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GENERAL

CHITOSAN

Yuan, Gaofeng, Xiaoe Chen and Duo Li. 2016. **Chitosan** films and coatings containing essential oils: The antioxidant and antimicrobial activity, and application in food systems. Food Res. Int'l. 89: 117-128.

Abstract

Chitosan edible films and coatings have shown great promise for their application in food preservation and also are promising systems to be used as essential oil (EO) carriers. This review reports the most recent and relevant studies concerning chitosan films and coatings containing EOs. The effect of EO incorporation on the antioxidant, antibacterial and antifungal activities of chitosan films and coatings in vitro and in vivo, as well as their applications in food systems have been discussed. In general, incorporation of EOs significantly increased the antioxidant, antibacterial and antifungal efficacy of chitosan films and coatings in vitro. EO-incorporated films and coatings also showed greater effectiveness against postharvest fungi and foodborne bacteria in food systems than pure films and coatings. The application of chitosan films and coatings containing EOs usually led to an extension of the shelf-life and reduction of lipid peroxidation of fish and meat products over pure chitosan films and coatings. In addition, chitosan coatings incorporated with EOs were more effective in maintaining fruit and vegetable quality, and controlling their postharvest decay during storage and shelf life than pure chitosan coatings.

Keywords: /Chitosan/ /Chitosan films/ /Chitosan Coating/ /Food Packaging/

COOLING EFFICIENCY

Berry, T. M., et al. 2017. The role of horticultural carton vent hole design on **cooling efficiency** and compression strength: A multi-parameter approach. Postharvest Biol. & Technol. 124: 62 - 74.

Abstract

Forced-air cooling (FAC) is used to rapidly remove the field heat of horticultural produce to better preserve quality. Cartons are ventilated to promote uniform cooling of the packed produce and to minimize energy used by pre-cooler fans. The resulting cooling efficiency is influenced by the area and configuration of carton vent holes. However, placing vent holes also reduces the carton compression strength, which requires reinforcement using additional fiberboard, thereby increasing carton manufacturing costs. This study, therefore, applied a multi-parameter evaluation approach to assess four carton designs, each for three vent hole areas and three corrugated fiberboard grades. Computational fluid dynamics (CFD) was used to evaluate airflow resistance, cooling rate, uniformity and package related energy consumption. Experiments were used to quantify box compression strength. Results of mechanical strength evaluation showed a negative linear relationship between carton strength and vent hole area. The effect of vent hole configuration on compression strength was

dependent on the corrugated fiberboard grade. For cartons packed using trays, the Multivent vent hole design used 58% less FAC energy and also significantly improved cooling uniformity compared to the Standard vent design. The significant improvement in FAC energy efficiency, therefore, enables the Multivent to match or improve the compression strength and FAC energy efficiency of the Standard vent design, by using a considerably smaller ventilation area. This study thus demonstrates the importance of incorporating a multi-parameter approach in developing improved packaging with optimized vent hole designs.

Keywords: /Cooling Efficiency/ /Ventilation/ /Forced-Air Cooling/

FOOD PACKAGING

Mlalila, N., et al. 2016. Transformation of **food packaging** from passive to innovative via nanotechnology: concepts and critiques. J. Food Sci. Technol. 53(9): 3395 – 3407.

Abstract

In recent decades, there is a global advancement in manufacturing industry due to increased applications of nanotechnology. Food industry also has been tremendously changing from passive packaging to innovative packaging, to cope with global trends, technological advancements, and consumer preferences. Active research is taking place in food industry and other scientific fields to develop innovative packages including smart, intelligent and active food packaging for more effective and efficient packaging materials with balanced environmental issues. However, in food industry the features behind smart packaging are narrowly defined to be distinguished from intelligent packaging as in other scientific fields, where smart materials are under critical investigations. This review presents some scientific concepts and features pertaining innovative food packaging. The review opens new research window in innovative food packaging to cover the existing disparities for further precise research and development of food packaging industry.

Keywords: /Food Packaging/ /Innovative Packaging/

FRUITS

APRICOT

Hashemi, S. M. B., et al. 2017. Basil-seed gum containing *Origanum vulgare* subsp. *viride* essential oil as edible coating for fresh cut **apricots**. Postharvest Biol. & Technol. 125: 26 - 34.

Abstract

Basil seed gum (BSG) edible films containing with *Origanum vulgare* subsp. *viride* essential oil (OEO) (1–6%) were formulated in order to coating of fresh cut apricots. Chemical attributes, microbial load and sensory characteristics of coated fresh apricot-cut during cold storage at 4 °C for 8 d were investigated. The addition of OEO significantly decreased water vapor permeability (WVP) of films while increased their moisture content ($p < 0.05$). The applied coatings reduced total plate count, yeasts and molds populations. Among all tested treatments, the BSG +6% OEO was determined as the most effective in reducing the microbial populations of apricot cuts. In comparison with the control, total soluble phenolic and antioxidant activity of OEO added samples was enhanced significantly at the end of cold storage. The new introduced incorporated OEO BSG film and coating could provide great improvement in terms of odor and overall acceptability and it could be applied in order to maintain quality of fresh apricot cuts.

Keywords: /Apricot/ /Fresh-Cut/ /Edible Coating/ /Active Packaging/

BAYBERRIES

Ma, R., et al. 2016. Effect of non-thermal plasma-activated water on fruit decay and quality in postharvest Chinese **bayberries**. Food Bioprocess Technol. 9: 1825 – 1834.

Abstract

Recently, non-thermal plasma-activated water (PAW) became a relatively new concept developed in the food industry. The effects of PAW on fruit decay, microbial loads, and quality of postharvest Chinese bayberry were investigated. Chinese bayberries were treated by PAW for 0.5, 2, or 5 min and then stored at 3 °C for 8 days. Experimental results show that all PAW treatments could reduce fruit decay by around 50 % compared to control at the end of storage. There was no dose-effect relationship between PAW treatment time and fruit decay. Meanwhile, a 0.5-min PAW treatment could remarkably decrease microbial population on Chinese bayberries during storage, and the maximum reductions reached around 1.1 log CFU/g both for bacteria and fungi at the end day of storage. Scanning electron microscopy results reveal that PAW could significantly change the morphology of microbial cells on Chinese bayberries. Moreover, physicochemical properties analysis of PAW demonstrates that the microbial inactivation of PAW is mainly attributed to the combined action of high oxidation reduction potential and low pH. Additionally, PAW treated fruits exhibited markedly higher firmness, color index of red grapes, and total soluble solids than the control did at the eighth day. These results indicate that PAW might be a promising strategy to control fruit decay and maintain quality of Chinese bayberry during postharvest storage.

Keywords: /Bayberry/ /Fruit Decay/ /Fruit Quality/

BLUEBERRY

Chu, W., et al. 2017. Composition and morphology of cuticular wax in **blueberry** (*Vaccinium* spp.) fruits. Food Chem. 219: 436 - 442.

Abstract

The chemical composition and morphology of cuticular wax in mature fruit of nine blueberry cultivars were investigated using gas chromatography–mass spectrometry (GC–MS) and scanning electron microscope (SEM). Triterpenoids and β -diketones were the most prominent compounds, accounting for on average 64.2% and 16.4% of the total wax, respectively. Ursolic or oleanolic acid was identified as the most abundant triterpenoids differing in cultivars. Two β -diketones, hentriacontan-10,12-dione and tritriacontan-12,14-dione, were detected in cuticular wax of blueberry fruits for the first time. Notably, hentriacontan-10,12-dione and tritriacontan-12,14-dione were only detected in highbush (*V. corymbosum*) and rabbiteye (*V. ashei*) blueberries, respectively. The results of SEM showed that a large amount of tubular wax deposited on the surface of blueberry fruits. There was no apparent difference in wax morphology among the nine cultivars.

Keywords: /Blueberries/ /Cuticular Wax/

DURIAN

Niponsak, Aranya, et al. 2016. Development of smart colourimetric starch–based indicator for liberated volatiles during **durian** ripeness. Food Res. Int'l. 89: 365 - 372.

