SELECTIVE DISSEMINATION OF INFORMATION
AS OF JUNE 2018

APPLE

Williams, Racquel S., Noureddine Benkeblia. 2018. Biochemical and physiological changes of star apple fruit (Chrysophyllum cainito) during different "on plant" maturation and ripening stages. Scientia Horticulturae, 236: 36-42.

Abstract

This study aimed to determine the respiration rate, ethylene production, total reducing sugars, total phenolic compounds, chlorophylls, color and firmness of green and purple varieties of star apple fruit (Chrysophyllum cainito) during "on-plant" maturation and ripening in order to contribute determining a ripening index for appropriate harvesting time. Respiration rate (RRCO2) and ethylene production decreased significantly during ripening, although an increase in ethylene was noted at mature stage of the purple variety. Total reducing sugars increased significantly during the three stages, while total phenolic compounds decreased, and skin showed higher level of total phenolics compared to pulp. Similarly, chlorophylls (a + b) and carotenoids in skin decreased during ripening, however, the decrease in carotenoids was less significant compared to the decrease of chlorophylls. Overall, color changed from darker to lighter and duller due to ripening. Firmness also decreased significantly during ripening causing softening of the fruit. Results also showed that color and firmness might be considered as a good ripening index for star apple. Conclusively, star apple does not seem to have a climacteric pattern, and its behavior during maturation and ripening was similar to most of non-climacteric fruits.

Keywords: /Respiration/ /Ethylene/ /Sugars/ /Phenolics/ /Ripening index/ /Chrysophyllum cainito/

ASPARAGUS

Toscano, Stefania, Antonio Ferrante, Cherubino Leonardi, Daniela Romano. 2018. PAL activities in asparagus spears during storage after ammonium sulfate treatments. Postharvest Biology and Technology, 140: 34-41.

Abstract

Lignification reduces the edible part of asparagus spears resulting in quality loss. Postharvest conditions such as low temperatures induce lignin accumulation. The aim of this study was to

inhibit the lignification in asparagus spears by affecting activity of phenylalanine ammonia-lyase (PAL), a key enzyme of the phenylpropanoids pathway. Spears were pulse treated with 0.5, 2 or 4 mmol L−1 ammonium sulfate, 2 mmol L−1 aminooxy acetic acid (AOA), and distilled water (control). PAL enzyme activity, total phenolic content, lignin content, antioxidant capacity, spear firmness, weight loss, and elongation were measured. PAL activity was reduced by ammonium sulfate, with 2 mmol L−1 being the most effective concentration. Total phenolic content was lower in spears treated with the higher concentrations of ammonium sulfate. Elongation was higher in AOA treated spears. Spear tip firmness was not affected by ammonium sulfate treatment, while it increased in the AOA treatment. Total antioxidant capacity was higher in all treatments until nine days of storage, but thereafter only 0.5 mmol L−1 ammonium sulfate was higher than the control. Ammonium sulfate showed promising results as a postharvest treatment for controlling PAL activities during storage.

Keywords: /Green asparagus/ /AOA/ /Lignin/ /PAL/ /Texture/ /Total phenolic contents/

AVOCADO

Arpaia, Mary Lu, Sue Collin, James Sievert, David Obenland. 2018. 'Hass' avocado quality as influenced by temperature and ethylene prior to and during final ripening. Postharvest Biology and Technology, 140: 76-84.

Abstract

Avocados (Persea americana Mill.) are often held for short periods after harvest at relatively high temperatures both in the field, in storage during preconditioning (ethylene ripening), or prior to ripening with unknown effects on subsequent quality. To better understand the quality effects of short-term high temperature exposure, avocados were harvested at five different times during the first commercial season and held at 20, 25, 30 or 35 °C for 24 h or 48 h, with and without ethylene. During the subsequent season (2) the experiment was repeated, but without the 30 and 35 °C treatments. In both seasons, following the short-term temperature treatment, fruit were either immediately ripened at 20 °C or stored for 14 d at 5 °C and then ripened to determine the influence of storage. After final ripening to eating firmness (4.4–6.7 N) the fruit were evaluated for quality parameters. Results from the first two seasons showed that even a 24 h exposure to 25 °C and above was sufficient to inhibit subsequent ripening and enhance the occurrence of postharvest disorders such as stem end rot and body rot. Application of ethylene during the short-term temperature exposure was ineffective in preventing the disorders. In the third season of the study the effect of prolonged temperature exposure on final ripening was examined. Although there had been research done in the past on this subject, prior work had not examined the effect of different ripening temperatures on flavor. Avocados were harvested at seven harvest dates, stored for either 4 d or 14 d at 5 °C and then ripened to eating firmness at temperatures ranging from 15 to 25 °C. Increasing temperatures up to 20 °C decreased

ripening time, beyond which there was no further change. Avocados ripened at temperatures above 20 °C had an increased incidence of the development of pink discoloration in the mesocarp. Ripening temperature had no effect on overall likeability, or ratings of grassy or rich flavor. This correlated with a lack of clear effect of ripening temperature on aroma volatile content of the fruit. Panelists found fruit ripened at 15 °C to have a different texture that those ripened at 20 °C but this had no influence on likeability. This study strongly indicated the importance of maintaining the ripening temperature of avocados at or near 20 °C both when the fruit is ripened soon after harvest or after storage to optimize postharvest quality.

