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As of March 2021

APPLE

Liu, H., Liu, S., Du, B., Dong, K., Wang, Y., & Zhang, Y. (2021). Aloe vera gel coating aggravates superficial scald incidence in "Starking" apples during low-temperature storage. *Food Chemistry*, *339*, 128151. https://doi.org/10.1016/j.foodchem.2020.128151

Abstract

The effects of aloe vera (*Aloe vera* (L.) Burm. f.) gel treatment on the incidence of superficial scald in 'Starking' apples (*Malus domestica* Borkh. Var. Starking) during cold storage were studied. Apples were harvested at the pre-climacteric stage and treated with aloe vera gel. The treatment increased malondialdehyde content and membrane lipid damage. Furthermore, it inhibited the release of ethylene at the early stage but increased it in the later stage. The expression level of ACC synthase 1 (*MdACS1*) also increased, and the antioxidant capacity in apples, particularly, catalase, peroxidase, and superoxide dismutase activities, all decreased, while concomitantly, the content of α-farnesene and its oxidation product, conjugated triene increased, thereby aggravating superficial scald incidence during storage at low temperature.

Keywords: /Superficial scald/ /Aloe vera gel/ /'Starking' apples/ /α-Farnesene/ /Conjugated triene/

Nicolau-Lapeña, I., Aguilo-Aguayo, I., Kramer, B., Abadias, M., Viñas, I., Muranyi, P. (2021). Combination of ferulic acid with Aloe vera gel or alginate coatings for shelf-life prolongation of fresh-cut apples. *Food Packaging and Shelf Life, 27*, 100620. https://doi.org/10.1016/j.fpsl.2020.100620

Abstract

Weight loss, microbial spoilage and enzymatic browning are the main quality-determining processes which limit the shelf-life of fresh-cut apples. In this study, two edible coatings based on Aloe vera gel (AV) and sodium alginate cross-linked with calcium lactate (AC), with the addition of 10 mg/mL ferulic acid (FA) as a functional ingredient, were developed in order to prolong the quality and safety of fresh-cut apple discs. Texture parameters, pH and Brix values and water activity did not undergo relevant changes related to the treatments. Except for weight loss, which was significantly lower for the coated samples, the addition of FA was found to be the most relevant factor for the other investigated parameters, including the total phenolic content and the antioxidant activity measured by ferric reducing antioxidant power (FRAP). Browning was delayed by the addition of FA and also by the AV coating, while non-coated and alginate coated samples showed the highest values in early stages. Although no effect on *Saccharomyces cerevisiae* was observed, FA treatments and alginate were effective in reducing *Listeria monocytogenes* populations by 2.3 ± 0.4 log CFU / g, which contributes to an enhanced product safety.

Keywords: /Edible coatings/ /*Listeria monocytogenes*/ /Browning/ /Weight loss/ /Preservation/ /Fresh-cut fruit/ /Ferulic acid/

Simonato, B., Lorenzini, M., & Zapparoli, G. (2021). Effects of post-harvest fungal infection of apples on chemical characteristics of cider. *LWT - Food Science & Technology*, *138*, 110620. https://doi.org/10.1016/j.lwt.2020.110620

Abstract

The impact of fungal post-harvest infection of apple on the chemical composition of cider was investigated through a comparative analysis of ciders obtained from apples (Gala variety) separately infected by five fungal species (*Alternaria alternata*, *Botrytis cinerea*, *Diplodia seriata*, *Monilinia fructigena,* and *Penicillium expansum*) and cider from sound apples. The content of several flavor-active molecules belonging to different chemical groups, such as alcohols, esters, acids, aldehydes, phenols, and lactones, significantly varied among ciders. Particularly, cider from sound apples had a higher concentration of ethyl ester acetate, fatty acid ethyl esters and fatty acids, molecules that contribute to fruity and sweet scent. Principal component analysis well discriminated ciders, evidencing species-specific fungal effect. Differences in precursor availability in juices and biosynthesis pathways in fungi could explain changes in aroma profile of ciders. This study provides information on the potential risk to produce cider from infected apples due to the possible quality depreciation.

Keywords: /Fungi/ /Infected apples/ /Cider/ /Aroma/

Thewes, F. R., Balkees, B. M., Büchele, F., Wünsche, J. N., Neuwald, D. A., & Brackmann, A. (2021). Ethanol vapor treatment inhibits apple ripening at room temperature even with the presence of ethylene. *Postharvest Biology & Technology*, *173*, 111415. https://doi.org/10.1016/j.postharvbio.2020.111415

Abstract

The present study aimed to evaluate the effect of two ethanol vapor doses (250 and 500 ppm), 1-methylcyclopropene (1-MCP) (0.650 ppm) with or without ethylene application (150 ppm) on the aerobic and anaerobic metabolism and quality of ‘Elstar’, a fast ripening apple cultivar, and ‘Nicoter’, a slowly ripening apple cultivar, over 14 d of holding at room temperature (20 ± 2 °C). Fruit were subjected to treatments for 24 h and analyses performed after 0, 7 and 14 d holding at room temperature (20 ± 2 °C). For both cultivars studied, ethanol vapor treatments, especially 500 ppm, inhibited the ripening of apples even when combined with 150 ppm of ethylene, but not as much as 1-MCP treatment in ‘Nicoter’ apples. Fruit treated with ethanol vapor maintained lower electrolyte leakage, higher flesh firmness, greener color and had more healthy fruit. However, its application increased the pyruvate decarboxylase (PDC) and alcohol dehydrogenase (ADH) activity, acetaldehyde and ethyl acetate accumulation, but in concentrations below the odor threshold reported in the literature. The 1-MCP treatment increased decay incidence, reducing the healthy fruit amount in ‘Nicoter’ apples after 14 d, but maintained a very low ethylene production and respiration rate, which allowed higher acidity maintenance after 14 d holding at room temperature. There was no incidence of external and internal physiological disorders in both cultivars.

Keywords: /*Malus domestica*/ /‘Elstar’/ /‘Nicoter’/ /Anaerobic/ /metabolism/ /Membrane permeability/ /Ethylene/ /Flesh firmness/

BANANA

Fernando, I., Fei, J., Stanley, R., Enshaei, H., & Rouillard, V. (2021). Developing an accelerated vibration simulation test for packaged bananas. *Postharvest Biology & Technology*, *173*, 111400. https://doi.org/10.1016/j.postharvbio.2020.111400

Abstract

Mechanical damage in packaged fruits is known to be exacerbated by the intensity and exposure duration of vibration excitation during road transport. However, the current single degree of freedom (SDOF) vibration simulation test standards for road vehicle transport have limitations for simulating long distance

road trips. The accelerated vibration simulation testing, based on the Basquin model of cyclic fatigue, has been used for reducing the simulation test time. However, the time-compression factor used in this model can result in significant errors in simulation outcome as the power constant is usually assumed (i.e. k = 2 or 5). This work aimed at developing an accelerated vibration simulation test for packaged bananas. For this, mechanical damage levels that occurred during the field transport of packaged bananas were compared with the damage levels resulting from laboratory-based vibration simulation. A SDOF averaged power-spectra derived from the measurement of vertical acceleration levels during the field transport, with a vibration intensity of 0.36 gRMS for a test duration of three hours, was found to be the most suitable test protocol that closely replicated the field damage levels during long distance transport of bananas. The power constant in the Basquin model was derived by comparing the simulation-induced mechanical damage levels, with those occurring during the field transport. This study therefore provides a practical time-compressed simulation test for packaged bananas and other similar products undergoing long distance transport. Improved package testing will contribute to developing more realistic solutions to minimize damage to delicate products in-transit.

