SELECTIVE DISSEMINATION OF INFORMATION
As of February 2019

ALMOND

Cortés, V., Talens, P., Barat, J. M., & Lerma-Garcia, M. J. (2019). Discrimination of intact almonds according to their bitterness and prediction of amygdalin concentration by Fourier transform infrared spectroscopy. Postharvest Biology and Technology, 148, 236-241. DOI: 10.1016/j.postharvbio.2018.05.006

Abstract

Intact almond kernels (N = 360, half sweet and half bitter) were analyzed using attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR) for the prediction of amygdalin concentration and to classify them according to their bitterness. Amygdalin concentrations for sweet and bitter almonds, determined by high performance liquid chromatography, were between 0.7–350 and 15,000-50,000 mg kg−1, respectively. Concentrations were successfully predicted by applying partial least squares (PLS) to the pre-treated spectral data with R2p of 0.951 and RMSEP of 0.398. Additionally, linear discriminant analysis (LDA), quadratic discriminant analysis (QDA) and PLS-DA models were constructed to classify samples according to their bitterness. All three models provided a satisfactory discrimination of almonds into sweet and bitter categories, providing overall accuracy values of 83.3%, 86.1% and 98.6%, respectively. The results indicate the potential of ATR-FTIR spectroscopy for the reliable, easy and fast prediction of amygdalin concentration, and for almond classification according to their bitterness.

Keywords: /ATR-FTIR/ /Amygdalin concentration/ /Bitterness/ /Intact almonds/ /PLS/ /Almond discrimination/

ANTHURIUM

Aghdam, M. S., Jannatizadeh, A., Nojadeh, M. S., & Ebrahimzadeh, A. (2019). Exogenous melatonin ameliorates chilling injury in cut anthurium flowers during low temperature storage. Postharvest Biology and Technology, 148, 184–191.
DOI: 10.1016/j.postharvbio.2018.11.008

Abstract

Cut anthurium flowers can develop chilling injury, which is manifested as spathe browning, during low temperature storage. Exogenous melatonin at 1, 10, 100 and 1000 μM ameliorated chilling injury in cut anthurium flowers by 11, 29, 51 and 31%, respectively, compared with that of untreated flowers, during storage at 4 °C for 21 d. Ameliorating chilling injury in flowers treated with 100 μM melatonin was accompanied by lower electrolyte leakage and malondialdehyde concentration during cold storage. Higher NADPH oxidase activity may be responsible for signaling H2O2 concentration in flowers treated with 100 μM melatonin than untreated flowers during storage at 4 °C for 7 d. Higher proline concentration in flowers treated with melatonin than untreated ones may result from higher pyroline 5-carboxylate synthetase

and ornithine aminotransferase activities, and lower proline dehydrogenase activity during cold storage. Higher phenolic concentrations in treated flowers than in untreated ones may be attributed to higher phenylalanine ammonia lyase activity and lower polyphenol oxidase activity that would result in greater DPPH scavenging capacity. Higher alternative oxidase gene expression accompanied by higher activities of catalase, superoxide dismutase, ascorbate peroxidase, and glutathione reductase, and higher ascorbate and glutathione concentrations may be responsible for ameliorating damaging H2O2 concentration in melatonin treated flowers than in untreated flowers during storage at 4 °C for 21 d. Exogenous melatonin can ameliorate chilling injury in cut anthurium flowers during low temperature storage.

Keywords: /DPPH scavenging capacity/ /Low temperature storage/ /Membrane integrity/ /NADPH oxidase activity/ /Polyphenol oxidase/ /Spathe browning/

APPLE

Harker, F. R., Feng, F., Johnston, J. W., Gamble, J., Alavi, M., Hall, M., & Chheang, S. L. (2019). Influence of postharvest water loss on apple quality: The use of a sensory panel to verify destructive and non-destructive instrumental measurements of texture. Postharvest Biology and Technology, 148, 32-37.
DOI: 10.1016/j.postharvbio.2018.10.008

Abstract

'Cripps Pink'/Pink Lady® and 'Sciros'/Pacific Rose™ apples were stored at 0.5 °C in containers through which dry or humidified air was passed for up to 19 weeks. Sensory analysis by trained panellists was undertaken on apples that were removed from storage at a single point in time (15 or 19 weeks, respectively) so that cultivars and treatments could be directly compared. Weight loss during storage was 1.8 to 2.4 % for humidified air treatments and 5.0 to 5.7% for dry air treatments. The trained panel perceived differences between cultivars, but within cultivars there was no significant sensory difference between apples from higher and lower water loss treatments, except for juiciness which was lower for dehydrated apples. Measurements of puncture firmness were in accordance with the sensory results, suggesting that there was no effect of water loss on mechanical properties. However, non-destructive measurements (based on acoustic impulse and tissue impact responses) declined with water loss. These sensory-instrumental data along with monitoring during storage suggested that non-destructive measurements, particularly those based on acoustic impulse responses, are detecting changes in water status rather than mechanical properties of the fruit.

Keywords: /Fruit quality/ /Trained panel/ /Texture/ /Water Loss/

van Dael, M., Verboven, P., Zanella, A., Sijbers, J., & Nicolai, B. (2019). Combination of shape and X-ray inspection for apple internal quality control: in silico analysis of the methodology based on X-ray computed tomography. Postharvest Biology and Technology, 148, 218-227. DOI: 10.1016/j.postharvbio.2018.05.020

Abstract

Multisensor inspection allows for inline detection of internal defects of products with variable shapes, such as fruit and vegetables, by combining X-ray radiography with 3D shape recognition and modelling. For products with a complex internal structure such as apple fruit, inspection must also account for the corresponding internal density gradients that can affect X-ray radiographic images. Apple fruit consist of different tissues with spatially varying differences and gradients in porosity, resulting in corresponding density gradients. Development of internal browning disorders during storage of apples result in damage to tissue structure and associated changes of density distribution. In this paper, a method is developed and evaluated to account for density gradients in apple to improve detection success of defected apples. Experiments were conducted with 26 'Braeburn' apples that were subjected to storage conditions in which internal browning develops. X-ray CT images of each apple were taken at 5 time points over a period of 9 months to obtain a reference dataset of 130 apples with varying levels of defects that could be accurately characterized. The fruit were additionally subjected to multisensory inspection. Using the images of healthy fruit, an internal density distribution model was created and used in the image processing pipeline of the proposed technique to correct for internal gradients. Accounting for a non-uniform internal density distribution increased the R2adjvalue from 0.73 to 0.86 for prediction of the degree of browning in a fruit. A receiver operator characteristic analysis found that accounting for non-uniform samples reduced the number of false positives from 14 to 5% at a true positive rate of 90%. It was demonstrated that the multisensor inspection approach requires relatively simple hardware of combined with prior knowledge in the form of a statistical shape model and associated density distribution. It is also flexible, since no specific segmentation and detection methods have to be developed for different types of defects.

Keywords: /Non-Destructive/ /Inspection/ /Online/ /X-ray/ /Statistical shape model/

Wei, M., Ge, Y., Li, C., Han, X., Qin, S., Chen, Y., Tang, Q., & Li, J. (2019). G6PDH regulated NADPH production and reactive oxygen species metabolism to enhance disease resistance against blue mold in apple fruit by acibenzolar-S-methyl. Postharvest Biology and Technology, 148, 228-235. DOI: 10.1016/j.postharvbio.2018.05.017

Abstract

Apple fruit were treated with 100 mg L−1 acibenzolar-S-methyl(ASM) and 100 μM dehydroepiandrosterone (DHEA) to investigate its effect on the lesion development inoculated with Penicillium expansum. Effects of ASM on the glucose-6-phosphate dehydrogenase (G6PDH) activity, nicotinamide ademine dinucleotidephosphate (NADPH) production, and reactive oxygen species (ROS) metabolism in apple fruit were also studied. The results indicated that ASM treatment decreased the lesion development of blue mold in apple fruit. ASM treatment enhanced the content of H2O2, the activities of NADPH oxidase (NOX),

superoxide dismutase (SOD), ascorbate peroxidase (APX), glutathione reductase (GR), monodehydroascorbate reductase (MDHAR), dehydroascorbate reductase (DHAR) and peroxidase (POD) in apple fruit. ASM treatment increased the gene expression of SOD, APX, DHAR as well as ascorbic acid (AsA) and reduced glutathione (GSH) content whereas it inhibited MDHARexpressions. The result also indicated that ASM treatment significantly inhibited CAT activity in apple fruit. In addition, the higher activity of G6PDH and content of NADPH was observed in ASM-treated apple fruit. In contrast, lesion diameter in ASM + DHEA-treated apple fruit developed more quickly than the control fruit. Also, the accumulation of H2O2, NADPH, AsA and GSH were reduced by DHEA treatment while inhibiting the activities of NOX, SOD, POD, APX, GR, MDHAR and G6PDH. Gene expressions of SOD, APX and DHAR were also inhibited by DHEA treatment. These results suggest that G6PDH played a crucial role in ROS metabolism and NADPH production in apple fruit to enhance resistance against P. expansum.

