

SELECTIVE DISSEMINATION OF INFORMATION
As of July 2019

AFRICAN NIGHTSHADE (*Solanum scabrum*)

Kirigia, D., Winkelmann, T., Kasili, R., & Mibus, H. (2019). Nutritional composition in African nightshade (*Solanum scabrum*) influenced by harvesting methods, age and storage conditions. *Postharvest Biology and Technology*, 153, 142–151. doi: 10.1016/j.postharvbio.2019.03.019

Abstract

African indigenous vegetables have a great potential in improving livelihood, offering sustainable food security and solving the malnutrition crisis in sub-Saharan Africa (SSA). African nightshade (*Solanum scabrum*) is one of such indigenous vegetables, highly appreciated for its nutritive and pharmacological benefits. The vegetable is rich in antioxidative compounds, vitamins, carbohydrates, carotenoids, folic acid, minerals and amino acids. However, the optimal nutritional benefits of nightshade are influenced by pre-harvest physiological maturity, postharvest storage conditions and harvesting methods. We analyzed the dynamics of phytonutrients in nightshade grown under Kenyan field conditions, harvested using different methods and at different developmental stages, 30, 60, 90 and 120 d after planting (dap) and storing them at 5 °C and room temperature (RT). Harvesting by uprooting and cutting offered higher yields, but had the lowest nutrients retained after 4 d storage at RT, while picking single leaves (continuous method) had lower yields but higher nutrients retained. The total carbohydrates (glucose, fructose, sucrose and starch) and chlorophyll were highest in concentration at 60 dap (136.3 ± 2.9 g kg⁻¹ and 5.8 ± 0.3 g kg⁻¹ dry weight (DW) respectively). Gallic acid equivalent phenolics (GAE), catechin equivalent flavonoids (CAE), trolox equivalent antioxidants (TEA) and total carotenoids were highest in concentrations at 90 dap with 12.6 ± 1.0 g kg⁻¹, 24.1 ± 1.6 g kg⁻¹, 108.8 ± 6.0 g kg⁻¹ and 1.01 ± 0.04 g kg⁻¹ DW respectively. The mineral elements mainly remained stable during development apart from iron which was highest at 30 dap (1.3 ± 0.5 g kg⁻¹), zinc was highest at 120 dap (62.1 ± 4.4 mg kg⁻¹) and calcium was highest at 90 dap (24.3 ± 0.7 g kg⁻¹ DW). A significant decline of phytonutrients was evidenced after 2 d storage at RT. At cold storage (5 °C), there was no significant decline on most of the phytonutrients, at least up to 4 d. Results in this study highlights the importance of maturity stages and low storage temperature for optimal nutrients and postharvest quality management of African nightshades.

Keywords: /African Nightshade/ /Postharvest/ /Physiological Maturity/ /Nutrients/ /Storage/

APPLE

Codron, J.M., DeMaria, F., Drogué, S., Le Gal, P.Y., Lubello, P., Pavez, I., Pissonnier, S., Scandella, D. and Vernin, X. (2019). Management of sanitary and phytosanitary risks in the apple value chain: the Sustain' Apple project. *Acta Hort.* 1242, 295-302 DOI: 10.17660/ActaHortic.2019.1242.41 <https://doi.org/10.17660/ActaHortic.2019.1242.41>

Abstract

In France, apples are the leading fruit in terms of both consumption and exports. The value chain is under high surveillance from a sanitary and phytosanitary (SPS) standpoint due to national and European regulations, private residue standards, phytosanitary barriers in certain emerging countries and the sometimes critical perceptions of consumers. The French ANR-funded Sustain' Apple project, the initial findings of which are presented in this paper aims to shed light on the organizational and institutional solutions that may be implemented at all stages of the national value chains (short and long chains) and at the international level with a focus on certain crucial players (China, Chile, Italy). Priority has been

given to improving the sustainability of the organizational and institutional solutions because while they are tightly interlinked with technical solutions, they have yet to receive much attention in the academic and empirical literature. Sustain' Apple also evaluates the impact of certain organizational and institutional solutions on consumer perceptions of the sanitary risk, international trade and environment. The consortium brings together all the capabilities necessary to address these sustainable apple chain issues, with INRA, CIRAD, IRSTEA and Montpellier Supagro involved on the research side examining the following scientific disciplines: organization and institutional economics, international economics, consumer economics, strategic management, international law, agronomy, landscape ecology and life cycle assessments. On the expertise side, the main contributions come from CTIFL on supermarkets, consumers, postharvest technologies and production systems, from GRAB on short organic chains and from ANPP on a detailed and global understanding of the apple production and export industry.

Keywords: /Apple/ /Sanitary/ /Phyto-sanitary/ /Sustain' Apple/

Lv, Y., Tahir, I. I., & Olsson, M. E. (2019). Effect of ozone application on bioactive compounds of apple fruit during short-term cold storage. *Scientia Horticulturae*, 253, 49–60. doi: 10.1016/j.scienta.2019.04.021

Abstract

Recently, ozone has been used to decrease postharvest disease in different fruits. The effects of different pre-storage ozone treatments combined with cold storage on concentrations of triterpenes, phenolic compounds as well as quality attributes in two apple cultivars, 'Amorosa' and 'Santana', were investigated. The results showed that overall the changes caused by ozone treatment were within the range of fluctuations normally occurring in untreated apples during storage. Ursolic acid concentration in the apple peel of both cultivars was not affected by any ozone treatment, while oleanolic acid showed cultivar-specific changes. After one month of storage, the concentration of total phenols in the peel of both cultivars were decreased 11 to 16% by gaseous ozone as well as ozonated water treatment, mainly due to decreased total flavonol concentration; while no differences were found in the concentration of total phenols in the apple flesh by ozone treatments. Procyanidin B2 and (-)-epicatechin were only detectable in 'Amorosa' but not in 'Santana'.

Keywords: /Apple/ /Triterpenes/ /Phenolic Compounds/ /Ozone Treatment/ /Storage/

Karagöz, Ş., & Demirdöven, A. (2019). Effect of chitosan coatings with and without *Stevia rebaudiana* and modified atmosphere packaging on quality of cold stored fresh-cut apples. *Lwt*, 108, 332–337. doi: 10.1016/j.lwt.2019.03.040

Abstract

In this study, it was aimed to investigate the changes in polyphenoloxidase (PPO) activity, antioxidant properties and microbiological quality of fresh-cut apple slices coated with chitosan and stevia combinations under MAP (polypropylene-PP, 30 µm) storage at +1 °C for 3 days. The apples were cube-shaped and divided into three samples: i-Control (C, without coating), ii-Chitosan (CH, dipped into film mixture consisting of 0.75% chitosan, 1.5% glycerol and 2% ascorbic acid) and iii-Chitosan-Stevia combination (CHS, same CH film contains 2.5% stevia extract). PPO activity and microbiological (total yeast & mold-TYM and total psychrophilic aerobic bacteria-TPAB, total mesophilic aerobic bacteria-TMAB), total phenolic, antioxidant capacity, O₂-CO₂% and pH analyzes were performed. Results showed that PPO activity, O₂-CO₂% and pH values were lower, antioxidant substances were higher than C sample. At the end of the storage, CHS samples showed high PPO activity and antioxidant capacity values compared to CH. TMAB was found in C sample but it was under detectable limit (<2) during storage in CH and CHS samples; TPAB was found under detectable limit (<2) in all samples.

Additionally, the chitosan and stevia have reduced the TYM counts. As conclusion; CH and CHS edible films are effective applications for reducing PPO activity and microbial load.

