

**SELECTIVE DESSIMINATION OF INFORMATION (SDI)
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GENERAL

COLD CHAIN

Aung, Myo Min, Yoon Seok Chang. 2014. Temperature management for the quality assurance of a perishable food supply chain. *Food Control*. 40: 198 – 207.

Abstract

Compared to most product supply chains, food supply chains are often more complex and more difficult to manage because the food product is perishable and has a short shelf life. A cold chain or temperature controlled supply chain provides the essential facilities and methods required to maintain the quality and quantity of foods. Since foods can be time and temperature sensitive in nature, they need to be properly taken care of in terms of harvesting, preparation, and packaging, transportation and handling e in other words, throughout the entire chain. Temperature is the most important factor in prolonging or maintaining the shelf life of perishables. Refrigeration is one of most widely used methods to date to slow the bacteria growth that leads to food deterioration. The proper control and management of temperature is crucial in delivering perishables to consumers and ensuring that those perishables are in good condition and safe to eat. This paper addresses the methods used to improve the ability to define an optimal target temperature for multi-commodity refrigerated storage. Simulation results support the fact that the presented methods provide more accurate results compared to the conventional method. In addition, an experiment with a Wireless Sensor Network (WSN) was conducted. As a result, the sensor-based methods for real time quality monitoring and assessment that consider product metabolism and Euclidean distance cost depending on temperature changes are found to be superior to the traditional visual assessment method.

Keywords: /Cold Chain/ /Shelf Life/ /Quality/

FOOD SAFETY

Keraitaa, B., et.al. 2014. Enhancing adoption of **food safety** measures in urban vegetable production and production and marketing systems. *Acta Hort*. 1021: 391 – 399.

Abstract

Urban vegetable production and marketing systems in low-income countries are prone to contamination from polluted irrigation water, use of manure as fertilizer, unsanitary market conditions and other improper postharvest handling practices. In the recent past, the multiple-barrier approach has been adapted in research to develop measures to reduce contamination at different levels on the food chain. However, adoption of these measures could be constrained by low awareness levels of risks and risk-reduction measures as well as lack of adoption incentives. This paper presents various approaches and practical considerations that could enhance adoption rates of these measures, based on lessons learned from extensive studies carried out in Ghana. These studies include participatory development of

risk reduction measures where end-users are actively involved in the process, incorporating their perceptions, needs and constraints. In addition, relevant social marketing techniques, incentive systems, awareness creation/education strategies and appropriate regulation measures are described. However, for optimal adoption, a combined framework of the most relevant approaches is advised.

Keywords: /Food Safety/ /Marketing/

FRESH CUT

Du, Wen-Xian, et.al. 2014. UV-B light as a factor affecting total soluble phenolic contents of various whole and **fresh-cut** specialty crops. *Postharvest Biol. & Technol.* 93: 72 – 82.

Abstract

The effect of ultraviolet-B (UV-B) light treatment on total soluble phenolic (TSP) contents of various whole and fresh-cut specialty crops was evaluated. Whole fruits (strawberries, blueberries, grapes), vegetables (cherry tomatoes, white sweet corn) and root crops (sweet potatoes, colored potatoes), and fresh-cut fruit, vegetables and root crops (apple wedge, iceberg lettuce, broccoli floret and stem, and sliced radish, daikon, and parsnip) were treated with increasing UV-B dose levels (1.3–5.9 kJ m⁻²) and followed by incubation to allow for the samples to respond. TSP levels were measured. The changes in TSP were species-dependent. Whole grapes, blueberries, pink and red cherry tomatoes, white sweet corn, colored potatoes and sweet potatoes did not benefit from UV-B exposure. Strawberries showed a slight, but significant increase in TSP at the highest UV-B dose. UV-B exposure did not affect TSP of apple wedge, broccoli floret and stem, sliced radish and daikon after incubation. Fresh-cut lettuce and parsnip showed significant 1.2 and 2.3 times increase, respectively, in TSP mostly due to the combination effect of wounding and UV-B light exposure after 3 d of incubation. UV-B light exposure (1.3–5.9 kJ m⁻²) can be used as an additional processing step on selected specialty crops to enhance their soluble phenolic contents.

Keywords: /Fresh Cut/ /Fruits/ /Vegetables/

MINIMALLY PROCESSED

Caterina Dinnella, Caterina, et.al. 2014. An exploratory study of sensory attributes and consumer traits underlying liking for and perceptions of freshness for **ready to eat** mixed salad leaves in Italy. *Food Res. Int'l.* 59: 108 – 116.

Abstract

The role of sensory attributes and storage time information in driving liking for and perceptions of freshness for ready to eat vegetables was investigated in mixed salad leaves for different storage times (0, 3, 7 and 9 days). A modified Repertory Grid Method was used to identify ten attributes describing consumer's perception of sensory properties over storage. Eighty-one consumers rated the overall liking, the intensity of sensory attributes and the level of freshness in salad samples at different storage times. Freshness was evaluated in blind and informed conditions. Furthermore, consumers filled in a Food Choice Questionnaire and rated the importance of six attributes known to be important for ready to eat salad choice. The relationships between sensory properties significantly affected by storage time, perceived freshness and liking showed that both liking and freshness were positively related to

appearance attributes (green colour, salad assortment and leaf turgidity). The perceived level of freshness, expiry date and appearance were confirmed as the most important attributes for ready to eat salad choice. Two clusters of consumers (C11: n = 49; C12: n = 32) were identified based on the mean liking rating. The positive effects on health and mood as well as ethical concerns drove food choice more in C11 than in C12 subjects. No significant effect of storage time was found on liking ratings expressed by C11 in blind conditions, while a significant decrease of perceived freshness was observed. On the other hand, results from C12 in blind conditions showed a significant decrease of both liking and perceived freshness. Information about storage time significantly affected freshness ratings in C11 but did not influence those from C12. Results suggest that collection of sensory data, affective responses and information about the background of subjects is needed to fully investigate the perceptions of freshness from a consumer perspective.

Keywords: /Minimally Processed/ /Storage/

MYCOTOXINS

Yeni, F. et.al. 2014. Rapid and standardized methods for detection of food borne pathogens and **mycotoxins** on fresh produce. Food Control. 40: 359 – 367.

Abstract

Due to the increase in consumption of fresh produce regarding to the health demand in the last decades, a considerable portion of foodborne outbreaks has been tracked back to contaminated fresh produce, which have appeared as highly possible vehicles for foodborne outbreaks nowadays. Delays in detection of pathogens and mycotoxins on fresh produce hindered the trace-back investigations in finding the source and revealed the urgent need of rapid and reliable methods. In the frame of this review, we summarized available fast, reliable and standardized methods (conventional, molecular, rapid and recently developed methods) used for detection of the most common foodborne pathogens and mycotoxins which are the most likely causative agents of outbreaks caused by contaminated fresh produce.

Keywords: /Mycotoxins/ /Fresh Produce/ /Foodborne Pathogens/

PETAL SENESENCE

Zopu, Jing-Jing, et.al. 2014. Increase in DNA fragmentation and the role of ethylene and reactive oxygen species in **petal senescence** of *Osmanthus fragrans*. Postharvest Biol. & Technol. 93: 7 – 105.

Abstract

In sweet osmanthus (*Osmanthus fragrans* Lour.) flowers, petal browning, partial abscission and wilting are the visible symptoms of senescence, 4–5 days after flowering, which seriously affect its ornamental and economic value. In the present study, DNA fragmentation was used as a marker to investigate the role of ethylene and reactive oxygen species (ROS) in flower senescence of *O. fragrans* 'Liuye Jingui'. In intact plants, nuclear shrinkage and DNA fragmentation occurred at the late full flowering stage when senescence symptoms became visible. This coincided with a rapid increase in ethylene production, ROS generation and lipid peroxidation. To further determine the role of ethylene and ROS in flower senescence, cut flowers were treated with ethephon, silver thiosulphate (STS),

hydrogen peroxide (H₂O₂), and vitamin C (Vc). The vase life of cut flowers was significantly prolonged by 0.2 mM STS and 2.5 mM Vc treatments, but reduced by 0.03% H₂O₂ and 500 mg L⁻¹ ethephon treatments, compared to distilled water. The percentage of DNA fragmentation was dramatically increased by ethephon but reduced by STS treatment throughout vase life. In contrast, the dramatic increase of DNA fragmentation in the H₂O₂ treated samples was only observed at day three, and clear petal abscission and rapid petal wilting occurred only with ethephon. Compared with the distinguishable nuclei and complete vacuoles in both STS treatment and distilled water, ethephon treatment caused substantial damage to large central vacuoles and other organelles, and many petal cells twisted out of shape due to a loss of cytoplasm, resulting in rapid petal wilting. Thus, it is concluded that ethylene plays an important role in flower senescence of sweet osmanthus, enhancing DNA fragmentation, damaging cellular structure, and leading to petal abscission and wilting. In addition, ROS is also involved in the regulation of late DNA degradation and lipid peroxidation.

Keywords: /Petal Senescence/ /Ethylene/

SUPPLY CHAIN

Dabbene, Fabrizio, Paolo Gay, Cristina Tortia. 2014. Traceability **supply chain** management: a review Biosystems Eng. 120: 65 - 80.

Abstract

In recent years, traceability aspects have become recognised as an essential tool for guaranteeing food safety and food quality. On the other hand, the design of a traceability system requires a thorough rethinking and reorganising of the whole food supply chain. This paper presents a comprehensive literature review on the aspects of supply chain management that are influenced by traceability, which is herein considered fully integrated in the chain management and not kept separately. The objective of the paper is twofold: the first goal is to analyse how traceability concepts, requirements and technologies influence modern supply chain management and are handled by the ensuing optimisation principles. This analysis is based on an in-depth scrutiny of the state of the art, and it is supported by precise pointers to the literature on the subject. The second goal is to highlight what could be, in the authors' opinion, the future trends and perspectives in this field of research.

Keywords: /Supply Chain/ /Traceability/

Sangudom, T. et. al., 2014. **Supply chain** management of Kluai Khai for exporting in Thailand. Acta Hort. 1024: 391 – 398.

Abstract

Supply chain management is very important to improve quality of fruits. The study was conducted in Chanthaburi Province (5 districts, viz., Makhom, Pong Nam Ron, Tha Mai, Khao Khitchakut and Klung) and Sukhothai Province (2 districts, viz., Sawankhalok and Thung Saliang) from October 2009 to May 2010 through structured interview of farmers, collectors, and exporters. In Chanthaburi, it was found that 'Kluai Khai' banana was grown as intercrop in fruit orchards. Plant density was approximately 937-1,562 plants/ha, depending on the spacing of the main fruit crop. Average yield was 1 ton per rai (1 rai=0.16 ha). Two to three suckers were usually allowed to grow per mother plant. Fruit bunches were harvested when fruit angularity was 3/4 light full and sold to the collectors. The produce was sorted into

two grades, standard grade and under-standard grade or off-grade. About 60-70% of the total production met the standard grade while the rest was off-grade due to insect and disease damage and/or under fruit size. Fruit hands that met the standard grade were subjected to postharvest operation conducted by the collectors who graded them into three sizes; AAA, AA and A, before packing into cardboard boxes and loaded onto a refrigerated truck at 13-14°C. This operation usually took 8-12 hours. Price of off-grade fruits was 8-10 times lower than that of standard-grade fruits. In Sukhothai, the banana had been grown as main crop at the density of 2,500 plants/ha. Only one sucker was allowed to grow successively after flower emergence of the mother plant. Postharvest handling operation was done at the farmers' orchard by the exporters. Fruit hands with insect pest, disease damage and small sized or undeveloped fingers, usually about 5-10 and 10-20% of total production, respectively, were sorted out and sold in local markets. Fruit hands that met the standard (60-70%) were graded into three sizes. Most exporters (74%) took 14-24 hours to complete the operation while the rest (26%) took 6-10 hours. Average yield was 0.36 t/ha and the production cost was around 66.6 US\$/ha.

Keywords: / Supply Chain/ /Banana/ /Postharvest Handling/

VALUE CHAIN

L.O. Olajide-Taiwoa, ET.AL. 2014. Prospects, challenges and institutional linkages of vegetable value chain in Ibadan City of Nigeria. Acta Hort. 1021: 301 - 305.

Abstract

The entire population of over 2.5 million people living in Ibadan city of Nigeria depends on farmers within and around the city to supply up to 80% of their vegetables, estimated at about 900 tonnes per day. This study was carried out to establish the presence, types, systems and institutional linkages influencing the urban and peri-urban vegetable-value chain in the city. Three local government areas (LGAs), comprising two urban and one peri-urban LGA were chosen among the 11 which make up the metropolitan city for the study. They were selected because of their high number of agricultural activities. From the estimated list of 5,082 farmers in the selected LGAs, 210 respondents were randomly selected. Data were collected from the farmers using a schedule of structured interviews. Marketers, processors and supplies dealers were also interviewed using focal group discussions of between 8 and 10 interviewees per session to generate qualitative data about their involvement in the vegetable-value chain in the city. Other stakeholders, in particular key informants from institutions (academic and research institutions, and extension, health, land and finance services) were interviewed. Because of the exploratory nature of the study, data were analyzed with descriptive (frequency counts, percentages, measures of central tendencies) statistics and rankings. An informal network of producers-marketers-consumers exists for the vegetable value chain in the city. The network provides income ranging from N 50,000.00-500,000.00 (N 150 = \$ 1.00) per annum for participants based on activities within the chain. Vegetables (*Amaranthus*, *Corchorus*, *Celosia*, okra and pepper) production accounts for 42% of the crop production enterprise. The crops are planted on roadsides (23%), in backyards (22%), and near streams (14%), among other locations. Inadequate finance ranked highest among the listed constraints, and institutional linkages are weak. Concerted and conscious efforts with enabling policies should be instituted to attain the full potential of the vegetable-value chain in the city of Ibadan.

Keywords: /Value Chain/ /Vegetables/ /Marketing/

FRUITS

AVOCADO

Pereira, Marcio Eduardo Canto, et.al. 2014. Ripening and sensory analysis of Guatemalan-West Indian hybrid avocado following ethylene pre treatment and/or exposure to gaseous or aqueous 1-methylcyclopropene. *Postharvest Biol. & Technol.* 92: 121 – 127.