Keywords: /Pre-conditioning/ /Flavor/ /Aroma volatiles/ /Storage disorder/

BELL PEPPER

Chen, Hui-zhi, Min Zhang, Bhesh Bhandari, Zhimei Guo. 2018. Applicability of a colorimetric indicator label for monitoring freshness of fresh-cut green bell pepper. Postharvest Biology and Technology, 140: 85-92.

Abstract

Freshness is one of the main considerations for consumption and storage of fresh-cut products. In this study, a freshness indicator label of packaged fresh-cut green bell pepper has been constructed based on pH-sensitive indicators. Compared to indicator labels made by bromothymol blue alone, indicator label made by mixing methyl red and bromothymol blue solutions (at 3:2 proportion) with a concentration of 70 mL L−1 in indicator film solution (MB2 formula) could more clearly monitor pepper decay, where indicator label of MB2 type changed from yellow-green to orange. The label accurately responded to the pepper freshness by significant color change, due to the increased carbon dioxide concentrations in the package as a result of deterioration of pepper at chill temperature. Similarly the other parameters, such as aerobic plate count, weight loss, chlorophyll content, malondialdehyde content, membrane permeability and sensory scores, were also evaluated. The levels of these parameters reached the threshold of spoilage at days 7 at 7 ± 1 °C. Thus, the results showed that label made with a mixture of methyl red and bromothymol blue can be applied as an easy-to-use and promising indicator for freshness monitoring of packaged fresh-cut green bell pepper.

Keywords: /Intelligent packaging/ /Color change/ /pH dye/ /Food spoilage indicator/ /Fresh-cut green bell pepper/

CASSAVA

Hu, Wei, Weiwei Tie, Wenjun Ou, Yan Yan, ... Anping Guo. 2018. Crosstalk between calcium and melatonin affects postharvest physiological deterioration and quality loss in cassava. Postharvest Biology and Technology, 140: 42-49.

Abstract

Rapid postharvest physiological deterioration largely reduces the quality and marketability of cassava. The molecular mechanism underlying cassava postharvest physiological deterioration and quality loss is largely unknown. The present study aimed to investigate the role of calcium and its relationship with melatonin in cassava postharvest physiological deterioration. Transcriptomic analyses indicate that most of the calcium ion (Ca2+) sensor genes are upregulated in cassava tuberous roots at different postharvest stages. Exogenous CaCl2 reduces postharvest physiological deterioration, increases the endogenous levels of Ca2+ and melatonin, reduces the degradation of ascorbic acid and starch, and induces the expression of genes related to melatonin biosynthesis after harvest. These effects are reversed by the exogenous application of a Ca2+ chelator (EGTA). Exogenous melatonin also increases endogenous melatonin levels and reduces ascorbic acid and starch degradation during postharvest physiological deterioration but do not affect endogenous Ca2+ content. Together, these findings demonstrate that calcium-induced activation of melatonin biosynthesis plays a role in reducing postharvest physiological deterioration and quality loss in cassava. Additionally, pretreatment with EGTA arrests the melatonin-induced reduction of postharvest physiological deterioration, suggesting the possible crosstalk between melatonin and calcium during postharvest physiological deterioration.

Keywords /Calcium/ /Melatonin/ /Postharvest physiological deterioration/ /Cassava/

CARROTS

Elsherbiny, Elsherbiny A., Mohamed A. Taher. 2018. Silicon induces resistance to postharvest rot of carrot caused by Sclerotinia sclerotiorum and the possible of defense mechanisms. Postharvest Biology and Technology, 140: 11-17.

Abstract

The inhibitory potential of silicon (Si) against Sclerotinia sclerotiorum, the causal agent of postharvest carrot rot was investigated under in vitro and in vivo conditions, and possible modes of action were evaluated. Silicon at the concentration of 10 mM strongly decreased the mycelial growth of S. sclerotiorum by 92.2% with inhibition of sclerotia formation by 76.3%. Myceliogenic and carpogenic germination of S. sclerotiorum sclerotia were inhibited by 89.1 and 78.9%,

respectively, at the same concentration. The minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFC) values were 12 and 30 mM, respectively. Cell membrane permeability and lipid peroxidation of S. sclerotiorum mycelia were increased with Si treatment. Silicon at 10 mM significantly decrease the content of oxalic acid in S. sclerotiorum mycelia compared to the control. Application of silicon at 10 mM reduced the incidence of sclerotinia rot in carrot roots by 60.6% with 40 mm lesion length. Silicon treatment enhanced the activities of peroxidase (POD), polyphenoloxidase (PPO) and phenylalanine ammonia-lyase (PAL) in carrot roots inoculated with S. sclerotiorum. These results confirm that silicon might applied as an alternative tool to chemical fungicides for controlling sclerotinia rot of carrot during storage and to promote the defense response in carrot.