Keywords: /*Stevia rebaudiana*/ /Chitosan/ /Edible Film/ /MAP/ /Apple/

Yuri, J. A., Moggia, C., Sepulveda, A., Poblete-Echeverría, C., Valdés-Gómez, H., & Torres, C. A. (2019). Effect of cultivar, rootstock, and growing conditions on fruit maturity and postharvest quality as part of a six-year apple trial in Chile. *Scientia Horticulturae*, 253, 70–79. doi: 10.1016/j.scienta.2019.04.020

Abstract

Fruit export is an important economic activity for Chile. Therefore, high productivity and quality fruit is a must in order to succeed in the business. A 6-year project was carried out to assess apple cultivars ('Galaxy', 'Brookfield@Gala', 'Super Chief', 'Fuji Raku Raku', 'Braeburn', 'Granny Smith', and 'Cripps Pink') and rootstock's (M.M.106 and M.9 EMLA) performance across different Chilean apple-growing areas (Graneros, San Clemente, Chillan, Angol, and Temuco). Fruit maturity (firmness, soluble solids, starch degradation, internal ethylene concentration, and skin color) pre-and-postharvest was assessed weekly starting one-month prior harvest and monthly postharvest during years 4, 5, and 6 of the trial. Physiological disorders were also evaluated monthly for 6 months in RA (0-10C, >95% RH) storage. Based on bioclimatic variables, growing sites showed a clear distribution pattern on all principal component analyses, and it was more relevant than the growing season. In general, red skin color of most cultivars increased in sites towards the south of the country (cooler), regardless of the rootstock. Overall fruit firmness increased towards the southern sites in some cultivars, although not always statistically different. The highest softening rates pre-harvest were observed in 'Galaxy' and 'Brookfield@Gala'. In 'Galaxy', the lowest softening rate was observed in Temuco (coolest site). 'Brookfield@Gala' and 'Galaxy' apples grown in warmer sites (San Clemente and Angol) showed a sharper increase in internal ethylene concentration (IEC) than cooler sites (Temuco and Chillan) earlier in the season. Fruit quality and condition postharvest is also discussed.

Keywords: /Ethylene/ /Apple Condition/ /Apple Rootstock/ /Apple Cultivar/ /Rosaceae/ /Apple Breeding/

ARTICHOKE

Pisanu, A.B., Baghino, L., Sanna, D. and Scano, E.A. (2019). EMAP technique application to obtain minimally processed eighths and slices fresh cut of 'Spinoso Sardo' globe artichoke. *Acta Hort.* 1242, 267-274 DOI: 10.17660/ActaHortic.2019.1242.37 <https://doi.org/10.17660/ActaHortic.2019.1242.37>

Abstract

The artichoke is characterized by a high respiration rate even higher when processed into eighths or slices. The EMAP technique allows controlling the concentration of O₂ and CO₂ at equilibrium inside a package of the fresh produce, increasing the shelf life. Several reports showed that the use of MAP and EMAP to obtain minimally processed whole artichokes are in progress as well as the attempts to apply the same technique to packaged eighths and slices. The aim of this research is to determine the required gas transmission rates of the sealing film for eighths and slices fresh cut artichokes by using a gas mixture composed by 5% O₂, 5% CO₂ and N₂ balance. The artichokes are subjected to cut off the upper thorns and to pull out of the harder lateral bracts, followed by sanitizing treatment in chlorinated water. Subsequently the artichokes are processed to obtain eighths and slices, placed in chlorinated water, washed in tap water, dipped in anti-browning solution and dried by means of a centrifuge. Finally, the different products are packaged using polypropylene food trays (800 mL) wrapped with PP films of know

gas permeability (O_2 TR=3.000-13.000 mL m⁻² 24 h⁻¹ atm⁻¹). The film features have been identified through respiration rate tests carried out by using the static and permeable methods. To calculate the respiration rate, the gas composition inside the packages was measured daily until an equilibrium atmosphere was reached. Evaluation of the designed packages was carried out for packages with different combinations of net weights (120 and 150 g) and chilled storage conditions (1°C passive refrigeration and 6°C conventional refrigeration). The microbiological shelf life of the products up to 10 days was assessed. All the samples stored at 6°C in conventional refrigeration conditions showed redness coloration on the products surface due to oxidation phenomena of the exposed plant tissues. The longer shelf life was obtained by using a film with lower permeability to oxygen, stored at 1°C in passive refrigeration conditions.

Keywords: /Equilibrium Modified Atmosphere/ /Globe Artichoke/ /Shelf-life/ /Minimally Processed Vegetable/ /Passive Refrigeration/

BAMBOO SHOOTS

Zheng, J., Li, S., Xu, Y., & Zheng, X. (2019). Effect of oxalic acid on edible quality of bamboo shoots (*Phyllostachys prominens*) without sheaths during cold storage. *Lwt*, 109, 194–200. doi: 10.1016/j.lwt.2019.04.014

Abstract

The effect of oxalic acid on the edible quality of postharvest bamboo shoots during storage at 6 ± 1 °C for 20 days was investigated to better understand the mechanism of quality improvement. Shoots were placed in cold storage after being removed from their sheaths and soaked in a 10 mmol/L oxalic acid solution for 10 min. The results showed that oxalic acid treatment enhanced membrane integrity, reduced respiration along with decreasing losses of total sugar content and weight, decreased disease incidence, inhibited enzymatic browning, and retarded the lignification process in bamboo shoots during cold storage. These characteristics collectively contribute to maintenance of the edible quality of bamboo shoots. It was suggested that application of oxalic acid might also be a promising method for quality control of bamboo shoots postharvest.

Keywords: /Bamboo Shoot/ /Edible Quality/ /Enzymatic Browning/ /Lignification/ /Oxalic Acid/

Li, D., Limwachiranon, J., Li, L., Zhang, L., Xu, Y., Fu, M., & Luo, Z. (2019). Hydrogen peroxide accelerated the lignification process of bamboo shoots by activating the phenylpropanoid pathway and programmed cell death in postharvest storage. *Postharvest Biology and Technology*, 153, 79–86. doi: 10.1016/j.postharvbio.2019.03.012

Abstract

Lignification is a typical characteristic of senescence of bamboo shoots during postharvest storage. In this study, exogenous hydrogen peroxide (H₂O₂) and diphenyliodonium iodide (DPI) were applied to postharvest bamboo shoots to explore the regulation of H₂O₂ in the lignification process. Bamboo shoots, soaked in 10 mM H₂O₂ or 5 mM DPI for 10 min, were stored at 20 ± 1 °C for 12 d. H₂O₂ treatment accelerated the accumulation of endogenous H₂O₂ by activating NADPH oxidase, while DPI treatment inhibited NADPH oxidase activity, leading to the decrease of endogenous H₂O₂. After 12 d of storage, the firmness and lignin content in H₂O₂-treated shoots was 4.79% and 5.14% higher, respectively, than in the control shoots. However, DPI treatment showed the opposite effects, with 10.88% less firmness and 19.23% less lignin content observed as compared with the control group. High level of endogenous H₂O₂ activated the activities of PAL, C₄H and 4CL, thus promoting lignin biosynthesis. Also, H₂O₂ upregulated DNase, RNase and caspase 3-like activities, leading to the acceleration of the programmed

cell death process, which finally contributed to the resulting lignification. Transmission electron microscopy further revealed thickened cell walls and the decompartmentalization of cellular structure in H₂O₂-treated shoots. Our results indicated that endogenous H₂O₂ may play a vital role in the lignification process of bamboo shoots.

Keywords: /Bamboo Shoots/ /Hydrogen Peroxide/ /Lignification/ /Phenylpropanoid Pathway/ /Programmed Cell Death/

BANANA

Hao, J., Li, X., Xu, G., Huo, Y., & Yang, H. (2019). Exogenous progesterone treatment alleviates chilling injury in postharvest banana fruit associated with induction of alternative oxidase and antioxidant defense. *Food Chemistry*, 286, 329–337. doi: 10.1016/j.foodchem.2019.02.027

Abstract

The effects of exogenous progesterone (PROG) on chilling injury (CI) in postharvest banana fruit were investigated. Concentration screening tests showed that 10–5 mol/l PROG was most effective in reducing CI in banana fruit stored for 25 d at 5 ± 1 °C, but did not markedly increase PROG content of pulps. This PROG treatment significantly reduced the electrolyte leakage, levels of malondialdehyde, O₂•⁻-production rate and H₂O₂ contents in banana compared with control fruit. The PROG treatment caused an early induction of alternative oxidase (AOX) at the transcript and protein level to reduce the generation of O₂•⁻ and H₂O₂. PROG treatment also enhanced the transcript levels and activities of antioxidant enzymes and maintained higher levels of reduced glutathione and ascorbic acid than the control fruit. These results suggested that PROG attenuating CI in banana fruit may be attributed to the induction of AOX and the improvement of enzyme and non-enzymatic antioxidant defenses.