Abstract

Previous reports showed that both gaseous and aqueous 1-methylcyclopropene (1-MCP) delay ripening of avocado (*Persea americana* Mill.), but there are no reports of the influence of 1-MCP on its sensory attributes. The objective of this study was to evaluate the effects of ethylene pre-treatment and/or exposure to gaseous or aqueous 1-MCP on fruit ripening and sensory attributes of 'Booth 7' avocado, a Guatemalan-West Indian hybrid. Separate experiments were conducted during two seasons (2008 and 2009) with fruit harvested at preclimacteric stage in October (early season) and in November (late season). Fruit from Season 1 were exposed to ethylene (4.07 $\mu\text{mol L}^{-1}$) for 12 h at 20 °C, and stored for more 12 h at 20 °C in an ethylene-free (ethylene, <0.1 $\mu\text{L L}^{-1}$) room prior to treatment with either aqueous (1.39 or 2.77 $\mu\text{mol L}^{-1}$ a.i.) or gaseous (3.15 or 6.31 nmol L^{-1} a.i.) 1-MCP. Ripening was monitored and firmness, respiration, ethylene production and weight loss were measured. Texture profile analysis and sensory analysis were performed on ripe fruit only (firmness, 10–15 N). Fruit from Season 2 were not exposed to ethylene pre-treatment but treated only with aqueous 1-MCP 24 h after harvest. Fruit were assessed exclusively for sensory analysis when ripe (firmness, 10–15 N). Treatment with either 1-MCP formulation effectively delayed ripening from 4 to 10 d for early-season fruit, and from 4 to 6 d for late season fruit. Higher concentrations of 1-MCP of either formulation had the greatest effect on selected pulp textural parameters of early-season fruit; the gaseous formulation had greater effect on late-season fruit quality than the aqueous formulation. In general, sensory panelist ratings of overall liking were not affected by 1-MCP treatment. Both aqueous and gaseous 1-MCP formulations delayed ripening of the Guatemalan-West Indian 'Booth 7' avocado without significant loss in appearance or in sensory attributes and, therefore, could be considered for use as a postharvest treatment for this hybrid.

Keywords: /Avocado/ /1-MCP/ /Harvest Maturity/

BANANA

Sagudom, T. et.al. 2014. Maturity and quality of Kluai Khai fruit as related in growing season. *Acta Hort.* 1024: 399 – 406.

Abstract

Maturity index is very important to determine the harvesting time for exporting banana. Nowadays, growers use number of days after male flower cutting or angularity of fingers to determine the harvesting time. This study was conducted during October 2010-August 2011 in three growing seasons of 'Kluai Khai' banana at Sukhothai Province (winter season) and Chantaburi Province (summer and rainy seasons). The objective of this study was to determine the optimum time for the relationships between harvesting bananas and growing seasons and find out on bagging bunch materials. The trial

was harvesting at different physiological ages, including 30, 33, 35, 37, 40, 45 and 50 days after male flower cutting. The results indicated that the optimum time for harvesting bunches (70-80% maturity) in winter, summer and rainy seasons were 45-50, 37-40 and 33-37 days after male flower cutting, respectively. The older the physiological ages the higher the starch contents, which were 12.11-17.69%. Most quality criteria at different physiological ages were not significantly different. Bagging bunches with paper coated with polyethylene bag gave lower skin defects. The growing degree days from flower bloom to harvesting in winter, summer and rainy seasons were 918-1008, 676-731 and 613-690 Celsius degree days, respectively.

Keywords: /Banana/ /Harvesting/ /Maturity/

BERRY

Remberg, S.F., et.al. 2014. Effects of preharvest factors on **berry** fruit. Acta Hort. 1024: 181 – 188.

Abstract

Investigations on preharvest factors influencing postharvest quality in berries has mainly focused on the effects of temperature and light as well as inherent genetic relations. A short review of some prominent examples of such research is presented. We also present results from a series of perennial field trials in which berry quality attributes are related to annual variation in important climatic factors. Cultivars of red raspberry (*Rubus idaeus* L.), highbush blueberry (*Vaccinium corymbosum* L.), and black currant (*Ribes nigrum* L.) have been grown under field conditions in Norway over the years 2002-2008. Berries were analysed for the content of important quality factors, and the contents related to important climatic factors during fruit ripening in the various years. Statistically significant differences were found for all studied quality attributes both among species and cultivars. Black currants were higher in soluble solids, L-ascorbic acid and antioxidant activity, but had smaller berries than red raspberries and blueberries. Correlation analyses revealed contrasting relations between quality traits and climatic conditions during fruit ripening in the various berry crops. Global radiation was positively related to the content of soluble solids in red raspberries and blueberries, while antioxidant activity and global radiation was positively related in raspberries, but negatively related in blueberries. Precipitation was negatively related to soluble solids in red raspberries and black currants, and to L-ascorbic acid in blueberries, while it was positively related to antioxidant activity in blueberries. Temperature was positively related to the content of soluble solids in red raspberries, but was not significant related to any other quality parameters in any of the studied berry crops. However, highly significant co-variation between temperature and global radiation and precipitation (positive and negative, respectively), suggest that, under field conditions, the effects of temperature may be masked by these other environmental parameters.

Keywords: /Berry/ /Blueberry/ /Preharvest/ /Quality/

BLUEBERRY

Blaker , K.M. and J.W. Olmstead. 2014. Effects of preharvest applications of 1-Methylcyclopropene on fruit firmness in Southern high bush **blueberry**. Acta Hort. 1017: 71 – 76.

Abstract

Fruit firmness was evaluated in southern highbush blueberry (*Vaccinium corymbosum* L.) cultivars after preharvest treatments with sprayable 1- methylcyclopropene (1-MCP). Two cultivars, 'Star' and 'Sweetcrisp', were sprayed with 1-MCP at a rate of 160 mg/L at five or nine days prior to harvest. Treatments were applied as a split plot cultivar × treatment design with three blocks. Berries were harvested when fully blue and measured for firmness using a Bioworks FirmTech II firmness tester (Bioworks, Inc., Wamego, KS). There were significant differences in firmness for both cultivars and treatments ($P<0.05$) but not for the cultivar × treatment interaction ($P=0.089$). For all treatments, 'Sweetcrisp' fruit were significantly firmer than 'Star' fruit. The untreated control was not significantly different from the nine day preharvest 1-MCP treatment ($P=0.808$), and the two preharvest 1-MCP treatments were not statistically different from one another ($P=0.058$), but the untreated control had firmer berries than the five day preharvest 1-MCP treatment ($P=0.011$). Postharvest application of 1-MCP is commonly used to inhibit ethylene production and ripening and thus maintain firmness in other climacteric fruits such as apple, but has recently been found to increase ethylene production and fruit softening in rabbit eye (*Vaccinium virgatum* Aiton) blueberry. The results of this study suggest that 1-MCP application five days prior to harvest may decrease postharvest fruit firmness of southern highbush blueberries.

Keywords: /Blueberry/ /1-methylcyclopropene/ /Firmness/ /Ethylene/ /Texture/

Cline, W.O. 2014. New and emerging diseases of **blueberry**. Acta Hort. 1017: 45 – 50.

Abstract

A number of new diseases of blueberry have been reported in the last four years, and some existing diseases have increased in importance. Emerging diseases may be caused by new pathogens, or by previously described, sometimes well-known pathogens that are increasing in incidence and severity. Examples of new or emerging diseases in the US include *Blueberry necrotic ring blotch virus*, blueberry bacterial scorch caused by *Xylella fastidiosa*, Exobasidium fruit and leaf spot caused by the fungus *Exobasidium vaccinii*, Valdensinia leaf spot of lowbush blueberry caused by the fungus *Valdensinia heterodoxa*, and *Blueberry red ringspot virus*. As blueberry production expands in the US and worldwide, disease incidence is being affected by changes in production practices, introduction of blueberries into new geographic areas, transmission via vegetative propagation from infected plants, and varying levels of resistance in new cultivars.

Keywords: /Blueberry/ /Diseases/

Lobos,G.A. et.al. 2014. Effect of mechanized (Automotive or Shaker) vs. hand harvest on postharvest fruit quality of **blueberries** (*Vaccinium corymbosum* L.). Acta Hort. 1017: 135 – 140.

Abstract

This research was carried out during the 2010/11 growing season to establish the effect of different types and times of harvest on the quality of fresh blueberries. The 6 treatments consisted of 3 harvest types (hand, automotive or shaker) and two harvest times (morning: 9-11 am; afternoon: 3-5 pm). Ten-year-old 'Brigitta' and 'O'Neal' plants, from a commercial planting in Linares (35°52' South and 71°37' West) were used. Measurements were made of: harvest duration, weight of fruit picked, and proportion, in weight, of fruit in the categories: fresh, discarded, IQF (individual quick frozen) and pre-size. Firmness was measured at harvest, and after 60 d at 0°C plus 1 d at 18°C (60+1). Mechanical

damage was measured after 60+3 d. Highest fruit firmness, independent of cultivar and harvest type, was for am pickings. Firmness for both measuring dates and cultivars was lowest for automotive; while in 'O'Neal', hand and shaker had equivalent firmness in 'Brigitta' shaker-harvested-fruit had intermediate firmness. Mechanical damage was greater for fruit picked with automotive equipment, and also in am pickings. Fruit picked by hand and with shaker had similar mechanical damage in 'Brigitta', but not in 'O'Neal', where shaking caused greater damage. After fruit sorting, 'Brigitta' had a greater proportion of fruit suitable for the fresh market. Averaging both cultivars, the proportion of fruit for the fresh market was 71.9, 76, and 82.9%, for automotive, shaker and hand harvest, respectively. These results indicate a positive potential for harvesting with shakers, but its effects on different cultivars and the cost/benefit ratio need to be studied.

Keywords: /Blueberry/ /Mechanical Harvesting/ /Firmness/ /Storage/

Moggia, C., G.A. Lobos and J.B. Retamales. 2014. Modified atmosphere packaging in **blueberries**: effect of harvest time and moment of bag sealing. Acta Hort. 1017: 153 – 158.

Abstract

The use of modified atmosphere in the packaging of fresh blueberries (*Vaccinium corymbosum* L. 'Brigitta') was studied as a function of harvest time and moment of bag sealing. In trial 1, four treatments were established considering harvest time (morning: am or afternoon: pm), and moment of bag sealing: before or after cooling at 0°C. In trial 2, the packaging system was compared to a control treatment, without bag, for am- and pm-harvested fruit. After harvest fruit were placed under shading and subjected to 6 h delay before sorting. Berries were stored for 30 and 45 d at 0°C and evaluated after 1 and 3 d at 18°C (30+1, 30+3, 45+1, 45+3). Evaluations included: %O₂ and %CO₂ evolution within the bags, berry firmness (g/mm) and fruit quality (% sound, rotten, dehydrated or mechanically damaged fruit). Results show that the use of bags increased the proportion of sound fruit (80-90%) with regards to controls (<60%), especially in the evaluations at 30+3, 45+1 and 45+3. Bagging increased the % of sound fruit in the am vs. pm; however, there was no effect of time of bag sealing. The main effect of bagging was a lower proportion of dehydrated fruit; which amounted to 4-10% in bag treatments vs. 20- 30% for control fruit. Additionally bagging retained fruit firmness, both for AM and PM-harvested fruit. Since bagging had little effect on gas composition, its effect must be studied further. These results evidence a high potential for the use of modified atmosphere packaging for boat shipping of blueberries for distant markets.

Keywords: /Blueberry/ /Modified Atmosphere Packaging/ /Firmness/ /Softening/

Peretto, C., C. Nocoletto and P. Sambo. 2014. Changes in qualitative traits of **blueberry** and blackberry in relation to storage temperature and film type. Acta Hort. 1017: 433 – 440.

Abstract

Blueberry and blackberry are becoming increasingly popular due to the benefits of their qualitative and nutritional traits on consumer health. As they are highly perishable fruits, their qualitative properties decrease very quickly in postharvest. A preliminary research was conducted to evaluate the effect of 8 different numbers of micro-perforations (MP) in polypropylene (PP) film packaging on several quality attributes, gas concentration and shelf life of fresh blueberry (BL) and blackberry (BA) fruits kept at 3 different temperatures: 4, 10 and 18°C – optimal, usual and poor conservation. For the quality

assessments, BL and BA texture, dry matter, color, pH, EC, °Brix, antioxidant activity (AOA), total polyphenols (TP) and ascorbic acid (AA) contents were evaluated at harvest time and at the end of the storage period. All the PP-packaging extended BA commercial shelf life by 2 to 8 days at 4 and 18°C respectively compared to the literature data. The most interesting BL results were observed for antioxidant compounds, especially for all packaged berries kept at 4°C where AOA, TP and AA values significantly increased compared to the clam shell control (NP). Temperatures determined different results in relation to the number of micro-perforations. For instance 2 MP showed the highest AOA and TP values at 10°C, whereas these were obtained with 6 MP at 4°C. In regard to BA quality features, the most interesting results were observed for AA content, especially at 18°C where the average values increased by more than 60% compared to the harvest time control. In general a strong interaction between micro-perforations and temperatures was registered for both fruits, implying interesting results for different qualitative traits during the storage period that could be significantly extended by this type of packaging.

Keywords: /Blueberry/ /Quality/ /Storage/ /Packaging/

Retamales, C.J.B. et.al. 2014. CPPU Sprays alter **blueberry** (*Vaccinium corymbosum* L. 'Duke') fruit quality at harvest and its behavior in postharvest. *Acta Hort.* 1017: 190 – 194.

Abstract

The application of CPPU increases fruit size and weight in blueberries, but the impact of CPPU on postharvest life of blueberry fruits has not been studied. A greater fruit size could reduce wax deposits on the fruit and diminish postharvest life. In this research the effect of CPPU on the quality and postharvest life of highbush blueberry fruit was assessed in the context of 30 and 45 d of sea transport, plus a shelf life of 1 and 5 d. The study was done in a five-year-old commercial 'Duke' blueberry field, located in Linares (35°57'56' South; 71°40'73' West). The treatments were: 10 or 5 ppm of CPPU applied 10 and 17 d after full bloom (DAF) plus a control (not sprayed). Evaluations were done at harvest, after 30 d cold storage (1°C) + 1 d at room temperature (30+1), as well as 30+5, 45+1 and 45+5; they included quality assessments (soluble solids, firmness, color and bloom) and condition (% rotten fruit). A completely randomized design with 4 replications was used. The application of 10 ppm CPPU reduced both fruit coloration and soluble solids (<1.5%) at harvest. No differences among treatments were found for fruit firmness at harvest. The most relevant effect was due to highest CPPU rate (10 ppm), since it increased berry weight (24.2%) and bloom (59% in bloom index) at harvest. The application of CPPU significantly reduced fruit rotting (15% at 45+5 evaluation). Fruits treated with CPPU had reduced firmness loss (<30.5% at 30+1) and higher soluble solids (levels above 12°Brix) during storage. Color during the storage evolved to maximum levels in all treatments (all treatments over the 98% in 45+5 days). A regression between quality indices vs. fruit condition had a high level of significance ($r>0.85$) for the soluble solids content and "bloom" (wax on the fruit). No consistent correlations were found for firmness.

