

**SELECTIVE DESSIMINATION OF INFORMATION (SDI)
PDF REPRINTS as of December 2013**

GENERAL

EXOTIC TROPICAL FRUITS

Saputra, D. and F. Pratama. 2013. Quality changes of **exotic tropical fruits** during storage in semi-passive modified atmosphere. Acta Hort. 1011: 243 – 250.

Abstract

Most exotic tropical fruits are seasonal fruits that have relatively short shelf life. Tropical fruits are different from fruits grown in temperate climate, due to the evolution stages; therefore they are unlikely to be stored under low temperature. An attempt of storing fruits at the temperatures of 15 and 20°C under semi-passive modified atmosphere packaging was developed. It was aimed to minimize the changes of tropical fruits quality by reducing the respiration rates of fruits in packaging through the typical patterns of valves as the air regulator. The results showed that the patterns of valves along the sides of the package could extend the shelf life of exotic fruits up to four times compared with the regular packing method. There were only slight changes in total sugar, vitamin C, total acid, weight loss, and color of fruits before and after stored in the package. Most panelists could not differentiate the fruits after stored in this typical package with the fresh harvested fruit.

Keywords: /Exotic Tropical Fruits/ /Modified Atmosphere/

POSTHARVEST COOLING

Heldman, D.R. 2013. Influence of **postharvest cooling** on product quality. Acta Hort. 1011: 49 – 54.

Abstract

The quality attributes of raw agricultural commodities are influenced significantly by handling and storage during the time periods shortly after harvest. One of the key product parameters with impact on quality is temperature. In order to control many of the reactions with negative impact on product quality, the product temperature must be reduced from ambient to storage temperature as rapidly as possible. The purpose of this paper is to review the factors influencing the postharvest cooling of raw agricultural products, as well as the influence of temperature on reactions with impact on product quality. The time to cool a product is influenced by several parameters and properties related to the product and the environment surrounding the product. Thermo physical properties (density, specific heat, thermal conductivity) of the product are part of the input to estimating the cooling time, but these properties do not vary significantly from one product to another. A parameter with more impact on cooling time is the surface heat transfer coefficient. The magnitude of the coefficient is dependent on the velocity of the cooling medium over the product surface. A third parameter is the size and shape of the product or the container holding the product during the cooling process. The final parameter with significant influence on the cooling time is the temperature of the cooling medium. This paper includes illustrations to demonstrate the relative impact of each parameter on time to cool different agricultural products. The influence of key parameters, such as the type and temperature of cooling medium, are illustrated. In addition, the importance of product or container dimensions is discussed. Specific product

examples and conditions are used to demonstrate the potential negative impacts of long cooling times on product quality attributes. The importance of rapid cooling to ensure maximum quality retention is emphasized.

Keywords: /Postharvest Cooling/ /Quality/

POSTHARVEST EDUCATION

Aldous, D.E. 2013. **Postharvest** horticulture **education**, research and consultancy: future challenges in the Asia-Pacific region. Acta Hort. 1011: 415 – 424.

Abstract

Between 2010 and 2050, the economies of China, India, Indonesia, Japan, Korea, Thailand and Malaysia could account for some 57% of the world's total population as well as 91% of the total Gross Domestic Product (GDP) in the Asia- Pacific region. In addition the region, where 80% of the world's small and marginal farmers live and work, has the potential to lose or waste up to one-third of food produced as it moves along the supply chain. These significant features require a rethink in horticultural education programming, research and consultancy training in the region. The objective of this paper is to describe the current status of postharvest horticulture education, research training and consultancy in the Asia- Pacific region with an emphasis on the universities in the region. In a recent survey conducted results show that about one-third of universities in the region have baccalaureate and/or postgraduate qualifications that target postharvest horticulture. However, there is a general consensus that there are insufficient postgraduates in postharvest horticulture currently entering the market to replace those that were retiring. There is also an emerging opportunity for training people at the vocational level to provide the necessary skills/artisan training in postharvest horticulture and food technology. Higher priority areas for research training are in quality assurance, handling, packaging and transport, maturation, ripening and product losses, and storage and in consultancy area the higher priority areas are in handling, packaging and transport, cool chain and storage, economics, market access, and quality assurance. Challenges to be faced in the research and teaching sectors of postharvest horticulture include the need to seek further investment so as to strengthen a weak research and development sector, and greater collaborative and interdisciplinary research and teaching with the institutions and institutes, both nationally and internationally.

Keywords: /Postharvest Education/ /Research Training/ /Consultancy/

Aldous, D.E. 2013. **Postharvest** horticulture **education** and training opportunities in the Asia-Pacific Region. Acta Hort. 1011: 25 – 34.

Abstract

Since the mid to late 1980s there has been a decline, for a range of reasons, in undergraduate student numbers and programmes that target postharvest horticulture and horticultural science. Postharvest horticulture has often been relegated as an elective or minor status within these undergraduate programs offered in science and/or biotechnology. Much of the postharvest horticulture teaching and research in the Asia-Pacific region is taken at the postgraduate level (M.Sc. and Ph.D. levels) both of which have demonstrated steady increases in student numbers and research projects. The objective of this paper is to investigate the current status of postharvest horticulture education and

training programs associated with the universities and vocational training colleges in the Asia-Pacific region. Methodology involved a 14 question electronic survey emailed to the major universities in the Asia-Pacific region that targeted postharvest horticulture units offered in their curriculum. Results showed that approximately one-third of the universities in the Asia-Pacific region, who participated in the survey, offered postharvest horticulture as a unit or major within their undergraduate or postgraduate degree program. Less than 6% of institutions offer postharvest horticulture at the vocational level. Most undergraduate degree programs were of 3-4 years in duration and included a 6-12 week period of industry experience. No training program or industry placement was required for seeking admission in a postgraduate qualification. Results indicated that the standards for postgraduate training in postharvest horticulture have been maintained through rigorous entry requirements with funding often coming from scholarship sources. High numbers of undergraduate students come directly from high school whereas graduate entrants principally came from government, industry researchers or as graduates from established undergraduate programs. Successful postgraduates principally found employment in teaching and research organisations and middle-senior management industry positions. The general consensus was that there were insufficient graduates entering the market to replace those that were retiring. The major challenges for education and training in postharvest horticulture, at the undergraduate level, is to make strategic curriculum changes in postharvest subjects, and in the case of vocational education providers, improve operational skills training in postharvest horticulture. At the postgraduate level there was a need to provide stronger incentives that emphasised the systems approach in the supply chain system, and provide for diversification of postharvest horticulture into non-postharvest horticulture outcomes in order to ensure longer term sustainability.

Keywords: /Postharvest Education/ /Postharvest Technology/ /Horticultural Education/

POSTHARVEST HANDLING

Underhill, S.J.R. 2013. Improving the effectiveness of small-holder farm postharvest practices in Fiji. Acta Hort. 1011: 41 – 48.

Abstract

This paper outlines current postharvest handling practices of five vegetables supply chains in Viti Levu, the Fiji Islands. Domestic-orientated chains involved characteristically low-input production systems, had limited postharvest infrastructure (packing sheds, cool rooms and grading equipment) and reflected inadequate grower and trader postharvest handling knowledge and expertise. Domestic supply chains are often short, with poor and asymmetric communications, discontinuous transport logistics and ineffective postharvest disease-management the major contributors to postharvest losses. Paradoxically, while increasing farm size tended to reflect greater professionalism of production practices, this did not translate to concurrent improvements in postharvest handling. Export-orientated chains involve a much more structured approach to postharvest handling, based on trader and exporter-led interventions. Product consignments are sourced from a large number of growers, graded and packed in a central pack-house and held under cool storage prior to transport. Aspects of a quality management system are evident, with some traders also providing a support services to their contracted growers to improve product quality and supply uniformity.

Keywords: /Postharvest Handling/ /Fiji/ /Horticulture/

POSTHARVEST RESEARCH

Underhill, S.J.R. 2013. An overview of postharvest research, extension and education capacity in the Pacific with a focus on Western Samoa, Tonga and The Fiji Islands. Acta Hort. 1011: 425 - 432.

