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GENERAL

BIOFILMS

Rodriguez-Lopez, P. and M.L. Cabo. 2017. Tolerance development in *Listeria monocytogenes*-*Escherichia coli* dual-species **biofilms** after sublethal exposures to pronase-benzalkonium chloride combined treatments. *Food Microbiol* 67: 58-66.

Abstract

This study was designed to assess the effects that sublethal exposures to pronase (PRN) and benzalkonium chloride (BAC) combined treatments have on *Listeria monocytogenes*-*Escherichia coli* dual-species biofilms grown on stainless steel in terms of tolerance development (TD) to these compounds. Additionally, fluorescence microscopy was used to observe the changes of the biofilm structure. PRN-BAC exposure was carried out using three different approaches and TD was evaluated treating biofilms with a final 100 µg/ml PRN followed by 50 µg/ml BAC combined treatment. Results showed that exposure to PRN-BAC significantly decreased the number of adhered *L. monocytogenes* ($P < 0.05$), while *E. coli* counts remained generally unaltered. It was also demonstrated that the incorporation of recovery periods during sublethal exposures increased the tolerance of both species of the mixed biofilm to the final PRN-BAC treatment. Moreover, control biofilms became more resistant to PRN-BAC if longer incubation periods were used. Regardless of the treatment used, log reduction values were generally lower in *L. monocytogenes* compared to *E. coli*. Additionally, microscopy images showed an altered morphology produced by sublethal PRN-BAC in exposed *L. monocytogenes*-*E. coli* dual-species biofilms compared to control samples. Results also demonstrated that *L. monocytogenes*-*E. coli* dual-species biofilms are able to develop tolerance to PRN-BAC combined treatments depending on way they have been previously exposed. Moreover, they suggest that the generation of bacterial tolerance should be included as a parameter for sanitation procedures design.

Keywords: /Biofilms/

EDIBLE FILMS

Otoni, C.G., et.al. 2017. Recent advances on **edible films** based on fruits and vegetables—A review. *Compr Rev Food Sci Food Saf* 16: 1151-1169.

Abstract

Food packaging materials are traditionally expected to contain foodstuffs and protect them from deteriorating agents. Although petroleum-derived polymers have been widely used for this purpose, the rising concern with their nonrenewable and/or nonbiodegradable nature paves the route for the development of greener alternatives, including polysaccharides and polypeptides. The use of

these food-grade biomacromolecules, in addition to fruits and vegetables, provides edible packaging with suitable physical-mechanical properties as well as unique sensory and nutritional characteristics. This text reviews the chronological development pathway of films based on fruit and vegetable purees, pomaces, and extracts. Recent advances are extensively reviewed with an emphasis on the role that each film component plays in the resulting materials, whose production methods are examined from a technical standpoint and essential properties are compiled and contrasted to their conventional, synthetic counterparts. Finally, this comprehensive review discusses advantages and limitations of edible films based on fruits and vegetables.

Keywords: /Edible Films/ /Active Packaging/

FRESH PRODUCE

Thorn, R.M.S., J. Pendred and R.M. Reynolds. 2017. Assessing the antimicrobial potential of aerosolised electrochemically activated solutions (ECAS) for reducing the microbial bio-burden on **fresh food produce** held under cooled or cold storage conditions. Food Microbiol 68: 41-50.

Abstract

The main aim of this study was to assess the antimicrobial efficacy of electrochemically activated fog (ECAf) for reducing the microbial bio-burden on artificially inoculated fresh produce held under cooled (cucumber and vine tomatoes) or cold (rocket and broccoli) storage conditions. The ECAf treatment (1100 ± 5 mV ORP; 50 ± 5 mg L⁻¹ free chlorine; 2.7 ± 0.1 pH) resulted in a significant log reduction in the potential pathogen *E. coli* recovered from rocket ($2.644 \text{ Log}_{10} \text{ CFU g}^{-1}$), broccoli ($4.204 \text{ Log}_{10} \text{ CFU g}^{-1}$), cucumber ($3.951 \text{ Log}_{10} \text{ CFU g}^{-1}$) and tomatoes ($2.535 \text{ Log}_{10} \text{ CFU g}^{-1}$) after 5 days. ECAf treatment also resulted in a significant log reduction in potential spoilage organisms, whereby a $3.533 \text{ Log}_{10} \text{ CFU g}^{-1}$, $2.174 \text{ Log}_{10} \text{ CFU g}^{-1}$ and $1.430 \text{ Log}_{10} \text{ CFU g}^{-1}$ reduction in presumptive Pseudomonads was observed for rocket, broccoli and cucumber respectively, and a $3.527 \text{ Log}_{10} \text{ CFU g}^{-1}$ reduction in presumptive *Penicillium* spp. was observed for tomatoes (after 5 days). No adverse visual effects on produce were recorded. The results of this study will inform industrial scale-up trials within commercial facilities (assessing shelf-life, microbial quality and organoleptic assessment) to assess the developed ECAf technology platform within a real food processing environment.

Keywords: /Fresh Produce/ /Cold Storage/

FOOD DEMAND

Wojciechowska-Solis, J. 2017. Motives and barriers of organic **food demand** among Polish consumers: A profile of the purchasers. Brit Food J. 119(9): 2040-2048.

Abstract

Purpose – The purpose of this paper is to clarify the intentions and behaviors of consumers of the Poland which recently puts emphasis on the promotion of organic food, healthy diet of its

population and shows concern for the protection of natural environment. The conducted studies aim to identify types of products and determine motives that Polish adults take into consideration when buying organic food. The studies have been also conducted to indicate the most common barriers that appear when purchasing this type of products. The above-mentioned aims are carried out in the context of a level of education among consumers of organic food.

Design/methodology/approach – A diagnostic survey method with authors' questionnaire was used in the studies to examine 3436 respondents from all over the Poland. The studies were conducted in 2015. After the use of construction and validation procedures, a five-point Likert scale was applied to measure the attitudes. An indicator of scale reliability was calculated where Cronbach's α was 0.85. The education was a criterion that divided respondents into study groups.