Keywords: /*Malus domestica*/ /Acibenzolar-S-methyl/ /*Penicillum expansum*/ /Induced resistance/ /Reactive oxygen species/

ASPARAGUS

Barberis, A., Cefola, M., Pace, B., Azara, E., Spissu, Y., Serra, P. A., Logrieco, A. F., D'hallewin, G., & Fadda, A. (2019). Postharvest application of oxalic acid to preserve overall appearance and nutritional quality of fresh-cut green and purple asparagus during cold storage: a combined electrochemical and mass-spectrometry analysis approach. Postharvest Biology and Technology, 148, 158-167. DOI: 10.1016/j.postharvbio.2018.10.016

Abstract

The effect of oxalic acid (OA) treatment on visual properties and bioactive compounds of two green and one purple cultivars of fresh asparagus was investigated during twelve storage days at 5 °C. Cold storage and OA treatment positively affected the overall appearance of the investigated cultivars. Cut-end dehydration increased, all along the storage period, in all cultivars but, the negative effect of the storage, clear on control samples, was mitigated by OA. The most represented compounds in Grande and Vegalim cultivars were: quercetin rutinoside, feruloyl quinic acid and cumaroyl quinic acid. Cyanidin glucosyl rutinoside, cyaniding rutinoside and peonidin rutinoside were identified in Purple Passion cultivar. The bioactive compounds seemed to be affected by storage but not by OA treatment. The sensor-biosensor system indicated that the antioxidant activity is negatively affected by storage but not by OA. The decrease of antioxidant activity coincided with the reduction of ascorbic acid levels in all the cultivars.

Keywords: /Asparagus/ /Oxalic acid/ /Cold storage/ /Sensor-biosensor system/ /LCMS phenol characterization/

AVOCADO

Perkins, M. L., Joyce, D. C., & Coates, L. M. (2019). Possible contribution of impact injury at harvest to anthracnose expression in ripening avocado: A review. Scientia Horticulturae, 246, 785–790. DOI: 10.1016/j.scienta.2018.11.012

Abstract

In spite of burgeoning global demand for avocados, meeting consumer expectations for fruit quality is an ongoing challenge. Flesh bruising and body rots (principally anthracnose) are the main postharvest quality defects of avocado fruit. Mechanical damage causes bruising more so in ripening fruit than in hard unripe fruit. As a result, current emphasis is on careful handling of avocado fruit during later supply chain stages. However, emerging evidence suggests mechanical injury to unripe avocado fruit may trigger body rot development. Fruit responses to impact injury and their possible relevance to the pathogenicity of fungi which cause anthracnose in avocado (i.e. various *Colletotrichum* species) are presented here. Research on impact-induced physiological and biochemical changes that occur in avocado fruit appears to be limited and contradictory. The pathogenicity of *Colletotrichum* spp. in avocado is influenced by tissue pH, lipoxygenase activity, and concentrations of reactive oxygen species, antifungal compounds, epicatechin and mineral nutrients. Understanding how these parameters change in response to impact is important for predicting disease development and providing appropriate postharvest handling advice to industry.

Keywords: /Body rot/ / Bruising/ /Colletotrichum/ /Fruit quality/ /Mechanical damage/ /Persea Americana/ Fruit quality/ /Mechanical damage/ Postharvest Disease/

BLUEBERRY

Chea, S., Yu, D. J., Park, J., Oh, H. D., Chung, S. W., & Lee, H. J. (2019). Preharvest β-aminobutyric acid treatment alleviates postharvest deterioration of 'Bluecrop' highbush blueberry fruit during refrigerated storage. Scientia Horticulturae, 246, 95-103. DOI: 10.1016/j.scienta.2018.10.036

Abstract

We examined the effect of preharvest β-aminobutyric acid (BABA) treatment on postharvest quality and the softening of 'Bluecrop' highbush blueberry fruit during postharvest refrigerated storage. Reddish purple-colored fruit on shrubs were treated with 20 mM BABA and harvested 7 days after treatment when they turned dark purple. The harvested fruit were stored in clear polyethylene terephthalate clamshells at 2 °C for up to 20 days. Preharvest BABA treatment significantly delayed color changes, enhanced individual soluble sugars and organic acids, and reduced decay incidence. BABA-treated fruit also retained higher skin firmness throughout the storage period. Cell wall materials, closely associated with fruit softening, were significantly higher in BABA-treated fruit than in control. Moreover, preharvest BABA treatment significantly enhanced fruit pectin content at harvest and reduced activities of polygalacturonase and endo-1,4-β-xylanase, although hemicellulose content was unchanged. These results suggest that preharvest BABA treatment alleviates the deterioration of postharvest quality in 'Bluecrop' highbush blueberry fruit including skin firmness during refrigerated storage.

Keywords: /β-Aminobutyric acid/ /'Bluecrop' highbush blueberry/ /Cell wall modification/ /Postharvest fruit quality/ /Preharvest application/ /Refrigerated storage/

Liu, B., Wang, K., Shu, X., Liang, J., Fan, X., & Sun, L. (2019). Changes in fruit firmness, quality traits and cell wall constituents of two highbush blueberries (*Vaccinium corymbosum* L.) during postharvest cold storage. Scientia Horticulturae, 246, 557-562. DOI: 10.1016/j.scienta.2018.11.042

Abstract

Blueberries are now the second most economically important soft fruit. However, they are highly perishable and susceptible to rapid spoilage. Softening is one of the main reasons for short postharvest life of blueberries. The changes of fruit firmness, weight loss, flavor quality and cell wall composition of Vaccinium corymbosum cv. Bluecrop and Vaccinium corymbosum cv. Sierra were investigated in this study. The results showed that fruit firmness declined concomitantly with the increase of fruit weight loss and water soluble pectin (WSP) content paralleled by a decrease in the content of cellulose (CEL) and hemicellulose (HCEL) during postharvest cold storage at 0 ℃ and 90% relative humidity. Compared with Sierra blueberries, Bluecrop blueberries were much more resistant to postharvest cold storage as manifested by the higher values in fruit flavor quality and firmness which were associated with less weight loss, lower WSP content and higher amount of CEL and HCEL.

Keywords: /Blueberry/ /Cell wall composition/ /Firmness/ /Softening/ /Weight loss/

BROCCOLI

Chen, H., Zhang, M., & Guo, Z. (2019). Discrimination of fresh-cut broccoli freshness by volatiles using electronic nose and gas chromatography-mass spectrometry. Postharvest Biology and Technology, 148, 168–175. DOI: 10.1016/j.postharvbio.2018.10.019

Abstract

This work was aimed to monitor the freshness of fresh-cut broccoli during refrigerated storage using electronic nose (e-nose) and solid phase microextraction (SPME) combined with gas chromatography-mass spectrometry (GC–MS). Traditional quality indices such as mass loss, chlorophyll content, aerobic plate count, sensory evaluation, malondialdehyde content and membrane permeability were also measured and the result of canonical discriminant analysis (CDA) can distinguish between fresh (on 0~3 d), medium fresh (on 6~9 d), and spoiled samples (on 12~15 d). A total of 43 volatiles (including hydrocarbons, alcohols, esters, ethers, aldehydes, ketones, sulfur compounds and sulfur nitrogen compounds) were detected in broccoli samples using GC–MS analysis. Significant accumulation of sulfur compounds like dimethyl disulfide was observed as storage timeincreased. Both principal components analysis (PCA), hierarchical cluster analysis (HCA) and CDA on e-nose data could discriminate freshness of fresh-cut broccoli. The result of e-nose analysis was in good agreement with that of GC–MS analysis.

This study suggested that e-nose has potential for applying as a rapid technique to determine freshness of fresh-cut vegetables.

Keywords: /Fresh-cut broccoli/ /Freshness/ /Flavor discrimination/ /Qualitative analysis/

CARAMBOLA

Ahmad, A., & Ali, A. (2019). Improvement of postharvest quality, regulation of antioxidants capacity and softening enzymes activity of cold-stored carambola in response to polyamines application. Postharvest Biology and Technology, 148, 208-217. DOI: 10.1016/j.postharvbio.2018.10.017

Abstract

The efficacy of putrescine (PUT) and spermidine (SPD) application in preserving postharvest quality, regulating bioactive compounds and cell wall softening enzymes was examined during cold storage of carambola fruit (Averrhoa carambola cv. B10). Three different concentrations (0.0, 0.1, 1.0 and 2.0 mM) of PUT and SPD were applied to fruit by immersion for 5 min and further stored at 3 °C, 85–90 % RH for 28 d. The highest concentration (2.0 mM) of PUT effectively reduced weight loss, maintained peel colour (L*, C*, h°), retained higher firmness, lowered respiration rate and ethylene emission, and suppressed the degradation of soluble solids content (SSC) and titrable acidity (TA) throughout storage. Moreover, 2.0 mM PUT treatment delayed the advancement of β-galactosidase (β-gal), polygalacturonase (PG) and pectin methylesterase (PME) enzymes activity concomitant with less apparent changes in fruit firmness. Ascorbic acid (AA), total antioxidant content (TAC) and phenolic content (TPC) were enhanced to higher levels in treated fruit, while control fruit experienced significant loss of these bioactive compounds. The highest concentration (2.0 mM) of PUT and SPD exhibited the best result of increasing TAC activity through an increment of TPC. In contrast, higher AA content was stimulated by lower concentration of SPD (1.0 and 0.1 mM). This present finding throws light on the potential of polyamines (PAs) as an effective mean for maintaining postharvest quality, enhancing antioxidants capacity and provokes reduction on softening enzymes activity, with the prolong shelf-life of B10 carambola.