Abstract

Historically there has been limited institutional postharvest research, education and training in the South Pacific. In Fiji, Western Samoa and Tonga, of the three universities, four government ministries and one regional agency, that currently possess horticulture research, extension or training capacity, few have any dedicated postharvest specialists. While private-sector postharvest extension services do exist they are often fragmented and commonly limited to specific export-focused supply chains. In the last decade, increasing concerns about regional food security and a greater emphasis towards expanding horticultural trade and exports have resulted in significant investment in new postharvest infrastructure in the region. Since 2008, postharvest research infrastructure has been established in Western Samoa and in Tonga, coupled with ongoing donor assistance of private-sector postharvest-export infrastructure in Fiji. Unfortunately there has been desultory attention towards concurrently improving postharvest skills and training. This is of particular concern as it undermines the ultimate effectiveness of this investment, creating questionable sustainability. This paper reviews the current postharvest horticulture research and education capacity in the Pacific highlighting the key challenges and opportunities.

Keywords: /Postharvest Research/ /Pacific/ /Education/ /Fiji/

POSTHARVEST TECHNOLOGY

Bu, J., et. al. 2013. Postharvest ultraviolet-C irradiation suppressed Psy 1 and Lcy- β expression and altered color phenotype in tomato (*Solanum lycopersicum*) fruit. Postharvest Biol. & Technol. 89: 1 – 6.

Abstract

Mature green cherry tomato fruit were harvested and treated with ultraviolet-C (UV-C) irradiation at a predetermined dose of 4.2 kJ m⁻², and stored at 18°C for 35 days. The effects of UV-C treatment on color change, pigment contents, and the expression of major genes involved in carotenoid metabolism, including Psy 1, Pds, Lcy- β , and Lcy- ϵ , encoding phytoene synthase, phytoene desaturase, lycopene β -cyclase and lycopene β -cyclase, respectively, were examined. The UV-C treated fruit developed a pink red color in contrast to the normal orange red color of control fruit. Lycopene accumulation during ripening in UV-C treated fruit was significantly inhibited but its final content was not affected. However, both accumulation and final content of β -carotene were significantly suppressed in UV-C treated fruit. The lower content of β -carotene, leading to a higher lycopene to β -carotene ratio, is probably responsible for the altered color phenotype in UV-C treated fruit. Psy 1, a major gene involved in lycopene synthesis was inhibited by UV-C irradiation. Significantly suppressed expression of Lcy- β gene was also observed in UV-C treated fruit. Thus it is possible that the lower transformation from lycopene to carotenes contributed to the relatively stable content of lycopene.

Keywords: /Postharvest Technology/ /Irradiation/ /Tomato/

Kanlayaranat, S. and C. Wongs-Aree. 2013. Postharvest research education and extension in Thailand: capacity building in **postharvest technology** at the university level. Acta Hort. 1011: 35 – 40.

Abstract

Postharvest losses in product quality and quantity are a major problem that limits domestic and export-import trade of many agricultural crops. The problem is more serious in less developed countries in The Asia Pacific Region including Thailand. The losses also limit the productivity and competitiveness of developing countries in the global market. On the other hand demand for quality and safe agricultural produce is increasing due to increased population, improved standards of living as a result of high economic growth, and better education which increases consumer's awareness of food quality and safety. The problem of postharvest losses and the need to ensure an increased and enduring supply of quality and safe agricultural produce are better addressed by developing a strong and solid human resource who can ably design, innovate, implement, and manage technological and non-technological interventions. A regional approach to human resource development (HRD) in postharvest technology is imperative in this era of market globalization. In Thailand, the postharvest technology course was established in Kasetsart University and Chiang Mai University for more than 30 years ago. After that this course has been expanded to many universities. The content of postharvest subjects and the curriculum depends on the policy of each university. The development of postgraduate education and research in close collaboration with industry is considered as an effective and optimum measure to address the various constraints and challenges in an interpreted manner. During 2000-2005, The Postgraduate Education Research Program in Postharvest Technology was implemented through a university consortium, with Chiang Mai University (CMU) as a leader and Kasetsart University (KU), Khon Kaen University (KKU) and King Mongkut's University of Technology Thonburi (KMUTT) as members. Ultimately, a Postharvest Technology Center was created and supported by the university consortium members. The program aimed to produce postgraduate students, high quality and coordinated research, effective collaboration with industry, and transfer of postharvest technologies. During 2006-2009, the program was expanded with new members of Maejo University, Naresuan University, Prince of Songkla University, Suranaree University of Technology and Ubon Ratchathani University, emphasizing on increasing of Ph.D. students, more apparent research focus, and formation of postharvest technology research groups among academic/research staff of participation universities, in order to tackle the present and future national postharvest technology problems. The program name was changed to be "Postharvest Technology Innovation Center" (PHTIC), finally. Besides, the PHTIC also transfers postharvest technology to many sectors including growers, exporters and other private sectors.

Keywords: /Postharvest Technology/ /Capability Building/ /Education/ Extension/

VALUE CHAIN

Adhikari, R.P., R. Collins and X. Sun. 2013. Relationship management in a **value chain** involving "bottom of the pyramid" participants: a case study from Nepal. Acta Hort. 1011: 41 – 48.

Abstract

This paper explores relationships within value chains in developing countries, suggesting that a greater understanding of the social, economic and behavioural dimensions can be used to manage collaborative relationships. Relationship management is frequently described as the management of

dyadic business relationships between organisations. However, the management of different dimensions of relationships at the same time among chain actors who may or may not be organised has received little attention. Findings in this paper are based on a case study of tomato value chains in Nepal. Results suggest that in a developing country, actors in value chains differ vastly in terms of organisational characteristics. Upstream, farmers are small, poor and unorganised, while downstream, supermarkets are typically larger, formally organised business entities. Actors in between them share characteristics from either end. For the majority of actors in agrifood value chains within a developing country, business relationships are personal and usually managed by the household head who is typically socially attached to other actors. For them, a relationship within a value chain is not only an economic phenomenon, but also has behavioural and social dimensions. For more formally organised actors such as supermarkets, employees who establish relationships with other actors in the chain have no social obligations to others. Evidence from this study suggests that a lack of understanding of these relationship dimensions leads to short term rather than long term relationships. This paper demonstrates that actors who better understand the nature and characteristics of their business partners and are able to act across various relational dimensions simultaneously, have been able to establish more effective longer term business relationships.

Keywords: /Value Chain/

FRUITS

BANANA

Sukasih, E., Setyadjit and A.W. Permana. 2013. Application of 1-MCP to delay ripening of 'mas kirana' **banana**. Acta Hort. 1011: 259 – 264.

Abstract

The main problem in bananas value chain in Indonesia is the long time distribution, for both export and local market, while the shelf life of bananas is relatively short. 'Mas Kirana' banana will reach full ripening 8 days after harvest. One of the substances that can inhibit the ripening process, hence, the activity of ethylene is 1-methylcyclopropene (1-MCP). The purposes of this research were to determine the shelf life of 'Mas Kirana' banana subjected to 1-MCP application, and to observe the changes in the banana quality characteristics, i.e., colour, hardness and total soluble solids. The 'Mas Kirana' bananas were packed in LDPE bag (one hand for one bag), sealed, injected by 100 µl LCP (liquid cyclo propene), from different ratios of LDA: CMP (2:1, 3:1 and 4:1), and exposure times (24 and 48 h). They were then stored at 25°C and analyzed for hardness, total soluble solids, and color, at initial condition, and every week after for 5 weeks. The best result was obtained by 'Mas Kirana' banana injected with LDA-CMP of 2:1 ratio under 24 h exposure time. The treatment was able to delay ripening of the bananas for five weeks at 25°C. The banana had 1009.33 g hardness, 20°Brix total soluble solids, and color value of 66.94 L, 2.57 a and 56.21 b.

Keywords: /Banana/ /Ripening/ /1-MCP/

Wills, R.B.H., et. al. 2014. Reduction of energy usage during storage and transport of **bananas** by management of exogenous ethylene levels. Postharvest Biol. & Technol. 89: 7 – 10.