Keywords: /Mechanical damage/ /Vibration/ /Transport/ /Simulation/ /Bananas/ /Package testing/ /Supply chain/

BROCCOLI

Xu, D., Zuo, J., Fang, Y., Yan, Z., Shi, J., Gao, L., Wang, Q., & Jiang, A. (2021). Effect of folic acid on the postharvest physiology of broccoli during storage. *Food Chemistry*, *339*, 127981. https://doi.org/10.1016/j.foodchem.2020.127981

Abstract

The objective of the present study was to explore the effect of folic acid on the postharvest physiology of broccoli placed in storage. Broccoli heads were immersed in 5 mg L^{-1} folic acid for 10 min, then stored at 20 ± 1 °C for 4 days. Results indicated that the postharvest treatment of broccoli with folic acid decreased the rate of flower opening and yellowing, inhibited weight loss, reduced the level of respiration, as well as ethylene generation. Folic acid-treated broccoli maintained their level of chlorophyll, total soluble solids, vitamin C, total phenolics, flavonoids, glucosinolate, and folic acid. Treated broccoli also exhibited reduced accumulation of malondialdehyde (MDA) and reactive oxygen species (ROS). Concomitantly, antioxidant enzyme activity and corresponding gene expression were also enhanced. In contrast, chlorophyll-degrading enzyme gene expression was suppressed. These results indicated that folic acid treatment of broccoli could be used to prolong shelf-life.
Keywords: /Folic acid/ /Broccoli/ /Postharvest physiology/ /Storage behavior/ /Antioxidant enzymes/ /Gene expression/

CARROT

Li, L., Li, C., Sun, J., Xin, M., Yi, P., He, X., Sheng, J., Zhou, Z., Ling, D., Zheng, F., Li, J., Liu, G., Li, Z., Tang, Y., Yang, Y., & Tang, J. (2021). Synergistic effects of ultraviolet light irradiation and high-oxygen modified atmosphere packaging on physiological quality, microbial growth and lignification metabolism of fresh-cut carrots. *Postharvest Biology & Technology*, *173*, 111365. https://doi.org/10.1016/j.postharvbio.2020.111365

Abstract

The present study investigated influences of ultraviolet light C (UV-C; 2 kJ m^{-2}) irradiation and high-oxygen modified atmosphere packaging (MAP; 80 % O_2, 10 % CO_2 and 10 % N_2) on physiological quality, microbial growth and lignification metabolism of fresh-cut carrots. After 15-d cold storage, compared with either treatment alone, the combination of UV-C irradiation and high-oxygen MAP (abbr.

UV-C + MAP) more obviously inhibited firmness, weight loss, ascorbic acid, total carotenoid and γ-aminobutyric acid declines, reduced respiration and ethylene production rates as well as delayed bacterial growth. UV-C + MAP more strongly restrained whiteness index, total phenolic, lignin and malondialdehyde increases. Furthermore, UV-C + MAP treatment more efficiently retarded lignin synthesis by suppressing phenolic metabolism-related enzyme (phenylalanine ammonialyase, PAL; polyphenoloxidase, PPO; peroxidase, POD) activities and their gene (*DcPAL*; *DcPPO*; *DcPOD*) expressions. Above results indicated that UV-C + MAP exhibited synergistic effects in retaining physiological quality, delayed senescence process, reducing microbial growth, alleviating lignification degree, and lessened surface whitening. Therefore, UV-C + MAP could maintain overall quality and extend shelf-life during storage of fresh-cut carrots.

Keywords: /Ultraviolet light C/ /High-oxygen modified atmosphere packaging/ /Fresh-cut carrots/ /Synergistic effects/ /Gene expressions/

DRAGON FRUIT

Ho, P. L., Tran, D. T., Hertog, M. L. A. T. M., & Nicolaï, B. M. (2021). Effect of controlled atmosphere storage on the quality attributes and volatile organic compounds profile of dragon fruit (Hylocereus undatus). *Postharvest Biology & Technology*, *173*, 111406. https://doi.org/10.1016/j.postharvbio.2020.111406

Abstract

The short shelf-life of dragon fruit is one of the inhibiting factors for the export of Vietnamese dragon fruit to distant markets. This study aimed at finding an optimal controlled atmosphere (CA) storage condition for dragon fruit by studying the effect of CA storage on fruit quality and its volatile organic compounds profile. Dragon fruit were stored at 4 different CA conditions and in ambient air as a control treatment. At harvest and at day 10, 20, 30, 40 and 50, different fruit quality attributes were measured, including scale color, firmness, electrolyte leakage, soluble solids content, total acidity, respiration rate, and disease score. Sensory evaluation and aroma analysis were also performed. The results revealed that CA storage significantly reduced the yellowing of the scales and maintained fruit acidity. The CA condition of 2 kPa O_2 + 5 kPa CO_2 at 6 °C seemed to be optimal for dragon fruit storage. Normal senescence caused the loss of many volatiles, while low O_2 and high CO_2 level had an opposite impact on the concentration of fermentation products. However, these volatile changes did not significantly impact on the sensory quality of the fruit during storage.

Keywords: /Dragon fruit/ /Controlled atmosphere/ /Aroma change/ /Gas chromatography/ /Solid phase micro-extraction (SPME)/

FRUIT

Bose, S. K., Howlader, P., Wang, W., & Yin, H. (2021). Oligosaccharide is a promising natural preservative for improving postharvest preservation of fruit: A review. *Food Chemistry*, *341*, 128178. https://doi.org/10.1016/j.foodchem.2020.128178

Abstract

Lack of proper postharvest management of fruits causes huge economic loss, increases poverty, hunger and malnutrition. To reduce postharvest losses, globally different postharvest technologies and synthetic chemical treatments were widely used, but some of them are reported to enhance the risk for human health and environment. Recently, oligosaccharides have attracted much attention because of their numerous health benefits, and potential applications in agriculture. Many previous reports demonstrated that oligosaccharides treatment improves the postharvest preservation of fruits and extends the shelf life. Oligosaccharides postharvest treatments maintained higher non enzymatic antioxidant activity, increased

antioxidant activity, regulated hormone biosynthesis and delayed cell wall degradation. In this review, we systematically summarize and discuss the recent research findings concerning the preservation effects of different oligosaccharides, and their mechanism underlying delaying ripening and senescence of fruits during postharvest storage. Moreover, we provide future research direction for the utilization of oligosaccharides to improve postharvest preservation of fruits.

Keywords: /Oligosaccharides/ /Chitosan oligosaccharides/ /Alginate oligosaccharides/ /Pectin oligosaccharides/ /Fruit/ /Shelf life/ /Quality/

Ze, Y., Gao, H., Li, T., Yang, B., & Jiang, Y. (2021). Insights into the roles of melatonin in maintaining quality and extending shelf life of postharvest fruits. *Trends in Food Science & Technology*, *109*, 569–578. https://doi.org/10.1016/j.tifs.2021.01.051

Abstract

Most of postharvest fruits are highly perishable, which limits greatly marketability and potential expansion. In recent years, significant progress on understanding the role of melatonin in delaying senescence have been achieved while the melatonin as a postharvest alternative in maintaining quality and extending shelf life of postharvest fruit has been developed.
This paper reviews the recent progresses in the multiple functions of melatonin, summaries the detection, content and synthesis of endogenous melatonin in postharvest fruit, discusses the possible mechanisms of melatonin in maintaining quality and extending shelf life of postharvest fruit, emphasizes the beneficial effects of the melatonin-related handling and provides the future research direction for postharvest alternative.
The amount of melatonin in postharvest fruit is relatively low and affected greatly by many factors. The major precursors and genes of the melatonin biosynthetic pathway have been identified in various fruits. Exogenous melatonin treatment not only delayed ripening, senescence and quality deterioration, but also enhanced disease resistance and chilling tolerance of postharvest fruit. The multiple biological functions of melatonin in postharvest fruit were attributed to the induction and interaction with reactive oxygen species and nitric oxide and coordination with plant hormones and other signaling molecules, which enhanced antioxidant and defense systems, reduced oxidative damage, and maintained energy of postharvest fruit.