Keywords: /Blueberry/ /Decay/ /Shelf Life/ /Fruit Size/

Guiyun Yang , Guiyun, et.al. 2014. Blueberry leaf extracts incorporated chitosan coatings for preserving postharvest quality of fresh **blueberries**. *Postharvest Biol. & Technol.* 92: 46 – 53.

Abstract

The phenolic compounds in blueberry (*Vaccinium* spp.) fruit and leaf extracts (BLE) were determined based on HPLC analysis. Antimicrobial assays against *Staphylococcus aureus*, *Listeria monocytogenes*, *Salmonella typhimurium* and *Escherichia coli*, as well as fungi isolated from the rotting blueberry fruit were conducted. The effects of chitosan coating incorporating different concentrations of BLE on the quality of fresh fruit during postharvest storage at 2 ± 1 °C and $95 \pm 2\%$ relative humidity (RH) for 35 d and then at room conditions for 3 d were also investigated. Five different coating treatments were applied including 2% (w/v) chitosan coating (T1), 2% (w/v) chitosan coating containing 4% (w/v, T2), 8% (w/v, T3), or 12% (w/v, T4) BLE, and 2% (w/v) chitosan coating containing 12% BLE plus modified atmosphere packaging (MAP at 3 kPa O₂ + 12 kPa CO₂) (T5). A sample of blueberries dipped into distilled water was used as control (T0). BLE had a greater variety of phenolic compounds than fruit extracts with syringic acid the highest concentration (0.259 ± 0.003 g kg⁻¹), but the total phenolic content in BLE was lower ($P < 0.05$) than in fruit extracts. BLE showed good antimicrobial activity against all tested microorganisms, with a minimum inhibition concentration from 25 to 50 g L⁻¹. The 2% chitosan coating that incorporated 8% or 12% BLE showed some degree of decreasing decay rate of fruit compared with the control, and the coating with BLE plus MAP had more effective control of fruit decay. All treated samples maintained higher total phenolic content and radical scavenging activity than the control. This study suggested that chitosan coating incorporating BLE can be employed to extend shelf-life and maintain high nutritional value of fresh blueberries during postharvest storage.

Keywords: /Blueberry/ /Chitosan/ /Phytochemicals/ /Postharvest/

CHERIMOYA

Manriquez, Daniel A., et. al. 2014. Development of flavor-related metabolites in cherimoya (*Annona cherimola* Mill.) fruit and their relationship with ripening. *Postharvest Biol. & Technol.* 94: 58 – 65.

Abstract

Flavor is one of the most important attributes of fresh fruit for the consumer, and is affected by severe factors, including genotype, maturity stage, and environmental conditions. Flavor-related metabolites were characterized in two important cherimoya varieties, cv. Concha Lisa and cv. Bronceada, during fruit ripening. The most important sugars present were glucose, fructose and sucrose, and only fructose and glucose increased during ripening. The most important acids were tartaric, malic and citric acids, and all increased as ripening progressed. Overall aroma profile was mainly determined by esters and terpenes in both varieties. Ester compounds such as ethyl hexanoate, butyl butyrate and hexyl propanoate increased during ripening. The activity of alcohol acyl transferase also increased during fruit ripening concomitant with ester accumulation. Terpenes, such as α and β -pinene, showed a reduction during ripening, where as others, such as myrcene and limonene, increased.

Keywords: /Cherimoya/ /Fruit Quality/

CHERRY

Agulheiro, A.C., et.al. 2014. Quality of 'sweetheart' cherry under different storage conditions. *Acta Hort.* 1020: 101 – 110.

Abstract

In Portalegre, Portugal, sweet cherry production is very important to the region's economic sustainability. The sweet cherry 'Sweetheart' has exhibited short shelf life in spite of being highly appreciated by consumers due to its organoleptic characteristics. In this trial, we evaluated fruit quality of 'Sweetheart' stored under different storage conditions: 1) cold conditions (1°C and high humidity 95%), 2) cold conditions and polypropylene film bags (MA), and 3) controlled atmosphere (CA) (1°C, 95% humidity, 10% CO₂ and 8% O₂). Fruit physical and chemical parameters were evaluated after 0, 6, 13, 20 and 27 days of cold storage. Quality parameters tested included weight loss, external colour (L* a* b*), visual assessment of the epidermis, epidermis and mesocarp penetration test, soluble solids content (SSC), and titratable acidity (TA). We also performed sensory analyses. The results for textural properties, colour coordinates and sensory analysis suggest that 'Sweetheart' fruit can be stored under cold conditions, 1°C, 95% humidity, for up to 21 days without significant loss of quality. Controlled atmosphere maintained tissue turgidity during storage; however, this was not noticed by the panelists, who consistently classified fruits stored under CA conditions with lower overall ratings than fruits under cold conditions with or without film bags.

Keywords: /Cherry/ /Fruit Quality/ /Controlled Atmosphere/ /Cold Storage/

Aryanpooya, Z., et.al. 2014. Postharvest quality of sour **cherry** fruits sprayed by ethephon. Acta Hort. 1020: 121 - 126.

Abstract

Ethephon (2-chloroethylphosphonic acid) was used to reduce the fruit removal force and facilitate the harvest process for sour cherries. The effect of pre harvest ethephon application on the quality of sour cherry during the storage period in modified atmosphere packaging (MAP) at 0°C was investigated. Modified atmosphere packaging was used with 10, 15 and 75 % O₂, CO₂ and N₂, respectively. This composition of gas at 0°C increased the postharvest shelf life of fruits. Fruit samples were evaluated at harvest date and after 6 weeks of storage. Weight loss, skin colour, pH, total soluble solids (TSS), titratable acidity (TA), TSS/TA ratio and firmness of fruits were monitored. Ethephon effects on TSS, TSS/TA ratio, L* value, and TA at harvest date were concentration-dependent. Fruit colour became darker after 6 weeks of storage.

Keywords: /Cherry/ /Shelf Life/ /Modified Atmosphere Packaging/

Candan, A.P., et.al. 2014. Study of the main points of impact during **cherry** handling and factors affecting pitting sensitivity. Acta Hort. 1020: 137 – 142.

Abstract

Pitting damage is one of the most important causes of quality loss during the postharvest life of cherries. The present work examines the effect of different factors that can affect pitting sensitivity. In a first trial, fruit samples of 'Lapins', 'Sunburst' and 'Stella' were taken from commercial orchards during commercial harvest and at different points of five packing lines and pitting incidence was determined. In a second trial, 'New Star', 'Lapins', 'Sunburst' and 'Stella' were harvested at commercial maturity and dropped from 15, 10 or 5 cm at a flesh temperature of 20, 10 or 2°C. The experiment was repeated with

'New Star' and 'Lapins' harvested at more advanced maturity stage. Furthermore, the effect of different calcium and gibberellic acid (GA3) preharvest treatments on pitting occurrence was evaluated with 'Stella'. Results showed that pitting occurrence was low during harvest handling except in highly susceptible cultivars like 'Sunburst'. The percentage of pitted fruit significantly increased during packing operations and both deficiencies in line design and lack of training of operators were observed. Pitting sensitivity was cultivar dependent and affected by temperature and drop height. At 20°C, all cultivars resisted a 15 cm drop, at 10°C only 'New Star' and 'Lapins' resisted a 5 cm drop, and at 2°C only 'Lapins' did not exhibit significant pitting from a 5 cm drop. Maturity at harvest and calcium- GA3 sprays did not affect pitting occurrence. We conclude that to reduce pitting, the maximum drop height during harvest should be 15 cm, where fruit temperature is usually above 20°C, and 5 cm in the packing lines where fruit temperature is between 10 and 2°C. Moreover, the best way to reduce this disorder in packing lines is by training operators and improving the design of the line.

Keywords: /Cherry/ /Maturity/ /Temperature/

Davarynejada, G.H.,Z. Aryanpooya and S. Persely. 2014. Effect of modified atmosphere packaging on fresh sour cherry fruit quality. Acta Hort. 1020: 143 – 148.

Abstract

Storage of fruits in modified atmosphere packaging (MAP) has been shown to be effective in extending the storage life. When handling and packing fresh sour cherry fruit, great care must be taken to assure adequate sanitation. Fruit have a short shelf life, as postharvest deterioration occurs very quickly if adequate precautions are not taken to prevent it. Reduction in the amount of colour, acid and firmness, incidence of decay and stem browning are potential benefits of MAP. In this study, the harvested fruit of 'Érdi jubileum' and 'Érdi bőtermő' sour cherries were stored at 0°C in MAP (15% O₂, 10% CO₂ and 75% N₂) for 6 weeks. Weight loss was reduced significantly under MAP compared with ambient air packaging. Fruits packaged with MAP films maintained higher flesh firmness than did the control. Control fruits had the highest TSS content. During the postharvest period, both titratable acidity and pH increased slightly. Skin colour was lighter (higher "L") and less blue (higher "b") under modified atmosphere than usual air packing.

Keywords: /Cherry/ /Modified Atmosphere Packaging/ /Shelf Life/

CITRUS

Silva-Junior, Geraldo Jose, et.al. 2014. Efficacy and timing of application of fungicides for control of citrus post bloom fruit drop. Crop Prot. 59: 51 – 56.

Abstract

Citrus postbloom fruit drop (PFD) caused by *Colletotrichum* spp. occurs in several countries in the Americas reducing yields by as much as 80%. Fungicide application is the main strategy for PFD control. Two field trials were performed to assess the timing of applications and another two were set up to investigate the efficacy of fungicides for PFD control in São Paulo State, Brazil. The percentage of symptomatic flowers per branch, the number of persistent calyces per branch, the number of fruit per branch and yield were evaluated. Four sprays of trifloxystrobin þ tebuconazole, carbendazim, difenoconazole or cyprodinil þ fludioxonil were effective in reducing yield losses due to PFD, however

the trifloxystrobin þ tebuconazole mixture was significantly more effective than all other treatments. The conventional PFD control programme, with one spray of difenoconazole followed by up to three carbendazim applications at different intervals, showed variable results, probably due to rainfall. The trifloxystrobin þ tebuconazole mixture was effective at controlling PFD under favourable conditions for infection and can be recommended in PFD control programmes.

Keywords: /Citrus/ /Fungicides/ /Blossom Blight/

GUAVA

Srimat, S., et.al. 2014. Correlations between fruit size and antioxidant contents in guava. Acta Hort. 1024: 407 – 412.

Abstract

The correlations between fruit size and antioxidant compounds are useful for determining a selection strategy for such traits in a guava breeding program. The objective was to determine the correlations between fruit size and antioxidant contents and activity in guava. Fifty-seven fruits of 'Paen Si Thong' were randomly chosen and weighted. Then the peel, pulp and central pulp parts of each fruit were separately evaluated for ascorbic acid, total phenolics content and antioxidant activity. Correlations among traits were analyzed by Pearson's correlation coefficient (r). The peel part had the highest level of ascorbic acid (104.8±25.8 mg/100 g FW), total phenolics (336.3±68.7 mg GAE/100 g FW) and antioxidant activity (24.6±6.6 µmol AAE/g FW). There was no significant difference in antioxidant activity between the pulp and the central pulp parts. Fruit size had no correlation with total phenolic content and antioxidant activity and was positively correlated with ascorbic acid content (r=0.18, P<0.05). Therefore, selection for larger fruit size may have no effect on reducing antioxidant contents in guava fruit.

Keywords: /Guava/ /Antioxidant/

JUJUBE

Promyou, S. and Supapvanich, S. 2014. Effect of surface coating on alleviating chilling injury and physico-chemical changes in jujube fruit. Acta Hort. 2014: 347 – 354.

Abstract

Jujube fruit (*Zizyphus mauritiana* Lam.) is an important commercial fruit in world trade. However, the quality of jujube is very limited due to the physicochemical changes and chilling injury during storage. The purpose of this study was to investigate the effect of surface coating on the alleviation of chilling injury and physicochemical changes in jujube fruit during refrigerated storage. Jujube fruit were harvested at 120 days after flowering. The fruit were coated with 100% of KU Shellac wax and Natural Fresh wax then stored at 4°C for 20 days. The results showed that the application of KU Shellac wax gave highest reduction in weight loss and electrolyte leakage and lowest chilling injury symptom. Moreover, total phenolic content and antioxidant capacity of the jujube fruit coated with KU Shellac wax were higher than those of other treatments. Malondialdehyde content, polyphenol oxidase (PPO) and lipoxygenase (LOX) activity of the fruit coated with KU Shellac wax were lower than that of the uncoated

fruit. These were accompanied by reduced chilling injury symptom in jujube fruit during refrigerated storage.

Keywords: /Jujube/ /Chilling Injury/ /Antioxidant/

Wang, Liting, et.al. 2014. Chitosan disrupts penicillium expansum and controls postharvest blue mold of jujube fruit. Food Control. 41: 56 - 62.

Abstract

Chitosan has been shown to be effective for control of postharvest diseases on various fruit. However, little is known about the effect of chitosan on blue mold caused by *Penicillium expansum* on jujube fruit. Here we show that application of chitosan reduced disease development of blue mold caused by *P. expansum* in wounded and inoculated jujube fruit at 25 °C. Chitosan also provided an inhibitory effect on natural decay of jujube fruit during storage at 0 °C. Application of a chitosan coating to fruit had hardly any significant effect on the changes of weight loss, soluble solid contents, titratable acidity, and vitamin C, as storage time increased. To investigate the mechanisms underlying the effectiveness of chitosan against blue mold on jujube fruit, we analysed the growth of *P. expansum* after chitosan treatment. Results indicated that spore germination, germ tube length and mycelial growth of *P. expansum* were significantly inhibited by chitosan in a concentration-dependent mode. Using the fluorescent probe propidium iodide, we found that the plasma membrane of *P. expansum* collapsed significantly after chitosan treatment. Further observation by electron microscopy revealed that plasma membrane of *P. expansum* was gradually disrupted after chitosan application. Our data suggest that chitosan may be potentially used for controlling postharvest diseases in jujube fruit without negative effect on fruit quality.

