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GENERAL

BIOFUNGICIDE

Spadaro, D, et.al. 2014. Discovery, development and technology transfer of biocontrol agents for post-harvest disease control. *Acta Hort.* 1053: 23 – 36.

Abstract

Several biocontrol agents (BCAs) have been discovered and tested for their efficacy in controlled and semi-commercial conditions. After the efficacy evaluation and preliminary studies on the mode of action, patenting is an essential step before contacting potential private companies interested in developing biofungicides. Several small enterprises are interested in developing BCAs, but the long and expensive registration process in Europe often discourages them. Further steps undertaken by the research sector include a comprehensive characterization of the mechanism of action, and the development of molecular tools to track the microorganisms in the environment. The biomass production process and the development of appropriate stabilization and formulation are key issues to extend the shelf life of the biocontrol product and to develop a commercial biofungicide. These steps need a close collaboration between industry and the research sector. Other possible ways of introducing the BCA on the market could include the creation of university spin off companies. To introduce biofungicides in the postharvest sector, appropriate technology transfer and outreach activities are very important in order to involve the producers and the packinghouses, which are often reluctant to introduce BCAs in the food chain. The current manuscript offers an overview of the results achieved at the University of Torino during the last number of years.

Keywords: /Biofungicide/ /Biocontrol/ /Postharvest Disease/

EDIBLE COATING

Guerreiro, Andriana C., et.al. 2015. The effect of alginate-based **edible coatings** enriched with essential oils constituents on *Arbutus unedo* L. fresh fruit storage. *Postharvest Biol. & Technol.* 100: 226 – 233.

Abstract

The effect of coating *Arbutus unedo* fresh fruit with alginate-based edible coatings enriched with the essential oils compounds (EOC) eugenol (Eug) and citral (Cit) was studied. The minimum inhibitory concentrations (MIC) against the main postharvest pathogens were determined for Eug and Cit giving values of 0.10 and 0.15 (w/v), respectively. Twelve formulations of edible coatings were used: sodium alginate (AL) was tested at 1 and 2% (w/v) with incorporation of Eug and Cit at MIC and double MIC or their combination at MIC. *Arbutus* berries were dipped in those solutions for 2 min, and then stored at 0.5°C. Control consisted of uncoated fruit. On days 0, 14 and 28, samples were taken to perform physicochemical and biochemical analysis [color CIE (L*, h°), firmness, soluble solids content (SSC), weight Loss, trolox equivalent antioxidant capacity (TEAC), microbial growth and taste panels]. Results showed that edible coatings of 1% AL were the best to maintain most quality attributes of the

commodity through storage at 0.5°C. The incorporation of Cit and Eug into the alginate edible coatings improved the coatings in most cases, AL 1% + Eug 0.20% and AL 1% + Cit 0.15% + Eug 0.10% being those that better preserved sensory and nutritional attributes and reduced microbial spoilage. Thus, these coatings may be useful for improving postharvest quality and storage life of fresh arbutus fruit.

Keywords: /Edible Coating/ /Storage/

FRESH-CUT

Ignat, Alexandra, et.al. 2014. 2015 . Minimization of water consumption in **fresh-cut** salad washing by UV-C light. Food Control. 50: 491 – 496.

Abstract

The decontamination effect of UV-C light at increasing fluence up to 1.2 kJ/m² was studied with reference to natural microflora and inoculated pathogens in lamb's lettuce wash water. UV-C light dose of 0.4 kJ/m² allowed to inactivate most of the native microflora and to achieve more than 5- Log-reductions in inoculated microorganisms (*Salmonella enterica*, *Listeria monocytogenes* and *Escherichia coli*). In multiple washing cycles up to 5, UV-C light treatment allowed to obtain more than 3-log reductions in native microflora in wash water. Spectral properties indicated that, independently on the number of recycling cycles, a considerable amount of UV-C light can penetrate wash water if its thickness is lower than circa 1 cm.

Keywords: /Fresh Cut/ /Lettuce/

GENETICALLY MODIFIED CROPS

Liang, Chanjuan, et.al. 2014. Safety aspects of **genetically modified crops** with abiotic stress tolerance. Trends in Food Sci. & Technol. 40: 115 – 122.

Abstract

Abiotic stress, such as drought, salinity, and temperature extremes, significantly reduce crop yields. Hence, development of abiotic stress-tolerant crops by modern biotechnology may contribute to global food security. Prior to introducing genetically modified crops with abiotic stress tolerance to the market, a food and environmental safety assessment is generally required. Although worldwide harmonised comparative approach is currently provided, risk assessors still face challenges to assess genetically modified crops with abiotic stress-tolerance. Here, we discuss current developments of abiotic stress tolerance as well as issues concerning food and environmental safety assessment of these crops, including current approaches, challenges and future directions.

Keywords: /Genetically Modified Crops/

MYCOTOXINS

Sanzani, S.M. and A. Ippolito. 2014. **Mycotoxin** contamination on harvested commodities and innovative strategies for their detection and control. Acta Hort. 1053. 123 – 132.

Abstract

Harvested fruit and vegetables often undergo a period of storage and shelf life, whose length can be influenced by several parameters, such as physiological properties, biotic/abiotic stresses, and final market destination. During these phases a portion of the product is lost, mainly due to fungal diseases, which are often not only of economic concern but also a threat to human and animal health due to presence of mycotoxins. Indeed, some species, primarily belonging to *Aspergillus*, *Fusarium*, *Penicillium* and *Alternaria* genera, produce secondary metabolites, mycotoxins, which pose a health risk to humans and animals. In fact, maximum permitted contents of mycotoxins in harvested commodities and derived products have been established by national and international organizations. Although in some instances mycotoxins have been shown to be toxic to competing microorganisms or plants, their biological-role has not yet been unequivocally established. Recent studies support their role as pathogenicity/virulence factors in host-pathogen interaction, so that a reduction in mycotoxin production might be relevant even from a plant disease perspective. Unfortunately, the use of traditional control measures, such as synthetic fungicides, is not always possible or effective in a postharvest setting because of restrictions on residue content and the appearance of resistant strains. Thus, the demand for alternative control means (as microbial antagonists, natural or generally regarded as safe compounds, and physical means), as well as for tools for the early detection of spoilage fungi, is increasing. In our research group, particular interest has been devoted to alternative means of control of blue mould caused by *Penicillium expansum* and consequent patulin accumulation in apples. To this purpose, the role of patulin in disease development was investigated.

Keywords: /Mycotoxin/ /Quercetin/ /Postharvest Diseases/

FRUIT

APRIUM

Ma, Lin, et.al. 2014. Effects of 1-methylcyclopropene in combination with chitosan oligosaccharides on postharvest quality of aprium fruits. Scientia Hort. 179: 301 – 305.

Abstract

Aprium (*Prunus armeniaca* × *salicina* L. cv. Xingmei) fruits were treated with 1.0 μL/L 1-methylcyclopropene (1-MCP) for 12 h at 20°C or dipped for 2 min into 0.5% (w/v) chitosan oligosaccharides (COS) solution, or treated with the combination of the both, then stored at 2°C for up to 30 days. Aprium fruits exhibited a typical climacteric pattern in ethylene production and respiration rate. Treatment with 1-MCP or COS could retard the decline in firmness, titratable acidity and total soluble solids of aprium fruits during storage, as well as reduce ethylene production and respiration rate. In addition, COS treatment also had a pronounced effect on reduction of decay rate.

Keywords: /Aprium/ /1-methylcyclopropene/ /Storage/

BANANA

Du, Lina, et.al. 2014. Characterization of the stage dependency of high temperature on green ripening reveals a distinct chlorophyll degradation regulation in banana fruit. *Scientia Hort.* 180: 139 – 146.

Bananas (*Musa*, AAA group) develop a bright yellow appearance when ripen at temperatures between 18°C and 24°C. At high ambient temperatures, the fruit display green-ripe and become unacceptable in the market. To understand the mechanisms that govern the color changing during banana green-ripening, the influence of high temperature on chlorophyll degradation at various ripening stages were investigated. After ripening initiation, the fruit were subjected to 8 different temperature changing regimes at both 20°C and 30°C in 5 days. The ripening and senescence parameters were monitored and relevant gene expression was analyzed by RNA gel blot hybridization. Temperature during the first 3 days, or precisely the stage around the on-set of the respiration peak, was found to be critical for color formation in bananas. When the fruit were held at 30°C at this stage, the fruit developed green-ripe with >30% of the original chlorophyll remaining, regardless the other stages were at 20°C. The repressed chlorophyll degradation by 30°C was positively correlated to the reduced expression of several key genes functioning in chlorophyll degradation, MaSGR, MaNYC and MaPaO, which behaved in a closely temperature responding manner. Conversely to chlorophyll degradation patterns, moving to 30°C induced fruit respiration rate, the expression of MaACO, an ethylene synthesis related gene, and accelerated the decrease in fruit firmness and chlorophyll fluorescence (Fv/Fm), indicating that the ripening of the fruit was accelerated at 30°C. Accordingly, in the context of fruit ripening but under not agreeable temperature (30°C), the expression of chlorophyll degradation genes in bananas was predominantly regulated by temperature, not responding to the fruit ripening proceeding. Interestingly, by using the alternating temperature system, we here the first time reported the sensitivity of chlorophyll degradation genes, MaSGR, MaPAO and MaNYC, to high temperature during banana fruit ripening.

Keywords: /Banana/ /Ripening/

BERRY

Mikulic-Petkovsek. 2015. Changes in fruit quality parameters of four *Ribes* species during ripening. *Food Chem.* 173: 363 – 374.

Abstract

There are no defined maturity parameters for berry fruit which often results in harvesting and marketing of inedible, immature or over ripe berries. In the present study the changes in quality characteristics of different white-, red-, and black-currant cultivars as well as gooseberry and jostaberry fruit were investigated at three maturity stages. Colour parameters, berry juice pH level and the content of sugars, organic acids and phenolic compounds have been evaluated. A total of 65 different phenolic compounds were detected by HPLC–PDA/MS. The results indicate that, during the last 2–4 weeks of fruit ripening, significant changes occur in colour parameters, primary and secondary metabolites and radical scavenging activity. The results suggest that the average content of specific phenolic groups and sugars/acids ratio can be used as a simple and reliable maturity index for optimisation of harvest time.

Keywords: /Berry/ /Antioxidant/

Feng, D., et.al. 2014. Effect of chitosan composite coating on Chinese **blueberry** fruit (*Vaccinium uliginosum* L.). Acta Hort. 1053: 207 – 214.

Abstract

The effects of chitosan and gelatin-based coatings on the postharvest quality of blueberry fruit were investigated by measuring changes in firmness, rate of weight loss, titratable acidity, vitamin C content, respiratory rate, and the activity of SOD during 20 d of cold storage at 2±0.5°C (RH 70-80%). The results indicated that chitosan composite coatings successfully reduced the rate of weight loss, inhibited changes in titratable acidity and the loss of vitamin C content. Fruit maintained their firmness, and exhibited increased activity of SOD. The coating used on the blueberry fruit consisted of 1% chitosan, 1% gelatin, 0.2% glycerol, 0.1% Tween 20, and 1.0 mmol/L salicylic acid. The incorporation of salicylic acid into the coating also reduced the respiratory rate in blueberry, which could also contribute to prolonging its shelf life.