Findings – The population was divided taking into account the place of residence: villages, towns up to 30 thousand inhabitants and towns over 30 thousand inhabitants. In the next stage of sample selection, respondents were proportionally divided according to their sex. Women constituted 51.3 percent, while men 48.7 percent. All respondents were of legal age. These methodological procedures allowed calculating a size of sample, where the level of confidence was set at 0.95, the estimated size fraction at 0.50 and the maximum error at 0.05.

Originality/value – There is a need for increased education on the importance of organic food and its influence on human health, especially among the young generation of Polish consumers. The conducted education should be aimed at encouraging producers and in particular sellers to promote sale of organic food in their stores, and thus to label it appropriately for easier identification by consumers. The barriers and motives presented in this paper which occur when buying organic food are identical to those that occur in developed and developing countries.

Keywords: /Food Demand/ /Organic Food/

ORNAMENTALS

Briercliffe, T. 2017. Growing the global market for **ornamentals**. Acta Horti 1165:1-8

Abstract

In the past the production and marketing of ornamentals has been focused around servicing demand in developed countries. The associated trading and logistics infrastructure has developed around this model. For many years the industry has been expanding production in developing countries (with lower production costs) but still with a market focus on the traditional market, particularly Northern Europe and North America. In these cases the majority of product exported from developing countries are cut flowers, rather than potted plants, due to transport costs. The dynamics of this market is changing as economic growth takes off in a number of developing countries. Development and urbanisation creates new markets for ornamentals both from households with more disposable income and plant procurement for urban landscaping. This market is serviced by increased plant production within that country or from imports, either way the plant production and supply businesses in these new markets are developing fast and changing the historical pattern of business. Alongside this ornamentals producers face challenges in relation to environmental sustainability, social welfare and competition. The industry needs to identify new ways to grow this new market into the future and meet

the needs of an ever changing consumer. In an increasingly technological world there is a need to promote the real benefits of plants (environmental, social, health, economic) to drive the greening of cities and people's lives, using ornamentals to address the challenges that cities and individuals face.

Keywords: /Ornamentals/ /Supply Chain/

READY-TO-EAT

Caradonna, T., et.al. 2017. Detection and prevalence of protozoan parasites in ready-to-eat packaged salads on sale in Italy . Food Microbiol 67: 67-75.

Abstract

To investigate the prevalence of protozoan contamination by *Giardia duodenalis*, *Cryptosporidium* spp., *Toxoplasma gondii* and *Cyclospora cayetanensis*, in 'ready to eat' (RTE) salads on sale in Italy, 648 packages were purchased from industrial and local brands. Nine individual packages from each brand were collected per month, pooled and subjected to microscopy and molecular analyses. Microscopic examination of 864 slides detected *Cryptosporidium* spp. but also *Blastocystis hominis* and *Dientamoeba fragilis*. Molecular tools identified *G. duodenalis* assemblage A, *Cryptosporidium parvum* and *Cryptosporidium ubiquitum*, *T. gondii* Type I and *C. cayetanensis*. *B. hominis* and *D. fragilis* were also molecularly confirmed. The overall prevalence of each protozoan species was 0.6% for *G. duodenalis*, 0.8% for *T. gondii*, 0.9% for *Cryptosporidium* spp., and 1.3% for *C. cayetanensis*, while prevalence for *B. hominis* was 0.5% and for *D. fragilis* 0.2%. Microscopy and/or molecular tools revealed that 4.2% of the samples were contaminated by at least one protozoan species, and 0.6% of samples presented contamination by two protozoan species, with a number of oocysts ranging from 62 to 554 per g of vegetable matter for *T. gondii*, and 46 to 1.580 for *C. cayetanensis*. This is Europe's first large-scale study on the presence of protozoans in packaged salads, and shows that RTE sanitation processes do not guarantee a product free from protozoans of fecal origin.

Keywords: /Ready-to-eat/

Castro-Ibanez, I., et.al. 2017. Ready-to-eat vegetables: Current problems and potential solutions to reduce microbial risk in the production chain . LWT-Food Sci & Technol 85: 284-292.

Abstract

The popularity of the consumption of fresh ready-to-eat (RTE) products has increased globally. Simultaneously, the number of outbreaks and cases of foodborne illness associated with the consumption of contaminated fresh produce continues to escalate. Thus, it becomes clear that fresh and fresh-cut vegetables are not processed in ways that effectively eliminate human pathogens. Processing of fresh vegetables involves the application of several unit operations that can provide opportunities for cross-contamination whereby a small proportion of contaminated product may cause the contamination of a large proportion of processed product. Some of these unit operations where

contamination and cross- contamination may occur are selection, cleaning, washing, trimming, peeling, cutting and shredding, sanitizing and packing. It is recommended that processors ensure that their suppliers (growers, harvesters, packers and distributors) adopt the principles outlined in the Code of Hygienic Practice for Fresh Fruits and Vegetables. A variety of intervention methods may be used such as mild preservation and/or disinfection techniques to enhance safety of minimally processed produce. Traditional methods of reducing microbial populations on produce involve chemical and physical treatments.

This review brings an overview of the main microbial risks faced by the producers and the available alternative strategies to reduce these risks. The information shown gives insights on microbial contamination throughout the processing operations involved in RTE vegetable production.

Keywords: /Ready-to-eat/ /Fresh Produce/

FRUITS

BLUEBERRY

Grozeff, G.E.G., et.al. 2017. Combination of nitric oxide and 1-MCP on postharvest life of the **blueberry** (*Vaccinium* spp.) fruit. *Postharvest Biol & Technol* 133: 72-80.

Abstract

Blueberries are a perishable fruit that loses its firmness and weight rapidly after harvest. High concentrations of ascorbic acid (AA) and phenolic compounds such as anthocyanins are important attributes contributing to the quality of the fruit. The aim of this work is to extend the postharvest life of three blueberries cultivars; 'Mistý and 'Blue Cuineé , firm and soft cultivars respectively and 'Blue Chip with intermediate firmness. The fruit was treated separately or in combination with a nitric oxide donor, S-nitrosoglutathione (GSNO) and 1-methylcyclopropene (1-MCP) and stored at 4 °C for 14 d. The best treatment for 'Blue Cuineé was the combination of 1-MCP and GSNO, while 'Mistý softened slower when treated with 1-MCP, and 'Blue Chip was not affected by treatment . The 1-MCP + GSNO treatment maintained higher concentrations of AA and GSH in 'Blue Cuineé . AA concentrations declined in 'Mistý but did not respond to GSNO. The combination of 1-MCP and GSNO extended the postharvest life of 'Blue Cuineé by improving the concentrations of AA and glutathione in the berries but not for 'Mistý . These results demonstrate that blueberry cultivars respond differentially to 1-MCP and nitric oxide, and that the sequence of application could be used to slow fruit softening and maintain antioxidant properties.