Keywords: /Progesterone/ /Banana Fruit/ /Chilling Injury/ /Alternative Oxidase/ /Antioxidative Enzymes/ /Reactive Oxygen Species/

Al-Qurashi, A. D., & Awad, M. A. (2019). Postharvest gibberellic acid, 6-benzylaminopurine and calcium chloride dipping affect quality, antioxidant compounds, radical scavenging capacity and enzymes activities of ‘Grand Nain’ bananas during shelf life. *Scientia Horticulturae*, 253, 187–194. doi: 10.1016/j.scienta.2019.04.044

Abstract

Effects of GA₃ (150 and 300 mg L⁻¹), 6-benzylaminopurine (BAP, 50 and 100 mg L⁻¹) or CaCl₂ (2 and 4%) dipping on quality and biochemical changes of ‘Grand Nain’ bananas were studied during 8 days of shelf life (SL) at 20 ± 2 °C and 60–70% RH. Weight loss increased during SL to 9.9% but was not affected by treatments. Firmness and membrane stability index (MSI) decreased during SL and were higher in treated fruit than control. Total soluble solids (TSS)/titratable acidity (TA) ratio increased during SL and was lower in treated fruit than control. GA₃ at 150 mg L⁻¹ retained more peel green, darker and less yellow color than control and reduced peel browning that was more apparent after 8 days of SL. However, BAP at 50 mg L⁻¹ retained more peel green color than control only during the first 3 days of SL with little or no effect for CaCl₂. Total phenol and flavonoid content in both peel and pulp fluctuated during SL and were higher in treated fruit than control. Vitamin C content decreased during SL and was lower in treated fruit than control. Radical scavenging capacity (RSC) of peel decreased during SL and was higher in treatments than control. While, RSC of pulp decreased, in most treatments, during SL and was higher in all treatments only after 3 days of SL. In both peel and pulp, polygalacturonase (PG), xylanase and α-amylase activities increased with fluctuation during SL and were lower in most treatments than control. Polyphenoloxidase (PPO) activity increased during SL and was lower in treated fruit than control. While,

peroxidase (POD) activity increased during SL and was higher in most treatments than control especially after 5 and 8 days of SL. In conclusion, postharvest dipping in either 150 mg L⁻¹ GA3, 50 mg L⁻¹ BAP or 2% CaCl₂ retarded ripening and retained quality of 'Grand Nain' bananas during SL. However, GA3 was more effective in reducing peel browning and retaining green color than other treatments including control.

Keywords: /Banana/ /Growth Regulators/ /CaCl₂/ /Ripening/ /Quality/ /Antioxidant/

BLACKBERRY

Edgley, M., Close, D. C., & Measham, P. F. (2019). Effects of climatic conditions during harvest and handling on the postharvest expression of red drupelet reversion in blackberries. *Scientia Horticulturae*, 253, 399–404. doi: 10.1016/j.scienta.2019.04.052

Abstract

Red drupelet reversion (RDR) causes individual drupelets on blackberries to revert from black at harvest to a red colour postharvest, reducing the quality and marketability of fruit. The objective of this trial was to assess the effects of time of harvest and associated climatic variables, as well as handling of fruit during harvest, on postharvest RDR expression and fruit quality. Fruit were harvested on ten occasions over two days by one of two methods: either hand-harvested into shallow buckets and transferred to industry standard 125 g clamshell punnets (standard practice) or harvested carefully without handling by cutting the pedicel and placing each fruit into individual cotton wool-lined trays. The number of partially red (PR) and fully red (FR) drupelets per fruit was counted, firmness was measured by compression, and skin firmness measured by a penetrometer. Air and fruit skin temperature, relative humidity, vapour pressure deficit, and soil water tension were all influenced by the time of day. 85% of fruit that was handled during harvest had at least one drupelet develop RDR, whilst only 6% of fruit not handled during harvest had any RDR. In handled fruit, warmer skin temperature at harvest was associated with increased RDR incidence and severity ($P < 0.001$). The skin firmness of fully black (FB) drupelets, measured by a penetrometer, also decreased significantly by an average of 0.56 N when harvested during warmer temperatures compared to fruit that was not handled. The data indicate that mechanical injury incurred during harvest is a major cause of RDR in fresh blackberries, and that harvest times associated with warmer temperatures result in significantly higher rates of RDR and reduced postharvest quality.

Keywords: /Postharvest Quality/ /Firmness/ /Reddening/ /Temperature/ /Bruising/

BLUEBERRY

Vintilă, M., Veringă, D., Bogoescu, M. and Sorică, C. (2019). Research on freezing behaviour of 'Augusta' and 'Simultan' blueberry fruits grown in Romania. *Acta Hort.* 1242, 779-784 DOI: 10.17660/ActaHortic.2019.1242.116 <https://doi.org/10.17660/ActaHortic.2019.1242.116>

Abstract

Preserving fruits and vegetables by freezing is one of the most important methods of keeping their quality, for a long period of time. In this research, various ways of the freezing behaviour of Augusta and Simultan blueberry cultivars were examined. Freezing systems used were a classical freezer, cooler, fast freezing tunnel and an experimental model (equipment) for fast freezing in a nitrogen atmosphere designed by INMA. Experiments were focused on sensory quality, and nutritional value of frozen fruits and changes in texture, taste and biochemical components namely vitamin C. In the same time a number of factors such as freezing time and rate, which have direct influence on the final quality of the frozen product have been followed and determined. The results confirmed that blueberry fruit lends itself to preservation by freezing

and that a quick-freezing process is recommended. Simultan presented better features compared to Augusta. The presented results allow establishing the freezing methods easy to use in Romania rural areas, within family farms whose technical equipment is deficient.

Keywords: /Cooler/ /Freezing Rate/ /Fast Freezing/ /Nitrogen/

CITRUS

Lin, Y., Fan, L., Xia, X., Wang, Z., Yin, Y., Cheng, Y., & Li, Z. (2019). Melatonin decreases resistance to postharvest green mold on citrus fruit by scavenging defense-related reactive oxygen species. *Postharvest Biology and Technology*, 153, 21–30. doi: 10.1016/j.postharvbio.2019.03.016

Abstract

Melatonin, an important and conserved indoleamine compound, is involved in many plant physiological functions. Postharvest diseases caused by fungal pathogens lead to huge economic losses worldwide, but nothing is currently known about the role of melatonin in fruit resistance to postharvest diseases. Here, we report on the effect of exogenous melatonin treatment of citrus fruit to postharvest green mold caused by *Penicillium digitatum* (*Pd*). Melatonin had no obvious effect on *Pd* germination and growth, but melatonin treatment of citrus fruit significantly promoted disease phenotype of green mold. In addition, the content and associated enzyme activity of hydrogen peroxide (H₂O₂) in citrus fruit was induced by *Pd* infection and H₂O₂ treatment of citrus fruit decreased disease phenotype of green mold. H₂O₂ content and associated enzyme activity in citrus fruit was declined after melatonin treatment. Transcriptome analysis identified a lot of differentially expressed genes from citrus upon melatonin treatment, which are mainly involved in cell wall, reactive oxygen species metabolism and plant defense. Our results indicate that melatonin decreases resistance to green mold on citrus fruit by scavenging defense-related reactive oxygen species, which provides significant insights into melatonin function in fruit resistance and also molecular mechanisms of fruit resistance to postharvest diseases.

Keywords: /Melatonin/ /Citrus/ /Fruit Resistance/ /Postharvest Disease/ /*Penicillium digitatum*/ /Reactive Oxygen Species/

FICUS

Lama, K., Modi, A., Peer, R., Izhaki, Y., & Flaishman, M. A. (2019). On-tree ABA application synchronizes fruit ripening and maintains keeping quality of figs (*Ficus carica* L.). *Scientia Horticulturae*, 253, 405–411. doi: 10.1016/j.scienta.2019.04.063

Abstract

Fresh fig ripening is controlled by abscisic acid (ABA) and ethylene. Uniform fig maturation is stimulated with oil or spray application of ethephon. Fig ripening is asynchronous—a single fruit ripens per shoot at a time—making it a challenge to increase the number of harvested fruit and minimize harvesting costs for growers. Here, we sprayed various concentrations of exogenous ABA on clusters with 3–5 mature fruit of 'Brown Turkey' (summer crop) and 'Autumn Honey' (autumn crop) figs under Israeli climatic conditions to identify suitable ABA concentration and fruit size, and analyze fruit ripening and postharvest qualities. Among the ABA concentrations tested in 2 consecutive years, application of 2.27 mM ABA to 'Brown Turkey' figs with pinkish ostioles that were 35–40 mm in diameter, and 2.84 mM ABA to 'Autumn Honey' figs that were 37–41 mm diameter, in clusters of 3–5 fruit per branch, resulted in uniform early onset of ripening followed by significantly increased fruit size and weight, and lower firmness compared to controls. During storage of ABA-treated 50% ripened fig fruit, weight, diameter, firmness, acidity and soluble solid contents were not significantly different from their respective controls for either cultivar.