Abstract

The mechanical, physical and barrier properties of colourimetric starch-based films (CSBFs) were developed by adding natural polymers (chitosan, citric acid, carboxymethylcellulose, and kraft fibre). Novel volatile compound indicator films were prepared from starch (as a film matrix with 30% w/w sorbitol) using the casting method and adding natural polymers, and pH-dye (methyl red and bromothymol blue as indicators). CSBFs mixed with 0.1% chitosan improved the mechanical and barrier properties with a significant decrease in water vapour transmission rate, water solubility, and oxygen transmission rate, as well as improved tensile strength. Trials using liberated fruit aromas verified that CSBFs resulted in visible colour changes in the presence of mixed sulphur and ethyl alcohol aromas. Colour change in terms of the total colour difference of CSBFs was related to mixed sulphur and ethyl alcohol levels, thereby enabling CSBFs could be used to monitor real-time ripeness of durian volatiles.

Keywords: /Durian/ /Ripening/

FIGS

Reyes-Avalos, M. C., et al. 2016. Improvement of the quality and the shelf life of **figs** (*Ficus carica*) using an alginate-chitosan edible film. Food Bioprocess Technol. 9: 2114 - 2124.

Abstract

The consumption of fresh figs (*Ficus carica*) has long been associated with longevity and health benefits. However, fresh figs are highly perishable. An alternative to extend the shelf life of this fruit might be the application of an edible film. Thus, in this study, fig fruits collected at two maturity stages (referred as stages III and IV) were coated with an alginate-chitosan bilayer edible (A-Ch BE) film and the main physiological and quality attributes were evaluated during storage at low temperature (6 °C) at 0, 3, 6, 9, 12, and 15 days of storage. Ethylene and CO₂ productions were considered as physiological parameters, while firmness, color changes, weight loss, and visual infection were the quality attributes evaluated. The application of the film reduced CO₂ production and increased ethylene emission, regardless of the maturity stage of the figs. Firmness for uncoated figs underwent a significant decrease during storage; exhibiting values lower than 1.0 N. On the contrary, for coated figs, firmness was not only maintained but also even increased up to 3 N, for figs of stage III, and up to 2.5 N for the more mature figs (stage IV). Furthermore, coated figs exhibited better external color retention ($\Delta E < 2$), lower weight loss (~8%), and also lower visual fungal contamination (<5%) than uncoated fruits during the 15 days of storage at 6 °C, regardless the maturity stage. Therefore, the results indicate that application of an A-Ch BE film not only can improve the overall quality of figs (*F. carica* var. Mission) stored at 6 °C but is also able to extend their shelf life.

Keywords: /Figs/ /Edible film/ /Chitosan/ /Shelf life/

GRAPES

Urcan, D. E., et al. 2017. 'Fortified' wines volatile composition: Effect of different postharvest dehydration conditions of wine **grapes** cv. Malvasiamoscata (*Vitis vinifera* L.). Food Chem. 219: 346 - 356.

Abstract

The impact of postharvest dehydration on the volatile composition of Malvasiamoscata grapes and fortified wines produced from them was assessed. The ripeness effect of fresh grapes on volatile

compounds of dehydrated grapes was evaluated for the first time in this study. Fresh grape berries were densimetrically sorted, and more represented density classes were selected. Dehydration of riper berries (20.5 °Brix) led to volatile profiles richer in terpenes, particularly linalool and geraniol. The effect of dehydration rate on the volatile composition of dehydrated grapes and fortified wines was also evaluated. Fast dehydration grapes were richer in total free terpenes, and the resulting wines contained greater amounts of volatile compounds. The predominant compounds were free esters, but linalool, rose oxide, citronellol and geraniol can also contribute to wine aroma, particularly for fast dehydration. β -Damascenone can be an active odorant, although its contribution was greater in wines made from slow dehydrated grapes.

Keywords: /Grapes/ /Postharvest dehydration/

KIWIFRUIT

Burdon, J., et al. 2016. Fruit maturation and the soluble solids harvest index for 'Hayward' **kiwifruit**. *Scientia Hort.* 213: 193 - 198.

Abstract

A harvest index of 6.2% soluble solids content (SSC) has long been used for New Zealand-grown 'Hayward' kiwifruit destined for storage and export, based on the soluble solids accumulation rate at this point having increased because of starch breakdown in response to low night temperatures. Fruit maturation in 'Hayward' and other kiwifruit cultivars has been investigated through monitoring changes in SSC, soluble carbohydrates and starch content as fruit developed on the vine. The initial increase in the rate of soluble solids accumulation was not necessarily the result of starch breakdown, occurring before a net decrease in starch and possibly the direct result of imported soluble carbohydrates. It is suggested that SSC should be considered in the context of starch metabolism, for which there is a progression from starch accumulation to starch degradation, with a period of variable duration of no net change in starch between these. The increased rate of soluble solids accumulation of fruit at 6.2% SSC may occur through either import of soluble carbohydrate or starch breakdown. Hence fruit at the same SSC may differ physiologically, thereby affecting fruit postharvest performance. The loss of temperature sensitivity of 'Hayward' kiwifruit occurred over a period of weeks and was initially associated with the change to dark seed coats, and was complete in association with the cessation of growth.

Keywords: /Kiwifruit/ /Chilling injury/ /Storage/

Li, H., et al. 2017. The effect of 1-methylcyclopropene, methyl jasmonate and methyl salicylate on lignin accumulation and gene expression in postharvest 'Xuxiang' **kiwifruit** during cold storage. *Postharvest Biol. & Technol.* 124: 107 - 118.

Abstract

Kiwifruit is susceptible to chilling injury during storage at 0 °C, which causes lignin accumulation, a substantial impact to fruit quality. Lignin has been observed in the pulp and core of kiwifruit (*Actinidia deliciosa* cv. Xuxiang), developing gradually from the stem end to the calyx end. Fruit firmness can be maintained at a higher level during cold storage through application of 1-methylcyclopropene (1-MCP), although with dramatically enhanced activities of phenylalanine ammonia-lyase (PAL, EC 4.3.1.5), cinnamyl-alcohol dehydrogenase (CAD, EC 1.1.1.195), and peroxidase (POD, EC 1.11.1.7) as well as lignification, which occurred during the later storage period. Methyl jasmonate (MeJA) and methyl

salicylate (MeSA) significantly inhibited lignification at later stages. Expression profiles of the four lignin-related genes (i.e., *AcPAL*, *AcCAD*, *AcPOD1*, and *AcPOD2*) were assessed, 1-MCP markedly increased the expression levels of *AcPOD1* in fruit core tissue. Together, these results illustrate that MeJA and MeSA can inhibit lignin accumulation to some degree; however, 1-MCP may aggravate lignin deposition, especially in core tissue, mainly via up-regulating *AcPOD1*, which is involved in lignin synthesis.

Keywords: /Kiwifruit/ /1-Methylcyclopropene/

Yi, Junjie, et al. 2016. Comparing the impact of high-pressure processing and thermal processing on quality of “Hayward” and “Jintao” kiwifruit puree: Untargeted headspace fingerprinting and targeted approaches. *Food Bioprocess Technol.* 9: 2059-2069.

Abstract

This study evaluated process-induced quality changes in kiwifruit purée of two commercial cultivars (green kiwifruit, “Hayward”, and gold kiwifruit, “Jintao”) treated by equivalent microbial safety-based processing: high-pressure processing (HPP; 600 MPa/3 min) and thermal processing (TP; P85 °C 8.3 °C = 5min). This comparative study was performed using both targeted, analyzing a priori selected quality attributes (color, sugars, organic acids, and vitamin C) and untargeted headspace-solid phase microextraction-gas chromatography- mass spectrometry approaches, combining multivariate data analysis techniques (partial least squares discriminant analysis and variable identification). HPP provided a better retention of color and vitamin C compared to TP. Sugar and organic acid were less affected by HPP and TP. Methyl and butyl esters were detected at higher amounts in both processed purée, compared to untreated purée. For processed samples, furanones, terpenes, and alcohols were detected at higher amounts after TP and aldehydes were detected at higher amount after HPP. Overall, the quality of HP-treated samples is clearly closer to that of fresh samples compared to thermally treated samples and HP treatment avoids the formation of typical temperature-induced compounds.

Keywords: /Kiwifruit/ /Quality/ /Thermal processing/

LEMON

D’Aquino, S., et al. 2017. A sequential treatment with sodium hypochlorite and a reduced dose of imazalil heated at 50 °C effectively control decay of individually film-wrapped lemons stored at 20 °C. *Postharvest Biol. & Technol.* 124: 75 - 84.

