

SELECTIVE DISSEMINATION OF INFORMATION (SDI) PDF REPRINTS AS OF DECEMBER 2017

GENERAL

ACTIVE FILMS

Castillo, L.A., et.al. 2017. **Active films** based on thermoplastic corn starch and chitosan oligomer for food packaging applications. Food Packag. & Shelf Life 14: 128-136.

Abstract

Antimicrobial biodegradable films based on thermoplastic corn starch (TPS) and chitosan oligomers (CO) were obtained in order to develop a package prototype for perishable food products. Active films were fabricated thermo-compressing a sandwiched structure constituted by a thin layer of an oligomers enriched solution between two TPS films, previously made by melt-mixing and hot-pressing. Regarding enriched solution, it was obtained by dissolving oligomers in diluted acetic acid. Final material was characterized, determining its physical and optical properties, as well as, studying its microstructure. By diffusion assays it was demonstrated the capability of CO to migrate from the active film towards the aqueous stimulant media. Moreover, oligomers were able to diffuse from the matrix, regardless the aqueous medium acidity. Experimental data of diffusion assays were fitted using a mathematical model, estimating diffusion coefficients at three studied pH values (3, 5, and 7). Active film was used to obtain sachets to package perishable foods such as strawberries, ricotta, and flavoured breads, which were stored for 7 days under controlled conditions. Antimicrobial capacity of active sachets was corroborated through molds and yeast counts in the stored food products. Additionally, it was demonstrated that CO incorporation to the packaging material resulted in a more efficient way to inhibit microbial development than the spraying technique.

Keywords: /Active Films/ /Food Packaging/

ACTIVE PACKAGING

Rollini, M., et.al. 2017. Propolis and chitosan as antimicrobial and polyphenols retainer for the development of paper based **active packaging** materials. Food Packag. & Shelf Life 14: 75-82.

Abstract

The research investigates the potential combination of propolis and chitosan to develop a completely bio-based active food packaging material. Propolis glycolic extract was used as antioxidant and antimicrobial, due to its polyphenols content. Two commercial chitosans with different molecular weights were comparatively used as antimicrobial, wet strength additive substitute and polyphenols retainer. The effects of the addition of carboxymethyl- (CMC) or microfibrillated cellulose (MFC) and two pH values in paper production were investigated for polyphenols retention and paper strength. Chitosan, in

replacement of the most commonly used wet strength resin (PAAE), increased polyphenols retention more than 10 times. Paper sheets produced with the highest molecular weight chitosan, at pH 7 and with MFC addition showed the best wet strength (7.4 ± 0.5 Nm/g) and wet resistance ($13.3 \pm 1.2\%$). Paper antimicrobial activity was confirmed on thinly sliced raw veal meat, where a decrease of intentionally inoculated *L. innocua* of around 1 log cycle was achieved in 48 h at 4 °C.

Keywords: /Active Packaging/

EDIBLE FILMS

Saberi, B., et.al. 2017. Physical, barrier, and antioxidant properties of pea starch-guar gum biocomposite **edible films** by incorporation of natural plant extracts. *Food Bioprocess Technol* 10: 2240-2250.

Abstract

Active food packaging based on pea starch and guar gum (PSGG) films containing natural antioxidants (NAs) was developed. Four kinds of NAs (epigallocatechin gallate (EGCG), blueberry ash (BBA) fruit extract, macadamia (MAC) peel extract, and banana (BAN) peel extract) were added into the PSGG-based films as antioxidant additive. The effects of these compounds at different amounts on the physical and antioxidant characteristics of the PSGG film were investigated. The antioxidant activity was calculated with three analytical assays: DPPH radical scavenging ability assay, cupric reducing antioxidant capacity (CUPRAC), and ferric reducing activity power (FRAP). EGCG-PSGG films showed higher antioxidant activity, followed by BBA-PSGG, MAC-PSGG, and BAN-PSGG films, at all concentrations (0.75–3 mg/mL) and with all procedures tested. Additionally, the antioxidant activity of films showed a concentration dependency. The results revealed that addition of NAs made the PSGG film darker and less transparent. However, the moisture barrier was significantly improved when NAs were incorporated into the film. The FTIR spectra were examined to determine the interactions between polymers and NAs. The results suggested that incorporation of EGCG, BBA, MAC, and BAN into PSGG films have great potential for use as active food packaging for food preservation.

Keywords: /Edible Films/

FILMS

Kadam, D.A., et.al. 2017. Effect of TiO₂ nanoparticles on thermo-mechanical properties of cast zein protein **films**. *Food Packag. & Shelf Life* 13: 35-43.

Abstract

Zein protein (ZP) films embedded with core-and-shell nanoparticles, with titanium dioxide as core and silica as shell (TiO₂@SiO₂), were prepared by solution-casting method for its effect on mechanical properties. ZP (> 90% protein) at 1.5% w/w was prepared in aqueous ethanol solution with addition of TiO₂@SiO₂ nanoparticles and sonicated at 0, 16, 80 and 160 μm amplitudes

prior to casting on leveled glass plates or petri dishes. The physical and mechanical properties of prepared films were characterized. Storage modulus below the glass transition temperature T_g (~ 40 °C) decreased after sonication at all levels. Multiple peaks for DSC measurements of ZP films starting at -33.74 to -25.43 °C, and 122 to 138 °C indicated different glass transition temperatures and degradation profiles. Temperature range for thermal degradation of films was between 280 and 340 °C, which corresponds to the decomposition of ZP proteins. Presence of three to four degradation stages were observed in oxidizing the protein films in the temperature range of 30 to 850 °C. Incorporation of 1.5% (w/w) of $\text{TiO}_2@SiO_2$ nanoparticles into ZP films was shown to change the film properties and helped to improve their mechanical properties; however, reduced the elongation-to-break by almost half to two-third. Initial contact angle of ZP films with and without nanoparticles varied from 19.6 to 25.3° and 17.9 to 22.8° , respectively, irrespective of sonication levels. Water vapor permeability (WVP) (10^{-11} g m/m² s Pa) was affected by film thickness, however, were not significantly affected by sonication conditions and nanoparticle loading at study levels.

Keywords: /Films/ /Food Packaging/

Volpe, S., et.al. 2017. Effect of solid concentration on structure and properties of chitosan-caseinate blend **films**. Food Packag. & Shelf Life 13: 76-84.

Abstract

The objective of the work was to investigate how different concentrations of sodium caseinate (SC) and chitosan (CH) affect the structure and physical properties of the obtained blended films. Different concentrations of SC and CH solution were mixed in a proportion of 1:1 (v/v) to obtain 16 different blends. The structure of film forming solutions and films were studied by phase separation behavior, rheological behavior and microstructure characterization. The properties of the films were investigated by the moisture adsorption behavior, water vapor permeability (WVP) and mechanical analysis.

Rheological behavior of samples highlighted that chitosan and caseinate electrolyte complexes are function of the biopolymer concentration and ration between CH and SC. Blend film showed improved mechanical properties respect to CH films. The sample with a SC/CH ratio equal to 2 and surface density of 10 mg cm⁻² has the greatest elastic modulus, tensile strength and elongation at break values. The hydrophilic nature of films is reduced by increasing biopolymer concentration and ratio between CH and CS even if the barrier proprieties of blend film were not optimized respect to chitosan film.

Keywords: /Films/ /Chitosan/

Xiaohan Ma, et.al. 2017. Hydrophilic modification of cellulose nanocrystals improves the physicochemical properties of cassava starch-based nanocomposite **films**. LWT - Food Sci & Technol 86: 318-326.

