method (TM) with four alternative dehydration methods [(a) multiple horizontal wires (MHW), (b) multiple vertical pallets (MVP), (c) low greenhouse (LGH) and (d) hot-air dryer treatment (HAD)] on phenolic composition, oenological parameters, aroma potential and browning compounds of musts obtained from dehydrated grapes (*Vitis vinifera* cv. 'Xynisteri'). Dehydrated grapes of the examined cultivar are being used to produce 'Commandaria' dessert wine, a protected designation of origin product in Cyprus. LGH and HAD treatments led to a significant reduction of the dehydration period. Soluble solid contents were used to monitor the progress of dehydration process; no changes among the examined dehydration methods in reducing sugar composition were found. Notably, HAD led to a dramatic rise (3.2-fold) of titratable acidity that was obviously not related only to the concentration effect. Furthermore, all dehydration methods concentrated total bound volatiles and induced the formation of brown pigments. Based on the Folin-Ciocalteu index, only HAD and LGH induced a significant increase in total phenolic content in dehydrated grape musts. Subsequently, forty phenolic compounds were identified and quantified by LC-DAD-qTOF-MS. Results showed a significant effect of dehydration methods that vary according to the different groups of phenolic compounds considered. Similarly to Folin-

Ciocalteu index, HAD and LGH methods increased significantly the phenolic content in grape musts, whereas MHW and MVP methods increased it slightly higher than the concentration factor. Flavonols, flavan-3-ols and flavanonols were the most affected polyphenolic groups. A significant increment of hydroxybenzoic and hydroxycinnamic acids, the predominant groups of phenolic compounds found in 'Xynisteri' grapes, was monitored. Taking into consideration that HAD cannot be exploited under the existing legal framework, LGH showed the greatest potential for the production of high quality dehydrated 'Xynisteri' grape must.

Keywords: /Grapes/

GUAVA

Murmu, S.B. and H.N. Mishra. 2018. The effect of edible coating based on Arabic gum, sodium caseinate and essential oil of cinnamon and lemon grass on **guava**. Food Chem 245: 820-828.

Abstract

The effect of five coating formulations viz.: (A) 5% Arabic gum (AG) + 1% sodium caseinate (SC) + 1% cinnamon oil (CE); (B) 5% AG + 1% SC + 2% CE; (C) 5% AG + 1% SC + 1% lemongrass oil (LG); (D) 5% AG + 1% SC + 2% LG; and (E) 5% AG + 1% SC + 2% CE + 2% LG on guava during 35 days storage at 4–7 °C was investigated. Thereafter samples were allowed to ripen for five days at 25 ± 2 °C. The quality of guava was analyzed at an interval of 7, 21, 35 and 40 days. The coating applications resulted in lower activity of PPO & POD, higher DPPH radical scavenging activity, higher retention of ascorbic acid, phenol & flavonoid content, exhibited slower rise of reducing and total sugar in guava pulp. Samples in treatment B and D were the best formulations for extending shelf-life of guava up to 40 days versus seven days of uncoated samples.

Keywords: /Guava/ /Edible Coating/ /Shelf Life/

KIWIFRUIT

Jiangtao Suo, et.al. 2018. Characteristics of chilling injury-induced lignification in **kiwifruit** with different sensitivities to low temperatures. Postharvest Biol & Technol 135: 8-18.

Abstract

The extent of chilling injury (CI) of kiwifruit varies greatly among cultivars. The characteristics of CI-induced lignification and the effects of 1-methylcyclopropene (1-MCP) on CI of kiwifruit has been studied on *Actinidia chinensis* var. *chinensis* 'Hongyang' and *A. chinensis* var. *deliciosa* 'Xuxiang'. 1-MCP delayed and reduced the CI proportion of the

subcutaneous flesh. CI-induced lignification was mainly concentrated in the flesh of 'Hongyang' fruit, but in the core of 'Xuxiang'. The lignified cells were formed by the deposition of lignin particles on the inside of the cell wall. The accumulation of lignin in the flesh of both cultivars was decreased after treating with 1-MCP, but the more serious lignification was observed in core tissues, especially those of 'Xuxiang'. Activities of phenylalanine ammonia-lyase (PAL), cinnamyl alcohol dehydrogenase (CAD), and peroxidase (POD) involved in lignin synthesis were analyzed. 1-MCP increased PAL and POD activities in both flesh and core tissues of the two cultivars, whereas CAD activity was enhanced in the core and decreased in the flesh. The results indicated that 1-MCP is effective in controlling the occurrence of CI, but the associated induced fruit core lignification in particular cultivars can be serious.

Keywords: /Kiwifruit/ /1-Methylcyclopropene/

MANGO

Santo, D., et.al. 2018. Escherichia coli and Cronobacter sakazakii in 'Tommy Atkins' minimally processed **mangos**: Survival, growth and effect of UV-C and electrolyzed water. Postharvest Biol & Technol 135: 8-18.