Abstract

Storage of individual seal-packaged citrus fruit at room temperature in China is a very common practice that requires a pre-storage treatment with a high concentration of an effective fungicide as imazalil (IMZ) to prevent decay. In this study, lemons were washed with NaOCl (200 mg L⁻¹) or not, treated with IMZ (50 or 1000 mg L⁻¹) at 20 or 50 °C and individually wrapped with a 16-mm thick extensible polyvinylchloride film (Film A) or two heat shrinkable polyolefinic films, thick 15 (Film B) or 19-mm (Film C). The sequential treatment with NaOCl and IMZ at 50 mg L⁻¹ at 50 °C, was as effective as IMZ at 1000 mg L⁻¹ at 20 °C in controlling *Penicillium* decay. Losses for decay in fruit wrapped with the two more permeable films (Film A and Film B) never exceeded 10%, while in those wrapped with Film C (the least permeable) peaked to 41%. All films reduced weight losses, which at the end of storage were 11% in fruit wrapped with Film A and below 4% in those wrapped with the other two films, while were 41% in unwrapped ones. After one week of storage, only 50% of unwrapped fruit were marketable whereas all wrapped fruit were still marketable after 8 weeks. Respiration as well as juice acetaldehyde

and ethanol were slightly affected by the two more permeable films, while an abnormal production of CO₂, acetaldehyde and ethanol occurred in those wrapped with film C. Changes in chemical parameters were relevant in fruit sealed with Film C and minor in those with Film A and Film B. Decay control and quality preservation of lemons stored at room temperature can be achieved for several weeks by a sequential treatment with NaOCl and a heated water emulsion of IMZ at 50 mg L⁻¹, when fruit are wrapped with plastic films highly permeable to gases.

Keywords: /Lemons/ /Decay/ /Storage/

LONGAN

Guntiya, N., et al. 2016. Application of gaseous chlorine dioxide for control of fungal fruit rots disease of harvested 'Daw' longan. *Scientia Hort.* 213: 164 - 172.

Abstract

Longan (*Dimocarpus longan* Lour.) fruit decay caused by microbial infection during storage is the main problem that results in a great loss of its market value. The objective of this study was to investigate the application of gaseous chlorine dioxide (ClO₂) to control fruit rot disease caused by three fungi: *Cladosporium* sp., *Fusarium* sp., and *Lasiodiplodia* sp. in longan fruit. The effect of ClO₂ fumigation at 10 mg L⁻¹ for 10 min on the onset of disease and the activities of two defense enzymes, chitinase and glucanase, in the harvested longan fruits during storage at 25 ± 3°C for 7 days were investigated. The inhibition of fungal growth and spore germination, and oxidative damage to fungal membrane by gaseous ClO₂ were also studied. It was found that ClO₂ fumigation could significantly reduce disease incidence (by 20–75%) and disease index (by 28–38%) of the inoculated longans and markedly increased chitinase and glucanase activities during 7 days of storage. ClO₂ stimulated the activity of chitinase and glucanase which were increased by 29.45–58.89% and 68.98–78.12%, respectively higher than those in the inoculated controls. ClO₂ was more efficient in stimulating the activity of glucanase than that of chitinase. ClO₂ also increased fungal membrane damage by causing an increase in malondialdehyde and conjugated diene contents, lipoxygenase activity and electrolyte leakage. The increase in the activities of both enzymes in fruits and the increase in fungal membrane damage caused by ClO₂, were in accordance with the inhibition of fungal growth and spore germination, leading to the reduction of fruit rot disease suggesting that it is the response mechanism of longan to reduce fungal fruit rot caused by the pathogens.

Keywords: /Longan/ /Fruit rot/

LOQUAT

Palou, Lluís, et al. 2016. Incidence and etiology of postharvest fungal diseases of **loquat** fruit (*Eriobotrya japonica* (Thunb.) Lindl. cv. 'Algerie') in Alacant province (Spain). *Eur. J. Plant Pathol.* 146: 847-860.

Abstract

'Algerie' is currently the most important loquat cultivar in Spain. The incidence and etiology of postharvest diseases affecting this cultivar were determined under local conditions. Latent and wound pathogens were evaluated for two consecutive seasons on commercially grown loquats from two orchards. Healthy loquats were either surface disinfected or artificially wounded in the rind and placed in humid chambers at 20 °C for up to 5 weeks. Additionally, decay was assessed on commercially-

handled loquats stored at 5 °C for up to 20 weeks. The most frequent disease was caused by *Alternariaalternata*, followed by *Penicilliumexpansum*. These two pathogens were present on fruit assessed for all types of infection. Moreover, decay caused by *Botrytis cinerea* was abundantly observed on both wounded and cold-stored fruit, while *Colletotrichumgloeosporioides* was frequently found on surface-disinfected fruit. Other pathogens that were observed causing latent infection to a lesser extent included *Pestalotiopsisclavispora* and *Diplodiaseriata*. Common isolates were identified by macroscopic and microscopic morphology and/or DNA amplification and sequencing. Pathogenicity of selected isolates was demonstrated by fulfilling Koch's postulates and disease development was assessed on artificially inoculated loquats stored at either 20 or 5 °C.

Keywords: /Loquat/ /Postharvest Diseases/ /Cold storage/

MANGO

Xu, X., et al. 2017. Antifungal activity of 1-methylcyclopropene (1-MCP) against anthracnose (*Colletotrichumgloeosporioides*) in postharvest **mango** fruit and its possible mechanisms of action. Int. J. Food Microbiol. 214: 1 - 6.

Abstract

Anthracoze caused by *Colletotrichumgloeosporioides* is one of the most important postharvest diseases in mango fruit, often causing huge economic losses. In this study, the effect of 1-methylcyclopropene (1-MCP) against anthracnose in postharvest mango fruit and the mechanisms involved were investigated. 1-MCP induced reactive oxygen species (ROS) generation, damaged the mitochondria and destroyed the integrity of plasma membrane of spores of *C. gloeosporioides*, significantly suppressing spore germination and mycelial growth of *C. gloeosporioides*. 1-MCP also decreased the decay incidence and lesion expansion of mango fruit caused by *C. gloeosporioides*. For the first time this study demonstrated that 1-MCP suppressed anthracnose of postharvest mango fruit by directly inhibiting spore germination and mycelial growth of *C. gloeosporioides*, thus providing a promising strategy for disease control.

Keywords: /Mango/ /1-Methylcyclopropene/ /Postharvest Diseases/

MULBERRY

Chen, Hangjun, et al. 2016. Variation in total anthocyanin, phenolic contents, antioxidant enzyme and antioxidant capacity among different **mulberry** (*Morus* sp.) cultivars in China. Scientia Hort. 213: 186 - 192.

Abstract

In the present work, fruit quality and antioxidant property of twenty-two cultivars of mulberry (*Morus* sp.) from China were evaluated. The results showed that contents of total soluble solid (TSS), titratable acid (TA), phenolics and anthocyanin as well as antioxidant enzyme activity and antioxidant capacity varied with cultivars. Among the twenty-two cultivars, contents of TSS and TA ranged from 6.2 to 16.00% and 0.20 to 2.05% citric acid, with *Jiguihua* and *Mengjian 5* showing the highest level, respectively. Most of cultivars were rich in anthocyanin and phenolics, and the highest contents were detected in *Zhongshen 831*. Highest activities of antioxidant enzymes, including As-POD, G-POD, CAT, GR, GSH-POD and SOD were found in *Taiwanguosang*, *Zhenzhubai*, *Mengjian 4*, *72C002*, *Da 10*, and *Jiguihua*,

respectively. Moreover, principal component analysis revealed that *Zhongshen* 831, *Huayang* novel and *Zhongsang* 5801 exhibited higher antioxidant capacities.

Keywords: /Mulberry/ /Antioxidant/ /Phenolics/

PEACHES

Piva, Giulio, et al. 2017. Evaluation of the antioxidant/antimicrobial performance of *Posidonia oceanica* in comparison with three commercial natural extracts and as a treatment on fresh-cut **peaches** (*Prunus persica* Batsch). *Postharvest Biol. & Technol.* 124: 54 - 61.