Abstract

Carboxymethyl cellulose nanocrystals (N-CMCs) were produced by carboxymethylation of cellulose nanocrystals (CNCs) that derived from sweet potato residue. Transmission electron microscopy showed that the N-CMCs which had a porous surface structure were more loosely packed and slightly larger with a uniform diameter ranging from 30 nm to 50 nm. N-CMCs with low viscosity (<25 mPa s) and nano-sized scale were used as reinforcement for preparing cassava starch-based films. Effect of N-CMCs varying 0.2 g/100 mL to 0.5 g/100 mL was studied on physicochemical properties of N-CMCs/cassava starch films. N-CMCs/cassava starch film with 0.4 g/100 mL N-CMCs exhibited a 554% increase in tensile strength, 41% increase in elongation at break, and 123% increase in water solubility compared with the CNCs/cassava starch film. Moreover, the water vapor permeability and moisture absorption of the N-CMCs/cassava starch film decreased by 42.7% and 15.9%, respectively. Better mechanical properties, water barrier properties and water solubility was achieved for the N-CMCs/cassava starch film than for the CNC/cassava starch film, indicating N-CMCs after carboxymethylation were beneficial for reinforcement of cassava starch-based films. The moisture absorption abilities of both cassava starch nanocomposite films were comparable. The results may be applied to the development of water-soluble and biodegradable edible films for food packaging.

Keywords: /Films/

FRESH CUT

Oladunjoye, A.O., et.al. 2017. Trisodium phosphate enhanced phage lysis of *Listeria monocytogenes* growth on **fresh-cut** produce. LWT-Food Sci & Technol 86: 312-317

Abstract

Combination of bacteriophage and trisodium phosphate (TSP) to inactivate *Listeria monocytogenes* inoculated on fresh-cut produce was investigated. Fresh-cut tomato and watermelon inoculated with *L. monocytogenes* cocktail at log 10⁷ CFU/g were treated with Listex P100 bacteriophage (10⁸ PFU/g) alone, and in combination with TSP at 10, 30 and 60 mg/ml using chlorine at 200 mg/L as control. Treated samples were stored at 4 and 10 °C for 6 days. Effect of treatment on pH and colour of treated samples was evaluated. Phage treatment alone significantly ($p < 0.05$) reduced *L. monocytogenes* on fresh-cut tomato by approximately 0.5 and 0.6 log CFU/ml and on fresh-cut melon by 1.30 and 1.49 log CFU/ml at 4 and 10 °C respectively. Addition of phage-TSP at 10 mg/ml was only effective on fresh-cut melon, but phage-TSP at 30 and 60 mg/ml approximately reduced inoculated tomato by 1 and 2 logs, and melon by 2 and 5 logs at 4 and 10 °C respectively. Chlorine treatment showed 1-2 log reduction. Phage titer declined rapidly on tomato unlike melon, pH and colour parameters slightly increased with treatment combinations with no impairment on both samples. Phage-TSP combination could serve as effective tool to control listeriosis outbreak in fresh produce.

Keywords: /Fresh Cut/ /Watermelon/ /Tomato/

FRUITS AND VEGETABLES

Pinela, J. and I.C.F.R. Ferreira. 2017. Nonthermal physical technologies to decontaminate and extend the shelf-life of **fruits and vegetables**: Trends aiming at quality and safety. *Crit Rev Food Sci & Nutr* 57(10): 2096-2111.

Abstract

Minimally processed fruits and vegetables are one of the major growing sectors in food industry. This growing demand for healthy and convenient foods with fresh-like properties is accompanied by concerns surrounding efficacy of the available sanitizing methods to appropriately deal with food-borne diseases. In fact, chemical sanitizers do not provide an efficient microbial reduction, besides being perceived negatively by the consumers, dangerous for human health, and harmful to the environment, and the conventional thermal treatments may negatively affect physical, nutritional, or bioactive properties of these perishable foods. For these reasons, the industry is investigating alternative nonthermal physical technologies, namely innovative packaging systems, ionizing and ultraviolet radiation, pulsed light, high-power ultrasound, cold plasma, high hydrostatic pressure, and dense phase carbon dioxide, as well as possible combinations between them or with other preservation factors (hurdles). This review discusses the potential of these novel or emerging technologies for decontamination and shelf-life extension of fresh and minimally processed fruits and vegetables. Advantages, limitations, and challenges related to its use in this sector are also highlighted.

Keywords: /Fruits and Vegetables/ /Minimally Processed/ /Shelf Life/

POSTHARVEST PATHOGENS

Jiali Yang., et.al. 2017. An insight on the ethylene biosynthetic pathway of two major fruit **postharvest pathogens** with different host specificity: *Penicillium digitatum* and *Penicillium expansum*. *Eur J Plant Pathol* 149: 575-585.

Abstract

Although several studies have reported the stress-induced ethylene burst occurring in fruit in response to pathogen attack, relatively little is known about the role of this hormone in the fungal metabolism of many postharvest pathogens. To gain further knowledge, we investigated the ethylene production capacity and which ethylene biosynthetic pathways (including the 1-aminocyclopropane-1-carboxylic acid (ACC), the 2-oxoglutarate (OXO) and the 2-keto-4-methylthiobutyric acid (KMBA) pathways) were used under different *in vitro* conditions by *Penicillium digitatum* and *Penicillium expansum*. Both pathogens were capable of producing ethylene *in vitro* using different pathways but were dependant on the growing conditions. For instance, both the KMBA and the OXO pathways seemed to be responsible for ethylene biosynthesis in *P. digitatum* when grown in more stressful conditions (limited surface and nutrient

availability as in PDA tubes), while only the KMBA pathway seemed to be activated under other culture conditions (i.e. on PDA plates) or when the fungal mycelium was placed within aqueous solutions containing ethylene precursors. In contrast, the KMBA appeared to be the exclusive pathway responsible for ethylene production by *P. expansum* yet only when the fungal mycelium was in contact with aqueous solutions containing ethylene precursors. In both pathogens, ethylene production seemed to be synchronized with certain stages of fungal growth rather than conidiation, suggesting a putative role of this hormone in fungal metabolism.

Keywords: /Postharvest Pathogens/

FRUITS

AVOCADO

Aguirre-Joya, J.A., et.al. 2017. Effects of a natural bioactive coating on the quality and shelf life prolongation at different storage conditions of **avocado** (*Persea americana* Mill.) cv. Hass. Food Packag. & Shelf Life 14: 102-107.

Abstract

A bioactive and biodegradable coating of candelilla wax, pectin, aloe mucilage and purified polyphenols from *Larrea tridentata* was applied on avocados cv Hass by immersion, in order to evaluate its effect on avocados shelf life, stored at refrigerated (7 ± 2 °C) and room (25 ± 1 °C, 60% RH) conditions. Control treatments were avocados without coating and avocados with coating but without polyphenols from *L. tridentata*. Changes in brightness, pH, total soluble solids (°Brix), loss of weight, and firmness were monitored during 21 and 8 days for avocados stored at refrigerated and room conditions. Bioactive film was able to significantly reduce loss of weight (40% and 58% for room and refrigerated conditions, respectively) and firmness (9 times under refrigerated conditions) and maintain brightness (50% more than control), and also inhibited the development of internal grey pulp (100%). The application of bioactive films appears to be a very promising, easy and cheap alternative for preservation, and quality and shelf life prolongation for avocados stored at refrigerated and room conditions.

Keywords: /Avocado/ /Bioactive Coating/ /Storage/ /Shelf Life/

Ortiz-Viedma, J., et.al. 2018. Textural, flow and viscoelastic properties of Hass **avocado** (*Persea americana* Mill.) during ripening under refrigeration conditions. J Food Eng 219: 62-70.

Abstract

Microstructural and rheological changes in whole and ground (puree) mesocarp of Hass avocado (*Persea americana* Mill.) were studied under storage conditions (40 days at 10 °C). The maximum stress (σ_{max}), relaxation test and microstructural changes were applied to mesocarp chunks. The shear stress (τ), apparent viscosity (η) and complex modulus of viscoelasticity (G^*) were analyzed

in the mesocarp puree. The ripening produced a decrease in σ_{max} in both harvest, observing microstructural damage of the plant tissue over 30 days. The values of τ and η decreased, adjusting well to the Cross - Williamson ($R^2 = 0.95-0.94$) and Herschel - Bulkley ($r^2 = 0.91-0.98$) models. G^* has an elastic tendency (G') with a decrease in hysteresis. The results corroborate the impact of ripening on the rheological properties of the fruit.