Keywords: /Blueberry/ /Chitosan/

CHERRY

Bakan, Ayse, Aziz Eksi. 2014. Effect of packaging materials and storage temperature on the quality of sour **cherry** nectar. Int'l. J. Food Sci. & Technol. 49: 2425 – 2432.

Abstract

The purpose of this research was to determine the effects of the packaging materials and size on the stability of monomeric anthocyanins, polyphenols, antioxidant activity, ascorbic acid, colour index and hydroxyl methyl furfural (HMF) during the 12-month shelf life of sour cherry nectars at 4 °C and 20 °C. Sour cherry nectars were aseptically filled out into packaging of different sizes and materials. The packaging included cartons of two different sizes (200 and 1000 mL) and aluminium cans (330 mL). Results showed that the nectars were of better quality when stored at lower temperatures. HMF generally increased significantly for all nectars during storage. Conversely, the total polyphenol content and the antioxidant activity of the nectars stored in aluminium cans and the larger-sized carton packaging decreased during storage. Lower anthocyanin loss and colour change were found in the nectars stored in aluminium cans. However, the better packaging material was found to be the large-sized carton package when HMF was analysed.

Keywords: /Cherry/ /Quality/ /Storage/

Ravanfar, Rahele, Mehrdad Niakousari and Neda Maftoonazad. 2014. Postharvest sour **cherry** quality and safety maintenance by exposure to hot- water or treatment with fresh Aloe vera gel. J. Food Sci. Techol. 51 (10): 2872 – 2876.

Abstract

Iranian sour cherries (*Prunus cerasus*) were coated with fresh Aloe vera gel or treated with hot water (40±2 °C) for 2 min and stored for 17 days at 4±1 °C. The physicochemical characteristics of gel coated and hot water treated samples were compared with untreated fruit during the cold storage period. Untreated fruit showed increased respiration rate, rapid weight loss and colour change,

accelerated aging and ripening. On the contrary, sour cherries, particularly those coated with gel significantly delayed the above mentioned parameters allowing a fruit storability extension. The sensory analysis in both treatments revealed beneficial effects in terms of delaying dehydration, maintenance of fruit visual aspect without any detrimental effect on taste, aroma or flavours. Consequently, Aloe vera gel coating and immersion in hot water maintained the properties during postharvest storage of sour cherries and could be introduced as two valuable, simple and non-contaminating treatments. Keywords Sour cherry . Aloe vera . Fruit coating . Hot water treatments .

Keywords: /Cherry/ /Shelf life/ /Hot Water Treatment/

CITRUS

El-Neshaway, S.M. 2014. An overview on biocontrol of postharvest diseases of citrus and stone fruits using potential yeast antagonists. Acta Hort 1053: 75 – 84.

Abstract

Several yeast antagonists i.e., *Candida kruisii*, *Trichosporon pullulans*, *Saccharomyces transvalensis*, *Candida tropicalis*, *Rhodotorella mucilaginoso*; and *Saccharomyces cerevisiae* and *Debaromyces carsoni* were selected and their potential efficacy was proved against *Penicillium digitatum* or *Penicillium expansum* on citrus and stone fruit, respectively, as two strategic horticultural crops in Egypt. Their efficacy is identified as antagonistic effect through restricting mycelial growth of the causal pathogens and reducing rot percentages on fruit surface injuries while maintaining fruit characteristics. Enhancement of the biocontrol efficacy of potential yeast antagonists against green mould of citrus was achieved through combination with each of 2-deoxy- D-glucose at (0.1%), sodium bicarbonate (1%) on oranges or with calcium chloride (1%), sorbic acid (0.5%) on lemons. The mode of action by which these potential yeasts provide protection against *P. digitatum* or *P. expansum* on either citrus or stone fruit are potential production of β -1,3-D-glucanase in fruit tissue, and decrease of peroxidase, polyphenyloxidase in stone fruit tissues. An increase of total sugar and phenol contents in fruit was evident as a result of application of each of *Debaromyces carsonii* and *Scharomyces cerevisiae* in stone fruit tissues. Direct interaction between each of yeast antagonists and *Penicillium digitatum* through EMS study following co-inoculation into citrus surface wounds was characterized and showed attachment interaction between the antagonists and the pathogen.

Keywords: / Citrus/ /Postharvest Diseases/ /Biocontrol/

Levin, E., et.al. 2014. Molecular interactions between the biocontrol agent *Metschnikowia fructicola* and citrus fruit tissue and *Penicillium digitatum*. Acta Hort. 1053: 37 – 50.

Abstract

To gain better understanding of the molecular interactions between the yeast biocontrol agent *Metschnikowia fructicola* and citrus fruit and *Penicillium digitatum*, microarray analysis was performed on grapefruit surface wounds using an Affymetrix Citrus GeneChip in concert with transcriptomic analysis, using RNASeq technology. The data indicated that yeast application induced, among others, the expression of the genes encoding respiratory burst oxidase (*Rbo*), phenylalanine ammonia-lyase (*PAL*), chalcone synthase (*CHS*) and 4-coumarate-CoA ligase (*4CL*). In contrast, three genes, *peroxidase (POD)*, *superoxide dismutase (SOD)* and *catalase (CAT)*, were down-regulated in grapefruit peel tissue treated

with yeast cells. Moreover, suppression was correlated with significantly higher levels of hydrogen peroxide, superoxide anion and hydroxyl radical production in yeast-treated surface wounds. Interestingly, large amounts of hydrogen peroxide were detected inside yeast cells recovered from wounded fruit tissue, indicating the ability of the yeast to activate reactive oxygen species when it is in contact with plant tissue. In the antagonist-pathogen interaction, genes related to trans membrane, multidrug transport and to amino acid metabolism were induced. In the antagonist-fruit interaction, expression of genes involved in oxidative stress, iron homeostasis, zinc homeostasis, and lipid metabolism were induced. This study provides the first global picture of gene expression changes in grapefruit in response to the yeast antagonist *M. fructicola*.

Keywords: /Citrus/ /Biocontrol/

Palou, L., et.al. 2014. Edible composite coatings formulated with antifungal GRAS compounds: a novel approach for postharvest preservation of fresh **citrus** fruit. Acta Hort. 1053: 143 – 150.

Abstract

New hydroxypropyl methylcellulose (HPMC)-lipid edible composite coatings containing food additives or GRAS ('generally regarded as safe') compounds with antifungal properties were developed for postharvest preservation of fresh citrus fruit. Stable emulsions were selected among a large number of formulations prepared with different solid concentrations (6-12% wet basis, wb), total lipid (beeswax and shellac) contents (up to 60% dry basis), and concentrations of the antifungal ingredients (0.05-4.5% wb). Disk diameter tests were used for in vitro selection of the most effective stand-alone films against the pathogens, *Penicillium digitatum* and *Penicillium italicum*. Selected coatings were tested in vivo against green and blue molds on 'Valencia' oranges and 'Ortanique' and 'Clemenules' mandarins, incubated at 20°C for 7 days or stored at 5°C for up to 60 days. Coatings containing sodium benzoate or potassium sorbate, alone or mixed with sodium propionate, were the most effective in reducing the incidence and severity of both molds on fruit coated 24 h after fungal inoculation (curative activity). The antifungal activity of the coatings was fungistatic rather than fungicidal and was dependent on varietal susceptibility to *Penicillium* decay (higher activity on oranges than on mandarins, and on 'Ortanique' than on 'Clemenules'). In general, green mold was more effectively controlled than blue mold on cold-stored fruit. Selected coatings significantly reduced fruit weight loss and maintained firmness during cold storage. Although the coatings modified the internal gas composition, they did not affect the overall sensory quality of oranges and mandarins.

Keywords: /Citrus/ /Postharvest Diseases/ /Edible Coating/

DRAGON FRUIT

Matan, Marumol, et.al. 2015. Combined antibacterial activity of green tea extract with atmospheric radio-frequency plasma against pathogens on fresh-cut **dragon fruit**. Food Control. 50: 291 – 296.

Abstract

The objective of this research was to observe the combined effect of green tea extract (at a tea: water; g ml⁻¹, ratio of 2.5e10.0%) and cold plasma (20 W and 40 W) against bacteria pathogens *Escherichia coli*, *Salmonella typhimurium*, and *Listeria monocytogenes*) that can be found on the fresh-cut dragon fruit. The change in pathogens after plasma treatment of a fresh-cut dragon fruit treated

with green tea at 4 ± 1 °C was also investigated. Dragon fruit's nutritional value, mineral, total phenolic content, and sensory within and without plasma and green tea was determined. It was found that atmospheric radiofrequency (RF) plasma at 40 W could extend the protection against all pathogen growth on the surface of fresh-cut dragon fruit treated with at a 5.0% of green tea to at least 15 days. Without the plasma treatment, green tea of 2.5e10.0% could not inhibit all bacterial growth. In addition, higher values of total phenolic content, crude protein, crude fat and crude fibre were observed in the fresh-cut dragon fruit with green tea after the plasma ($p < 0.05$) treatment; however, no change was found ($p > 0.05$) regarding the minerals Fe, Cu, and Mn and the sensory test. The research indicated that green tea extract and atmospheric RF plasma in combination could protect against the growth of pathogens on fresh-cut dragon fruit and extend its shelf-life.

Keywords: /Dragon Fruit/ /Fresh Cut/

GRAPEFRUIT

Lado, Joanna, et. al. 2014. Involvement of lycopene in the induction of tolerance to chilling injury in **grapefruit**. *Postharvest Biol. & Technol.* 100: 176 – 186.

Abstract

Grapefruit are among the more sensitive Citrus varieties likely to develop chilling injury (CI) symptoms during postharvest storage at low temperatures. Comparative observations of the incidence of CI in fruit of white Marsh (MSH) and red Star Ruby (SR) grapefruit during postharvest storage at 2 °C plus 7 days at 20 °C to simulate shelf-life revealed that (1) the former was consistently more sensitive to CI, developing cold damage uniformly throughout the whole rind surface, and (2) more strikingly, CI symptoms in fruit of SR grapefruit were restricted to the yellow areas of the rind and the red-colored zones were almost absent of cold damage. This tolerance to CI in red flavedo was associated with high carotenoid (x2) and lycopene (x14) contents, as compared with yellow-colored flavedo. Absence of chilling damage in red areas of SR grapefruit rind was confirmed by cellular ultrastructure observations, in which these epidermal cells were intact, with a well-defined structure and compact vacuoles filled with content. Cells of yellow-colored tissue developing CI, were collapsed, with a contracted vacuole and shrinking organelles. To explore whether the tolerance to CI in red areas of grapefruit rind was due to an elevated lycopene concentration, chemical and environmental stimulation of this carotenoid was performed in fruit of both grapefruit varieties. Application of the inhibitor of the lycopene cyclase activity, CPTA (2-(4- chlorophenylthio) triethylamine hydrochloride) induced red coloration, increased lycopene accumulation (x32) and significantly delayed development of CI symptoms in the rind the CI-sensitive MSH. Bagging of SR grapefruit enhanced a homogenous red coloration and substantially induced lycopene accumulation (x75). CI symptoms in bagged fruit were notably delayed and reduced, as compared with non-bagged yellow fruit, upon subsequent storage at 2 °C for up to 58 days and 7 days at 20 °C. Analysis of the expression of ethylene biosynthetic genes (ACS1, ACS2 and ACO) revealed a significant induction in chilling-damaged tissue of both varieties that was almost absent in red chilling-tolerant tissue. Similarly, accumulation of transcripts of the ethylene receptors ETR1 and ETR3 were also associated with chilling damage, but a cold factor appears to also mediate the expression of these genes. Taken together, our results indicate that high lycopene concentration appears to be responsible for the induction of tolerance to chilling in the red-colored areas of the flavedo of grapefruit during postharvest storage at low temperatures.