Keywords: /Carambola/ /Polyamines/ /Postharvest quality/ /Softening enzymes/ /Antioxidants activity/ /Cold storage/

CELERY

Massolo, J. F., Forte, L. G., Concellón, A., Viña, S. Z., & Vicente, A. R. (2019). Effects of ethylene and 1-MCP on quality maintenance of fresh cut celery. Postharvest Biology and Technology, 148, 176, 183. DOI: 10.1016/j.postharvbio.2018.11.007

Abstract

Ethylene is accepted to be a key player in the regulation of climacteric fruit ripening and senescence of leafy vegetables. In contrast, there is still disparity in the literature on the role it

may have on quality deterioration of edible petioles. In this work, we evaluated the influence of the ethylene generator 2-chloroethylphosphonic acid (Ethephon) and the ethylene action inhibitor 1-methylcyclopropene (1-MCP) on quality maintenance of fresh cut celery. Commercially mature stalks from self-blanching celery cv. Golden Clause were cut into 2 cm-long slices. Samples from the apical and basal petiole zones were segregated and treated with 2000 mg L−1 2-chloroethylphosphonic acid or with 1 μL L−1 1-MCP. Corresponding slices without any treatment were used as control. Samples were packed and stored for 0, 6, 13 and 20 d at 4 °C and during this period celery visual deterioration (VD), respiration, weight loss and aerobic mesophilic bacteria, yeasts and molds counts were determined. Carotenoids, chlorophylls, phenolics, ascorbic acid, polyphenol oxidase (PPO), sugars, acidity, cell wall content and consumer acceptability were also evaluated. Ethylene had no major effects on weight loss, PPO, phenolic, sugars, acidity, and ascorbic acid. Instead, it increased respiration and accelerated chlorophyll degradation and surface yellowing. These changes were delayed in 1-MCP treated celery, which also maintained lower mesophilic bacteria and yeast counts, showed lower incidence of soft rots. 1-MCP treated celery received higher consumer acceptability scores. The effects were more marked on the samples obtained from the apical region of the petioles. Overall, results reassess the role of ethylene on celery petiole metabolism and indicate that 1-MCP treatments may be useful to supplement the benefits of refrigeration and extend the shelf life of fresh cut self-blanching celery.

Keywords: /*Apium graveolens*/ /Stalks/ /1-methylcyclopropene/ /Senescence/ /Refrigerated storage/

CHERRY

Zhao, H., Wang, B., Cui, K., Cao, J., & Jiang, W. (2019). Improving postharvest quality and antioxidant capacity of sweet cherry fruit by storage at near-freezing temperature. Scientia Horticulturae, 246, 68–78. DOI: 10.1016/j.scienta.2018.10.054

Abstract

To improve postharvest quality of sweet cherry, the effect of near-freezing temperature (NFT) storage was evaluated by analyses of postharvest characteristics, biological compounds and antioxidant property. The fruit were stored at 5 °C, 0 °C and NFT (determined by biological freezing curve) respectively. NFT extended the longest storage period (up to 100 d) and maintained the consumable and better sensory quality. NFT storage delayed the senescence by suppressing respiration rate, softening, malondiadehyde accumulation and decay rate. Compared to 0 °C storage, the decay rate of fruit stored at NFT was approximately 4~8-fold lower at the end of storage and shelf-life. NFT also reduced weight loss and biological disorder (such as pitting and pedicel browing) during sweet cherry storage. Moreover, NFT delayed color changes and improved the levels of soluble solids content (SSC), titratable acidity, ascorbic acid, total phenolic compounds, total flavnoids and total anthocyanins in sweet cherry. The SSC in fruit at NFT was about 1.2–1.4 fold higher than that of 0 °C in both cultivars sweet cherry during shelf life after 80 days of cold storage. Additionally, NFT storage also enhanced antioxidant property and delayed the peak value of antioxidant capacity in fruit. These results suggested that NFT storage could be considered as a preservation method for improving postharvest quality and antioxidant property of sweet cherry fruit.

Keywords: /Sweet cherry fruit/ /Near-freezing temperature/ /Postharvest quality/ /Consumer acceptance/ /Antioxidants/

Dong, Y., Zhi, H., & Wang, Y. (2019). Cooperative effects of pre-harvest calcium and gibberellic acid on tissue calcium content, quality attributes, and in relation to postharvest disorders of late-maturing sweet cherry. Scientia Horticulturae, 246, 123–128. DOI: 10.1016/j.scienta.2018.10.067

Abstract

Six Ca(NO3)2 sprays at 0.3% and 0.6% from pit hardening (PH) to 1 week before harvest (1WBH) most effectively increased Ca uptake in sweet cherry (Prunus avium). Low concentration (<0.3%) did not affect the absorption of Ca; high concentration (> 1.6%) caused burning of leaf margins. Fruit treated with Ca had greater fruit firmness (FF), soluble solids content (SSC) and titratable acidity (TA) and fewer disorders than untreated fruit while retaining marketable color and size. A single, low concentration of GA3 combined with Ca sprays enhanced Ca uptake, cracking resistance, and FF without delaying maturation. When Ca plus GA3 sprays were reduced to four times, Ca uptake was retarded, but had an equal or greater benefit than Ca sprays alone. The 5-d harvest delay in combination-treated fruit did not affect skin color, but these fruit had reduced Ca levels at harvest and displayed stem browning after storage.

Keywords: /*Prunus avium*/ /Calcium/ /Gibberellic acid/ /Quality/ /Postharvest disorders/

Aghdam, M. S., Kakavand, F., Rabiei, V., Zaare-Nahandi, F., & Razavi F. (2019). γ-Aminobutyric acid and nitric oxide treatments preserve sensory and nutritional quality of cornelian cherry fruits during postharvest cold storage by delaying softening and enhancing phenols accumulation. Scientia Horticulturae, 246, 812-817.
DOI: 10.1016/j.scienta.2018.11.064

Abstract

During postharvest life, cornelian cherry fruits suffer from browning accompanying by sensory and nutritional quality deterioration. Cold storage isn't along sufficiently effective for delaying browning accompanying by preserving the sensory and nutritional quality of cornelian cherry fruits during postharvest life. In this experiment, the mechanisms employed by γ-aminobutyric acid (GABA) at 0, 2.5, 5 and 10 mM and NO donor sodium nitroprusside (SNP) at 0, 250, 500 and 1000 μM on delaying browning accompanying by preserving the sensory and nutritional quality of cornelian cherry fruits during storage at 4 °C for 21 days was investigated. Our result showed that the cornelian cherry fruits treated with 5 mM GABA and 500 μM SNP exhibited higher firmness which may arise from lower cell wall degrading enzymes polygalacturonase (PG) and pectin methylesterase (PME) activity. Also, lower browning in cornelian cherry fruits treated with 5 mM GABA and 500 μM SNP during storage at 4 °C for 21 days may arise from higher phenylalanine ammonia lyase (PAL) enzyme activity along with lower polyphenol oxidase (PPO) enzyme activity giving rise to higher phenols, flavonoids and anthocyanins accumulation

and superior DPPH scavenging capacity. Accordingly, our results suggest that the postharvest 5 mM GABA and 500 μM SNP treatments may be beneficial strategies for supplying firm cornelian cherry fruits with higher bioactive molecules accumulation which is crucial for consumer health.

Keywords: /Bioactive molecules/ /Cornelian cherry fruits/ /DPPH scavenging capacity/ /Nutritional quality/ /Polygalacturonase/ /Postharvest softening/

Kokalj, D., Zlatić, E., Cigić, B., & Vidrih, R. (2019). Postharvest light-emitting diode irradiation of sweet cherries (Prunus avium L.) promotes accumulation of anthocyanins. Postharvest Biology and Technology, 148, 192–199. DOI: 10.1016/j.postharvbio.2018.11.011

Abstract

Light influences postharvest formation of bioactive compounds in fruit and vegetables. The objectives of this study were to determine the physicochemical changes and phenylalanine ammonia lyase and flavonoid 3′-hydroxylase activities in sweet cherries (Prunus avium L.) irradiated with light-emitting diodes. Cherries were stored under light-emitting diodes for 10 days, exposed to UV-B and blue light, and to the combination of white, blue and green light. Irradiation with blue light significantly increased the anthocyanin content (cyanidin 3-O-glucoside, cyanidin 3-O-rutinoside) and significantly influenced the CIE color parameters hue, C* and ΔE. Combined white-blue-green light provoked similar but less pronounced effects, while UV-B light was similar to control (in the dark). Blue and white-blue-green light increased phenylalanine ammonia lyase activity. Light irradiation had no significant effects on ascorbic acid and the phenolic profile. Highly significant correlations were found between anthocyanins and phenylalanine ammonia lyase on the one side, and the color parameters hue, C* and ΔE on the other.