Abstract

Unripe Australian-grown Cavendish and Lady Finger bananas were stored at 15, 20 and 25°C in an atmosphere containing 0.001, 0.01, 0.1 and 1.0 µL/L ethylene in air and the green life was determined as the time to reach the respiratory climacteric. As expected, green life increased as the temperature and ethylene concentration decreased. The equation describing the relationship between temperature, ethylene concentration and green life of Cavendish bananas was applied to a five-day 3000 km road transport route from the major tropical production area to the major urban markets. It predicted that bananas transported in the prevailing mean summer temperature of 25°C would not require refrigeration if the ethylene level did not exceed 0.58 µL/L while transport at the mean winter temperature of 14°C fruit could withstand a level of about 0.90 µL/L without ripening en route. The equation was also applied to a shipment protocol of 19 days for bananas exported from Central America to southern Europe. This predicted that fruit could be transported without refrigeration if ethylene levels were maintained at 0.04 µL/L during the winter temperature of 17°C and at 0.002 µL/L at the summer transport temperature of 24°C. Since a range of technologies are available to maintain such low ethylene levels or reduce the action of ethylene, these findings suggest that the current refrigerated transport of bananas could be minimised or eliminated. The use of higher temperatures in the supply chain would reduce energy consumption with resultant environmental and economic benefits.

Keywords: /Banana/ /Storage/ /Transport/ /Ethylene/

BLUEBERRY

Zaho, J., et. al. 2013. Evaluation of postharvest quality of three southern highbush **blueberry** (*Vaccinium corymbosum* Hybrid) cultivars subjected to heat pre-treatment. Acta Hort. 1011: 187 - 196.

Abstract

Fresh blueberries are delicious and nutritious but easily perishable under natural conditions. Southern High bush blueberries are low chill cultivars and three cultivars namely 'Misty', 'O'Neal' and 'Sharp blue' are popular in the south of China. The effects of thermal pre-treatments on the shelf life of fresh berries of 'Misty', 'O'Neal' and 'Sharp blue' fruits were studied. The results show that the decay rate of fruit subjected to elevated temperatures not exceeding 50°C for 30 min and stored at 5°C was the lowest for all three cultivars. The decay rate of fruit subjected to cooling below 5°C for 30 min and 5°C for 30 min was the lowest for berries stored at room temperature. At the early stage of fruit storage, superoxide dismutase (SOD) activity and malondialdehyde (MDA) content in fruits increased gradually slowly. This demonstrated that the thermal pre-treatment was capable of increasing SOD activity in fresh blueberries. At a later stage of fruit storage, SOD activity decreased and MDA content increased gradually. The results of this study indicate that the thermal pre-treatment and especially the temporary increase of temperature could inhibit the decrease of SOD activity and the increase of MDA content in the blueberry fruits. And the thermal pre-treatments can prevent the upward trend of respiration rate and inhibit the decrease of anthocyanin content of fruits effectively in the postharvest storage period. Thus, the thermal pre-treatment appears to be a useful method for prolonging the shelf-life of fresh blueberries and preserving the berry quality.

Keywords: /Blueberry/ /Postharvest/ /Quality/

CALAMANSI

Agravante, J.U., et. al. 2013. Postharvest losses in the supply chain of **calamansi** (*Citrofortunella microcarpa*) and loss reduction with modified atmosphere packaging. Acta Hort. 1011: 49 – 56.

Abstract

During the off-season, calamansi is sourced from Mindanao for the Metro Manila market. To reduce postharvest losses, a multi-disciplinary team sought to determine the effectiveness of modified atmosphere packaging (MAP), coupled with the curing of the fruit prior to shipment. Of the 9,422 kg of fruit harvested, only 0.6% was classified as unmarketable, but at the retail level, 13% were considered unmarketable. Postharvest disease, mainly due to *Penicillium digitatum*, was the primary cause of loss at the retail level (86%). Other losses were attributed to plugging (6%), yellowing (4%) and browning (4%). Packaging cured calamansi in 20 kg crates with a polyethylene bag (0.038 mm thick with 160 diffusion holes) increased the amount of marketable fruit from 68% (no curing, no MAP) to 95% (cured, with MAP). Furthermore, MAP of cured calamansi reduced moisture loss during transport from 5% to 0%.

Keywords: /Calamansi/ /Modified Atmosphere Packaging/ /Transport/ /Handling/

CITRUS

Hassan, Z.H., et. al. 2013. Effective postharvest management of tangerine **citrus** (*Citrus reticulata* 'Siam Banjar') to reduce losses, maintain quality, and protect safety. Acta Hort. 1011: 399 – 404.

Abstract

Among various tangerine citrus (*Citrus reticulata*) or *jeruk siam* known and found in Indonesia, the most popular cultivars are 'Siam Banjar', 'Siam Pontianak', and 'Siam Madu'. Tangerine citrus 'Siam Banjar' is mostly grown in South Kalimantan province, Indonesia, and is generally planted in the lowland or swampy land. The fruits are in high demand by local consumers because of its fresh sweet taste and its high nutritional content. Although the fresh tangerine citrus 'Siam Banjar' currently produced is in good quality, poor postharvest handling consequently results in significant product losses and quality deterioration. Effective postharvest management during the postharvest handling is a strategic effort to improve the quality of tangerine citrus (*Citrus reticulata*) 'Siam Banjar'. Simple innovation in postharvest technology is the key in maintaining the quality properties (color, flavor, aroma), extending the shelf-life, and maximizing the added value of the fruits, so that they are more attractive to consumers, as well as compliant to the trading standards. This paper outlined some simple and low cost primary postharvest technologies for tangerine citrus 'Siam Banjar' during the postharvest handling activities, from harvest until storage prior to marketing. Postharvest treatments were applied in several stages, i.e., harvesting, initial sorting, washing, grading, degreening, waxing, packaging, and storage. The optimum maturity of the tangerine citrus 'Siam Banjar' was obtained at 28-30 weeks after anthesis. Initial sorting was normally conducted in the orchard by discharging the immature, overripe, damaged and diseased fruits. Tangerine citrus 'Siam Banjar' was washed by scrubbing gently the fruit surface in warm water (40-45°C) containing hypochlorous acid (150 ppm), fungicide of benomyl (500 ppm) and small amount of detergent for 3-4 min. Based on the fruit weight and diameter, the tangerine citrus 'Siam Banjar' was categorized into four grades, Category-A, Category-B, Category-C and Category-D. The treatment with 0.4% w/w of calcium carbide for 72 h provided the best result for degreening of the

fruits. The combination of 12% bee wax coating and storage at 5°C was the most effective treatment in maintaining the quality of tangerine citrus 'Siam Banjar'. A proper postharvest handling helped to reduce losses, maintain produce quality, and protect the safety of the fruits.

Keywords: /Citrus/ /Postharvest Management/ /Losses/ /Quality/ /Safety/

DURIAN

Abad, R.G. and K.T.G. Cruz. 2013. Incidence of *Phytophthora* fruit rot on four **durian** cultivars in Davao City, Philippines. Acta Hort. 1006: 35 – 40.

Abstract

A two-year study was conducted on a farm in Davao City to investigate the incidence of *Phytophthora* fruit rot on four commercial durian (*Durio zibethinus* Murr.) cultivars previously laboratory tested for their reaction to the disease using isolates of the pathogen, *Phytophthora palmivora* Butler. In Year 1, disease incidence was highest on cultivars 'Alcon Fancy' and 'Arancillo' at 10.7% and 9.9%, respectively. Lower levels of infection were observed for cultivar 'Puyat' (0.5%) and no infection was recorded for cultivar 'Seri Kembangan'. The same trend was obtained in Year 2, further confirming previous laboratory infection test results. The incidence of infection for 'Alcon Fancy' was 47.3%, followed by 'Arancillo' (25.9%), 'Puyat' (12.6%) and 'Seri Kembangan' (2.1%). In monetary terms, the Year 1 total of 545 infected fruit was equivalent to a potential income loss of PhP 27,250. In Year 2, the total of 1,233 infected fruit translated into a potential income loss of PhP 49,320. 'Alcon Fancy', with the highest level of infection, contributed PhP 21,873, followed by 'Arancillo' (PhP 15,967), 'Puyat' (PhP 11,925) and 'Seri Kembangan' (PhP 1,295). Results of the study suggest that more disease management interventions are necessary for the more susceptible, but commercially preferred cultivars. Several fruit nursery operators in Davao City indicated that propagating 'Alcon Fancy' and 'Arancillo' seedlings is no longer profitable since knowledgeable farmers do not plant them anymore, citing high susceptibility to *Phytophthora* as the primary reason.

