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APPLE

Wang, G.-B., & Zhang, X.-R. (2022). Irreversibility Analysis Related to Heterogeneous Airflow and Heat Transfer during Room Cooling of Postharvest Apples. Heat Transfer Engineering, 43(8–10), 846–863. https://doi.org/10.1080/01457632.2021.1906514

Abstract

Room cooling is traditionally used for postharvest products and is always involved with heterogeneous airflow and heat transfer. Despite the current evaluation of such heterogeneity, the irreversibility parameters are still not considered to evaluate the corresponding characteristics. Furthermore, the relationships between the irreversibility and the heterogeneous airflow and heat transfer should be also analyzed. To this end, based on the numerical simulation using an experimentally validated model, the distribution characteristics of air velocity, local mean air age, temperature, local volumetric rates of entropy generation, and entransy dissipation during the room cooling process for postharvest apples are respectively discussed. The relationships between the irreversibility parameters and apparent heterogeneity are further analyzed. The results show that higher local mean air age and temperature inside bins are resulted by lower air velocity nearby, and significant local volumetric rates of entropy generation and entransy dissipation at the surfaces of bins are also obtained for longer duration in the room cooling process. The irreversibility parameters, including local volumetric rates of entropy generation and entransy dissipation, are related to local mean air age with the Pearson's coefficients of between 0.60 and 0.80 and better related to temperature with the Pearson's coefficients of above 0.80.

Keywords: /Heat transfer/ /air flow/ /Atmospheric temperature/ /Entropy/ /Cooling/

Zha, Z., Tang, R., Wang, C., Li, Y., Liu, S., Wang, L., & Wang, K. (2022). Riboflavin inhibits browning of fresh-cut apples by repressing phenolic metabolism and enhancing antioxidant system. Postharvest Biology & Technology, 187, 111867. https://doi.org/10.1016/j.postharvbio.2022.111867

Abstract

Fresh-cut browning is a significant global challenge for fresh-cut produce. Riboflavin has been studied in terms of physiological function; however, its effect on fresh-cut browning remains elusive. Here, the changes in quality attributes including browning, phenolic metabolism, and oxidative metabolism were compared between fresh-cut apples treated with riboflavin coupled with LED-blue illumination, and control. LED-based riboflavin treatment is an effective strategy for quality preservation of fresh-cut apples, as indicated by controlled browning, microbial growth, weight loss and softening, as well as improved whiteness and soluble solid content. Enzymatic activities of polyphenol oxidase and peroxidase were repressed by the riboflavin application, whereas the phenolic content was enhanced. The reduced membrane peroxidation can be explained by the impairment of H 2 O 2 accumulation due to an enhanced antioxidant system. In conclusion, photosensitizing riboflavin can reduce the browning of fresh-cut apples by inhibiting phenolic metabolism and strengthening the antioxidant system to avoid membrane peroxidation. LED-illuminated riboflavin controlled the browning of fresh-cut apples. The riboflavin treatment inhibited the activities of polyphenol oxidase and peroxidase. The riboflavin treatment alleviated membrane peroxidation. The riboflavin treatment enhanced the antioxidant system.

Keywords: /Antioxidant system/ /Apple/ /Browning/ /Fresh-cut/ /Phenol/ /Riboflavin/

ASPARAGUS

Wang, M., Li, J., & Fan, L. (2022). Quality changes in fresh-cut asparagus with ultrasonic-assisted washing combined with cinnamon essential oil fumigation. Postharvest Biology & Technology, 187, 111873. https://doi.org/10.1016/j.postharvbio.2022.111873