Keywords: /Avocado/ /Ripening/

CITRUS

Kellerman, M., et.al. 2018. Postharvest dip, drench and wax coating application of pyrimethanil on **citrus** fruit: Residue loading and green mould control. Food Crop Prot 103: 115-129.

Abstract

Residue loading of pyrimethanil (PYR) with application methods typically used in South African packhouses and green mould control was studied. PYR was applied curatively (after inoculation) and protectively (before inoculation) in dip, drench and wax coating treatments and fruit were inoculated with an imazalil (IMZ)-sensitive or an IMZ-resistant isolate of *Penicillium digitatum*, the causal agent of citrus green mould. The dip treatments consisted of PYR concentrations 0, 50, 100, 250, 500 and 1000 mg L⁻¹; fruit were dipped for 60 s at 18 °C at pH 7. Residues loaded differed between fruit type and batch. At the registered concentration of 1000 mg L⁻¹, an average of 1.96 mg kg⁻¹ PYR (range 1.40–2.95 mg kg⁻¹) was loaded. Increased residue levels generally resulted in improved control, but better curative than protective control was observed with effective residue levels of 0.27 and 0.91 mg kg⁻¹ for 50% and 75% curative control of green mould, respectively. Effective residue levels for 50% protective control were 0.97–1.43 mg kg⁻¹. Drench treatments consisted of exposure times of 30, 60 and 90 s with 1000 mg L⁻¹ PYR. PYR residues on Valencia oranges were 2.46–4.22 mg kg⁻¹ PYR, and on navel oranges were 2.09–7.64 mg kg⁻¹. Green mould control on Valencia orange fruit was moderate (57.3–69.8% for curative treatment after 6 h) to relatively poor (4.9–14.6% control for curative treatments after 24 h and 18.1–26.4% for protective treatments). Control on navel oranges following these treatments was poor (0–7%). Drench applications with different combinations of PYR, IMZ, thiabendazole (TBZ), guazatine (GZT) and didecyl dimethyl ammonium chloride were applied to navel orange fruit with 60 s exposure time. In general, fungicide mixtures performed better than single fungicides (44.4–64.6% for mixtures vs. 24.3, 39.6 and 46.5% for PYR, GZT and TBZ respectively). Drench applications where fruit were inoculated with spore suspensions containing 106, 105, 104 or 103 spores mL⁻¹ showed that infections from lower inoculum loads were better controlled (90.6–98.6% vs. 32.6–62.2% for 103 vs. 106 spores mL⁻¹). Wax with 2000 or 4000 mg L⁻¹ PYR was applied at 0.6, 1.2 and 1.8 L wax ton⁻¹ of fruit. Residues loaded on navel oranges were 1.75–6.33 mg kg⁻¹, and on Valencia oranges were 1.05–9.91 mg kg⁻¹. Green mould control on navel oranges was poor and were 0–12.2%. On Valencia oranges, higher levels of protective control (28.8–54.0%) than curative treatments (10.5–27.3%) was observed. The IMZ-resistant isolate was successfully controlled by all

PYR treatments, in some cases better than the sensitive isolate. In conclusion, PYR provided very good curative control in dip applications, but gave poor results in drench and wax applications. Green mould control following PYR drench treatment improved on fruit inoculated with smaller spore loads, or when PYR was mixed with other fungicides.

Keywords: /Citrus/

FIG

Allegra, A. and G. Colelli. 2017. The effect of passive atmosphere on quality of 'Dottato' breba **fig** stored at low temperature. Acta Horti 1173: 315-318.

Abstract

'Dottato' is the most representative fig (*Ficus carica* L.) Italian cultivar. Consumers prefer fresh figs at tree ripe maturity stage and fig fruit do not stand more than 3 days, even at low temperatures. To reduce their respiration rate and increase their postharvest life, the effectiveness of low temperature storage was studied on 'Dottato' fig fruit either placed in rigid bi-oriented polystyrene bags or left in open bags, and stored for 3, 5, 7, 10 and 14 days at 4°C and 90% RH. Appearance score, respiration rate, soluble solids, were measured at each sampling date. Fig fruit control in air, showed excellent quality performances still after 7 days of storage, while fruit held, in passive modified atmosphere, showed substantial decay after 3 days of storage.

Keywords: /Fig/ /Storage/ /Visual Appearance/ /Shelf Life/

Ingrassia, M., et.al. 2017. Consumer preferences for **fig** fruit (*Ficus carica* L.) quality attributes and postharvest storage at low temperature by in-store survey and focus group. Acta Horti 1173: 383-388.

Abstract

Fig (*Ficus carica* L.) is cultivated mainly in southern Italy and in several countries of the Mediterranean area. According to official statistics the quantities of fresh fig placed on domestic market are low, though the home consumption is known to be relatively high in summer. The objective of this study was to discover consumers' preferences for sensory, quality attributes of fresh fig and primary drivers of liking, in order to enhance fruit marketing value. An in-store consumer test and two focus groups were carried out to assess preferences in regards to fresh figs after 3 and 7 days of storage at low temperature: the selected sensory, intrinsic and extrinsic attributes were ranked by consumers. Spearman rank-order correlation coefficient was applied. Results demonstrate that intrinsic and extrinsic attributes of fig are not the key drivers of liking, contrarily the sensory attributes are. Sensory qualities of fruit are the main drivers for purchasing. Consumers' acceptance after 7 days of storage was good. Values of correlations between in-store evaluations and of focus group ones demonstrate the effectiveness of the storage at low temperature. These results may be important for future improvements in postharvest research and marketing actions in regards to consumers.

Keywords: /Fig/ /Consumer Preference/ /Storage/

Sortino, G., et.al. 2017. Postharvest quality and sensory attributes of *Ficus carica* L.. Acta Horti 1173: 353-358.

Abstract

The aim of this research was to evaluate the relationship between some physical and chemical characteristics and sensory descriptors of fig fruits 'Dottato' and 'Melanzana', belonging to the national germplasm bank of fig trees and cultivated in Southern Italy. The sensory principal descriptors used are external appearance, skin color, pulp color, odor, sweetness, stickiness, bitterness, juiciness, firmness, tannic taste and presence of achenes. Fresh weight, total soluble solids (TSS), titratable acidity (TA), TSS:TA, firmness, and sensory properties changed with cultivar. SSC was more correlated with sensory attributes than TA, but other factors may also be important in controlling this relationship, such as firmness. Our results proved that simple analysis of TSS, TA and firmness can not fully describe fruit quality, as sensory analysis does. The correlation between chemical traits and sensory descriptors, indicate that flavor, sweetness, skin color and texture best describe fruit quality, while smoothness, stickiness and bitterness were not important.

Keywords: /Fig/ /Postharvest Quality/

Vivaldi, G.A., et.al. 2017. Genetic diversity of early ripening breba accessions (*Ficus carica* L.) found in the "Pomona" Apulian collection. Acta Horti 1173: 121-126.

Abstract

In order to study fig (*Ficus carica* L.) biodiversity in Southern Italy, a study was performed in a private Apulian collection, "I Giardini di Pomona", in which 350 different native and international cultivars were recovered in the last 15 years. This collection is located in middle part of Apulia region inside an area of great charm called "Valle D'Itria". In the region, fig is an important edible fruit tree species and it has been used for fresh fruit production, for centuries. Moreover, fig is considered as an important element of natural landscape and as significant cultural heritage. In this study, the Apulian breba cultivars, characterized by interesting agronomic traits, such as early ripening and fruit quality, were characterized by using morphological descriptors and microsatellite markers to unambiguously identify interesting genotypes. The genetic variability among different early ripening accessions located in the collection was investigated analyzing the polymorphism of 18 simple sequence repeat (SSR) markers. The SSR analysis showed a large genetic diversity among early ripening accessions and it was observed a high morphological variability, not always revealed by microsatellite markers. Several genotypes not characterized yet were found and this information is useful for agronomical valorisation of native early ripening fig cultivars in both national and international markets. This research evidenced the richness of the available genetic resources in the "Pomona" collection and it increased knowledge on fig characterization, in order

to identify fig genotypes with appreciated commercial characteristics and suitable for extending the ripening season.