Keywords: /Decay/ /Melatonin/ /Postharvest fruit/ /Quality/ /Ripening/ /Senescence/

GARLIC

Mondani, L., Chiusa, G., Pietri, A., & Battilani, P. (2021). Monitoring the incidence of dry rot caused by Fusarium proliferatum in garlic at harvest and during storage. Postharvest Biology & Technology, 173, 111407. https://doi.org/10.1016/j.postharvbio.2020.111407

Abstract

Dry rot is an emerging postharvest disease of garlic (*Allium sativum*) attributed to *Fusarium proliferatum*, which has caused huge economic losses in the past few years. In this study, we aimed to detect the presence of *F. proliferatum* on garlic bulbs postharvest during prolonged storage, and to identify other fungal species associated with garlic dry rot. We also quantified the level of fumonisins in symptomatic and asymptomatic cloves. A total of 100 plants were sampled from three production seasons at six farms located in Northern Italy at three time points (at harvest, processing, and 6 months post-storage at –4 °C). The *Fusarium*–garlic pathosystem was split into two parts: basal plate/root and bulb. *F. proliferatum* was the dominant fungus in infected bulbs and was confirmed as the causal agent of dry rot in garlic postharvest (mean incidence: 35.4 %). *F. oxysporum* co-occurred with *F. proliferatum* but caused disease only in the basal plate/root. Dry rot incidence slightly increased during cold storage (from 14.6 % at processing to 18.4 % at 6-month storage). Although *F. proliferatum* incidence was stable during cold

storage, fumonisins were produced. Symptomatic cloves were more contaminated than asymptomatic cloves, both by the fungus (mean incidence 39 % vs. 25.3 %) and the toxin (287.0 vs. 24.4 μg kg^{-1}). These results suggest that cold storage delays the progression of dry rot, but the risk of health issues related to fumonisins and the occurrence of infection in asymptomatic cloves should be seriously considered.

Keywords: /*Allium sativum*/ /*Fusarium proliferatum*/ /*Fusarium oxysporum*/ /Fumonisin/ /*Penicillium*/ /Dry rot/

GRAPE

Yang, M., Luo, Z., Gao, S., Belwal, T., Wang, L., Qi, M., Ban, Z., Wu, B., Wang, F., & Li, L. (2021). The chemical composition and potential role of epicuticular and intracuticular wax in four cultivars of table grapes. *Postharvest Biology & Technology*, *173*, 111430. https://doi.org/10.1016/j.postharvbio.2020.111430

Abstract

Plant cuticular wax is the first barrier to resist biotic and abiotic stress. However, little is known about the compositional differences between the epicuticular and intracuticular wax in grape berry. The compositional, morphological and functional features of cuticular wax in grape berries of *Vitis vinifera* cv. 'Kyoho', 'Muscat Hamburg', 'Redglobe', and 'Zuijinxiang' were investigated. The total and epicuticular wax of four berries were mainly composed of terpenoids, hydrocarbons, alcohols, fatty acids and esters. Oleanolic acid was the most abundant terpenoid among the four cultivars. Scanning electron microscopy revealed the crystalline flakes structure of the cuticular wax. Additionally, the removal of epicuticular wax accelerated the weight loss, browning, and softening of grape berries, indicating the plastic-wrap-like effect of the cuticular wax on postharvest quality. This study provided the theoretical basis for further application of the fruit wax or waxy analogue.

Keywords: /Epicuticular wax/ /Grape berry/ /Composition/ /Morphology/ /GC–MS/ /SEM/

Shahkoomahally, S., Sarkhosh, A., Richmond-Cosie, L. M., & Brecht, J. K. (2021). Physiological responses and quality attributes of muscadine grape (Vitis rotundifolia Michx) to CO2-enriched atmosphere storage. *Postharvest Biology & Technology*, *173*, 111428. https://doi.org/10.1016/j.postharvbio.2020.111428

Abstract

Muscadine grape (*Vitis rotundifolia* Michx) is a non-climacteric fruit that rapidly loses quality during storage. This study aimed to assess the effect of controlled atmosphere (CA) on quality parameters and muscadine grapes decay. Berries of two muscadine grape cultivars, Triumph, and Supreme, were stored at 4 °C with 95 % relative humidity in either regular air (AIR), regular CA (RCA) (6 % O_2 + 10 % CO_2), or CA with extreme CO_2 level (ECA; 4 % O_2 + 30 % CO_2) for up to 42 d. Treated berries with either RCA or ECA provided better control of weight loss. Both CA treatments reduced decay incidence, but there was no decay in ECA berries after 42 d for both cultivars and no evidence of CO_2 injury. The results showed that berry softening was significantly delayed by RCA and ECA, which had a lower ethylene production rate than berries exposed to AIR. Application of RCA and ECA also retained greater total antioxidant activity, total phenolic compounds, and firmness compared to AIR. These results demonstrate that maintaining CA conditions postharvest leads to improved preservation of compositional quality and delayed softening and decay of harvested muscadine grapes compared with AIR storage.

Keywords: /Berry quality/ /Controlled atmosphere/ /Decay/ /Ethylene production/ /Modified atmosphere/ /Postharvest quality/

JUJUBE

Deng, B., Xia, C., Tian, S., & Shi, H. (2021). Melatonin reduces pesticide residue, delays senescence, and improves antioxidant nutrient accumulation in postharvest jujube fruit. *Postharvest Biology & Technology*, *173*, 111419. https://doi.org/10.1016/j.postharvbio.2020.111419

Abstract

Melatonin reportedly delays postharvest fruit senescence, but information on its *in vivo* effects on pesticide degradation in postharvest fruit is limited. In this study, we investigated the effect of melatonin on the regulation of pesticide degradation and antioxidant nutrient accumulation in jujube fruit after storage. The results showed that melatonin treatment markedly promoted the degradation of three different types of pesticide (chlorothalonil, malathion, and glyphosate) in postharvest jujube fruit. However, this melatonin-enhanced pesticide degradation was greatly reduced by *p*-chlorophenylalanine (a specific inhibitor of melatonin synthesis) and l-buthionine-sulfoximine (a specific inhibitor of glutathione). Furthermore, pesticide-induced glutathione and melatonin accumulation, coupled with increased glutathione reductase and glutathione S-transferase activities, was further enhanced by melatonin in jujube fruit after storage. Pesticide-delayed fruit senescence (evaluated by weight loss, decay incidence, and firmness) was also further enhanced by melatonin. Interestingly, pesticide-impaired ascorbic acid contents, total phenolics accumulation, and total antioxidant capacities (as evaluated by Fe^{3+} reducing power) recovered with melatonin treatment in postharvest jujube fruit. This study provides a new biodegradable method for pesticide removal and improves postharvest fruit quality in agronomic production.

Keywords: /Antioxidant nutrient/ /Glutathione/ /Melatonin/ /Pesticide removal/ /Postharvest fruit/

KIWIFRUIT

Zhang, W., Lv, Z., Shi, B., Xu, Z., & Zhang, L. (2021). Evaluation of quality changes and elasticity index of kiwifruit in shelf life by a nondestructive acoustic vibration method. *Postharvest Biology & Technology*, *173*, 111398. https://doi.org/10.1016/j.postharvbio.2020.111398

Abstract

A nondestructive acoustic vibration method combined with kinetic models was used to evaluate the quality changes and elasticity index (*EI*) of kiwifruit in shelf life in this study. The kiwifruit was stored at 0, 4, 10 or 20 °C. On each test day, the elasticity index of the kiwifruit was measured by the nondestructive acoustic vibration method. Then, the samples were measured by the puncture test and sensory evaluation. The results showed that *EI* and the quality indices changed gradually during storage and were significantly affected by the storage temperature. Moreover, *EI* correlated well with the tissue strength and sensory indices. Different kinetic models were used to fit the change in *EI*. The results showed that the first-order kinetic model had a better performance (with R^2 values of 0.986~0.997 and RMSE values of 0.009–0.019 $kHz^2\ kg^{2/3}$) than the zero- and second-order kinetic models. The temperature dependence of the reaction rate (*k*) of *EI* was further modelled by the Arrhenius model. The Arrhenius model showed good performance for modelling *k* as a function of temperature (R^2>0.99). The first-order kinetic model combined with the Arrhenius model was used to evaluate quality changes and *EI* for kiwifruit. The results showed that the errors between the predicted and experimental values of *EI* were within 12%, indicating the established model could be used for the evaluation of quality changes and *EI* of kiwifruit. This study provides a nondestructive method for evaluating the quality changes and *EI* of kiwifruit in shelf life.