Keywords: /Blueberry/ /1-MCP/

CHERRY

Golding, J.B., et.al. 2017. Effect of postharvest display conditions on **cherry** stem quality. *Acta Horti* 1161: 569-574.

Abstract

The appearance of cherry stems greatly influences consumer perception of cherry quality, where green stems are often used as indicators of overall cherry fruit freshness. In a series of storage trials with a range of cherry cultivars ('Sweetheart', 'Stella', 'Sweet Georgia'), we examined the effect of different storage temperatures (5 or 20°C) and display relative humidities (70 and 100%RH) on stem browning and water loss. The results showed that water loss from the stems was strongly affected by all storage factors. As expected, according to the vapour pressures of the different treatments, water loss from the stems was greatest in the high temperature (20°C) and low humidity storage (70%). The treatments with the lowest water loss from the stems were the low temperature storage (5°C) with high relative humidity (100%). The overall 'freshness' of the stems was significantly affected by all storage factors and is a better indication of stem acceptability. A linear relationship between stem diameter and water loss was determined with each cultivar, with over 85% of the variance in the data accounted for by each relationship. In conclusion, the results clearly demonstrate the importance of temperature and relative humidity during the retail display of cherries.

Keywords: /Cherry/ /Storage/ /Quality/

Gonzalez-Gomez, D., et.al. 2017. Evaluation of different postharvest conditions to preserve the amount of bioactive compounds, physicochemical quality parameters and sensory attributes of 'Sweetheart' cherries. Acta Hort 1161: 581-586.

Abstract

Sweet cherries (*Prunus avium* L.) are among the most valued seasonal fruit, 'Sweetheart' being one of the most representative cultivars. The high consumer acceptance of sweet cherries could be attributed to different factors, as an adequate ratio between soluble solid contents (SSC) and titratable acidity (TA), skin colour, as well as the relevant nutritious properties and the important amount of health-promoting compounds, mostly due to the presence of considerable quantity of phenolic and anthocyanin pigments. This research aims to evaluate different postharvest treatments in order to establish the most appropriate storage conditions to preserve the overall quality of 'Sweetheart' cherries: external attributes of fruit (mainly color and firmness) chemical parameters (SSC and TA) and the maintenance of concentration of functional compounds (anthocyanin, phenolic acids and flavonoids contents). Fruit was harvested at commercial maturation, from an orchard in S. Julião region (Alentejo, Portugal). Cold conditions (CC) and modified atmosphere (MAP) samples were carefully accommodated in 1-kg plastic boxes. Samples for MAP treatment were packed in micro-perforated bags of Pplus® (Sidlaw Packaging, Bristol, UK). Fruits were kept in different storage conditions: cold conditions CC (1°C, 95% RH); modified atmosphere MAP (1°C, 95% RH with PPlus bags); controlled atmosphere CA (1°C, 95% RH, 10% CO₂ and 8% O₂). The experimental design was a factorial: storage method (CC, MAP, and CA) and storage period (0, 6, 13, 20 and 27 days). Fruits from day 0, considered without storage, were kept at 20°C and analyzed after temperature stabilization. Every sampling day, 90 fruits of each treatment, were randomly picked up and submitted to several analyses. According to our results, the MAPs storage

conditions were the most appropriate conditions to maintain and increase the concentration of these determined bioactive compounds.

Keywords: /Cherry/ /MAP/ /Controlled Atmosphere/ /Storage/

Nagpala, E.G.L., et.al. 2017. Cherry-Meter: an innovative non-destructive (vis/NIR) device for **cherry** fruit ripening and quality assessment. Acta Horti 1161: 491-496.

Abstract

The color of sweet cherry fruit is an important indicator of ripeness and quality. However, the tools that can be used to determine the ripeness of cherry fruits on trees or at storage are mostly subjective in practice. A new portable device based on visible and near infrared (vis/NIR) spectroscopy developed by Bologna University was used to follow the ripening evolution of cherry fruits. The Cherry-Meter measures the I_{AD} , an index that is able to follow the ripening evolution of cherry fruit. The reliability of the I_{AD} as a ripening index is confirmed by the fact that it does correlate with some quality traits such as chroma (skin color intensity), fruit anthocyanin content and soluble solids content (SSC). The strict correlation of I_{AD} with the common quality parameters of cherry fruit also indicates the possibility to achieve fruit homogeneity by sorting the fruits with similar characteristics based on their color and sugar content. The robustness of the I_{AD} as a ripening index, including the portability and non-destructive nature of the device makes the Cherry-Meter an innovative instrument to properly assess ripening of cherry fruits.

Keywords: /Cherry/ /Ripening/ /Quality/

Ruisa, S., et.al. 2017. The effect of rain protective covering on sweet **cherry** fruit quality. Acta Horti 1161: 143-148.

Abstract

Sweet cherry (*Prunus avium* L.) cultivars with large and firm fruit are susceptible to rain induced fruit cracking during fruit ripening in wet summers. Cracked fruit are susceptible to the entry of fungal pathogens. To obtain qualitative sweet cherry yield for fresh market, polyethylene rain cover was used in the trial for the first time in Latvia. Four cultivars of sweet cherries on *Prunus mahaleb* L. were grown under VOEN type plastic cover. Trees were covered at the beginning of June (at time of green fruit) and throughout the harvest for three years (2010-2012) at the orchard of Latvia State Institute of Fruit-Growing. Fruit cracking and rots depending on cultivar and season was reduced significantly by using rain cover. Outcome of marketable fruit varied from 56.9 to 99.0% under rain cover. Fruit under cover can be harvested in optimal ripening period also in rainy season.