Abstract

These studies were aimed at assessing the growing capacity of *Escherichia coli* and *Cronobacter sakazakii* and the effectiveness of Ultraviolet-C (UV-C) radiation, acidic electrolyzed (AEW) and neutral electrolyzed (NEW) waters in the inhibition of these bacteria on minimally processed 'Tommy Atkins' mangoes (MPM). The fruits were contaminated by dip inoculation and kept 10 days at 4, 8, 12 and 20 ° C while enumerating bacteria. Contaminated mangoes were disinfected using UV-C (2.5, 5, 7.5 and 10 kJ/m2), AEW, NEW and sodium hypochlorite (SH) and the microorganisms were monitored. None of the enterobacteria grew at 4, 8 and 12 ° C regardless of having persisted during the 10-day period. At 20 ° C, *E. coli* and *C. sakazakii* grew, after adaption phases of 48 h and 24 h, to values of 8.7 and 8.5 log cfu/g at day eight, respectively. E. coli showed the highest reduction counts on the MPM washed with NEW and SH (2.2 log cfu/g). UV-C was more effective in reducing *C. sakazakii* (2.4e2.6 log cfu/g), when compared to AEW, NEW and SH (1.2e1.8 log cfu/g). The efficacy of decontamination technologies depends on microorganisms, highlighting the importance of preventing contamination at the primary production and of combining different methods to increase the safety of fresh-cut fruits.

Keywords: /Mango/ /Minimally Processed/

PEACH

Shaolei Guo, et.al. 2018. Genome-wide identification and expression analysis of beta-galactosidase family members during fruit softening of **peach** [Prunus *persica* (L.) Batsch]. Postharvest Biol & Technol 136: 111-123.

Abstract

Plant β-galactosidase (β-Gal) is an important glycosyl hydrolase, which is associated with cell wall biogenesis and modification during fruit softening. However, the roles of *β*-Gal family members in peach fruit softening remain unclear. In the present study, we identified 17 *PpBGAL* genes in peach genome, and these were investigated using bioinformatics including chromosomal locations, phylogenetic relationships, gene structure and domain and promoter analyses. Furthermore, quantitative real-time PCR analysis during fruit storage of four peach varieties with different softening characteristics suggested that *PpBGAL* genes, especially *PpBGAL2* and *PpBGAL16*, may be required for peach fruit softening. These results will be useful for further functional analyses of the *β*-Gal gene family in plants.

Keywords: /Peach/

PEAR

Aparicio-Fernandez, X., et.al. 2018. Physical and antioxidant characterization of edible films added with Red Prickly **Pear** (Opuntia ficus-indica L.) cv. San Martín Peel and/or its aqueous extracts. Food Bioprocess Technol 11: 368-379.

Abstract

The aim of this research was to investigate the effect of the addition of peel powder and/or its aqueous extract on physical and antioxidant characteristics of carboxymethyl cellulose (CMC) edible films. Prickly pear peel powder and aqueous extract (2 and 4%) were characterized in color, bio-active compounds (betalains and total phenolic compounds), antioxidant capacity and reducing power. Edible films were prepared with CMC, glycerol, varying the dissolution medium (0, 2, or 4% aqueous extract from prickly pear peel) and peel powder (0, 1, or 2%) using a face-centered central composite design. Physical, mechanical, bioactive compounds, and anti-oxidant capacity properties were investigated in edible films. Prickly pear peel powder presented 58.8 ± 0.08 mg of betacyanins/100 g, 53.8 ± 0.2 mg of betaxanthins/100 g, 967.8 ± 20 mg Gallic acid equivalent (GAE)/100 g for total phenolic compounds, an antioxidant capacity equivalent to 420.9 ± 4.9 mg GAE/100 g and a reducing power of 879.1 ± 115.9 mg ascorbic acid equivalent (AAE)/100 g. High concentration of aqueous extract and peel powder in CMC films increased the bioactive compound content, anti-oxidant capacity and reducing power. Films mechanical properties were not affected by the aqueous extract; nevertheless, were strongly affected by the peel powder. Response

surface methodology was used to optimize edible films formulation with high antioxidant characteristics, being the optimal formulation 1.7% of peel powder plus 3.3% of aqueous extract. This study may be the base for exploitation of prickly pear peel as source of bioactive compounds with antioxidant capacity for their use in edible coatings.

Keywords: /Pear/ /Edible Films/

Iglesias M.B., et.al. 2018. Efficacy of *Pseudomonas graminis* CPA-7 against *Salmonella* spp. and *Listeria monocytogenes* on fresh-cut **pear** and setting up of the conditions for its commercial application. Food Microbiol 70: 103-112.

Abstract

Pseudomonas graminis CPA-7 has been reported to control foodborne pathogens on fresh-cut apple, peach and melon. The first aim of this study was to assess its antagonistic activity against *Salmonella* spp. and *L. monocytogenes* on fresh-cut pear. CPA-7 was able to control both pathogens on fresh-cut pear stored in air conditions at 5, 10 and 20 ° C. However, when CPA-7 antagonistic effect was tested by simulating commercial application (with antioxidant solution and passive modified atmosphere packaging), its effect decreased and no reductions of foodborne pathogens were reported at 10 ° C. Therefore, the second aim was to optimise the antioxidant solution and the packaging in order to retain its antagonistic capacity. The selected antioxidant solution was 2% ascorbic acid +2% sodium citrate +1% $CaCl_2$ according to growth and effect of CPA-7. Film permeability, which affects gas composition inside fruit packages, influenced CPA-7 efficacy. If the biopreservative strain is used, film has to be sufficiently gas permeable to allow CPA-7 function and at the same time to maintain product quality.

Keywords: /Pear/ /Fresh Cut/ /Modified Atmosphere/ /Fruit Quality/

Yu Dong, et.al. 2018. Compositional changes in cell wall polyuronides and enzyme activities associated with melting/mealy textural property during ripening following long-term storage of 'Comice' and 'd'Anjou' **pears**. Postharvest Biol & Technol 135: 131-140.