Thus, normalized concentrations of exogenous ABA could be sprayed on clusters of fruit of the selected size to increase the yield of fresh figs up to fivefold, reducing harvesting costs and accommodating market demand with no adverse effect during commercial storage.

Keywords: /Fig Fruit/ /Abscisic Acid (ABA)/ /Fruit Development/ /Storage/

GRAPE

Wang, L., Luo, Z., Li, J., Yang, M., Yan, J., Lu, H., ... Li, L. (2019). Morphological and quality characterization of grape berry and rachis in response to postharvest 1-methylcyclopropene and elevated oxygen and carbon dioxide atmospheres. *Postharvest Biology and Technology*, 153, 107–117. doi: 10.1016/j.postharvbio.2019.04.001

Abstract

This research studied the morphological characterization and quality attributes of 'Kyoho' and 'Yongyou NO.1' (*Vitis vinifera* L. × *Vitis labrusca* L.) grape berry and rachis in response to postharvest treatment with 1-methylcyclopropene (1-MCP) alone or in combination with elevated 80% O₂ (H-O₂) / 20% CO₂ (H-CO₂). Results indicated that the integrated application of exogenous 1-MCP alone and combined with H-O₂/H-CO₂ significantly prevented the rachis browning and chlorophyll degradation, maintained the cellular microstructure integrity and promoted esters and terpenes synthesis. Additionally, the transcriptional expression of genes involved in ethylene biosynthesis was sharply downregulated by 1-MCP treatment in both cultivar rachis and berries. And genes expression related to softening was also downregulated by 1-MCP alone and plus elevated O₂/CO₂ atmospheres treatment. Particularly, the combinatorial treatment of 1-MCP and H-O₂ effectively impeded berry abscission and alcohols accumulation; whereas 1-MCP with H-CO₂ treatment maintained the membrane permeability in berries. Nevertheless, 1-MCP alone or in combination with elevated atmospheres did not significantly affect total soluble solids and titratable acidity and did not harm sensory quality in both 'Kyoho' and 'Yongyou NO.1' cultivars after 32 days of storage.

Keywords: /1-Methylcyclopropene/ /Elevated O₂/CO₂ Atmosphere/ /Berry/ /Rachis/ /Gene Expression/

Zhou, X., Tan, J., Gou, Y., Liao, Y., Xu, F., Li, G., ... Chen, Z. (2019). The biocontrol of postharvest decay of table grape by the application of kombucha during cold storage. *Scientia Horticulturae*, 253, 134–139. doi: 10.1016/j.scienta.2019.04.025

Abstract

Grapes are susceptible to fungal infection and decay after harvest. The objective of this study was to investigate the effects of kombucha on postharvest fresh-keeping in table grape (*Vitis vinifera* cv. Fujiminori). Here, we studied the effects of kombucha on the fruit quality and antioxidant system of grape at 4 °C storage. The fruits of grape were dipped into water or kombucha for 15 min and then stored at 4 °C. The physical parameters of fruits, such as the good fruit rate, fruit hardness, contents of soluble solid, ascorbic acid (Vit C) and malodialdehyde (MDA), and activities of the antioxidant enzymes were measured during storage. The application of kombucha reduced deterioration of table fruit during cold storage. The kombucha treatment also delayed the decrease in fruit hardness, soluble solid and Vit C contents, and inhibited the MDA accumulation in grape during storage. Furthermore, fruit treated with kombucha showed significantly higher activities of polyphenol oxidase, peroxidase, catalase and superoxide dismutase with a significantly lower MDA accumulation at the late stage of storage compared the control. Our findings suggested that kombucha application was useful in inhibiting postharvest decay of table grape fruit and appeared to have potential for commercial application to store table grape at cold storage.

Keywords: /Table Grape/ /Kombucha/ /Fruit Quality/ /Decay/ /Cold Storage/ /Antioxidant Enzyme/

GRAPEFRUIT

Wang, F., Deng, J., Jiao, J., Lu, Y., Yang, L., & Shi, Z. (2019). The combined effects of Carboxymethyl chitosan and *Cryptococcus laurentii* treatment on postharvest blue mold caused by *Penicillium italicum* in grapefruit fruit. Scientia Horticulturae, 253, 35–41. doi: 10.1016/j.scienta.2019.04.031

Abstract

The blue mold caused by *Penicillium italicum* in grapefruit fruit was controlled by the antifungal activities of Carboxymethyl chitosan (CMCS) alone and combined with *Cryptococcus laurentii* treatments in this study. According to the study results spore germination of *P. italicum* can be inhibited by both CMSC and *C. laurentii* treatment. Moreover, the growth of *C. laurentii* can be maintained by low CMCS concentration in vitro. The blue mold in grapefruit fruit inoculated with *P. italicum* was decreased in all treatments compared with the control fruit. The combination of CMSC and *C. laurentii* treatment resulted in a significantly synergistic effects in smallest lesion diameter and decay incidence. The defense enzyme activities, such as phenylalanine ammonia-lyase, polyphenol oxidase, peroxidase and antifungal compounds like total phenolic related to disease resistance can be induced by combined treatment. Furthermore, the commercial quality parameters of the CMCS combined with *C. laurentii* treatment which were measured by ascorbic acid, titratable acidity, weight loss and total soluble solid, were better than those treated with treatments alone. According to the results, the combination of CMSC and *C. laurentii* treatment can maintain fruit quality and control postharvest decay more effectively than single treatment, and can be commercially used in grapefruit fruit.

Keywords: /Carboxymethyl Chitosan/ /*Cryptococcus laurentii*/ /Blue Mold/ /Grapefruit Fruit/ /Biological Control/

KIWI

Prencipe, S., Nari, L., Vittone, G., Gullino, M.L., Garibaldi, A. and Spadaro, D. (2019). Postharvest quality and health of kiwifruit 'Hayward' affected by *Pseudomonas syringae* pv. *actinidiae*. Acta Hort. 1243, 91-96 DOI: 10.17660/ActaHortic.2019.1243.15 <https://doi.org/10.17660/ActaHortic.2019.1243.15>

Abstract

Pseudomonas syringae pv. *actinidiae* (*Psa*) is the causal agent of bacterial canker of kiwifruit. The presence of *Psa* could affect the postharvest quality and health of fruit, which depends on the physiological state of the fruits and the techniques used for storage. In order to evaluate the effects of the presence of the pathogen on postharvest quality, the fruits from 12 orchards of *Actinidia deliciosa* 'Hayward', affected or not by *Psa*, were examined. Firmness, total soluble sugar (TSS), titratable acidity (TA) and postharvest rots were measured in different storage conditions, such as normal and controlled atmosphere, at three time points: at harvest, after 90 days storage, and in shelf life (after 120 days storage). The experiments were performed for two years. A further pre-storage treatment with 1-MCP was applied to evaluate the effects on fruit quality and storage. Significant differences between healthy and diseased samples were found for all the parameters analyzed. Fruits coming from diseased orchards showed lower firmness and TA values and higher TSS compared to healthy fruits. The fruits from diseased plants were much more susceptible to *Botrytis* rot. The results confirmed that the presence of *Psa* in orchards is associated to lower shelf life of kiwifruits and higher incidence of postharvest rots.