Keywords: /Sweet cherry (Prunus avium L.)/ /Light emitting diode/ /UV–B/ /Blue light/ /Anthocyanins/ /Phenylalanine ammonia lyase/

CHESTNUT

Song, M., Wu, S., Shuai, L., Duan, Z., Chen, Z., Shang, F., & Fang, F. (2019). Effects of exogenous ascorbic acid and ferulic acid on the yellowing of fresh-cut Chinese water chestnut. Postharvest Biology and Technology, 148, 15–21. DOI: 10.1016/j.postharvbio.2018.10.005

Abstract

Yellowing of the cut surface is one of the main causes of quality loss in fresh-cut Chinese water chestnut (CWC). However, the mechanism underlying this phenomenon remains unclear. In this study, the peeled corms of CWC were treated with ascorbic acid (AsA) and ferulic acid (FA) and stored at 10 °C for 6 d. Changes in color, flavonoid content, activity levels of phenylalanine ammonia-lyase (PAL), polyphenol oxidase (PPO), and peroxidase (POD), and the expression of

key enzyme-coding genes in the phenylpropanoid pathway were measured. FA was significantly effective in inhibiting the yellowing of fresh-cut CWC, while AsA did not inhibit yellowing. Both AsA and FA suppressed the activity of POD and PPO during storage. Only with FA treatment, PAL activity and eriodictyol and naringenin levels were suppressed. However, in the in vitro test, FA did not significantly inhibit PAL activity, indicating that the inhibitory effect of FA on PAL was indirect. Furthermore, the analysis of key enzyme-coding genes in the phenylpropanoid pathway showed that in the control and AsA treatment, the expression levels of all the phenylpropanoid pathway genes were significantly upregulated after peeling, while eight genes (CwPAL, CwC4H, Cw4CL1, Cw4CL2, CwCHI, CwCHS1, CwCHS2, and CwF3′H) were down-regulated in CWC tissues treated with FA. To the best of our knowledge, this is the first study to report the effect of FA on the inhibition of CWC yellowing and the transcriptional regulation of genes encoding key enzymes in the phenylpropanoid pathway.

Keywords: /Chinese water chestnut/ /Ferulic acid/ /Phenylpropanoid pathway/ /Yellowing/

CITRUS

Ramakrishnan, S. R., Jo, Y., Nam, H., Gu, S., Baek, M., & Kwon, J. (2019). Implication of low-dose e-beam irradiation as a phytosanitary treatment on physicochemical and sensory qualities of grapefruit and lemons during postharvest cold storage. Scientia Horticulturae, 245, 1-6. DOI: 10.1016/j.scienta.2018.09.058

Abstract

Since irradiation is a proven decontamination measure, it is essential to monitor the shelf-life and quality of agricultural produce. We evaluated the impacts of low e-beam doses (0, 0.4, 1 kGy) on quality of grapefruit and lemons directly after irradiation as well as during storage (4 °C, 20 d) to simulate transport and market conditions. E-beam irradiation doses of 0.4 kGy and 1 kGy did not alter the weight, texture, total soluble solids (TSS), titratable acidity (TA), sugars, organic acids, vitamin C, narinrutin, hesperidin, and product preference with the exception of a decrease in citric acid of grapefruit and TSS/TA in lemons at 1 kGy. Besides minimal weight loss, firmness did not change in any samples during storage regardless of irradiation doses. Values of TSS and TA remained constant during 20 d of storage in grapefruit and 1 kGy irradiated lemons. Free sugar contents significantly increased, while vitamin C content decreased in both grapefruit and lemons after 10 d. Organic acids and flavonoids underwent delayed (grapefruit) or no changes (lemons) in 1 kGy irradiated stored fruits. Overall, 1 kGy e-beam used for phytosanitation of grapefruit and lemons minimizes quality deterioration during storage.

Keywords: /Cold storage/ /Electron beam irradiation/ /Grapefruit/ /Lemon/ /Physicochemical properties/ /Sensory evaluation/

EDIBLE FLOWER

Stefaniak, A., & Grzeszczuk, M. (2019). Nutritional and Biological Value of Five Edible Flower Species. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 47(1), 128–134. DOI: 47.15835/nbha47111136

Abstract

The introduction of edible flowers into our menu and their consumption significantly increases as a result of decorative, taste or aroma qualities. Current research on the chemical composition of edible flowers indicates a high content of vitamins, mineral compounds, essential oils, fibre, mucilage and other compounds characterized by a very high antioxidant activity. The aim of the experiment was to compare the nutritional value and antioxidant activity of three annual and two perennial ornamental plant species with edible flowers: Mimulus x hybridus L. 'Magic Yellow' and 'Magic Red', Antirrhinum majus L. 'Cavalier', Dianthus chinensis L. 'Chianti', Hemerocallis x hybrida Hort. and Monarda didyma L. Among the edible flower species compared in the study, M. didyma L. showed the highest nutritional value and antioxidant activity (DPPH and ABTS). While flowers of D. chinensis L. 'Chianti' were characterized by highest content of antioxidants such as L-ascorbic acid, total anthocyanins, total polyphenols and ferric reducing antioxidant power (FRAP), H. × hybrida and A. majus L. 'Cavalier' flowers - by the highest content of total soluble sugars and sugar/acid ratio, and M. × hybridus L. 'Magic Red' and 'Magic Yellow' - by the highest content of total carotenoids.

Keywords: /Mimulus/ /Antirrhinum/ /Dianthus/ /Hemerocallis/ /Monarda/ /chemical composition/ /antioxidants/

GOJI FRUIT

Fan, X. J., Zhang, B., Yan, H., Feng, J. T., Ma, Z. Q., & Zhang, X. (2019). Effect of lotus leaf extract incorporated composite coating on the postharvest quality of fresh goji (Lycium barbarum L.) fruit. Postharvest Biology and Technology, 148, 132–140. DOI: 10.1016/j.postharvbio.2018.10.020

Abstract

This study was carried out to evaluate the effect of composite coating with lotus leaf extract (LLE) on the quality of fresh goji fruit during postharvest storage at ambient temperature. The best coating formulation as follows: 0.2% LLE + 1% film former (the blend mass ratio 2:3:3 included sodium alginate, konjae glucomannan and starch) + 1% glycerin + 0.5% CaCl2 was defined based on the effect of the weight loss and decay ratio on goji berries. Goji fruit coated with LLE incorporated coating had significantly lower weight loss, decay rate and malondialdehyde (MDA) content than the blank control (uncoated) and the positive control (fumigated with 1-methylcyclopropene) after 9 d of storage. Moreover, LLE incorporated coating was found to effectively maintain ascorbic acid, titratable acidity, soluble solids content and superoxyde dismutase (SOD), catalase (CAT), peroxidase (POD) activities higher levels compared to other treatments. Using LLE incorporated coating can extend the shelf life of goji

berries for about 4 d. These findings suggested that LLE incorporated coating treatment has positive effects on extending postharvest life and improving quality of fresh goji fruit.

Keywords: /Lotus leaf extract/ /Edible composite coating/ /Fresh goji berries/ /Postharvest storage/

KINNOW FRUIT

Habiba, Noreen, R., Ali, S. A., Hasan, K. A., Sultana, V., Ara, J., & Ehteshamul-Haque, S. (2019). Evaluation of biocontrol potential of epiphytic yeast against postharvest Penicillium digitatum rot of stored Kinnow fruit (Citrus reticulata) and their effect on its physiochemical properties. Postharvest Biology and Technology, 148, 38–48. DOI: 10.1016/j.postharvbio.2018.10.007

Abstract

Twenty five isolates of epiphytic yeasts were isolated from healthy surface of tomato, mango, lemon, orange, grape fruit and green chili and evaluated for their potential against postharvest Penicillium digitatum decay of kinnow fruits. Identification of yeast was confirmed by molecular biology tools. Twenty isolates have shown maximum in-vitro activity against P. digitatum. Eight effective lead isolates were examined for their potential against postharvest natural infection of P. digitatum on kinnow fruit stored for fifteen days at the room temperature (25–30 °C). All eight isolates showed least infection of P. digitatum with minimum quality loss as compared to a set of control and positive control (1% K sorbate). Isolates HAB-31 and HAB-53 which showed no postharvest decay of kinnow due to P. digitatum were further evaluated on kinnow by artificially spraying of P. digitatum on kinnow fruits. Yeast treated fruit showed least fruit decay with minimum quality changes as compared to control and positive control set.

Keywords: /*Penicillium digitatum*/ /Postharvest/ /*Citrus reticulate*/ /Epiphytic yeast/ /Physiochemical properties/

LEAFY GREENS

Roy, D., & Melotto, M. (2019). Stomatal response and human pathogen persistence in leafy greens under preharvest and postharvest environmental conditions. Postharvest Biology and Technology, 148, 76–82. DOI: 10.1016/j.postharvbio.2018.10.013

Abstract

Human pathogens can internalize and persist inside crop plants leading to foodborne outbreaks and illnesses. Pathogenic bacteria might use natural openings on the plant surface, such as the stomatal pore, to penetrate the leaf interior and colonize the intercellular space. Once internalized, these pathogens often escape current sanitation procedures that are mostly efficient to clean the plant surface. Plants have evolved mechanism to quickly perceive the presence of bacteria and close the stomatal pore, potentially diminishing leaf contamination. In this study, we assessed the ability of several fresh leafy greens in mounting stomatal immunity

against Escherichia coli O157:H7 and Salmonella enterica serovar Typhimurium (STm) SL1344 and determined the influence of environmental conditions (light, temperature, and humidity) on the effectiveness of the stomatal response and bacterial persistence in the leaf. We observed that, independent of the air relative humidity (RH), E. coli O157:H7 induces stomataclosure in Butter Lettuce, Romaine, Basil, Spinach, and Cilantrowhen compared to the water control. However, STm SL1344 induces a variable stomatal response in different plant species and environmental conditions. Furthermore, endophytic STm 1344 population increases with high RH independently of other environmental conditions, whereas O157:H7 population sizesignificantly increases in Romaine and Spinach only under post-harvest conditions. The phenotypic variability observed among the various STm-plant interactions provides opportunities to discovering the underlying genetic basis of both the plant and the pathogen, as well as to proposing additional plant-specific control measure to reduce pathogen load on/in leafy greens.