Keywords: /Cherry/ /Quality/

Serrano, M., et.al. 2017. Effect of *Aloe vera* gel treatment on bioactive compounds and antioxidant activity during storage of sweet **cherry**. Acta Horti 1161: 607-612.

Abstract

In a previous experiment we have found that postharvest sweet cherry treatment with Aloe vera gel (at concentration of 33, 66, and 100%) led to significant delay on the changes in parameters related to fruit quality losses during storage, such as fresh weight, acidity and firmness losses. The main effect was obtained with 100% concentration, and this concentration was chosen to investigate the effect of such treatment on bioactive compounds and antioxidant activity. Total phenolic concentration increased during postharvest storage in control fruit, from initial levels of 130.24 ± 5.56 mg 100 g^{-1} at day 0 to 170.48 ± 7.25 mg 100 g^{-1} after 28 days of storage. A similar trend was found in treated fruit, although with a significant lower concentration than the control. Accordingly, total anthocyanin concentration increased along storage. Phenolic concentration was correlated with total antioxidant activity in the hydrophilic fraction of the extracts, showing that phenolics are the main hydrophilic compounds with antioxidant activity in sweet cherry. Thus, the increase in bioactive compounds and antioxidant activity that usually occurs during sweet cherry storage was delayed by aloe gel treatment, showing an effect of gel coating on delaying the normal postharvest ripening process, in accordance with previous experiments in which this treatment delayed the evolution of other nutritive and organoleptic parameters. Thus, from overall results, it could be concluded that the use of *Aloe vera* gel, as edible coating, could be an innovative and natural tool to preserve sweet cherry quality during storage, without detrimental effect on its content on bioactive compounds or antioxidant properties.

Keywords: /Cherry/ /Edible Coating/

Swarts, N.D., E. Mertes and D.C. Close. 2017. Role of nitrogen fertigation in sweet **cherry** fruit quality and consumer perception of quality: at- and postharvest. Acta Horti 1161: 503-510.

Abstract

The management of nitrogen (N) is key for commercial orchard production as N plays an important role in the quality of sweet cherry fruit. Whilst fertigation is commonly practised by cherry growers in Australia, research into optimal N supply to meet tree demands is limited and the effects of oversupply of preharvest N on fruit quality are virtually unknown. This study aims to investigate (i) the role of preharvest N application on fruit N concentration and the implications for fruit quality postharvest; (ii) consumer perception of stored fruit produced under a relatively high N supply compared with high grade export quality fruit and; (iii) how consumer perception aligns with objective quality measures of firmness (compression test by FirmTech and puncture test by Guss Texture Analyser), sugar and acid composition. Nitrogen treatments, applied as calcium nitrate, were imposed preharvest to 10 year old 'Lapin' trees on F12 rootstock in southern Tasmania through a drip irrigation system. Nitrogen concentration in cherry fruit at harvest significantly increased under the high N treatments. Fruit firmness at harvest and in storage was significantly reduced under increased N supply. Results demonstrate an immediate effect of increased N supply on cherry N concentration and fruit firmness. Sensory analysis demonstrated that consumers strongly preferred export grade over high N fruit and that perception generally matched instrumental fruit quality assessments for the range of

parameters tested with the exception of firmness. Preharvest N application must be carefully managed to avoid over-supply of N and consequent detrimental impacts on fruit quality at- and postharvest.

Keywords: /Cherry/ /Storage/ /Firmness/

CITRUS

Sdiri, S., et.al. 2017. Changes in the volatile profile of citrus fruit submitted to postharvest degreening treatment. *Postharvest Biol & Technol* 133:48-56.

Abstract

Despite citrus fruit are considered as non climacteric, ethylene is effectively used to accelerate external colour change of early-season citrus fruit in the Mediterranean area and is generally assumed to have no effect on internal fruit ripening. In this study we investigated if this postharvest degreening treatment has any effect on the volatile profile of early-season citrus fruit. The experiment was carried out under commercial conditions, thus a quarantine treatment was also simulated. Degreening of early-season citrus varieties ('Navelina' oranges (*Citrus sinensis* (L.) *Osbeck*), 'Clemenules' and 'Oronules' mandarins (*Citrus reticulata* Blanco) and three mutations of 'Oronules' namely 'Prenules', 'Basol' and 'Clemenrubi') with ethylene produced reproducible and variety-specific changes in the levels of fruit volatiles. The volatile profile in response to ethylene in 'Oronules' and 'Clemenrubi' presented quite dramatic changes with higher levels of some esters such as ethyl propionate and ethyl octanoate. The volatile profile of 'Navelina', 'Prenules' and 'Basol' was only slightly affected by ethylene exposure and 'Clemenules' did not show significant differences in the levels of aroma active compounds between degreened and control fruit, as would be expected for non climacteric fruits. On the whole, the results indicate that despite citrus being a non climacteric fruit some aspects of its ripening could be still sensitive to external exposure to ethylene.

Keywords: /Citrus/

MELON

Collazo, C., et.al. 2017. Studies on the biocontrol mechanisms of *Pseudomonas graminis* strain CPA-7 against food-borne pathogens *in vitro* and on fresh-cut melon. *LWT-Food Sci & Technol* 82: 301-308.

Abstract

The present study was aimed at gaining insight into the mode of action of the antagonistic bacteria *Pseudomonas graminis* CPA-7, which has been previously identified as an effective biocontrol agent against *Listeria monocytogenes*, *Salmonella enterica* and *Escherichia coli* O157:H7 on fresh-cut fruit. *In vitro* experiments did not reveal any antimicrobial or proteolytic activity on solid media or any biosurfactant activity on hydrophobic surfaces. Metabolites produced by CPA-7 in two different culture media and on 'Galia' melon were unable to inhibit *L. monocytogenes* populations on 'Galia' melon plugs

at 25 ° C or 5 ° C. In contrast, at 25 ° C the population of this pathogen on 'Galia' plugs was reduced by 2.1 and 3.3 log-units when co-inoculated with the antagonist in water, after 24 and 48 h, respectively. CPA-7 did not form biofilms after 72 h at 25 ° C (OD 1/4 0.03) or at 30 ° C (OD 1/4 0.01) on polystyrene plates and the production of alginate was close to the negative control. Studies of nutritional profiles showed high overlap (NOI > 0.9) between CPA-7 and *E. coli* O157:H7 regarding the use of carboxylic acids. This functional group could also contain putative targets for competitiveness between CPA-7 and *S. enterica*, although overlapping was not restrictive enough (NOI 1/4 0.83).