Keywords: /Silicon/ /Carrot rot/ /Sclerotinia sclerotiorum/ /Oxalic acid/ /MDA/ /Defense-related enzymes/

CITRUS

Jo, Yunhee, Hyun-A Nam, Sudha Rani Ramakrishnan, Mi-Eun Baek, ... Joong-Ho Kwon. 2018. Postharvest irradiation as a quarantine treatment and its effects on the physicochemical and sensory qualities of Korean citrus fruits. Scientia Horticulturae, 236: 265-271.

Abstract

Two Korean citrus fruits, Jinjihyang and Chunggyun, were exposed to gamma irradiation at 0, 0.4 and 1 kGy as an ionizing quarantine treatment and were then subjected to evaluations of physicochemical and sensory quality attributes during storage at 4 ± 1 °C for 0, 10 and 20 days. Upon irradiation at 1 kGy, the narinrutin content of Jinjihyang significantly decreased (109.64–94.80 mg/100 g), while hesperidin content remained stable. However, both flavonoids decreased significantly during storage in both fruit varieties. Vitamin C was stable after irradiation but a significant decrease (42.97–27.21 mg/100 mL) was observed in 1 kGy-irradiated sample at the 20th day of storage. Brix, organic acids, and sensory properties of both fruits were not affected by irradiation or storage. The 1 kGy-treated fruits showed the highest titratable acidity (%) but this was not reflected in the sensory scores, even though Jinjihyang was more susceptible to irradiation than Chunggyun. Overall, irradiation at less than 1 kGy shows a potential to be used as a postharvest quarantine treatment for Korean citrus fruits.

Keywords: /Citrus fruits/ /Ionizing quarantine treatment/ /Organic acid/ /Narinrutin/ /Hesperidin/

GENERAL

Kim, Dowan, Jongchul Seo. 2018. A review: Breathable films for packaging applications Trends in Food Science and Technology, 76: 15-27.

Abstract

Various packaging technologies have been developed to meet continuously increasing consumer demand for comfortable and safe use, convenience of use, and fresh quality of packaged products. Porous and breathable films provide various advantages such as the minimization of anaerobiosis originating from the accumulation of CO2 in packaging and the automatic release of steam in a microwave system. Non-porous breathable films are among the alternative candidates for packaging applications and they can respond to desired and undesired temperature fluctuations by reversibly changing the gas permeability depending on the temperature change. They can also prevent problems related to packaging integrity such as the intrusion of insects and microorganisms through perforations, undesired permeation of moisture, and loss of flavor in agricultural products and food. This review mainly addresses porous and non-porous breathable films that are responsive to stimuli like temperature changes. Further, the importance and possible packaging application areas of non-porous breathable films with temperature-dependent gas permeabilities are briefly identified.

Keywords: /Porous breathable films/ /Non-porous breathable films/ /Temperature-dependent gas permeability/ /Packaging for agriculture and microwavable products/ /Packaging for various sterilization conditions/

Aghdam, Morteza Soleimani, et.al. 2018. Ensuring sufficient intracellular ATP supplying and friendly extracellular ATP signaling attenuates stresses, delays senescence and maintains quality in horticultural crops during postharvest life. Trends in Food Science and Technology, 76: 67-81.

Abstract

As universal energy currency, intracellular ATP (iATP) shortages in horticultural crops during postharvest stresses and senescence. In addition to function as intracellular energy currency, ATP serves as friendly extracellular signaling molecule (eATP). Postharvest treatments attenuate stresses, delay senescence and maintain quality in horticultural crops by ensuring sufficient iATP supplying, which was accompanied with lower phospholipase D (PLD) and lipoxygenase (LOX) enzymes activity concomitant with higher antioxidant system activity which along with higher heat shock proteins (HSPs) accumulation resulting in lower reactive oxygen species (ROS) accumulation leading to higher membrane unsaturated/saturated fatty acids (unSFA/SFA), higher shikimate and phenylpropanoid pathways activity revealing by higher