Abstract

Irregular ripening is a major deterrent for the purchase of European pears. Cell wall polyuronides and related-modifying enzymes were investigated in two European winter pears, 'Comice' and 'd'Anjou', during ripening at 20 °C following 5 and 8 months of storage at −1.1 °C. Both pear cultivars developed a melting (buttery-juicy) texture and higher water-soluble polyuronides (WSP) in flesh tissue after 5 months, but the pears' texture quality decreased and a mealy (coarse-dry) texture presented in 'Comice' pear after long-term storage. Activities of pectin methylesterase (PME) and α-arabinofuranosidase (α-ARF) in 'Comice' pears was positively correlated with texture development, whereas in 'd'Anjou' pears polygalacturonase (PG), PME, cellulase (CEL), and β-galactosidase (β-GAL) were more

highly correlated with texture. 1-MCP reduced pear ripening by inhibiting ethylene production and the activities of cell wall-modifying enzymes, maintaining higher antioxidants, and alleviating membrane lipid peroxidation. These results indicated melting texture developed in European pears as a result of the synthesis of WSP and increase of PME activity during pear fruit softening.

Keywords: /Pear/ /Ripening/

PERSIMMON

Aktaruzzaman, Md., et.al. 2018. The occurrence of postharvest gray-mold rot of sweet **persimmon** caused by Botrytis cinerea in Korea. Eur J Plant Pathol 150: 245-251.

Abstract

In this study, we identified the causative agent of postharvest gray-mold rot in sweet persimmon fruit that were collected from Gangneung, Gangwon Province, Korea in October 2016. Symptoms included extensive growth of mycelia on post harvested fruit. The fungus was isolated from infected fruit and cultured on potato dextrose agar (PDA). For identification of the fungus, we examined morphology characteristics and rDNA sequencing analysis of the fungus and confirmed its pathogenicity according to Koch's postulates. The results of morphological examinations, pathogenicity tests, 5.8S rDNA sequences of the internal transcribed spacer regions (ITS1 and ITS4) and the five nuclear protein-coding genes *G3PDH*, *HSP60*, *RPB2*, *MS547* and *TUB* revealed that the causal agent of postharvest gray-mold rot on sweet persimmon fruit in Korea was *Botrytis cinerea*.

Keywords: /Persimmon/ /Postharvest/

Liamnimitr, N., et.al. 2018. Optimization of bulk modified atmosphere packaging for long-term storage of 'Fuyu' **persimmon** fruit. Postharvest Biol & Technol 135: 1-7.

Abstract

An optimal design procedure for bulk modified atmosphere packaging (MAP) that would enable the long-term storage of 'Fuyu' persimmon fruit for export market was proposed in this study. Initially, the lower O_2 limit of aerobic respiration was determined, based on the respiratory quotient breakpoint, and found to be 0.65 kPa. Next, the parameters of a Michaelis–Menten type respiration model were estimated, and they were used to predict the O_2 consumption rate at 1.5 kPa, which was set as the target O_2 partial pressure inside the package and is considered safe to avoid fermentation. Then, the values of the predicted respiration rate, the surface area of the packaging, and the sample weight were substituted into the mathematical model to calculate the gas composition change inside the package; as a result, the necessary O_2 permeance of the packaging film material

was estimated as 2.59 × 10−7 L m^{-2} s^{-1} kPa^{-1} for the prospective bulk packaging system. Finally, the efficacy of the designed bulk MAP on the quality changes in the fruit was practically examined by comparing the MAP performance to that of fruit in an individual package (having 60-µm thick low-density polyethylene film bag) and to that of non-packed fruit (i.e., control). All the samples were stored under conditions simulating the long-term storage and subsequent transportation of fruit from Japan to Thailand. The results revealed that the O_2 concentration at a steady state in the designed bulk MAP could be established at 1.3–1.6 kPa, which successfully corresponded with the target value. Furthermore, losses in flesh firmness and color, and the external damage of fruits were reduced in the bulk MAP when compared to storage in the other two package treatments. Overall, the bulk MAP designed could be used for ca. 4 months storage of 'Fuyu' persimmon fruit and for its commercial application to maintain fruit quality and to export fruit to international markets.

Keywords: /Persimmon/ /Storage/ /Modified Atmosphere Packaging/

PINEAPPLE

Xueping Li, et.al. 2018. Postharvest application of wax controls **pineapple** fruit ripening and improves fruit quality. Postharvest Biol & Technol 136: 99-110.

Abstract

Pineapple (*Ananas comosus* (L.) Merr.) fruit ripen and soften rapidly after harvest. This study focused on examining the effect of wax application on the ripening and storage quality of the fruit. An optimized waxing treatment (65 g L^{-1} for 1 min) could effectively control fruit ripening by delaying fruit color change, decreasing the respiration rate and ethylene production, decreasing content of organic acids and relieving the symptoms of internal browning of pineapple fruit. Waxing enhanced the relative level of pentose phosphate pathway of respiration and affected the enzymes involved in organic acid metabolism. Waxing also reinforced the anti-oxidant system and enhanced the expression levels of genes related to defense, such as *PGIP*. These results indicated that wax treatment could effectively improve the fruit quality, mainly through the reduction of organic acid content.

Keywords: /Pineapple/ /Ripening/

POMEGRANATE

Czieczor, L., et.al. 2018. Non-invasive determination of the quality of **pomegranate** fruit. Postharvest Biol & Technol 136: 74-79.

Abstract

In the apparent absence of non-invasive studies of the glossiness and roughness of pomegranate fruit (cv. 'Hicaz') during storage, we investigated changes in their surface micro-structure using two new non-destructive technologies: a profilometer providing 3D digital photography and surface roughness as visual and parametric roughness (Ra; Rz) as well as glossiness by non-invasive luster sensor technology. The 3D intact sections of the pomegranate showed a shimmering surface with fresh fruit, but a rough structure in the RGB images after three weeks storage, associated with a wider range of values, i.e. higher peaks and lower troughs over time, which was visualised in the images.