Keywords: /Shelf life/ /Kiwifruit/ /Nondestructive/ /Acoustic vibration/ /Elasticity index (*EI*)/ /Kinetics/

Zhang, W., Luo, Z., Wang, A., Gu, X., & Lv, Z. (2021). Kinetic models applied to quality change and shelf life prediction of kiwifruits. *LWT - Food Science & Technology*, *138*, 110610. https://doi.org/10.1016/j.lwt.2020.110610

Abstract

Kinetic models were used to describe the quality changes in kiwifruits and predict shelf life in this study. The kiwifruits were stored at the temperature of 0, 5, 10, 15 and 20 °C, respectively. Quality indices, including weight loss, firmness, soluble solids content, ascorbic acid, titratable acidity, total color change and sensory score, were measured at set intervals during storage. The results showed that the quality changes were better fitted by the zero-order reaction model (with R^2 values of 0.892–0.985) than by the first- and second-order reaction models. Furthermore, the temperature-dependent reaction rate was assessed by the Arrhenius, Eyring and Ball models, and the Ball model showed better performance (with R^2 values of 0.947–0.991). Therefore, the zero-order reaction model combined with the Ball model was used for the prediction of shelf life and quality changes in kiwifruits. The results showed that the error between the predicted and experimental values of quality indices was within 6.5%, indicating that the zero-order reaction model combined with the Ball model for the prediction of shelf life and quality changes in kiwifruits was feasible. The results can help distributors and consumers to determine the storage time and optimal edible time of kiwifruits.

Keywords: /Kinetic model/ /Storage/ /Shelf life/ /Kiwifruit/ /Quality/

LETTUCE

Vaštakaitė-Kairienė, V., Kelly, N., & Runkle, E. S. (2021). Regulation of the Photon Spectrum on Growth and Nutritional Attributes of Baby-Leaf Lettuce at Harvest and during Postharvest Storage. *Plants*, *10*(3), 549. https://doi.org/10.3390/plants10030549 (NPS)

Abstract

The photon flux density (PFD) and spectrum regulate the growth, quality attributes, and postharvest physiology of leafy vegetables grown indoors. However, limited information is available on how a photon spectrum enriched with a broad range of different wavebands regulates these factors. To determine this, we grew baby-leaf lettuce 'Rouxai' under a PFD of 200 µmol m^{-2} s^{-1} provided by warm-white (WW; control) light-emitting diodes (LEDs) supplemented with either 30 µmol m^{-2} s^{-1} of ultraviolet-A (+UV30) or 50 µmol m^{-2} s^{-1} of blue (+B50), green (+G50), red (+R50), or WW (+WW50) light. We then quantified growth attributes and accumulated secondary metabolites at harvest and during storage in darkness at 5 °C. Additional +G50 light increased shoot fresh and dry weight by 53% and 59% compared to the control. Relative chlorophyll concentration increased under +UV30, +G50, and especially +B50. At harvest, +B50 increased total phenolic content (TPC) by 25% and anthocyanin content (TAC) by 2.0-fold. Additionally, +G50 increased antiradical activity (DPPH) by 29%. After each day of storage, TPC decreased by 2.9 to 7.1% and DPPH by 3.0 to 6.2%, while TAC degradation was less pronounced. Principal component analysis indicated a distinct effect of +G50 on the lettuce at harvest. However, concentrations of metabolites before and during storage were usually greatest under the +B50 and +R50 treatments.

Keywords: /DPPH; anthocyanins/ /Light-emitting diodes/ /Phenols/ /White light/

LISIANTHUS

López-Guerrero, A. G., Zenteno-Savín, T., Rivera-Cabrera, F., Izquierdo-Oviedo, H., & Soriano Melgar, L. de A. A. (2021). Pectin-derived oligosaccharins effects on flower buds opening, pigmentation and antioxidant content of cut lisianthus flowers. *Scientia Horticulturae*, *279*, 109909. https://doi.org/10.1016/j.scienta.2021.109909

Abstract

Most flower buds do not open after the cut flower has been separate from the plant without having an external energy source. Sugar added in vase solutions usually has positive effects; however, it can also elicit and generate greater senescence. The objective of this paper was to determine the effects of sucrose, another external elicitor such as oligosaccharins, and the synergy of these compounds applied in vase solutions on the opening and pigmentation of lisianthus (*Eustoma grandiflorum* cv. 'Mariachi blue') flower buds. Different vase solutions were applied, including a negative control (water alone) and a positive control (commercial Floralife Crystal Clear®). The treatments were sucrose (4 %), pectin-derived oligosaccharins (Pectimorf® at 1 mg L^{-1} and 2 mg L^{-1}), and the combination (2 mg L^{-1} oligosaccharins and 4 % sucrose). Physical and biochemical parameters were evaluated in flowers and leaves. Results suggest that oligosaccharins and sucrose synergy caused greater bud opening (12 % greater than negative control) and flower diameter (74 mm, 20 % greater than negative control), produced more intense color in young flowers, and modified antioxidant compounds content. These effects allow for prolonging vase life, maintaining the appearance, and increasing the color and flower size of lisianthus during postharvest as compared to water or sucrose alone treatments.

Keywords: /Anthocyanin/ /Antioxidant enzymes/ /Pectimorf®/ /Postharvest quality/ /Vase solutions/

MANGO

Chilakala, S., Mehtab, V., Tallapally, M., Vemula, M., Shaikh, A. S., Chenna, S., & Upadhyayula, V. (2021). SEC-MS/MS determination of amino acids from mango fruits and application of the method for studying amino acid perturbations due to post harvest ripening. *LWT - Food Science & Technology*, *138*, 110680. https://doi.org/10.1016/j.lwt.2020.110680

Abstract

A simple and sensitive size exclusion chromatography – liquid chromatography tandem mass spectrometry (SEC-MS/MS) based analytical method was developed for the quantification of free amino acids from mango fruit pulp samples. The pulp samples were extracted with 70:30 acetonitrile:water containing 0.05 mol/L formic acid and treated with activated charcoal to remove the phenolic and hydrophobic impurities. The amino acids were isolated by a strong cation exchange process and quantified by SEC-MS/MS. The method was validated for linearity, the limit of detection and limit of quantification. The LOQ values were observed in the range of 0.2–145 ng/g at 10:1 signal to noise ratio and the interday and intraday precisions were below 15%. The developed method was applied for the analysis of amino acids in mango fruits ripened with ethylene, calcium carbide and ethephon ripening agents. Alanine was observed as major amino acid and other amino acids showed significant changes, which were studied by ANOVA and principal component analysis (PCA). The PCA studies showed that the fruits ripened with calcium carbide are similar to that of naturally ripened fruits.

Keywords: /Postharvest ripening/ /Amino acids/ /SEC-MS/MS/ /Calcium carbide/ /Principal component analysis/

Hossain, A., Rana, M., Uddin, S., & Kimura, Y. (2021). Changes in organoleptic and biochemical characteristics of mango fruits treated with calcium chloride in hot water. *Journal of Horticulture and Postharvest Research, 4 (1),* 37-50. http://dx.doi.org/10.22077/jhpr.2020.3191.1127 (NPS)

Abstract

In Bangladesh, mango fruit supply is limited in the local market as well as for export due to its short self-life and susceptibility to post-harvest diseases. This study aimed to evaluate the effects of CaCl2 in hot water on organoleptic and biochemical characteristics of mango fruits for extension of shelf-life.