Abstract

This research aimed at extending the choice of natural antimicrobials/antioxidants for food applications. Four plant extracts, *Posidonia oceanica* (PO), Green Tea (GT), Grape seeds (GS) and Grape skin (GK), were analyzed to determine their total phenolic content, antioxidant activity and in vitro antimicrobial performance. PO extract showed the highest total phenolic content (711 mg gallic acid/g extract) and antifungal activity against *Aspergillus niger* and *Penicillium chrysogenum*. The highest antioxidant (3.81 mg/L EC₅₀) and antibacterial activities (bactericidal against Gram positives and bacteriostatic against Gram negatives) were found for GT extract. The best performing extracts (PO and GT) were applied by dipping on peach slices in storage trials. Microbiological and pomological parameters were evaluated during 7 d storage. Total aerobic count, *Pseudomonas* as well as yeasts and moulds populations, were reduced by about 0.5 log cfu/g, mainly up to 5 d in all treated samples compared to the control. Total soluble solids, titratable acidity and colour (L*a*b*) changes were also delayed in treated fruit.

Keywords: /Peaches/ /Ready-to-eat fruit/

PEAR

Gollas, J., et al. 2016. Effect of controlled atmosphere storage on production of volatiles and ethylene from cv. Zaosuli **pears**. *Hort. Sci.* (3): 117-125.

Abstract

Harvest-mature fruits of the pear cv. Zaosuli (*Pyrus bretschneideri* Rehd.) were stored at 1.0–1.5°C under two different experimental atmospheres. The controlled atmosphere (CA) had low oxygen (2.0%) and high CO₂ (7%), while the regular atmosphere (RA) had 20.9% O₂ and 0.1% CO₂. Sixty-four volatile compounds were subsequently detected and quantified by solid phase micro-extraction (SPME) including 1 hydrocarbon, 16 alcohols, 15 aldehydes, 4 ketones, 15 esters, 8 terpenes, 2 lactones and 2 fatty acids. The principal component analysis of data was carried out to assess the effects of these post-harvest storage conditions in comparison to fruit stored in air at room temperature for 5 days. Thirteen compounds were found to be sufficient to differentiate the two different pear treatments, which were followed by subsequent warming to 20°C. The observed differences in the production of volatiles between the start of storage and 40 days later (RA), or 40 days later (CA), are principally due to just four compounds, namely n-hexanol, 2-furaldehyde, cis-geraniol and α-damascenone. Ethylene production is also lower in the CA treatment. The higher concentration of CO₂ in the CA treatment causes a rise in respiration rates due to anaerobic respiration.

Keywords: /Pears/ /Ethylene production/

Suchanek, M., et al. 2017. Application of low-field MRI for quality assessment of 'Conference' **pears** stored under controlled atmosphere conditions. *Postharvest Biol. & Technol.* 124: 100 - 106.

Abstract

A novel, non-destructive, and cost-effective method to evaluate internal disorders occurring in 'Conference' pears stored under controlled atmosphere (CA) is described. A low-field Magnetic Resonance Imaging (MRI) system operating at 0.2 T was used to determine water content in the fruit, and to distinguish damaged and healthy tissues by exploiting the differences of their relaxation times. The extent of damage was evaluated quantitatively by applying a proper segmentation technique to the T1-weighted images, followed by separate calculation of the volumes of browning tissue and internal voids. The dynamics of the induced changes within the microstructure of the fruit as a function of the CA storage time was analyzed by repeating the measurements periodically during a six-month storage.

Keywords: /Pears/ /Internal Browning/ /Storage/

PERSIMMON

Munera, Sandra, et al. 2017. Astringency assessment of **persimmon** by hyperspectral imaging. *Postharvest Biol. & Technol.* 125: 35 - 41.

Abstract

One of the current challenges of persimmon postharvest research is the development of non-destructive methods that allow determination of the internal properties of the fruit, such as maturity, flesh firmness and astringency. This study evaluates the usefulness of hyperspectral imaging in the 460–1020 nm range as a non-destructive tool to achieve these aims in Persimmon cv. 'RojoBrillante' which is an astringent cultivar. Fruit were harvested at three different stages of commercial maturity and exposed to different treatments of CO₂ (95% CO₂ – 20 °C – from 0 to 24 h) in order to obtain fruit with different levels of astringency. Partial Least Square (PLS) based methods were used to classify persimmon fruits by maturity and to predict flesh firmness from the average spectrum of each fruit. The results showed a 97.9% rate of correct maturity classification and an R²_p of 0.80 for firmness prediction with only five selected wavelengths. For astringency assessment, as our results showed that the soluble tannins that remain after CO₂ treatments are distributed irregularly inside the flesh, a model based on PLS was built using the spectrum of every pixel in the fruit. The model obtained an R²_p of 0.91 which allowed the creation of the predicted distribution maps of the tannins in the flesh of the fruit, thereby pointing to hyperspectral systems as a promising technology to assess the effectiveness of the deastringency treatments that are usually applied before commercializing persimmons from astringent cultivars.

Keywords: /Persimmon/ /Quality/

PINEAPPLE

Ghate, Vinayak, et al. 2017. Effect of 460 nm light emitting diode illumination on survival of *Salmonella* spp. on fresh-cut **pineapples** at different irradiances and temperatures. *J. Food Eng.* 196: 130-138.

Abstract

Blue light emitting diodes (LEDs) have emerged as an intervention against *Salmonella*, which colonizes and grows on fresh-cut fruits. This study evaluated their efficacy on fresh-cut pineapples. Pineapple slices were surface-inoculated with a *Salmonella* cocktail and illuminated with 460 nm LEDs at different irradiances (92, 147.7 and 254.7 mW/cm²) and temperatures (7, 16 and 25 °C). The resulting differences in the populations of control and illuminated samples were modeled to determine the antibacterial effect. The color of the slices was also measured. Bactericidal action was observed at 7 and 16 °C and growth inhibition at 25 °C. An adapted Weibull model best described the inactivation, with the D values ranging from 15 to 27 kJ/cm². Temperature influenced the antibacterial effect but the irradiance had no significant effect ($P \geq 0.05$). Though the illuminated pineapple slices tended to be bleached, this study demonstrated the potential of 460 nm LEDs against *Salmonella* on fresh-cut pineapple slices.

Keywords: /Pineapple/ /Fresh-Cut/

PLUM

Louw, J. P. and L. Korsten. 2016. Postharvest decay of nectarine and **plum** caused by *Penicillium* spp. Eur. J. Plant Pathol. 146: 779 - 791.

Abstract

Stone fruit are highly perishable and susceptible to numerous postharvest pathogens. *P. expansum* is a well-known pathogen of stone fruit but little is known about other *Penicillium* spp. that could potentially cause decay. This study aims to determine pathogenicity profiles of *P. expansum*, *P. crustosum*, *P. solitum* and *P. digitatum* on selected nectarine and plum cultivars, and in part examine the disease cycle within new fruit-*Penicillium* interactions to observe the potential of the pathogens to cross-infect. Lesions caused by *Penicillium* spp. isolated from the pear and citrus handling chain environments were not different on nectarine. *P. digitatum* was the most aggressive species on most nectarines and plums evaluated. Decay was associated with older fruit (long stored). The highest aggressiveness was observed on Nectar gold, May Glo and African Rose. *P. expansum* and *P. crustosum* had the highest disease incidences and were the second and third most aggressive species respectively. *P. solitum* caused small lesions and its role in the fresh produce market can be negligible. Scanning electron microscopy confirmed infection and provided new information on the growth and reproduction of *P. expansum*, *P. crustosum* and *P. digitatum* on infected nectarine, pear and lemon. Pear and lemon can serve as cross-infection sources for stone fruit in the fresh produce chain. To our knowledge this is the most complete description of disease caused by *P. digitatum*, *P. crustosum* and *P. solitum* on nectarine and plum. Rapid decay caused by *P. digitatum* highlighted the potential of the species to contribute to losses in the stone fruit industry. Future research should investigate the presence and impact of *P. digitatum* in the stone fruit supply chain. The role of fruit maturity in fruit-*Penicillium* interactions requires further investigation.