Keywords: /Melon/ /Fresh-cut/

NECTARINES

Cortes, V., et.al. 2017. Sweet and nonsweet taste discrimination of **nectarines** using visible and near-infrared spectroscopy. *Postharvest Biol & Technol* 133: 113-120.

Abstract

Discrimination The feasibility of using visible and near-infrared spectroscopy technology combined with multivariate analysis to Chemometrics discriminate cv. 'Big Top' and cv. 'Diamond Ray' nectarines has been studied. These varieties are very difficult to differentiate visually on the production line but show important differences in taste that affects the acceptance by final consumers. The relationship between the diffuse reflectance spectra and the two nectarine varieties was established. Five hundred nectarine samples (250 of each variety) were used for the study. Tests were performed by using a spectrometer capable of measuring in two different spectral ranges (600–1100 nm and 900–1700 nm). These spectral ranges were used to develop two accurate classification models based on linear discriminate analysis (LDA) and partial least squares discriminate analysis (PLS-DA). Later, selection techniques were applied to select the most effective wavelengths. The results showed that the PLS-DA model achieved better accuracy and less latent variables than LDA model, and specifically, good results with 100% classification accuracy were obtained using only the 600–1100 nm spectral range for the two models and eight selected wavelengths. These results places visible and near-infrared spectroscopy as an accurate classification tool for nectarine varieties with a very similar appearance but different tastes that could be potentially used in an automated inspection system.

Keywords: /Nectarine/

PEACH

Lingxia Huang, et.al. 2017. A primary study on forecasting the days before decay of **peach** fruit using near-infrared spectroscopy and electronic nose techniques. *Postharvest Biol & Technol* 133: 104-112.

Abstract

Forecasting the number of days until peach fruit decay is important not only for consumers to determine when to eat the fruit, but also for sellers to determine their sale strategies. However, traditional visual observation, chemical and anatomy-digital caliper methods are applicable only when the decay has already begun. In this work, the possibility of forecasting the days before decay (DBD) of peach fruit was explored by means of near-infrared (NIR) spectroscopy and an electronic nose (e-nose). Partial least squares regression, least-squares support vector machines, and multiple Gaussian fitting regressions were used for model calibration. Successive projections algorithm, uninformed variable elimination, and competitive adaptive reweighted sampling were used for variable selection. The best DBD prediction model had a correct answer rate of 82.26%. The results show that the combination of NIR spectroscopy and e-nose data holds promise as a reliable and rapid alternative to forecasting the DBD of peach fruit. This study reveals the attractive prospect of non-destructively estimating how long peach fruit can be edible before decaying, which is important for improving both the daily lives of people and management efficiency in the peach industry.

Keywords: /Peach/ /Decay/

Xiaobei Wang, et.al. 2017. Genes involved in ethylene signal transduction in **peach** (*Prunus persica*) and their expression profiles during fruit maturation . *Scientia Horti* 224: 306-316.

Abstract

Ethylene is an essential regulator of fruit development. However, the role of this phytohormone in the development and maturation of peach (*Prunus persica* L. Batsch) fruit has not been systematically examined. In this study, through BLAST analysis of tomato (*Solanum lycopersicum*) protein sequences against the peach genome database and transcriptome analysis of all APETALA2/Ethylene Responsive Factor (AP2/ERF) genes in peach, we identified 15 ethylene signal transduction genes and 15 AP2/ERF genes and examined their expression levels in SH (stony hard) peaches and MF (melting flesh) peaches during fruit maturation. We investigated the expression patterns of six genes, including one ETR-like gene (Prupe.1G034300) and five AP2/ERF genes (Prupe.1G037700, Prupe.2G289500, Prupe.3G240000, Prupe.5G061800, and Prupe.7G194400), through quantitative RT-PCR expression analysis. The transcript levels of these genes were lower at the early stages of fruit development and increased dramatically at stage S4 in MF peaches, while they remained low in SH peaches, which mirrors the pattern of changes observed in ethylene production. Treatment of MF ('Zhongyoutao 13', 'CN13') fruit at stage S4 II with 1-MCP was ineffective in blocking ethylene production, and the expression of these genes was inhibited by 1-MCP treatment in 'CN13' on day 1, further demonstrating that these genes are closely related to fruit ripening. We detected a slight change in fruit firmness in 'CN13' after 1-MCP treatment, whereas ethylene production was not affected. By contrast, the transcript profile of gene Prupe.5G090800 exhibited the opposite trend. The comprehensive data generated in this study will improve our understanding of the ethylene receptor genes and ERF genes in peach and lay the foundation for further exploring the mechanisms underlying peach fruit ripening and softening.

Keywords: /Peach/ /Ethylene/

PERSIMMON

Do Su Park, et.al. 2017. Quality and expression of ethylene response genes of 'Daebong' persimmon fruit during ripening at different temperatures. *Postharvest Biol & Technol* 133: 57-63.

Abstract

This study was conducted to investigate the changes in quality and ethylene related genes expression in astringent persimmon 'Daebong' during ripening at 15 °C and 25 °C after an application of 100 µg kg⁻¹ ethylene. Ethylene production in treated fruit was higher than in untreated fruit throughout the ripening period. Total soluble solids content was reduced slightly during ripening in both treatment and control fruit. However, the reducing sugar content was increased as ripening proceeded. Firmness and water soluble tannin contents were reduced with similar patterns in treated fruit during ripening at both temperatures. Ethylene treated fruit showed more rapid expression of *DKEIL*, *DKERF2*, *DKERF5* and *DKERF8* genes at 25 °C than 15 °C. In conclusion, ethylene treatment improved the ripening quality of astringent persimmon regardless of temperature. In addition, the expression of ethylene related genes was higher at 25 °C than 15 °C, which may be associated with faster ripening.