Keywords: /*Eschericia coli O157:H7*/ /*Salmonella enterica* serovar Typhimurium/ /Stomatal immunity/ /Food safety/ /Leafy greens/ /Relative humidity/

LEMON

Ramallo, A. C., Olmedo, G. M., Ramallo, J., Cerioni, L., & Rapisarda, V. A. (2019). Effectiveness of an ametoctradin-dimethomorph formulation to control brown rot on postharvest lemons. Scientia Horticulturae, 246, 574-577. DOI: 10.1016/j.scienta.2018.11.035

Abstract

Brown Rot (BR), caused by Phytophthora spp., is a citrus postharvest disease. In Argentina, world leader in lemon production, BR management is based on cultural practices and chemical control using inorganic salts of limited efficacy. Commercial formulations containing ametoctradin plus dimethomorph (A + D) and ametoctradin plus methiran (A + M) have been recommended against Phytophthora infestans in potato crops; however, their use on citrus is unexplored. The aim of this work was to evaluate the effectiveness of A + D and A + M to inhibit a Phytophthora citrophthora local isolate and to control BR in lemons by pre- and postharvest applications. A + D affected zoospore structure and motility, and inhibited mycelial growth and sporangia formation more efficiently than A + M. In applications on postharvest lemons, A + D presented BR preventive activity (90% incidence reduction), while it lacked curative action. A field treatment with A + D reduced 50% of BR incidence in lemons harvested and inoculated up to 21 d post-application. Our results encourage the incorporation of the commercial A + D formulation into the management strategies to reduce or avoid citrus BR.

Keywords: /Citrus/ /*Phythopthora citrophthora*/ /Fungicides/ /Preharvest/

MANGO

Camacho-Vázquez, C., Ruiz-May, E., Guerrero-Analco, J. A., Elizalde-Contreras, J. M., Enciso-Ortiz, E. J., Rosas-Saito, G., … Aluja, M. (2019). Filling gaps in our knowledge on the cuticle of mangoes (Mangifera indica) by analyzing six fruit cultivars: Architecture/structure, postharvest physiology and possible resistance to fruit fly (Tephritidae) attack. Postharvest Biology and Technology, 148, 83–96. DOI: 10.1016/j.postharvbio.2018.10.006

Abstract

The cuticle is a critical barrier covering the surface of plant aerial organs. It is associated with important physiological and biological fruit traits, but few studies on this structure have been conducted in tropical fruit such as mango. Here, we have reported on a detailed investigation on the cuticle of six cultivars of mangoes (Kent, Tommy Atkins, Manila, Ataulfo, Criollo and Manililla), by combining several advanced microscopy tools and chemical analyses. All mango cultivars exhibited high variability in cuticle architecture, epicuticular wax layer (EWL) deposition, and different pattern of changes in cutin monomers. Mango cultivars exhibited different water transpiration rates, firmness and fruit quality appearance during postharvest shelf life (PSL), which could not be simply explained by an isolated cuticle structural feature. However, mango cuticles of premium mangos such as Kent, Tommy and Ataulfo displayed prominent cuticle deposition during PSL compared to other cultivars. Tommy fruit with large wax deposition, marginal number of lenticels and prominent cuticle thickening during PSL, exhibited lower percentage of weight lost by transpiration and less visual deterioration of all mango cultivars studied. In contrast, Criollo fruit, with a significant number of lenticels, small EWL, and marginal cuticle thickening during PSL were associated with the highest rate of water transpiration, fruit deterioration, and abscisic acid content. Our results partially explain the resistance patterns to fruit fly attack documented in earlier studies, clearly showing that cultivars such as Criollo are highly susceptible whereas Tommy, Kent, and Ataulfo are resistant because of the cuticle characteristics described in this study.
Keywords: /Mangifera indica cultivars/ /Cuticle architecture/ /Waxes/ /Lenticels/ /Fruit flies (Tephritidae)/

MUME

Endo, H., Ose, K., Bai, J., & Imahori, Y. (2019). Effect of hot water treatment on chilling injury incidence and antioxidative responses of mature green mume (*Prunus mume*) fruit during low temperature storage. Scientia Horticulturae, 246, 550-556. DOI: 10.1016/j.scienta.2018.11.015

Abstract

Mume (Prunus mume Sieb. et Zucc.) fruit are harvested and consumed at the mature green stage and have a short storage life at ambient temperature. The current handling and storage temperatures, below 6 °C, extend the storage life to a week, but chilling injury (CI) occurs after a longer storage. A pre-storage hot water treatment, dipping ‘Nankou’ fruit in 45 °C water for

5 min, substantially reduced susceptibility of fruit to CI at 6 °C storage, and extended storage life for three-fold. This research was conducted to reveal the antioxidantive responses of fruit to pre-heat treatment and chilling storage. Hot water treatment inhibited the increases in malondialdehyde and hydrogen peroxide levels, and delayed the decreases in ascorbate contents and total antioxidant capacity levels compared with the control fruit during storage. The activities of antioxidant-related enzymes including ascorbate peroxidase and monodehydroascorbate reductase were higher in hot water treated fruit than in the control fruit during cold storage. These results indicate that the alleviation of CI in mature green fruit by hot water treatment might be due to the protection and enhancement of the antioxidant system by increased activity of related enzymes.

Keywords: /*Prunus mume*/ /Chilling injury/ /Hot water treatment/ /Monodehydroascorbate reductase/ /Total antioxidant capacity/ /Ascorbate/

ORCHID

Yu, Z., Yang, Z., Teixeira da Silva, J. A., Luo, J., & Duan, J. (2019). Influence of low temperature on physiology and bioactivity of postharvest Dendrobium officinale stems. Postharvest Biology and Technology, 148, 97–106. DOI: 10.1016/j.postharvbio.2018.10.014

Abstract

Polysaccharides are the most important group of active ingredients in the orchid Dendrobium officinale. Previous studies have focused on D. officinale polysaccharides during the pre-harvest period, but little is known about the changes in the amounts and activities of polysaccharides in D. officinale stems during the postharvest period. In this study, we evaluated the physiological properties of D. officinale stems during postharvest storage for 90 days at ambient temperature (25 °C) and at low temperatures (4 °C and 0 °C). The contents of polysaccharides, mannose, and glucose first increased then decreased during all storage conditions (storage at 25 °C, 4 °C and 0 °C). The carbohydrate and starch contents decreased considerably as the storage period extended, while cellulose content showed the opposite trend. Polysaccharides from D. officinale stored at ambient temperature exhibited lower antioxidant activity in vitro than polysaccharides from D. officinale stored at low temperatures. The transcript levels of genes encoding α-amylases and β-amylases were related to the degree of starch degradation, and application of an amylase inhibitor prevented starch degradation and polysaccharide accumulation. These results suggested that the increase in polysaccharide content in D. officinale stems stored under low temperatures was related to the decrease in starch content. Our results show that low-temperature storage is a useful approach to enhance the content of polysaccharides and extend the shelf-life of D. officinale.

Keywords: /Amylase/ /Low-temperature storage/ /Medicinal orchid/ /Polysaccharide/ /Starch/

PEACH

An, X., Xu, Y., Jiang, L., Huan, C., & Yu, Z. (2019). Effects of postharvest temperature on apoptosis-related enzyme activity and gene expression in peach fruits (*Prunus persica* L. cv. Xiahui 8). Scientia Horticulturae, 245, 178-184. DOI: 10.1016/j.scienta.2018.10.020

Abstract

Peach fruits are inevitably affected by rapid ripening and senescence after harvest, leading to the relatively quick deterioration of fruit quality. Although previous studies have confirmed that temperature influences fruit ripening and senescence, information regarding apoptosis in stored peach fruits is limited. Moreover, the relationship between apoptosis and ripening and senescence has not been characterized. In this study, peach fruits (Prunus persica L. cv. Xiahui 8) were stored at room temperature (25 °C) or under cold conditions (4 °C) for 8 and 20 days, respectively. The effects of the two temperatures on fruit cell apoptosis as well as the activity of apoptosis-related enzymes and the associated gene expression levels were investigated. Flow cytometry data indicated that the apoptosis of peach fruit cells was delayed more at 4 °C than at room temperature. This observation was supported by an analysis of the activities of apoptosis-related enzymes (i.e., serine protease, lipoxygenase, superoxide dismutase, peroxidase, and catalase). Additionally, serine protease activity, which directly affects apoptosis, exhibited the greatest temperature-induced changes. Moreover, RNA-sequencing and iTRAQ results confirmed that storage temperature affects the expression levels of the genes encoding the abovementioned apoptosis-related enzymes. The observed temperature effects on peach fruit ripening and senescence from the perspective of apoptosis may be relevant for clarifying the molecular mechanism responsible for fruit ripening and senescence and for improving fruit storage techniques.