The roughness coefficients Ra and Rz, provided by the 3D-profilometer, confirmed the colour-coded visualization in the false images and increased with storage time: The roughness values (Ra) were 11 µm for the fresh pomegranate fruit with a smooth peel; 24 µm with aged pomegranate and 43 µm with the old shriveled fruit. The Rz values were 69 µm for the fresh pomegranate fruit with the smooth surface, 148 µm at the intermediate pomegranate and 255 µm for old fruit.

During the three weeks storage, the luster values of red or yellow, non-russet peel sections decreased more rapidly from 90 to 50 arbitrary units (a.u.) than those of the russet peel; the latter areas with a rough appearance showed significantly lower luster values of ca. 40 a.u. compared with the russet-devoid areas. Luster and roughness values were always inversely correlated and confirmed their visual appearance. The lack of significant differences between the luster values of the red and yellow peel portions supports our hypothesis that colour plays an insignificant role in this luster/gloss detection, and proves the suitability of this innovative real-time, contactless and cost-effective sensor technology as a novel evaluation used in post-harvest technology.

Keywords: /Pomegranate/ /Fruit Quality/ /Storage/

STRAWBERRY

Yanzhen Wei, et.al. 2018. The combined effects of tea tree oil and hot air treatment on the quality and sensory characteristics and decay of **strawberry**. Postharvest Biol & Technol 136: 139-144.

Abstract

In this study, the antifungal activities of tea tree oil (TTO) combined with hot air (HA) treatment against *Botrytis cinerea*, the causal agent of strawberry gray mold, was tested *in vitro* and *in vivo*. Results showed that both TTO and HA treatment inhibit mycelial growth and destroy the hyphal ultrastructure of *B. cinerea*. The combined treatment (TTO + HA) results in a significantly synergistic effects in *in vitro* tests. Compared with control fruit, each treatment (TTO, HA, TTO + HA) reduced the gray mold in strawberry fruit inoculated with *B. cinerea*, the combined treatment resulted in lowest decay incidence and lesion diameter. The combined treatment also induced higher activities of chitinase (CHI) and β-1, 3-

glucanase (GLU) and these strawberries subjected to this combined treatment maintained a better commercial quality as measured by firmness, TSS, a* value and sensoryevolution, than those treated with TTO or HA alone. It was concluded that combined TTO and HA treatment of strawberry fruit is more effective at controlling decay and maintaining fruit quality than single treatment, that may be a potential strategy for commercial application in strawberries.

Keywords: /Strawberry/

VEGETABLES

BEAN

Jones, M.S., et.al. 2018. Economic consequences of post-harvest insect damage in Rwandan common **bean** markets. Crop Prot 104: 92-100.

Abstract

Post-harvest losses have major economic consequences for smallholders in sub-Saharan Africa. One significant contributor to economic losses is price penalties for poor quality marketed grain. This study investigates farmgate level discounts demanded by rural Rwandan bean traders for insect-damaged common beans. We use a simplified contingent valuation methodology with physical bean samples to elicit seasonal damage discount schedules based on data from 270 trader interviews in 25 regionally-diverse rural markets, in periods of both common bean abundance and scarcity. While levels of 5–10% insect damage can generally be sold with a moderate discount, beans with 20–30% insect damage are largely unmarketable. We model the physical and non-physical drivers of buying insect-damaged beans and, if so, the extent of discounts demanded. Results indicate that while insect damage levels play a central role, large volume traders penalize damage less while traders in the seed market, storing before re-sale, or purchasing heavily from farmers (vs. other traders) penalize damage significantly more. Findings help develop more evidence-based extension programming and methods could be adapted as an easily implemented and potentially insightful model for developing country agencies. Additionally, derived discount coefficients help evaluate the cost-effectiveness of technologies throughout the region which prevent post-harvest damage.

Keywords: /Bean/ /Postharvest Losses/ /Storage/

BROCCOLI

Ben-Fadhel, Y., et.al. 2018. Combined post-harvest treatments for improving quality and extending shelf-life of minimally processed **broccoli** florets (Brassica oleracea var. italica). Food Bioprocess Technol 11: 84-95..

Abstract

Broccoli is an important source of many nutritional and bioactive compounds. However, its shelf-life is very short due to physicochemical losses and microbiological degradation. This study was undertaken to implement treatments that could improve the quality of ready-to-eat (RTE) broccoli during storage by evaluating the effect of pre-treatment with calcium chloride ($CaCl_2$) and alginate coating on the physico-chemical and microbial properties of RTE broccoli. Broccoli florets were pre-treated with three different concentrations of $CaCl_2$ (1, 2.5, and 4 g L^{-1}), then coated with an alginate formulation (13 g L^{-1}) and stored at 4 °C for 24 days. Texture, color, weight loss, respiration rate, and total mesophilic flora (TMF) counts were evaluated at days 0, 3, 7, 14, and 24 of storage. The obtained results in this study showed that combining pre-treatment with calcium and alginate coating led to reducing the weight loss and respiration rate of broccoli, maintaining its color and texture as well as extending its shelf-life by 6 days. These results not only allowed reducing post-harvest losses resulting in the loss of the product but also have a major impact on the environment and resources involved in the production process.