Keywords: /Plum/ /Stone Fruit/

POMEGRANATE

Belay, Zinash A., Oluwafemi J. Caleb and Umezuruike Linus Opara. 2017. Impacts of low and super-atmospheric oxygen concentrations on quality attributes, phytonutrient content and volatile compounds of minimally processed **pomegranate** arils (cv. Wonderful). Postharvest Biol. &

Abstract

This study investigated the impact of modified atmosphere (MA) storage: at low oxygen (O₂) (MA-1; 5 kPa O₂ + 10 kPa CO₂ + 85 kPa N₂), (MA-2; 10 kPa O₂ + 5 kPa CO₂ + 85 kPa N₂); super-atmospheric O₂ (MA-3; 70 kPa O₂ + 10 kPa CO₂ + 85 kPa N₂); and air (MA-4; 21 kPa O₂ + 0.03 kPa CO₂ + 78 kPa N₂) on the physicochemical, phytonutrient, volatile organic compounds (VOCs) and microbiological quality of minimally processed 'Wonderful' pomegranate arils stored at 5 °C for 12 d. In addition, the effect of temperature fluctuation on the physical and microbiology quality of arils was evaluated. Samples were removed from cold storage on each sampling day, and kept for 2 d at ambient (20 °C) condition. Low O₂ atmosphere (MA-1) best maintained phytonutrient content of arils at 5 °C. Aerobic mesophilic bacteria, yeast and mould counts were found to be significantly lower under super-atmospheric O₂ (MA-3) storage in comparison to other treatments at 5 °C and ambient. A total of 25 volatile organic compounds (VOCs) were detected and identified for pomegranate 'wonderful' across the different MA conditions. Highest relative composition of VOCs was found in samples stored under MA-3. Temperature fluctuation had a significant impact on the physical and microbiology quality of pomegranate arils.

Keywords: /Pomegranate/ /Quality/

STRAWBERRY

doRosário, Denes Kaic Alves, et al. 2017. Ultrasound improves chemical reduction of natural contaminant microbiota and *Salmonella enterica* subsp. *enterica* on strawberries. Int'l. J. Food Microbiol. 241: 23 - 29.

Abstract

New sanitization methods have been evaluated to improve food safety and food quality and to replace chlorine compounds. However, these new methods can lead to physicochemical and sensory changes in fruits and vegetables. The present study evaluated the effects of acetic acid, peracetic acid, and sodium dodecylbenzenesulfonate isolated or combined with 5 min of ultrasound treatment (40 kHz, 500 W) on strawberry quality over 9 days of storage at 8 °C. The strawberry natural contaminant microbiota (molds and yeasts, mesophilic aerobic and lactic acid bacteria), physicochemical quality (pH, total titratable acidity, total soluble solids, vitamin C, and color), sensory quality (triangle test) and inactivation of *Salmonella enterica* subsp. *enterica* intentionally inoculated onto strawberries were analyzed. Ultrasound increased the effect of all chemical compounds in the reduction of aerobic mesophilic, molds and yeasts. The best treatment for those groups of microorganisms was ultrasound combined with peracetic acid (US + PA) that reduced 1.8 and 2.0 log cfu/g during 9 days of storage. Bactericidal effect of peracetic acid was also improved by ultrasound inactivation of *S. enterica*, reaching a decimal reduction of 2.1 log cfu/g. Moreover, synergistic effects were observed in contaminant natural microbiota inactivation for all tested compounds during storage, without any major physicochemical or sensory alteration to the strawberries. Therefore, ultrasound treatment can improve the effect of sanitizers that are substitutes of chlorine compounds without altering the quality of strawberries during storage. Acetic acid (PubChem CID: 176); Peracetic acid (PubChem CID: 6585); Sodium dodecylbenzenesulfonate (PubChem CID: 18372154).

Keywords: /Strawberry/ /*Salmonella enterica*/ /Sensory Quality/

Pagliarulo, Caterina, et al. 2016. Preservation of strawberries with an antifungal edible coating using peony extracts in chitosan. Food Bioprocess Technol. 9: 1951 - 1960.

Abstract

Strawberries represent a valuable source of bioactive compounds including vitamin C, E, β -carotene, and phenolic compounds, but they are fruits with an extremely short postharvest life. Therefore, the current study was conducted to investigate the effectiveness of an active coating consisting in antifungal microparticles obtained by spray drying of peony extracts (*Paeonia rockii* (PPR)) dispersed in chitosan (Ch) and subsequent addition to polysaccharide gels to slow the fungal attack of small highly perishable fruits, such as strawberries. The results of the antimicrobial assays indicate that the peony extracts in chitosan are able to counteract effectively the growth of different fungal isolates from deteriorated strawberries. In conclusion, through the treatment with this antifungal coating, it is possible to prolong the shelf life of delicate fruits, such as strawberries, to about 16 days, slowing down the weight loss, affecting the safeguard of important vitamins and antioxidant capacity during storage, without causing any significant alteration of the nutritional and sensorial properties of the product.

Keywords: /Strawberry/ /Postharvest/ /Shelf life/

VEGETABLES

BROCCOLI

Ben-Fadhel, Yosra, et al. 2017. Active edible coating and γ -irradiation as cold combined treatments to assure the safety of broccoli florets (*Brassica oleracea* L.). Int. J. Food Microbiol. 241: 30 - 38.

Abstract

The antimicrobial activity of essential oils (EOs), organic acid (OA) salts and natamycin, a natural antifungal produced during fermentation by the bacterium *Streptomyces natalensis*, was assessed against four pathogens (*Escherichia coli* O157:H7, *Listeria monocytogenes*, *Salmonella* Typhimurium and *Aspergillus niger*). The Minimum Inhibitory Concentration (MIC) of each antimicrobial (AM) was assessed to determine their efficiency on tested microbial species in order to select the most efficient. Then, the interactions between different antimicrobial compounds showing the lowest MIC were determined by the checkerboard method. The most effective antimicrobial formulation showing synergistic or additive effects was then encapsulated in an alginate matrix to protect the antimicrobial efficiency during storage. The effectiveness of the formulation was then evaluated in situ using broccoli as a food model. A combined treatment of active coating and γ -irradiation (0.4 and 0.8 kGy) was also done in order to evaluate the possible synergistic effect between treatments. The results of this study allowed the selection of 4 EOs, one OA salt and the natamycin as an antifungal agent exhibiting lower MIC values. The interactive antimicrobial effects between them showed that an antimicrobial formulation composed of 300 ppm of lemongrass EO, 5000 ppm of sodium diacetate and 80 ppm of natamycin resulted in an additive effect against *A. niger*, *E. coli* and *S. Typhimurium* and showing synergistic effect against *L. monocytogenes*. Finally, in situ analyses showed a synergistic antimicrobial activity between active coating and γ -irradiation and allowed the extension of the shelf life of ready-to-eat (RTE) broccoli during storage at 4 °C.

Keywords: /Broccoli/ /Active Coating/ / γ -Irradiation/ /Shelf-life/

CARROT

Oladunjoye, Adebola O., et al. 2017. Prediction of *Listeria monocytogenes* ATCC 7644 growth on fresh-cut produce treated with bacteriophage and sucrose monolaurate by using artificial neural network. LWT- Food Sci. Technol. 76: 9 - 17.

Abstract

Combination of bacteriophage and sucrose monolaurate (SML) against *Listeria monocytogenes* growth on fresh-cut produce and prediction of relationship among initial bacterial load, fresh-produce type, anti- microbial concentration and residual bacteria using Artificial Neural Networks (ANNs) was investigated. Inoculated samples (tomato and carrot) containing 10^8 log cfu mL⁻¹ *L. monocytogenes*, treated with bacteriophage (10^8 pfu mL⁻¹), SML (100, 250 and 400 ppm) and chlorine control (200 ppm) were stored at 4, 10 and 25 °C for 6 days. Mathematical models were developed using a linear regression and sigmoid (hyperbolic and logistic) activation functions. Data sets (120) were trained using Back propagation ANN containing one hidden layer with four hidden neurons. Phage treatment on tomato and carrot showed ($p < 0.05$) < 1 and 2 fold bacterial reductions respectively. Addition of SML at 100 and 250 ppm was ($p > 0.05$) ineffective, but showed significantly ($p < 0.05$) higher log reductions on both fresh produce at 400 ppm. Control treatment resulted in 1-2 log reductions on both fresh produce. Prediction with logistic activation function showed the highest positive correlation relationship between predicted and observed values with ~ 0.99 R²-value and MSE of 0.0831. ANN offered better prediction in phage biocontrol of pathogens in fresh produce.