Mangoes were treated with different concentrations (0.0, 0.5, 1, 2, 3, 4 & 5 %) of CaCl2 in hot water (50°C) for 10 min and kept at 25±2°C over 12 days. Each treatment included 20 mangoes with three replications. The physiological changes were observed and biochemical characteristics of mango fruits were analyzed. Better skin color and aroma were observed at 0.5~4.0% CaCl2 and no fungal infection was found at 3~5% CaCl2 as compared with untreated control whereas taste and texture of mangoes increased significantly with the increasing concentration of CaCl2. The shelf life of treated mangoes increased 2~3 days with increasing concentration of 4~5% CaCl2 but slight skin shriveling and weight loss were observed. Higher concentration of CaCl2 treated fruits maintained higher values of moisture, ash, titratable acidity, vitamin-C, reducing sugar, starch, invertase activity whereas total soluble solid, total sugar, non-reducing sugar, total phenol, amylase, polyphenoloxidase activity decreased significantly. In future, mechanism of CaCl2 in hot water for extending shelf life of mangoes will be elucidated using molecular approach. The treatment of 4% CaCl2 in hot water could be used to extend the shelf life of mangoes up to 2~3 days with consumer acceptance.

Keywords: /Biochemical characteristics/ /CaCl2 treatment/ /Mangifera indica/ /Postharvest technology/ /Shelf life/

Moomin, A., Abbey, L.D., & Amey, N.K. (2021). Relation of harvesting time on physicochemical properties of Haden, Kent, Palmer and Keitt mango varieties for export and local markets. *Journal of Horticulture and Postharvest Research, 4 (1),* 87-100. http://dx.doi.org/10.22077/jhpr.2020.3170.1126 (NPS)

Abstract

Fruit ages (early, mid, and late harvest stages) of Haden, Kent, Palmer, and Keitt mango varieties were determined through age-control and established for physiological (early harvest) and eat-ripeness stages (mid and late harvests). This was followed by determining physicochemical properties at these stages that could be used as simple harvest indicators for export and local markets. Randomized Complete Block Design and Completely Randomized Design with four replications in each case were used. For each of the four varieties, five mango trees were sampled at random in each of the four replications of a mango plantation when fruits were physiologically matured. Physiological and ripe maturity index values were 8.94, 6.88, 7.25, and 6.56 oBrix respectively, for soluble solids; 24.9, 8.5, 35.5, and 23.8 mg.100g-1 respectively, for ascorbic acid; 3.25, 3.50, 3.33, and 3.49 respectively, for pH; and 18.5, 17.5, 19.5, and 17.0 oBrix respectively, for total soluble solids; 8.05, 3.32, 5.52, and 3.66 mg.100g-1 respectively, for ascorbic acid; 5.11, 4.08, 5.00, and 5.80 respectively, for pH; respectively. Pulp colour (turning yellow) was nearly the same for the different varieties at physiological maturity but varied when ripe, with uniform consistent texture at both stages. No limitations to report. Fruit should be harvested after full maturity in order to develop the most adequate organoleptic quality and the longest post-harvest life, and before full ripeness but should never be over-ripe or immature for any purpose unless otherwise.

Keywords: /Age-control/ /Eat-ripeness stage/ /Mango fruit/ /Physiological maturity/ /Physicochemical constituents/

MUSHROOM

Li, D., Wang, D., Fang, Y., Belwal, T., Li, L., Lin, X., Xu, Y., Chen, H., Zhu, M., & Luo, Z. (2021). Involvement of energy metabolism and amino acid metabolism in quality attributes of postharvest Pleurotus eryngii treated with a novel phase change material. Postharvest Biology & Technology, 173, 111427. https://doi.org/10.1016/j.postharvbio.2020.111427

Abstract

Phase change material (PCM) is a substance which absorbs latent heat by a phase transition, and it plays important roles in short-time cold chain transportation. In the present study, we developed a novel

water-based PCM, which showed a better effect on maintaining low-temperature conditions compared with ice, and applied in postharvest storage of *Pleurotus eryngii* at room temperature for 5 d. The results showed that the novel PCM treatment alleviated the deterioration of the visual appearance of *P. eryngii*. Amino acids assay revealed the novel PCM treatment improved the accumulation of phenylalanine, glutamate, and proline. Increased phenylalanine potentially delayed the decrease of total phenolic and flavonoid, and increased glutamate enhanced characteristic flavors of *P. eryngii*. In addition, a high level of proline contributed to delayed postharvest senescence by maintaining the membrane integrity, as well as promoting antioxidant capacity. Further, the energy status assay clarified that the novel PCM treatment maintained sufficient energy supply in *P. eryngii* by activating succinate dehydrogenase, cytochrome C oxidase, and ATPase activities, therefore should partially contribute to the decrease of catabolism of glutamate and proline as a result. Our current study indicated that the novel PCM might be a good substitute for ice in cold chain transportation of postharvest *P. eryngii*.

Keywords: /Phase change materials/ /*P. eryngii*/ /Amino acid metabolism/ /Energy metabolism/

Shao, P., Yu, J., Chen, H., & Gao, H. (2021). Development of microcapsule bioactive paper loaded with cinnamon essential oil to improve the quality of edible fungi. *Food Packaging and Shelf Life, 27,* 100717. https://doi.org/10.1016/j.fpsl.2020.100617

Abstract

Edible fungi are highly susceptible to water loss and microbial contamination, resulting in short shelf life and deterioration of food quality. Therefore, it is important to develop a packaging material to increase the shelf life of edible fungi. In this research, we developed a bioactive paper for preservation of edible fungi by combining cinnamon essential oil (CEO) microcapsules with paper-based materials. The results indicated that CEO microcapsules were successfully introduced and bonded to paper fibers by starch, which ensured the sustained release of CEO on paper. In addition, the mechanical properties and water vapor permeability of coated paper had also been improved. Microcapsule bioactive paper was more suitable for high humidity fungi products, such as Agaricus bisporus, which could regulate the stability of the internal environment and improve the bacteriostasis. The developed bioactive paper provided an effective packaging material for preservation of edible fungi and prolonged shelf life of edible fungi.

Keywords: /Bioactive paper/ /Cinnamon essential oil microcapsules/ /Sustained release/ /Water vapor permeability/ /Edible fungi preservation/

Xu, D., Gu, S., Zhou, F., Hu, W., Feng, K., Chen, C., & Jiang, A. (2021). Mechanism underlying sodium isoascorbate inhibition of browning of fresh-cut mushroom (Agaricus bisporus). *Postharvest Biology & Technology*, *173*, 111357. https://doi.org/10.1016/j.postharvbio.2020.111357

Abstract

The effect of sodium isoascorbate (SI) on the browning of fresh-cut mushrooms was investigated. Results indicated that fresh-cut mushrooms treated with 10 g L^{-1} SI exhibited increased firmness, decreased weight loss, a lower respiration rate, a lower degree of browning, and lower polyphenol oxidase and tyrosinase activity, over 12 d of storage, relative to untreated mushrooms. The exogenous SI treatment also delayed a decline in total phenolics, total flavonoids, gallic acid, and catechin, decreased electrolyte leakage, as well as lowered levels of MDA and reactive oxygen species. The levels of of ascorbic acid and glutathione, and antioxidant enzyme activity (superoxide dismutase, catalase, ascorbate peroxidase and glutathione reductase) were also enhanced in 10 g L^{-1} SI-treated fresh-cut mushrooms. Collectively, results indicate that a 10 g L^{-1} SI treatment induces a series of antioxidant responses in fresh-cut mushrooms that inhibits browning and maintains overall quality. The prescribed treatment could be used to prolong the shelf life of fresh-cut mushrooms.