Keywords: /Grapefruit/ /Citrus/ /Chilling Injury/

Conesa, A. 2014. The degreening of lemon and grapefruit in ethylene atmosphere: a cost analysis. *Scientia Hort.* 179: 140 – 145.

Abstract

Lemons and grapefruit are harvested commercially before the fruit have reached their characteristic colour and are submitted to a process of degreening in special chambers before entering the retail chain. The aim of this work is to make a cost analysis of this process for different times of harvest. The period analysed ran from October to December in 2012 and 2013. Fruit were harvested on six occasions in each year (T1–T6) and the fruit classified into seven lots each time (three for lemon and four for the grapefruit cultivars studied). The lemon cultivars studied were 'Eureka', 'Fino 49' and 'Lisbon' on *Citrus macrophylla* and the grapefruit cultivars were 'Marsh', 'Red Blush', 'Rio Red' and 'Star Ruby' on the mandarin *Cleopatra*. Each lot remained in the ethylene chamber for 7 days, and the colour coordinates were measured every 2 days to obtain the Colour Index (CI*) of the fruit for each harvesting date. The data showed that the greener the fruit when they entered the ethylene chamber, the greater the degreening rate. The different costs of degreening were estimated for each harvesting date and cultivar. The findings showed that the costs involved in degreening the grapefruit cultivars 'Red Blush' and 'Rio Red' were three times greater than the costs associated with 'Marsh' and 'Star Ruby'. The costs of degreening lemon did not differ during the first half of the harvesting period and fell gradually during the second half. The findings provide a useful tool for calculating the cost of degreening as a function of harvesting date for each cultivar.

Keywords: /Grapefruit/ /Ethylene/ /Rind Colour/

LONGAN

Yao, Furong, et al. 2014. Phenolic components, antioxidant enzyme activities and anatomic structure of longan fruit pericarp following treatment with adenylate triphosphate. *Sci. Hort.* 180: 6–13.

Abstract

Fruit senescence and pericarp browning are strongly related to the antioxidant properties and are affected by the cellular energy status. In the present study, longan fruits were treated with 1 mmol L⁻¹adenosinetriphosphate (ATP) before storage for six days at 25°C. The phenolic contents and antioxidant enzyme activities in relation to pericarp browning were determined, and the fruit pericarp structure was observed under a confocal laser scanning microscope (CLSM) and transmission electron microscope. Increases in the browning index, membrane permeability, peroxidase (POD) activity and gallic acid content were slowed during storage following exogenous ATP application, whereas the flavonoids accumulation was increased significantly by ATP treatment. In addition, decreases in catechin, corilagin, epicatechin and galocatechin gallate were accelerated by exogenous ATP treatment. The cuticle in the pericarp of the untreated longan fruit was incomplete, the organelle was swollen or disintegrated, the grana lamellae was destroyed and osmiophilic particles accumulated in the chloroplast, the cytoplasm was granulated and the fruiting body of a possible pathogenic organism was observed after storage. However, the pericarp structure maintained its relative integrity without any visible pathogenic organisms, as determined with CLSM in the ATP-treated fruit. It is suggested that ATP application protects longan fruit from pathogen attack, maintains the pericarp structure and delays senescence, which are closely related to the fruit's higher total phenolic levels and lower POD activity.

Keywords: /Longan/ /Storage/

MANGO

Alvinda D. G. & M. A. Acda. 2015. Revisiting the efficacy of hot water treatment in managing anthracnose and stem-end rot diseases of mango cv. 'Carabao'. *Crop Protection* 67: 96 - 101.

Abstract

This study was conducted to revalidate the efficacy of hot water treatment (HWT) as a standard protocol in managing postharvest disease in 'Carabao' mangoes. We elucidated the possible reasons for the inadequacy of HWT in management of anthracnose and stem-end rot. The effect of HWT on the cultures of anthracnose and stem-end rot-causing pathogens and on the overall quality of fruit was examined. The present investigation suggested 53 °C for 20 min as optimal exposure for 'Carabao' mango. At this exposure however, the propagules of *Colletotrichum gloeosporioides* and *Lasiodiplodia theobromae* were not totally controlled. HWT was unstable in controlling *C. gloeosporioides* and *L. theobromae* as demonstrated by high standard deviation of radial growth. HWT manner of control is fungistatic rather than fungicidal as pathogens developed after treatment. Fungistatic activity of HWT was perhaps inadequate to protect the fruit from decay due to absence of residual action. There were no significant changes in the quality of 'Carabao' mangoes submerged in hot water at 53 °C for 20 min whilst the severity of anthracnose was reduced by 48.71%e52.63% and stem-end rot by 48%-60.86%.

Keywords: /Mango/ /Mangifera indica/ /Decay/ /Heat Treatment/ /Firmness/

MELON

Terao D., et al. 2014. Potential use of bioagents in the control of postharvest rot in melon. *Acta Hort.* 65 – 74.

Abstract

Rot caused by *Fusarium pallidoroseum* has had a severely negative impact on the export of melons from Brazil. Uncertainty regarding the health of the fruit due to the quiescent infection of the pathogen has led producers to use fungicides in the postharvest treatment of the fruit, thereby causing contamination and risking the health of consumers. Consequently, there is a demand for clean and safe natural technologies for the postharvest treatment of melons, including biological control. The present study aimed at evaluating bioagents for use in controlling Fusarium rot in 'Galia' melon. The following bioagents were evaluated: two isolates of *Bacillus subtilis*, *B. licheniformis* and a mixture of *B. subtilis* and *B. licheniformis*, as well as the yeasts *Sporidiobolus pararoseus*, *Pichia* spp., *Pichia membranifaciens*, *P. guilliermondii*, *Sporobolomyces roseus*, *Debaryomyces hansenii* and *Rhodotorula mucilagenosa*. Treatment with imazalil and water were used as controls. Two experiments were conducted in a completely randomised design with 10 replicates per treatment with four fruit per replicate; the disease incidence was evaluated in the first experiment, and the disease severity was evaluated in the second. Similarity analysis of the temporal evolution profiles of rot incidence caused by *F. pallidoroseum* allowed the evaluated treatments to be clustered into four groups. In the first experiment, the yeasts *P. membranifaciens* and *D. hansenii* produced results similar to that of the fungicide imazalil. The second experiment highlighted the yeasts *P. guilliermondii* and *R. mucilagenosa*. Electron microscopy studies

confirmed that once applied to the fruit, the yeasts colonised the skin and damaged the pathogen mycelium; the action of the yeasts affected the mycelium of *F. pallidoroseum*, which had infected wounds on the fruit's surface. *Bacillus* spp. did not provide good disease control. These results demonstrated that yeasts have the potential to control postharvest rot caused by *F. pallidoroseum* in 'Galia' melon.

Keywords: /Melon/*Cucumis melo*/ /Biocontrol/

ORANGE

Gambetta G., et al. 2014. Gibberellic acid and norflurazon affecting the time-course of flavedo pigment and abscisic acid content in 'Valencia' sweet **orange**. *Sci. Hort.* 180: 94 – 101.

Abstract

In Citrus, colour break has been positively related to ethylene, abscisic acid (ABA) and carbohydrates, and negatively related to gibberellins and nitrogen. However, the mechanisms by which these substances affect the process are not well understood. This study analyses the role of gibberellins and ABA, through gibberellic acid (GA3) and norflurazon (NFZ) applications, on the evolution of flavedo pigments in on-tree degreening and regreening 'Valencia' sweet orange fruit. In two experiments, 180 fruits were tagged previous to colour break, 60 were treated with NFZ, another 60 with GA3, and the remaining 60 were used as control. In control fruit, flavedo ABA concentration increased as did colour development, declining just before full colour developed. NFZ did not affect chlorophyll degradation, but provoked a partial blockage of the carotenoid biosynthesis pathway increasing phytoene and phytofluene concentrations in the flavedo. As a consequence, flavedo ABA concentration temporarily reduced as did fruit colour intensity, but it did not delay the onset of colour break. Conversely, GA3 delayed flavedo chlorophyll degradation and reduced B-cryptoxanthin and B-citraurin biosynthesis, and, thus, delayed fruit colour break. GA3-treated fruit also accumulated higher lutein and carotene concentrations, but remained greener than control fruit, and reduced flavedo ABA concentration, but not significantly. Ethylene was not detected, in any treatment. Our results confirm that ABA concentration paralleled colour development, but it did not trigger the process.

Keywords: /Orange/ /Citrus/ /Ripening/

Vilanova L., et al. 2014. Effect of fruit maturity stage of **orange** on the wound response to *Penicillium digitatum* (Pathogen) and *P. expansum* (Non-Host Pathogen). *Acta Hort.* 177 - 184.

Abstract

Penicillium digitatum and *P. expansum* are postharvest necrotrophic fungi that require wounds to infect the fruit. Therefore, injuries caused during harvesting and postharvest handling provide an optimal locus for infection. In this study, we evaluated the effect of wound response in oranges harvested at three different maturity stages and stored at two different temperatures (20 and 4°C), on the infection of fruit by either pathogen. The effect of wounding and pathogen inoculation on lignin content and the expression of several phenylpropanoid pathway-related genes were also analyzed. *P. digitatum* exhibited lower decay incidence and severity as the time between wounding and inoculation increased, and these differences were more evident in fruit from immature and commercial harvests. *P. expansum* was able to infect oranges, and lesions obtained at 4°C were larger than those obtained at

20°C. In general, lignin content was highest in fruit from the immature harvest. The accumulation of *pal1* and *pox1* mRNA at 24 h was higher in samples infected with both pathogens than in control samples. However, samples inoculated with *P. digitatum* showed an important decrease after 48 h. Our results indicate that maturity and storage temperature play important roles in orange wound response.

Keywords: /Orange/ /Green Mould/ /Blue mould/ /Maturity/

PAPAYA

Garcia C. C., et al. 2014. Influence of edible coating on the drying and quality of **papaya** (*Carica papaya*). Food Bioprocess Technol. 7: 2828 – 2839.