Keywords: /Jujube/ /Chitosan/ /Postharvest Disease/

Zhang, Shaoying, et.al. 2014. Effect of ultraviolet irradiation combined with chitosan coating on preservation of jujube under ambient temperature. LWT- Food Sci. & Technol. 57: 749 - 754.

Abstract

The effect of ultraviolet irradiation combined with chitosan coating on fresh jujube under ambient temperature was investigated. In the first period, the jujubes were irradiated for 4, 6, 8, 10 min at 253.7 nm ultraviolet, or coated with 1%, 1.5%, 2% and 2.5% of chitosan, respectively. In the second period, the jujubes were firstly irradiated 6 min, and then coated with 1.5% of chitosan. The result showed that combined treatment could reduce decay incidence of jujubes and restrain increase of respiration rate, weight loss, malonaldehyde content and electrolyte leakage of jujubes. Furthermore, the activities of superoxide dismutase, peroxidase, and catalase were maintained at higher level, and the decrease of ascorbic acid and chlorophyll was restricted. The present data indicated that treating post-harvest jujubes with ultraviolet irradiation combined with chitosan coating was an effective method, and might be considered in commercial application for preservation of postharvest fruit.

Keywords: /Jujube/ /Irradiation/ /Chitosan/

KIWI FRUIT

Burdon, J. et.al. 2014. The potential for commonly measured at harvest fruit characteristics to predict chilling susceptibility of Hort16A kiwi fruit. *Postharvest Biol. & Technol.* 94: 41 - 48.

Abstract

The propensity for physiological disorders to arise during low temperature storage of kiwifruit is a significant commercial risk. The potential to use fruit characteristics (flesh colour, soluble solids content (SSC), dry matter and firmness) estimated non-destructively at harvest as markers for the susceptibility of 'Hort16A' kiwifruit to chilling injury (CI) has been investigated for individual fruit. While the fruit that developed CI during storage were some of the least advanced fruit on each orchard, the flesh colour, SSC, firmness and dry matter of the susceptible fruit differed considerably among orchards, such that there was not a clear minimum or maximum threshold for which fruit did or did not develop CI across all orchards. There was a large 'orchard factor' in the susceptibility of fruit to CI that was as important, if not more important, than the flesh colour, SSC, firmness and dry matter values. The 'orchard factor' may derive from a combination of environmental conditions and/or orchard management practices, in conjunction with fruit growth and development. Hence it is concluded that a generally applicable at-harvest prediction of 'Hort16A' fruit susceptibility to CI is not possible from an at-harvest non-destructive estimation of flesh colour, SSC, firmness and dry matter.

Keywords: /Kiwifruit/ /Actinidia chinensis/ /Storage/ /Disorder/ /Chilling injury/

LITCHI

Mitra, S.K., D. Mandal. 2014. Delaying the harvesting of litchi by using gibberellic acid. *Acta Hort.* 1024: 183 - 188.

Abstract

India is the second largest producer of litchi after China in the world. Indian litchi is highly acceptable in the international market for its good size and quality. Hence quality litchi production is of utmost importance to meet the national as well as global demand. In India, West Bengal is the second largest producer of litchi and the cultivation is mainly based on a single cultivar, 'Bombai'. However, the harvesting period of the fruit is very short (about 10-15 days) in the month of May. The present investigation was carried out to find a strategy for delaying the ripening period of litchi so that the growers could extend the harvesting period and can earn higher return. Treatments included in this study were application of gibberellic acid (GA) at 50, 100 and 200 mg L⁻¹ sprayed on 1 cm panicle; GA at 50 mg L⁻¹ sprayed at 15 days after fruit set (DAFS), at 21 DAFS, at 28 DAFS, three spraying at 15, 21, 28 DAFS and control (water sprays). The results revealed that 6-7 days delay in harvesting is possible when GA at 50 mg L⁻¹ was sprayed at 21 or 28 DAFS. Spraying of GA at 50 mg L⁻¹ at 21 DAFS produced maximum percentage of normal fruits (96.67%) and least burnt (2.88%) and cracked fruits (0.51%) compared to control. The fruit quality characteristics in terms of TSS/TA ratio (71.60) and aril recovery (68.97%) were also markedly improved by the treatment. However, spraying of GA at 100 mg L⁻¹ on 1 cm panicle caused the maximum TSS/acid ratio of fruit (74.58); average fruit weight (24.40 g) and maximum yield (87.7 kg/tree).

Keywords: /Litchi/ /Harvesting/ /Ripening/

LONGANS

Apai, W. et.al. 2014. Evaluation of the use of hydrochloric acid on fruit quality and consumer acceptability of fresh longans during cold storage. Acta Hort. 2014: 359 – 366.

Abstract

Dipping in hydrochloric acid (HCl) for improving fresh longan fruit quality and consumer acceptance was investigated as an alternative to sulphur dioxide (SO₂) fumigation. The fruit with panicle attached was placed in 11.5 kg commercial perforated plastic basket. The first experiment was carried out to reduce the contact time during dipping and rinsing process by increasing the concentration of HCl. The evaluation of different HCl application techniques showed that dipping in 6.4% HCl (pH 0.03) for 5 min then draining for 10 min without rinsing in water and stored immediately in cold room provided the best compromise between controlling fruit browning and decay and maintaining eating quality. Another experiment was to find out the optimum storage temperatures after dipping in HCl. The fruit placed in four baskets (46 kg in total weight) was dipped in 200 L of 6.4% HCl for 5 min and drained for 10 min. They were stored at 3, 10 and 30°C for 30 days. This treatment was compared with the fruits treated with SO₂ treatment. It was found that the fruits treated with HCl and SO₂ held at fluctuating temperature (30°C) decayed after five and ten days. Dipping in HCl and storage at 3°C was most suitable to store longan. This condition decreased pericarp browning and disease incidence and maintained consumer acceptance for 30 days; however, SO₂ treatment had the highest score for consumer acceptance. There was no significant difference in total soluble solid, titratable acidity and flesh pH in HCl and SO₂ treatments during storage. This HCl treatment is a potential tool to control postharvest losses and therefore increase the market life of fresh longans.

Keywords: /Longan/ /Fruit Quality/ /Consumer Acceptance/

MANGO

Fukuda, Shinji, et.al. 2014. Modelling the relationship between peel colour and the quality of fresh mango fruit using random forests. J. Food Eng. 131: 7 - 17.

Abstract

Mango (*Mangifera indica* L.) is one of the major tropical fruits exported through long supply chains to export markets. Production of high quality fruits and monitoring postharvest changes during storage and transport are thus primary concerns for exporters to ensure the premium value of fresh mango fruit after distribution. This study aims to demonstrate the applicability of Random Forests (RF) for estimating the internal qualities of mango based on peel colour. Two cultivars, namely Nam Dokmai and Irwin, having different fruit properties and grown in intensively managed orchards in Thailand and Japan, respectively, were used in this study. Postharvest changes in peel colour and fruit quality were observed under three storage conditions with respect to temperature. RF models were applied to establish a relationship between peel colour and fruit quality, and then tested the applicability based on model accuracy and variable importance computed by the RF. Specifically, this work demonstrates how the variable importance can be used to interpret the model results. The high accuracy and the

information retrieved by the RF models suggest the applicability and practicality as a non-destructive assessment method for the quality of fresh mango fruit.

Keywords: /Mango/ / *Mangifera indica* L./ /Postharvest/ /Ripening/ /Fruit Quality/

Pojanagaroon, S. et.al. 2014. Effect of harvesting time and climatic variation on postharvest qualities of early seasonal Nam Dok Mai mangoes in Chiang Mai. Acta Hort. 1021: 419 - 426.

Abstract

The effect of harvesting time, weather condition and fruit-size at the bagging period on postharvest qualities of early-seasonal 'Nam Dok Mai' mango was investigated during the 2010-2011 season, in cooperation with farmers of the High- Quality Mango Growers' Community Enterprise for Export, Phanai Sub-district, Phrao District, Chiang Mai Province. The experimental design was 4×7 factorial in RCB with four fruit sizes at bagging (8, 9, 10 and 11 cm) and seven harvesting times (45, 50, 55, 60, 65, 70 and 75 days after bagging). These 28-treatment combinations were done in five orchards (blocks) using 15 fruits/block. Fruits harvested between mid-March and mid-April 2011 were sunk in various concentrations of saline solution (0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5 and 6.0%) to determine maturity of the fruit. The results revealed that there was a moderate correlation between the harvesting time and fruit maturity and with total soluble solids (TSS) in ripe fruit. Moreover, the weather conditions in mid-March that were regarded as abnormal heavy rain and rapid temperature drop, delayed the fruit maturity and harvesting time by about 1-2 weeks and decreased the fruit peel quality together with the premium grade percentage. Thus, the harvesting time and weather conditions strongly influenced postharvest qualities of early seasonal 'Nam Dok Mai' mango, especially TSS of ripe fruits and fruit peel quality.

Keywords: /Mango/ /'Nam Dok Mai'/ /Fruit Maturity/ /Harvesting/

ORANGE

Strano, Maria C. et.al. 2014. Hot water dipping treatments on Tarocco orange fruit and their effects on peel essential oil. Postharvest Biol. & Technol. 94: 26 - 34.

Abstract

The most common and serious diseases which affect citrus fruit after harvest in Italy are induced by *Penicillium digitatum* Sacc. and *Penicillium italicum* Weh., responsible respectively for green and blue mold rots. This paper deals with the effectiveness of hot water dipping (HWD) treatments as alternative means to control postharvest decay on Tarocco orange fruit [*Citrus sinensis* (L.) Osbeck] and their effect on fruit quality with special regard to peel essential oils. Selected treatments were HWD at 52°C for 180 s and at 56°C for 20 s. These treatments were compared with an effective fungicide standard treatment (Imazalil) and an untreated control. The results showed that HWD at 56°C for 20 s was more effective in inhibiting *P. digitatum* spore germination than HWD at 52°C for longer exposure time. In addition, HWD treatment at 56°C significantly increased the level of alcohols, esters and aliphatic (fatty) aldehydes. Therefore, the lowest values of decay incidence recorded in HWD fruit treated at 56°C may be due to the increase in oxygenated monoterpenes, esters and aldehydes. Finally, HWD treatments did not cause surface damage or color change and did not influence internal quality parameters.

Keywords: /Orange/ /Postharvest Treatments/ /Cold storage/

PAPAYA

Choengthong, S. 2014. Production and marketing of papaya in Surat Thani, Thailand; present practice and its opportunity. Acta Hort. 1022: 175 - 180.

Abstract

Surat Thani, having the largest rubber plantation, is one of the potential planting areas for papaya. Intercropping papaya with rubber for three years has been receiving increasing attention. This is because papaya can avoid the ring spot disease, similar to shifting cultivation. This paper aims to present the current practices on producing and marketing of papaya in Surat Thani, which includes cultivar, production practice, production costs and returns, market channel and marketing practices as well as its future needs. Data were collected from 50 farmers and the related middlemen using questionnaires. The data were analyzed using descriptive and cost-return analyses. The results showed that most farmers have grown papaya as an intercrop with rubber with the average planting area and average number of trees per area of 0.64 ha and 518 trees/ha, respectively. The popular papaya cultivar planted was 'Khaek Dam' because of high market demand and ease of cultivation. Most papayas were mainly grown from the self-collected seeds, resulting in fruit mutation. However, the marketing chains of papaya were not complicated because they were mainly sold in the fresh form, especially in the ripe form, to the middlemen. The papaya market prices fluctuate depending on demand and fruit quality. The papaya obtained higher price if they were ripe and graded. The raw papaya price was about US\$ 8.58/kg, whereas the ripe one was at US\$ 12.32/kg. Average yield of papaya was 30,562 kg/ha/year, providing revenue of US\$ 2,840-4,079/ha/year. The production cost was US\$ 3.93/kg and the estimated net profit of growing papaya as the intercrop with rubber was US\$ 1,649-2,823/ha.

Keywords: /Papaya/ /Marketing/

Diczbalis, Y. et.al. 2014. Evaluation of the use of prochloraz in the control of postharvest diseases of papaya in Australia. Acta Hort. 1022: 133 - 142.

Abstract

Prochloraz as Sportak at 450 g a.i./L is registered for the control of postharvest diseases in papaya in Australia. A project in far north Queensland in 2011, examined the use patterns of postharvest treatments, evaluated treatment dips and sprays for prochloraz concentrations and evaluated the efficacy of prochloraz at 0, 20, 40, 55 and 70 ml/100 L, fludioxonil as Scholar at 260 ml/100 L and azoxystrobin as Amistar at 50 ml/100 L. Results showed that packing shed use of Sportak varied with recycled and stored solutions showing a depletion of the active ingredient. Measured prochloraz in solution was highly pH dependent with nominal solution values only being measured when the pH was less than 3.0. In the fungicide efficacy trial Sportak at the label rate of 55 ml/100 L provided more effective disease control than fludioxonil and azoxystrobin. The trial also suggested that fruit from older trees showed a high degree of disease incidence relative to fruit from young trees.

Keywords: /Papaya/ /Carica papaya/ /Postharvest/ /Anthracnose/ /Fruit Quality/

Khairil, Mohd J. and M. Muhammad Munzir. 2014. Experiences in managing bacterial dieback disease of papaya in Malaysia. Acta Hort. 1022: 125 - 132.

Abstract

Bacterial Dieback Disease (BDB) caused by *Erwinia papayae* was first recorded in Malaysia in 2003 and has since obliterated most of the papaya farms in the country. All commercial cultivars are susceptible and management practices by farmers have not been proven successful so far in managing this disease. Our observations are that the bacterium typically enters the host through wounds, and passes through the petiole into the green stem. The segment of the petiole attached to the lamina subsequently dries up and rots, resulting in a hanging leaf or 'flag-leaf' symptom. The area on the green stem around the diseased petiole often shows dark water-soaked streaks or lesions, and in severe infections the crown of the tree gradually withers and the tree collapses and dies within four to eight weeks. The Malaysian Agrifood Corporation Berhad (MAFC) had established a large papaya farm in Lanchang, Pahang in December 2006. The farm was initially disease-free and therefore a 'BDB exclusion programme' was imposed whereby traffic and visitors were restricted in entry to the farm. Those permitted entry were sanitized with shoe-dips and disinfectant tyre sprays. Despite these measures, BDB was detected in the farm in late 2009 requiring that a 'BDB containment programme' be initiated. An intensive surveillance programme to detect diseased plants was established, and all trees with mild symptoms had their diseased parts (leaves or fruits) promptly removed. Trees with severe infections are cut back to a meter from the ground and allowed to re-shoot. For the most serious infections, the whole tree including the root is removed and Calcium carbonate is sprinkled around the diseased area and copper fungicides are sprayed around the trees in the vicinity to help reduce spread. This paper discusses the disease dynamics, thresholds and some of the recent control measures being evaluated for prevention and mitigation of BDB, including thermal surgical treatment and the use of antibacterial compounds.