Keywords: /*Agaricus bisporus*/ /sodium isoascorbate/ /browning/ /antioxidant enzyme/

MUSTARD

Sun, B., Di, H., Zhang, J., Xia, P., Huang, W., Jian, Y., Zhang, C., & Zhang, F. (2021). Effect of light on sensory quality, health-promoting phytochemicals and antioxidant capacity in post-harvest baby mustard. *Food Chemistry*, *339*, 128057. https://doi.org/10.1016/j.foodchem.2020.128057

Abstract

The effect of light exposure on sensory quality, health-promoting phytochemical contents, and antioxidant capacity in the lateral buds of baby mustard plants was investigated at ambient storage temperature (20 °C). The results showed that light exposure (36 μmol m^{-2} s^{-1}) during post-harvest storage significantly prolonged shelf life (more than 1.75-fold), delayed the weight loss and the decrease of firmness. Light treatments also enhanced chlorophyll and carotenoid contents, and retarded declines in contents of soluble sugars, ascorbic acid, flavonoids and glucosinolates, as well as antioxidant capacity. The quality of baby mustard plants receiving 24 h daily light treatment was superior to those in plants receiving 12 h treatment and constant darkness at 20 °C. These findings indicate that light exposure, especially 24 h treatment, is an effective method of prolonging shelf life and maintaining sensory and nutritional qualities in baby mustard plants stored at ambient temperature.

Keywords: /Baby mustard/ /Lateral buds/ /Light exposure/ /Post-harvest storage/ /Antioxidants/ /Glucosinolates/

ORANGE

Firozi, M., Amiri, M.E., & Kahneh, E. (2021). Effect of tea seed oil on post-harvest quality of Moro blood orange. *Journal of Horticulture and Postharvest Research, 4(1),* 115-126. http://dx.doi.org/10.22077/jhpr.2020.3355.1143 (NPS)

Abstract

The use of natural and organic products increases to produce a healthy product free of pollutants. Tea seeds contain 15-20% oil, which is used as edible oil and an organic pesticide. In previous years, these seeds were used to produce tea seedlings. But now, cuttings are used for tea propagation and seeds are a byproduct of tea production. Therefore, this study aims to compare the effect of TSO with commercial wax on post-harvest quality of Citrus sinensis cv. Moro. An experiment was done as Completely Randomized Design; fruits were coated with control (distilled water), commercial wax (XEDASOL- MX20), and tea seed oil. The fruits were stored for 60 days in cold storage. The weight of the fruit skin, the contents of juice, total soluble solids, titratable acidity, and anthocyanins of the fruit were measured.
The results showed that fruits coated with commercial wax and tea seed oil have the lowest fruit weight loss, the highest percentage of TSS (10.42%), the most top content of anthocyanins (15.17 mg/l) and flavonoids (196.17 mg/l) that there was a significant difference with control. The lowest titratable acidity (2.28%) was observed in fruits impregnated with tea seed oil, and there was a considerable difference with control. In general, the effect of tea seed oil was similar to commercial wax. No limitations were founded. These results indicate that the application of tea seed oil proved to be effective in extending the quality and storage time of Citrus sinensis (cv. Moro).

Keywords: /By-product/ /Citrus/ /Oil/ /Quality/ /Tea/

PAKCHOI

Zhu, Z., Geng, Y., & Sun, D.-W. (2021). Effects of Pressure Reduction Modes on Vacuum Cooling Efficiency and Quality Related Attributes of Different Parts of Pakchoi (Brassica Chinensis L.). *Postharvest Biology & Technology*, *173*, 111409. https://doi.org/10.1016/j.postharvbio.2020.111409

Abstract

Rapid/moderate/slow pressure reduction modes of vacuum cooling (VC) with pressure reduction rates ranging from 0.0043 to 0.0502 s^{-1} were developed. The effects of VC in different modes on the cooling efficiency and quality-related attributes of different edible parts of pakchoi including total and free water contents, colour differences, respiration rates, membrane stability and microstructures were investigated, and the cluster analysis (CA) was employed for visualizing and classifying the VC-induced quality variation. Results showed that the leaf and the petiole exhibited different temperature changes and vacuum tolerances, of which the adaxial epidermis of the leaf was more sensitive to VC, showing more severe cell damage due to the internal moisture gradient. The rapid pressure reduction mode (α_1 = 0.0502 s^{-1}) could predominately improve cooling efficiency and minimize the quality attenuation, while the moderate pressure reduction mode (α_2 = 0.0184 s^{-1}) contributed to better temperature uniformity and colour acceptance. Moreover, the result of CA further confirmed the above conclusions, suggesting that α_1 and α_2 endowed pakchoi with similar quality-related attributes to the fresh one. The current study proved that the slow pressure reduction mode should be avoided for uses in VC of leafy vegetables.

Keywords: /Vacuum cooling/ /pressure reduction mode/ /leafy vegetables/ /edible parts/ /cluster analysis/

PEAR

Busatto, N., Giné-Bordonaba, J., Larrigaudière, C., Lindo-Garcia, V., Farneti, B., Biasioli, F., Vrhovsek, U., & Costa, F. (2021). Molecular and biochemical differences underlying the efficacy of lovastatin in preventing the onset of superficial scald in a susceptible and resistant Pyrus communis L. cultivar. *Postharvest Biology & Technology*, *173*, 111435. https://doi.org/10.1016/j.postharvbio.2020.111435

Abstract

The molecular and biochemical events underlying the onset of superficial scald in two pear cultivars with different susceptibility (‘Blanquilla’ and ‘Conference’) was investigated in fruit untreated and treated with lovastatin, 1-MCP or ethylene. ‘Conference’ pears were characterized by higher content of flavonols and linolenic acid (18:3), two metabolites related to chilling injury resistance. In this cultivar, the expression level of three genes belonging to the ascorbate glutathione pathway (*APX*, *DHAR* and *MDHAR*) were constitutively over-expressed, highlighting the role that endogenous antioxidant potential played in scald control. In the scald-susceptible cultivar (‘Blanquilla’) the lovastatin treatment, in contrast to 1-MCP, effectively prevented superficial scald development and α-farnesene production without affecting fruit ripening. Moreover, lovastatin stimulated an increased production of ethanol and oleic + cis vaccenic acid (18:1), both compounds being also involved in cold stress tolerance. In both cultivars, and in contrast to 1-MCP, lovastatin did not impair the expression level of the genes devoted to ethylene production (*ACO*, *ACS*) and perception (*ERS1*, *ERS2*). As a consequence, the expression levels of the genes involved in texture modifications (*PG1*) and volatile emission (*LOX*, *HPL*, *ADH* and *AAT*) were maintained in lovastatin-treated samples allowing the fruit to reach an adequate final quality.
The results from this study are discussed to highlight the complex regulatory network underlying superficial scald development in different pear cultivars.

Keywords: /Superficial scald/ /Pear/ /Cold storage/ /Chilling injury/ /Ripening/ /Antioxidant content/

Li, M., Zhi, H., & Dong, Y. (2021). The influence of pre- and postharvest 1-MCP application and oxygen regimes on textural properties, cell wall metabolism, and physiological disorders of late-harvest “Bartlett” pears. *Postharvest Biology & Technology*, *173*, 111429. https://doi.org/10.1016/j.postharvbio.2020.111429

Abstract

Late-harvest (LH) pears are prone to postharvest disorders and eating-quality deterioration in storage and retailing. The purpose of this work was to evaluate the effects of pre- and post-harvest 1-methylcyclopropene (1-MCP, Harvista (H) and SmartFresh (SF)) on LH 'Bartlett' pears under the various O_2 regimes. Spraying 320 μL L^{-1} H delayed fruit maturation and suppressed ethylene production rate (EPR) when pears were harvested at 70.51 N (LH, whereas commercial harvest (CH) at 75.04 N). However, the H-treated LH fruit had 100 % decay after 5 months of regular-air (RA) storage. The 0.15 μL L^{-1} SF and SF + 160 μL L^{-1} H extended melting texture life of LH fruit to 5 months with high levels of water-soluble polyuronides (WSP) and CDTA-soluble polyuronides (CSP) and activities of pectin methylesterase (PME), pectate lyase (PL), and α-arabinofuranosidase (α-ARF). Raising H application concentration from 160 to 320 μL L^{-1} in H + SF treatments resulted in blockage of ripening capacity. Decreasing O_2 concentration from 2 to 1 % did not impact LH pears' ripening, but effectively curtailed the development of melting texture in H-treated LH fruit by suppressing EPR, degradation of pectin polyuronides, and activities of PL and β-galactosidase (β-GAL). Furthermore, applying SF in H-treated LH pears stored in 1 or 2 % O_2 resulted in the loss of ripening capacity. Results indicated that 160 μL L^{-1} H + SF and H at 160−320 μL L^{-1} extended the melting period and controlled physiological disorders in LH 'Bartlett' pears for 5 and 7 months of storage in RA and 2 % O_2, respectively.