Keywords: /Fig/

KIWIFRUIT

Fangliang Zheng, et.al. 2017. Chitosan controls postharvest decay and elicits defense response in **Kiwifruit**. Food Bioprocess Technol 10:1937-1945.

Abstract

Chitosan is an eco-friendly alternative to synthetic fungicides for managing postharvest decay of fruits and vegetables. The ability of chitosan to enhance resistance to postharvest gray (*Botrytis cinerea*) and blue mold (*Penicillium expansum*) in kiwifruit was investigated. The gene expression and activity of antioxidant enzymes, and total phenolic compounds were determined. Results showed that chitosan at 5 g/L significantly inhibited gray and blue mold in kiwifruit stored at 25 and 4 °C. Chitosan significantly induced the gene expression of *catalase*, *superoxide dismutase*, and *ascorbate peroxidase*, as well as increased the enzyme activity. Moreover, chitosan markedly increased the content of total phenolic compounds in kiwifruit. Importantly, chitosan also exhibited beneficial effects on fruit quality. Taken together, the ability of chitosan to reduce mold in stored kiwifruit may be associated with the elicitation of host defense response. These results have practical implications for the application of chitosan to reduce postharvest losses.

Keywords: /Kiwifruit/ /Postharvest Decay/ /Fruit Quality/ /Chitosan/

LEMON

Martinez-Hernandez, G.B., et.al. 2017. Postharvest treatments to control physiological and pathological disorders in **lemon** fruit. Food Packag. & Shelf Life 14: 34-39.

Abstract

Physiological and pathological disorders of lemons (*Citrus limon* (L.) Osbeck) are the main causes of quality losses during shelf life leading to high economic losses. This experiment studied the effect of innovative postharvest chemical treatments [Fortisol Ca (1%; FoCa), Fortisol CaPlus (1.5%; FoCaPlus), Philabuster (0.2%; PHI) and Ortocil (1%; ORT)], and their combinations, by immersion (30 s), to control decay, chilling injury and red blotch in lemon fruit. The influence of a preharvest application of Fortisol Ca (1%) over the trees was also studied. Lemons washed with tap water were used as control fruit (CTRL). Lemons were stored for 33 d at 7 °C, which simulated a long storage and transportation period, followed by 5 d at 22 °C of retail sale period, simulating then a prolonged shelf life. The PHI + ORT treatment completely avoided pathological disorders after both shelf life periods. FoCa and FoCaPlus reduced chilling injury and red blotch. The incidence of such physiological disorders was even highly reduced when combined FoCa and FoCaPlus with PHI + ORT

treatments were used. In particular, the combination of PHI + ORT + FoCaPlus completely avoided the incidence of chilling injury and red blotch. In conclusion, a combined postharvest treatment of PHI + ORT with FoCa/FoCaPlus highly reduced, or even avoided, physiological disorders (chilling injury and red blotch), minimizing mass losses, in lemon fruit during long storage and transportation, and retail sale periods extending its shelf life.

Keywords: /Lemon/ /Postharvest Treatments/

MANGO

Ambuko, J., et.al. 2017. Comparison of the postharvest characteristics of **mango** fruits produced under contrasting agro-ecological conditions and harvested at different maturity stages. J Agric Sci 9(8): 181-192.

Abstract

Mango (*Mangifera indica*) fruit production in Kenya occurs under diverse agro-ecological zones (AEZs). The different AEZs have variations in rainfall, sunlight, temperature, soils and cultural practices all of which affect fruit physiology and quality at harvest. Maturity stage at harvest also affects mango fruit quality and storage potential. In the present study, the effect of AEZs and fruit maturity stage on the postharvest shelf-life of mango variety apple was determined. The study was conducted over two seasons in 2011 and 2013 and the fruits were harvested from two different AEZs: Embu (high potential zone) and Makueni (low potential zone). The fruits were also harvested at two maturity stages based on flesh color. The fruits were selected for uniformity and allowed to ripen at ambient room conditions (Temperature; 25 ± 1 °C and RH $60 \pm 5\%$) until a predetermined end stage. Five fruits were randomly sampled from each batch for determination of respiration, cumulative weight loss, total soluble solids, titratable acidity, ascorbic acid and mineral nutrients (potassium and magnesium). The results showed that 'apple' mango fruit quality was significantly affected by production location, maturity stage and the interaction between the two factors. Fruits harvested from Makueni and fruits harvested at early maturity stage (S1) had a longer shelf life (3 days more). Makueni fruits had significantly ($p < 0.05$) lower respiration rates accompanied with minimal weight loss. In addition, total soluble solids (TSS), ascorbic acid and mineral (magnesium) were significantly ($p < 0.05$) high in Makueni fruits while fruits from Embu were significantly ($p < 0.05$) high in total titratable acidity and potassium content. This study confirms profound variability in fruit quality as affected by the production location and harvest maturity.

Keywords: /Mango/ /Shelf Life/ /Postharvest Characteristics/ /Maturity/

Awad, M.A., et.al. 2017. Quality and biochemical changes of 'Hindi-Besennara' **mangoes** during shelf life as affected by chitosan, gallic acid and chitosan gallate. J Food Sci Technol 54(13): 4139-4148.

Abstract

Quality and biochemical changes of 'Hindi-Besennara' mangoes in response to chitosan, gallic acid (GA) and chitosan gallate (CG) postharvest dipping were studied during 2 weeks of storage at 20 ± 2 °C and 60–70% RH. Both GA and CG lowered decay and weight loss during storage. Chitosan and GA at high level and CG at both level maintained higher membrane stability index of peel than control. Fruits treated only CG and GA at high level and chitosan at both levels retained higher acidity and vitamin C but lower pH and total soluble solids (TSS) than control. All treatments resulted with fruits with higher flesh firmness and lower TSS/acid ratio than untreated fruits. GA at both rates gave lower total phenols after 1 week of storage than control. Both levels of GA and low level of chitosan resulted with fruits with higher antioxidant capacity (lower IC₅₀ values) after 1 week of storage than control. All treatments decreased α -amylase activity of fruit peel compared to control. CG and GA at high level and chitosan at low level increased peroxidase activity compared to control. It was concluded that CG and GA dipping delayed ripening and maintained quality of 'Hindi-Besennara' mangoes during 2 weeks of shelf life.

Keywords: /Mango/ /Edible Coating/ /Shelf Life/ /Postharvest Quality/

Reddy, S.V.R., et.al. 2017. Influence of 1-MCP on texture, related enzymes, quality and their relative gene expression in 'Amrapali' **mango** (*Mangifera indica* L.) fruits. *J Food Sci Technol* 54(12): 4051-4059.

Abstract

The mango fruits remain biologically active even after harvest as they continue respiration, transpiration and other bio-chemical processes. Being highly perishable, the fruit quality deteriorates fast under ambient conditions (30 ± 5 °C and $50 \pm 5\%$ RH), rendering them unmarketable within 5–6 days. In order to extend the shelf-life of 'Amrapali' mango fruits, we have treated them with three different concentrations (500, 750 and 1000 ppb) of 1-Methylcyclopropene (1-MCP) @ 20 °C and stored at ambient conditions. Among all the treatments, 1000 ppb was found to be an effective in extending shelf-life till twelfth day with minimum physiological loss in weight (19.24%), maximum firmness (10.43 N), highest retention of quality parameters such as soluble solid concentrates (27.88 °B), ascorbic acid (28.49 mg 100 g⁻¹ FW) and total antioxidant activity (675.41 μ mol Trolox g⁻¹ FW) compared to untreated mango fruits (21.79%, 5.45 N, 23.17 °B, 19.55 mg 100 g⁻¹ FW and 265.41 μ mol Trolox g⁻¹ FW, respectively). Gene expression studies have revealed that the texture related gene *expansin* was significantly repressed till fifth day of storage with increasing concentrations of 1-MCP.