Keywords: /Psa/ /Fruit Quality/ /Botrytis Rot/ /'Hayward'/ /Controlled Atmosphere/ /1-MCP/

Lu, Z., Wang, X., Cao, M., Li, Y., Su, J., & Gao, H. (2019). Effect of 24-epibrassinolide on sugar metabolism and delaying postharvest senescence of kiwifruit during ambient storage. *Scientia Horticulturae*, 253, 1–7. doi: 10.1016/j.scienta.2019.04.028

Abstract

Effect of 5 μ M 24-epibrassinolide (EBR) on delaying the senescence of 'Huayou' kiwifruit and possible defense mechanisms were elucidated during ambient storage. Results revealed that EBR treatment retarded decrease in firmness as well as increase in weight loss and total soluble solid content in kiwifruit. EBR treatment prevented the increase of membrane permeability and suppressed the accumulation of malondialdehyde. EBR treatment postponed the degradation of starch to soluble sugars, resulting from the inactivation of amylase activity. EBR treatment also inhibited the activity of acid invertase, neutral invertase, sucrose phosphate synthase, sucrose synthase, hexokinase and fructokinase, and subsequently EBR-treated fruit exhibited the lower contents of sucrose, glucose and fructose. These results suggest that EBR treatment could be an innovative solution to delay the senescence of kiwifruit by regulating sugar metabolism.

Keywords: /24-Epibrassinolide/ /Sugar Metabolism/ /Kiwifruit/ /Postharvest Senescence/

LAMB'S LETTUCE

Decombel, A., Jacobs, B., Lommel, J. V., Vandeveld, I., Verlinden, B., & Bleyaert, P. (2019). Impact of cooling temperature and wrapping on storage quality of lamb's lettuce (*Valerianella locusta* L.). *Acta Horticulturae*, (1242), 153–156. doi: 10.17660/actahortic.2019.1242.21

Abstract

Lamb's lettuce (*Valerianella locusta* L.) is occasionally stored by the growers before delivering to the vegetable auctions in anticipation of better prices. The aim of this experiment was to optimize the storage methods that can be used at the level of the grower. Plants from commercial growers were stored at 1 and 4°C. Half of the storage boxes at each temperature were wrapped in shrink-film. At 5, 7, 14 and 21 days after storage the plant quality was determined by a panel of experts. Withering of the plants was higher without wrapping. Wrapping combined with higher temperatures reduced withering but favoured leaf rot. However, the plants that were wrapped and stored at 1°C still met the requirements of the retail after 21 days. Withholding the wrapping application until plant temperature has reached the temperature set point could optimize the storage quality because the wrapping slows down the cooling process. Nevertheless, storage by the grower beyond two weeks is not advised. Yellowing of the leaves becomes an issue and as this process accelerates with higher temperatures, problems could occur further down the distribution chain.

Keywords: /Quality/ /Growers/ /Withering/ /Yellowing/ /Rot/

LOQUAT

Öz, T., Kafkas, E. and Eker, T. (2019). Effects of active modified atmosphere packaging with argon and nitrogen on postharvest quality of loquat. *Acta Hortic.* 1242, 335-342 DOI: 10.17660/ActaHortic.2019.1242.47 <https://doi.org/10.17660/ActaHortic.2019.1242.47>

Abstract

The effects of active modified atmosphere packaging (MAP) with four different gas compositions (12% O₂ + 3% CO₂ + 85% Ar), (12% O₂ + 3% CO₂ + 85% N), (15% O₂ + 5% CO₂ + 80% Ar), (15% O₂ + 5% CO₂ + 80% N) and control (air) on the postharvest quality and shelf life of Ottawianni loquats fruits were assessed. To monitor effects of active MAP with high percent of argon and nitrogen gases on loquats fruits, fruit skin colour (L*, a*, b*, C) values, total soluble solids (TSS), titratable acidity (TA), pH, total phenolic content (TPC), total flavonoid content (TFC), skin browning and percentage of O₂/CO₂ changes were evaluated each 0, 4, 8, 16, 24 and 30 days of storage at 5°C with a relative humidity of 90%. Results indicated that argon-treated fruits had higher TPC and TFC contents. However, nitrogen application kept fruit skin browning percentage lower compared to other treatments. The present findings show that active MAP storage including different headspace gas concentrations were found to be effective in maintaining the postharvest quality of Ottawianni loquats fruits for 30 days of storage.

Keywords: /Active MAP/ /Loquat/ /Postharvest/ /Quality/ /Browning/ /Argon/ /Nitrogen/

Hadjipieri, M., Gavriel, K., Sismanidis, G. and Manganaris, G.A. (2019). The effect of modified atmosphere packaging on postharvest performance of two loquat cultivars. *Acta Hortic.* 1242, 729-734 DOI: 10.17660/ActaHortic.2019.1242.108 <https://doi.org/10.17660/ActaHortic.2019.1242.108>

Abstract

Loquat (*Eriobotrya japonica* (Thunb.) Lindl.) is the only fruit tree crop in the Mediterranean zone with ripening period during early spring, particularly when specific pre-harvest practices are applied such as cultivation under plastic cover. Loquat fruit is characterised by its refreshing taste and it is highly appreciated by consumers. However, loquat fruit is characterised by relatively short storage potential partially due to senescence and/or chilling related disorders. The aim of the current study was the evaluation of Xtend® packaging as a means of modified atmosphere packaging (MAP) on postharvest performance of fruit from the main loquat cultivars grown in Cyprus, namely Karantoki and Morphitiki. Fruit were subjected to cold storage in conventional refrigerator (4°C) for 3 weeks and subsequently allowed at room temperature for 0, 2, 4 and 7 days, respectively. For each treatment, 30 fruits were used to determine weight loss, peel colour differentiations (CIEL*, a*, b*), flesh firmness (Texture analyser, Stable Micro Systems), soluble solids content (SSC) and titratable acidity (TA). Morphitiki presented better phenotypic appearance compared to Karantoki after extended storage, mainly due to reduced weight loss. Application of MAP significantly reduced weight loss after removal from cold storage. However, extended maintenance at room temperature (4 and 7 days) deteriorated the performance of both cultivars. As a technological perspective of the current study, data suggest that Morphitiki fruit subjected to MAP can be refrigerated up to 3 weeks, provided they are consumed within two days after removal from storage.

Keywords: /*Eriobotrya japonica*/ /Cold Storage/ /Weight Loss/ /Soluble Solids Content/ /Titratable Acidity/ /Chilling/

MANGO

Shao, Y.Z. (2019). Effects of pre-harvest and post-harvest applications of gibberellin (GA3) on appearance quality of 'Guifei' mangoes. Acta Hortic. 1244, 83-92 DOI: 10.17660/ActaHortic.2019.1244.14 <https://doi.org/10.17660/ActaHortic.2019.1244.14>

Abstract

The effects of pre-harvest and post-harvest applications of gibberellin (GA3) at different concentrations of 0.0, 0.5, 1.0, 2.0 and 3.0 g L⁻¹ on appearance quality of Guifei mango were investigated. The results showed that: (1) When application with GA3 during pre-harvest, lower GA3 treatments could delay the change of a* value, inhibit degradation of chlorophyll and the accumulation of carotenoid and anthocyanin, and decrease the activities of chlorophyllase (Chlase) and chalcone isomerase (CHI). However, higher concentration (>1.0 g L⁻¹) treatment could result in incomplete change in peel color until ripening. (2) When application with GA3 during post-harvest, the degradation of chlorophyll, the synthesis of anthocyanin and carotenoid, and the change of peel color were retarded greatly by GA3 treatment. Thus, the higher concentration (>2.0 g L⁻¹) could make mangoes not turning color completely at the end of storage period. Therefore, it is suggested that unsuitable GA3 concentration applied during pre-harvest (>1.0 g L⁻¹) or post-harvest (>2.0 g L⁻¹) had a negative influence on the appearance quality of Guifei mangos.