Keywords: /*Pyrus communis*/ /Late harvest/ /1-Methylcyclopropene/ /O_2 regimes/ /Melting texture/ /Physiological disorders/

POME

Joseph, M., Van Beers, R., Postelmans, A., Nicolai, B., & Saeys, W. (2021). Exploring oxygen diffusion and respiration in pome fruit using non-destructive gas in scattering media absorption spectroscopy. *Postharvest Biology & Technology*, *173*, 111405. https://doi.org/10.1016/j.postharvbio.2020.111405

Abstract

Pome fruit stored under a controlled atmosphere (CA) often suffers hypoxia due to the mismatch of O_2 level in the storage rooms and the fruit's O_2 consumption. Fruit response-based O_2 sensing and control could be an efficient approach to reduce the hypoxia-related physiological disorders and therefore increase the shelf life of stored fruit. This research aims to validate and evaluate the application of nondestructive gas in scattering media absorption spectroscopy (GASMAS) O_2 sensing in fruit post-harvest. In the first stage, the GASMAS O_2 sensor was validated on a fruit mimicking multilayer model system where a high correlation was observed between the measured and reference O_2 partial pressures ($r^2 \geq 0.9$). Later, the GASMAS sensor was evaluated on two apple cultivars (*Malus* x *domestica* 'Golden delicious', *Malus* x *domestica* 'Nicoter') and one pear cultivar (*Pyrus communis* 'Conference'). The observed GASMAS signal from the 'Golden delicious' apples were nearly 2 times higher than the signal from 'Nicoter' apples and 5 times higher than from the 'Conference' pears. In the next stage, GASMAS measurements were taken on water submerged 'Golden delicious' apple and 'Conference' pear to investigate the difference in O_2 consumption in those fruits. The calculated relative O_2 changes during respiration and evolution of the O_2 partial pressure after nitrogen treatment for both the fruit were found different. It was hypothesized that these findings may be attributed to variations in fruit porosity. And finally, the influence of skin and additional surface coating on the gas exchange was studied by immersing unpeeled, peeled and coated samples in the gaseous nitrogen for 2 h before measurement. The coating was found to reduce the gas exchange compared to the unpeeled samples which already exhibited a lower exchange rate than the peeled samples.

Keywords: /Hypoxia/ /O_2 diffusion/ /GASMAS/ /Liquid phantom model/ /Monte Carlo simulations/ /CA/

POTATO

Meng, Z., Dong, T., Malik, A. U., Zhang, S., & Wang, Q. (2021). Harvest maturity affects the browning of fresh-cut potatoes by influencing contents of amino acids. *Postharvest Biology & Technology*, *173*, 11404. https://doi.org/10.1016/j.postharvbio.2020.111404

Abstract

Browning is the major issue affecting the quality and shelf-life of fresh-cut potatoes. In this paper, in order to study the influences of maturity on browning and its mechanism, potatoes were harvested at three different stages, and the browning degrees, related physiological and biochemical properties of potatoes were evaluated. The results showed that with the increased maturity, potatoes are more prone to browning. However, polyphenol oxidase (PPO) activities of late harvested potatoes were lower than early and middle harvested ones, and main PPO genes expressed significantly higher in early harvested potatoes than in middle and late harvested ones. Generally, the antioxidant capacity was enhanced with the increase of maturity, which was not in line with more browning of late harvested potatoes. The content of total free amino acids (FAAs) increased significantly in late harvested potatoes, and adding the differential contents of total FAAs aggravated the mash browning of early harvested potatoes. Accumulation of each FAA also increased significantly with the development stage from middle to late harvest date. Addition of differential amino acids showed that isoleucine and other eleven amino acids can inhibit the browning of potato mash, but serine, lysine and tyrosine, especially tyrosine, promoted the browning degree significantly. Results demonstrated that harvest maturity affects the browning of fresh-cut potatoes by influencing the accumulation of FAAs, especially tyrosine, not by PPO activity and antioxidant capacity. This research comprehensively elucidated why the potatoes with different maturities have different browning degrees.

Keywords: /Maturity/ /Enzymatic browning/ /Potato/ /PPO/ /Free amino acid/

Tosetti, R., Waters, A., Chope, G. A., Cools, K., Alamar, M. C., McWilliam, S., Thompson, A. J., & Terry, L. A. (2021). New insights into the effects of ethylene on ABA catabolism, sweetening and dormancy in stored potato tubers. *Postharvest Biology and Technology*, *173*, 111420. https://doi.org/10.1016/j.postharvbio.2020.111420

Abstract

Continuous ethylene supplementation suppresses postharvest sprouting, but it can increase reducing sugars, limiting its use as an alternative to chlorpropham for processing potatoes. To elucidate the mechanisms involved, tubers were treated after curing with or without the ethylene binding inhibitor 1-methylcyclopropene (1-MCP at 1 μL L^{-1} for 24 h), and then stored in air or air supplemented with continuous ethylene (10 μL L^{-1}). Across three consecutive seasons, changes in tuber physiology were assessed alongside transcriptomic and metabolomic analysis.

Exogenous ethylene alone consistently induced a respiratory rise and the accumulation of undesirable reducing sugars. The transient respiratory peak was preceded by the strong upregulation of two genes encoding 1-aminocyclopropane-1-carboxylate oxidase (ACO), typical of wound and stress induced ethylene production. Profiles of parenchymatic tissue highlighted that ethylene triggered abscisic acid (ABA) catabolism, evidenced by a steep fall in ABA levels and a transient rise in the catabolite phaseic acid, accompanied by upregulation of transcripts encoding an ABA 8´-hydroxylase. Moreover, analysis of non-structural carbohydrate-related genes revealed that ethylene strongly downregulated the expression of the *Kunitz-type invertase inhibitor*, already known to be involved in cold-induced sweetening. All these ethylene-induced effects were negated by 1-MCP with one notable exception: 1-MCP enhanced the sprout suppressing effect of ethylene whilst preventing ethylene-induced sweetening.

This study supports the conclusions that: i) tubers adapt to ethylene by regulating conserved pathways (*e.g.* ABA catabolism); ii) ethylene-induced sweetening acts independently from sprout suppression, and is similar to cold-induced sugar accumulation.

Keywords: /Exogenous ethylene/ /*Kunitz-type invertase inhibitor/* /ACO/ /ACS/ /1-MCP/

STRAWBERRY

Inselberg, H., & do Nascimento Nunes, M. C. (2021). Using Cannabidiol as a potential postharvest treatment to maintain quality and extend the shelf life of strawberries. *Postharvest Biology & Technology*, *173*, 111416. https://doi.org/10.1016/j.postharvbio.2020.111416

Abstract

Cannabis has been used in ancient medicine to treat a wide array of medical issues. Specifically, Cannabidiol (CBD), a non-psychoactive component of cannabis, has been linked to containing antimicrobial properties. However, research surrounding the potential use of CBD as an antimicrobial agent is still preliminary. This study aims to examine the potential of CBD oil as a postharvest treatment used by consumers at home to reduce microbial growth and extend the shelf life of strawberries. CBD oil was applied to fresh fruit after harvest followed by storage at 1 °C for 8 days and 10 °C for 8 days. Strawberries were evaluated for visual quality and microbial load before and during storage. Results from this study showed that CBD oil was effective at maintaining the visual appearance of strawberries, above the minimum threshold of a visual rating score of 3, compared to the fruit that was not treated. It was also found that CBD oil was effective at reducing the microbial load on treated strawberries compared to fruit that was not treated. This research shows that CBD oil has the potential to be used by consumers at home as an effective antimicrobial treatment and to extend strawberry shelf life.