Keywords: /*Carica papaya*/ /*Erwinia* disease/ /Bacterial dieback/ /Disease Management/

Ombwara, F.K. et.al. 2014. The distribution and prevalence of papaya ring spot PRSV in Kenyan papaya. Acta Hort. 1022: 119 - 124.

Abstract

At an estimated 86,000 tons, Kenya's annual fruit production of papaya (*Carica papaya*, L.), represents approximately 1.2% of global yield. The *Papaya ring spot virus* presents one of the greatest constraints to production worldwide, causing significant decline in fruit yield and economic life span of the plant. The objective of this study was to determine the distribution and prevalence of the virus in the main papaya growing regions of Kenya. Surveys were conducted between June 2008 and December 2010, through six Kenyan provinces of Central, Coast, Eastern, Rift Valley, Nyanza and Western province. Total 516 plants were sampled from 54 sites and the presence/absence of symptoms on representative plants was used to evaluate disease prevalence. Disease severity was quantified based upon a subjective scale of 1-5. Symptomatic plants were observed in all provinces at mean prevalence level of 23%, while severity indices ranged between 1.2 and 3.5. Double Antibody Sandwich Enzyme linked Immuno-Sorbent Assays (DAS-ELISA) however proved ambiguous. Reverse transcription polymerase chain reaction (RT-PCR) however presented a strong correlation between symptom expression and molecular diagnostic test results. Five sites, located in Coast, Western, and Eastern provinces respectively, presented asymptomatic populations of papaya. This suggests the need for development of alternate

serological test methods for PRSV and recommends further study to determine the extent of sequence variation within Kenyan isolates of PRSV.

Keywords: /Papaya/ /Ring Spot/

Paull, R. E. and N.J.Chen. 2014. Recent advances in postharvest management of **papaya**. Acta Hort. 1024. 321 - 328.

Abstract

Papaya fruit postharvest losses of up to 75% have been reported to Hawaii shippers by mainland USA wholesalers and retailers. These losses are associated with mechanical injury, fruit ripening, chilling injury and postharvest diseases. Papaya needs to be considered as having unique requirements due to the fact that we are harvesting a fruit that has started to ripen, that is very susceptible to abrasion injury and postharvest diseases, and whose ripening changes differ from other fruit that have wider genetic resources available and greater postharvest handling experience. Recent advances in handling of fresh fruits highlight the difficulty of transferring experience from other fruit to papaya. Papaya fruit treated with various concentrations of 1-MCP are delayed in ripening. However, papaya treated with 1-MCP at the color break stage are firmer and showed a 'rubbery' texture at the full ripe stage while fruit treated with 1-MCP when more than 25% skin yellow, ripen normally. For shippers and wholesaler, the question is also whether fruit more 25% ripe treated with 1-MCP can be effectively integrated into the marketing chain. In addition, this is the extra cost of the treatment recouped in a better quality product for consumers. Another area is postharvest disease control where mechanical injury due to poor handling is not as easily researchable and implemented area. Bio-control using epiphytic microorganisms naturally found on papaya fruit has potential, in particular yeast that compete for nutrients with other organisms that cause stem end and body rots. All technologies need to be investigated and evaluated as to how they will be integrated into the postharvest chain that varies widely depending upon the resources available at the different steps.

Keywords: /Papaya/ /Postharvest/ /Mechanical Injury/ /1-MCP/ /

PEACH

Cao, Lijun, et.al.2014. The role of hexosaminidase in **peach** (*Prunus persica*) fruit softening. Scientia Hort. 169: 226 - 233.

Abstract

To determine the role of β -hex in peach fruit softening, we cloned two β -hexosaminidase (β -hex) gene homologs, Pphex1 and Pphex2. Results showed that the full cDNA length of Pphex1 (JQ979080) was 1859bp, containing an open reading frame (ORF) with 1689bp and encoding a polypeptide of 562 amino acids. Pphex2 (JX069961) was 2018bp in length, containing an ORF with 1794bp and encoding a polypeptide of 594 amino acids. Pphex1 and Pphex2 showed different expression patterns during peach fruit development and storage period. During peach fruit development, the Pphex1 expression initially decreased, but later increased towards ripening. However, Pphex2 expression was very low during fruit developmental stage, and then increased significantly towards ripening. During fruit storage, β -hexosaminidase activity increased in the first 6 days. The expression peak of Pphex1 occurred at the second day during storage. Pphex2 showed relative high expression during the whole storage period.

Treatment with 2-Acetaido-1,2-dideoxynojirimycin (2-ADN) caused inhibition in PpHex1 and PpHex2 transcription and β -hexosaminidase activity, at the same time, the rapid decline in fruit firmness was also delayed. Suppression of 2-ADN treated fruits in ethylene production, as well as the expression of PpACO and PpACS, and the activities of cell wall degrading enzymes (endo-PG, exo-PG, PME, and β -Gal) were also observed. Our study suggests the involvement of β -hex in the regulation of fruit softening in peach.

Keywords: /Peach/ /Softening/

Spadoni, Alice, et. al. 2014. Influence of hot water treatment on brown rot of **peach** and rapid fruit response to heat stress. *Postharvest Biol. & Technol.* 94: 66 - 73.

Abstract

Recent results on hot water as an alternative treatment open a new perspective in disease incidence reduction. In the present work peach fruit were wounded, inoculated with conidia of *Monilinia laxa* and 15 min, 3, 6, 12, 24 and 48 h after inoculation treated by dipping in hot water (HT) at 60°C for 20 s. The effect of heat treatment on some cell wall genes involved in ripening such as β -galactosidase (β -GAL), pectin lyase (PL), polygalacturonase (PG) and pectin methyl esterase (PME), was analysed by qRT-PCR. The expression levels of defense related genes, phenylalanine ammonia lyase (PAL) and chitinase (CHI), heat stress-related genes such as heat shock proteins 70 and 90 (HSP70, HSP90), and reactive oxygen species (ROS) scavenging genes were also evaluated by qRT-PCR. A 100% disease incidence reduction, as compared to untreated fruit, was obtained by treating 6 and 12 h after inoculation. Moreover, brown rot was inhibited by 85.7% when fruit were heat-treated 48 h after inoculation. The expression levels of cell wall genes (β -GAL, PL, PG and PME) showed a general decrease in HT fruit as compared to the control, whereas PAL, CHI, HSP70 and ROS-scavenging genes increased their expression level in HT samples with respect to the untreated ones. Our results show a curative activity of heat on peach inoculated with *M. laxa* 48 h before treatment. Each analysed gene proved to be differentially expressed following heat treatment.

Keywords: /Peach/ /Heat treatment/ /Postharvest Diseases/

PEAR

Li, Guopeng, et.al. 2014. Emission of volatile esters and transcription of ethylene and aroma related genes during ripening of Pingxiangli **pear** fruit *Pyrus ussuriensis* Maxim. *Scientia Hort.* 170: 17 - 23.

Abstract

The fruit of *Pyrus ussuriensis* Maxim produces an intense aroma, which is accompanied by elevated ethylene levels, during postharvest ripening. In this study, we evaluated the relationships between lipoxygenase (LOX) pathway-derived volatiles and the transcription of genes related to ethylene and ester biosynthesis during fruit ripening. The amount of esters produced by the fruit increased dramatically during ripening, while the amount of aldehydes decreased. During the 12-day ripening period, the transcript levels of PuACO₂ and PuACO₃ peaked on day 6, and then remained constant. The transcript levels of PuACO₅ and PuACO₆ peaked on day 6 and day 3, respectively, and subsequently decreased throughout the ripening period. PuLOX6 and PuLOX11 showed increased

transcript levels as the fruit ripened while the transcript levels of PuLOX1 and PuLOX8 peaked on day 3. The highest transcript levels of PuADH2, PuADH3, and PuADH5 were detected on day 6, day 3, and day 1, respectively, during the 12-day ripening period. The transcript levels of PuAAT first increased, and then decreased during ripening. Climacteric increases in ethylene production and volatile ester concentrations were observed during the ripening of *P. ussuriensis*, and PuLOX1, PuLOX8, PuADH3 and PuAAT may play important roles in ester formation.

Keywords: /Pear/ /Ethylene/ /Ripening/

Ochoa-Velasco, Carlos Enrique, Jose Angel Guerrero-Beltran. 2014. Postharvest quality of peeled prickly pear fruit treated with acetic acid and chitosan. *Postharvest Biol. & Technol.* 92: 139 - 145.

Abstract

White (*Opuntia albicarpa*) and red (*Opuntia ficus-indica*) prickly pears were peeled and submerged in chitosan solutions containing different concentrations of acetic acid (1.0 or 2.5%) to obtain ready-to-eat prickly pear products. Some physicochemical (pH, total soluble solids, color, weight loss, and firmness), antioxidant (phenolic compounds and antioxidant activity), microbiological (aerobic mesophile bacteria and yeasts plus molds), and sensory (color, firmness, aroma, flavor, and overall acceptance) characteristics were assessed during 16 d of storage at 4 ± 1 °C and $85 \pm 5\%$ of relative humidity. Chitosan coating containing 1.0% of acetic acid delayed weight loss, maintained firmness and color of white prickly pear during the storage time. Most of the sensory values for white prickly pear coated with chitosan containing 1.0 and 2.5% of acetic acid were higher than those obtained for uncoated fruit. Red prickly pear coated with chitosan with 2.5% acetic acid did not maintain its sensory quality throughout 16 d of storage. Chitosan coating with 1 and 2.5% acetic acid did not affect phenolics content and antioxidant activity in white prickly pears; however, an increase of these compounds was observed in red prickly pears. Microbe populations were unchanged in white prickly pears (<10 CFU g⁻¹) and slightly increased in red prickly pears (10–500 CFU g⁻¹) coated with chitosan during the entire storage time.

Keywords: /Pear/ /Antioxidant/ /Chitosan/

PERSIMMON

Biton, Esti, et.al. 2014. Control of alternaria black spot in persimmon fruit by a mixture of gibberellins and benzyl adenine, and its mode of action. *Postharvest Biol. & Technol.* 94: 82 - 88.

Abstract

In Israel, alternaria black spot (ABS) disease, caused by *Alternaria alternata*, is the main postharvest factor that reduces quality and impairs storability of persimmon fruit *Diospyros kaki* cv. Triumph. The fungus infects the fruit in the orchard and remains quiescent until harvest, or renews its development just before harvest, following rain or high humidity; it then preferentially colonizes the stem-end of the fruit. Recent findings suggest the importance of ethylene and respiration during early fruit growth as factors influencing maturity, crack development, and occurrence of ABS in the stem end of the fruit. We tested the effects of the growth regulator Superlon, a mixture of gibberellin (GA4+7) and benzyl adenine (BA), applied at 40 µg mL⁻¹ once a month during three consecutive months, on fruit physiological responses during growth and on ABS occurrence during storage at 0°C. Superlon

treatments during the early stages of fruit growth, i.e., starting 40 days after fruit set (daf), applied once monthly during three consecutive months, inhibited ethylene and CO₂ production in the stem end. Treatments applied starting 100 daf enhanced cell proliferation under the fruit cuticle. Regardless of application timing, Superlon delayed chlorophyll degradation, and reduced fruit cuticle cracking and ABS susceptibility during the late stages of fruit growth and during storage. Present results suggest that the phytohormone, acting as a modulator of host physiological responses that result in delayed fruit maturation, is a main factor in enhanced resistance to ABS at harvest and during storage.

Keywords: /Persimmon/ /Disease Control/ /Quiescent infections/

Biton, Esti, et.al. 2014. The mechanism of differential susceptibility to alternaria black spot, caused by *alternaria alternata*, of stem and bottom end tissues of persimmon fruit. *Postharvest Biol. & Technol.* 94: 74 - 81.

Abstract

In Israel, alternaria black spot (ABS), caused by *Alternaria alternata*, is the main postharvest factor that reduces quality and impairs storability of persimmon fruit *Diospyros kaki* cv. Triumph. The fungus infects the fruit in the orchard and remains quiescent until harvest, or starts development just before harvest, following rain or high humidity. During 2–3 months of storage at 0°C, the pathogen colonizes the fruit, eliciting ABS symptoms. Susceptibility of the fruit to *A. alternata* attack is characterized by colonization in the upper, stem-end tissue, in contrast to lack of development at the bottom end. Comparison between the physiology of the stem-end and the bottom-end tissues showed greater production of ethylene and CO₂ in the former during early stages of fruit growth, and greater cracked areas and reduced chlorophyll levels in the later stages of growth, before harvest. Increasing fruit weight by increasing irrigation in the orchard enhanced the cracked area and susceptibility to ABS during growth and at harvest. Wound inoculation enhanced ABS colonization in both ends of the fruit, but more significantly in the upper stem end. The present results suggest that the differential susceptibility to ABS during storage is caused by a differential ripening process, and possibly, by increased maturity at the stem end, leading to cracking and increased ABS development.

Keywords: /Persimmon/ /Ethylene/ /Postharvest Disease/ /Respiration/ /Ripening/

Lv, Jingyi, et.al. 2014. Cloning and expression of lipoxygenase genes and enzyme activity in ripening persimmon fruit in response to Ga and ABA treatments. *Postharvest Biol. & Technol.* 92: 54 – 61.

Abstract

Two genes of the lipoxygenase (LOX) family, DkLox1 and DkLox3 (GenBank accession No. JF436951 and JF436950), were cloned from persimmon fruit (*Diospyros kaki* L. 'Fuping Jianshi'). Sequence analysis indicated that they belong to the 9-LOX sub-group. Transcriptional profiles of both LOX genes during fruit ripening and in response to gibberellin (GA3) and abscisic acid (ABA) treatments during postharvest storage were studied using quantitative reverse transcription PCR (qRT-PCR). The expression of DkLox1 and DkLox3 peaked at 15 d after the fruit were harvested under room temperature, corresponding to the patterns of LOX activity and ethylene production. ABA treatment accelerated the persimmon fruit softening and increased LOX enzyme activity, ethylene production and MDA content; and the expression of DkLox1 and DkLox3 peaked three days earlier than the non-treated control. By contrast, the GA3 treatment decelerated the ripening process and down-regulated the

expression of DkLox1 and DkLox3 genes. The roles of LOX gene expression during persimmon fruit ripening are discussed.