phenylalanine ammonia lyase (PAL) enzyme activity leading to higher phenols accumulation, higher endogenous proline and glycine betaine accumulation, higher endogenous polyamines accumulation, and higher pathogenesis (PRs) proteins accumulation, which are crucial for membrane fluidity and integrity maintaining and cell wall fortification. In addition to intracellular energy currency, friendly eATP signaling is crucial for promoting iATP biosynthesis machinery activity and reinforcing defense response by triggering jasmonic and salicylic acids signaling pathways. Also, friendly eATP signaling not only is crucial for regulating stomatal closure which is pivotal for attenuating stresses and delaying senescence in horticultural crops but also is crucial for postharvest biofactories representing high phenols accumulating fresh horticultural crops in response to abiotic stresses which are beneficial for human health. Ensuring sufficient iATP supplying and friendly eATP signaling would be crucial for attenuating stresses, delaying senescence and maintaining quality in horticultural crops during postharvest life.

Keywords: /Browning/ /Chilling injury/ /Energy status/ /Fungal decay/ /Postharvest biofactories/ /Senescence/

Droby, Samir, Michael Wisniewski. 2018. The fruit microbiome: A new frontier for postharvest biocontrol and postharvest biology. Postharvest Biology and Technology, 140: 107-112.

Abstract

Microorganisms are an integral part of the composition of fruits and vegetables and are found as epiphytes on the surface or as endophytes within tissues. The realization that fruit surfaces harbor beneficial microorganisms fostered the field of biological control using epiphytic microorganisms which led to the development of several commercial biocontrol products. Advances in DNA sequencing and “omics” technologies have enhanced our ability to characterize the diversity and function of microbial communities (microbiome) present in and on plant tissues. Microbiome studies have the potential of providing knowledge that will lead to a fundamental paradigm shift in the way we think about biocontrol strategies, biocontrol products, and postharvest biology, as well as the health attributes of fruits and vegetables. Fruit microbiome research will enhance our understanding of harvested commodities as an ecosystem in which the microbiome plays an essential role in the health and physiology of fruit after it is harvested. Meta-omic (metagenomics, metatranscriptomics, metaproteomics, and metametabolomics) technologies are only beginning to be applied to postharvest studies and will revolutionize our understanding of postharvest biocontrol systems, foodborne pathogens, and postharvest physiology. The role of the microbiome in plant health, productivity, and cultivar development should be considered as much as the plant itself. Plant breeding or genetic modification of plants could be used to intentionally modulate the composition of the microbiome and its function, recruiting disease antagonists and plant-growth promoters that enhance plant health and the quality of the harvested products. Increased knowledge of microbial community

systems will lead to the development of natural or synthetic consortia that can be used to prevent postharvest diseases and mitigate physiological disorders in harvested commodities.

Keywords: /Biological control/ /Postharvest diseases/ /Synthetic microbial communities/ /Fruit endopytes/ /Fruit epiphytes/ /Stem-end rots/ /Microbial networks/

Frisina, Christine, Dario Stefanelli, Khageswor Giri, Bruce Tomkins. 2018. A revised method for the field collection and storage of fruit ethylene samples using evacuated vials. Scientia Horticulturae, 236:123-126.

Abstract

Ethylene is an important indicator of climacteric fruit maturity. Measuring ethylene production may be delayed because of the distance between the sample collection site and the gas chromatograph. Consequently, fruit maturity may be overestimated and harvested prior to optimal ripeness. In this study, 12-mL evacuated Exetainer® vials were used to hold ethylene samples from a static respiration system containing harvested fruit. The collection and transfer system was tested for accuracy of sample transfer to vials and for storability with evacuated vials containing samples held for up to 28 days at room temperature with no loss of sample integrity. Ethylene production differed between day of harvest (day 0) and the following day (day 1) of several stone fruit selections (‘Autumn Bright’ nectarine, ‘August Flame’ peach and ‘Golden May’ apricot) when testing this system. The use of evacuated vials as a storage tool for at harvest collection of ethylene samples, allowing delayed laboratory analysis, was shown to be a viable option for researchers with field sites at great distance to analysis equipment.

Keywords: Climacteric fruit/ /Delayed analysis/ /Gas systems/ /Static collection chambers/ /Sample/ /Volume/ /Gas chromatography/

JUJUBE FRUIT

Zhang, Zhong, Jian Huang, Xingang LiTranscript analyses of ethylene pathway genes during ripening of Chinese jujube fruit. Journal of Plant Physiology, 224–225: 1-10.