Keywords: /Broccoli/ /Minimally Processed/ /Edible Coating/ /Shelf Life/

CABBAGE

Kim, H.W., et.al. 2018. Predictive modeling of bacterial growth in ready-to-use salted napa **cabbage** (Brassica pekinensis) at different storage temperatures. Food Microbiol 70: 129-136.

Abstract

The objectives of the current study were to investigate the fate of microbial indicators [aerobic plate counts (APC), total coliforms (TC), and lactic acid bacteria (LAB)] in commercial salted napa cabbages during storage conditions at different temperatures (5, 22, and 30 ° C, for up to 72 h) and to develop a predictive growth model using the modified Gompertz equation to determine shelf life. Microbial population sizes (initial log CFU g^{-1}: APC, 5.1; TC, 3.0; LAB, 3.7) remained stable at 5 ° C, but rapidly increased by 2-4 log CFU g^{-1} within 12 h at 22 and 30 ° C; furthermore, the pH of salted napa cabbages decreased significantly ($P < 0.05$: initial pH 6.3; final pH 4.1-4.4) due to LAB fermentation. The pH showed a negative correlation with all bacterial groups and did not prevent the growth of TC during storage. According to the modified Gompertz model ($R^2 \geq 0.97$), the highest μmax was observed for LAB at 30 ° C [0.61 log CFU h^{-1}], while the lowest was noted for TC at 5 ° C [0.04 log CFU h^{-1}]. Shelf-life was determined using APC (7.7 log CFU g^{-1}) and LAB (6.0 log CFU g^{-1}) limits; the microbiological acceptability period of salted napa cabbage was predicted to be 12.6 and 9.3 h at 22 and 30 ° C, respectively. Thus, consumers should use the product within 12 h of storage at room temperature (more quickly in the summer (9 h)), or store it in a refrigerator. The presented research proposes a shelf-life modeling of commercial salted

napa cabbages, which may be used as a scientific basis for product quality control and issuing appropriate guidance for consumer use at home.

Keywords: /Cabbage/ /Storage/ /Shelf Life/

LETTUCE

Murray, K., et.al. 2018. Dynamic changes in free-chlorine levels within a commercial postharvest wash and prevention of cross-contamination between shredded **lettuce** batches. Food Control 85: 127-134.

Abstract

The dynamic changes in free-chlorine levels within a commercial shredded lettuce washing process and implications for preventing cross-contamination by human pathogens during processing has been determined. The commercial lettuce processing line incorporated a pre-wash in Wash Tank 1 followed by a biocidal wash in Wash Tank 2. Within the commercial wash process, the free-chlorine concentration fluctuated in a cyclic pattern (ranging from 4 to 27 ppm) in Wash Tank 1 but was depleted within Wash Tank 2 (low as 0.1 ppm). Despite the variation in free-chlorine levels the Oxidation Reduction Potential of the wash tanks remained stable and consequently there was no significant correlation to free-chlorine levels and ORP (r^2 = 0.37). From analysis of the spent wash water it was found the Chemical Oxygen Demand (COD) was significantly higher in Wash Tank 1 (>5000 mg/l) compared to Wash Tank 2 (800 e1001 mg/l). Significantly, both wash tanks operated below the chlorine demand that partly explained the inability to maintain constant free-chlorine levels. In laboratory studies, the spent wash water (containing disinfection byproducts) from the Wash Tanks supported inactivation of *Salmonella* (>3 log cfu reduction), *Listeria monocytogenes* (>4 log cfu reduction) and *Escherichia coli* O157:H7 (1e3 log cfu reduction). By adding chlorine beyond the chlorine breakpoint it was possible to achieve >4 log cfu reduction of the aforementioned pathogens, in addition to minimizing cross-contamination events between batches. The study has illustrated that commercial wash tanks for leafy greens operate below the chlorine breakpoint and hence maintaining specific free chlorine levels would be an unsuitable monitoring metric. Although disinfection byproducts contributed to antimicrobial capacity of the wash tank water it would be challenging to designate a specific limit of free-chlorine for purpose of process monitoring.

Keywords: /Lettuce/ /Postharvest Wash/

Saltveit, M.E. 2018. Anaerobic exposure before or after wounding reduces the production of wound-induced phenolic compounds in fresh-cut **lettuce**. Postharvest Biol & Technol 135: 77-82.

Abstract

Wounding lettuce (*Lactuca sativa* L., Longifolia) leaves by excising 5-mm thick mid-rib segments increased phenylpropanoid metabolism with the synthesis and accumulation of wound-induced phenolic compounds (WIPC). Immersing freshly excised segments for 1 h in 20 °C water agitated with air or N2 produced a 45% or 65% reduction in wound-induced phenolic content, respectively, compared to non-immersed segments when measured after incubation for 48 h at 10 °C in air. In contrast, agitating the water with O_2 produced a 23% increase in WIPC over the non-immersed controls. The enhanced reduction of WIPC in N_2 versus air agitated water, and the increase in WIPC in O_2 agitated water suggests that anaerobiosis, and not dilution of the wound signal, was the cause of the reduction in WIPC. Holding 5-mm segments in an anaerobic N_2 atmosphere produced a similar reduction in WIPC as did holding the segments in water. Delaying the 1 h anaerobic treatment for up to 3 h had no significant effect on the ability of the anaerobic treatment to reduce WIPC. Exposing 8-cm long mid-rib sections to anaerobiosis for 2 h before excision of the 5-mm segments reduced subsequent WIPC from the 5-mm segments. The previous anaerobic treatment of the 8-cm sections predisposed the tissue to have a reduced response to subsequent wounding. After a 2 d lag in WIPC accumulation, the rates of accumulation were similar for the air and 2 h anaerobic treated 5-mm segments. Using vacuum treatments to facilitate the loss of volatile products of anaerobic metabolism (e.g., acetaldehyde and ethanol) did not have a significant effect on the accumulation of WIPC. Ion leakage from the symplastic volume of the tissue (i.e., across the cell membrane) was unaffected by the anaerobic treatments, but leakage from the apoplastic volume increased with increasing duration of the anaerobic treatment. Immersing fresh-cut lettuce in an aqueous solutions did not reduce the wound response because of dilution of the wound signal, but because of the anaerobic environment created within the tissue. Some remnant of the anaerobic treatment seems to persist in the tissue and delay the accumulation of WIPC.