Keywords: /Carrot/ /Tomato/ /*Listeria monocytogenes*/

CUCUMBER

Minich, A.S., et al. 2016. Morphogenesis and productivity of *Cucumissativus* L. hybrids under the thermic polyethylene films modified by coating of metals by magnetron sputtering. Hort. Sci. (2): 59 - 66.

Abstract

The results of the investigation of morphogenesis and productivity characteristics of *Cucumissativus* parthenocarpic hybrids Marinda and Kurazh in ontogenesis in greenhouses under the thermic films are presented. The thermic films have IR- and UV-shielding properties at the expense of coating with nanoparticles of copper compounds (film TF1) and compounds of silver and copper (film TF2) on the surface of films by magnetron sputtering. It is shown that thermic films contributed to levelling of day and night temperatures. The use of the film TF1 favoured seeds germination, activation of plant growth and development, shortening of period of the fruiting beginning and increase in productivity of hybrid Marinda by 13% and hybrid Kurazh by 35%. The use of the film TF2 led to inhibition of growth processes of both hybrids and decrease in their productivity.

Keywords: /*Cucumissativus* L./ /Modified polyethylene films/

LETTUCE

Mbong, Victor BaiyeMfortaw, et al. 2017. The effect of temperature on the metabolic response of lamb's lettuce (*Valerianellalocusta*, (L), Laterr.) cells to sugar starvation. *Postharvest Biol. & Technol.* 125: 1 - 12.

Abstract

Fresh leafy vegetables are highly perishable and may suffer from sugar starvation during postharvest storage. To fully understand their metabolic response to sugar starvation, isolated lamb's lettuce (*Valerianellalocusta*, (L) Laterr.) cells were used as a model system to study biochemical and metabolic stress response to sugar starvation at 1 °C, 18 °C and 25 °C. The effect of sugar starvation was minimal at 1°C. While the higher temperature showed clear impact of sugar starvation on the overall metabolic profile no significant differences were observed between the starvation at either 18 °C or 25 °C for the main sugars (glucose, glucose-6-phosphate, fructose, fructose-6-phosphate and sucrose). Biochemical and metabolic changes of the isolated cells upon sugar starvation involved a decrease in the levels of sugars, except for trehalose and ribose, as well as an increase in the levels of sugar alcohols. Sugar starvation altered the central metabolism by decreasing the levels of the intermediates of the glycolytic pathway, except for 3-phosphoglycerate and pyruvate. Increased levels of the intermediates of the tricarboxylic acid cycle were also observed. ¹³C labelling data showed a decreased label accumulation in almost all metabolites, except for mannitol, myo-inositol, and trehalose. The increase in the levels of free soluble amino and fatty acids with a corresponding decrease in their ¹³C label suggested a breakdown of protein and triacylglycerides.

Keywords: /Lettuce/ /Temperature/

Paillart, M.J.M., et al. 2017. Bacterial population dynamics and sensorial quality loss in modified atmosphere packed fresh-cut iceberg lettuce. *Postharvest Biol. & Technol.* 124: 91 - 99.

Abstract

The end of shelf life of fresh-cut iceberg lettuce packed in modified atmosphere (MA) is determined by its visual quality and by its microbial load. The total microbial load should not exceed 6–7 log CFUg⁻¹ mesophilic counting and be free of human pathogens. Not much is known about specific interactions between the levels of specific spoilage microorganisms and the sensorial quality attributes of the fresh-cut product. We studied the changes in sensorial quality attributes and the growth and population dynamics of microorganisms in three independent batches of MA packed fresh-cut iceberg lettuce stored at 7°C. The sensorial quality of the fresh-cut product was daily evaluated by visual determination of color, shape (indication of crispness) and discoloration (browning); together these attributes were translated into an Overall Visual Quality (OVQ) value. In addition, off-odour and sourness production were scored immediately after opening of the bags. Samples of the fresh-cut product were taken to determine the total microbial load and to investigate the bacterial species composition using mass sequencing analysis. The decrease of OVQ over time showed a down sigmoid curve, reaching the limit of consumer acceptance after about eight days. Total bacterial counts increased from about 5 log at day 1 to about 8 log colony forming units (CFU) per gram at day 7. Initially, *Pseudomonas* species were dominant but when the package became anaerobic, lactic acid bacteria (LAB), in particular *Leuconostoc* spp. and *Lactococcus* spp. became more abundant and dominated the bacterial population. Especially the rapid growth of *Leuconostoc* species correlated with development of a sour off-odour, represented by the accumulation of acetic and lactic acids in the product and the

decrease in OVQ. Results indicate that metabolites produced by LAB are responsible for off-odour production and loss of sensorial quality. Based on this knowledge, new strategies for shelf-life improvement may be designed to prevent the dominance of LAB in fresh cut lettuce or make shelf-life better predictable based on initial counts of LAB, that may assist the industry and retail to reduce food waste.

Keywords: /Lettuce/ /Quality/ /Fresh-Cut/ /Shelf life/

PAPAYA

Ayón-Reyna, Lidia Elena, et al. 2017. Application of a hydrothermal-calcium chloride treatment to inhibit postharvest anthracnose development in **papaya**. *Postharvest Biol. & Technol.* 124: 85 - 90.

Abstract

Anthracnose is considered an important postharvest disease in papaya. The hydrothermal treatment (HT) and calcium chloride (Ca) have been shown to be effective to inhibit anthracnose. The objective of this study was to investigate the effect of the combination HT-Ca on the development of anthracnose in papaya. Fruit were inoculated with *Colletotrichum gloeosporioides* by immersion in a spore suspension and then were divided into two groups: one received a HT treatment (48°C, 20 min) combined with Ca (1% w/v, 20 min) and the other was used as control. Afterwards, fruit were stored during 20 days at 12°C to allow the development of the fungal infection. Anthracnose incidence and severity were estimated visually while the development of the disease was analyzed by light and electron microscopy. HT-Ca reduced anthracnose incidence and severity compared with the control. Microscopy analysis showed that HT-Ca melted the epicuticular wax, which covered most of the stomata; this resulted in a lower mycelial growth in HT-Ca fruit with respect to the control samples. HT-Ca also induced the formation of round shaped vesicles, which corresponded with the greater accumulation of total phenolics observed in treated fruit. HT-Ca was effective to delay the symptoms of anthracnose up to 10 days during storage of papaya at 12°C.

Keywords: /Papaya/ /*Carica papaya*/ /Postharvest/ /Anthracnose/

Kim, Min-Jeong, Woo Suk Bang and Hyun-Gyun Yuk. 2017. 405 ± 5 nm light emitting diode illumination causes photodynamic inactivation of *Salmonella* spp. on fresh-cut **papaya** without deterioration. *Food Microbiol.* 62: 124 - 132.

Abstract

This study evaluated the antibacterial effect of 405 ± 5 nm light emitting diode (LED) illumination against four *Salmonella* serovars on fresh-cut papaya and on fruit quality at various storage temperatures. To determine the antibacterial mechanism of LED illumination at 0.9 kJ/cm², oxidative damage to DNA and membrane lipids of *Salmonella* in phosphate-buffered saline solution was measured. The populations of *Salmonella* on cut fruits were significantly ($P < 0.05$) reduced by 0.3e1.3 log CFU/ cm² at chilling temperatures following LED illumination for 36e48 h (1.3e1.7 kJ/cm²). However, at room temperature, bacterial populations increased rapidly to 6.3e7.0 log CFU/ cm² following LED illumination for 24 h (0.9 kJ/ cm²), which was approximately 1.0 log lower than the number of colonies on non-illuminated fruits. Levels of bacterial DNA oxidation significantly increased, whereas lipid peroxidation in bacterial membrane was not observed, suggesting that DNA oxidation contributes to

photodynamic inactivation by LED illumination. LED illumination did not adversely affect the physicochemical and nutritional qualities of cut papaya, regardless of storage temperature. These results indicate that a food chiller equipped with 405 ± 5 nm LEDs can preserve fresh-cut papayas in retail stores without deterioration, minimizing the risk of salmonellosis.