Keywords: /Peach fruit/ /Temperature/ /Apoptosis/ /Gene expression/ /Enzyme activity/

Li, H., Fan, Y., Zhi, H., Zhu, Y., Liu, Y., & Wang, Y. (2019). Influence of fruit stalk on reactive oxygen species metabolism and quality maintenance of peach fruit under chilling injury condition. Postharvest Biology and Technology, 148, 141–150. DOI: 10.1016/j.postharvbio.2018.10.018

Abstract

Chilling injury (CI) is a physiological disorder of peach fruit, occurring at low temperature storage, especially at 5 °C. In this study, the influence of fruit stalk retention on fruit quality and reactive oxygen species (ROS) metabolism of white-fleshed peach (cv. Okubo) was investigated. Fruit with and without stalk was exposed to chilling condition and subsequent shelf-life at 20 °C. Fruit physiological changes and ROS metabolism were monitored. The results showed that stalk retention effectively maintained fruit membrane integrity and reduced juice extraction rate under CI condition. ROS metabolism assay revealed that retention of fruit stalk significantly maintained activities of ascorbate peroxidase (APX), peroxidase (POD), and catalase (CAT), and reduced the peak level of hydrogen peroxide (H2O2) of fruit stored at 5 °C. Multivariable analysis (principal component, partial least squares and path analyses)

demonstrated that the improvement of fruit quality indexes such as membrane integrity due to stalk retention was mainly achieved by maintaining APX and POD activities.

Keywords: /Postharvest/ /Amygdalus persica/ /Stalk/ /Antioxidant capacity/ /Physiological disorder/

Belge, B., Goulao, L. F., Comabella, E., Graell, J., & Lara, I. (2019). Postharvest heat and CO2 shocks induce changes in cuticle composition and cuticle-related gene expression in 'October Sun' peach fruit. Postharvest Biology and Technology, 148, 200-207. DOI: 10.1016/j.postharvbio.2018.11.005

Abstract

Fruit cuticles influence greatly postharvest quality of produce. Yet, few published studies have addressed changes in cuticle composition and related gene expression from a postharvest perspective, particularly for fruit species within the Rosaceae family. Because physical treatments have proved effective in improving postharvest potential in some commodities, we were interested in assessing whether such benefits could arise, at some extent, from treatment-related alterations in cuticular components. In this work, commercially ripe 'October Sun' peaches were submitted to heat or CO2 shocks, and then stored at 0 °C for two weeks followed by five days at 20 °C. Wax and cutin composition was analyzed from cuticle samples isolated enzymatically from fruit skin, and expression of selected genes PpCER1, PpLACS1 and PpLipase, putatively involved in cuticle deposition, was quantified by quantitative real-time PCR. The amount (g m−2) of the main cuticular wax families identified was higher in treated fruit in comparison with the controls, particularly after the shelf life period. Treatment influence on cutin composition was less clear. Gene expression was generally impaired under cold storage, to recover to a variable extent upon transfer to 20 °C. The differential gene expression shown in response to treatments may relate to the observed compositional changes in the cuticle.

Keywords: /CO2 shock/ /Cuticle/ /Gene expression/ /Heat shock/ /Peach/ /Postharvest/ /Prunus persica L./

PEAR

Zhang, H., Wu, J., & Ma, H. (2019). Acoustic firmness measurement of differently shaped pears: Comparison of resonance indices with propagation indices. Postharvest Biology and Technology, 148, 151–157. DOI: 10.1016/j.postharvbio.2018.11.002

Abstract

We have used a two-point acoustic sensing setup to conduct a comparative study between four resonance indices and two propagation indices for firmness evaluation of differently shaped pears. All firmness indices correlate with the Magness-Taylor penetration firmness of pears. Our proposed dual-frequency index is the most sensitive to the firmness changes and classifies pears with the highest accuracy. Except for the conventional single frequency index, the other three resonance indices and two propagation indices show a relatively higher firmness

prediction capability for differently shaped pears. Accordingly, the resonance methods and the propagation methods are suitable for nondestructive detection of firmness of non-spherical pears. However, an appropriate choice of the method depends on the complexity of fruit shapes and the availability of cost-effective hardware.

Keywords: /Firmness evaluation/ /Fruit shapes/ /Dual-frequency index/ /Propagation methods/ /Acoustic technique/

POMEGRANATE

Jannatizadeh, A. (2019). Exogenous melatonin applying confers chilling tolerance in pomegranate fruit during cold storage. Scientia Horticulturae, 246, 544–549. DOI: 10.1016/j.scienta.2018.11.027

Abstract

In this study, the mechanism hired by melatonin treatments (0, 1, 10, 100 and 1000 μM) for conferring chilling tolerance in pomegranate fruit during storage at 4 °C for 120 days was explored. Melatonin treatment at 100 μM meaningfully conferred chilling tolerance in pomegranate fruit manifesting by lower husk browning accompanying by higher membrane integrity representing by lower electrolyte leakage and malondialdehyde (MDA) accumulation. Higher membrane integrity in pomegranate fruit treated with melatonin may arise from lower H2O2 accumulation owing to higher reactive oxygen species (ROS) scavenging enzymes catalase (CAT), superoxide dismutase (SOD), ascorbate peroxidase (APX) and glutathione reductase (GR) activity. In addition to higher ROS scavenging enzymes activity, higher membrane integrity in pomegranate fruit treated with melatonin may ascribe to lower membrane degrading enzymes phospholipase D (PLD) and lipoxygenase (LOX) activity. Also, higher phenols accumulation giving rise to higher DPPH scavenging capacity arising from higher phenylalanine ammonia-lyase (PAL) enzyme activity concomitant with lower polyphenol oxidase (PPO) enzyme activity may be vital for conferring chilling tolerance in pomegranate fruit by exogenous melatonin applying. Accordingly, exogenous melatonin applying serves as a safe beneficial strategy for conferring chilling tolerance in pomegranate fruit during cold storage.

Keywords: /DPPH scavenging capacity/ /Husk browning/ /Membrane integrity/ /Phospholipase D/ /Polyphenol oxidase/ /Pomegranate/

Hussein, Z., Fawole, O. A., & Opara, U. L. (2019). Bruise damage susceptibility of pomegranates (*Punica granatum, L.)* and impact on fruit physiological response during short term storage. Scientia Horticulturae, 246, 664-674. DOI: 10.1016/j.scienta.2018.11.026

Abstract

Bruise damage resulting from excessive impact and compression forces between the point of harvest and consumption is a major quality problem in fresh fruit marketing. This study investigated the susceptibility of three pomegranate (Punica granatum, L.) fruit cultivars (‘Acco’,

‘Herskawitz’ and ‘Wonderful’) to drop impact bruising. Impact threshold required to bruise fruit was investigated by determining the probability of bruise occurrence (PBO) from the population of the fruit of three pomegranate cultivars impacted at minimal drop heights (0.1, 0.15, 0.2 m). The effect of temperature on bruise susceptibility and fruit physiological response was studied by impacting fruit equilibrated at 5 and 20 °C from three higher impact (drop heights) levels above threshold (0.2, 0.4 and 0.6 m) followed by storage for 10 d to monitor fruit weight loss and respiration rate. Minimum drop impact level at which bruising was first observed and the associated PBO were 0.1 m (PBO; 0.44), 0.15 m (PBO; 0.5) and 0.15 m (PBO; 0.75) for ‘Wonderful’, ‘Herskawitz’ and ‘Acco’, respectively. ‘Wonderful’ pomegranate fruit had the lowest impact threshold, with the highest value of PBO (0.44) and lowest impact energy (371.87 mJ). Bruise susceptibility at higher impact levels above threshold (measured in bruise volume and bruise area) was cultivar dependent; in the order of ‘Wonderful’>‘Herskawitz’>‘Acco’. The measure of pomegranate fruit sensitivity to bruising measured as bruise susceptibility (mm3mJ−1) and specific bruise susceptibility (mm3 mJ−1 g−1) that took into account the impact energy and fruit mass suggested that ‘Acco’ was the most sensitive cultivar to impact bruising followed by ‘Herskawitz’. Fruit stored in cold (5 °C) condition had larger bruise size (bruise volume and bruise area) than those stored at ambient (20 °C) temperature. Weight loss and respiratory activity were significantly reduced both in non-bruised control and bruised fruit stored in cold (5 °C) temperature. Conversely, at ambient storage, the highest respiration rate and percentage weight loss were recorded in bruised ‘Herskawitz’ and ‘Acco’ fruit, which increased with the level of impact bruising and storage temperature. These findings provide an evidence-based understanding of the bruise damage susceptibility of pomegranates and could be used to develop a postharvest handling tool for the investigated pomegranate cultivars.

Keywords: /Pomegranate fruit/ /Bruise susceptibility/ /Cultivar/ /Impact energy/ /Drop height/

ROCKET

Yahya, H. N., Lignou, S., Wagstaff, C., & Bell, L. (2019). Changes in bacterial loads, gas composition, volatile organic compounds, and glucosinolates of fresh bagged Ready-To-Eat rocket under different shelf life treatment scenarios. Postharvest Biology and Technology, 148, 107–119. DOI: 10.1016/j.postharvbio.2018.10.021

Abstract

Temperature abuse and improper shelf life treatment of Ready-to-Eat wild rocket is a leading cause of product quality losses and consumer rejection. It can cause the deterioration of appearance, the build-up of bacterial numbers, and the production of off-odours. This study subjected commercially produced and processed bags of wild rocket to various temperature and shelf life duration treatments that could hypothetically be experienced by a consumer, purchasing bags from supermarkets that have suffered cold-chain breaches. We take a unique experimental perspective that accounts for potential temperature variation scenarios within supermarkets and the home. Bacterial counts, volatile organic chemical production, glucosinolate concentration, and internal bag atmosphere composition were measured under these temperature scenarios and across growing seasons. Our results showed that the season of purchase significantly affects wild rocket respiration and bacterial loads. Prolonged high

temperature abuses increased microbial loads, disulfide abundance, and reduced content of the glucosinolate glucoerucin. Short temperature abuse treatments resulted in no significant changes in bacterial numbers, providing bags were returned to cool-chain conditions. Samples stored under these conditions (<5 °C) saw no significant changes. The effect of growth season also significantly affects wild rocket respiration. Summer-grown produce had high bacterial loads, but winter-grown had a higher respiration rates. These data illustrate the importance of maintaining cold-chain conditions for wild rocket to preserve key glucosinolate compounds and prevent sulfide formation via bacterial propagation and anaerobic respiration.