Abstract

The fruit of Chinese jujube (Ziziphus jujuba Mill.) is immensely popular worldwide, while its fleshy fruit has a very short shelf life and suffers serious postharvest damage. The fruit has been controversially classified as non-climacteric, though the mechanisms underlying its ripening behavior, particularly the role of ethylene, have remained unclear. In this study, low and stable ethylene production was detected during ripening of Z. jujuba ‘Dongzao’ fruit, with

production increasing at the full maturity stage. To determine potential ripening behavior, the fruit of five cultivars were harvested at the white mature stage, and all exhibited a first decreasing and then moderately increasing respiration rate without concomitant climacteric-like ethylene production during shelf storage. Treatment with 1.0 μL L−1 1-methylcyclopropene (1-MCP) inhibited respiration and ethylene production in white mature fruit, though the effects of 100 μL L−1 exogenous ethylene were not significant. The transcript levels of genes involved in ethylene biosynthesis, perception, and signal transduction were not elevated during fruit-ripening onset but substantially increased at the full-red ripening stage. Moreover, expression of genes controlling ethylene biosynthesis and perception mainly occurred in an auto-inhibited System-1-like manner, but signaling pathway genes were minimally affected by exogenous ethylene or 1-MCP. These results show that the ripening of Chinese jujube is non-climacteric. The basal level of ethylene likely plays a minor role in ripening regulation but is necessary to maintain normal ripening. This study elucidates the effects of ethylene on jujube fruit ripening, characterizing the ripening of this fruit as non-climacteric, and also provides strategies for the improvement and maintenance of fruit quality and the extension of shelf life during postharvest storage.

KIWIFRUIT

Kim, J. G., Y. Park, M. H. Shin, S. Muneer, R. Lerud, C. Michelson, D. Il Kang, J. H. Min, H. M. P. Chamidha Kumarihami. 2018. Application of NIR-Spectroscopy to predict the harvesting maturity, fruit ripening and storage ability of Ca-chitosan treated baby kiwifruit. Journal of Stored Products and Postharvest Research, 9(4): 44-53.

Abstract

In this study, near infrared (NIR) spectroscopy was performed to establish a non-destructive method to predict the harvesting maturity, fruit ripening and storage ability of Ca-chitosan treated baby kiwifruit. Destructive measurements of firmness, dry matter (DM), soluble solids content (SSC), and acidity was performed. The calibration range investigated for dry matter content (DM) and SSC using NIR reflectance spectrums were observed at 729-975 nm wavelengths. NIR predictions of those quality factors were calculated using the modified partial least square regression method. The predicted R2 value for DM and SSC was 0.73, and the standard error deviation (SED) value was greater than 2. The correlation between the actual value and predicted model of DM were r = 0.74. The correlation between the predicted DM content and the actual SSC, using SSC model was r = 0.65. The correlation between the predicted value of SSC and the actual value of SSC (baby kiwifruits ripen with ethylene) was r = 0.48, which was lower than the actual SSC model. Further, Ca-chitosan pre-harvest treatment on baby kiwifruit showed considerable effects on baby kiwifruit quality. The actual DM content of untreated fruits was 21.4% and it was 22.3% in Ca-chitosan treated fruits. Also, the predicted DM content was significantly high in Ca-chitosan treated fruits (22.7%) compared to untreated

fruits. NIR spectroscopy is an effective and efficient method to measure DM and SSC to determine the fruit harvest maturity hence, date of harvest and storability for quality baby kiwifruits from the marketing point of view.

Key words: /Ca-chitosan/ /Firmness/ /Harvest index/ /Maturation/ /Nondestructive measurement/

(GOLA) LICHI

Ali, Sajid, Ahmad Sattar Khan, Aman Ullah Malik, Tayyaba Shaheen, Muhammad Shahid. 2018. Pre-storage methionine treatment inhibits postharvest enzymatic browning of cold stored 'Gola' litchi fruit. Postharvest Biology and Technology, 140: 100-106

Abstract

Antibrowning effect of methionine was investigated on litchi fruit. Fruit were treated with 0.25% methionine and kept under cold-storage at 5 ± 1 °C for 28 d. Methionine treatment reduced weight loss, and inhibited fruit decay. Methionine application to litchi fruit significantly reduced pericarp browning, malondialdehyde content, hydrogen peroxide, electrolyte leakage and peroxidase, and polyphenol oxidase activities with conserved pericarp anthocyanins. The treated fruit also had higher ascorbic acid contents, total phenolics, 2, 2–diphenyl–1–picrylhydrazyl–radical (DPPH) scavenging activity, and activities of ascorbate peroxidase, catalase, and superoxide dismutase enzymes. Methionine treated fruit also showed higher soluble solid contents, titratable acidity, and sensory attributes with reduced sugar: acid ratio. In conclusion, postharvest methionine application to litchi fruit showed significantly reduced browning, higher antioxidative activities, and maintained quality.

Keywords: /Antibrowning treatment/ /Electrolyte leakage/ /Pericarp browning/ /Peroxidase/ /Polyphenol oxidase/

MANDARIN

Lu, Laifeng, Lifeng Ji, Liping Qiao, Yali Zhang, ... XiaoDong Zheng. 2018. Combined treatment with Rhodosporidium paludigenum and ammonium molybdate for the management of green mold in satsuma mandarin (Citrus unshiu Marc.). Postharvest Biology and Technology, 140: 93-99.