Keywords: /Persimmon/ /Shelf-life/

TABLE GRAPES

Pinto, L., et.al. 2017. Efficacy of gaseous ozone to counteract postharvest table grape sour rot. *Food Microbiol* 66: 190-198.

Abstract

This work aims at studying the efficacy of low doses of gaseous ozone in postharvest control of the table grape sour rot, a disease generally attributed to a consortium of non-*Saccharomyces* yeasts (NSY) and acetic acid bacteria (AAB). Sour rot incidence of wounded berries, inoculated with 8 NSY strains, or 7 AAB, or 56 yeast-bacterium associations, was monitored at 25 °C up to six days. Sour rot incidence in wounded berries inoculated with yeast-bacterium associations resulted higher than in berries inoculated with one single NSY or AAB strain. Among all NSY-AAB associations, the yeast-bacterium association composed of *Candida zemplinina* CBS 9494 (Cz) and *Acetobacter syzygii* LMG 21419 (As) showed the highest prevalence of sour rot; thus, after preliminary *in vitro* assays, this simplified As-Cz microbial consortium was inoculated in wounded berries that were stored at 4 °C for ten days under ozone (2.14 mg m⁻³) or in air. At the end of cold storage, no berries showed sour-rot symptoms although ozonation mainly affected As viable cell count. After additional 12 days at 25 °C, the sour rot index of inoculated As-Cz berries previously cold-stored under ozone or in air accounted for 22.6 ± 3.7% and 66.7 ± 4.5%, respectively. Molecular analyses of dominant AAB and NSY populations of both sound and rotten berries during post-refrigeration period revealed the appearance of new strains mainly belonging to *Gluconobacter albidus* and *Hanseniaspora uvarum* species, respectively. Cold ozonation resulted an effective approach to extend the shelf-life of table grapes also after cold storage.

Keywords: /Table Grapes/ /Shelf-life/

Servili, A., et.al. 2017. Exposure to volatiles of essential oils alone or under hypobaric treatment to control postharvest gray mold of table grapes. *Postharvest Biol & Technol* 133: 36-40.

Abstract

After harvest, table grapes can easily undergo fungal spoilage, which is mainly caused by *Botrytis cinerea*, the causal agent of gray mold. To reduce such losses, table grapes are usually treated with conventional fungicides during the season, and cold stored in the presence of sulfur dioxide. However, these applications are not permitted in organic agriculture, and at the same time, there is a growing demand from consumers for fresh fruit free from pesticide residues. The application of essential oils and hypobaric treatments are promising alternatives to sulfur dioxide with minimal environmental impacts and limited concerns about human health risks. The aim of this study was to determine the effectiveness for control of postharvest gray mold of table grapes of 24-h exposure to volatiles of essential oils of *Rosmarinus officinalis* (rosemary), *Mentha piperita* (peppermint), and *Thymus vulgaris* (thyme) individually and in combinations with hypobaric treatment at 50 kPa (0.5 atm). Exposure to volatiles of rosemary essential oils under atmospheric pressure and hypobaric conditions reduced by around 65% the incidence and McKinney's Index of gray mold for table grapes that were then stored at room temperature for 9 d and 5 d, respectively, or that were stored at 4 °C for 7 d and followed by 3 d shelf life at 20 °C. Peppermint essential oils similarly controlled gray mold for grapes stored at room temperature and under hypobaric conditions for 24 h. Panel tasting revealed perception of the essential oils soon after the treatments and 24 h later for grape berries exposed to vapors of rosemary, peppermint, and *Lavandula × ibrida* (lavender). Then 48 h after treatment, the rosemary and peppermint essential oils were no longer perceived on grapes stored at 4 °C and at 20 °C. Exposure to volatiles of the rosemary and peppermint essential oils alone or in combination with hypobaric treatment might represent an innovative method to control postharvest gray mold of table grapes, although at least 48 h were needed between exposure to volatiles of essential oils and presentation to consumers.

Keywords: /Table Grapes/ /Sensory Evaluation/

VEGETABLES

LETTUCE

Paillart, M.J.M, E.C. Otma and E.J. Woltering. 2017. Effect of mild heat-shock treatments on pink discoloration and physiological parameters in fresh-cut iceberg lettuce. *LWT – Food Sci & Technol* 85: 456-459.

Abstract

Pink discoloration is one of the major quality issues occurring in fresh-cut lettuce. Low oxygen atmosphere in modified atmosphere packaging prevents pinking but may lead to other major quality losses such as fermentation, growth of lactic acid bacteria and associated production of off-odours. The application of mild heat-shock treatment on fresh-cut lettuce is known to reduce the activity of Phenylalanine Ammonia Lyase (PAL), an enzyme involved in pink discoloration. Heat-shock treatment, however, may also affect the vitality of the plant tissue, leading to early senescence symptoms. In the present study several heat-shock treatments were tested for their effect on pink discoloration and on lettuce tissue vitality. The optimal heat-shock treatment was found within a narrow range of temperatures (between 45 and 47.5 ° C) and application times (between 30 and 180 s). Heat-shock treatment reduced significantly the PAL activity by a factor 3 during the first 5 d of storage but increased the respiration rate of the produce by a factor 2 on day 5. We recommend to optimize the packaging to suit the heat-shock associated higher respiration rate of the treated product in order to increase the shelf life of the fresh-cut lettuce.

Keywords: /Lettuce/ /Fresh-cut/

Siroli, L., et.al. 2017. Effect of thyme essential oil and *Lactococcus lactis* CBM21 on the microbiota composition and quality of minimally processed lamb's lettuce. Food Microbiol 68: 61-70.

Abstract

The main aim of this work was to evaluate, at pilot scale in an industrial environment, the effects of the biocontrol agent *Lactococcus lactis* CBM21 and thyme essential oil compared to chlorine, used in the washing step of fresh-cut lamb's lettuce, on the microbiota and its changes in relation to the time of storage. The modification of the microbial population was studied through pyrosequencing in addition to the traditional plate counts. In addition, the volatile molecule and sensory profiles were evaluated during the storage. The results showed no significant differences in terms of total aerobic mesophilic cell loads in relation to the washing solution adopted. However, the pyrosequencing data permitted to identify the genera and species able to dominate the spoilage associations over storage in relation to the treatment applied. Also, the analyses of the volatile molecule profiles of the samples during storage allowed the identification of specific molecules as markers of the spoilage for each different treatment. The sensory analyses after 3 and 5 days of storage showed the preference of the panelists for samples washed with the combination thyme EO and the biocontrol agent. These samples were preferred for attributes such as flavor, acceptability and overall quality. These results highlighted the effect of the innovative washing solutions on the quality of lettuce through the shift of microbiota towards genera and species with lower potential in decreasing the sensory properties of the product.