Keywords: /Persimmon/ /Ethylene/ /Ripening/

Novillo, Pedro, et.al. 2014. Deastringency treatment with CO₂ induces oxidative stress in persimmon fruit. *Postharvest Biol. & Technol.* 92: 16 - 22.

Abstract

Because of astringency at harvest, 'Rojo Brillante' persimmons are regularly submitted to deastringency treatment based on exposing fruit to a high CO₂ concentration. The treatment conditions that ensure total astringency removal throughout the various maturity stages have been determined to be 95% CO₂, 20 °C, 24 h. The aim of this study was to investigate changes in the redox state of persimmon fruit associated with this deastringency treatment. The levels of reactive oxygen species (ROS) (O₂⁻ and H₂O₂), and the activities of the main ROS scavenging enzymes (CAT, POD, APX, and SOD), were determined at harvest and after deastringency in fruit at three different maturity stages. Our results showed that during 'Rojo Brillante' persimmon maturation, the level of O₂⁻ gradually increased, while APX activity was lowered. The deastringency treatment with CO₂ induced oxidative stress in the fruit, observed as an over-accumulation of O₂⁻ and H₂O₂. As a response to ROS accumulation, the activities of the CAT, APX and SOD scavenging enzymes were up-regulated after deastringency treatment. The response of POD enzyme was dependent on maturity stage, showing enhanced activity after CO₂ treatment only for the fruit at the most mature stage.

Keywords: /Persimmon/ /Astringency/ /Tannins/ /

PINEAPPLE

Pusittigul, I. J., J. Siriphanich, C. Junttee. 2014. Role of calcium on internal browning of pineapples. *Acta Hort.* 1024: 329 - 338.

Abstract

Internal browning (IB) of pineapples limits the storage life and transportation potential at low temperature. 'Queen' and 'Smooth Cayenne' pineapples were harvested from various planting locations in Thailand. The total calcium content in nine sample fruits was determined and the remainder stored at 10°C for 21 days. It was found that 'Queen' pineapple developed more internal browning after storage than 'Smooth Cayenne' pineapple. A relationship was found between the calcium content and IB in one experiment but not in the other. The effect of preharvest and postharvest calcium applications on IB of 'Queen' pineapple was also studied. Pineapples sprayed with 1,000 mg L⁻¹ calcium-boron solution combined with 150 kg ha⁻¹ of calcium oxide exhibited a 47.6% internal browning reduction. In a second experiment, the calcium application was not effective in reducing IB. In a postharvest study, calcium application by the immersion of pineapple fruit stems in 0, 1, 2 and 4% calcium chloride solutions at 25°C (80-85% RH) for 18 hours reduced IB by 35, 77 and 79%, respectively. The 2 and 4% calcium chloride solutions caused a dark brown area in the fruit stem, which extended 2.5 cm into the core. Repeated experiments could not confirm the effect of postharvest calcium application on IB reduction. This suggests that calcium content is only one of the factors influencing internal browning in pineapples.

Keywords: /Pineapple/ /Storage / /Smooth Cayenne' / /Black Heart/

POMEGRANATE

Arendse, E. et al. 2014. Effects of postharvest storage conditions on phytochemical and radical scavenging activity of pomegranate fruit (cv. Wonderful). *Scientia Hort.* 169: 125 - 129.

Abstract

This study was conducted to investigate the effects of storage temperature and duration on phytochemical and antioxidant properties of pomegranate fruit (cv. Wonderful). Commercially ripe fruit were stored at $5 \pm 0.7^\circ\text{C}$, $7.5 \pm 0.3^\circ\text{C}$, $10 \pm 0.5^\circ\text{C}$ with $92 \pm 2\%$ relative humidity (RH) and $21 \pm 3^\circ\text{C}$ with $65 \pm 6\%$ RH for 5 months. Fresh pomegranate juice was assessed for concentrations of total phenolic compounds (TP), total anthocyanin (Acy) ascorbic acid. The radical-scavenging activity of fruit juice was tested against 2, 2-diphenyl-1-picrylhydrazyl (DPPH). The investigated parameters differed significantly ($p < 0.05$) at different temperatures and duration. Results showed that TP increased with storage temperatures and duration with the maximum levels measured at 10°C ($364.47\text{mg}/100\text{ml}$) for 3 months storage period. However, the concentration declined thereafter at all storage regimes; the lowest concentration was $196\text{ mg}/100\text{ml}$ in fruit stored at 7.5°C for 5 months. Similarly, Acy concentration increased with storage temperatures in the first month, and gradually declined thereafter. Furthermore, ascorbic acid concentration gradually declined with storage period, with the lowest concentration ($12.69\text{mg}/100\text{ml}$) measured at 7.5°C after 5 month storage. For antioxidant activity, storage of fruit at 5°C , 7.5°C , and 10°C significantly ($p < 0.05$) reduced the radical scavenging activity of juice by more than 56% when stored beyond 2 months. This study highlights the need to consider the effects of different temperatures and duration on health promoting compounds in pomegranate fruit, especially where a fruit restored for long term and primarily used for health-promoting purposes.

Keywords: /Pomegranate/ /Storage/

RASPBERRY

Andrianjaka-Camps, Z.N. et al. 2014. b Raspberry cultivar evaluation according to their fruit quality and antioxidant capacities. *Acta Hort.* 1017: 63 - 70.

Abstract

The interest of consumers in health related compounds in fruits is increasing. This obliges raspberry producers to supply the market not only with attractive fruits but also fruits rich in bioactive compounds. The aim of this study was to evaluate 8 floricane fruiting cultivars/genotypes in terms of taste and health related compounds, as well as antioxidant activity of the fruits and the leaves. The fruit parameters measured were color, firmness, soluble solids and acid content as well as the following health related compounds: vitamin C, total phenolics and anthocyanins. For the potential antioxidant capacities, DPPH radical scavenging capacity, Ferric Reducing Antioxidant Power (FRAP) and Oxygen Radical Absorption Capacity (ORAC) assays were performed. Phenol content, FRAP and ORAC of the leaves were also measured. The results showed that the influence of the genotypes is high for all the measured fruit parameters, especially for the health related compounds and the antioxidant capacities. The difference in anthocyanin and phenolic contents between the cultivars was high with about 35 and

64% respectively. The antioxidant activities were more related to the phenolic content than to the other bioactive compounds measured. Cultivars producing fruits with good physical quality parameters have generally relatively poor antioxidant activities and lower amounts of bioactive compounds. No relation was found between parameters measured in leaves and fruits. Finally, the adaptability of the different cultivars to meet consumer demands is discussed.

Keywords: /Raspberry/ /Fruit Quality/ /Antioxidant/

STRAWBERRY

Zamani-Zadeh, Maryam, et.al. 2014. Integration of *Lactobacillus plantarum* A7 with thyme and cumin essential oil as a potential biocontrol tool for gray mold rot on **strawberry** fruit. *Postharvest Biol. & Technol.* 92: 149 - 156.

Abstract

Chemical fungicides have been intensively used in the control of postharvest decay in fruit in postharvest conditions; nevertheless, continuous use of these fungicides has faced two major obstacles: development of pathogen resistance to many key fungicides, and public knowledge on the health and environmental hazards of these compounds. This study evaluated the efficacy of *Lactobacillus plantarum* A7, thyme (*Thymus vulgaris* L.) and cumin (*Cuminum cyminum* L.) essential oils and the combination of these three elements as postharvest biocontrol agents against *Botrytis* spp. on strawberry fruit. Thyme oil had a remarkable antifungal effect against *Botrytis* spp. in vitro, whereas an inhibitory effect of cumin oil was achieved in higher concentrations. With thyme oil (2 h after artificial inoculation of the fruit), among three tested concentrations, only the 200 µL/L concentration showed an inhibitory effect on strawberries against *Botrytis* spp. (91.97%), while higher concentrations of cumin oil were required to prevent decay significantly. Both combinations of *L. plantarum*+ cumin oil and *L. plantarum*+ thyme oil completely inhibited the mycelia growth of the pathogens in vitro. Results showed that the combined treatments of strawberry fruit with *L. plantarum*+ cumin oil (50 µL/L) and *L. plantarum*+ thyme oil (100 µL/L) resulted in remarkably improved control of *Botrytis* infections, in comparison to the stand-alone application of *L. plantarum* A7 or essential oils. Quality (i.e. pH, acidity and ascorbic acid content) and sensory attributes of the strawberry fruit were better in the case of using cumin compared to thyme oil, when a combination of *L. plantarum* A7 and essential oils was used. This study has demonstrated that the integration of *L. plantarum* A7 with thyme and cumin essential oils is a potential biocontrol tool as a biofungicide in postharvest stage.

Keywords: /Strawberry/ /Postharvest/ /Postharvest/ /Graymold/

SWEET CHERRY

Borve, J. 2014. Fungal contamination of fruit in **sweet cherry** grading lines. *Acta Hort.* 1020: 127 - 130.

Abstract

Sweet cherry fruit in Norway are graded and packed with chlorinated water according to drinking water standards (max. 2 ppm free chlorine after fruit contact) as a transport medium in parts of the grading lines. A possibility of fruit contamination from fungal pathogens exists in such water. 'Lapins' fruit from 10 commercial orchards at each of three packinghouses were put through a simulated sale

period (10 days at 2°C and 2-3 days at 20°C) either directly or after being transported on a grading line in 2007. In 2008, fruit were sampled at different times of the day (early, mid and late) and compared with the control. Fruit samples containing 5 x 100 fruits were weighed at time of sampling, after 10 days at 2°C (in a Lifespan bag) and after 2-3 days at 20°C. The number of fruit decayed with fungal pathogens were counted and diagnosed. Total fruit decay in a mean of 3 packing houses x 10 orchards was 14% before packing and 28% after packing in 2007. Brown rot (caused by *Monilinia laxa*) incidence decreased from 1.1% to 0.3% and Mucor rot (caused primarily by *Mucor piriformis*) incidence increased from 11% to 26%. In 2008, there were no significant differences between unpacked and packed fruits, or between the different packing hours, on the different fungal diseases or incidence of total fruit decay. These preliminary results indicate that there might be a risk of contamination in seasons with high levels of fruit decay (such as 2007), but in normal seasons a slight chlorination of water is satisfactory to minimize the risk to an acceptable level.

Keywords: /Sweet Cherry/ /Postharvest/

Romano, G.S. and E.D. Cittadini. 2014. Postharvest color dynamics of Bing and Newstar **sweet cherry**. Acta Hort. 1020. 153 - 156.

Abstract

In sweet cherry, exocarp colour is important to consumer perception of quality. Besides the intrinsic quality of each cherry, batch homogeneity (size and colour) is recognized as a parameter of commercial quality. During the packing process, homogeneity is improved by grading and selection. However, fruit heterogeneity in the orchard might result in differential quality dynamics during postharvest. The objective of this study was to analyse the dynamics of 'Bing' and 'Newstar' sweet cherry fruit colour during postharvest as affected by between-trees variability. Fruits of colour 4 (CTIFL colour chart) were collected for objective colour parameters and indices from harvest through multiple postharvest samplings from cold storage. Colour was measured with a colorimeter Minolta Cr 400 and the HUE angle, Colour Difference, Colour Index and Chroma were calculated. There were no clear patterns in the changes of HUE angle and Colour Index during postharvest. In both cultivars, there were significant differences between trees in Chroma and Colour Difference at harvest. Chroma decreased and Colour Difference increased linearly in time, but there were differences in the models fitted for each tree. Between-tree colour variability at harvest and variable colour dynamics during postharvest handling may constitute a restriction for obtaining homogeneous batches at sale points.

Keywords: /Sweetcherry/ /Postharvest/

Wang, Yan, Lynn E. Long. 2014. Respiration and quality responses of **sweet cherry** to different atmospheres during cold storage and shipping. Postharvest Biol. & Technol. 92: 62 - 69.

Abstract

Most sweet cherries produced in the US Pacific Northwest and shipped to distant markets are often in storage and transit for over 3 weeks. The objectives of this research were to study the effects of sweet cherry storage O₂ and CO₂ concentrations on the respiratory physiology and the efficacy of modified atmosphere packaging (MAP) on extending shelf life. Oxygen depletion and CO₂ formation by 'Bing' and 'Sweetheart' cherry fruit were measured. While respiration rate was inhibited linearly by reduced O₂ concentration from 21% to 3–4% at 20°C, it was affected very little from 21% to ~10% but

declined logarithmically from ~10% to ~1% at 0 °C. Estimated fermentation induction points determined by a specific increased respiratory quotient were less than 1% and 3–4% O₂ for both cultivars at 0 and 20 °C, respectively. 'Bing' and 'Sweetheart' cherry fruits were packaged (~8 kg/box) in 5 different commercial MAP box liners and a standard macro-perforated polyethylene box liner (as control) and stored at 0 °C for 6 weeks. MAP liners that equilibrated with atmospheres of 1.8–8.0% O₂ + 7.3–10.3% CO₂ reduced fruit respiration rate, maintained higher titratable acidity (TA) and flavor compared to control fruit after 4 and 6 weeks of cold storage. In contrast, MAP liners that equilibrated with atmospheres of 9.9–14.4% O₂ + 5.7–12.9% CO₂ had little effect on inhibiting respiration rate and TA loss and maintaining flavor during cold storage. All five MAP liners maintained higher fruit firmness (FF) compared to control fruit after 6 weeks of cold storage. In conclusion, storage atmospheres of 1.8–14.4% O₂ + 5.7–12.9% CO₂ generated by commercial MAP, maintained higher FF, but only the MAP with lower O₂ permeability (i.e., equilibrated at 1.8–8.0% O₂) maintained flavor of sweet cherries compared to the standard macro-perforated liners at 0 °C. MAP with appropriate gas permeability (i.e., equilibrated at 5–8% O₂ at 0 °C) may be suitable for commercial application to maintain flavor without damaging the fruit through fermentation, even if temperature fluctuations, common in commercial storage and shipping, do occur.