Keywords: /Lettuce/ /Browning/

TOMATO

Goffar, M.A., et.al. 2017. Evaluation of AVRDC **tomato** advanced lines for high yield, multiple disease resistance and long shelf life in Bangladesh. Acta Hortic 1179: 311-316.

Abstract

Tomato is one of the most important vegetables in Bangladesh and other countries worldwide. The Bangladesh Agricultural Research Institute (BARI) and seed companies have supplied several open-pollinated and hybrid tomato cultivars for commercial production in the country. However, most of these cultivars are susceptible to viral and wilt diseases and the fruit have poor shelf life; therefore, these cultivars are not desired by farmers. This study was conducted to evaluate nine advanced lines from AVRDC – The World Vegetable Center (AVRDC) (CLN3940, CLN3946, CLN3947, CLN3948, CLN3949, CLN3953, CLN3954,

CLN3961 and 'Tanya') for yield, disease resistance and keeping quality. BARI cultivar 'Tomato-14' was used as the local control. The tomato lines differed significantly in most of the parameters studied. Flowering of the advanced lines was more uniform and earlier than in the control, except for CLN3946. Plant height of the advanced lines was also more than 30 cm taller despite a determinate growth habit compared with the semi-determinate control, except for CLN3947, CLN3953 and 'Tanya'. No entries showed symptoms of early blight, bacterial wilt, Fusarium wilt or southern blight disease. Slight damage by late blight disease and yellow leaf curl disease was noted only in CLN3953, which was similar to that of the control cultivar, while 'Tanya' was more severely affected. The other lines did not show any of these diseases. Damage by tomato fruit borer was noted only in CLN3949 and 'Tanya'. Yield was highest in CLN3946 and CLN3948, with more than 3 kg $plant^{-1}$ or more than 80 t ha^{-1}. CLN3949 and CLN3954 had similar yields to the control (73 t/ha). The other lines had lower yields than the control, with 'Tanya' as the lowest yielder (less than 2 kg $plant^{-1}$ or about 48 t ha^{-1}). Shelf life was found to be longest (18-20 days) in CLN3946, CLN3948, CLN3949 and CLN3954 fruits whereas the shelf life of control fruits was only 10 days. However, these four lines showed relatively lower firmness, soluble solids and vitamin C content than the control. It will thus be worthwhile to verify further the performance of these four promising lines in advanced yield trials.

Keywords: /Tomato/ /Fruit Quality/

Jian Zou, et.al. 2018. Transcriptome analysis of aroma volatile metabolism change in **tomato** (*Solanum lycopersicum*) fruit under different storage temperatures and 1-MCP treatment. Postharvest Biol & Technol 135: 57-67

Abstract

Temperature control and ethylene inhibitor 1-methylcyclopropene (1-MCP) treatment are the main techniques for increasing the shelf life of tomato (*Solanum lycopersicum* L.) fruit. However, these techniques could strongly affect the aromatic flavor of tomato. In this study, RNA-sequencing was employed to characterize the transcriptomic profiles of cherry tomato fruit, harvested at breaker stage, during postharvest storage under different temperatures (25 °C, 10 °C, and 4 °C) and at 10 °C after 1-MCP treatment. Results showed that storage temperature remarkably affected the expression of numerous genes in tomato fruit, especially on several key genes associated with aroma volatile biosynthesis. It was found that 33 genes presented significantly different expression between 10 °C and 25 °C, and in particular, five genes expressed significantly lower at 10 °C than that at 25 °C, including *CCD1*, *GOT1*, *ADH2*, *PDC1-like1*, and *PDC1-like2*, mainly involved in the syntheses of pseudoionone, β-ionone, phenylacetaldehyde, phenylethylalcohol, *cis*-3-hexenol, and *trans*-3-Hexenol. The expression level of other 14 genes associated with aroma volatile biosynthesis was lower at 4 °C than that at 10 °C, among which, five genes, including *TPS24*, *PDS*, *ACOT9-like*, *ADH2* and *AAT* were directly related to the bio-synthesis of terpenoids, alcohols and esters. Only few genes associated with aroma volatiles were affected by 1-MCP treatment at 10 °C. The presented results implied that the recommended storage

temperature of 10 °C is able to result in a significant negative effect on the aromatic flavor of tomato at the gene transcriptional level, which could explain the flavor loss of tomato under market storage temperatures (8–12 °C) and household refrigerator temperatures (3–5 °C). To be mentioned, our results provide strong evidence that 10 °C, as the recommended storage temperature for tomato fruit, is not ideal to maintain the flavor quality of tomato, and 1-MCP treatment under 10 °C cannot further affect the flavor quality of tomato fruit compared with that at 10 °C alone.

Keywords: /Tomato/ /Storage Temperature/

Junliang Lin, et.al. 2018. Identification of circular RNAs and their targets during **tomato** fruit ripening. Postharvest Biol & Technol 136: 90-98.