Keywords: /Lettuce/ /Minimally Processed/ /Shelf-life/

SPROUTS

Raimondi, G., et.al. 2017. notypic, storage and processing effects on compositional and bioactive components of fresh sprouts. LWT – Food Sci & Technol 85: 394-399.

Abstract

Fresh sprouts constitute an appealing, nutritional and functional food product. The present study profiles the nutritional and bioactive components of quality of fresh sprouts of five select species (barley, lentil, mung bean, radish and wheat) against their postharvest performance during 4 ° C cold storage. Moreover, the impact of lyophilisation followed by 30-day ambient storage was assessed on sprouts composition and quality. The highest proteins, P and K contents were observed in radish sprouts. Moreover, radish sprouts demonstrated higher hydrophilic and lipophilic antioxidant activities (HAA and LAA) by 185% and 95%, respectively, than the other species examined. Compositional and quality attributes were however influenced by storage: total soluble solids increased on average by 1.0 ° Brix after day 0, while LAA activity decreased by 33% after day 1. Dry matter, proteins and nitrate contents, juice pH and HAA remained stable. Lyophilisation preserved the compositional and quality attributes of fresh sprouts as no significant differences in proteins, nitrate, K and P contents, HAA and LAA were observed compared to fresh sprouts. The current findings highlight genotypic variation and postharvest performance of fresh sprouts with respect to their functional quality and the impact of lyophilisation as an alternative processing application for their preservation.

Keywords: /Sprouts/ /Postharvest/

TOMATO

de la Torre-Gonzalez, A., et.al. 2017. Study of phytohormone profile and oxidative metabolism as key process to identification of salinity response in tomato commercial genotypes. J. Plant Physiol 216: 164-173.

Abstract

Climatic change, intensive agriculture, and worsening water quality induce abiotic stress conditions for plants. Among these factors, salinity stress is a limit factor for plant growth. Therefore, the purpose of this study was to analyze the phytohormones role and oxidative metabolism in response to salt stress of two genotypes of tomato cv. Grand Brix and cv. Marmande RAF, the crops were carried out in a growth chamber. Salinity stress reduces biomass and relative growth rate (RGR) in both genotypes, this effect being greater in cv. Marmande RAF. These results, together with main stress indicator response, the O_2^- , indicate that cv. Marmande RAF is more sensitive to Saline stress. Grand Brix showed less oxidative stress, because it presented greater detoxification of the O_2^- , due to SOD enzyme activity induction and greater antioxidant capacity. Furthermore, Grand Brix has a better hormonal profile adapted to salt stress resistance, the accumulation of IAA, GA4 and CKs and their beneficial role against oxidative stress could make the difference between resistance and sensitivity to salt stress. On the other hand, a lower ACC concentration, ethylene precursor, combined with a greater

O₂.- detoxification in the cv. Grand Brix could play a fundamental role in tolerance to saline stress. Besides, an increase in ABA levels promotes better stomatal closure, better photosynthesis control and a lower rate of water loss. This data could be essential to select plants with greater resistance to saline stress.

Keywords: /Tomato/

Gilli, C., et.al. 2017. Accelerating ripening of greenhouse tomatoes in autumn at the end of harvest with ethylene application. Acta Horti 1170: 791-796.

Abstract

Accelerating maturation of greenhouse tomatoes at the end of the growing season permits to save energy and to reduce the quantity of unripe tomatoes. Indeed, at the end of the cropping season, several kg m⁻² of tomatoes do not reach a degree of maturity permitting them to be sold. In Switzerland, it was possible to accelerate the ripening of tomatoes by applying ethephon, a product which releases ethylene. Since August 2014, this product is no longer authorized, in Switzerland. An alternative is the application of ethylene, a naturally occurring hormone, directly in the greenhouse. In collaboration with the company Carbagas, Agroscope tested the effect of ethylene application on tomato ripening. The trials were conducted in 2012 and 2013 in two identical compartments of a Venlo greenhouse. In one compartment, ethylene was injected at a concentration of 10 ppm during nine or ten nights. The other compartment served as control. In 2012, tomatoes 'Levanzo', 'Komeett' and 'Endeavour' were planted and in 2013 'Endeavour'. In average over the two years, the application of ethylene enabled to harvest 1.5 truss m⁻² or 0.75 kg m⁻² (1.5% of the total yield) more compared to the control compartment. The quality of tomatoes at harvest (acidity, firmness and total soluble substances) was only slightly influenced by the addition of ethylene. Economically, such an application seems profitable. Registration for the application of ethylene in greenhouse is in progress in Switzerland.

Keywords: /Tomato/ /Maturity/

Vallarino, J.G., et.al. 2017. Postharvest changes in LIN5-down-regulated plants suggest a role for sugar deficiency in cuticle metabolism during ripening. Phytochemistry 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/ /Postharvest/

POTATO AND TUBERS

POTATO

Ierna, A., et.al. 2017. Effect of different anti-browning agents on quality of minimally processed early potatoes packaged on a compostable film. *LWT – Food Sci & Technol* 85: 434-439.