Keywords: /Gibberellin/ /'Guifei' Mango/ /Appearance Quality/ /Peel Color/ /Pigment/ /Enzyme Activity/

Khan, A.S., Ali, J., Ali, S., Rehman, R.N.U., Rajwana, I.A. and Amin, M. (2019). Physico-chemical quality evaluation of commercial mango cultivars of Punjab, Pakistan during fruit ripening. Acta Hortic. 1244, 167-174 DOI: 10.17660/ActaHortic.2019.1244.25 <https://doi.org/10.17660/ActaHortic.2019.1244.25>

Abstract

Mango fruit quality at ripe stage significantly influences the consumers acceptance. Present study evaluated changes in fruit quality during ripening. Fruit physical (weight loss, ethylene production and respiration rate) and biochemical [soluble solids contents (SSC), titratable acidity (TA), ascorbic acid, sugars, antioxidants, carotenoids and phenolics] quality attributes of commercial mango cultivars were studied. Minimum weight loss (6.68%) was noted in White Chaunsa and maximum (22.30%) was found in Malda on ripening day-9. Respiration rates of the mango cultivars were ranged from 0.5 to 9.4 mmol CO₂ kg⁻¹ h⁻¹ from day-1 to day-9 of the fruit ripening period. Mango fruit Rataul No. 12 had maximum rate of respiration (9.4 mmol CO₂ kg⁻¹ h⁻¹); whereas, highest ethylene production was found in Malda mango fruit (0.70 mmol C₂H₄ kg⁻¹ h⁻¹). At day-9 during ripening, White Chaunsa exhibited maximum SSC (24.43 Brix°); whereas, minimum SSC (12.63 Brix°) was found in Dusehri. Total sugars were found maximum in Kala Chaunsa (27.39%) at ripening day-9 while, maximum ascorbic acid (399.57 mg 100 g⁻¹ FW) and total antioxidants (7.3 mM Trolox g⁻¹ FW) were observed in Langra at ripening day-5 and day-1. Minimum total carotenoids (0.02 mg 100 g⁻¹) were found in Rataul No. 12 at ripening day-1; whereas, Anwar Rataul showed maximum (1.98 mg 100 g⁻¹ FW) carotenoids at day-3. In case of total phenolics, Langra had maximum phenolic contents (145.5 mg 100 g⁻¹ FW) and Anwar Rataul has minimum (68.43 mg 100 g⁻¹ FW). Overall, Samar Bahisht Chaunsa, Langra, Kala Chaunsa and White Chaunsa excelled in physico-chemical attributes with maximum eating quality after 7 days of ripening.

Keywords: /Fruit Ripening/ /Mango/ /Physico-Chemical Attributes/ /Quality Evaluation/

Kumpoun, W., Uthaibutra, J. and Raveeyan, P. (2019). Application of pH indicator labelling for monitoring the quality of mango 'Nam Dok Mai See Thong' in modified atmosphere packaging. Acta Hortic. 1244, 175-180 DOI: 10.17660/ActaHortic.2019.1244.26 <https://doi.org/10.17660/ActaHortic.2019.1244.26>

Abstract

Fresh fruit storage is very important for the exporter in order to keep the fruit in good quality. Modified atmosphere packaging is one of the useful methods but it can cause fruit fermentation, abnormal ripening and off flavours. The application of the pH indicator label for monitoring 'Nam Dok Mai See Thong' mango fruit in modified atmosphere packaging was investigated. 'Nam Dok Mai See Thong' mango fruit, sized 300-400 g, were packed individually in a zip locked polypropylene bag with 4, 6, 8 and 10 holes (0.5 mm diameter hole-1). The pH indicator label for monitoring quality was applied in all bags. All fruit was stored at 11°C for 3 days (mimicking transportation time). The fruits were removed and allowed to ripen at 25°C. Changes of the label colour were observed and gas condition in the package and the quality of mango fruit was determined. The results found that the mango fruit in packages where the indicator label colour did not change colour, showed normal ripening. The fruit in packages that had the indicator label where the colour changed, displayed fermentation and high concentrations of carbon dioxide and ethanol. By increasing the number of holes the abnormal ripening could be prevented. The results indicate that the use of pH indicator labels, combined with the modified atmosphere packaging, were able to indicate and inform the seller to open the package in order to prevent the fruit from abnormal ripening. Moreover, 85% of consumers accepted packaging with indicator labels.

Keywords: /Modified Atmosphere Package/ /Indicator Label/ /Storage/ /Mango/

Oliveira, M.B., Sales, R.P., Pereira, M.C.T., Mouco, M.A.C., Ferreira, J.D., Cano, R.N., Kondo, M.K., Santos, I.P., Martins, R.S. and Pegoraro, R.F. (2019). Maturation and quality of 'Palmer' and 'Espada Vermelha' mango fruits in the Brazilian semi-arid. Acta Hortic. 1244, 237-244 DOI: 10.17660/ActaHortic.2019.1244.35 <https://doi.org/10.17660/ActaHortic.2019.1244.35>

Abstract

Brazil, the seventh largest producer of mango in the world, has the semi-arid region as the main producer in the country. The northern part of the state of Minas Gerais produces fruit with great regularity throughout the year, especially in off-season periods, thanks to the technology of floral induction. The objective of this work was to evaluate the effect of formulations that alter the physiological and nutritional condition of the plants in the management of maturation and quality of Palmer and Espada Vermelha mango fruits. An experiment was conducted with two cultivars, Palmer and Espada Vermelha, using a randomized complete block design with nine treatments consisting of four products (HOLD®, SCO®, MOVER® and FRC®) in two (30 and 10 days before harvest) or three applications (30, 20 and 10 days before harvest), plus one control. The evaluations focused on the time to physiological maturity and yield and quality of fruits. HOLD® and SCO® were efficient in delaying the physiological maturity of the fruits, delaying the harvest by 21 days in the Espada Vermelha mango tree and 33 days in Palmer mango tree. MOVER® and FRC® anticipated harvesting the Espada Vermelha mango (harvested ripe) in a week and were not efficient for the Palmer mango (harvested green). MOVER®, HOLD® and SCO® increased the color of the peel (intense red) and maintained longer the firmness of the fruit in the post-harvest. FRC® was not effective in maintaining the quality characteristics of fruit (red color, soluble solids and firmness) at post-harvest of Espada Vermelha mango. HOLD® and MOVER® promoted increases in fruit weight, which allowed higher yields by 4 and 2.7 t ha⁻¹, respectively, in the Palmer cultivar.

Keywords: /Soluble Solids/ /Firmness/ /Fruit Mass/ /Yield/ /*Mangifera indica* L/

Nordey, T., Davrieux, F., & Léchaudel, M. (2019). Predictions of fruit shelf life and quality after ripening: Are quality traits measured at harvest reliable indicators? *Postharvest Biology and Technology*, 153, 52–60. doi: 10.1016/j.postharvbio.2019.03.011

Abstract

Nondestructive methods such as near infrared spectroscopy (NIRS) are increasingly used in sorting lines to assess quality traits of unripe fruit, i.e. dry matter (DM) and total soluble solid (TSS) contents, in order to create homogenous batches of fruit. The use of this approach is based on the assumption that fruit quality traits at harvest are reliable indicators of their postharvest behavior and their quality after ripening. The present study tested this assumption by analyzing the relationships between quality traits at harvest and after ripening. In parallel, models were developed to determine the capacity of NIRS measurements on unripe fruit at harvest to predict their shelf life and quality after ripening. The quality traits DM, TSS content, pulp color (PC) and titratable acidity (TA) of 92 mangoes from different harvests, production years, and orchards were compared at harvest and after ripening. Previously developed NIRS models were used to nondestructively assess the quality traits of the mangoes at harvest. New partial least squares (PLS) regressions using different variable selection procedures and preprocessing techniques were used to predict fruit shelf life and fruit quality after ripening based on NIRS measurements at harvest. Weak relationships ($r^2 < 0.41$) were found between fruit quality traits measured at harvest and after ripening, except for DM content ($r^2 = 0.61$). The PC of mango measured at harvest was found to be the best indicator of fruit shelf life. Errors of PLS regressions to predict the TSS content (RMSEV = 1.1%), titratable acidity (RMSEV = 0.52%), and the Hue angle of the flesh (RMSEV = 1.86°) were in the same range as those of linear regressions based on quality traits assessed at harvest except for PC. This work provides evidence that fruit maturity and quality should be assessed using different indicators.