Keywords: /Fresh-cut produce/ /*Diplotaxis tenuifolia*/ /Respiration rate/ /Salad quality/ /Microbiological safety/ /Disulfides/

ROSE

Zeng, L., Wang, X., Dong, F., Watanabe, N., & Yang, Z. (2019). Increasing postharvest high-temperatures lead to increased volatile phenylpropanoid/benzenoids accumulation in cut rose (*Rosa hybrida*) flowers. Postharvest Biology and Technology, 148, 68-75. DOI: 10.1016/j.postharvbio.2018.10.012

Abstract

Fragrance is an important quality index of horticultural flowers. Floral volatile formation in flowers during plant growth has been widely studied, but less is known about floral volatile formation in cut flowers and its responses to postharvest conditions. In this study, cut rose (Rosa hybrida cv. Tineke) flowers subjected to 5, 15 and 30 °C for 36 h showed increased concentrations of volatile phenylpropanoids/benzenoids (VPBs) including 2-phenylethanol (2PE), phenylacetaldehyde, benzyl alcohol, benzaldehyde, and phenethyl acetate, but a reduced 3,5-dimethoxytoluene concentration, as temperatures increased. l-[2H8]Phenylalanine (Phe) tracing in vivo suggested that phenylpyruvic acid (PPA) was involved in the increase in 2PE in response to increasing temperature. Genes for two aromatic amino acid aminotransferases (AAATs) were isolated and functionally characterized. Transient expression analyses in Nicotiana benthamiana plants provided in vivo evidence that RhAAAT2 was able to convert l-Phe into PPA, and that it was localized in the cytoplasm. These results advance our understanding of floral aroma formation in flowers after harvest.

Keywords: /Aroma/ /Biosynthesis/ /Phenylpyruvic acid/ /Rose flower/ /Temperature/ /Volatile/

SOURSOP

Berumen-Varela, G., Hernández-Oñate, M. A., & Tiznado-Hernández, M. E. (2019). Utilization of biotechnological tools in soursop (Annona muricata L.). Scientia Horticulturae, 245, 269–273. DOI: 10.1016/j.scienta.2018.10.028

Abstract

Global interest in soursop (*Annona muricata* L.) had increased considerably in recent years due to its medical properties. Nevertheless, there is a rather scarce information regarding genomic and genetic resources. Soursop fruit shows a short postharvest shelf life due to the high respiration rate, ethylene production and fungi attack which increases the postharvest fruit losses and makes difficult its commercialization at international markets. Besides, postharvest handling and processing of this fruit is deficient due to the lack of scientific information in physiology, diseases and molecular biology.

In this regard, the utilization of biotechnology tools should be integrated to increase the genetic variability and help in the design of improved agronomic practices with the goal to improve yield, reduce fungi attack and prolong the postharvest shelf life of soursop in the near future. The objective of this review is to discuss the most important biotechnological aspects of *Annona muricata* L. including fruit physiology, postharvest technologies, disease control, micropropagation and the utilization of tools derived from the DNA recombinant technology.

Keywords: / Biotechnology/ /Disease/ /Micropropagation/ /Postharvest treatments/ /Soursop/ /Transcriptomics/

SPINACH

Gutiérrez-Rodríguez, E., Gundersen, A., Sbodio, A., Koike, S., & Suslow, T. V. (2019). Evaluation of post-contamination survival and persistence of applied attenuated E. coli O157:H7 and naturally-contaminating E. coli O157:H7 on spinach under field conditions and following postharvest handling. Food Microbiology, 77, 173–184. DOI: 10.1016/j.fm.2018.08.013

Abstract

This study determined the variability in population uniformity of an applied mixture of attenuated *E. coli* O157:H7 (*attEcO157)* on spinach leaves as impacted by sampling mass and detection technique over spatial and temporal conditions. Opportunistically, the survival and distribution of naturally contaminating pathogenic *E. coli* O157:H7 (*Ec*O157), in a single packaged lot following commercial postharvest handling and washing, was also evaluated. From the main study outcomes, differences in the applied inoculum dose of 100-fold, resulted in indistinguishable population densities of approximately Log 1.1 CFU g−1 by 14 days post-inoculation (DPI). Composite leaf samples of 150 g and the inclusion of the spinach petiole resulted in the greatest numerical sensitivity of detection of *attEcO157* when compared to 25 and 150 g samples without petioles ($P < 0.05$). Differences in population density and protected-site survival and potential leaf internalization were observed between growing seasons and locations in California ($P < 0.05$). A Double Weibull model best described and identified two distinct populations with different inactivation rates of the inoculated *attEcO157*. Linear die-off rates varied between 0.14 and 0.29 Log/Day irrespective of location. Detection of *Ec*O157- *stx*1-negative and *stx2*-positive, resulting from a natural contamination event, was observed in 11 of 26 quarantined commercial units of washed spinach by applying the 150 g sample mass protocol. The capacity to detect *Ec*O157 varied between commercial test kits and non-commercial qPCR. Our findings suggest

the need for modifications to routine pathogen sampling protocols employed for lot acceptance of spinach and other leafy greens.

Keywords: /Spinach/ /*E. coli* O157:H7/ /Molecular detection/ /Natural contamination/ /Pathogen distribution/ /Produce safety/

STONE FRUIT

Calvo, H., Redondo, D., Remón, S., Venturini, M. E., & Arias, E. (2019). Efficacy of electrolyzed water, chlorine dioxide and photocatalysis for disinfection and removal of pesticide residues from stone fruit. Postharvest Biology and Technology, 148, 22–31. DOI: 10.1016/j.postharvbio.2018.10.009

Abstract

Concerns about chemicals and pesticides in food plants have increased dramatically during the last decade. Following stricter legislation and studies about toxicity and human health risks, new ways of reducing toxic residues are urgently required. In this study, oxidizing agents such as electrolyzed water (EW), chlorine dioxide (ClO2) and photocatalysis have been used during the postharvest phase in order to remove the residues of cyprodinil, tebuconazole and iprodione from the surface of peaches, nectarines and apricots. Moreover, the disinfection capability of these agents has also been tested as an alternative to sodium hypochlorite. Our results show that pesticide removal from stone fruits by oxidizing technologies significantly varies depending on the treatment used and the target substance. ClO2 significantly reduced tebuconazole residues from all the fruits (by more than 60%) and photocatalysis similarly reduced iprodione residues (between 50 and 70%). However, EW achieved a percentage of residue reduction similar to that of tap water, never exceeded 40%. In contrast, EW reduced the superficial microbiota to undetectable counts, also decreasing the percentage of rotted fruit from 32 to 7%. Photocatalysis produced similar results since it was able to decrease the microorganisms present on the fruit surface by nearly 2 log units and the incidence of disease by 50%. It was concluded that a strategy combining photocatalysis treatment during cold storage to reduce pesticide residues and spoilage microorganisms with electrolyzed water washing to reduce any remaining microbial contamination prior to commercialization will substantially reduce disease and ensure the safety of stone fruits for human consumption.

Keywords: /Oxidizing technologies/ /Pesticide residues/ /Microbial decontamination/ /Postharvest rots/

STRAWBERRY

Van de Velde, F., Méndez-Galarraga, M. P., Grace, M. H., Fenoglio, C., Lila, M. A., & Pirovani, M. É. (2019). Changes due to high oxygen and high carbon dioxide atmospheres on the general quality and the polyphenolic profile of strawberries. Postharvest Biology and Technology, 148, 49–57. DOI: 10.1016/j.postharvbio.2018.10.015

Abstract

The aim of this work was to study and model the effects of refrigerated storage with high O2 and high CO2 atmospheres (70 kPa O2 + 20 kPa CO2 and 90 kPa O2 + 10 kPa CO2) on microbial growth, general quality attributes, and the polyphenolic compound profile of fresh strawberries. The storage of samples in 70 kPa O2 + 20 kPa CO2 controlled microbiological decay and slightly affected soluble solids and pH values for 20 d at 5 °C. Moreover, vitamin C and proanthocyanidin contents of these samples were kept almost constant throughout the storage period. Samples in 90 kPa O2 + 10 kPa CO2 controlled microbiological decay for 12 d at 5 °C, soluble solids and pH values were slightly affected, and vitamin C and proanthocyanidin contents experienced up to 15% decrease during this period. However, anthocyanins underwent a substantial increase during the first 3–5 d of storage in these samples. The highest anthocyanin accumulations occurred for pelargonidin-3-O-glucoside, elargonidin-3-O-rutinoside, and pelargonidin-3-O-acetylglucoside, which increased by 68%, 132%, and 167%, respectively over their initial values at 5 d. Thereafter, anthocyanins content decreased gradually or remained even higher than their initial values at 12 d. This behavior was associated with a physiological response to stress and was not seen for strawberries stored at 70 kPa O2 + 20 CO2, probably due to its higher CO2 concentration which was deleterious for anthocyanin stability. Flavonols, phenolic acids, and ellagitannins also experienced increases up to 130% at 5–12 d of storage in samples exposed to both atmospheres. The changes in general quality attributes were fitted with zero or first-order kinetics, and changes in individual phenolic compounds were adequately fitted with a consecutive reaction mechanism kinetic model.