Keywords: /Durian/ /Phytophthora/

MANGO

Makino, Y. et. al. 2013. Non-destructive analysis of internal and external qualities of **mango** fruits during storage by hyperspectral imaging. Acta Hort. 1011: 443 – 450.

Abstract

Internal and external qualities of mango fruit during storage were evaluated by a hyper spectral camera system. Mangoes at table maturity and full maturity were harvested in Okinawa Prefecture, Japan, and stored for 10 or 6 d at 27°C (RH 90%). Spectral reflectance (380-1000 nm) and soluble solid content (SSC) were measured during storage, and their relationship was investigated. The hue angle (H_o) of the fruit on the vine side was usually smaller than that on the blossom side during storage, possibly because the red color on the vine side was more perfect in hue than that on the blossom side. However, the SSC on the blossom side was slightly higher (i.e., better) than that on the vine side. The red color of the peel is an important index for grading mangoes by visual inspection. Conversely, sweetness is one of the most important qualities of fruits in general. These results suggest that

sweetness is not associated with the red color of the peel; thus, a non-destructive method for predicting the SSC on each side is needed. Spectral reflectance data were transformed to the scores of principal component analysis. A non-linear model was constructed by artificial neural networks for predicting the SSC. SSC and principal components 1-5 were selected as output and input variables, respectively. The SSC of mangoes was predicted by the proposed ANN model with a correlation coefficient of 0.79 and a root-mean-square error of cross validation of 0.069. This method may be effective for the non-destructive prediction of the SSC of mango fruit.

Keywords: /Mango/ /Postharvest/ /Non-Destructive/

Purwanto, Y.A., et. al. 2013. Chilling injury in green mature 'gedong gincu' mango fruits based on the changes in ion leakage. *Acta Hort.* 1011: 219 – 226.

Abstract

In this study, the chilling induced of green mature mango fruits stored at chilled temperature and the changes in its quality during storage period were examined. The chilling induced was investigated through the changes in the rate of ion leakage. The quality of mango fruits during storage was examined through the changes in firmness, total soluble solid, weight loss and visual appearance. The storage conditions were set at 8, 13°C and room temperature. Ion leakage during storage period was measured every 2 days. The rate of ion leakage was determined by calculating the slope of percentage of total ion leakage with time. The result showed that the rate of ion leakage for mango fruits stored at 8°C was higher than that at 13°C, respectively. The increase in the rate of ion leakage indicates the chilling induced of cell membrane. For mango fruits stored at 8°C, the slope of rate of ion leakage changed from 0.1762 at 0 days to 0.2121 at 4 days and decreased to 0.1777 at 8 days. The highest value of slope at 4 days indicated that mango fruits were beginning to experience chilling injury. This phenomenon was supported by the emergence of black spot on the surface of mango fruits which observed at day 20. For those mango fruits experiencing chilling injury showed the abnormal ripening process which was indicated by the low total soluble solid. This study has demonstrated that the changes in ion leakage could indicate the symptom of chilling injury in mango fruits.

Keywords: /Mango/ /Chilling Injury/

Setyawan, N., et. al. 2013. Trials for application of handling technology in mango export. *Acta Hort.* 405 – 412.

Abstract

Mango is one of the horticultural export commodities in Indonesia. Mango production reached 1.29 million tons in 2010, the fourth largest after the production of bananas, oranges, and pineapple, and 1.84 million tons in 2011, the third largest after bananas, and oranges. This study was to observe the physical characteristic changes of mango during shipment to Hong Kong both in static and dynamic ways. Static trial was conducted in a refrigerated container with the capacity of 7 tons (20 ft size). Dynamic shipments of mangoes to Hong Kong were conducted by air and sea with the capacity of 1 ton, respectively. Results of static trial showed that treatments of natural antimicrobial and waxing were able to maintain the freshness of mangoes until 3 weeks at 9-11°C with a length of display until 8 days at 18-22°C. In export trial to Hong Kong by air, treatment of waxing after 8 days reduced the damage to 1.5% lower than 6.5% damage performed by mangoes without waxing treatment. The delivery of mangoes to

Hong Kong by sea for 14 days indicated that mangoes relatively were in good quality but experienced disease incidences. The spoilage amounted to 18.2 and 22.0%, respectively, for mangoes treated with natural anti microbial agent, and waxing. The high level of spoilage might be because the incidence had happened starting from the orchard when mangoes were harvested in heavy rainfall.

Keywords: /Mango/ /Handling/ /Export/

MANGOSTEEN

Ahmad, U., et. al. 2013. Application of semi-cutting and waxing in low temperature storage of mangosteen. Acta Hort. 1011: 101 – 110.

Abstract

Peel hardening of mangosteen fruit is one of the problems in low temperature storage and it makes it difficult to open them before consumption. One attempt to solve this problem is the application of semi-cutting treatment before storage of the fruits. Semi-cutting application requires a combination with waxing and cold storage to prevent faster quality deterioration because it provides a way for microorganisms to enter the fruits, and increases the respiration as well. Waxing helps to cover the pores, and especially in this case, the cut opening, of mangosteen fruit and cold storage helps to slow down the respiration and metabolism. The purpose of this research is to study the effect of semi-cutting treatment in combinations with waxing treatment to increase shelf life, and provides easier opening of the fruits at the end of long storage. Treatment of semi-cutting was conducted on two depths, 3 and 5 mm whereas waxing treatment was conducted with 2 concentrations, 6 and 10%. Mangosteen fruit which has been semi-cut and waxed was stored at 8 and 27°C for 60 days. It was observed that application of semi-cutting 5 mm and waxing 6% in mangosteen fruit stored at 8°C provided easy opening until 33 days of storage while maintaining fruit quality, which is the best result compared with other treatments, because the treatment was able to reduce the peel hardening.

Keywords: /Mangosteen/ /Waxing/ /Storage/

Edris, I.M., S. Mardjan and E. Darmawati. 2013. Development of postharvest handling model for mangosteen fruit (*Garcinia mangostana* L.) along the export supply chain. Acta Hort. 1011: 377 – 384.

Abstract

The research aimed to obtain the best scenario of postharvest handling that could increase added value along the export supply chain. As a part of ongoing research, this paper aimed to identify the postharvest handling and losses that occur along the existing export supply chain in the study site, to develop a model and scenario of postharvest handling system that could potentially increase added value. The existing export supply chain consists of four actors i.e., farmers, small middlemen, medium middlemen and exporter. The present situation shows that mangosteen suffers high mechanical damage (about 9.92-24.8%) caused by current postharvest handling technique. Improvement in postharvest handling could reduce losses up to 9.02-14.88%. The developed model consisted of four sub-models based on critical handling steps i.e., harvesting, 1st packaging (conducted by middlemen), storage and 2nd packaging (conducted by exporter). In the harvesting sub-model, export volume was defined as a function of utilized harvesting tools, i.e., farmer stick (stick with hook), stick with serrated knife, stick

with cut knife. While in the packaging sub-model, the export volume was expressed as a function of the type and layout of packaging such as hard plastic crate without partition, BE flute, BC flute cartoon with net foam, C flute cartoon with inner packaging. Finally, in the storage sub-model, the export volume was defined as a function of various temperature i.e., 28, 20, 13°C. In order to obtain the best scenario, eleven scenarios were developed which characterize handling technique alternatives comprising of high, moderate and low level of losses.

Keywords: /Mangosteen/ /Postharvest/ /Model/

PAPAYA

Yeoh, Wei Keat, Asgar, Charles F. Forney. 2014. Effects of ozone on major antioxidants and microbial populations of fresh-cut papaya. *Postharvest Biol. & Technol.* 89: 56 – 58.