Keywords: /Papaya/ /Salmonella/

Lima Gomes, Bruna, João Paulo Fabi and Eduardo Purgatto. 2016. Cold storage affects the volatile profile and expression of a putative linalool synthase of **papaya** fruit. *Food Res. Int'l* . 89: 654 - 660.

Abstract

Cold storage is largely employed to extend the postharvest life of papayas. However, the knowledge regarding molecular effects of low temperatures in aroma production and volatile-related genes remains limited. Here we verified how cold storage of 'Golden' papaya fruit, in temperatures defined as resistant to chilling injury, affects its volatile profile. Indeed, fruits placed at room temperature after a period of cold storage could restore ethylene production, the loss of green peel color and the loss of firmness. They reach similar levels to that of the control, whereas their volatile profile has markedly changed. Furthermore, low temperatures impaired linalool production, detected as major compound in the Golden variety, and down-regulated LIS expression, a putative linalool synthase in papaya. These results added new insights regarding molecular mechanisms involved in the effects of low temperatures on papaya fruit, which can further result in molecular markers that can be incorporated into papaya breeding programs for aroma improvements.

Keywords: /Papaya/ /Ripening/

Zerpa-Catanho, Dessiree, et al. 2017. Transcription analysis of softening-related genes during postharvest of **papaya** fruit (*Carica papaya* L. 'Pococi' hybrid). *Postharvest Biol. & Technol.* 125: 42 - 51.

Abstract

Fruit of *Carica papaya* L. (papaya) has several post-harvest problems mainly caused by quick softening that reduces its shelf life. This softening is directly related to degradation and modification of cell wall oligosaccharides. Therefore, it is important to study, understand and, eventually, regulate the softening process of this fruit to increase its shelf life. This work aims at looking for correlations between transcription patterns of four genes potentially involved in papaya fruit softening with postharvest treatments and the softening process. Papaya fruit ('Pococi' hybrid) were treated with ethylene ($275\text{--}300$ mL L⁻¹), 1-methylcyclopropene (1-MCP, 300 nL L⁻¹), or not treated, as control. Fruit were subsequently stored for eleven days at $18\text{--}20$ °C and 95% relative humidity. During the evaluation period, firmness (N) and color (CIE L*, a* and b*) of pulp and peel were determined; pH, titratable acidity (TA) and total soluble solids (TSS) of pulp were also measured; in addition, transcription patterns of polygalacturonase, endoxylanase, pectinesterase and expansin genes were determined by real time PCR. Treatments showed differences in terms of firmness, color, pH, TA, ripening index and accumulation of transcripts of some genes. Transcription of polygalacturonase and endoxylanase genes correlated negatively with firmness of pulp and peel; whereas pectinesterase gene was positively correlated with peel firmness. No correlation with transcription of the expansin gene analyzed was

found. Our results also suggest that polygalacturonase and endoxylanase correlated negatively with papaya fruit firmness and that 1-MCP treatment repressed and reduced the expression of these two genes, respectively. According to these results, silencing genes that encode polygalacturonases or endoxylanases might be a potential strategy to confirm their crucial role on papaya ripening.

Keywords: /Papaya/ /Ethylene/ /1-methylcyclopropene/

SPINACH

Kinsinger, Nichola M., et al. 2017. Efficacy of post-harvest rinsing and bleach disinfection of *E. coli* O157:H7 on **spinach** leaf surfaces. Food Microbiol. 62: 212 - 220.

Abstract

Attachment and detachment kinetics of *Escherichia coli* O157:H7 from baby spinach leaf epicuticle layers were investigated using a parallel plate flow chamber. Mass transfer rate coefficients were used to determine the impact of water chemistry and common bleach disinfection rinses on the removal and inactivation of the pathogen. Attachment mass transfer rate coefficients generally increased with ionic strength. Detachment mass transfer rate coefficients were nearly the same in KCl and AGW rinses; however, the detachment phase lasted longer in KCl than AGW (18 ± 4 min and 4 ± 2 min, respectively), indicating that the ions present during attachment play a significant role in the cells' ability to remain attached. Specifically, increasing bleach rinse concentration by two orders of magnitude was found to increase the detachment mass transfer rate coefficient by 20 times (from $5.7 \pm 0.7 \cdot 10^{-11}$ m/s to $112.1 \pm 26.8 \cdot 10^{-11}$ m/s for 10 ppb and 1000 ppb, respectively), and up to $88 \pm 4\%$ of attached cells remained alive. The spinach leaf texture was incorporated within a COMSOL model of disinfectant concentration gradients, which revealed nearly 15% of the leaf surface is exposed to almost 1000 times lower concentration than the bulk rinse solution.

Keywords: /Spinach/ /Disinfection/ /Postharvest/

Oliveira, Ana, et al. 2016. Optimization of temperature, relative humidity and storage time before and after packaging of baby **spinach** leaves using response surface methodology. Food Bioprocess Technol. 9: 2070 - 2079.

Abstract

Second-order polynomial models were used to relate the independent variables, temperature, relative humidity and storage time; to the quality attributes (electrolyte leakage, chlorophylls, weight loss, humidity and headspace gas composition inside packages before and after packaging) of ready-to-eat spinach leaves. Results show that while waiting for processing the best conditions to assure high quality spinach leaves before packaging were 4°C , 83 % RH and 4 h. The weight loss of spinach leaves was time-dependent: increasing the exposure time under these conditions decreased the amount of wet leaves before packaging. Under the same conditions, the electrolyte leakage was lower (4.63 %) and the chlorophyll content (45.44) was higher. After packaging and while waiting for dispatch, temperature most affected the package headspace atmosphere. Indeed, an increase in storage temperature from 3 to 7°C led to a significant increase in respiration. The best combination of conditions in the high carer room was 3°C , 74% relative humidity for a maximum of 1 day before dispatch. In this case, the moisture content (0.46 %) and electrolyte leakage (4.16 %) were lower and the chlorophyll content (43.37) and oxygen concentration inside the packages of ready-to-eat spinach leaves (19.55 kPa) were higher.

Keywords: /Spinach/ / Ready-to-eat/ /Storage/ /Temperature/

TOMATO

Candir, Elif, AltanCandir, and Fatih Sen.Effects of aminoethoxyvinylglycine treatment by vacuum infiltration method on postharvest storage and shelf life of **tomato** fruit.Postharvest Biol. & Technol. 125: 13 - 25.

Abstract

The aim of this study was to determine effects of postharvest aminoethoxyvinylglycine (AVG) treatment using vacuum infiltration method on retardation of ripening, storage and shelf life of tomato fruit. In the Experiment-1, beefsteak 'Grando F1' tomato fruit was harvested at breaker stage and treated with AVG at six different doses (0, 62.5, 125, 250, 500 and 1000 mg L⁻¹) and three different vacuum pressures (0 kPa, -20 kPa and -30 kPa) using vacuum infiltration method and kept at 20 °C for 8 d. The AVG treatment of 1000 mg L⁻¹ at -30 kPa reduced ethylene production rate by 45.53%, delayed color changes and extended the number of days reaching to red ripe stage from 6 to 8 d at 20 °C and was confirmed as the optimal treatment for the maximum retardation of tomato fruit ripening by response surface methodology. In Experiment-2, untreated and treated breaker 'Grando F1' tomato fruit with 1000 mg L⁻¹ at -30 kPa were kept at 12 °C for 0, 5, 10, 15 or 20 d and for 2 d at 20 °C after cold storage. AVG treated fruit had lower ethylene production rate, lycopene content, a* and C* values and higher fruit firmness, chlorophyll content, L* and h^o values, compared to control during storage and shelf life period. For shipping to distant markets, storage and shelf life of untreated fruit were 10 d at 12 °C plus 2 d at 20 °C while AVG treatment extended storage and shelf life to 20 d at 12 °C plus 2 d at 20 °C.

Keywords: /Tomato/ /Ripening/ /Storage/ /Shelf life/

Lu, Hongyan, et al. 2016. Effect of UV-C on ripening of **tomato** fruits in response to wound. Scientia Hortic. 213: 104 - 109.