Keywords: /Strawberry/ /Cannabidiol/ /CBD/ /Natural antimicrobial/ /Quality/ /Shelf life/

Nguyen, D.H.H. & Nguyen, H.V.H (2021). Effects of storage temperature on postharvest physico-chemical attributes of nano-chitosan coated strawberry (Fragaria × ananassa Duch.). *Journal of Horticulture and Postharvest Research, 4(1)*, 101-114. http://dx.doi.org/10.22077/jhpr.2020.3317.1139 (NPS)

Abstract

Recently, there are researches showing positive effects of nano-chitosan in prolonging the postharvest quality and shelf life of strawberry, however, influences of storage temperatures on the nano-chitosan coated fruit have been overlooked. Therefore, in this work, changes of physiological traits of strawberry (Fragaria × ananassa Duch.) coated with 0.2% nano-chitosan and stored at different temperatures were studied. Strawberry was coated with 0.2% nano-chitosan and stored at different temperatures (2°C, 5°C, 10°C and 25°C) for 12 days. The effects of temperatures on the coated fruits were tested by measuring visual quality, weight loss, antioxidant properties, malondialdehyde content, firmness, total soluble solid, polyphenol oxidase activity in three days intervals. After storing 0.2% nano-chitosan coated strawberry at four different temperatures, 2°C showed the most effective one as maintaining the overall quality of strawberry higher than the acceptable/marketable level after 12 days; meanwhile, fruits stored at 25°C were quickly decayed after 3 days. The treatments at low temperatures (2°C, and 5°C) significantly reduced weight loss, maintained firmness, total soluble solid, polyphenol oxidase activity and malondialdehyde content of the stored fruits. Nano-chitosan has not been widely traded. Coating strawberry with nano-chitosan and storing at 2°C effectively maintained the postharvest quality of strawberry as well. This treatment is quite simple and would be useful for stakeholders in the strawberry supply chain.

Keywords: /Antioxidant properties/ /Firmness/ /Malondialdehyde/ /Polyphenol oxidase assay/

/Visual quality/

Temiz, N. N., & Özdemir, K. S. (2021). Microbiological and physicochemical quality of strawberries (Fragaria × ananassa) coated with Lactobacillus rhamnosus and inulin enriched gelatin films. *Postharvest Biology & Technology*, *173*, 111433. https://doi.org/10.1016/j.postharvbio.2020.111433

Abstract

The consumption of probiotic foods has increased in recent years due to consumer concerns related to healthy diets. In this study, strawberries were used as an alternative product to deliver probiotics and the study aimed to investigate the effect of *Lactobacillus rhamnosus* on microbial and physicochemical quality of strawberries during refrigerated storage. For this purpose, probiotic *Lactobacillus rhamnosus* and inulin were added to gelatin-based coatings and applied to fresh strawberries. Probiotic survivability, microbial and physicochemical quality parameters of strawberries were monitored during 16 d of refrigerated storage. According to the results, gelatin-probiotic coatings and gelatin-probiotic-inulin coatings increased the shelf-life of strawberries compared to the control. These coatings significantly decreased the weight loss in strawberries and did not change the quality parameters (pH, titratable acidity, and total soluble solids) during storage. Gelatin-probiotic coatings slowed down fungal growth and total aerobic mesophilic counts in strawberries. While the initial count of *Lb. rhamnosus* was 11 log CFU g^{-1}, it was found as 8.9 log CFU g^{-1} and 7 log CFU g^{-1} on the 10th and last day of the storage, respectively. These results revealed that probiotic incorporated gelatin films can be an alternative way to deliver probiotics and improve the shelf-life of perishable fruits.

Keywords: /Lactic acid bacteria/ /Probiotics/ /Ready to eat/ /Functional foods/ /Shelf life/

SWEET CHERRY

Zhang, Q., Shi, W., Zhou, B., Du, H., Xi, L., Zou, M., Zou, H., Xin, L., Gao, Z., & Chen, Y. (2021). Variable characteristics of microbial communities on the surface of sweet cherries under different storage conditions. *Postharvest Biology & Technology*, *173*, 111408. https://doi.org/10.1016/j.postharvbio.2020.111408

Abstract

Ripe fruit is susceptible to postharvest rotting induced by microbial pathogens. The development of fruit storage technologies requires a comprehensive understanding of the overall microbial community involved in fruit storage. In this study, we investigated the microbiota of bacteria and fungi on cherry surfaces under room-temperature storage condition (25 ℃) and low-temperature storage condition (0 ℃) using high-throughput sequencing. The results demonstrated that *Enterobacter, Erwinia, Botrytis,* and unidentified *Pleosporales* were significantly enriched in the rotten samples, while *Bacillus* and *Aureobasidium* were enriched in the unrotten samples. After the fruit rotted, more dramatic changes were observed in fungal microbiota than in bacterial microbiota. Rotting significantly reduced fungal α-diversity without noticeably altering bacterial α-diversity, under both room-temperature storage and low-temperature storage conditions. Furthermore, temperature condition significantly impacted the composition of the surface microbiota of cherries, and the microbiota changed more significantly when rotting under room-temperature storage condition than under low-temperature storage condition. Low-temperature storage reduced the α-diversity and network complexity. Significant correlations among potential pathogens, beneficial microorganisms, and other microbiota members indicated that in addition to pathogens, microbiota along with pathogens also influences fruit rot. This study provides new insight into the dynamics of the microbiome in cherries during storage.

Keywords: /Postharvest rot/ /Fungal community/ /Bacterial community/ /Sweet cherry/ /Storage condition/

TOMATO

Firdous, N. (2021). Post-harvest losses in different fresh produces and vegetables in Pakistan with particular focus on tomatoes. *Journal of Horticulture and Postharvest Research. 4 (1),* 71-86. http://dx.doi.org/10.22077/jhpr.2020.3168.1125 (NPS)

Abstract

International agencies have advocated that monitoring food security and world food resources are necessary to meet the needs of growing populations and to minimize postharvest losses. This paper focuses on the biochemical and physiological bases of changes that cause post-harvest losses and ways to mitigate them. By controlling these metabolic changes, some degree of preservation is possible. Postharvest losses are 30-50% in developing countries due to energy crisis and lack of proper handling procedures and refrigeration; in contrast to less than 15% in developed countries. Highly perishable commodities like fruits and vegetables are living entities which are characterized by life evolving activities like respiration, transpiration, ripening and metabolic changes. Various compositional changes, such as chlorophyll degradation, softening, and ascorbic acid losses can result in short shelf life. Total 63 species of vegetables are grown in Pakistan but onions, potatoes, tomatoes, garlic, green chilies, coriander, spinach, pumpkin and okra are mostly grown and consumed. In Pakistan due to energy crisis and economic constraints no cold food chains/transport is available as a result of which fresh produce endured post-harvest losses. There is a need to use production technologies supplemented with postharvest techniques to mitigate postharvest losses.Directions for Future Research: Many new technologically viable preservation techniques like modified atmosphere packaging and controlled atmosphere storage should come into existence due to increased health consciousness, increased purchasing power and an increase in percentage of postharvest losses (25-80% fresh produce) which could be applied with such economic constraints.

Keywords: /Food Security/ /Post-harvest Techniques/ /Perishable/ /Shelf Life/ /Tomatoes/