Abstract

This study evaluated the effectiveness of the combined treatment of ammonium molybdate and

Rhodosporidium paludigenum, a yeast species with broad-spectrum antifungal effects, in controlling green mold caused by Penicillium digitatum in satsuma mandarin (Citrus unshiu Marc.). The addition of 0.1 mmol L−1 ammonium molybdate markedly improved the biological activity of R. paludigenum against green mold and decreased disease incidence by 89.3%, and simultaneously discontinued mold development within 0–12 h of infection. Although treatment with ammonium molybdate alone did not effectively reduce the incidence of green mold, treatment with high doses of ammonium molybdate attenuated disease severity. The use of R. paludigenum markedly reduced the dose of ammonium molybdate required to control green mold. Ammonium molybdate significantly depressed the ecto-phosphatase activity of P. digitatum, as well as interrupted the environmental acidification caused by this pathogen. These results suggested that ammonium molybdate contributes to the control of green mold infection by suppressing P. digitatum spore germination and proton-pump activity on the surface of P. digitatum membranes. Moreover, the results indicated that ammonium molybdate may be utilized as an environmentally-friendly additive that can enhance the performance of R. paludigenum against green mold rot in satsuma mandarin fruit.

Keywords: /Rhodosporidium paludigenum/ /Satsuma mandarin/ /Biological control/ /Ammonium molybdate/

MANGO

Rosalie, Rémy, Mathieu Léchaudel, Claudie Dhuique-Mayer, Laurent Dufossé, Jacques Joas. 2018. Antioxidant and enzymatic responses to oxidative stress induced by cold temperature storage and ripening in mango (Mangifera indica L. cv. 'Cogshall') in relation to carotenoid content. Journal of Plant Physiology, 224-225: 75-85.

Abstract

The effects of 15 days of storage at 12 °C and 7 °C followed by fruit ripening at 20 °C on oxidative status, antioxidant defense systems and carotenoid accumulation were studied for two successive years in mango fruits (Mangifera indica L.) cv. Cogshall. Changes in the non-enzymatic (ascorbate) and enzymatic (SOD, CAT, APX, MDHAR, DHAR and GR) antioxidant systems, as well as oxidative parameters (H2O2 and MDA) and the contents of the major carotenoids were measured for three maturity stages, at harvest and after ripening following cold temperature storage. In control conditions (20 °C), ripening induced an increase in oxidation resulting in ROS production and a decrease in ascorbate content. Fruit tissue protection was activated by means of antioxidant and ascorbate regeneration enzyme systems. Carotenoid accumulated exponentially during ripening. Storage at low temperatures increased respiration crisis intensity and therefore increased oxidation in the fruit pulp. Fruit response to this increase varied according to the maturity stage, i.e., enzymatic responses in younger fruits were very low in comparison to the control, whereas second harvest fruits had a significantly

higher degree of enzymatic activity to cope with the oxidative stress. Carotenoid contents decreased with low temperatures and first harvest fruits showed significantly lower values than the control, in opposition to second harvest fruits that appeared not to be affected. We also suggest that, based on a review of the literature, a link can be made between antioxidant system defense and carotenoid metabolism since ROS seems to play a central role as a stress signal in plants.

ONION

Fonseca, Susana C., Luísa Gil, Maria C. Manso, Luís M. Cunha. 2018. Modelling the influence of storage temperature and time after cutting on respiration rate of diced red onions (Allium cepa L. cv. Vermelha da Póvoa). Postharvest Biology and Technology 140: 27-33.

Abstract

Ready-to-use diced onions are very convenient to final consumers and food service companies due to unpleasant pungency and lacrimation effects during bulb cutting. Nevertheless maintaining freshness and functional quality of diced onions is a challenge in the food industry. Thus it is important to know and model the influence of external factors on the product respiration phenomena in order to better control product deterioration. The respiration rate (RR) of diced red onions (Allium cepa L., cv. Vermelha da Póvoa) was studied over a period of storage time after dicing at different temperatures (4, 8, 12, 16 and 20 °C) under a normal atmosphere. At each of the tested temperatures, RR for both O2 and CO2 showed an exponential increase over time. This effect was enhanced with temperature. It was further observed that both the initial RR and reaction rate constants changed with temperature according to an Arrhenius-type equation with identical activation energy. This effect was incorporated in the primary model and the fit of the global model to experimental data was good (R2 = 0.94), with normal distribution of the residuals and correlation coefficients between the model constants below 0.85. Results helped establish a global mathematical model describing RR dependency on temperature over a period of storage time after dicing onions that will allow for a proper package design of this product.