Abstract

The edible coating applied to food pieces prior to hot air drying is a technology that can improve the nutritional and sensory qualities of dehydrated products. The effects of the pectin coating technique on the drying efficiency and quality of papaya slices of the Formosa cultivar were investigated, determining the cell structure, color, and vitamin C contents of the fresh and dried fruits, with and without a pectin coating. The drying kinetics was evaluated based on Fick's Law. The analytical solution for a plane sheet was used to estimate the water effective diffusion coefficients, and, in order to take into account shrinkage during drying, the average and variable thicknesses were considered in an approximate manner. Diffusion modelling presented a better fit when considering the thickness of the slices as variable. Regarding fruit quality, the coating applied to papaya slices before drying enhances vitamin C retention in comparison to papaya dried without coating, showing that pectin coating efficiently prevented oxidation of this bioactive compound. In addition, the moisture diffusivity of the coated samples was higher than that of the non-coated slices, due to the hydrophilic nature of the pectin. Light and transmission electron microscopy images revealed intense rupturing of the cell membranes in the dried tissues. The cell tissue arrangement in the coated papaya slices was similar to that found in the fresh papaya slices, before and after drying.

Keywords : /Papaya/ /Edible Coating/ /Quality/

Ong, Mei Kyng, et. al. 2014. Effect of different concentrations of ozone on physiological changes associated associated to gas exchange, fruit ripening, fruit surface quality and defence-related enzymes levels in **papaya** fruit during ambient storage. Sci. Hort. 179: 163 – 169.

Abstract

Papaya fruit (*Carica papaya* L.) were exposed continuously to ozone fumigation (0, 1.5, 2.5, 3.5 and 5.0 $\mu\text{L L}^{-1}$) for 96 h prior to ambient storage ($25 \pm 3^\circ\text{C}$ and $70 \pm 5\%$ RH) for an additional 10 days. The rate of ethylene formation and changes in the activities of the plant defence enzymes, phenylalanine ammonia-lyase (PAL) (EC 4.3.1.5), peroxidase (POD) (EC 1.11.1.7) and polyphenol oxidase (PPO) (EC 1.10.3.1), were measured in ozone treated and untreated papaya fruit after 0, 2, 4, 6, 8, 10, 12 or 14 days. The fruit treated with ozone at concentrations lower than 5 ppm had lower respiration rate and delayed ripening compared to the control. However the fruit that had received high ozone concentrations ($>3.5 \mu\text{L L}^{-1}$) produced more ethylene and caused injury to fruit tissue. Enzyme activities were higher in ozone treated papaya fruit than in untreated fruit throughout the storage period. The greatest changes in enzyme activities were obtained with the highest ozone dose (5 $\mu\text{L L}^{-1}$).

Keywords: /Papaya/ /Ripening/ /Browning/

Vawdrey L. L., et al. 2015. Field and laboratory evaluation of fungicides for the control of *Phytophthora* fruit rot of papaya in far north Queensland, Australia. Crop Protection 67: 116 - 120.

Abstract

Results from the first of two artificially inoculated field experiments showed foliar applications of copper hydroxide (Blue Shield Copper) at 600 g a.i./100 L⁻¹ (0% infected fruit), copper hydroxide þ metalaxyl-M (Ridomil Gold Plus.) at 877.5 g a.i./100 L⁻¹ (0.27%), metiram þ pyraclostrobin (Aero) at 720 g a.i./100 L⁻¹ (0.51%), chlorothalonil (Bravo WeatherStik) at 994 g a.i./100 L⁻¹ (0.63%) and cuprous oxide (Nordox 750 WG) at 990 g a.i./100 L⁻¹ (0.8%) of water significantly reduced the percentage of infected fruit compared to potassium phosphonate (Agri-Fos 600) at 1200 g a.i./100 L⁻¹ (8.22%), dimethomorph (Acrobat) at 108 g a.i./100 L⁻¹ (11.18%) and the untreated control (16%). Results from the second experiment showed fruit sprayed with copper hydroxide (Champ Dry Prill) at 300 (2.0% infected fruit), 375 (0.4%) and 450 g a.i./100 L⁻¹ (0.6%) and metiram þ pyraclostrobin (Aero) at 360 (2.8%), 480 (0.6%) and 600 g a.i./100 L⁻¹ of water (1.0%) significantly reduced the percentage of infected fruit compared to the untreated control (19.4%). Foliar sprays of copper hydroxide at 375 g a.i./100 L⁻¹ in rotation with chlorothalonil at 994 g a.i./ 100 L⁻¹ every two weeks is now recommended to growers for controlling *Phytophthora* fruit rot of papaya.

Keywords: /Papaya/*Carica papaya*/Fungicides/ /Tropical fruit/

PEACH

Fruk G., et al. 2014. Pectin role in woolliness development in peaches and nectarines: a review. Sci. Hort. 180: 1 – 5.

Abstract

One of the main problems during peach and nectarine cold storage is the associated chilling injuries, which can include woolliness, mealiness, leatheriness, flesh browning, internal reddening, and flesh or pit cavities. Woolliness is one form of chilling injury. It manifests as a lack of juiciness and a dry 'woolly' texture of the fruit flesh. Its occurrence is correlated with pectin metabolism and is controlled directly or indirectly by the pectolytic enzymes (i.e., polygalacturonase, pectin esterase, cellulase, lipoxygenase). Chilling injury to these fruit also results in changes in the fruit physiology and cell anatomy. A reduction in woolliness is possible with post-harvest treatments, such as with heat (which must be carried out carefully), calcium, ethylene (blocking or producing), nitrogen monoxide, or a controlled atmosphere. This paper focuses only on woolliness and factors affecting its occurrence. In this paper the role of pectin metabolism, temperature and postharvest treatments on occurrence of woolliness is discussed. The role of some enzymes, such as pectin esterase, and postharvest treatment with 1-MCP still remain unclear and further research is needed to elucidate physiological mechanisms that lead to development of woolliness.

Keywords: /Peach/ /Nectarine/ /Ethylene/ /Chilling injury/ /Temperature/

Spadoni A., et al. 2014. Heat treatment to control brown rot and preserve the fruit quality of peaches. Acta Hort. 1053: 157 - 162.

Abstract

In order to evaluate the efficacy of a hot water (HW) treatment against postharvest diseases of peaches, four cultivars, 'Springebelle', 'Rich Lady', 'Symphonie' and 'Benedicte® Meydicte*', were dipped for 20 s in water at 60°C. After treatment, fruits were stored at 0°C for 4 days, followed by another 4 days of shelf life. Fruits dipped in water at room temperature represented the positive control (PC) and fruits not dipped in water were the negative control (NC). The HW treatment significantly reduced brown rot in naturally infected peaches with a decay reduction of approximately 80%. The HW treatment also significantly affected the epiphytic microflora population. In fact, the fungal population on HW treated fruit was reduced by 70%, the yeast population by 20%, and the bacteria population was completely inhibited compared to PC-treated fruits. A physico-chemical analysis revealed no substantial differences between HW, PC, and NC treated fruits, although there was a slight improvement in acceptability for HW treated fruits. Based on our results, HW treatment may be of commercial interest for the control of brown rot, reducing the pathogen inoculums, and the general population of microflora on the fruit surface, maintaining quality, and prolonging shelf life in several cultivars of peaches.

Keywords: /Peach/ /Heat treatment/ /Peach/ /Fruit Quality/

PEAR

Oveisi, Z. Et.al. 2014. Application of vibration response technique for the firmness evaluation of pear fruit during storage. J. Food Sci. 51 (1): 3261 – 3268.

Abstract

Storage conditions of pear affect its subsequent softening process and shelf life. Measurements of firmness have traditionally been carried out according to the Magness Taylor (MT) procedure; using a texture analyzer or penetrometer in reference texture tests. In this study, a non-destructive method using Laser Doppler vibrometer (LDV) technology was used to estimate texture firmness of pears. This technique was employed to detect responses to imposed vibration of intact fruit using a shaker. Vibration transmitted through the fruit to the upper surface was measured by LDV. A fast Fourier transform algorithm was used to process response signals and the desired results were extracted. Multiple Linear Regression models using fruit density and four parameters obtained from modal tests showed better correlation ($R^2=0.803$) with maximum force in Magness Taylor test compared to the models that used only modal parameters ($R^2=0.798$). The best polynomial regression models for pear firmness were based on elasticity index (EI) and damping ratio (η) with $R^2=0.71$ and $R^2=0.64$, respectively. This study shows the capability of the LDV technique and the vibration response data for predicting ripeness and modeling pear firmness and the significant advantage for commercially classifying of pears based on consumer demands.

Keywords: /Pear/ /Firmness/

Wenneker, M. & J. Köhl. 2014. Postharvest decay of apples and pears in the Netherlands. Acta Hort. 1053: 107 - 112.

Abstract

Postharvest diseases are a major problem in long storage of apples and pears in The Netherlands. Despite intensive preharvest spraying programs significant losses occur (over 60% of fruit losses are recorded). Over 125 heavily affected lots of apples (mainly 'Elstar') and pears (mainly 'Conference') from packing houses in different regions of The Netherlands were evaluated for decay symptoms and causal organisms in the 2011/2012 season. Results showed that the most important pathogens were *Neofabraea* spp. (apples and pears) and *Cadophora* spp. (pears). Other pathogens such as *Botrytis* spp., *Penicillium* spp., *Fusarium* spp., *Alternaria* spp., and *Cladosporium* spp. were isolated at low frequencies and are considered of minor importance. Also new problems with sooty blotch and lenticel rot of apple were noticed, most likely caused by other, not yet identified pathogens. Pathogenicity testing and characterization of isolates are on-going. For major pathogens, qPCR assays are developed. Samples of substrates (e.g., leaves, cankers,) were monthly taken from 10 apple and 10 pear orchards in 2102. Samples will be assessed using the qPCR assays for presence and dynamics of pathogen populations. This information on the pathogen life cycles is needed for the development of innovative strategies (e.g., sanitation practices) to prevent postharvest losses.

Keywords: /Pear/ /Storage/ /Diseases/

PERSIMMON

Khademi O., et al. 2014. Changes in pectin methylesterase, polygalacturonase, catalase and peroxidase activities associated with alleviation of chilling injury in **persimmon** by hot water and 1-MCP treatments. *Sci. Hort.* 179: 191 – 197.