Abstract

The problems that are usually associated with fresh-cut commodities are the rapid depletion of nutritional value and the presence of high microbial populations. Ozone is a strong oxidant that can elicit physiological, chemical and microbial changes in fresh produce. Therefore, fresh-cut papaya was treated with ozone (9.2 ± 0.2 _l/L) at 10, 20 and 30 min to investigate its effect on phytochemicals and microbial load. Following a 20 min ozone treatment, the total phenolic content of fresh-cut papaya increased by 10.3% while the ascorbic acid content decreased by 2.3% compared to that of untreated control fruit. Also, gaseous ozone reduced microbial counts being more effective on coliforms ($0.39\text{--}1.12$ log 10 CFU/g) than on mesophilic ($0.22\text{--}0.33$ log 10 CFU/g) bacteria. The results suggest that microbial populations on fresh-cut papaya can be reduced without depleting its major antioxidants except for ascorbic acid when subjected to 9.2 ± 0.2 _l/L gaseous ozone for 20 min.

Keywords: /Papaya/ /Fresh Cut/ /Phytochemicals/

PERSIMMON

Fahmy, K. and K. Nakano. 2013. Favorable transportation conditions preventing quality loss of 'jiro' persimmon for exports. *Acta Hort.* 1011: 73 – 80.

Abstract

The aim of the present study was to determine the favorable conditions for maintaining the quality of 'Jiro' persimmon during overseas transport. Harvested fruits were packed using plain cardboard boxes and cardboard boxes with modified atmosphere packaging (MAP) using 40- μ m thick low-density polyethylene (LDPE) film bag as an inner packaging material. These fruits were exported to Hong Kong via sea in 7 days using reefer containers with temperature set at 2 and 15°C. After delivery, the fruits were stored at room temperature for 6 days. The number of softened fruits in each test condition was counted on the day of delivery and on every second day during storage for six days. The softening of fruits was judged directly by touch and the fruits that had even slightly softened were regarded as softened fruits. Simultaneously a laboratory test was conducted under conditions mimicking the transport conditions to determine the effect of MAP on persimmon quality based on the evaluation of headspace gas composition (O₂ and CO₂) inside the package, electrolyte leakage and fruit skin color. The results indicate that the number of softened fruits was less at 2°C than at 15°C transportation

temperatures at delivery. Storage at room temperature, the number of softened fruits increased, particularly, fruits transported at 2°C softened more rapidly than those at 15°C. Using MAP is more effective to prevent the loss of fruit quality. Moreover, it was also found that high-grade persimmon is more suitable for export.

Keywords: /Persimmon/ /Transportation/ /Modified Atmosphere Packaging/

RAMBUTAN

Paramawati, P., et. al. 2013. Effect of carnauba coating and plastics wrapping on the physico-chemical and sensory characteristics of rambootan. Acta Hort. 1011: 111 – 118.

Abstract

As a tropical country, Indonesia has plenty kinds of tropical fruits. Rambutan (*Nephelium lappaceum*) is one of the tropical fruits that is specific to South-East Asian countries, especially Indonesia. However, since rambutan is perishable it cannot easily be sold to other provinces or abroad. Rambutan still performs active respiration although it has been picked up from the tree, which will affect the physico-chemical characteristic and the shelf life. The aim of this research was to prolong the shelf life of rambutan by introducing carnauba coating and plastics wrapping combined with low temperature and CAS (controlled atmosphere storage). Treated and untreated fruit as control were stored at low temperature within cold storage (15°C). The characteristics including weight loss, sugar content (TSS) and total acid (TA) were observed periodically until all fruits were rejected by panelists which evaluated the sensory attributes. The results noted that rambutan stored with controlled atmosphere (CAS, 3% O₂-5% CO₂) at 15°C had prolonged shelf life up to 11 days based on sensory analysis of panelists on hairy skin color as critical sensory attributed to rambutan. Carnauba coating was the best method that could reduce the weight loss, followed by treatment without coating/wrapping. Moreover, all treatments showed a similar increase in total soluble solid (TSS) and total acid (TA) parameter, and then decrease after a certain number of days of storage.

Keywords: /Rambutan/ /Carnauba Coating/ /Plastic Wrapping/

Tongtao, S., et. al. 2013. Sugar components and invertase activity in different maturity stages of 'rongrien' rambutan. Acta Hort. 1011. 81 – 86.

Abstract

Rambutan fruits were harvested at four maturity stages depending on peel and spintern colors: green, color breaker (orangy yellow), orange red and red with green spintern tip and stored at 25±2°C (60% RH) for 6 days. Changes in sugar content and invertase activity throughout peel color development were investigated. The rambutan aril was fertile with high carbohydrate source of which sucrose was the predominant amount. The sucrose content varied by maturity stages: the harvested green rambutan had lowest sucrose content while the breaker, orange red and red colors contained slightly high sucrose according to pulp color. However, the amount of sucrose sharply decreased in all maturity stages a few days after harvest. As the same tendency of sucrose, glucose content rapidly decreased from day 1 to day 4 in harvested green and breaker stages and slightly increased at day 6 after storage whereas glucose quantity in both harvested orange red and red rambutans sharply increased throughout storage

periods. The invertase activity of harvested breaker and orange red stages was high on day 1 after harvest that could brake down sucrose into fructose and glucose.

Keywords: /Rambutan/ /Maturity/

Tongtao, S., et. al. 2013. Supply chain management of rambutan fruit for exporting in chanthaburi province. Acta Hort. 1011: 385 – 390.

Abstract

This study was conducted in Chanthaburi province during November 2009-April 2010. Information about general management of rambutan cultivation, cultural practices, postharvest handling and marketing was collected by interviewing targeted exporters and farmers from 4 districts, namely, Khaokitchakood, Makham, Khlung and Thamai. The age of farmers ranged from 28-80 years. 'Rongrien' was the main commercial cultivar and the range of plantation area and plant growing period varied ranging from 3-78 rai and 4-40 years, respectively. The cultivation systems included both single plantings and intercropping with plants of other commercial fruit crops, so spacing between trees ranged from 3×4 m (space between plants 3 m, and between rows 4 m) to 12×12 m. Yield of rambutan ranged between 181 to 3 000 kg/rai, the ratio of marketable yield, of grading and non marketable yield were 74.9, 19.8 and 6.3%, respectively. In general, the duration of harvest period was 6.27 h/day, and 55% of farmers harvested continuously from morning till noon. Farmers used many technical practices during harvesting, grading, packing and transporting to the market. The harvested rambutan was sold to collectors, wholesalers and retailers at the meeting point market or vender along the main roadside. Normally, the fruit was distributed for local consumption, only 6.8% for destined for export. The main export markets for rambutan were mainland China, Hong Kong and Chinese Taipei. A standard grade of rambutan produce was produced following grading, cleaning and packing into foam bag (9 kg/bag). To maintain postharvest quality, exporters used ice to maintain a cool temperature in the packing box during transport. The transport time from pack house to airport was estimated to be 4 h and 3-4 h from airport to terminal market. The information obtained about supply chain management obtained from this study could help support the planning, improving and supporting the future exports of rambutan in the future.

Keywords: /Rambutan/ /Supply Chain Management (SCM)/

SAPODILLA

Nugroho, J., et. al. 2013. Applications of electronic nose to determine the maturity of sapodilla using pattern recognition system. Acta Hort. 1011: 87 – 94.

Abstract

Sapodilla is a tropical fruit that has a distinctive taste preferred by most people. Determination of fruit maturity with non-destructive method for sapodilla has not been commercially practiced. The purpose of this study was to identify the aroma of sapodilla fruit at different levels of ripeness, as well as to assess the effect of calcium carbide (CaC₂) concentration on the ripening of the fruit. Sapodilla fruit samples were stored in a 30°C incubator under the following treatments: 0.1%CaC₂, 0.2% CaC₂, and control. Fruit aroma was measured by electronic nose using four sensors (TGS222, TGS 825, TGS826, and TGS2602), every day for 8 days during the ripening process. Data recorded were the voltage changes of

electronic nose readings. The level of fruit hardness, and total soluble solids were also measured, and a sensory test was carried out for comparison. The recorded data were further used as the basis for pattern recognition system on artificial neural networks (ANN). Results that had been trained by ANN were then tested to identify the level of ripeness for other sapodilla fruits. The aroma data were then analyzed using Principle Component Analysis (PCA). The goal was to classify the fruits based on the level of sapodilla ripeness. The results indicated that the ANN was able to recognize the fruit ripeness with a level of accuracy of 90.11%. PCA was also able to identify the ripeness of sapodilla fruit quite well.