Keywords: /Mango/ /1-MCP/ /Postharvest Quality/

PAPAYA

Caez-Ramirez, Gabriela, et.al. 2018. Morphometric analysis and tissue structural continuity evaluation of senescence progression in fresh cut **papaya** (*Carica papaya* L.). *J Food Eng* 216: 107-119.

Abstract

Senescence prompted after cutting and environmental exposure was evaluated in fresh cut papaya in two ripening stages and two tissue locations by confocal laser scanning microscopy and digital image analysis to establishing tissue structural stability. Self-fluorescence images from two emission channels were analysed through multifractal parameters, lacunarity, and skeleton attributes. Skeletons features reflected tissue integrity by the number and length of branches, and amount of junctures as key elements in the microarchitecture of the cellular supportive structure, depending on pectin variation. Tissue stability could be described through the integrity of continuity lines given by the connected cell walls and middle lamella. The patterns of structural continuity lines showed properties of a multifractal set. Ripened and exposed tissues addressed lower singularity. Digital Image analysis allowed to determining stability status associated to tissue integrity and structural continuity by establishing singularities in heterogeneous tissue netting when describing senescence progression of fresh cut papaya.

Keywords: /Papaya/ /Fresh Cut/

PEAR

Iglesias, M.B., et.al. 2018. Biopreservation of fresh-cut **pear** using *Lactobacillus rhamnosus* GG and effect on quality and volatile compounds. LWT - Food Sci & Technol 87: 581-588.

Abstract

In recent years, the consumption of minimally processed fruit has increased. However, unfortunately, these products could be an appropriate vehicle for the transmission of foodborne pathogens. In this study, the antagonistic capacity of the probiotic strain *Lactobacillus rhamnosus* GG against a cocktail of 5 serovars of *Salmonella* and 5 serovars of *Listeria monocytogenes* on fresh-cut pear at conditions simulating commercial application was assessed. Moreover, its effect on fruit quality, particularly on the volatile profile, was determined, during 9 days of storage at 5 °C. *L. monocytogenes* population was reduced by approximately 1.8 log-units when co-inoculated with *L. rhamnosus* GG. However, no effect was observed in *Salmonella*. Fruit quality (soluble solids content and titratable acidity) did not change when the probiotic was present. A total of 48 volatile compounds were identified using gas chromatography. Twelve of the compounds allowed to discriminate *L. rhamnosus* GG-treated and untreated pears. Considering their odour descriptors, their increases could be positive in the flavour perception of *L. rhamnosus* GG-treated pear. The probiotic was able to control *L. monocytogenes* population on fresh-cut pear, which could be a vehicle of probiotic microorganisms as quality of fruit was not affected when the probiotic was present.

Keywords: /Pear/ /Fresh Cut/

POMEGRANATE

Belay, Z.A., et.al. 2017. Application of simplex lattice mixture design for optimization of active modified atmosphere for **pomegranate** arils (cv. Wonderful) based on microbial criteria. Food Packag. & Shelf Life 14: 12-17.

Abstract

Despite the advantages of low O₂ and enriched CO₂ for extending the storage life of pomegranate arils, limited studies on systematic selection and optimization of gasses to reduce the microbial growth during storage have been reported. Therefore, this study was undertaken to optimize the gas composition for cold storage (10 °C) of pomegranate arils (cv. Wonderful) based on microbiological criteria. Selecting experimental points and optimizing gas concentration were carried out according to the simplex lattice mixture design with three factors (O₂, CO₂ and N₂). Seven gas combinations including low O₂ (2–18 kPa), enriched and high C O₂ (2–18 kPa) and 80–96 kPa N₂ were used in varying concentrations and the bacterial, yeast and mould growth on arils were analysed. Aerobic mesophilic bacteria growth varies between 3.95–5.89 log CFU g⁻¹ and yeast growth was between 3.84–5.91 log CFU g⁻¹, whereas, mould growth was between 2.15–3.63 log CFU g⁻¹ across the modified atmospheres. Data from these analyses were used to fit linear and cubical polynomial models. Pareto analysis and ternary contour plots showed that the main effects (CO₂, N₂ and O₂) as well as their interaction had significant effects on microbial growth. For all microbial criteria's, the lowest growth was tend to move to the highest CO₂ in the modified atmosphere system. On the contrary, the presence of higher O₂ concentration stimulated the growth. This was evident that, the gas mixture containing 12.67–18 kPa CO₂, 2–4.67 kPa O₂ and 80 – 82.67 kPa N₂ significantly reduced microbial count on pomegranate arils. Validation of the model showed that the cubical model predicted the microbial counts effectively with high correlation coefficients of R₂ > 94% for mould and > 99% for aerobic mesophilic bacteria and yeast, whereas, the linear model overestimated bacteria and yeast counts and underestimated mould count.

Keywords: /Pomegranate/ /Minimally Processed/ /Active Modified Atmosphere/

STRAWBERRY

Octavia, L. and Wee Sim Choo. 2017. Folate, ascorbic acid, anthocyanin and colour changes in **strawberry** (*Fragaria X annanasa*) during refrigerated storage. LWT - Food Sci & Technol 86: 652-659.

Abstract

Colour and the composition of folate, ascorbic acid and anthocyanin of strawberry cv. Camarosa was monitored during refrigerated storage at 4 °C each day for 6 days. Folate, anthocyanin and ascorbic acid compositions were determined using High Performance Liquid Chromatography (HPLC) with UV-Vis detector. Five forms of folate: 5 methyl-tetrahydrofolate (THF) [65%], 10 formyl-folic acid (28%), 5 methylene-THF (4%), 5 formyl-THF (2%), and THF (<1%) and two forms of anthocyanins: pelargonidin 3-O-glucoside (97%) and cyanidin 3-O-rutinoside (3%) were identified in the fresh strawberries. The total folate content

of the fresh strawberries determined using HPLC method was lower than that using microbiological assay. The ascorbic acid content in fresh strawberry was 57 ± 11 mg/100 g of fruit. The colour of the external skin of strawberries was measured using a Hunter colorimeter and showed fluctuation only for L* values (lightness), but a* (redness) and b* (yellowness) values remained constant during the refrigerated storage. There was no positive correlation between a* values and anthocyanin content. Strawberries should be consumed within a day or two after harvest since the reduction of these three bioactive compounds occurred even after a day of refrigerated storage.

Keywords: /Strawberry/ /Cold Storage/ /Low Temperature Storage/

VEGETABLES

LEAFY VEGETABLES

Vazquez-Armenta, F.J., et.al. 2017. Antibacterial and antioxidant properties of grape stem extract applied as disinfectant in **fresh leafy** vegetables. J Food Sci Technol 54(10): 3192-3200.

Abstract

In the present study total phenolic content (TPC), total flavonoid content (TFC), antioxidant activity and antimicrobial properties of grape (*Vitis vinifera* var. Red Globe) stem extract is reported. Also, the identification of main phenolic compounds was carried out by UPLC-PAD analysis. TPC and TFC of extract were 37.25 g GAE kg^{-1} and 98.07 g QE kg^{-1} , respectively. Extract showed an antioxidant capacity of 132.60 and 317 g TE kg^{-1} for DPPH and ABTS radical scavenging capacity, respectively. The main phenolic compounds identified were rutin, gallic acid, chlorogenic acid, caffeic acid, catechin and ferulic acid. Extract inhibited the growth of *Listeria monocytogenes*, *Staphylococcus aureus*, *Salmonella enterica* subsp. *enterica* serovar Typhimurium, and *Escherichia coli* O157: H7 at MIC range 16 – 18 g L^{-1} . Extract affected the different phases of bacterial growth. In addition, application of Extract (25 g L^{-1}) as a sanitizer was effective to reduce the populations of all bacteria inoculated in lettuce (0.859 – 1.884 log reduction) and spinach (0.843 – 2.605 log reduction). This study emphasizes the potential of grape processing byproducts as an emergent and attractive source of bioactive compounds with antioxidant properties and antimicrobial activity against important foodborne pathogens. The study demonstrated that stem extract could be used to control the presence of human pathogenic bacteria in fresh leafy vegetables.