Abstract

Circular RNAs (circRNAs) have been found to be highly abundant and evolutionarily conserved in both animals and plants. Tomato is a widely characterized model plant, but very little information is available about the feature and functions of circRNAs in this species. In the present study, to invest whether circRNAs are involved in fruit ripening process, we used deep sequencing to monitor the changes in circRNAs between mature green tomato fruit and red ripening ones. A total of 705 circRNAs were detected in these two samples, of which 340 were differentially regulated. CircRNAs were reported to function as cis-regulator and miRNA sponge to regulate physiological and biochemical metabolism in animals. In this study, 19 differentially expressed circRNAs were found to function as putative miRNA sponges to regulate the expression of 94 target mRNAs. Furthermore, Gene Ontology (GO) enrichment and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway annotation of both parent genes and target mRNAs were performed to reveal the functions of differentially expressed circRNAs during ripening. The results revealed that circRNAs may be involved in regulating fruit ripening by mediating metabolism adaptation, hormone balance, and photosynthesis related pathways. Besides, circRNAs were predicted to be involved in transcription regulation through targeting transcription factors such as ethylene-responsive transcription factor (ERF), squamosa promoter binding-like protein (SBP) and myeloblastosis (MYB) proto-oncogene protein. These results shed light on the role of circRNAs in fruit ripening and help to identify novel circRNAs in tomato

Keywords: /Tomato/ /Ripening/

HERBS AND SPICES

BASIL

Patino, L.S., et.al. 2018. Influence of 1-MCP and modified atmosphere packaging in the quality and preservation of fresh **basil**. Postharvest Biol & Technol 136: 57-65.

Abstract

A study was conducted to assess the individual and combined effect of 1-methylcyclopropene (1-MCP) and modified atmospheres packaging (MAP) in preserving basil (*Ocimum basilicum* L.) leaves. Fresh samples were stored at 11 °C and 85% RH, by packing them in sealed LDPE bags and in open macro-perforated LDPE bags with and without previous exposition to 1-MCP. Preliminary evaluations were performed to define a suitable 1-MCP dose in solution and exposure time being these, 0.3 cm^3 m^{-3} and 24 h, respectively, and to preconfigure the MAP system with satisfactory gas levels, obtaining steady concentrations inside the packaging of ca. 10.5% of O_2 and 4.2% of CO_2. The combined treatment of MAP and 1-MCP increased the storage life of the basil leaves up to 18 days, compared to 9 days in the control samples (stored at 11 °C in open bags without 1-MCP exposure), delaying changes in the evaluated quality properties

Keywords: /Basil/ /Shelf Life/ /1-Methylcyclopropene/

BLACK PEPPER

Collings, E.R., et.al. 2018. Effect of UV-C on the physiology and biochemical profile of fresh *Piper nigrum* berries. Postharvest Biol & Technol 136: 161-165.

Abstract

Application of UV-C has been shown to enhance the biochemical profile of various plant materials. This could be used to increase biochemical load, reducing the amount of material required but still impart equivalent flavour. As spices, such as black pepper (*Piper nigrum* L.), are typically dried to low moisture content to create a stable product for transportation and storage, little work has explored the use of modern postharvest treatments to enhance flavour. In this work, fresh *P. nigrum* berries were exposed to four UV-C doses (0, 1, 5 and 15 kJ m^{-2}) and subsequently stored at 5 °C for ca. 4 weeks. Two separate experiments (early and late season) were conducted across one season. Replicate *P. nigrum* berry clusters were stored separately within continuously ventilated 13 L boxes. Real-time respiration rate (*ex situ*), ethylene production, fruit colour and water potential were measured at regular intervals during storage. In addition, piperine and essential oils were assessed using a simple newly developed method which enabled both compound groups to be simultaneously extracted and subsequently quantified. UV-C was found to cause significant changes in colour (from green to brown) whilst also altering the

biochemical composition (piperine and essential oils), which was influenced by UV-C dose and berry maturity. Low to medium UV-C doses could potentially enhance flavour compounds in black pepper enabling processors to create products with higher biochemical load.

Keywords: /Black Pepper/

HABANERO PEPPER

Perez-Ambrocio, A., et.al. 2018. Effect of blue and ultraviolet-C light irradiation on bioactive compounds and antioxidant capacity of **habanero pepper** (Capsicum chinense) during refrigeration storage. Postharvest Biol & Technol 135: 19-26.

Abstract

The aim of this study was to evaluate the effect of blue and UV-C light as abiotic stress on bioactive compounds and antioxidant capacity of habanero pepper (*Capsicum chinense*) stored under close package and low temperature (4–5 °C). Habanero peppers were harvest at immature condition (green color), disinfected and irradiated with blue (0, 1.5 and 3 min) and UV-C (0, 0.5 and 1 min) light following a face-centered central composite design. Pepper were evaluated for color parameters, chlorophylls, total carotenoids, total flavonoids, phenolic compounds, total capsaicin and antioxidant capacity for 30 d. Color parameters indicate that low temperature and closed packaging maintain habanero pepper green color, corroborated by the low change in chlorophyll and total carotenoids during storage. On the other hand, both lights stimulated the synthesis of all bioactive compounds evaluated and consequently the antioxidant capacity. However, in some bioactive compounds such as chlorophylls and total carotenoids, the effect was appreciable only in the first days of storage. Habanero pepper treated with a combination of 3 min of blue light plus 0.5 min of UV-C light showed the higher bioactive compounds and antioxidant capacity during storage. At the end of storage, the proposed design indicates that 3 min of blue light treatment plus 0.43-0.92 min of UV-C light (depends of the compounds) was the optimal combination to increase habanero pepper bioactive compounds. This study is a first approach to evaluate the effect of combined irradiation treatment as abiotic stress to enhance habanero pepper bioactive compounds and its antioxidant capacity.