Keywords: /Sapodilla/ /Ripeness/ /Electronic Nose/

STRAWBERRY

Arifin, H.R., I.S. Setiasih and J.S. Hamdani. 2013. Shelf Life and characteristics of **strawberry** (*Fragaria nilgerensis* L.) coated by *aloe vera*-glycerol and packed with perforated plastic film. Acta Hort. 1011: 307 – 312.

Abstract

The use of *Aloe vera* gel added with glycerol (GLBG) coating, combined with perforated plastic film packaging may slow the damage of strawberry. The objective of this study was to obtain the appropriate concentration of glycerol in the GLBG coating combined with perforated plastic film packaging to gain strawberry that had long storage durability while having good characteristics. The experimental design used was randomized block design (RBD). The experiment consisted of 6 treatments namely coating with GLBG at the concentration of 0.5% (v/v), and without coating combined with perforated plastic film packaging (8, 16, 24 holes) repeated 3 times. The experiment was conducted at the Laboratory of Food Technology, Faculty of Agro Industrial Technology, Padjadjaran University, Bandung. The results of the first phase of the study indicated that the critical quality of strawberry was based on color with the value of $L^*=34.39$ (dull), $a^*=27.22$ (brownish dark red), and $b^*=18.55$ (brownish amber). The concentration of glycerol selected to be applied in the second phase was 0.5% (v/v). The second phase found that the GLBG coating at the concentration of 0.5% (v/v) combined with 24 hole perforated plastic film packaging gave the best result because it could preserve the shelf life of strawberry fruit up to 11 days storage. This treatment could reduce the strawberry weight loss, maintain color, hardness, moisture content, total soluble solid, total acid, and the most preferred by a sensory panel. In addition, this treatment could reduce vitamin C decrease, respiration rate, and total microbial count in the strawberry fruits.

Keywords: /Strawberry/ /Aloe Vera Gel/

Peretto, G., et. al. 2013. Increasing **strawberry** shelf-life with carvacrol and methyl cinnamate antimicrobial vapors released from edible films. Postharvest Biol. & Technol. 89: 11 – 18.

Abstract

The effect of carvacrol and methyl cinnamate vapors incorporated into strawberry puree edible film on the postharvest quality of strawberry fruit (*Fragaria × ananassa*) was investigated. Fresh strawberries were packed in clamshells and kept at 10°C for 10 days with 90% RH. Strawberry puree edible films, applied in the clamshell, served as carriers for the controlled release of natural antimicrobial compounds without direct contact with the fruit. Changes in weight loss, visible decay,

firmness, surface color, total soluble solids content, total soluble phenolics content and antioxidant capacity of strawberries during storage were evaluated. A significant delay and reduction in the severity of visible decay was observed in fruit exposed to antimicrobial vapors. Carvacrol and methyl cinnamate vapors released from the films helped to maintain firmness and brightness of strawberries as compare to the untreated strawberries. The natural antimicrobial vapors also increased the total soluble phenolics content and antioxidant activity of fruit at the end of the storage period.

Keywords: /Strawberry/ /Shelf-life/ /Edible Films/

HERBS AND SPICES

KALE

Ragusa, L., et. al. 2013. Development of modified atmosphere packages on the quality of sicilian **kale** (*Brassica oleracea* var. *acephala*) shoots. Acta Hort. 1005: 315 – 322.

Abstract

Since some decades, and also in the present global economic crisis, the request for fresh-cut products has showed an increasing trend, and its productive chain represent one of the most remunerative activity of agriculture. In this frame we pointed our attention to diversify fresh-cut vegetable items by several minor and/or underutilized crops and in some case by wild species gathered and utilized as vegetables in Sicily. Kale (*Brassica oleracea* var. *acephala*) shoots seem to be of great interest for fresh-cut production both for its environmental friendly growing techniques and nutraceutical properties, as it is rich in antioxidants compounds as ascorbic acid, total polyphenols, carotenoids and glucosinolates. The use of low level of oxygen (O₂) and of high level of carbon dioxide (CO₂) atmosphere appeared useful for maintain quality and extend shelf-life for several vegetables. In this condition the plant reduces respiration process that involves complex biochemical reactions, delayed ripening and senescence and also reduces fungal development. Besides, refrigeration is important for elongate the shelf-life but modified atmosphere packaging (MAP) is an important complementary technique to apply. We studied a kale Sicilian type evaluating three modified atmospheres (air, 70% N₂:30% CO₂; 100% CO₂), three temperature levels (0, 4 and 8°C) during three storage times (0, 3 and 7 days). Every day, the percentages of oxygen and carbon dioxide, colour parameters (CIE L*, a* and b*) and dry weight of the shoots were monitored. Results showed the best shoots quality utilizing 70% N₂:30% CO₂ storage atmosphere at 4°C, the product is kept in good condition for all seven days. This study has improved knowledge about the respiration process and variation of color of kale shoots in relation to modified atmospheres packaging, temperature and time.

Keywords: /Kale/ /Modified Atmosphere Packaging/

SWEET PEPPER

Promyou, S. and S. Supapvanich. 2013. Chilling injury alleviation in ‘golden bell’ **sweet pepper** caused by UV-C treatment. Acta Hort. 1011: 357 – 362.

Abstract

The objective of this study was to investigate the effect of UV-C treatment in alleviation of chilling injury (CI) in 'Golden Bell' sweet pepper fruits. Sweet peppers, having 90% yellow color, were treated with UV-C light at 2.2, 4.4 and 6.6 kJ/m² and then stored at 4°C. The CI evaluation, weight losses, firmness, total carotenoid content, antioxidant capacity and the activities of catalase (CAT) of the sweet pepper fruits treated with UV-C were monitored. The results showed that UVC treatment at 6.6 kJ/m² had more efficiency on reducing chilling injury and retaining fresh weight and firmness than other treatments. No significant difference in total carotenoid content was detected in the fruits treated with UV-C and the control over storage. Sweet pepper treated with UV-C 6.6 kJ/m² significantly enhanced antioxidant capacity and CAT activity, which were concomitant with the alleviation of CI during refrigerated storage.

Keywords: /Sweet Pepper/ /UV-C/ /Chilling Injury/

TUBERS AND ROOTCROPS

POTATO

Widodo, T.W., et. al. 2013. Design and development of **potato** grading machine. Acta Hort. 1011: 125 – 132.

Abstract

Potato (*Solanum tuberosum* L.) is one of the important vegetable commodities in Indonesia. Productivity of potato is increasing year by year. However, potato farming still faces obstacles such as cultivar, seed, farming method, pest and disease control techniques, and also harvest and postharvest handlings. Experimental results indicated that 70% of total damage was caused by harvest, 30% during transportation and storage; more than 30% for all products may be damaged during harvesting. After harvest, potato requires to be classified for further handling purposes, such as for storage or marketing. However, the harvesting season is generally in the same period as land preparation and other activities resulting in lack of labors for grading. Moreover, potato is perishable and easy to decay if it is not well and fast handled. Thus, suitable machinery for potato grading is necessary. A prototype of the potato grader machine was designed to classify potatoes into four classes according to SNI 01-3175-1992 based on the weight that was converted into potato diameter, and then it was used for determining the roller distance of the grader machine. Performance test indicated that the machine capacity was 1800 kg/hour with less than 8% of grading error and less than 1% of potato damage (bruise). Manual grading needs 25 persons/day/ha, Rp 27500,- /person/day, with average of potato yield of 15 tons/ha, manual grading cost was 46,-/kg, whereas by potato grader with capacity of 1800 kg/hour, grading cost was Rp 26,-/kg, it reduced grading cost down to 43% lower than manual grading cost.