Keywords: /*Mangifera indica*/ /Near-Infrared Spectroscopy/ /Non-Destructive Prediction/ /Eating Quality/ /PLSR/

MUSHROOM

Huang, Q., Qian, X., Jiang, T., & Zheng, X. (2019). Effect of chitosan and guar gum based composite edible coating on quality of mushroom (*Lentinus edodes*) during postharvest storage. *Scientia Horticulturae*, 253, 382–389. doi: 10.1016/j.scienta.2019.04.062

Abstract

The effect of chitosan (CH) (1%) along with guar gum (GG) (5, 15, and 25%) on the quality of shiitake mushroom (*Lentinus edodes*) stored at 4 ± 1 °C for 16 days was investigated. The results indicated that shiitake mushroom coated with CH 1% + GG 15% maintained higher tissue firmness, and slowed the rate of declines in soluble protein and ascorbic acid, as well as increases in total soluble solids, reducing sugar, malondialdehyde (MDA), and electrolyte leakage. Similarly, the effect of CH 1% + GG 15% coating in improving the overall quality of shiitake mushroom was identified through sensory evaluation. Moreover, the result of transmission electron microscopy (TEM) showed that subcellular elements could be scarcely observed in uncoated mushrooms at the end of storage, and destructive symptoms in shiitake mushroom were significantly mitigated by the CH 1% + GG 15% coating. Thus, it was suggested that the CH 1% + GG 15% coating might be used commercially for maintaining the quality of shiitake mushroom during long-term storage.

Keywords: /Chitosan/ /Coating/ /Cold Storage/ /Guar Gum/ /Quality/ /Shiitake Mushroom/

PEARS

Sakaldas, M., Gundogdu, M.A. and Gur, E. (2019). The effects of preharvest 1-methylcyclopropene (Harvista) treatments on harvest maturity of 'Santa Maria' pear cultivar. Acta Hort. 1242, 287-294 DOI: 10.17660/ActaHortic.2019.1242.40 <https://doi.org/10.17660/ActaHortic.2019.1242.40>

Abstract

In this research, the effects of preharvest 1-methylcyclopropene (1-MCP) (Harvista) treatments on fruit drop, harvest maturity due to fruit quality parameters and shelf life of Santa Maria pear cultivar were studied. For this purpose, Harvista treatments at doses of 50, 100, 150 and 200 g ha⁻¹ were applied to Santa Maria pear cultivar with the comparison of naphthalene acetic acid in Çanakkale, Biga region, Turkey. Samplings were carried out on trees 1 day before and 7, 14, 28 and 42 days after applications, respectively. Fruit drop rate, flesh firmness, soluble solids content, starch degradation, titratable acidity, skin colour, and total phenolic compounds were evaluated after each sampling date. Furthermore, fruits were kept at 20-22°C temperature and 50-60% relative humidity conditions as shelf life for 7 and 14 days to determine the ethylene production. According to the results, Harvista applications with 150 and 200 g ha⁻¹ doses were found as the most positive applications because of preventing fruit drop and minimizing the changes of quality parameters. Harvest maturity could be prolonged for 28 days with these application doses. Harvista could be a good alternative for enlarging the harvest period on Santa Maria pears.

Keywords: /'Santa Maria' Pear/ /1-MCP/ /Application Dose/ /Fruit Drop/ /Quality Parameters/ /Ethylene Production/

POTATO

Karanisa, T., Alexopoulos, A.A., Akoumianakis, K.A., Karapanos, I.C. and Passam, H.C. (2019). Effect of surface coating with waxes on the dormancy of potato tubers grown from true potato seed (TPS). Acta Hort. 1242, 711-718 DOI: 10.17660/ActaHortic.2019.1242.105 <https://doi.org/10.17660/ActaHortic.2019.1242.105>

Abstract

The control of dormancy is of great importance for the long-term storage of potato tubers. The effect of tuber coating with two waxes (paraffin wax and the edible wax Teycer, based on shellac and oxidised polyethylene) on the dormancy, weight loss, respiration and soluble sugars (glucose, fructose, sucrose) content of tubers grown from true potato seed (IP88008) was studied, using untreated tubers as controls. Tubers were stored for 120 days after treatment (DAT) in the dark at three different temperatures (5, 15, 20°C) and 80±5% R.H. Paraffin wax and Teycer did not affect tuber dormancy at 5°C. In comparison with the controls, paraffin-treated tubers had a lower number of sprouted buds after the 42nd (15°C) and the 35th (20°C) DAT, lower weight loss (5, 15°C) and lower respiration rate up to the 15th (5°C) and the 5th (15, 20°C) DAT. However, they presented higher weight loss at 20°C and a higher respiration rate after the 25th and 10th DAT at 15 and 20°C, respectively. In contrast, Teycer increased tuber sprouting after the 7th (20°C) and the 21st (15°C) DAT, as well as tuber weight loss at 5°C, but it had no effect on tuber weight loss at 15 and 20°C. In addition, Teycer caused tuber rotting (18-32%) at all storage temperatures. Teycer-treated tubers had lower respiration rates than the controls from 5 to 15 DAT (5°C) and up to the 10th (15°C) and the 5th (20°C) DAT. However, respiration was higher than the controls after the 40th (5°C) and the 50th (15, 20°C) DAT. In comparison with the control, fructose, glucose and sucrose content was higher in both paraffin-treated and Teycer-treated tubers at all storage temperatures. These findings suggest that paraffin wax effectively controls tuber dormancy at 15°C, whereas the application of Teycer is not satisfactory for the control of tuber dormancy.

Keywords: /Edible Wax/ /Fructose/ /Glucose/ /Paraffin/ /Respiration/ /*Solanum tuberosum*/ /Sucrose/

SAPODILLA

Khaliq, G., Ramzan, M., & Baloch, A. H. (2019). Effect of Aloe vera gel coating enriched with *Fagonia indica* plant extract on physicochemical and antioxidant activity of sapodilla fruit during postharvest storage. *Food Chemistry*, 286, 346–353. doi: 10.1016/j.foodchem.2019.01.135

Abstract

The effect of *Aloe vera* (AV) gel (at 50% or 100%) alone or enriched with *Fagonia indica*(FI) plant extract at 1% on physiological and biochemical responses of sapodilla fruit were studied during storage at 20 °C for 12 days. Sapodilla fruit treated with AV 100% and FI 1% significantly reduced weight loss, decay incidence, soluble solids concentration, and kept a high level of firmness and titratable acidity compared to the untreated fruit. FI 1% added to AV 50% or AV 100% efficiently maintained higher ascorbic acid, total flavonoids, total phenolics and radical scavenging activity of sapodilla fruit. The panelists did not detect any negative effect of AV gel and FI plant extract on the sensory attributes of sapodilla fruit. Therefore, the addition of FI plant extract to AV gel coating could be a promising approach to prolong the shelf life and preserve the quality of sapodilla fruit during storage.

Keywords: /Sapodilla/ /*Aloe vera*/ /*Fagonia indica*/ /Quality Attributes/ /Flavonoids/ /Antioxidant Activity/

STRAWBERRY

Li, D., Zhang, X., Li, L., Aghdam, M.S., Wei, X., Liu, J., Xu, Y., Luo, Z. (2019). Elevated CO₂ delayed the chlorophyll degradation and anthocyanin accumulation in postharvest strawberry fruit. *Food Chemistry*. 285, 163-170 doi: 10.1016/j.foodchem.2019.01.150

Abstract

Colour is an important quality attribute for the consumer's acceptability of fruit. Elevated CO₂ was applied to strawberry fruit to explore its influence on chlorophyll catabolism and anthocyanin synthesis. The results showed that 20% CO₂ delayed the changes of a* and b* values in strawberry fruit. The degradation of chlorophyll was delayed in CO₂ treated fruit by inhibiting the activities of chlorophyllase and down-regulating the expression of *FaChl b reductase*, *FaPAO* and *FaRCCR*. In addition, lower concentration of anthocyanins and lower activity of PAL, C4H, 4CL and CHS were recorded under the effect of 20% CO₂. Meanwhile, qRT-PCR analysis showed that 13 genes involved in the phenylpropanoid pathway and the flavonoid biosynthesis pathway were also down-regulated under CO₂ stress. However, no residual effect on pigment metabolism was observed when elevated CO₂ was removed. Our study provided new insights into the regulation of elevated CO₂ in the role of pigment metabolism in postharvest.