Keywords: /Leafy Vegetables/

LETTUCE

Volpe, S., et.al. 2018. Condensation and moisture regulation in packaged fresh-cut iceberg **lettuce**. J Food Eng 216: 132-137.

Abstract

The aim of this work was to understand the transpiration rate of fresh-cut iceberg lettuce and select appropriate packaging material for regulating moisture and minimising condensation inside the package. Experiments were conducted by conditioning the sample at 2, 6 and 10 °C and 76, 86, 96 and 100% RH. TR was recorded during 7 days of storage. Packaging design optimization (with a cellulose-based film window on polymeric film) was performed using TR predicted at temperature of 6 °C and 98 and 99% of RH, respectively, in order to establish the desired WVTR of packaging materials. TR ranged from 0.04 to 2.36 g kg⁻¹ h⁻¹ over all the combinations of temperature and RH tested. Based on package design optimization both pure materials (polymer or cellulose-based) didn't satisfy WVTR requirement for fresh-cut iceberg lettuce. Among combined packages, the use of a surface ratio between 5% and 15% could prevent moisture condensation inside the package. Results from validation experiment confirmed the goodness of the package design procedure and showed that the package film with 15% of cellulose film window area on polymeric film was the only one that prevent water vapour condensation inside the package and avoid an excessive weight loss.

Keywords: /Lettuce/ /Fresh Cut Produce/ /Packaging Design/

TOMATO

Mditshwa, A., et.al. 2017. Effect of ultraviolet irradiation on postharvest quality and composition of **tomatoes**: a review. J Food Sci Technol 54(10): 3025-3035.

Abstract

Ultraviolet (UV) irradiation has recently emerged as a possible alternative to currently used postharvest phytosanitary treatments. Research has also highlighted other benefits associated with UV irradiation in postharvest technology. This review presents the effects of UV irradiation on postharvest and nutritional quality of tomatoes. The application of UV irradiation on tomatoes is discussed including its effect on biological (respiration rate, ethylene production and microbial growth), physico-chemical (firmness, colour, total soluble solids and titratable acidity) and nutritional (vitamins, carotenoids, phenolic and antioxidants) quality. UV-treated tomatoes have shown resistance to microbial growth and decay. Although UV irradiation reduces the loss of vitamin C during storage, the loss of vitamin E remains a concern. UV treatments lead to higher antioxidant capacity, flavonoids and phenolic content. UV irradiation significantly reduced carotenoids in certain cultivars. Based on the literature reviewed, the success of UV irradiation treatments is cultivar-dependent. While improved retention of phytochemicals has been reported in UV-C treated fruit, increased losses have been reported in certain cultivars. Research efforts on the development of cultivar-specific UV irradiation protocols are warranted. The effect of harvest maturity and seasonal differences in the efficacy of UV treatments is required to be investigated.

Keywords: /Tomato/ /Postharvest Quality/

Siracusa, L., et.al. 2018. Targeted secondary metabolic and physico-chemical traits analysis to assess genetic variability within a germplasm collection of “long storage” **tomatoes**. Food Chem 244: 275-283.

Abstract

“Long storage” tomato is a crop traditionally cultivated in the Mediterranean area under no water supply, that recently has attracted the interest of breeders for its high tolerance to drought and as potential genetic source in breeding programs for water stress resistance. A collection of 28 genotypes of “long storage” tomato (*Solanum lycopersicum* L.) was studied for carotenoid and polyphenol profile and content, vitamin C, and other physico-chemical traits of fruits. Tomato carotenoids and polyphenols were identified and quantified using high-performance liquid chromatography coupled with diode array detection and electrospray-mass spectrometry (HPLC/DAD/ESI-MS); nineteen different phenolic compounds and six different carotenoids, for a total of 25 markers, have been detected, quantified and used to discriminate among the different landraces to find out which could be the best candidate for a medium-to-large scale cultivation. Different statistical approaches (ANOVA, Principal Components Analysis, Cluster Analysis) have been used for data analysis.

Keywords: /Tomato/

Vallarino, J.G., et.al. 2017. Postharvest changes in LIN5-down-regulated plants suggest a role for sugar deficiency in cuticle metabolism during ripening. Phytochem 142: 11-20.

Abstract

The cell wall invertase gene (*LIN5*) was reported to be a key enzyme influencing sugar uptake of tomato (*Solanum lycopersicum*) fruit. It was additionally revealed to be a key regulator of total soluble solids content in fruit as well as for reproductive development, being mainly involved in flower development, early fruit and seed development but also in ripening. Here, we demonstrate that silencing of the *LIN5* gene promotes changes affecting fruit cuticle development which has a direct effect on postharvest properties. Transformants were characterized by reduced transpirational water loss in mature fruits accompanied by several other changes in the cuticle. Quantitative chemical composition, coupled with microscopy of isolated cuticle fruits revealed that the cuticle of the transformants were characterized by an increase of the thickness as well as significant increase in the content of cuticle components (cutin, phenolic compounds, and waxes). Furthermore, detailed analysis of the waxes revealed that the transformants displayed changes in waxes composition, showing higher levels of *n*-alkanes and triterpenoids which can shift the proportion of crystalline and amorphous waxes and change the water flux through the cuticle. Expression of the genes involved in cuticle biosynthesis indicated that *LIN5* influences the biosynthesis of components of the cuticle, indicating that this process is coupled to sugar uploading via a mechanism which links carbon supply with the capacity for fruit expansion.

Keywords: /Tomato/ /Ripening/

VEGETABLES

Singh, M. and T. Sahareen. 2017. Investigation of cellulosic packets impregnated with silver nanoparticles for enhancing shelf-life of **vegetables**. LWT - Food Sci & Technol 86: 116-122.

Abstract

Losses due to postharvest spoilage are major factors in food industries. Microbial contamination from field, cold storage and at consumer's place is one of the main causes for food quality loss and shelf life reduction. This report demonstrates the usefulness of low cost and eco-friendly cellulosic packets impregnated with silver nanoparticles for storage of vegetables. *Aeromonas* sp. was isolated from rotten vegetables (tomatoes and cabbage) and was designated as CTM. Biochemical and microbiological tests together with 16S rDNA sequencing confirmed the isolate as *Aeromonas hydrophila*. Silver nanoparticles showed bactericidal effect on bacterial isolate CTM. Minimum Inhibitory Concentration (MIC) value of nanoparticles against CTM was 15.3 µg/ml. Packets impregnated with nanoparticles exhibited significant antimicrobial property. Periodic evaluation of stored vegetables in these packets demonstrated enhanced shelf life with no significant changes in nutritional values whereas vegetables stored in packets without nanoparticles impregnation demonstrated decreased in values. Moisture content was also maintained which makes the vegetables looks fresh. Thus, the developed food packets will be helpful in preventions of microbial growth at varied conditions and will enhanced the shelf life of vegetables.

Keywords: /Vegetables/ /Shelf Life/ /Packaging/

HERBS AND SPICES

BELL PEPPER

Hui-Zhi Chen, et.al. 2018. Evaluation of the freshness of fresh-cut green **bell pepper** (*Capsicum annuum* var. *grossum*) using electronic nose. LWT-Food Sci & Technol 87: 77-84.