Keywords: /Potato/ /Grading/

Singh, Fateh, V.K. Katiyar, B.P. Singh. 2014. Analytical study of turgor pressure in apple and **potato** tissues. Postharvest Biol. & Technol. 89: 44 – 48.

Abstract

Mechanical injuries are the main cause of damage (such as bruising) and loss of quality of fruit and vegetables, occurring mainly from mechanical forces during compression, vibration and impact loads. Apples and potatoes are susceptible to external and internal pressures, which causes bruising and

fracture in soft tissues. The study of turgor pressure and the compressive stiffness of apple and potato tissues is essential to understand their fracture strength against external and internal pressures. In the present study, a generalized form of a strain energy function is proposed, and a relation between turgor pressure and stretch ratio is developed by considering its appropriate form. It is considered that the tissues are isotropic, incompressible, homogeneous, and show hyperelastic behavior. The Levenberg–Marquardt algorithm was used for regression analysis to calibrate the material constants by correlating predicted and experimental values of turgor pressure and stretch ratio for apple and potato tissues. A good fit of the developed relation to experimental data was obtained with the coefficients of determination of 98.02% for apple and 98.0% for potato.

Keywords: /Potato/ /Apple/

VEGETABLES

BROCCOLI

Calabrese, N. and A. Carito. 2013. Agronomical evaluation of **broccoli** raab genotypes for fresh cut and processing products. Acta Hort. 1005: 361 – 368.

Abstract

Broccoli raab (*Brassica rapa* L.) also called turnip top or rapini, is widely cultivated in central and southern Italy; the edible portion is composed of the green immature inflorescences (heads) and the tender stems with its most young leaves. In the last years the interest of the consumers to this vegetable is rising; moreover, a substantial increase of consumption could come from processed (frozen) or fresh-cut products (FCP), that offer to consumers convenience, high nutritional value and flavour, while still maintaining their freshness. This paper provides information on the suitability of different genotypes of broccoli raab to obtain frozen and fresh-cut products. Two year open field trials were carried out on six genotypes of broccoli raab: 'Locale di Bari', 'Molfettese', 'Centoventina', 'Pasqualina', 'Fasanese' and 'Quarantina'. Total yield, biometric traits and colour measurements were determined on broccoli raab plants at each harvest. To prepare FCP, young stems, heads, leaves and secondary cuts were selected trimmed, washed and drained. Panel tests were arranged on the FCP to evaluate organoleptic attributes; the results were graphically represented by sensorial profiles. Biomass production varied from 45 t ha⁻¹ observed for 'Pasqualina' to 26 t ha⁻¹ for 'Quarantina', whereas the highest percentage of the portion useful for processing resulted for 'Quarantina' (69%) and the lowest for 'Centoventina' and 'Pasqualina' (30% on mean). The width of main heads reached 9 cm for 'Pasqualina' and was 4.2 cm for 'Locale di Bari', 'Molfettese' and 'Quarantina'. High number of side cuts (13), was recorded by 'Fasanese' and 'Pasqualina'. The results seem to show good perspectives to obtain fresh cut and processed products of good quality by broccoli raab.

Keywords: /Broccoli/ /Fresh-cut/ /Quality/

Conversa, G., et. al. 2013. Changes in biochemical and qualitative properties in fresh-cut **broccoli** genotypes during storage. Acta Hort. 1005: 641 – 647.

Abstract

Content of bioactive compounds in broccoli head varies with genotype, environmental, agronomical, processing, and postharvest conditions. A study was planned to characterize and evaluate

changes in fresh (FW) and dry (DW) weight, in antioxidant capacity (AC) and total phenolics (TP) content, in fresh-cut processed florets in seven broccoli cultivars after 7 (T7), 14 (T14), and 21 (T21) days of storage at 5°C in OPP packaging. Heads were harvested in early spring from a commercial farm located in Foggia province (southern Italy). Results indicate that at harvest cultivars cv1, cv2, cv3, cv4, cv5, and cv6 showed the highest floret DW content, followed by cv7. Postharvest storage was stopped on day 14 for cv1, cv2, cv3 and cv4, because of strong off-odors produced. At T14, floret DW concentration decreased much more in cv4 than in cv7. Fresh weight loss (WL) was negligible, however cv5 and cv7 showed the lowest values. The main component of total weight loss during storage was the respiratory component being not significant that connected with transpiration. Differences in AC and TP content were detected in raw material. Compared with T0 AC decreased at T7 and increased at T14, particularly in cv1 and cv2. After 7 days of storage TP content was unchanged (except cv3 and cv6), while at T14 increased (except in cv7). No relationship seems to exist between AC and TP, whereas it is possible to suppose that the higher the initial AC the longer the shelf life of fresh-cut florets.

Keywords: /Broccoli/ /Fresh Cut/ /Quality/ /Postharvest/

CAULIFLOWER

Candido, V., et. al. 2013. Quality traits of some **cauliflower** cultivars grown in the “valle dell’ ofanto” area (Italy) as affected by post-harvest storage. *Acta Hort.* 1005: 405 – 410.

Abstract

Some quality characteristics of the “Valle dell’Ofanto” cauliflower, that has been recently appointed the certification of collective brand, were investigated at Gaudio (41°03’N; 15°42’E, Southern Italy, Basilicata Region). Six white head cauliflower cultivars, characterized by a different length of the crop cycle (2 early, 2 medium and 2 late), were studied. The above cultivars were transplanted in open field at the middle of August 2004 and harvested from the middle of October 2004 to the end of March 2005. At harvest time, yield traits and head sizes of cauliflowers were measured. Among the qualitative traits, color, weight loss, total soluble solids, nitrate and vitamin C content were assessed on the fresh florets and after a storage period lasting 15 days at 0°C and 95% R.H. The “Valle dell’Ofanto” cauliflower was characterized by a high content in sugars and vitamin C, even if significant differences in some qualitative parameters (e.g., vitamin C and nitrate content) were affected by cultivars and crop cycle length. On the other hand, the storage at controlled temperature and R.H. did not substantially change the qualitative characteristics of the heads, but caused only a slight increase of dry matter and soluble solids levels, especially in those cultivars more susceptible to weight loss.

Keywords: /Cauliflower/ /Storage/ /Postharvest/

Licciardello, F., et. al. 2013. Evaluation of some quality parameters of minimally processed white and violet-pigmented **cauliflower** curds. *Acta Hort.* 1005: 301 – 308.

Abstract

The impact of minimal processing on the shelf life of White and Violet-pigmented cauliflowers packaged in two different films was evaluated during refrigerated storage. White cauliflower was characterized by a weight loss around 8% after 5 days of storage in the perforated film, while the Violet-

pigmented exceeded 22%. Packaging in the permeable film was effective at reducing the weight loss for both varieties to about 0.3%. The colorimetric analysis on racemes from both varieties did not reveal significant differences during storage, while important changes were observed on the cut surfaces of the White cultivar. Packaging in the permeable film allowed cauliflower, irrespective of the variety, to reach a steady-state O₂ level ranging from 11 to 13% and a CO₂ level of 8.5% after 72 hours. Although the initial mesophilic bacteria counts in both cultivars were high, all the analyzed samples were in compliance with the recommended microbial limits of total plate counts (8 log cfu/g). Count values for molds and yeasts reached the limit values (5 log cfu/g) after a few days of storage, especially for the White-type packaged in the perforated film, while a different behaviour was shown by *Enterobacteriaceae*, which evidenced a higher load throughout the considered storage period in samples packaged in the permeable film. The use of a non-perforated, permeable packaging determines a suitable atmosphere, limiting moisture loss. Violet cauliflower is more suitable for minimal processing due to a higher color stability on the cut surface area, however, microbial quality of raw materials represents a crucial aspect for the shelf life extension.

Keywords: /Cauliflower/ /Microbiological Quality/ /Browning/

Miceli, A., F. Vetrano and C. Romano. 2013. Effect of hot air treatment on minimally processed cauliflower. Acta Hort. 1005: 309 – 314.