Abstract

Fresh-cut asparagus is susceptible to spoilage and quality deterioration during storage, which seriously affects its shelf-life and commercial value. The effects of ultrasonic-assisted citric acid and nisin washing (CNUS) combined with cinnamon essential oil fumigation (CEO) on microbial growth, physiological quality, and sensory characteristics of fresh-cut asparagus during storage at 4 °C were evaluated. The results showed that CNUS treatment immediately reduced the initial microbial load, and CEO treatment inhibited microbial growth during storage. CNUS + CEO treatment efficiently reduced the microbial counts and maintained acceptable levels for 20 d. In addition, CNUS + CEO treatment reduced respiration rate and weight loss, delayed respiration peak time, and maintained high ascorbic acid, chlorophyll and total soluble solids contents. Moreover, CNUS + CEO treatment greatly retarded lignin deposition by inhibiting phenylalanine ammonia lyase and peroxidase activities. CNUS + CEO treated samples had the lowest electrolyte leakage. The CNUS + CEO treatment could maintain the sensory characteristics and the shelf-life of fresh-cut asparagus for 20 d at 4 °C. Therefore, CNUS + CEO treatment could be used as an effective combination preservation technique for fresh-cut asparagus. CNUS + CEO exhibited synergistic effects in reducing microbial counts. CNUS + CEO maintained physiological and sensory qualities of fresh-cut asparagus. CNUS + CEO retarded lignin deposition by suppressing related enzyme activities. CNUS + CEO extended the shelf-life to 20 days for fresh-cut asparagus.

Keywords: /Essential oils/ /Fresh-cut asparagus/ /Shelf-life/ /Storage quality/ /Ultrasound assistance/

BANANA

Qiao, Y., Xu, L., Xu, G., Cao, Y., Gao, Y., Wang, Y., & Feng, J. (2022). Efficacy and potential mechanism of hinokitiol against postharvest anthracnose of banana caused by Colletotrichum musae. LWT - Food Science & Technology, 161, N.PAG. https://doi.org/10.1016/j.lwt.2022.113334

Abstract

Anthracnose caused by Colletotrichum musae is a devastating post-harvest disease on bananas, and it leads to serious economic losses. Exploring environmentally friendly natural compounds to manage anthracnose in fruit has been attracting more attention. In the current study, the effect of hinokitiol against C. musae and on banana quality was investigated. Our results showed that hinokitiol exhibited promising antifungal activities both in vitro and in vivo. Importantly, it effectively delayed banana ripening by maintaining weight, color, firmness, and TSS content, and it dramatically reduced the release of ethylene, the respiration rate, and the expression of genes involved in releasing ethylene. Moreover, the activities of defense-related enzymes including SOD, POD, and APX were enhanced by hinokitiol. The mechanism of hinokitiol against C. musae may be attributed to the destruction on the integrity of the plasma membrane, which leads to the leakage of cellular constituents and eventually the cell death of C. musae. Taken together, this study provided substantial evidence that hinokitiol had great potential to be developed as a natural antifungal agent against C. musae, prolonging the storage period of postharvest bananas. Hinokitiol exhibited promising activity against C. musae both in vitro and in vivo. Hinokitiol delayed banana ripening and enhanced the antioxidant enzyme activities.s Hinokitiol destroyed the morphology and the cell membrane integrity of C. musae.

Keywords: /Action mechanism/ /Banana anthracnose/ /Fruit quality/ /Hinokitiol/ /Postharvest preservation/

BLACKBERRY

Myers, A., Gunderman, A., Threlfall, R., & Yue Chen. (2022). Determining Hand-harvest Parameters and Postharvest Marketability Impacts of Fresh-market Blackberries to Develop a Soft-robotic Gripper for Robotic Harvesting. HortScience, 57(5), 592–594. https://doi.org/10.21273/HORTSCI16487-22

Abstract

Hand-harvesting parameters and postharvest marketability attributes of freshmarket blackberries (Rubus L. subgenus Rubus Watson) were characterized to develop a prototype for a soft-robotic gripper for robotic harvesting. A custom-made, force-sensing apparatus attached to the thumb and fingers of a person hand-harvesting blackberries was developed to quantify forces used to harvest and to identify appendages for harvesting. Four cultivars of blackberries grown in Arkansas were harvested at optimal ripeness and stored at 2 °C for 21 days to determine the impact on marketability attributes (leakage, decay, and red drupelet reversion). The forces during harvest imparted by the thumb and middle finger were greatest (0.77 N and 0.37 N, respectively), whereas the index and ring fingers used lower forces (0.16 N and 0.06 N, respectively), primarily to stabilize the blackberry. The forces applied to grab, stabilize, and harvest blackberries caused minimal marketability damage (leakage, <10%; decay, <2%; and red drupelet reversion, <8%) after postharvest storage. This project quantified harvest and postharvest parameters, allowing data-driven design of a three-prong soft-robotic gripper for harvest of fresh-market blackberries.