Abstract

Tomato fruits were dropped from 1.5 m to simulate wound, treated with 4.1 kJ/m²ultraviolet-C (UV- C) radiation, stored at 20°C for 12 d. During storage, firmness, color, ethylene production, respiration rate, lycopene, chlorophyll, protopectin, water soluble pectin (WSP), pectin methyl esterase (PME) and polygalacturonase (PG) activities of the tomato fruits were analyzed. UV-C delayed the decrease of firm- ness and hue angle in wounded tomato fruits. Lycopene accumulation and chlorophyll degradation were retarded by UV-C. Wound advanced the climacteric ethylene production and respiration rate peaks, while a delay up to 4 d in UV-C treated fruits was found. UV-C significantly postponed protopectin degradation and WSP accumulation, which were associated with the delay of PME and PG activities and contributed to the firmness maintenance. These results indicated that UV-C could maintain quality and delay wounded tomato fruits ripening.

Keywords: /Tomato fruit/ /Ripening/ /Quality/

Scott, G., et al. 2017. A comparison of low intensity UV-C and high intensity pulsed polychromatic sources as elicitors of hormesis in **tomato** fruit. Postharvest Biol. & Technol. 125: 52 - 58.

Abstract

Postharvest hormetic treatment of mature green tomato fruit (*Solanum lycopersicum* cv. Mecano) with high intensity pulsed polychromatic light (HIPPL) significantly delayed ripening to levels comparable to those achieved using a conventional low intensity UV-C (LIUV) source. A 16 pulse HIPPL treatment reduced the Δ TCI (tomato colour index) by 50.2% whilst treatment with a LIUV source led to a reduction of 42.8%. Moreover, the 16 pulse treatment also induced disease resistance in the fruit to *Botrytis cinerea* with a 41.7% reduction in disease progression compared to a 38.1% reduction for the LIUV source. A single 16 pulse HIPPL treatment was found to significantly reduce disease progression on ripe fruit with a 28.5% reduction in comparison to 13.4% for the LIUV treatment. It is shown here that delayed ripening and disease resistance are local responses in side-treated tomato fruit for both LIUV and HIPPL treatments. Finally, utilising a 16 pulse HIPPL treatment would reduce treatment times from 370 s for LIUV sources to 10 s per fruit – a 97.3% reduction.

Keywords: /Tomato/ Delayed Ripening/

HERBS AND SPICES

RED PEPPER

Lama, Kumar, et al. 2016. Nutritional qualities and aroma volatiles of harvested **red pepper** fruits stored at suboptimal temperatures. *Scientia Hort.* 213: 42 - 48.

Abstract

Red pepper fruits cv. Cannon stored at suboptimal temperatures of 1.5 or 4°C for 3 weeks followed by 3 days of shelf-life simulation were evaluated by analyzing selected quality traits and quantifying candidate aroma-related volatiles with a Gas Chromatograph-Mass Spectrometer to understand the quality associated with nutritional level and aroma. Analysis of variance showed that storage temperature and containment in microperforated Xtend[®] bags significantly influenced the nutritional qualities, with significant interaction between temperature and packaging material. Vitamin C, total phenolic and hydrophilic antioxidant contents were not significantly reduced ($\alpha=0.05$) at suboptimal storage temperatures of 4 or 1.5 °C in Xtend packaging, compared with those stored at the optimum storage temperature of 7 °C in Xtend[®] packaging. Aromatic volatiles, which create fruity, spicy, pungent, floral sweet, floral green and bell pepper-like odor notes, were observed. Most of the volatiles decreased in quantity at reduced storage temperatures when Xtend packaging was used. Particularly, 2-isobutyl-3-methoxypyrazine – the source of bell pepper-like aroma notes was found to decrease at lower storage temperatures but the fruits did not lack aroma. Thus quality and aroma of red pepper fruits can be maintained at suboptimal temperatures of 4 or 1.5 °C, which can serve as a quarantine treatment that would simultaneously eliminate Mediterranean fruit fly (*Ceratitiscapitata*).

Keywords: /*Capsicum annuum*/ /Postharvest/ /Quality/ /Shelf life/

Wang, Jun, et al. 2017. Effect of high-humidity hot air impingement blanching (HHAIB) on drying and quality of **red pepper** (*Capsicum annuum* L.). *Food Chem.* 220: 145 - 152.

Abstract

Effects of high-humidity hot air impingement blanching (HHAIB) under different times (30, 60, 90, 120, 150, 180, 210, and 240 s) on drying characteristics and quality attributes of red peppers in terms of surface colour, red pigment content, microstructure and texture were investigated. Results showed that polyphenol oxidase (PPO) residual activity of the samples decreased with increasing blanching time; it was decreased to 7% after 120 s. A first-order fraction model described PPO inactivation well. Suitable HHAIB time can reduce drying time extensively. Pepper surface colour was influenced by different treatments. In terms of red pigment content, there was no significant difference for blanching time under 120 s, whereas over blanching (blanching time ≥ 150 s) can significantly reduce the red pigment content. Microstructure observations indicate that superficial micro-cracks occur, which explain, why HHAIB enhances drying rate. The firmness, hardness, and gumminess of the samples decreased with increase of HHAIB time.

Keywords: /Red Pepper/ /Texture/ /Quality/

TUBERS AND ROOT CROPS

CASSAVA

Gutierrez, Tomy J. and Gema Gonzalez. 2016. Effects of exposure to pulsed light on surface and structural properties of edible films made from cassava and taro starch. Food Bioprocess Technol. 9: 1812 - 1824.

Abstract

Edible films derived from starch have been proposed as packaging materials. However, they may suffer physicochemical changes due to a variety of factors, such as pulsed light (PL) treatments. In this study, the effect of PL treatment as a crosslinking method on films made from cassava (*Manihotesculenta*C.) and taro (*Colocasiaesculenta* L. Schott) starch, plasticized with glycerol was evaluated. The average molecular weight, contact angle, moisture content, X-ray diffraction pattern, color, and mechanical and microstructural properties were evaluated. Films subjected to PL showed deterioration compared with control films as demonstrated by an increase in the contact angle, surface roughness, and crystallinity, and a decrease in the tensile strength, transparency, and water content, independent of the amylose content of the starches evaluated. Finally, the surface properties of these materials are defined by intermolecular interactions such as van der Waals-type force interactions (hydrogen bond), new bonds (crosslinking) formed between the biopolymeric chains (starch), and by breakage of covalent bonds.

Keywords: /Cassava/ /Edible Films/

ORNAMENTALS

CHRYSANTHEMUM

vanGeest, Geert, et al. 2017. Breeding for postharvest performance in chrysanthemum by selection against storage-induced degreening of disk florets. Postharvest Biol. & Technol. 124: 45 - 53.

Abstract

Breeding for postharvest performance in ornamentals is challenging, since many different

deteriorative processes determine vase life. In order to improve postharvest performance by breeding, selection should take place on these processes separately. To define processes that are important for chrysanthemum postharvest performance, vase life was assessed after two weeks of cold storage in a set of 44 chrysanthemum cultivars. Since disk floret degreening was the most frequent reason for ending vase life, we further investigated this trait in a large biparental population (n=381). To quantify disk floret degreening in this large number of genotypes, we developed a high-throughput phenotyping method. The method consists of the quantification of loss of green color as expressed by an increase of intensity of red divided by the intensity of green (R/G) in dark-held detached capitula. R/G increases when disk florets lose green color. The increase in R/G correlated significantly with the number of days until disk floret degreening occurred during vase life. This was the case for the 44-cultivar cultivar panel (Pearson's correlation coefficient (p) of -0.70; $p < 0.0001$) as well as in a subset of the biparental population (n = 145; $p = -0.67$; $p < 0.0001$). R/G increase segregated in a quantitative manner in the full biparental population, and had a moderately high heritability of 0.73. Carbohydrate content after harvest was measured in a smaller subset of the biparental population (n=55). The R/G increase correlated with carbohydrate content ($p=-0.56$; $p<0.0001$). Since carbohydrate content did not explain all variation in degreening sensitivity, we discuss different possible mechanisms to cope with carbohydrate starvation and avoid degreening. In conclusion, disk floret degreening is an important postharvest trait in chrysanthemum, and it is related to carbohydrate starvation. The quantitative segregation suggests involvement of multiple alleles, probably at multiple loci. The moderately high heritability makes it a suitable trait for QTL mapping, which we will commence in the near future.

Keywords: /Chrysanthemum//Vase life/