Abstract

The request of minimally processed vegetable is continuously increasing, and there is a growing interest for new fresh cut products. Cauliflower, as other cabbages, is highly appreciated for its nutritional value due to the good content of vitamins, antioxidants and anti-carcinogenic compounds. It is suitable to be used as a minimally processed vegetable, but harvesting and the following processing can cause a severe stress determining the appearance of accelerated senescence symptoms. The aim of the present work was to investigate the effect of hot air treatment and cold storage on minimally processed green cauliflower. Fresh-cut cauliflower florets put in sealed PE bags were treated at 48°C for 180 min and then stored at 4°C for 21 days. During the storage period, weight loss, colour, firmness, soluble solids, titratable acidity and overall quality were evaluated. Non treated fresh-cut cauliflower maintained soluble solid content, good firmness and showed low weight loss, but marketability was limited to 14 days, mainly due to the browning occurring in the cut zones. The hot air treatment increased weight loss during storage, but strongly reduced colour changes of minimally processed cauliflower. This lead to prolonged shelf life up to 3 weeks.

Keywords: /Cauliflower/ /Fresh-cut/ /Cold Storage/ /Browning/

Setiasih, I.S., R. Kastaman and D. Musaddad. 2013. The effect of packaging and storage temperatures on the shelf-life of minimally processed cauliflowers. Acta Hort. 1011: 363 – 368.

Abstract

Minimal processing is one of the promising technology inventions to anticipate social dynamic of the vegetable consumers in meeting their needs for fast, simple, and safe food. However the wound caused by minimally processed can speed up the damage in vegetables. The objectives of this study were to find out the effect of packaging and storage temperatures on the shelf-life of minimally processed cauliflower (MPC). The experiment used a split plot design with three replications. The main

plot consisted of four storage temperatures levels, i.e., 0, 5, 10°C, and ambient temperature (21±2°C). The sub-plot consisted of three types of packaging, i.e., polyethylene (PE) film without perforation, PE film with perforation of 1% and control without packaging. Determination of the cauliflower shelf-life was based on the critical of L value (78.51). The results showed that the perforated PE packaging film produced MPC with 1.5-3 times longer shelf-life than the other treatments for all levels of storage temperature. Lower storage temperature made the shelf-life of the cauliflower longer. The longest shelf-life of MPC was provided by the perforated PE packaging film and storage temperature of 0°C in 54.22 days, while the shortest one (1.84 days) was performed by the PE film without perforations stored at the ambient temperature.

Keywords: /Cauliflower/ /Minimally Processed/ /Packaging Storage/ /Temperature/ /Shelf-life/

ONION

Srilaong, V., et. al. 2013. The effect of temperature on the quality of japanese bunching onion (*Allium fistulosum* L. 'Kujyo'). Acta Hort. 1011: 119 – 124.

Abstract

The Japanese bunching onion (*Allium fistulosum* L. 'Kujyo') is a highly perishable crop. Japanese bunching onions have a relatively short shelf life in terms of external appearance. After harvesting, Japanese bunching onion leaf tips become yellow, rendering them unacceptable for consumption. This study evaluated the effect of temperature (4 and 25°C) on physiological changes in the Japanese bunching onion. Hue angle value of bunching onions stored at 25°C rapidly declined while it remained unchanged in onions at 4°C. The L value of leaves stored at 25°C was higher than those stored at 4°C. As expected, postharvest color change of bunching onions was correlated with chlorophyll degradation. Chlorophyll *a*, chlorophyll *b* and total chlorophyll contents of Japanese bunching onions sharply decreased in leaves stored at 25°C compared with 4°C. These results indicated that low temperatures delayed yellowing of bunching onion leaves as a consequence of delay in chlorophyll breakdown during storage. Interestingly, we observed chlorophyll and its derivatives in vacuoles of bunching onions. This suggested that degradation of chlorophyll in bunching onions occurred in both chloroplasts and vacuoles.

Keywords: /Onion/ /Storage/ /Quality/

RADISH

Xiao, Zhenlei, et.al. 2014. Postharvest quality and shelf life of radish microgreens as impacted by storage temperature, packaging film, and chlorine wash treatment. LWT – Food Sci. & Technol. 55: 551 – 558.

Abstract

Microgreens are new and emerging products, which are young seedlings of vegetables and herbs. A recent study showed that microgreens contain higher nutrients compared to their mature counterparts. However, they typically have a short shelf life (1e2 days) at ambient temperature. The objective of this study was to optimize postharvest handling conditions to reduce the quality loss and extend the shelf life of daikon radish (*Raphanus sativus* L. var. longipinnatus) microgreens. Storage

temperature, packaging film, and wash treatment were investigated. Changes in headspace composition, quality index, chlorophyll concentration, tissue electrolyte leakage, and aerobic mesophilic bacteria (AMB) and yeast & mold (Y&M) counts were monitored periodically during storage. Results indicated that (1) storage temperature significantly ($P < 0.05$) affected package atmosphere, product quality and shelf life. One degree Celsius was the optimal temperature for storage of radish microgreens with no chilling injury observed; (2) film oxygen transmission rate (OTR) significantly ($P < 0.05$) affected O₂ and CO₂ composition, but OTR did not significantly affect quality attributes during 28 days of storage at 1 °C; (3) Chlorine wash treatment (100 mg/L) significantly reduced initial microbial populations by 0.5 log cfu g⁻¹, including AMB and Y& M. However, microbial populations rebounded after day 7.

Keywords: /Radish/ /Postharvest/ /Quality/ /Shelf life/ /Packaging Film/

TOMATO

Jiaping Chen, et.al. 2014. Combination effect of chitosan and methyl jasmonate on controlling *Alternaria alternata* and enhancing activity of cherry **tomato** fruit defense mechanisms. *Crop Prot.* 56 : 31 – 36.

Abstract

The effect of chitosan treatment alone or in combination with methyl jasmonate (MeJA) against *Alternaria alternata* in vitro and in vivo, and defense related enzyme activities were investigated. 100e500 ml/l MeJA significantly inhibited mycelial growth of *A. alternata*. The inhibitory activity of MeJA on mycelia growth, spore production, spore germination and germ tube length of *A. alternata* in vitro could be enhanced by 0.1% chitosan. The combination of 0.1% chitosan and 500 ml/l methyl jasmonate was more effective to reduce the disease incidence and lesion diameter of postharvest decay of cherry tomato than the application of MeJA or chitosan alone. The combined treatments resulted in higher activities of PPO (polyphenol oxidase), POD (peroxidase) and PAL (phenylalanine ammonialyase) than the control. This work indicated that the combination of chitosan and methyl jasmonate is a promising method to control postharvest decays of fruit and vegetables.

Keywords: /Cherry Tomato/ /Methyl Jasmonate/ /Chitosan/ /Postharvest decay/ /*Alternaria Alternata*

Santoso, F. and V.A. Rahmat. 2013. Safety and quality assurance of **tomato** using *Aloe vera* edible coating. *Acta Hort.* 1011: 133 – 140.

Abstract

This study assessed the application of *Aloe vera* as edible coating for tomato. The effectiveness of two coating solutions made from fresh *A. vera* gel and spraydried *A. vera* powder was compared. Evaluations were performed for organoleptic quality, physicochemical characteristics and microbiological assays. Organoleptic test showed that the application of coating was acceptable. Noteworthy was the finding at day 15 which demonstrated higher freshness score for edible coated tomatoes compared to non-coated samples. The fresh gel coated tomatoes could maintain their texture firmness, as well as reduce their weight loss. The microbiological assays revealed that gel solution made of fresh *Aloe vera* was proven to inhibit the growth of microorganism. Nevertheless, this finding had negative correlation with pH and total soluble solids. In conclusion, edible coating solution prepared

from fresh *Aloe vera* gel was confirmed to be more effective in assuring the safety and quality of fresh vegetables compared to the gel prepared from spray dried powder. This opens the possibility of application of *Aloe vera* as natural and safe edible coating for tomatoes by major industries and more important by the small and middle scale industry.

Keywords: /Tomato/ /Edible Coating/ /Aloe Vera Gel/