Keywords: /Habanero Pepper/ /Storage/

TUBERS AND ROOTCROPS

POTATO

Licciardello, F., et.al. 2018. Integrated agronomical and technological approach for the quality maintenance of ready-to-fry **potato** sticks during refrigerated storage. Postharvest Biol & Technol 136: 23-30.

Abstract

The paper addresses the effect of nitrogen fertilization rate, storage time, packaging film and locust bean gum (LBG)-based edible coating on the quality maintenance of fresh-cut ready-to-fry potato sticks. Quality change was assessed monitoring color and firmness, microbiological parameters and content of bioactive components. Results demonstrate that the highest (280 kg ha^{-1}) nitrogen fertilization rate determines rapid color changes, lower firmness and faster microbial (total mesophilic bacteria and yeasts and molds) growth. Similarly, excess in nitrogen fertilization rate determines lower ascorbic acid levels and a faster loss of nutritional value during storage, while the LBG coating was effective at reducing color changes and microbial growth. Results highlight the need for accurate management of nitrogen fertilization in order to obtain high quality fresh-cut potato sticks, and point out that excess nitrogen fertilization levels enhance the proneness to physical, microbial and nutritional changes.

Keywords: /Potato/ /Fresh-cut/ /Potato Quality/ /Storage/

Sinha, R., et.al. 2018. FAIMS based volatile fingerprinting for real-time postharvest storage infections detection in stored **potatoes** and onions. Postharvest Biol & Technol 135: 83-92.

Abstract

Field asymmetric ion mobility spectrometry (FAIMS) was evaluated towards rapid and non-destructive detection of storage infections under varied storage conditions. Potato tubers and onion bulbs were inoculated with *P. carotovorum* subsp. *carotovorum* (causing soft rot) and *B. cepacia* (causing sour skin), respectively; and were incubated at room (around 25 °C) and reduced temperature condition (4 °C). Additional tubers and bulbs were inoculated with sterile water, which served as healthy controls. At room temperature, FAIMS could detect potato soft rot and onion sour skin pertinent volatile organic compounds (VOCs) as early as 1 and 3 day(s) after inoculation (DAI) for potato tubers and onion bulbs, respectively. At a reduced temperature (4 °C), the respective detection time frames were 11 and 16 DAI. Principal component analysis (PCA) based contribution analysis on FAIMS dispersion field data revealed a significant range of dispersion field (DF) intensity (52%–72%) and compensation voltage (CV) (−1.30 V to −0.90 V) that can potentially be used to train FAIMS for triggering an alarm during real-time monitoring of soft rot pertinent

VOCs. This critical range was 47%–77% DF and −0.24 V to 0.48 V CV for sour skin pertinent VOCs. Naïve Bayes (NB) and linear discriminant analysis (LDA) classifiers tested on PCA datasets reported overall accuracies in the range of 71–100% and 69–100% for soft rot and 63–97% and 58–100% for sour skin, respectively. Higher accuracies were reported as days after inoculation progressed. Baseline sensing of different VOCs using FAIMS revealed that ethanol, acetone, 2-butanone and ethyl acetate were specifically contributing to *P. carotovorum* subsp. *carotovorum* caused soft rot peaks whereas pentane and 1-butanol were associated with healthy as well as inoculated tubers. Dimethyl disulfide, dipropyl disulfide, methyl propyl disulfide, undecane and 2-undecanone were found to be associated with healthy controls as well as with sour skin infected onion bulbs.

Keywords: /Potato/ /Onion/ /Storage/

ORNAMENTALS

ROSE

Woltering, E.J. and M.J.M. Paillart. 2018. Effect of cold storage on stomatal functionality, water relations and flower performance in cut **roses**. Postharvest Biol & Technol 136: 66-73.

Abstract

Symptoms of water stress are the most frequent cause for the “end of vase life” in prior stored roses. It was hypothesized that dark storage may alter the stomatal functionality and may cause water balance problems during the subsequent vase life period. The effect of short- and long-term storage on functionality of stomatal and subsequent flower performance was investigated in two rose cultivars (cvs) (‘Akito’ and ‘Grand Prix’) with presumed different sensitivity for development of water stress symptoms during the vase life.

Compared to no storage, both short term storage (2.3 d at 6 °C) and long term storage (28 d at 0.5 °C) negatively affected the stomatal functionality in cultivar (cv) Akito. Stomatal functionality parameters such as the rapidity of the closing response upon dehydration and the relative water content at which stomata are fully closed showed good correlations with flower performance parameters (flower weight changes and vase life). This indicates that in cv Akito, the decreased stomatal functionality is one of the factors involved in the poor vase life of prior stored flowers. In cv Grand Prix, however, storage did not greatly affect the stomatal functionality but storage negatively affected flower performance in a comparable way as in cv Akito.

A pre-treatment with abscisic acid prior to storage slightly improved stomatal functionality in both cvs, but no clear effect on flower performance was observed. Addition of the bactericide 8-HQC to the vase water improved flower performance in both cvs but could not alleviate the negative effect of cold storage on flower performance.

Results show that in roses cold storage may, depending on the cultivar, negatively affect stomatal functionality and this may contribute to water stress and ultimately flower failure. In addition, cold storage may negatively affect xylem water conducting properties through processes not related to bacterial contamination.

Keywords: /Rose/ /Storage/ /Cut Flower/ /Vase Life/