Keywords: /Elevated CO₂/ /Strawberry Fruit/ /Chlorophyll Catabolism/ /Anthocyanin Synthesis/

SWEET CHERRIES

Ma, Y., Fu, L., Hussain, Z., Huang, D., & Zhu, S. (2019). Enhancement of storability and antioxidant systems of sweet cherry fruit by nitric oxide-releasing chitosan nanoparticles (GSNO-CS NPs). *Food Chemistry*, 285, 10–21. doi: 10.1016/j.foodchem.2019.01.156

Abstract

Sweet cherries rapidly depreciate in market value owing to decay and the quick loss of fruit quality after harvest. Therefore, optimum postharvest treatment is crucial for maintaining the qualities of cherries during storage. Here, we tested a new method of postharvest treatment by immersing sweet cherries in nitric oxide-releasing chitosan nanoparticles (GSNO-CS NPs), storing them at 0 °C and evaluating fruit quality over time. The results indicated that GSNO-CS NPs more effectively preserved the quality of cherries during cold storage compared to other methods. Specifically, GSNO-CS NPs reduced fruit weight loss, respiration rate and ethylene production and increased soluble solids content. Additionally, GSNO-CS NPs reduced reactive oxygen species, increased antioxidant enzyme activity in direct and indirect antioxidant systems, and increased the levels of ascorbic acid and reduced glutathione. Overall, the results suggest that treatment with GSNO-CS NPs can effectively preserve the quality of cherries and enhance antioxidant capacity during cold storage.

Keywords: /Sweet Cherry/ /Quality/ /GSNO-CS NPs/ /Antioxidant System/

Cozzolino, R., Martignetti, A., Cefola, M., Pace, B., Capotorto, I., Giulio, B. D., ... Pellicano, M. (2019). Volatile metabolites, quality and sensory parameters of “Ferrovia” sweet cherry cold stored in air or packed in high CO₂ modified atmospheres. *Food Chemistry*, 286, 659–668. doi: 10.1016/j.foodchem.2019.02.022

Abstract

Volatile organic compounds, quality and sensory attributes of sweet cherry cv “Ferrovia”, cold packaged in Air or in different modified atmospheres (Low-O₂ = 1% O₂/0.03% CO₂; High-CO₂ = 16% O₂/20% CO₂; Mix = 1% O₂/20% CO₂), were monitored until 21 days of conservation. Results showed that sweet cherry cv “Ferrovia” is sensitive to CO₂ accumulation (over 20%) in low oxygen (about 1%) modified atmosphere, as showed by the increase in respiration rate, biosynthesis of fermentative volatile metabolites, and sensory perception of off-odours. However, High-CO₂ treatment seemed to preserve quality and sensory traits, presumably due to the high initial concentration of O₂ (16%) that could limit the synthesis of ethyl esters and γ -butyrolactone, keeping the accumulation of off-flavours below their sensory perception threshold. Finally, PLSR analysis allowed to select 1-pentanol as putative marker of sensory alteration and hexanal and 2-hexenal as possible predictors of freshness for “Ferrovia” sweet cherries.

Keywords: /Sweet Cherry cv “Ferrovia”/ /Volatile Organic Compounds/ /Respiration Activity/ /Sensory Analysis/ /PCA/ /PLSR/

CHERRY TOMATO

Madureira, J., Severino, A., Cojocar, M., Garofalide, S., Santos, P., Carolino, M., ... Verde, S. C. (2019). E-beam treatment to guarantee the safety and quality of cherry tomatoes. *Innovative Food Science & Emerging Technologies*, 55, 57–65. doi: 10.1016/j.ifset.2019.05.013

Abstract

The aim of this study was to evaluate the effects of electron beam treatment on microbiological parameters and bioactive content of cherry tomatoes in order to assess the feasibility of irradiation as a post-harvest treatment for this fruit. E-beam inactivation studies of natural cherry tomatoes microbiota and inoculated potential foodborne pathogens (*Salmonella enterica*; *Escherichia coli* and *Listeria monocytogenes*) were performed before and after irradiation and at a storage time of 14 days at 4 °C. A 4 log reduction on mesophilic bacterial population, and no detection of filamentous fungi and foodborne inoculated pathogens was achieved after e-beam treatment at 3.6 kGy and storage. Regarding the effects on bioactive content, the achieved data suggested that an e-beam treatment at 3 kGy could preserve the lycopene content and the antioxidant activity of cherry tomatoes extracts, but the storage time is a determinant factor on its bioactivity. Moreover, the results indicated an antiproliferative effect on human lung cancer cells of lycopene extracts from irradiated and stored cherry tomatoes and no cytotoxicity on human non-cancer cells. Overall the results of this comprehensive study support the feasibility of e-beam irradiation as post-harvest treatment of cherry tomatoes.

Keywords: /Cherry Tomatoes/ /E-beam/ /Food Irradiation/ /Food Safety/ /Antioxidant Activity/ /Lycopene Content/ /Antiproliferative Activity/

TOMATO

Kong, J., Zhang, Y., Ju, J., Xie, Y., Guo, Y., Cheng, Y., ... Yao, W. (2019). Antifungal effects of thymol and salicylic acid on cell membrane and mitochondria of *Rhizopus stolonifer* and their application in postharvest preservation of tomatoes. *Food Chemistry*, 285, 380–388. doi: 10.1016/j.foodchem.2019.01.099

Abstract

This study investigated the effects of the simultaneous application of thymol and salicylic acid (SIMTSA) on the target sites of *Rhizopus stolonifer*, as well as the defence enzymes of postharvest tomato, when applied as edible coating. SIMTSA induced the changes of ultrastructure and membrane integrity of *R. stolonifer*. When the concentrations of the fungistat increased, cells stained with propidium iodide and leakage of 260/280 nm-absorbing materials increased while ergosterol synthesis decreased, suggesting damage of cell membrane. Furthermore, SIMTSA treatment significantly reduced the citric acid content and the activities of enzymes related to the tricarboxylic acid cycle, and increased the mitochondrial membrane potential and reactive oxygen species, indicating damage of mitochondrial-related functions. Moreover, SIMTSA edible coating increased the defence enzyme activities in tomato. Based on the results, SIMTSA can be used as a potential preservation method for tomato as it showed a targeted effect on the cell membrane and mitochondria of *R. stolonifer*.

Keywords: /Thymol/ /Salicylic acid/ /*Rhizopus stolonifer*/ /Cell Membrane/ /Mitochondria/ /Defence Enzymes/

Suthar, R. G., Barrera, J. I., Judge, J., Brecht, J. K., Pelletier, W., & Muneeppeerakul, R. (2019). Modeling postharvest loss and water and energy use in Florida tomato operations. *Postharvest Biology and Technology*, 153, 61–68. doi: 10.1016/j.postharvbio.2019.03.004

Abstract

With a growing worldwide population, feeding 10 billion people by the year 2050 is the next global challenge. Fresh produce systems account for a significant fraction of total food and resource consumption due to their perishable nature, with postharvest quality being a key challenge. Production models for fresh produce are widely used and well adapted, whereas postharvest operations (PO) models have only recently been developed. The overarching goal is to quantify interactions of food quality, water and energy use in PO. In this study, an existing PO model was enhanced and implemented for a field grown tomato operation in Florida. Model estimates were compared with data from a representative operation, and were upscaled to obtain statewide estimates. The enhanced model was found to be the most sensitive to harvest frequency, quantity shipped to customer, and quantity harvested. At maximum grower profit, the model estimated water and energy quantities roughly 20% lower for each operation. The representative operation exceeded optimal water and energy usage because the farmers, despite having efficient production, commonly "over-produce" far beyond optimal levels for reasons including risk of loss, tradition, low market prices, and large fixed costs of operation. Postharvest loss estimated by the model was 22% of quantity harvested for the representative operation. The upscaled regional postharvest losses were at 16% for the state of Florida. Operation-specific water and energy use from the case study were upscaled to give regional monthly estimates of 50.3 million liters and 28.3 million kWh, respectively. Such interactions provide insights into postharvest decisions made by commercial operations and impacts of these decisions on the food, water and energy system. The integrated modeling framework in this study can be extended to other crops and quantify interactions of water, energy and, postharvest losses to optimize efficient management practices.

Keywords: /Postharvest Operations/ /Fresh Produce Systems/ /Water And Energy Consumption/
/Postharvest Loss/ /Optimization/