Abstract

'Rojo Brillante' persimmon is an astringent cultivar whose fruits are chilling injury-sensitive. A pre-treatment of 1-MCP or Hot Water before cold storage is known to alleviate flesh softening, the main chilling injury symptom to occur when fruit is transferred from low to moderate temperatures. In order to better understand the chilling injury alleviation mechanism in persimmon through these two treatments, the changes of antioxidant system enzymes (catalase and peroxidase) and cell wall degrading enzymes (pectin methylesterase and polygalacturonase) were evaluated. Persimmon fruits subjected to the 1-MCP treatment (500 nL L⁻¹) or to hot water treatments (45°C for 30 min) (HWT-45°C) and 50°C for 20 min (HWT-50°C) were stored at 1°C for 30 days. Then they were submitted to a deastringency treatment (98% CO₂ at 20°C for 24 h) before being transferred to shelf-life conditions for 5 days at 20°C. The HWT applied at 50°C and 1-MCP were observed to be the most effective treatments to reduce firmness loss after cold storage. During the shelf-life period, the activities of (pectin methylesterase and polygalacturonase) were lower in fruit treated with both treatments than in control fruit, which may result in higher cell wall integrity and, therefore, in fruit softening alleviation. The 1-MCP and HW-treated fruits exhibited higher catalase and lower peroxidase activities if compared to untreated fruit. While peroxidase activity was especially inhibited by 1-MCP, HWT exerted a more marked effect on the catalase enzyme. The changes in cell wall degrading and antioxidant system enzymes induced by 1-MCP and HWT-50°C during the symptom development period reveal that these enzymes are involved in the chilling-tolerance of persimmon.

Keywords: /Persimmon/ /Chilling injury/ /Softening/

PLUM

Bobrich A., et al. 2014. Phytochemicals in Japanese **plums**: impact of maturity and bio accessibility. Food Res. Int'l. 65: 20 – 26.

Abstract

In recent years there has been increasing consumer interest in the potential health benefits of dietary derived phytochemicals such as polyphenols (including anthocyanins and flavonols) and carotenoids. A new variety of Japanese plum (*Prunus salicina* Lindl.), named Queen Garnet (QG), was developed as a high anthocyanin plum in a Queensland (Australia) Government breeding program and may be attractive to consumers, but knowledge of other phytochemical content, and bioaccessibility, is currently limited. As a result, the present study examined (1) the impact of harvest date on anthocyanins, quercetin glycosides and carotenoids in Queen Garnet and another red fleshed commercial Japanese plum variety, Black Diamond (BD), (2) the content of bound phenolics in plum fruit and (3) the in vitro bioaccessibility and release of these phytochemicals as an initial measure to predict their potential bioavailability. For both QG and BD, the last harvest resulted in the highest anthocyanin content in peel, flesh and whole fruit, whereas no significant effects could be observed for quercetin glycosides, and total carotenoids decreased over time. The highest content of bound phenolics (30% of total amount) could be found in BD flesh. Between 53% and 59% of quercetin glycosides and anthocyanins were released from QG after the gastric and small intestinal digestion procedure, whereas the release of carotenoids ranged between 4–6%. A relative high release of anthocyanins and quercetin glycosides could be observed from QG which may result in a higher gastro-intestinal absorption rate of these compounds. However, follow-up studies (clinical trials) are warranted to investigate the in vivo bioavailability and subsequently biological activity of QG.

Keywords: /Plums/ /Phytochemicals/ /Maturity/

RASPBERRY

Hassanpour H. 2015. Effect of aloe vera gel coating on antioxidant capacity, antioxidant enzyme activities and decay in **raspberry** fruit. LWT - Food Sci. & Technol. 60: 495 - 501.

Abstract

Native populations of raspberry fruits (*Rubus* spp.) were coated with Aloe vera gel and were then assayed for the antioxidant capacity, total anthocyanin, total phenol, antioxidant enzyme activities and postharvest quality after 8 days storage at 4 °C, relative to a control group. These berries, coated with Aloe vera gel, showed a higher antioxidant capacity, total anthocyanin and total phenol than those of the controls (non-treated) group. The treated fruits exhibited less incidence of decay during storage at 4 °C than the control group. Thus postharvest life (as affected by fungal decay) was longer for berries treated with Aloe vera gel than for the control fruit. However, total soluble solid, titratable acidity and pH were predominantly influenced by storage periods. Aloe vera gel treatments could reduce the natural decay that happens over time. The activities of antioxidant enzymes, including glutathione peroxidase (GSHPOD), glutathione reductase (GR), superoxide dismutase (SOD), ascorbate peroxidase (AsA-POD) and guaiacol peroxidase (G-POD) were enhanced. The nonenzyme components such as

reduced glutathione (GSH) and oxidized glutathione (GSSG) were also increased by Aloe vera gel. In conclusion, raspberry fruits treated with Aloe vera gel maintained higher levels of antioxidant capacity, total phenol, and total anthocyanin and antioxidant enzymes during storage periods.

Keywords: /Postharvest life/ /Raspberry/

STRAWBERRY

Balode A. 014. Evaluation of microbiological products to control grey mould in strawberries. Acta Hort. 1053: 85 – 90.

Abstract

Within small distances, climate is subject to considerable variations – from heavy precipitation and limited sunshine to moderate, dry and warm. Throughout the growing season, damp and cold conditions promote spreading of *Botrytis cinerea*. It is necessary to both suppress the pathogens and to reduce environmental damage; therefore, experimentation with and application of microbiological products have a promising future in horticultural production. The strawberry (*Fragaria × ananassa*) cultivar ‘Polka’ was used for this trial. Two microbiological products were evaluated for their ability to reduce *Botrytis* infection. BioMikss is a mixture of microorganisms that contains cells of 7 various bacteria strains (*Azotobacter chroococcum* E-t, *Polyangium cellulorum* 5-t, *Polyangium cellulorum* 56, *Pseudomonas putida* 48-t, *Rhizobium meliloti* 15, *Streptomyces cellulosa* D and *Streptomyces griseoviridis* P-t) and cells of two various fungus strains (*Trichoderma harzianum* 7-t and *Trichoderma viride* A-L), and Trihodermin (*Trichoderma harzianum* 8-21 and *Trichoderma viride* 1-5). Two forms of BioMikss and Trihodermin were used: dry powder (103-105 CFU g⁻¹) and solution (107-109 CFU ml⁻¹). In the field trial, either a dry powder form (10 kg ha⁻¹) was applied as a soil treatment or a water suspension (300 L ha⁻¹) to plants three times during the growing period. The results proved that BioMikss in solution form was the most effective for reducing disease incidence under field conditions. When compared to control plants, treated plants showed significantly higher resistance to *Botrytis cinerea* and increased yield of treated strawberry was observed. The results indicated it is important to apply microbiological products before *Botrytis cinerea* infection has started to spread.

Keywords: /Strawberries/*Botrytis cinerea*/ /*Fragaria × ananassa*/

SWEET CHERRY

Feliziani E., et al. 2014. Use of resistance inducers to control storage decay of sweet cherry. Acta Hort. 1053.

Abstract

Postharvest decay can cause severe losses of sweet cherry in storage, and the use of synthetic fungicides is not allowed after harvest on this crop. Therefore, the effectiveness of alternative means for the control of postharvest decay of sweet cherry was tested in vitro and in vivo. When amended to potato dextrose agar, oligosaccharides, benzothiadiazole, chitosan, calcium plus organic acids (COA), and nettle macerate reduced the growth of *Monilinia laxa*, *Botrytis cinerea* and *Rhizopus stolonifer*. Treatments of sweet cherries three days before harvest or soon after harvest with oligosaccharides, benzothiadiazole, chitosan, COA, nettle extract, fir extract, laminarin, or potassium bicarbonate reduced

brown rot, gray mold, Rhizopus rot, Alternaria rot, blue mold, and green rot of cherries kept 10 d at 20±1°C, or 14 d at 0.5±1°C and then exposed to 7 d of shelf life at 20±1°C. Among these resistance inducers, when applied either preharvest or postharvest, chitosan was one of the most effective in reducing storage decay of sweet cherry, and its antimicrobial activity in vitro and in field trials was comparable to that of the fungicide fenhexamid. Benzothiadiazole was more effective when applied postharvest than with preharvest spraying. These resistance inducers could represent good options for organic growers and food companies, or they can complement the use of synthetic fungicides in an integrated disease management strategy.

Keywords: /Sweet Cherry/ /Prunus avium/ /Botrytis cinerea/ /Storage/ /Chitosan/

SWEET TAMARIND

Teerachaichayut S., et al. 2014. Non-Destructive detection of internal mold infection in sweet tamarind using short wavelength near infrared spectroscopy. Acta Hort. 113 - 120.

Abstract

Internal quality of sweet tamarind ('Prakaytong') is an essential commercial attribute. Determination of internal mold cannot be done by visual inspection on the outside of an intact tamarind. Therefore, a non-destructive measurement and data evaluation technique were considered using short wavelength near infrared (SW-NIR) transmittance spectroscopy in order to detect internal mold infection in sweet tamarind. A set of 176 tamarind samples (a calibration set = 124 and a prediction set = 52) were used in this research. Spectra in the region of 665-955 nm were acquired from scanning the center of each seed pod. The averaged spectral reading was used for partial least squares discriminant analysis (PLS-DA) to establish a classification model for tamarind quality between groups of normal and defected samples. The calibration model obtained optimal result by cross validation using second derivative spectral pretreatment. The classification accuracy on the calibration set was 86.3% (58 out of 62 for the normal samples and 49 out of 62 for the defected samples) and on the prediction set was 84.6% (26 out of 26 for the normal samples and 18 out of 26 for the defected samples). The results showed that SW-NIR transmittance spectroscopy can be used to non-destructively detect internal mold infection in intact sweet tamarind.

Keywords: /Sweet Tamarind/ /Quality/

TABLE GRAPES

Champa, Harindra W. A., et al. 2015. Exogenous treatment of spermine to maintain quality and extend postharvest life of table grapes (*Vitis vinifera* L.) cv. Flame Seedless under low temperature storage. LWT - Food Sci. & Technol. 60: 412 - 419.

Abstract

Potential of spermine as a postharvest dip treatment for maintaining quality and extending storage life of table grapes (*Vitis vinifera* L.) cv. Flame Seedless was investigated. Grape clusters were dipped in different concentrations (0.0 e control, 0.5, 1.0 and 1.5 mmol/l) of spermine for 5 min, thereafter stored in the cold room (3-4°C, 90e95% RH). Evaluation of physic-chemical parameters and other fruit quality attributes were made at 0 day (before treatment) and at 30, 45, 60e75 days after

treatment. Spermine at the dose of 1.0 mmol/l effectively maintained berry firmness, peel colour (L*, a*, b*), stabilized anthocyanins, suppressed the activity of pectin methyl esterase, while reducing the rate of membrane electrolyte leakage. In addition, it effectively retarded the degradation of TSS and TA on the contrary to other two doses and the control. In conclusion, postharvest dip treatment of 1.0 mmol/l spermine extended the postharvest life of grape cv. Flame Seedless up to 60 days in contrast to control, which was commercially acceptable only up to 45 days.

Keywords: /Table Grapes/ /Firmness/ /Quality/

VEGETABLES

CUCUMBER

Manjunatha, M. & Rahul K. Anurag. 2014. Effect of modified atmosphere packaging and storage conditions on quality characteristics of **cucumber**. J. Food Sci. Technol. 5(11): 3470 – 3475.