Keywords: /Mathematical modelling/ /Minimally processed vegetables/ /Fresh-cut/ /Oxygen consumption rate/ /Carbon dioxide production rate

PANSY FLOWER

da Silva, Tania Pires, Fernanda Ferreira Araujo, Fernando Luiz Finger. 2018. Longevity of wild pansy flowers treated with growth regulators. Ornamental Plant, 24 (2): 103-108.

Abstract

The objective of this study was to evaluate the growth regulators action on the senescence of wild pansy flowers. In the first experiment, floral stems were treated with ethylene for 24 hours at concentrations of 0.1, 1.0, 10, 100 and 1000 µL L-1 and control without the hormone. In a second experiment, the flowers were immersed in solutions of abscisic acid (ABA) containing 5, 20, 50 and 100 µM for one minute and control with water. In a third experiment, 1-methylcyclopropene (1-MCP) was applied at concentrations of 0.5, 1.0 and 1.5 µL L-1 and control without the chemical. In a fourth experiment, 1-MCP and ethylene were applied, where 1-MCP was first applied followed by ethylene. After the treatments with 1-MCP and ethylene, the floral stems were removed from the hermetic chambers and kept in a vessel containing distilled water at 25 °C, 10 µmol m-2 s- 1 white fluorescent light and 50-70% relative humidity as for the ABA treatment. Flowers treated with ethylene did not present significant differences among the concentrations for visual senescence, showing evidence that this flower is not sensitive to ethylene. Treatment with 1000 µL L-1 of ethylene led to a slightly higher fresh weight loss than other treatments, which had a loss of about 33% at end of the experiment. For the ABA treatment, the flowers showed similar fresh weight loss among the different treatments; however, higher concentrations induced slight senescence of flowers. The use of 1-MCP increased the longevity of wild pansy flowers. These results show that 1-MCP is beneficial in maintaining the flower water status, even in the presence of exogenous ethylene, although ethylene may not be directly involved in the senescence of wild pansy flowers.

Keywords: /Viola tricolor/ /1-Methylciclopropene/ /Abscisic acid/ /Ethylene/ /Longevity/

PAPAYA

Barragán-Iglesias, Josué, Lilia L. Méndez-Lagunas, Juan Rodríguez-Ramírez. 2018. Ripeness indexes and physicochemical changes of papaya (Carica papaya L. cv. Maradol) during ripening on-tree. Scientia Horticulturae, 236: 272-278.

Abstract

The degree of ripeness of fruits is a determining factor for consumption, marketing, and minimal processing. The aim of this study was to establish ripeness stages of papaya (Carica papaya L. cv. Maradol) by describing the physicochemical changes and the relationships between different ripeness indexes during ripening stages on-tree (RST). Papayas from physiological (RST1) to consumption (RST5) ripeness, with three intermediate (RST2, RST3 and RST4) stages, and over-ripe fruits (ORF) were selected by visual color perception and days after anthesis. Physicochemical changes such as epicarp color, total soluble solids (TSS), mesocarp firmness (MF), moisture content, pH, and titratable acidity (TA) and sugar-acid ratio were determined.

Multiple comparisons between stages were performed and the significance were determined by Tukey test ($p \leq 0.05$). The relationship between color parameters, TSS, and MF was determined by Pearson correlation coefficient from RST1 to RST5. Parameters as L*, a*, b*, C*, and TSS values linearly increased during ripening; conversely, h° decreased as a result of color change from green to orange-red. Mesocarp firmness non-linearly decreased due to gradual softening of fruit tissues, it was higher at early stages and similar between later stages. Additionally, pH and TA values increased when ripening was developed. Fruits showed no significant changes ($p \leq 0.05$) in moisture content indicating continuous water supply while fruits were still on-trees. TSS content and MF can be calculated (high R2 coefficient) by considering maximum and minimum h° values in each RST. The high correlation showed between ripeness indexes allowed to establish model equations for destructive tests values such as TSS and MF with nondestructive test such as CIEL*a*b* and CIEL*C*h° scales. Papayas on tree can be selected and harvested with quantitative parameters at desired ripeness while the ripening process elapses.

Keywords: /Maradol papaya/ /Ripeness stages/ /Color-TSSColor-firmness/ /Ripening on-tree/

TOMATO

Huang, Yuping, Renfu Lu, Yifei Xu, Kunjie Chen. 2018. Prediction of tomato firmness using spatially-resolved spectroscopy. Postharvest Biology and Technology, 140: 18-26.