Keywords: /Sweet Cherry/ /Prunus avium L. / /Respiration/ /Modified Atmosphere Packaging/

Zoffoli, J.P. and J. Rodriguez. 2014. Effect of active and passive modified atmosphere packaging of **sweet cherry**. Acta Hort. 1020: 115 - 120.

Abstract

Modified atmosphere packaging (MAP) has been widely used to extend the postharvest life of sweet cherry. Under passive MAP, the new atmosphere around the fruit is generated by the fruit respiration starting from 21 kPa O₂ and 0.03 kPa CO₂. Under active MAP, the atmosphere is generated by the respiration of the fruit starting from an atmosphere produced by vacuum and gas mixture of CO₂/O₂ of 40 kPa CO₂ and 60 kPa N₂. 'Sweetheart' fruit were harvested, selected from a packing line and packed in three commercial modified atmosphere bags, including passive and active systems. Fruit packed in a non-sealed bag was left as control. CO₂ and O₂ concentrations inside of active and passive MA bags were similar and varied between 6 to 9 kPa and 10 to 13 kPa after two days of packaging, respectively. Steady state CO₂ and O₂ concentration was not dependent on the initial modification of the atmosphere in the MA bags evaluated for sweet cherry. All MAP systems evaluated reduced the incidence of decay similarly compared with control bags; however, the incidence of decay was not controlled after three days at 20°C.

Keywords: /Cherry/ /Prunus avium/ /Postharvest Technology/ /Fruit Quality/ /Postharvest Decay/

Zoffoli, J.P. and J. Rodriguez. 2014. Fruit temperature affects physical injury sensitivity for **sweet cherry** during postharvest handling. Acta Hort 1020: 111 - 114.

Abstract

Sweet cherry fruit is considered very sensitive to physical injury produced during harvest and postharvest handling. Surface depression (pitting and bruising) appears on the injured fruit area after a week of storage at 0°C. Two trials were conducted on 'Van', 'Royal Dawn', or 'Sweetheart' sweet cherry to test the hypothesis that fruit becomes more sensitive to physical injury at lower temperatures. In the

laboratory trial, the incidence of impact damage was evaluated by dropping a steel ball at ten cm height on fruits with 2, 7, 10 or 15°C pulp temperature. A significant reduction in pitting incidence was obtained when the fruit temperature was increased from 2°C to 7°C or 10°C for 'Van' and 'Royal Dawn'. In the packing line trial, 'Sweetheart' fruit were placed on a commercial packing line using cold water to achieve a 2.5-3.8°C or 5.3-6.3°C fruit temperature. The incidence of pitting and bruising from fruit handling at 5.3-6.3°C was 30.9% compared with 70.8% when the fruit temperature was in the range of 2.5-8°C. Evaluations comparing the different sectors of the packing line demonstrated that fruit at low temperature was more sensitive to develop small pit symptoms and these were mainly induced at the stem cutting sector. Therefore, water temperature management along the cherry processing line is required to reduce surface pitting symptoms after storage.

Keywords: /Sweet Cherry/ *Prunus avium*/ /pitting/ /Physical Damage/ /Packing line/

VEGETABLES

ASPARAGUS

Chinsirikul, W. et.al. 2014. Porous ultrahigh gas permeable polypropylene film and application in controlling in pack atmosphere for **asparagus**. *Packaging Technol. & Sci.* 27: 313 - 325.

Abstract

Porous polypropylene (PP) films with greater gas permeability and lower permeability ratios (b) than existing commercial films were developed for fresh produce packaging. PP containing high content of beta-form crystal was biaxially stretched under controlled conditions. Resulting porous films with uniquely high oxygen transmission rate (OTR) of $2\ 659\ 000\ \text{cm}^3\cdot\text{m}^{-2}\cdot\text{d}^{-1}$, water vapor transmission rate of $67\ \text{g}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$, and β value of 0.76 was used as a "breathable window" attached to the less permeable commercial BOPP (biaxially oriented PP) lidding film. Various sizes/areas of the breathable windows were designed and tested on packaging asparagus of 400 g, at 5°C. Results demonstrated that in-pack O₂ and CO₂ concentrations could be practically controlled and modified by changing areas of the breathable windows. Altered porous high OTR area directly affected total gas permeation of the package. Optimum gas composition of O₂ and CO₂ within the recommended controlled atmosphere for asparagus, stored at 5°C, was effectively created and maintained in the package containing 25 cm² breathable window (15% of total film lid's area). The shelf life of asparagus under optimum modified atmosphere was extended to 29 days, as compared with <3 days in the normal, low OTR tray sealed with BOPP lidding film. Clearly, these developed porous ultrahigh permeable PP films can be useful materials in designing high OTR package with desirable in-pack O₂ and CO₂ concentrations.

Keywords: /Asparagus/

BROCCOLI

Ansorena, Roberta M., et.al. 2014. Combined effect of ultrasound, mild heat shock and citric acid to retain greenness, nutritional and microbiological quality of minimally processed **broccoli** (*Brassica Oleracea* L.): an optimization study. *Postharvest Biol. & Technol.* 4 : 1 – 13.

Abstract

Response surface methodology (RSM) and Box–Behnken design were used to study the combined hurdle effect of mild heat time (1–5 min) at 50°C, ultrasonic processing time (0–10 min) and citric acid concentration (0–2%) on the quality of refrigerated broccoli after 10 d of storage at 5°C. Treatment effects were evaluated on weight loss, superficial colour (hue angle (H°) and total colour difference (ΔE)), head space gas composition (O_2 and CO_2), overall browning potential, chlorophyll content, ascorbic acid content, mesophilic counts and overall visual quality (OVQ) and optimize the process by means of the desirability function. Predicted models were found to be significant with high regression coefficients (91–97%). High regression coefficients indicated that second-order polynomial models could be used to predict and optimize the quality retention in minimally processed broccoli during storage. The mesophilic counts, ascorbic acid content and the overall visual quality were significantly influenced by the three independent variables either independently or interactively. Both thermal and ultrasonic treatments were found to be critical factors influencing changes in chlorophyll content, O_2 concentration inside the package, hue angle and ΔE . On the other hand, thermal treatment and citric acid concentration were found to be significant on overall browning potential. By using the desirability function approach and considering superficial colour parameters, O_2 concentration, mesophilic counts, browning potential, ascorbic acid and chlorophyll content, the optimum processing conditions were 7.5 min of ultrasonic treatment, 3 min of a heat shock treatment and a citric acid concentration of 1.5%. These results were in good agreement with the maximum found from the canonical analysis performed from the response surface when only considering sensorial analysis. Under these optimal processing conditions it is possible to employ citric acid treatment in combination with ultrasonic and thermal treatments as hurdles for retention of green colour, nutritional quality, microbial control and for extending shelf life of refrigerated minimally processed broccoli.

Keywords: /Broccoli/ /Minimally Processed/ /Postharvest/

CABBAGE

Kumah, P., P.K. Amopaka and I.A. Idun. 2014. Cold storage an option in reducing pesticide residue level in cabbage *Brassica oleracea* heads. Acta Hort. 1021: 427 - 432.

Abstract

Laboratory analysis to establish the residue levels of pesticides in cabbage heads harvested from farms in the forest ecozone of Ghana revealed the presence of organochlorines, and further analysis quantified the amounts present. Analysis of organochlorine residue levels in heads of cabbage at harvest indicated alpha-BHC, gamma-BHC (Lindane), beta-BHC, delta-BHC, beta-Endosulfan and Heptachlor residue levels of 0.321, 0.908, 0.883, 0.394, 0.207 and 0.140 mg/kg, respectively, which are all higher than the FAO/WHO guideline value of 0.05 mg/kg. However, DDT, DDE, Endrin, Dieldrin and Endosulfan sulphate showed residue levels of 0.017, 0.07, 0.022, 0.010 and 0.005 mg/kg, respectively, which are all below the FAO/WHO guideline value of 0.02 mg/kg for DDT and DDE, and 0.05 mg/kg for Endrin, Dieldrin and Endosulfan sulphate, respectively. Analysis of residue levels of the organochlorines, after 14 days of storage in a refrigerator at 5°C, showed significant reductions ($p < 0.05$) in pesticide residues in the cabbage heads. All of the pesticide levels fell below the FAO/WHO recommended levels, except gamma-BHC (Lindane) and beta-BHC, whose levels dropped significantly ($p < 0.05$) but were still higher than the FAO/WHO recommended levels. From the results of the analyses, storing cabbage for 14 days could remove all traces of Aldrin, Dieldrin and Endosulfan sulphate. Organochlorine pesticides are banned for vegetable production in Ghana; therefore, the detection of these organochlorine pesticide residues in cabbage samples indicates misuse of agrochemicals among cabbage producers in the forest

ecozone, and these cabbages therefore pose health hazards for consumers, particularly if they are consumed soon after harvest.

Keywords: /Cabbage/ /Cold Storage/ Pesticide Residue/

CUCUMBER

Zhang, Na, 2014. Effects of intermittent heat treatment on sensory quality and antioxidant enzymes of cucumber. *Scientia Hort.* 170: 39 - 44.

Abstract

Effects of intermittent heat treatment on sensory quality and antioxidant enzymes were investigated by immersing cucumber in hot water (40°C) for 30 (H1), 50 min (H2) continuously, or for 30 (I1), 50 (I2)min intermittently, respectively, and the intermittent treatment was realized through the temperature return process by room temperature water after every 10 min continuous treatment. Compared with the control group, the relative lower weight loss, decay index, and higher CAT activity et al., indicated that H1, I1 and I2 helped to delay cucumber ripening, and I1, I2 performed better. At the end of storage, the weight losses of I1, I2 were 79.93, 69.63% of H1, and the POD activity of I1, I2 was 1.31 and 1.23times of H1. Nevertheless, the severe softening and etiolation implied a slight heat injury occurred in H2 due to heat stress. In addition, results from the analysis of heat transfer characteristics suggested: the superior preservation effect were probably result of the faster temperature change and the higher average temperature gradient of cucumber; the highest temperature that the cucumber achieved and the duration were the important reasons for heat stress.

Keywords: /Cucumber/ /Heat Treatment/

ONIONS

Berno, Ntalia Dallocca, et.al. 2014. Storage temperature and type of cut affect the biochemical and physiological characteristics of fresh cut purple onions. *Postharvest Biol. & Technol.* 93: 91 - 96.

Abstract

Minimal processing of onion (*Allium cepa* L.) results in convenience and freshness in a single product. However, inappropriate storage of fresh-cut onion results in losses of nutritional and sensory characteristics. To further understand this phenomenon, we evaluated the effect of the storage temperature and type of cut on the quality of fresh-cut purple onions. Purple onions (cv. Crioula Roxa) were minimally processed using two types of cut (10 mm cubes and 3–5 mm thick slices) and stored at different temperatures (0, 5, 10 and 15°C) with 85–90% relative humidity (RH) for 15 days. The following analyses were performed to evaluate the shelf life of the purple onion: pungency, total phenolic content, anthocyanin content, quercetin content, respiratory rate, color, soluble solids content, titratable acidity, pH, dryness and deterioration index (DDI), and decay index (DI). Fresh-cut onions stored at 0°C showed less pungency, lower respiratory rate levels and less variation of total phenolic, anthocyanin and quercetin contents. In addition, the physicochemical aspects and appearance changed less with fresh-cut onions stored at 0°C. Moreover, slicing enabled a higher stability of the physicochemical and biochemical aspects in comparison to dicing. Storage of slices at 0°C allowed preservation for up to 15 days.

Keywords: /Onion/ /Allium cepa/ /Fresh-cut/ /Quality/ /Shelf-life/ /Pungency/

RADISH

Goyeneche, Rosario, et.al. 2014. Application of citric acid and mild heat shock to minimally processed sliced **radish** color evaluation. *Postharvest Biol. & Technol.* 93: 106 - 113.

Abstract

The aim of this research was to study the effects of two hurdle technologies, citric acid application (CA) at 0.3%, 0.6% and 0.9% and thermal treatments (IT) for 1, 2 and 3 min at 50°C, on the color of radish slices over 10 d of refrigerated storage. Contribution of the hurdles and their interactions were evaluated by examining the treatment effects on the following parameters: chromatic coordinates (L^* , a^* and b^*) and the indices: chroma (ΔC^*), total color difference (ΔE) and Color Index (CI^*). The chromatic parameters for fresh radish (control samples) were $L_0 = 69.43 \pm 0.62$, $a_0 = -0.46 \pm 0.05$ and $b_0 = 5.37 \pm 0.37$, while the calculated color indices were chroma = 5.39 ± 0.36 , $\Delta E = 0$ and $CI^* = -1.19 \pm 0.17$. Regarding control samples, the b^* values showed an increasing trend during storage, which was associated with browning of the slices. Both ΔE and ΔC^* values presented similar trends as reported for b^* . Based on statistical analysis of the parameters and indices tested, the single hurdle application of low citric acid concentration (0.3%) or intermediate immersion time (2 min) at 50°C minimized the radish slices color changes during storage. However, better results were obtained when two hurdles in series were applied. According to analysis, the treatment T7 (1 min IT, 0.3% CA) was selected as the best treatment to improve the retention of typical natural color of the minimally processed sliced radishes.

Keywords: /Radish/ /Minimally Processed/ /Heat Treatment/

SPINACH

Fan, Di, et.al. 2014. Pre harvest treatment of **spinach** with *Ascophyllum nodosum* extract improves postharvest storage and quality. *Scientia Hort.* 170: 70 - 74.

Abstract

Fresh spinach (*Spinacia oleracea* L.) leaves contain high concentrations of beneficial phytochemicals. However, spinach does not store well and is highly perishable especially during handling and post-harvest storage. In this study, we investigated the effect of pre-harvest root-treatment of spinach with *Ascophyllum nodosum* extract (ANE) at different concentrations (0, 0.1, 1.0, or 5.0 g L⁻¹) on post-harvest quality of fresh-cut spinach over a 35-day storage period. At the time of harvest there was no significant difference in dry weight, chlorophyll, ascorbate and lipid peroxidation between ANE-treated and non-treated plants. However, the loss in fresh weight and visual quality (color and turgor) of spinach leaves during storage was reduced by pre-harvest application of ANE. Lipid peroxidation was significantly reduced in ANE-treated leaves. The total chlorophyll content and ascorbate content in the control and treated leaves was however identical over the storage period and decreased at a similar rate. A negative correlation was observed between visual quality and lipid peroxidation. The results show that pre-harvest ANE application through root drench, especially at 1.0 g L⁻¹, enhanced post-harvest storage quality of spinach leaves.