Keywords: /Fingers/ /Force/ /Mechanical/ /Rubus/ /Sensors/ /Storage/

Shi, C., Xia, S., Gao, M., Han, T., Wu, W., & Li, W. (2022). Postharvest quality comparison of six blackberry cultivars under two storage conditions. Journal of Food Processing & Preservation, 46(5), 1–12. https://doi.org/10.1111/jfpp.16575

Abstract

The fruit of six blackberry cultivars "Ningzhi 3," "Arapaho," "Kiowa," "Hull," "Shuofeng," and "Triple Crown" were stored under different storage conditions 25°C (RT) and 4°C (LT). Compared to RT treatment, LT treatment-restricted deterioration and nutritional loss, and maintained antioxidant capacity of samples. Among LT samples, color of "Ningzhi 3," "Hull," and "Shuofeng" changed fewer than other cultivars, and the decay rate of "Shuofeng" and weight loss of "Hull" were lower than others. At the end of LT, total soluble solid and soluble sugar content of "Arapaho," soluble protein content of "Shuofeng" were the highest. During the storage period, "Arapaho," "Hull", and "Shuofeng" maintained higher antioxidant enzyme activity and lower hydrogen peroxide content. The storage stability of "Arapaho," "Hull," and "Shuofeng" was better than the other three blackberry cultivars because of their better postharvest quality. This study provides a comprehensive insight into the postharvest treatment to maintain the quality of blackberry. Novelty impact statement: In this study, six blackberry cultivars were stored under two storage conditions. Low temperature delayed appearance, color, and microstructure deterioration, restricted weight loss, firmness decrease, and nutritional loss, and maintained antioxidant capacity during the storage period. We found that "Arapaho," "Hull," and "Shuofeng" exhibited better storage stability during 4°C.

Keywords: /Cultivars/ /Oxidant status/ /Hydrogen peroxide/ /Storage/ /Blackberries/ /Low temperatures/

BLACK PLUM

Mishra, S., Barman, K., Singh, A. K., & Kole, B. (2022). Exogenous polyamine treatment preserves postharvest quality, antioxidant compounds and reduces lipid peroxidation in black plum fruit. South African Journal of Botany, 146, 662–668. https://doi.org/10.1016/j.sajb.2021.12.002

Abstract

Black plum (Syzygium cumini L. Skeels) is a tropical and sub-tropical fruit having several medicinal properties, especially in curing diabetes. Due to non-climacteric nature, the fruit is harvested at a ripe stage. However, presence of thin skin and rapid softening make the fruit highly susceptible to moisture loss and microbial attack, which drastically reduce its shelf life. Black plum, due to its high perishability cannot be stored more than 2 – 3 days at ambient conditions. In the present study, the effect of pre-storage polyamines treatment on quality and storability of black plum fruit was investigated. Ripe fruits were treated with putrescine (PUT) and spermine (SPM) each at 0.5 mM and 1.0 mM concentration by immersion method while control fruits were treated with distilled water. The fruit were stored at ambient conditions (27 ± 3 °C, 85 ± 5% RH) for 6 days. Results revealed that 1.0 mM PUT treatment was most effective in minimizing weight loss and spoilage of about 1.5-fold compared to control. The treated fruits also retained higher anthocyanins and minimized lipid peroxidation than control. The loss of bioactive compounds like total phenolics, flavonoids, ascorbic acid and antioxidant capacity is also minimized in response to polyamine treatments. The soluble solids content retained higher in 1.0 mM PUT-treated fruits but, polyamine treatments did not affect acid content. The findings of the study can be beneficially exploited in extending storability, long distant marketing and reducing postharvest loss of black plum fruit. [Display omitted] Postharvest PUT and SPM treatment preserved the quality of black plum fruit. 1.0 mM putrescine treatment reduced weight loss, spoilage and lipid peroxidation. PUT treatment reduced loss of anthocyanins, ascorbic acid, phenolics and flavonoids. 1.0 mM putrescine treatment retained the highest antioxidant capacity in the fruit.