Abstract

Cucumbers (*Cucumis sativus* L.) stored in perforated modified atmosphere packaging (MAP) under cold room (4±1 °C and 90±2 % RH) and ambient condition (23–26 °C and 63–66 % RH) were evaluated for firmness, weight loss (WL), colour, chilling injury and sensory characteristics. The firmness of cucumbers was decreased to 0.333 and 0.326 N on 6th and 12th day of storage, respectively from initial value of 0.38 N. After 12 days of storage, the WL was in the range of 1.62–12.89 % whereas the cucumber stored under MAP having 2 perforations at 4± 1 °C and 90±2 % RH recorded least WL of 1.62 %. The minimum change in colour (Hunter L, a and b values) was observed in the cucumber samples stored at cold room condition. The increase in 'b' values (yellowness) was more in the sample stored at ambient condition with unsealed sample registered highest 'b' values (35.82). On 12th day of storage, sensory quality evaluation revealed that samples stored under perforated MAP at 4±1 °C and 90±2 % RH were acceptable in condition with sensory score of 7.1 and 7.5. Chilling injury was severe in sample unsealed (4.4 chilling injury score) and slight to moderate chilling injury was observed in 2 and 4 perforated package samples stored under cold room condition. The study revealed that cucumber can be stored under MAP with 2 perforations at 4±1 °C and 90±2 % RH and ambient condition (23–26 °C and 63–66 % RH) for 12 and 6 days, respectively.

Keywords: /Cucumber/ /Modified Atmosphere Packaging/ /Chilling injury/ / Quality/

GREEN BEANS

Severino R., et al. 2015. Antimicrobial effects of modified chitosan based coating containing nano-emulsion of essential oils, modified atmosphere packaging and gamma irradiation against *Escherichia coli* O157:H7 and *Salmonella Typhimurium* on **green beans**. Food Control 50: 215 - 222.

Abstract

The antibacterial activity of modified chitosan-based coatings containing nanoemulsion of essential oils (EOs), gamma irradiation, modified atmosphere packaging (MAP), alone or in combinations, against *Escherichia coli* O157:H7 and *Salmonella Typhimurium* was evaluated on

inoculated green bean samples. Firstly, four different nanoemulsions, made of carvacrol, mandarin, bergamot and lemon Eos, respectively, were compared in terms of minimum inhibitory concentration (MIC) against the two bacteria evaluated in vitro using the micro-broth dilution method. Carvacrol nanoemulsion resulted to be the most effective antibacterial agent and was therefore selected to be incorporated into modified chitosan (MC) to form a bioactive coating. Secondly, the radiosensitivity of *E. coli* and *S. Typhimurium* to gamma irradiation was evaluated on inoculated green beans after coating deposition and MAP. Results showed that, without MAP, MC-based coating containing carvacrol nanoemulsion significantly increased the radiosensitization of *E. coli* and *S. Typhimurium* by 1.32-fold and 1.30-fold, respectively. Remarkably, the use of bioactive coating under MAP caused a synergistic effect with an increase in radio sensitivity by 1.80-fold and 1.89-fold for *E. coli* and *S. Typhimurium*, respectively. Thirdly, the antibacterial effects of the antimicrobial coating, gamma irradiation, MAP alone and their combinations were evaluated against these two bacteria during a 13-days storage of green beans at 4°C. Bioactive coating deposition or gamma irradiation treatment resulted effective in controlling the growth of the two bacteria during the entire shelf-life. Moreover, it was also found that the combined treatment of antimicrobial coating, gamma irradiation and MAP caused the reduction of microbial population to undetectable levels during the whole storage period for *E. coli* and from day 7 to the end of storage for *S. Typhimurium*. The obtained results can be interesting to food companies aiming to ensure the food safety with a prolonged shelf life.

Keywords: /Modified Atmosphere Packaging/ /Gamma irradiation/ /Antimicrobial Coating/

LETTUCE

Lopez-Galvez F., et al. 2015. High oxygen atmospheres can induce russet spotting development in minimally processed iceberg lettuce. Postharvest Biol. & Technol. 100: 168 – 175.

Abstract

High oxygen modified atmospheres have been suggested as an alternative preservation technique to classical low O₂ modified atmosphere packaging (MAP) for fresh-cut lettuce. The advantages of high O₂ storage would be a strong reduction of browning, avoidance of low O₂ levels linked to off-odors, and the inhibition of microbial growth. However, storage under high O₂ potentially could increase both production of ethylene and sensitivity to this hormone in lettuce tissue, leading to the development of quality problems linked to ethylene. In this study, different quality parameters (sensory quality, microbiological load, electrolyte leakage, volatile metabolites) were studied on fresh-cut iceberg lettuce stored under different gas conditions at 7°C: (low O₂ MAP (3% O₂ compensated with N₂), atmospheric conditions, high O₂ MAP (50 or 90% O₂ compensated with N₂)). Furthermore, additional experiments using ethylene absorbers were performed in order to assess the link between high O₂ storage, ethylene accumulation, and russet spotting. There was no significant difference between storage conditions regarding growth of mesophilic bacteria and yeasts, electrolyte leakage, or ethanol production. On the other hand, high O₂ atmospheres reduced browning but promoted russet spotting development compared with low O₂ and atmospheric conditions. In further specific experiments the relationship between high O₂ storage, ethylene production, and russet spotting in fresh-cut iceberg lettuce were made evident.

Keywords: /Lettuce/ /Fresh-Cut/ /Gamma Irradiation/ /

Peng, Xiaoli, et al. 2015. Influence of allicin on quality and volatile compounds of fresh-cut stem lettuce during cold storage. LWT - Food Sci. & Technol. 60: 300 - 307.

Abstract

Lettuce (*Lactuca sativa* L. var. *angustana Irish*) was cut into slices and treated with water (control), 2 g/l and 10 g/l allicin respectively, followed by cold storage for 6 days (4 °C, >90% relative humidity). Allicin showed a positive effect on color, while it did not influence fresh weight loss and firmness. The contents of ascorbic acid, soluble protein and soluble sugar in lettuce were maintained by allicin, and degradation of chlorophyll was also delayed. Volatile components were analyzed by gas chromatography-mass spectrometry (GCeMS). The content of two main quality contributors, 1-hexanol and hexanal were much higher in allicin treated samples than control, while the generation of some volatiles such as ethanol, 1-butanol and b-elemene that brings negative influence on the fragrance was significantly inhibited. Conclusively, Allicin treatment helped maintain appearance color, nutrition characteristics and volatile aroma compounds preferred by consumers, therefore this technology could be developed for maintaining the quality of minimally processed lettuce.

Keywords: /Lettuce/ /Fresh-Cut / /*Lactuca sativa* L./

MUNGBEAN

Goyal, Ankit, Saleem Siddiqui. 2014. Effects of ultraviolet irradiation, pulsed electric field, hot water dip and ethanol vapours treatment on keeping and sensory quality of mung bean (*Vigna radiata* L. Wilczek) sprouts. J. Food Sci. Technol. 51: 2664 – 2670.

Abstract

The objective of this research work was to evaluate the effects of UV- irradiation, pulsed electric field (PEF), hot water dip (HWD) and ethanol vapours on the quality and storage life of mung bean sprouts (*Vigna radiata* L. Wilczek). The sprouts were subjected to various treatments viz., UV irradiation (10 kJm⁻² in laminar flow chamber for 1 h), PEF (10,000 V for 10s), HWD (50 °C for 2 min) and ethanol vapours (1 h); and then stored in thermocol cups wrapped with perforated cling films at room (25±1 °C) and low (7±1 °C) temperature conditions. The sprouts were analyzed regularly at 24 h interval for sprout length, sprout weight, total soluble solids (TSS), titratable acidity, non-enzymatic browning, total plate count and overall acceptability. Sprout length and weight increased during storage. There was no significant effect of various treatments on sprout length and weight, except in ethanol treatment, where suppression was observed. HWD showed higher TSS and acidity than that of control. The least browning was observed in ethanol treatment. The total plate count was not significantly affected by various treatments. Overall acceptability under various treatments decreased during storage period both at room and low temperature. Hot water and ethanol vapour treated sprouts showed higher acceptability than other treatments. However, the acceptability scores for sprouts remained within the acceptable range (≥6) up to 72 h at room temperature and 120 h at low temperature conditions.

Keywords: /Mungbean/ /Quality/ /Hot Water Dip/

PEPPER

Rodoni, Luis, et.al. 2015. Quality retention of fresh-cut pepper as affected by atmosphere gas composition and ripening stage. LWT - Food Sci. & Technol. 60: 109 – 114.

Abstract

The responses of fresh-cut (FC) vegetables to CO₂ and O₂ levels depend on their ripening stage and degree of processing. In this work we evaluated the effect of storage under different CO₂ (2.5; 5; 10 and 15 kPa) and O₂ (2.5 and 5 kPa) combinations or air on quality retention of FC green and red pepper. Atmospheres with 15 kPa CO₂ caused physiological injury at both ripening stages. Red pepper strips were less tolerant to CO₂ enrichment within the range 5e10 kPa. Ripe FC peppers were also more sensitive to O₂ reductions below 5 kPa. Marked benefits were obtained at both ripening stages with 5 kPa O₂ þ 5 kPa CO₂. CA-stored strips showed lower spoilage and dehydration and ion leakage. Storage under 5 kPa O₂ þ 5 kPa CO₂ was highly effective to maintain the firmness and resistance to bending of the strips. The selected CA caused no alterations in color, acidity, sugars and antioxidants and was effective to maintain lower respiration rate. CA maintained lower counts of mesophilic bacteria, yeasts and molds in red ripe strips.

Keywords: /Pepper/ /Capsicum annum L./ /Storage/
RADISH

Lim S., et al. 2014. Decreased sulforaphene concentration and reduced myrosinase activity of radish (*Raphanus sativus* L.) root during cold storage. Postharvest Biol. & Technol. 100: 219 – 225.

Abstract

Glucosinolates (GSLs) are sulfur-rich secondary metabolites characteristic of the Brassica vegetables. After disruption of tissue, GSLs are hydrolyzed by myrosinase to produce hydrolysis products, isothiocyanates (ITCs) including sulforaphene (SFE), which is one of the main ITCs in radish roots and has health benefits. The postharvest quality of radish roots for SFE content and myrosinase has not yet been assessed. In this study, we measured the SFE concentration and myrosinase activity in two radish cultivars, namely 'Chungwoon plus' (CP) and 'Taebaek' (TB), during storage at 0°C for 4 months. The SFE concentrations in the CP and TB cultivars were 66.0 and 69.2 mg/g fresh weight, respectively, at harvest. After 4 months in storage, the concentrations were 12.7 and 41.2 mg/g fresh weight in the CP and TB cultivars, which represented an 81 and 40% reduction from the SFE concentrations at harvest, respectively. The myrosinase activity decreased from 0.31 to 0.1 in CP and 0.32 to 0.06 U/g fresh weight in TB, respectively. The reduced myrosinase activity decreased the formation of SFE. Our findings suggest that postharvest conditions, even with storage of the radish roots at cold temperature, may play a key role in either the maintenance of SFE or myrosinase activity. The development of specific postharvest technology to improve the freshness of radish roots is required because radish roots are vegetables with health benefits and are often stored long term.