Keywords: /Spinach / /Visual Quality/ /Weight loss/ /Shelf life/

SQUASH

Massolo, Juan F. et.al. 2014. Benzyl aminopurine BAP treatments delay cell wall degradation and softening, improving quality maintenance of refrigerated summer squash. *Postharvest Biol. & Technol.* 93: 122 - 129.

Abstract

Round summer squash are harvested before reaching full maturity and even though they are highly perishable, fruit postharvest handling is mostly based on storage at non-chilling temperatures. Finding complementary treatments minimizing deterioration and reducing postharvest losses would be extremely useful. In this work we evaluated the effect of postharvest cytokinin (CK) treatments on refrigerated round soft rind squash. Fruit were harvested at commercial maturity and sprayed with 1 mmol L⁻¹benzylaminopurine (BAP) or water (control) prior to storage at 5°C for 0, 13 or 25 days. Quality was assessed upon removal from cold storage as well as after a 2 day shelf-life period at 20°C. CK-treated fruit showed slower deterioration and dehydration and remained firmer than the control. BAP sprays did not affect color, respiration or sugar-acid balance. The treatments prevented phenolic compound accumulation, and decreased pectin solubilization. By the end of the storage period BAP-treated squash had higher levels (45%) of tightly-bound polyuronides than untreated controls, indicating a substantial delay in cell wall dismantling. CK sprays also reduced neutral sugar solubilization from pectin-rich fractions, but no changes were found in the cross-linking glycans or cellulose. To our knowledge, this is the first work showing that CK can regulate pectin disassembly in developing fruit. Postharvest BAP sprays preventing texture deterioration may be a simple treatment to complement refrigeration of round, soft rind, summer squash.

Keywords: /Squash/ Texture/ /Firmness/

TOMATO

Conesa, Miguel A. et.al. 2014. The postharvest tomato fruit quality of long shelf life Mediterranean landraces is substantially influenced by irrigation regimes. *Postharvest Biol. & Technol.* 93: 114 – 121.

Abstract

Postharvest shelf-life is a critical trait for fleshy fruit and so studies of genotypes with long shelf-life (LSL) phenotypes are of great potential importance, since they can lead to strategies for crop improvement. Examples of such a genotype are the Delayed Fruit Deterioration (DFD) tomato, and most accessions of the “Tomàtiga de Ramellet” (TdR) Mediterranean landrace group, some of which have a particularly dramatic LSL phenotype and remain palatable for many months after reaching a fully ripe stage. The TdR accessions collectively show a wide variation in shelf-life, although, the basis of this variation is not known. More-over, little has been reported regarding the relationship between cultivation conditions, fruit shelf-life and specific genetic loci. Here we show that the LSL trait in those landraces is both partially associated with a defined genetic component, in the form of the *alcobac*, a (*alc*) mutation, and is profoundly affected by the irrigation regime during cultivation.

Keywords: /Tomato/ /Quality/ /Postharvest/ /Quality/ /Shelf Life/

Yang, Chun-Chieh, et,al, 2014. Development of multispectral imaging algorithm for detection frass on mature red **tomatoes**. *Postharvest Biol. Technol.* 93: 1 - 8.

Abstract

In this research, a multispectral fluorescence-based imaging algorithm was developed to detect frass contamination on mature Campari tomatoes. Tomato images were acquired using a hyperspectral fluorescence line-scan imaging system with violet LED excitation then analysed for wavelength selection. The fluorescence intensities at five wavelengths, 515 nm, 640 nm, 664 nm, 690 nm, and 724 nm, were used to compute three simple ratio functions to detect frass contamination. The contamination spots were created on the tomato surfaces using four low-concentration frass dilutions. The algorithms detected over 99% of the 0.2 kg/L and 0.1 kg/L frass contamination spots and successfully differentiated these spots from tomato skin surfaces, stem scars, and stems. However, differentiation of the 0.05 kg/L and 0.02 kg/L frass contamination spots was more difficult. Adjusting the algorithm to successfully detect 95% of the 0.05 kg/L spots also resulted in false-positive pixel detections occurring on 28% of the tomatoes. This study demonstrates that a simple multispectral fluorescence imaging algorithm based on violet LED excitation could be useful for rapid postharvest detection of frass contamination on tomatoes in processing lines.

Keywords: /Tomato/ /Food Safety/ /Fresh produce/ /Machine vision/

HERBS AND SPICES

GREEN CHILLIES

Chitravathi, K. O.P. Chauchan, P.S.Raju. 2014. Postharvest shelf life extension of green **chillies** *Capsium annuum* L. using shellac based edible surface coatings. *Postharvest Biol. & Technol.* 92: 146 – 148.

Abstract

Shellac-based coatings were developed in combination with starch, EDTA and sodium alginate and were evaluated for shelf-life extension of fresh green chillies during storage at ambient temperature (26 ± 2 °C, RH $68 \pm 4\%$) for 12 days. The developed composite coatings were found to be effective in extending the shelf-life of chillies. The control samples showed a higher weight loss (12.35%) compared to coated ones (5.60-6.90%). The coated samples showed significantly ($p < 0.05$) higher retention of ascorbic acid, firmness and chlorophyll content, whereas, total phenolic content was found to be significantly ($p < 0.05$) higher in uncoated samples after 12 days of storage. Shellac-sodium alginate based coating was found to be the most effective in maintaining the quality of fresh green chillies during ambient storage as compared to other coatings.

Keywords: /Green chillies/ /Coating/ /Shelf-life/ /Postharvest handling/

PEPPER

Bae, Haejin, et.al. 2014. Ascorbi acid, capsaiinois, and flavonoid aglycone concentrations as a function of fruit maturity stage in greenhouse-grown peppers. J. Food Comp. & Anal. 33: 195 - 202.

Abstract

Bioactive compounds in plant-derived foods provide essential human health benefits. However, the content and types of bioactive compounds may vary based on genetic and environmental factors. The present study examined the impacts of cultivar, fruit maturity stage (mature versus immature), and growing season (2008, 2009) on the concentration of bioactive compounds in diverse pungent and non-pungent peppers. Significant interactions were observed among cultivars, maturity stages, and growing seasons. Mature peppers generally had the highest content of ascorbic acid (782.0–2305.3 µg/g FW in 2008 and 693.5–2817.2 µg/g FW in 2009), and capsaicinoids (115.5–338.9 µg/g FW in 2008 and 93.8–326.3 µg/g FW in 2009) compared to immature peppers. Paprika-type peppers generally had the highest contents of ascorbic acid and flavonoids especially in mature fruits, while capsaicinoids were higher in all mature stage peppers. Flavonoid concentrations varied considerably depending on cultivar and maturity stage. Total phenolics were also significantly higher in mature fruits compared to immature peppers in both years. A positive correlation between total phenolics and DPPH radical scavenging activity was observed. This indicates that the health beneficial components in peppers could also vary as a function of cultivar, fruit developmental stage and production season. The genetic variability in bioactive compounds found in this study constitutes a useful genetic base for improving the nutrient quality of peppers.

Keywords: /Pepper/ /Capsicum/ /Fruit Maturity/

ORNAMENTALS

ANTHURIUM

Promyou, S., S. Ketsa. 2014. Cultivar difference in sensitivity of chilling injury of anthurium flowers *Anthurium andraeanum* during low temperature storage. Acta Hort. 1025: 179 - 186.

Abstract

Anthurium is an important economic cut flower in world trade, but its storage life is limited due to chilling injury (CI) when stored at temperature lower than 12°C. Wilting of the spadix, purpling and browning of the spathe are the main symptoms of CI. The effects of low temperature on CI and flower senescence were investigated in five anthurium cultivars, namely 'Tropical' (red spathe), 'Casino' (orange spathe), 'Cheers' (pink spathe), 'Angel' (white spathe) and 'Pistache' (green spathe). Cut flowers were packed wet in fibreboard carton boxes and then stored at 4 and 12°C (85-90% RH). The results showed that cut flowers stored at 4°C developed CI more rapidly than those stored at 12°C. Cultivar 'Cheers' was the most sensitive to CI when stored at 4°C for four days and showed visible CI symptoms of dried spadix and spathe turned pink and dark brown. Moreover, increasing in electrolyte leakage, rate of respiration and weight loss percentage of the spathe, and the shortest vase life (15 days) was found. Whereas CI symptoms, electrolyte leakage, rate of respiration and weight loss were the lowest in 'Casino' and vase life was 28 days. Changes in membrane lipid oxidation in anthurium spathe during low temperature storage were investigated. The results showed that 'Cheers' showed highest electrolyte

leakage, TBA-reactive compounds and lipoxygenase activity throughout the storage period at 4°C and it was accompanied by dramatical increase in CI symptoms. These data suggest that CI at 4°C is related to an increase in the membrane lipid oxidation.

Keywords: /Anthurium/ /Weight Loss/

CHRYSANTHEMUM

Fukai, S. 2014. Flowering physiology of chrysanthemum. Acta Hort. 1025: 135 - 142.

Abstract

Chrysanthemum constitutes an important floricultural crop in the world flower market. Understanding of their growth and flowering physiology is necessary to achieve stable year-round cut flower production. Dormancy and photoperiodism are two important elements by which chrysanthemum growth and flowering are characterized. Recently, the elucidation of flowering physiology based on molecular genetics has progressed rapidly. FT protein in *Arabidopsis thaliana* and Hd3a protein in rice, which are produced in leaves, move to apical meristems and induce a strongly reproductive transition. Those proteins can be regarded as florigens: the final cues for flowering. Chrysanthemums transformed with foreign florigen genes show reproductive transition under non-inductive conditions, suggesting that chrysanthemums have the same flowering pathway as *A. thaliana* and rice. The study of molecular genetics in chrysanthemum requires a model plant because greenhouse chrysanthemums are hexaploids and are genetically highly heterozygous. Using *Chrysanthemum seticuspe* f. *boreale*, a promising candidate as a model plant, some flowering-related genes such as florigen gene *CsFTL3* were isolated from the wild diploid chrysanthemum. Function analyses are in progress.

Keywords: /Chrysanthemum/ /Cut flowers/

TUBERS AND ROOTCROPS

POTATO

Mahto, R. M. Das. 2014. Effect of gamma irradiation on the physic-mechanical and chemical properties of potato *Solanum tuberosum* L., cv. Kufri Sindhuri, in non refrigerated storage conditions. Postharvest Biol. & Technol. 92: 37 – 45.

Abstract

The effects of γ -irradiation doses, 0.04, 0.08, 0.12 and 1 kGy, applied at two different postharvest times (5 and 30 days after harvest), were studied on the textural behaviour (puncture force, shear force, work done to puncture and shear, cohesiveness and gumminess), microstructure, reducing sugar, total sugar and tuber losses of potato (*Solanum tuberosum* L.), cv. 'Kufri Sindhuri', during storage at 22 °C (RH: 85–90%). The lowest dose (0.04 kGy) was sufficient to inhibit sprouting in potatoes exposed on day 5 but not in the tubers exposed on day 30. The irradiated, non-sprouted potatoes maintained their appearance during storage. Potatoes irradiated early appeared more sensitive to radiation-induced damage, resulting in excessive loss of tubers at 1 kGy but low doses (up to 0.12 kGy) did not increase the susceptibility of the tubers to rotting. No significant differences between reducing

sugar and total sugar contents of the control and low dose irradiated tubers were observed after 120 d. High dose (1 kGy) induced blackening of the bud tissue, increased rotting percentage and poor textural quality. Increasing low doses (up to 0.12 kGy) progressively reduced the textural deterioration in the tubers during storage. The scanning electron micrographs of potatoes irradiated with 0.08–0.12 kGy showed intact cells with rigid cell walls, accounting for the higher textural values registered by the samples. Among the two treatment timings, 'K. Sindhuri' irradiated early after harvest (i.e., on day 5) with 0.08–0.12 kGy doses retained higher textural parameters compared to those irradiated after a delay (day 30). The study showed the potential effect of γ -irradiation for enhancing the storage life of potatoes in non- refrigerated storage.

Keywords: /Potato/ /Gamma irradiation/ /Storage/ /Rotting/

Zommick, D.K., Knowles, L.O. and Knowles, N.R. (2014). Tuber respiratory profiles during low sweetening (LTS) and reconditioning of LTS-resistant and susceptible **potato** (*Solanum tuberosum* L.) cultivars. *Postharvest Biol. & Technol.* 92: 128 - 138.

Abstract

Potato cultivars Premier Russet, GemStar Russet, Defender and Russet Burbank differ substantially in resistance to low temperature sweetening (LTS) and associated metabolism. 'Gemstar Russet' and 'Premier Russet' have moderate and high resistances, respectively, while 'Defender' loses processing quality progressively during storage at 9 °C, and similar to 'Russet Burbank', has virtually no resistance to LTS at 4 °C. The different mechanisms of LTS resistance or susceptibility in these cultivars were indicated by changes in sucrose (Suc), fructose (Fru) and glucose (Glc) concentrations in relation to tuber respiratory profiles during wound healing (9 °C), LTS (4 °C) and reconditioning (16 °C). At 4 °C, 'Premier Russet' tubers maintained low levels of Suc and reducing sugars (RS, Glc + Fru), while 'GemStar Russet' tubers accumulated Suc with little inversion to RS. 'Defender' and 'Russet Burbank' tubers accumulated RS during LTS but only moderate levels of Suc. Changes in RS content reflected the combined activities of acid invertase and its endogenous inhibitor. In response to an immediate drop from 9 °C to 4 °C, tuber respiration decreased to a minimum and then increased to a new maximum over the next approximately 5 days, before decreasing to a constant basal rate at 4 °C. Relative changes in respiration from the minimum to maximum rate during cold acclimation (respiratory acclimation response, RAR) were 80% for 'GemStar Russet' and 'Defender', 51% for 'Russet Burbank' and 26% for 'Premier Russet'. The RARs correlated with total sugar (Suc + Glc + Fru) accumulation during LTS and likely reflected the metabolic energy required to catabolize starch to Suc, Glc and Fru. The relative ratio of Fru/Glc was also demonstrative of LTS resistance, discriminating genotypes that accumulated Suc versus RS under LTS conditions. Changes in carbohydrates, invertase, respiration rates and RARs in response to temperature over the wound healing, LTS and reconditioning phases of storage characterized the LTS phenotypes unique to each cultivar, and revealed different mechanisms of resistance to LTS.

Keywords: /Potato/ /Solanum tuberosum/ /Low temperature/