Abstract

Nowadays, there is a growing interest in bio-based compostable packaging also for fresh fruits and vegetables. We evaluated the influence of two different packaging: a bio-based compostable film (BIO) and a conventional coextruded polyamide/polyethylene (CONV), combined with 3 anti-browning solutions (sterile water - SW, 0.2 g kg⁻¹ sodium bisulphite - SB; 20 g kg⁻¹ ascorbic acid + 20 g kg⁻¹ citric acid - AA + CA) on the physico-chemical and microbiological traits of minimally processed potatoes of cvs. 'Bellini' and 'Marabel' during storage at 4 ° C for 9 days. Preliminary results showed that the BIO film was less suitable to guarantee quality (i.e., higher browning, fresh weight loss and microbial growth) of minimally processed potato tubers than CONV film. This result was reasonably related to the drastically modified barrier properties of compostable polymeric film by migration of water from potatoes, more markedly in 'Bellini' than in 'Marabel' cultivar. Dipping in AA + CA solution allowed containing microbial growth during whole storage time, more efficiently in CONV than in BIO bags

Keywords: /Potato/ /Minimally Processed/ /Packaging/ /Shelf Life/ /Composite Film/

Jones, S., et.al. 2017. Temperature management of potatoes in packaging with reusable plastic crates in the fresh produce supply chain. *Aust J Crop Sci* 11(06): 638-643.

Abstract

Although initially the introduction of reusable plastic crates was because of cost savings, their speed of adoption was accelerated by environmental considerations. RPCs having a lower direct impact across a broad range of environmental parameters when compared with display-ready containers (DRCs). Also RPCs can have an indirect effect with lower levels of produce waste, further reducing the environment impact of using plastic crates. This paper considers the temperature management

challenges with packaging formats used in the fresh produce supply chain. The different scenarios are compared of bagged and loose potatoes in RPCs and DRCs when placed in still and moving air. The temperature changes of the potato flesh showed that with the greater free area of the RPCs there is potential to warm up significantly more quickly than with DRCs. In the first three hours the flesh temperatures for loose potatoes in RPCs increased at almost three times the rate experienced in DRCs. The study found that with RPCs for the temperature rise in the first hour in air at 0.1 m/s was fifteen times as great as in still air, but with the adoption of a single plastic film wrap of 25 micron polythene it was reducing the temperature rise by 69%. The adoption of RPCs throughout the supply chain has had many advantages but these trials highlight the potential issues with temperature and quality management, However the study underline the dangers of changing packaging formats without paying due consideration to the temperature and airflow variables inherent in each packaging format.

Keywords: /Potato/ /Packaging/ /Supply Chain/

ORNAMENTALS

DENDROBIUM

Nakkuntod, M., et.al. 2017. Fungal chitosan for growth and *PAL* gene expression of *Dendrobium* Sonia 'Bom 17' in vitro. Acta Horti 1167: 331-338.

Abstract

Orchids are among the largest group of the flowering plants in the world. *Dendrobium* Sonia 'Bom 17' is one of the most popular orchid hybrids and important for agricultural industries in Thailand. Hence, their high productivity via tissue culture techniques combined with various plant elicitors, such as chitosan is needed. This research focused on the effects on *Denbrobium* Sonia 'Bom 17' growth rates and *PAL* gene expression following treatments with fungal chitosan of different molecular weights and concentrations. The results showed that low molecular weight chitosan at 50 and 100 mg L⁻¹ could promote shoot and root length, respectively; while, low molecular weight chitosan at 10 mg L⁻¹ was more effective than high molecular weight chitosan at this concentration for promoting new shoots. However, high molecular weight chitosan was more effective in promoting the appearance of new leaves. Expression of the *PAL* gene, which is normally expressed when plants are under stressed conditions following fungal infection, was also studied. The results showed that, the *PAL* gene expression in the shoot of *Dendrobium* Sonia 'Bom 17' is at its highest 48 h after treatment with 50 mg L⁻¹ of low molecular weight chitosan.

Keywords: /Dendrobium/ /Chitosan/

HELICONIA

Banuelos-Hernandez, K.P., et.al. 2017. Chitosan coating effect on vase life of flowering stems of *Heliconia* (L.) L. cv. Halloween. Postharvest Biol & Technol 132: 179-187.

Abstract

Tropical ornamentals such as heliconias play a key role in the growth of the floriculture market due to their bright coloured and attractively shaped inflorescences. *Heliconia bihai* is one of the most popular of the Heliconias in the global market. New postharvest handling techniques to increase distribution of the cut flowers without compromising flower stem quality as measured by vase life are needed. The effects of chitosan coating on vase life of flower stems of *Heliconia bihai* (L.) L. Halloween stored under laboratory conditions has been studied. Flowering stem fresh weight loss, bract colour (L^* , C^* and h°), concentration of anthocyanin, total flavonoids and total sugars, percentage of absolute integrity of cell membranes (PAI) of stem, peduncle and bracts, and duration of vase life were evaluated on day 1, 5, 10 and the final day of vase life. Concentrations of 1.0 and 1.5% of chitosan, extended the vase life by 10.3 and 7 d more than the control, respectively. An internal cell damage gradient from the base to the apex based on ion release was observed and the visual quality of inflorescences decreased over time in all treatments, but at different rates.

Keywords: /Heliconia/ /Vase Life/ /Quality/

ORCHID

Deewatthanawong, R, S. Chanapan and A. Suwanagul. 2017. Evaluation of methyl bromide alternatives to control thrips in orchid cut-flowers. Acta Horti 1167: 393-398.

Abstract

Methyl bromide (MB) has been widely used as a pest control agent in various agricultural products including cut-flowers. MB is being phased out under the Montreal protocol due to its ozone depletion effect. Since the phase out has been planned to complete in 2015, investigation of alternatives to MB is urgently needed. In Thailand, all orchid cut-flowers are normally fumigated with MB for postharvest control of thrips before export. This project aimed to evaluate efficiency of other chemicals as MB alternatives. Phytotoxicity assessment of ethyl formate (25-100 g m⁻³), methyl formate (25-100 g m⁻³), acetaldehyde (0.05-0.2%) and phosphine (4-30 g m⁻³) on *Dendrobium* Sonia 'No. 17' was investigated. Fumigation with ethyl formate, methyl formate and acetaldehyde at all concentrations resulted in significant damages to orchid cut-flowers, while there was no damage in phosphine fumigation. Phosphine fumigation at 4 g m⁻³ for 1 h was sufficient to obtain 100% mortality of the second instar larvae of thrips. Our results demonstrated that phosphine fumigation showed great potential for quarantine treatment of orchid cut-flowers. Further research is required to determine the use of this chemical commercially.

Keywords: /Orchid/ /Cut-flowers/