Keywords: /Radish/ /Postharvest/ /Quality/

SNAP PEAS

Mohammed M. W. Elwan, et al. 2014. Storability, shelf-life and quality assurance of sugar snap peas (cv. super sugar snap) using modified atmosphere packaging. *Postharvest Biol. & Technol.* 100: 205 – 211.

Abstract

This investigation was aimed at selecting the most suitable package to maintain quality of sugar snap peas pods. The effectiveness of five types of polypropylene packages: highly perforated (HPPP), non-perforated (NPPP) and micro-perforated with 6, 12 and 24 holes (MPPP6, MPPP12 and MPPP24) on storability of pods was studied during cold storage at 0 °C with 90–95% RH for 7, 14, 21 days and simulating shelf-life conditions at 10 °C with 80–85% RH for 2 or 4 days after 21 days at 0 °C. O₂ and CO₂ concentrations, weight loss, visual quality, off odors, decay, color, firmness, crispness, taste, total chlorophyll, vitamin C, SSC, and total sugar contents were measured. Results revealed that O₂ decreased and CO₂ increased slowly inside MPPP6, MPPP12 and MPPP24 bags, however, the reduction in O₂ and the increments in CO₂ in NPPP bags were very sharp and accompanied with high levels of off odors. HPPP had the highest weight loss compared with other bags. MPPP12 bags maintained quality during storage and simulated shelf-life, in terms of higher scores for visual quality, firmness, crispness and taste as well as highest contents of chlorophyll, vitamin C and sugars. NPPP bags had the worst values for quality. At the end of storage and shelf-life, an increment in h* was observed in samples stored in MPPP6, MPPP12 and MPPP24 bags (more green color) in comparison with those in NPPP bags.

Keywords: /Snap Beans/ /Modified Atmosphere Packaging/ /Cold storage/ /Shelf-life/ /Quality/

TOMATO

Aghdam, Morte Solelmani, Mohammadreza Asghari & Orojali Khorsandi & Mehdi Mohayjei. 2014. Alleviation of postharvest chilling injury of tomato fruit by salicylic acid treatment. *J. Food Sci. Technol.* 51(10): 2815 – 2820.

Abstract

Tomato fruit at the mature green stage were treated with salicylic acid at different concentrations (0, 1 and 2 mM) and analyzed for chilling injury (CI), electrolyte leakage (EL), malondialdehyde (MDA) and proline contents and phospholipase D (PLD) and lipoxygenase (LOX) activities during cold storage. PLD and LOX activities were significantly reduced by salicylic acid treatment. Compared with the control fruit, salicylic acid treatment alleviated chilling injury, reduced electrolyte leakage, malondialdehyde content and increased proline content. Our results suggest that the reduced activity of PLD and LOX, by salicylic acid may be a chilling tolerance strategy in tomato fruit. Inhibition of PLD and LOX activity during low temperature storage could ameliorate chilling injury and oxidation damage and enhance membrane integrity in tomato fruit.

Keywords: /Tomato/ /Chilling injury/ /Postharvest/

Barickman T. C., et al. 2014. Foliar applications of abscisic acid decrease the incidence of blossom-end rot in tomato fruit. *Sci. Hort.* 179: 356 – 362.

Abstract

Various environmental stress factors, such as drought and high relative humidity, can cause calcium (Ca) deficiency and lead to physiological disorders such as blossom-end rot (BER) in tomato (*Lycopersicon esculentum*) fruit. Recent studies demonstrate that abscisic acid (ABA) triggers whole-plant and fruit-specific mechanisms to increase fruit Ca uptake and prevent BER development. The objective of this study was to examine the effects of foliar application of ABA and hydroponic Ca treatments in fertilizer solution on localized deficiency of Ca causing BER in tomato fruit. The application of 500 mg L⁻¹ABA foliar spray treatment significantly decreased Ca in the leaf tissue. Ca decreased by 10.7% in the leaf tissue when comparing the foliar application of ABA to the control. In addition, decreasing Ca treatments from the 180 mg L⁻¹ to the Ca deficient treatment of 60 mg L⁻¹ decreased Ca concentration in the leaf tissue by 39.5%. The interaction of ABA and Ca treatments had a significant effect on Ca concentration in the fruit tissue. Ca concentration increased 25.7% when comparing the 180 mg L⁻¹Ca and 0.0 mg L⁻¹ABA treatment to the combination treatment of 180 mg L⁻¹Ca and 500 mg L⁻¹ABA treatment. In addition, ABA treatments had statistically significant effect on Ca in tomato fruit proximal and distal tissue and increased the concentrations 14.7% and 34.6% in, respectively. The incidence of BER in tomato fruit tissue was lowest with ABA treatments and Ca treatment of 180 mg L⁻¹. The incidence of BER decreased by 86.2% from the combination of 180 mg L⁻¹Ca and 0.0 mg L⁻¹ABA treatment to the combination treatment of 180 mg L⁻¹Ca and 500 mg L⁻¹ABA treatment. The results demonstrate that the application of ABA increased Ca in the fruit tissue as Ca treatments were decreased from the 180 mg L⁻¹Ca. Furthermore, our results demonstrate that, despite reducing total plant Ca uptake in the leaf tissue, the 500 mg L⁻¹ABA foliar spray treatments significantly reduced the incidence of BER development in tomato fruit. Thus, ABA could be an alternative treatment to increase Ca uptake into fruit and distribution into the distal tissue of the fruit relative to leaf uptake.

Keywords: /Tomato/ /Blossom End Rot/

Baysal-Gurel, F, et.al. 2014. Postharvest applications of disinfectants using a fog tunnel system to manage *Botrytis* gray mold in tomatoes. Act Hort. 1053: 237 - 244.

Abstract

Greenhouse tomatoes marketed on the vine are very susceptible to *Botrytis* gray mold during shipping and storage. We evaluated the efficacy of the disinfectants StorOx[®] (hydrogen dioxide and peroxyacetic acid) and KleenGrow (didecyl dimethyl ammonium chloride) applied using microdroplet technology (Smart Fog[®] tunnel system) in controlling postharvest gray mold of cluster tomatoes. Tomatoes were inoculated with a suspension of 10⁶ conidia/ml of *B. cinerea*. Treatments were applied in the fog tunnel with 10 and 30 s contact times, then five calyces were sampled and numbers of conidia were determined by dilution plating on PDA and *Botrytis*-selective media immediately after treatment. Samples were placed in storage at 13°C, 70% RH for 15 days. The number of fruits and calyces with gray mold were recorded 2, 4, 6, 8, 10 and 15 days after treatment. Sporulation of *B. cinerea* was quantified on day 15. Treatment with a 1:10 rate of StorOx[®] and 1:5 and 1:10 rates of KleenGrow were consistently effective in reducing *Botrytis* disease incidence. However, the higher rate of KleenGrow was phytotoxic to the clusters. Contact time of 30 s was significantly more effective in reducing *Botrytis* disease incidence than 10 s contact time. Where tomato fruits were in contact, disinfectant deposition was blocked and disease incidence and severity were higher than on unblocked surfaces. Microdroplet application of effective disinfectants may be an integral component of postharvest loss prevention when

used in conjunction with preharvest management practices to reduce *Botrytis* inoculum on fresh produce.

Keywords: /Tomato/ /*Solanum lycopersicum*/ /*Botrytis* gray Mold/

Jannok, P. et.al. 2014. Detection of internal mold infection in tomato by transmittance near infrared spectroscopy. Acta Hort. 1053. 93 - 100.

Abstract

Alternaria alternata is the black mold occurring inside tomato. This defect can be normally found by destructive method but it cannot be detected by visible inspection from outside appearance of intact tomato. Therefore, a non-destructive technique for prediction of internal mold infection in tomato is required. Near infrared (NIR) spectroscopy technique was considered in this research. Transmittance NIR spectra in the range of 665-955 nm of tomato were acquired. Partial least squares-discriminant analysis (PLS-DA) was performed to establish the calibration model. Results indicated that combination of the standard normal variate transformation (SNV) and smoothing (Savitzky-Golay) pre-treatment appeared the best method to develop the model. The calibration model was cross validated by a training set (N=140) and used for prediction by a test set (N=60). It obtained 85.0% (corrected 88.7% in normal samples and corrected 81.2% in defected samples) and 91.7% (corrected 100% in normal samples and corrected 83.9% in defected samples) of the total accuracy for calibration and prediction, respectively. Moreover, defected samples were classified in 3 levels of infection severity. The accuracies of cross validation for groups of low, medium and high infection severity were investigated and obtained 82.2, 82.4 and 90.0%, respectively. In conclusion, the calibration model from transmittance NIRS technique can be applied for rapid and non-destructive sorting of internal mold infection in intact tomato.

Keywords: /Tomato/ /Non-destructive/ /Pre-treatment/

Jun Tian, et al. 2015. Perillaldehyde, a potential preservative agent in foods: Assessment of antifungal activity against microbial spoilage of cherry tomatoes. LWT - Food Sci. & Technol. 60: 63 - 70.

Abstract

The application of natural preservatives has recently become a very attractive method of controlling postharvest decay. The objective of this study was to test the antifungal properties of perillaldehyde (PAE) in vitro and in vivo against four spoilage fungi of cherry tomatoes (*Solanum lycopersicum* L.): *Aspergillus flavus*, *Aspergillus oryzae*, *Aspergillus niger* and *Alternaria alternata*. The effect of PAE was evaluated on the mycelial growth and spore germination in the four tested fungi, as well as mycelium weight and AFB1 content in *A. flavus*. Effect of PAE in the conservation of cherry tomatoes was also assessed. The mycelial growth of the tested fungi was totally inhibited at 0.5 and 0.08 mL/L PAE in the air at contact and vapor conditions, respectively. Spore germination was inhibited in a dose-dependent during exposure to PAE. PAE inhibited synthesis of aflatoxin B1 by *A. flavus* at 0.4 mL/L. In vivo experiments indicated that all applied concentrations of PAE inhibited the four tested fungi and a broad spectrum of fungal microbiota growth on cherry tomatoes when compared with the control groups. Thus, PAE would be a promising bioactive compound for use as an alternative natural preservative to control the common postharvest spoilage of cherry tomatoes.

Keywords: /Tomatoes/ /Aflatoxin/ /Postharvest/

Zhang, Xinhua, et al. 2014. Metabolism of endogenous arginine in **tomato** fruit harvested at different ripening stages. *Sci. Hort.* 9: 349 – 355.