Abstract

This study investigated a freshness assessment method utilizing electronic nose (e-nose) for fresh-cut green bell pepper (*Capsicum annuum* var. *grossum*) stored at 7 ± 1 °C. Physicochemical results showed that the fresh-cut green bell peppers were fresh until 5 days and became spoiled at 7 days, particularly as evidenced by a surge in aerobic plate count and malondialdehyde content on subsequent days. The e-nose data combined hierarchical cluster analysis (HCA) can preliminarily distinguish between fresh (days 0, 1, 3 and 5) and spoiled (days 7 and 9) samples. Principal component analysis (PCA) result showed that days 0 and 1 samples were mixed together in PCA plot, and the other different groups can be obtained according to the different sampling days. Partial least squares

(PLS) statistical model ($R^2 = 0.9783$, RMSE = 0.3317) was used to correlate the e-nose data with the aerobic plate counts. The results suggested the promising possibility of e-nose system for monitoring freshness of fresh-cut green bell pepper.

Keywords: /Bell Pepper/ /Fresh Cut/ /Shelf Life/

ROCKET LEAVES

Mastrandrea, L, et.al. 2017. Effect of temperature abuse and improper atmosphere packaging on volatile profile and quality of **rocket leaves**. Food Packag. & Shelf Life 14: 59-65.

Abstract

This study aimed to investigate the effect of temperature abuse and improper packaging on volatiles profile, vitamin C and sensorial attributes of rocket leaves packaged in modified atmosphere. Leaves packed in sub-optimal conditions (high ratio of product weight/bag surface) were stored for 10 days at 0 and 5 °C, and for 8 days at 15 °C. Rocket leaves were kept in macroperforated bags in order to prevent modification of atmosphere within the headspace (as control). The packed rockets at 0 °C retained ascorbic acid content while it decreased during storage at higher temperatures. The main losses in the appearance and vitamin C content were observed when the O₂ level reached about 0 kPa corresponding to the highest CO₂ accumulation in the bag (25 kPa). The off-odors from dimethyl sulfide (DMS), dimethyl disulfides (DMDS) and other volatiles were produced at 5° and 15 °C, changing the initial headspace fingerprint, which was best preserved at 0 °C. Results of this work showed that improper packaging condition may decrease the shelf-life of rocket leaves compared to storage in air, inducing loss of appearance score, the production of off-odors and the degradation of Vitamin C. No additional benefit was obtained by optimal gas composition when bags were stored at 0 °C, indicating that the use of low temperature was effective to slowing down degradation reactions.

Keywords: /Rocket Leaves/ /Shelf Life/

TUBERS AND ROOTCROPS

POTATO

Fehres, H. and A. Linkies. 2018. A mechanized two-step cleaning and disinfection process strongly minimizes pathogen contamination on wooden **potato** storage boxes. Crop Prot 103: 111-114.

Abstract

For storage of fruit and vegetables wooden boxes are often used. The reuse of these boxes provides a mean of pathogen transmission and food spoilage and therefore poses a risk for the consumers' health. The efficacy of a newly developed fully automatized machine for cleaning and disinfection of wooden potato storage boxes against various plant pathogens was tested. The

moveable machine with two separate treatment chambers is fixed on a trailer. The technique is optimized for the disinfectant MENNO-Florades (90 g/L benzoic acid). In the first chamber the disinfectant is applied as a solution and in the second chamber as foam. The pathogens tested, *Pectobacterium carotovorum* subsp. *Carotovorum*, *Xanthomonas campestris* pv. *campestris*, *Colletotrichum coccodes* and *Fusarium solani* were eliminated to 100, 96.9, 96.9 and 90.6% respectively. Additionally the effects against two quarantine pathogens (*Clavibacter michiganensis* subsp. *sepedonicus*, *Ralstonia solanacearum* race 3 biovar 2) were tested by simulating the process inside the machine in a quarantine greenhouse chamber. Both pathogens were eliminated completely. This shows that a combination of liquid and foam application of a disinfectant can successfully eliminate storage pathogens and in that way help to prevent pathogen spread and ensure crop health during storage.

Keywords: /Potato/ /Storage/

YACON

Lago, C.C. and C.P.Z. Norena. 2017. Thermodynamic and kinetics study of phenolics degradation and color of **yacon** (*Smallanthus sonchifolius*) microparticles under accelerated storage conditions. J Food Sci Technol 54(13): 4197-1204.

Abstract

This study aimed to investigate the kinetics and thermodynamic of the phenolics degradation and the kinetics of degradation of the total color difference of yacon juice microcapsules produced by spray drying using Gum Arabic and polydextrose as wall materials. The degradation of the microcapsule was evaluated by accelerated tests under controlled conditions at 35 and 45 °C, and relative humidity of 75 and 90%, for 35 days. Degradation of phenolics followed the first order model and the degradation constant was in the range of 0.0124-0.0209 days⁻¹. The microparticles with gum Arabic were more stable than those with polydextrose for all conditions studied, with longer half-lives. Both wall materials showed similar thermodynamic characteristics, indicating similar mechanism of degradation of phenolics. With respect to the color parameters, the first order model adjusted to data of the total color difference, and no significant differences were observed for the conditions studied.

Keywords: /Yacon/ /Storage Conditions/

ORNAMENTALS

BIRD-OF-PARADISE

Da Silva Vieira, M.R., et.al. 2017. Endogenous levels of polyamines during cold storage of **bird-of-paradise** treated with biocides. Ornament Horticult 23(3): 370-377.

Abstract

This study aimed to analyse the endogenous levels of free polyamines putrescine (Put), spermidine (spd) and spermine (spm) under the effect of 8-HQC (8-hydroxyquinoline citrate) and chlorine during cold storage of bird-of-paradise floral scapes. Flowers were selected, labelled and randomly distributed in recipients for postharvest trials. The base of flower scapes was immersed with pulsing treatments (Control, 100 chlorine, 250 or 500 mg L⁻¹ 8-HQC) for 48 h, thereafter, stored at 10.5 °C and 90% relative humidity for a period of 12 days. Flower parts were sampled for polyamines analysis at day 0, 4, 8 and 12 days during storage. All samples had higher Put levels than the control. Treatment with 500 mg L⁻¹ 8-HQC showed the highest Spd levels in bracts, while chlorine treatment had the highest Spm levels in stems.

Keywords: /Bird-of-Paradise/ /Postharvest/ /Senescence/

ELDERLY FLOWER

Anacleto, A., et.al. 2017. Profile and behavior of **elderly flower** consumer in Paraná. *Ornam Hortic* 23(3): 337-344.

Abstract

The *per capita* consumption of flowers in Brazil has presented successive growth rates, although the consumption in consumer class called elderly, that is 60 years old or more, is still incipient when compared to other countries such as the United States, Japan and the most part of European countries where the consumption of these people is more than the double of consumption in Brazil. In this context, it is presented the results of the profile and consumer behavior evaluation of elderly flowers consumer, aiming to subsidize the establishment of marketing actions for the retail segment of the flower production chain. The study was accomplished using 169 interviews with elderly people of both genres at the time that they were buying flowers in 22 flower shops in Paraná Coast. The female gender was identified as the majority consumer ($p=78.7\%$). It was observed a tendency in the increase of consumption based on advanced schooling. It was registered an average of acquisition of 5,81 times per year, with preferential consumption of roses, violets and orchids. The accessibility to stores, the service quality followed by the high prices of flowers, were the main consumption limiting factors in the class evaluated.

Keywords: /Elderly Flower/

GERBERA

Alves, A.M.O.S., et.al. 2017. Non-structural carbohydrate metabolism and postharvest conservation of **gerbera** flowers. *Ornam Hortic* 23(3): 329-336.