Keywords: /Modified atmosphere packaging/ /Abiotic stress/ /Anthocyanins/ /Phenolic acids/ /Ellagitannins/ /Vitamin C/

Bang, J., Lim, S., Yi, G., Lee, J. G., & Lee, E. J. (2019). Integrated transcriptomic-metabolomic analysis reveals cellular responses of harvested strawberry fruit subjected to short-term exposure to high levels of carbon dioxide. Postharvest Biology and Technology, 148, 120–131. DOI: 10.1016/j.postharvbio.2018.11.003

Abstract

Harvested strawberry (*Fragaria* × *ananassa*) fruit has a short shelf life due to rapid postharvest metabolism, quick softening, mechanical damage, and fungal decay. To improve the storability of strawberry fruit, we subjected harvested fruit to short-term exposure to 30% carbon dioxide (CO2) and used transcriptomic and metabolomic analyses to identify the cellular responses induced by this treatment. Fruit was stored at 10 °C for 10 d after a 3-h exposure to 30% CO2 (treatment) or ambient air (control) at 25 °C, respectively. The CO2 treatment reduced fruit decay and softening compared to the control throughout the 10-d storage period. Transcriptomic analyses revealed that expression levels of genes encoding cell wall-degrading enzymes (expansin, pectinesterase, and β-xylosidase) decreased in response to the CO2 treatment. Within 1 d after the CO2 treatment, the expression levels of genes encoding heat-shock proteins significantly increased. Metabolite profiling revealed that glucose, quinic acid, and succinic acid increased in responses to the CO2 treatment at 1 d. Transmission electron microscopy showed that disintegration of the middle lamella in the cell wall was inhibited by the CO2 treatment. Polyuronide (insoluble pectin) content in cell walls was 30% higher, on average,

in the treated fruit than those in the control fruit during the 10-d storage period. These results indicate that a short-term treatment with 30% CO2 reduces the degradation of pectin in the cell wall by reducing the activity of cell wall-degrading enzymes and induces abiotic stress-response genes in harvested strawberry fruit. Our results improve our understanding of the molecular mechanisms behind CO2-responsive genes in strawberry fruit and provide insight into ways to improve the postharvest quality of strawberries.

Keywords: /Carbon dioxide/ /*Fragaria* × *ananassa*/ /Heat-shock proteins/ /Metabolites/ /Plant cell wall/ /Postharvest/

TOMATO

Aghdam, M. S., Moradi, M., Razavi, F., & Rabiei, V. (2019). Exogenous phenylalanine application promotes chilling tolerance in tomato fruits during cold storage by ensuring supply of NADPH for activation of ROS scavenging systems. Scientia Horticulturae, 246, 818-825. DOI: 10.1016/j.scienta.2018.11.074

Abstract

In this experiment, the mechanisms displayed by exogenous phenylalanine application to confer chilling tolerance in tomato fruits (Lycopersicon esculentum cv. Izmir) during storage at 4 °C for 28 days were studied. Phenylalanine application at 5 mM significantly confers chilling injury tolerance in tomato fruits associated with membrane integrity maintenance reflected by a lower degree of electrolytes leakage and malondialdehyde (MDA) accumulation. Membrane integrity maintenance in tomato fruits in response to exogenous phenylalanine application at 5 mM may arise from lower H2O2 accumulation due to higher activity of reactive oxygen species (ROS) scavenging enzymes superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX) and glutathione reductase (GR), concurrent with higher endogenous lycopene and proline accumulation. In addition, higher phenols and flavonoids accumulation arising from higher phenylalanine ammonia-lyase (PAL) enzyme activity is concurrent with higher ascorbic acid (AA) accumulation giving rise to higher DPPH scavenging capacity, which may be vital for the maintenance of membrane integrity in tomato fruits treated with exogenous phenylalanine. Ensuring supply of reducing power NADPH by triggering of folates pathway demonstrated by higher methylenetetrahydrofolate dehydrogenase (MTHFD) enzyme activity may be responsible for activation of ROS scavenging systems in tomato fruits in response to exogenous phenylalanine application, contributing to membrane integrity maintenance. Accordingly, exogenous phenylalanine application may serve as a safe promising procedure to confer chilling tolerance in tomato fruits during cold storage.

Keywords: /Chilling injury/ /DPPH scavenging capacity/ /Folate pathway/ /Membrane integrity/ /Nutritional quality/ /Phenols accumulation/ /ROS scavenging system/

Black-Solis, J., Ventura-Aguilar, R. I., Correa-Pacheco, Z., Corona-Rangel, M. L., & Bautista-Baños, S. (2019). Preharvest use of biodegradable polyester nets added with cinnamon essential oil and the effect on the storage life of tomatoes and the development of *Alternaria alternata*. Scientia Horticulturae, 245, 65-73. DOI: 10.1016/j.scienta.2018.10.004

Abstract

Nets in agriculture are used during crop development to provide shade and protection against the pest attack, while fruit packaging during storage is used to extend and maintain the quality of horticultural products. This study has evaluated the in vitro antifungal activity of biodegradable nets and their effect on the shelf life and control of A. alternata in tomatoes. The biodegradability of the nets was also determined. The nets were made from extruded fibres of two biodegradable polymers, poly (lactic acid) (PLA) and poly (butylene adipate-co-terephthalate) (PBAT) and cinnamon bark essential oil (CEO). The fiber with 6.1% of CEO inhibited the in vitromycelial growth of A. alternata in 72.7% and germination in 100%. The use of nets during the development of tomatoes in the plant had no effect on weight loss, firmness, TSS; titratable acidity and carotenoid content during storage, but values of the antioxidant capacity and ethylene were notably higher in those tomatoes grown in nets with CEO. The incidence of A. alternatain tomatoes was slightly higher in non-treated fruit compared with those grown only with nets and nets with CEO. The biodegradation of nets at 24 weeks was higher in those made with PLA followed by those with CEO. Our results lead us to continue to consider this technology for further pre- and postharvest issues.

Keywords: /*Solanum lycopersicum L./* /Fibres/ /Chitosan/ /Polymers/ /Ripening/ /Biodegradability

Gonzalez, C., Zanor, M. I., Ré, M. D., Otaiza, S., Asis, R., Valle, E. M., & Boggio, S. B. (2019). Chilling tolerance of Micro-Tom fruit involves changes in the primary metabolite levels and in the stress response. Postharvest Biology and Technology, 148, 58–67. DOI: 10.1016/j.postharvbio.2018.10.010

Abstract

Prevention of post-harvest fruit losses is important to increase food availability. In the case of tomato, postharvest storage at low temperature and the subsequent handling and distribution of fruit is limited by chilling injury, a physiological disorder that causes failure to normally ripen and increased decay disease. Micro-Tom fruit, a dwarf tomato variety, is relatively tolerant to cold storage (4 °C for 4 weeks). To understand the tolerance mechanism of Micro-Tom fruit at the molecular level, its transcriptome and metabolome were evaluated before, after chilling storage, and shortly after transferring the fruit to ambient temperature to focus on the critical early events accounting chilling tolerance. Changes in gene expression and metabolic profiles indicate metabolic adaptation (fermentation, amino acid mobilization and photosynthesis recovery after cold storage) and induction of defense mechanisms (biotic and abiotic stress, and redox metabolism) that can be related with Micro-Tom tolerance to postharvest chilling injury. The

current research extends the understanding of the mechanisms involved in chilling tolerance and provides tools for developing new technologies and varieties.

Keywords: /Chilling injury/ /Postharvest/ /Abiotic stress/ /Antioxidant/ /Biotic stress/ /Cold storage/

WALNUT

Habiebie, A., Yazdani, N., Saba, M. K., & Vahdati, K. (2019). Ascorbic acid incorporated with walnut green husk extract for preserving the postharvest quality of cold storage fresh walnut kernels. Scientia Horticulturae, 245, 193-199. DOI: 10.1016/j.scienta.2018.10.022

Abstract

This study assessed the effects of antioxidant edible coating on the walnut green husk extract (WGHE) in combination with ascorbic acid (AsA) and the effects were studied on the postharvest quality of fresh kernels (FKs). FKs were dipped in distilled water (Control), WGHE (0.15 and 0.3 g L−1), AsA 1 % and the combination of treatments. The samples were stored for 60 days at 4 ± 1 °C with 93 % relative humidity. The results showed that low temperature increased the levels of total phenols (TP), reduced the polyphenol oxidase (PPO) enzyme activities after 15 days of storage and preserved the antioxidant activity (AC) for up to 30 days of storage. Compared with uncoated kernels, all coated samples inhibited the increase in microbial growth, peroxide index (PI) and PPO activity. The values of TP, AC, color and sensory properties were also significantly preserved as a result of coating the FKs. In summary, all edible coatings may be used to extend the shelf life of the FKs in dry environment.

Keywords: /Antioxidant/ /Browning/ /Edible coating/ /Sensory properties/