Abstract

Tomato (*Solanum lycopersicum* cv. Messina) fruit, at five ripening stages (mature green, breaker, pink, light red and full red), have been analyzed for the expression of genes involved in arginine metabolism, polyamines and arginine-related amino acids content, as well as the nitric oxide synthase (NOS) activity and nitric oxide (NO) content. During ripening, the expression of LeARG1 and LeARG2, two genes encoding arginase, and NOS activity, as well as NO content decreased and the highest levels of them were found in mature green fruit. The expression of gene encoding arginine decarboxylase (ADC) increased with fruit ripening and reached the highest value at pink stage, which possibly contributed to the increased polyamines concentration. While the ornithine decarboxylase (ODC) might play a minor role in polyamines biosynthesis during tomato fruit ripening, the gene expression pattern of which differed with that of polyamines accumulation. The expression of gene encoding ornithine aminotransferase (OAT) increased during the later ripening stages of tomato, which was accompanied by proline accumulation. From all the amino acids tested, glutamate content was the most abundant and showed a marked increase during the course of fruit ripening. In contrast, arginine and ornithine contents remain relatively uniform throughout fruit ripening. These results implicate that the unique physiological roles of arginine in fruit ripening may depend on the coordination of different pathways of arginine metabolism.

Keywords: /Tomato/ /Ripening/

Zhu, Tong, et al. 2015. Effects of brassinosteroids on quality attributes and ethylene synthesis in postharvest **tomato** fruit. *Postharvest Biol. & Technol.* 100: 196 – 204.

Abstract

Effects of brassinosteroids (BRs) on postharvest ripening of tomato fruit were studied in this work. Mature green tomato fruit were harvested and treated with brassinolide (BL, the most active brassinosteroid) or brassinazole (BRZ, a brassinosteroid biosynthesis inhibitor). Following treatment fruit were stored at 20°C with 85% RH for 20 days. Fruit quality, respiration rate, ethylene production, lycopene content, chlorophyll content and the expression of ethylene and lycopene biosynthesis related genes, including golden 2-like (LeGLK2), phytoene synthase 1 (LePSY1), ripening-related ACC synthase 2 (LeACS2), ripening-related ACC synthase 4 (LeACS4), *1-aminocyclopropane-1-carboxylate oxidase 1* (LeACO1) and *1-aminocyclopropane-1-carboxylate oxidase 4* (LeACO4) were measured. The results showed that during fruit ripening, the application of brassinolide was effective in inducing tomato fruit ripening, increasing soluble sugars, ascorbic acid, lycopene contents, respiration rate and ethylene production, but significantly decreasing chlorophyll content compared with the control. Furthermore, the expression of LeACS2, LeACS4, LeACO1, LeACO4 and LePSY1 was increased by brassinolide treatment, while the expression of LeGLK2 was reduced. However, fruit treated with brassinazole showed the opposite effects, where tomato fruit ripening was delayed. These findings suggest that brassinosteroids are involved in the development of fruit quality attributes and ethylene-mediated fruit ripening of tomato.

Keywords: /Tomato/ /Ethylene/ /Ripening/

HERBS AND SPICES

CHILLI

Chetti, Mahadev, B. et.al. 2014. Influence of vacuum packaging and long term storage on quality of whole **chilli** (*Capsicum annum* L.). J. Food Sci. Technol. 51(10): 2827 – 2832.

Abstract

Investigations were carried out to study the influence of vacuum packaging and long term storage on quality in red chilli. Chilli fruits were stored in vacuum packed and jute bags at two moisture levels (10 % and 12 %) in room and cold environments under both light and dark conditions for a period of 24 months. During storage period, average room and cool chamber temperatures were 25±2 °C and 4±1 °C, respectively. Changes of moisture (Halogen moisture analyzer), capsaicin (HPLC-UV), oleoresin and total extractable colour (spectrophotometer) were analyzed at 3 months interval up to 12 months and 6 months interval from 12 to 24 months. Statistical analysis (ANOVA) and Duncan's test were applied to the analytical data to evaluate the effect of treatments applied. It was observed that the vacuum packed chillies under cold storage were found to have the least per cent decline in various quality parameters.

Chillies with 12 % moisture and stored in vacuum packaged bags recorded better quality parameters over 10 % moisture.

Keywords: /Chilli/ /Packaging/ /Storage/ /Quality/

PEPPER

Rodoni L., et al. 2015. Quality retention of fresh-cut **pepper** as affected by atmosphere gas composition and ripening stage. LWT - Food Sci. & Technol. 60: 109 - 114.

Abstract

The responses of fresh-cut (FC) vegetables to CO₂ and O₂ levels depend on their ripening stage and degree of processing. In this work we evaluated the effect of storage under different CO₂ (2.5; 5; 10 and 15 kPa) and O₂ (2.5 and 5 kPa) combinations or air on quality retention of FC green and red pepper. Atmospheres with 15 kPa CO₂ caused physiological injury at both ripening stages. Red pepper strips were less tolerant to CO₂ enrichment within the range 5-10 kPa. Ripe FC peppers were also more sensitive to O₂ reductions below 5 kPa. Marked benefits were obtained at both ripening stages with 5 kPa O₂ p 5 kPa CO₂. CA-stored strips showed lower spoilage and dehydration and ion leakage. Storage under 5 kPa O₂ p 5 kPa CO₂ was highly effective to maintain the firmness and resistance to bending of the strips. The selected CA caused no alterations in colour, acidity, sugars and antioxidants and was effective to maintain lower respiration rate. CA maintained lower counts of mesophilic bacteria, yeasts and moulds in red ripe strips.

Keywords: /*Capsicum annum* L./ /Microbial growth/ /Texture/ /Color/ /Storage/

ORNAMENTALS

GLADIOLUS

Hassan F. A. S. & Ali E. F. 2014. Protective effects of 1-methylcyclopropene and salicylic acid on senescence regulation of gladiolus cut spikes. *Sci. Hort.* 179: 146 – 152.

Abstract

Reports indicate that senescence in cut flowers is accelerated. Therefore, the effects of 1-methylcyclopropene (1-MCP) or salicylic acid (SA) on the postharvest quality of gladiolus cut flowers and whether these treatments can regulate the flower senescence were investigated. Two concentrations of each 1-MCP (0.2 and 0.4 g m⁻³) or SA (0.5 and 1 mM) were studied. The control spikes were kept in distilled water. 1-MCP or SA treatments significantly prolonged the vase life and minimized the weight loss of gladiolus spikes compared with the control. Both treatments enhanced the relative water content (RWC) of leaves and maintained chlorophyll content compared with the control values, which were decreased. Ethylene production, proline accumulation and malondialdehyde content were increased in florets of untreated spikes. 1-MCP or SA reduced ethylene production, decreased both proline content and malondialdehyde level and hence maintained membrane stability. An increase in floret antioxidant enzyme activities (CAT, SOD and POX) was observed in 1-MCP- or SA-treated spikes compared with the control. The effects of 1-MCP or SA on floret senescence seemed not entirely limited due to their effects on ethylene, but they most likely had a sustainable impact on the above-tested physiological parameters.

Keywords: /Gladiolus/ /Vase life/ /Ethylene/ /1-MCP/

ROSE

Hassan F. A. S., et al. 2014. Improvement of postharvest quality of cut rose cv. 'First Red' by biologically synthesized silver nanoparticles. *Sci. Hort.* 9: 340 – 348.

Abstract

The efficacy of biologically synthesized silver nanoparticles (AgNPs) was evaluated for their potential to improve the postharvest quality of rose cut flowers cv. 'First Red'. AgNPs were applied as pulse treatment at 25, 50 and 100 mg L⁻¹ for 24 h. Control flowers were pulsed in distilled water for the same period of time. The treated and untreated flowers were then transferred to distilled water for vase life evaluation. All levels of AgNPs significantly prolonged the vase life compared with the control. The microbial growth was suppressed in vase solution, while relative fresh weight (RFW), relative water content (RWC) and chlorophyll content as well as membrane stability index (MSI) were maintained as a result of using AgNPs. In addition, stomatal conductance, ethylene production and malondialdehyde (MDA) were decreased in response to AgNPs application. H₂O₂ production was decreased while antioxidant enzyme activities (CAT, SOD and POX) were increased in AgNPs treated flowers relative to the control. Among AgNPs treatments, the most effective level was 50 mg L⁻¹. The results suggest that the biologically synthesized AgNPs could be used for improving the postharvest quality of cut roses as a promising eco-friendly, non-toxic and novel alternative source to chemical and physical AgNPs sources or common chemicals used in preservative solutions in rose flowers.

Keywords: /Roses/ /Postharvest/ /Quality/

Yudong Jiang, et al. 2014. Cu/ZnSOD involved in tolerance to dehydration in cut rose (*Rosa hybrida*).
Postharvest Biol. & Technol. 100: 187 – 195.

Abstract

Dehydration results in abnormal flower opening and quality loss during the marketing of cut rose flowers. Our previous studies have revealed that changes in superoxide dismutase (SOD) activity are related to the dehydration tolerance of cut roses. Here, we demonstrate that cut roses were adversely influenced by dehydration conditions, which affected the normal flower opening process, suppressing the increase in flower diameter and shortening vase life. Pre-treatment with sodium diethyldithio carbamate (DDTC), an inhibitor of Cu/ZnSOD activity, accelerated the adverse effects of dehydration on flower opening quality. Compared to flowers placed in water continuously, in dehydrated flowers superoxide anion (SOA) production and SOD activities were enhanced during dehydration and decreased during subsequent rehydration. DDTC pre-treatment diminished SOA production and inhibited Cu/ZnSOD activities during both dehydration and subsequent rehydration. Five SOD genes, RhMnSOD1, RhCu/ZnSOD1, RhCu/ZnSOD2, RhCu/ZnSOD3 and RhFeSOD1, were isolated and their expression was analyzed in petals. Dehydration reduced the expression of RhMnSOD1 and RhCu/ZnSOD1/2/3 genes; during rehydration, expression levels recovered. DDTC pre-treatment delayed the reduction and recovery of gene expression during dehydration and rehydration, respectively. In conclusion, our results suggest that SOD enzymes, especially Cu/ZnSODs, are involved in the dehydration tolerance of cut rose flowers and that the inhibition of Cu/ZnSOD activities may increase the expression of RhCu/ZnSOD genes in cut rose flower petals via a negative feedback mechanism.

Keywords: /Rose/

TUBERS AND ROOTCROPS

POTATO

Singh F., et al. 2014. Analytical study of turgor pressure in apple and potato tissues. Postharvest Biol. & Technol. 89: 44 – 48.

Abstract

Mechanical injuries are the main cause of damage (such as bruising) and loss of quality of fruit and vegetables, occurring mainly from mechanical forces during compression, vibration and impact loads. Apples and potatoes are susceptible to external and internal pressures, which causes bruising and fracture in soft tissues. The study of turgor pressure and the compressive stiffness of apple and potato tissues is essential to understand their fracture strength against external and internal pressures. In the present study, a generalized form of a strain energy function is proposed, and a relation between turgor pressure and stretch ratio is developed by considering its appropriate form. It is considered that the tissues are isotropic, incompressible, homogeneous, and show hyperplastic behaviour. The Levenberg–Marquardt algorithm was used for regression analysis to calibrate the material constants by correlating predicted and experimental values of turgor pressure and stretch ratio for apple and potato tissues. A good fit of the developed relation to experimental data was obtained with the coefficients of determination of 98.02% for apple and 98.0% for potato.

Keywords: /Potato/