Abstract

The species *Gerbera jamesonii* Adlam has great economic importance in the ornamental sector, due to exuberance of floral stems. However, florists face

some challenges such as postharvest handling and difficulty of conservation. Therefore, this study aimed to characterize the non-structural carbohydrate content in different floral stages of *G. jamesonii* var. Dawn and evaluate the effect of preservative solutions during the postharvest storage of this species. For this purpose, it was quantified TSS, RS and NRS from the seven stages of gerbera stems ontogeny (E1, E2, E3, E4, E5, E6 and E7). The preservative solutions used were: T1) distilled water; T2) citric acid (100 mg L⁻¹); T3) glucose (20 g L⁻¹); T4) gibberellic acid (GA₃, 5 mg L⁻¹); T5) calcium chloride (CaCl₂, 20g L⁻¹) and T6) Sodium Thiosulphate (STS, 20 mM). The effect of preservative solutions were assessed daily, considering the longevity of flowers, variation in the absorption of preservative solution, pH of the solution and fresh mass variation. The experimental design was completely randomized with four replicates. There was a difference in carbohydrate metabolism during floral opening and senescence. In the orange bracts there was a lower TSS content, while in the inflorescences it was observed a reduction in the yellowish, greenish-green and greenish stages. The content of RS increased in the bracts, whereas in the inflorescence there was no difference. The NRS content was higher in the orange bracts, showing lower rates in the inflorescences in yellowish and yellowish greenish stages. The preservative solutions had an impact, on the floral stem longevity, varying according to the solutions used, i.e. CaCl₂ and STS reduced the durability of gerbera flower in 9.25 and 11.5 days, respectively, compared to stems kept in distilled water. The glucose solution did not promote a significant difference compared to water. Therefore, we conclude that there is variation in the metabolism of non-structural carbohydrates during the floral development of *G. jamesonii* var. Dawn and the tested solutions were not effective in promoting postharvest conservation of gerbera.

Keywords: /Gerbera/ /Postharvest Conservation/

Brandler, D., et.al. 2017. Evaluation of biological control of fusarium wilt in **gerbera** with *Trichoderma asperellum*. *Ornam Hortic* 23(3): 234-239.

Abstract

The increase in flower cultivation in recent years has been reflecting the higher incidence of soil pathogens that can cause serious problems. This study aimed to evaluate the biological control of Fusarium wilt in gerbera with *Trichoderma asperellum*. The evaluated treatments were: T1) Control, only sterile substrate; T2) Substrate + *Fusarium oxysporum*; T3) Substrate + *Fusarium oxysporum* + *Trichoderma asperellum*; and T4) Substrate + *Trichoderma asperellum*. For this, the pathogen was isolated from gerbera with disease symptoms and, subsequently, it was identified according to morphological characters. Furthermore, the degree of antagonism of *T. asperellum* against *F. oxysporum* was evaluated through the culture pairing test. For greenhouse evaluations, commercial autoclaved substrate was used and infested with corn grains infected by the pathogen. Morphological identification confirmed the pathogen species as *Fusarium oxysporum*. In the culture pairing test, it was found that *T. asperellum* did not present a high degree of antagonism. The plants cultivated on substrate infested by the pathogen had no visible symptoms of wilt, but the substrate infestation with the pathogen provided lower values of fresh and dry

mass of shoots and roots. The treatment with *T. asperellum* obtained higher values of fresh and dry mass of both shoots and roots, and also more vigorous inflorescences in relation to the plants treated with the pathogen.

Keywords: /Gerbera/

ORCHIDS

South, K.A., et.al. 2017. Ice cube irrigation of potted *Phalaenopsis* **Orchids** in bark media does not decrease display life. HortScience 52(9): 1271-1277.

Abstract

Phalaenopsis orchids are an increasingly popular potted house plant in the United States. New cultivars have a long display life in home environments, but these epiphytes are often overirrigated by consumers. Irrigating potted *Phalaenopsis* orchids weekly with ice cubes has been recommended as a simple solution to help consumers, but concern has been raised about whether the ice cubes will cause low temperature damage in these tropical plants. The effect of ice cube irrigation on the display life and quality of four cultivars of potted *Phalaenopsis* orchids was, therefore, evaluated. Irrigation treatments included weekly application of three ice cubes or the equivalent volume of room-temperature tap water. The longevity of individual flowers and the overall display life of the orchid plants were determined. Monthly measurements determined the volume of leachate in the outer decorative pots after irrigation. The quantum yield of photosystem II (Φ_{PSII}) in roots and leaves was evaluated monthly to determine if photosynthetic efficiency was affected by the ice irrigation. The temperature in the orchid bark growing media during irrigation events was recorded, and a programmable antifreeze bath was used to determine the temperature at which damage to PSII was observed in orchid roots. The flower longevity and display life were unaffected by irrigation treatment. In general, the leachate volume over time was the same or lower in ice irrigated orchids compared with those irrigated with the same volume of water. The lowest temperature in the bark media irrigated with ice cubes was ≈ 11 °C, while controlled freezing experiments showed that damage to photosystem II in orchid roots did not occur until bath temperatures were below -7 °C. The internal temperature of roots in direct contact with ice cubes decreased to around 4 °C. Ice cube irrigation had no detrimental effects on the quality or display life of potted *Phalaenopsis* orchids growing in bark, demonstrating that ice cubes are a viable method of irrigating these tropical house plants

Keywords: /Orchid/ /Postharvest/ /Display Life/

ORNAMENTAL PEPPER

Lima, P.C.C., et.al. 2017. Action of ethylene, 1-methylcyclopropene and silver thiosulfate in two developmental stages of potted **ornamental pepper**. Ornam Hort 23(3): 240-249.

Abstract

The species of *Capsicum* genus have great genetic variability with enormous potential for marketing as ornamental potted plants. The exposure at ethylene induces various deleterious responses during plants life cycle, but there are few studies on how the ethylene affects early developmental stages of these ornamental plants. Thus, this study aimed to evaluate the effects of the application of ethylene and ethylene inhibitors, 1-methylcyclopropene (1-MCP) and silver thiosulphate (STS) in two early development stages (seedling or initial flowering) of potted ornamental peppers of the cultivars 'Calypso' and 'MG 302'. Cultivar 'MG 302' showed intermediate sensitivity to ethylene, while the cultivar 'Calypso' showed complete abscission of leaves when exposed to 10 µl of ethylene for 48 hours in both development stages. Plants treated with 1-MCP showed similar durability to control for both varieties and developmental stages, and the treatment with 1-MCP + ethylene was beneficial only for 'MG 302'. STS was the most efficient substance in delaying the ethylene, wherein at stage 1 there was no leaf abscission and at stage 2 had much reduced leaf abscission occurred, regardless the cultivar. Treatment with STS + ethylene was efficient only at stage 1 for 'Calypso' and at stage 2 for 'MG 302'. According to the data, cultivars showed different levels of sensitivity to ethylene, 'Calypso' is very sensitive and 'MG 302' showed intermediate sensitivity. Regardless the cultivar, STS treatment significantly blocked the ethylene action in both development stages and the use of 1-MCP was less efficient

Keywords: /Ornamental Pepper/ /Ethylene Inhibitors/ /Senescence/

ROSES

Dias, G.M., et.al. 2017. Controlled atmosphere and refrigerated storage in cut roses 'Avalanche'. *Ornam Hort* 23(3): 363-369.

Abstract

In Brazil, there are few studies on cut flowers cold storage, and there is no research on the association of controlled atmosphere with flower cooling. Worldwide research in this sector is considered scarce; this requires the establishment of adequate postharvest technology, involving cold storage and controlled/modified atmosphere for cutting flowers. In Brazil, roses are the most widely cultivated cut flower and a single producer exports three pallets of this species by airfreight per week. The objectives of this work were to define the concentrations of O₂ and CO₂ in which cut roses 'Avalanche' should be submitted, defining procedures for postharvest conservation and establishing technical guidelines for the exportation of cut roses under controlled atmosphere. The experiments were carried out at 1±1 °C with the help of a flowchart to dose the gases, and the concentration of O₂, CO₂ and ethylene were assessed. Phase 1 experiment had O₂ concentration set at 21% associated with four different concentrations of CO₂, 10, 20, 30 and 40%. Phase 2 experiment had O₂ at 3% associated with four different concentrations of CO₂, 3, 6, 10 and 15%. The controlled atmosphere with 3% O₂ and 6% CO₂ associated with 1±1 °C was indicated for the storage of cut rose 'Avalanche'.

Keywords: /Rose/ /Storage/ /Controlled Atmosphere/