Keywords: /Antioxidants/ /Black plum/ /Polyamine/ /Postharvest/ /Quality/ /Senescence/

BLUEBERRY

Saito, S., Wang, F., & Xiao, C.-L. (2022). Natamycin as a postharvest treatment to control gray mold on stored blueberry fruit caused by multi-fungicide resistant Botrytis cinerea. Postharvest Biology & Technology, 187, 111862. https://doi.org/10.1016/j.postharvbio.2022.111862

Abstract

Natamycin controlled gray mold and other rots on blueberry fruit. Natamycin had no adverse effect on blueberry fruit quality. Natamycin is an effective tool to control fungicide-resistant Botrytis cinerea. Botrytis cinerea is the cause of gray mold, a major postharvest disease of blueberries grown in California. Control of gray mold is largely dependent on the use of synthetic fungicides. However, multiple resistance to different classes of fungicides is commonly present in B. cinerea populations from blueberries in the region. Alternatives to conventional chemical fungicides are needed to control postharvest gray mold. Natamycin, a naturally occurring substance listed as biofungicide, is registered for postharvest use in certain fresh fruit and it was highly effective to control various postharvest fungal diseases. In this study, natamycin was evaluated for its effectiveness to control gray mold caused by B. cinerea with resistance to various commonly used fungicides as well as its effectiveness to reduce decays in general that resulted from natural infections. Our results showed that as low as a quarter rate of the label rate of natamycin reduced gray mold incidence and lesion size regardless of fungicide resistance phenotypes. Natamycin also reduced overall fruit decay caused by natural infections and it had no adverse effect on fruit quality. Natamycin can be a promising tool to control postharvest gray mold of blueberry fruit while maintaining fruit quality.

Keywords: /Blueberry/ /Botrytis cinerea/ /Fungicide resistance/ /Natamycin/ /Postharvest diseases/

CITRUS

Li, X., Tian, Z., Chai, Y., Yang, H., Zhang, M., Yang, C., Xu, R., Zhu, F., Zeng, Y., Deng, X., Wang, P., & Cheng, Y. (2022). Cytological and proteomic evidence reveals the involvement of mitochondria in hypoxia-induced quality degradation in postharvest citrus fruit. Food Chemistry, 375, 131833. https://doi.org/10.1016/j.foodchem.2021.131833

Abstract

Hypoxia frequently occurs in postharvest logistics, which greatly influences fruit storability. Here, we for the first time studied the dynamic variations of mitochondrial morphology in living citrus fruit cells, and revealed that waxing treatment-induced hypoxia strongly triggered mitochondrial fission and fragmentation. Correspondingly, hypoxia caused a decline in mitochondrial membrane potential and mobility. Besides, impairment of energetic and redox status was also found in waxed fruit. The proteomic changes of mitochondria after waxing treatment were also characterized. Using weighted gene co-expression network analysis (WGCNA), we identified 167 key hypoxia-responsive proteins, which were mainly involved in fatty acid, amino acid and organic acid metabolism. Metabolite analysis verified that waxing treatment promoted the accumulation of several hypoxic metabolites, such as ethanol, acetaldehyde, succinic acid and γ-aminobutyric acid (GABA). Taken together, our findings provide new insights into the cytological and proteomic responses of mitochondria to hypoxia during fruit storage.