Abstract

This paper reports on evaluating the firmness of tomato fruit using a newly developed spatially-resolved spectroscopy (SRS) system with an illumination optic fiber and 30 detection optic fibers arranged at the source-detector distances of 1.5–36 mm. Spatially-resolved (SR) spectra of 550–1650 nm were acquired for 600 ‘Sun Bright’ tomatoes at six maturity stages. The firmness of tomatoes was measured using acoustic/impact, compression and puncture tests. Partial least squares (PLS) models for individual SR spectra and their combinations were developed to determine optimal prediction models for the firmness parameters. The results indicated that firmness predictions varied with the light source-detector distance or SR spectra, and the optimal single spectrum was different for prediction of different firmness parameters. Those spectra acquired for the light source-detector distances of 6–24 mm resulted in better prediction results. Combinations of SR spectra gave consistently better predictions for the multiple firmness parameters than the optimal single SR spectra, with the correlation coefficients (rp) of 0.760 and 0.911 for acoustic and impact measurement, rp = 0.935 for compression, and rp = 0.917, 0.948 and 0.859 for puncture maximum force, slope and flesh firmness. Overall, the SRS technique gave excellent predictions of firmness parameters for impact, compression and puncture tests that measured the local properties of tomato tissues, and combinations of SR spectra improved prediction results.

Keywords: Spatially resolved/ /Hyperspectral imaging/ /Spectroscopy/ /Tomato/ /Firmness

Mata, Clara I., Bram Van de Poel, Maarten L.A.T.M. Hertog, Dinh Tran, Bart M. Nicolai. 2018. Transcription analysis of the ethylene receptor and CTR genes in tomato: The effects of on and off-vine ripening and 1-MCP. Postharvest Biology and Technology, 140: 67-75.

Abstract

Ethylene, the main hormone regulating ripening in climacteric fruit, is perceived by the ethylene receptors starting a cascade of reactions of the ethylene signal transduction. In order to gain insight in the perception of ethylene during the ripening process, this work presents the transcriptional characterisation of the ethylene receptor (ETR) and CTR (CONSTITUTIVE TRIPPLE RESPONSE) genes of tomato fruit at different developmental stages and postharvest ripening conditions. Our results show that both ETR and CTR genes were differentially expressed when comparing on the vine ripening with off the vine (postharvest ripening) and in response to 1-MCP. Expression of the six ethylene receptors revealed SlETR3 and SlETR4 as the most expressed genes and together with SlETR6 to be the most ethylene-responsive, as they were the fastest to react to changes in conditions such as the 1-MCP application in detached fruit ripening off the vine. A climacteric pattern of expression similar to that of ethylene production itself was observed for most of the receptors and CTR genes during ripening, most strongly during postharvest ripening. All together our results suggest a dedicated regulation of the expression of ETRs and CTRs that allows the plant to precisely control the timing of ripening.

Keywords: /Ethylene receptors/ /CTRs/ /Ethylene signal transduction/ /Gene expression/ /Solanum lycopersicum L./ /1-MCP/ /Postharvest/ /Ripening/

Mohd Sabri Pak Dek, Priya Padmanabhan, Jayasankar Subramanian, Gopinadhan Paliyath. 2018. Inhibition of tomato fruit ripening by 1-MCP, wortmannin and hexanal is associated with a decrease in transcript levels of phospholipase D and other ripening related genes. Postharvest Biology and Technology, 140: 50-59.

Abstract

Membrane deterioration is an inherent aspect of the advancement in senescence and loss in fruit quality during storage. Postharvest technologies used for extending shelf life and quality are targeted to reduce membrane damage through downregulating or blocking ethylene action. In this study, mature green tomato fruit were treated with inhibitors of ethylene receptor (ETR), phosphatidylinositol 3-kinase (PI3K) and phospholipase D (PLD), all recognized to be targets of

regulation of fruit ripening. The inhibitors used included 1-methylcyclopropene (1-MCP, an ethylene receptor blocker), wortmannin (an inhibitor of PI3K), and hexanal (a PLD inhibitor). Fruit were treated at optimal levels of the inhibitors and were stored at 21 °C for 10 days. Color development was strongly delayed in wortmannin treated tomatoes just as in 1-MCP treated fruit; while, changes in respiration, firmness and ethylene evolution were very similar to that of control fruit. Hexanal delayed the initiation of these changes; while 1-MCP and wortmannin blocked the ripening process. Changes in expression levels of key genes involved in ethylene signalling, phosphoinositide metabolism, and lycopene synthesis that occurred in response to inhibitors, suggested potential roles for PI3K and PLD in ethylene signalling. Furthermore, fruit treated with all the three inhibitors showed a marked reduction in PLD transcript levels; suggesting that, regulation of PLD gene expression is a common critical regulatory point that regulates ripening. Lowered PLD levels may reduce membrane lipid catabolism and the generation of phosphatidic acid (PA), an intermediate in ethylene signalling regulation through downstream components.

Keywords: /Solanum lycopersicum/ /Ethylene signal transduction/ /PI3 kinase/ /Senescence/ /Wortmannin/