Keywords: /Citrus/ /Low oxygen/ /Mitochondria/ /Off-flavors/ /Waxing treatment/

COCONUT

Shen, X., Wang, Y., Ran, L., Liu, R., Sun, X., Hu, L., Xiao, Y., & Chen, F. (2022). Flavor deterioration of liquid endosperm in postharvest tender coconut revealed by LC-MS-based metabolomics, GC-IMS and E-tongue. Postharvest Biology & Technology, 187, 111866. https://doi.org/10.1016/j.postharvbio.2022.111866

Abstract

LC-MS-based non-targeted metabolomics, GC-IMS and E-tongue were employed to study the dynamical changes of the liquid endosperm, normally known as coconut water (CW), in postharvest coconut matured 8 months after full bloom. A total of 61 compounds were identified as differential metabolites responsible for metabolic changes during the whole storage (35 d at 25 ℃) using UPLC-MS/MS, whereas 8 volatiles were considered as the main components contributed to odor deterioration by GC-IMS. E-tongue data showed that bitterness response of CW was enhanced during storage, which was consistent with the variation of some bitter amino acids and epicatechin, while sweetness, sourness and umami exhibited an increased tendency except a decrease at 7 d due to the alteration of phenolic, amino acid, sugar and nucleotide. Postharvest storage displayed a distinct metabolic signature characterized by increased amino acid, nucleotide and sugar metabolisms. These results provided some new insights for biochemical changes of CW inside the postharvest coconuts. Liquid endosperm deteriorated significantly based on LC-MS, GC-IMS and E-tongue. E-tongue could differentiate coconut water inside nuts stored within 28 days. GC-IMS could distinguish liquid endosperms in coconut stored for different stages. Some aldehydes and 3-metylindole accumulated in the coconut water of stored nuts. Postharvest storage mainly enhanced amino acid metabolic pathway in coconut water.

Keywords: /Coconut water/ /E-tongue/ /Metabolomics/ /Postharvest storage/ /Volatile flavor compounds/

DURIAN

Ran, Y., Zheng, Y., Du, M., Jia, X., Wang, X., Wang, L., & Li, X. (2022). Automatic periodical sulfur dioxide fumigation in combination with CO2-enriched atmosphere extends the storage life of durian (Durio zibethinus Murr.). Journal of Food Processing & Preservation, 46(5), 1–12. https://doi.org/10.1111/jfpp.16382

Abstract

The postharvest decay of durian (Durio zibethinus Murr.) increases rapidly when the storage time is extended, which seriously limits the commercial value. In this research, the effects of appropriate periodical SO2 fumigation and different CO2-enriched atmospheres (3% O2 + 10%–13%, 14%–17%, or 18%–21% CO2) on the storage quality of durian stored at 14°C were investigated. Results showed that SO2 fumigation in combination with enriched CO2 atmosphere (14%–17%) could maintain firmness (16.37 N), retard weight loss (10.24%), reduce decay rate (11%), and inhibit the production of ethylene (9.2 μl kg−1 h−1) and malondialdehyde (12.10 μmol/g). Moreover, the treatment consolidated the disease resistance of durian by, first, enhancing peroxidase (POD) and catalase (CAT) activities, and, second, by restraining polyphenol oxidase (PPO) activity, which helped to maintain the cell integrity structures. More importantly, this treatment retained a high sensory score (41.35) and extended the storage life up to 60 days. Therefore, a combination of 1,500 mg/L SO2 fumigation and controlled atmosphere storage (3% O2 + 14%–17% CO2) was the more effective method to delay maturation and senescence and improve the storage quality of durian. Novelty impact statement: Durian (Durio zibethinus Murr.) is susceptible to rapid water loss, softening, browning, and chemical deterioration after harvest, which greatly limits the storage quality and commercial value of fruits. Automatic periodical SO2 fumigation of 1,500 mg/L in conjunction with CO2-enriched controlled atmosphere storage (3% O2 + 14%–17% CO2) will be a promising postharvest strategy to reduce decay and extend the storage life of fresh durian.

Keywords: /Durian/ /Fumigation/ /1-Methylcyclopropene/ /Atmospheric Carbon Dioxide/ /Sulfur Dioxide/ /Polyphenol Oxidase/ /Atmosphere/

FRUITS AND VEGETABLES

Etefa, O. F., Forsido, S. F., & Kebede, M. T. (2022). Postharvest Loss, Causes, and Handling Practices of Fruits and Vegetables in Ethiopia: Scoping Review. Journal of Horticultural Research, 1. https://doi.org/10.2478/johr-2022-0002

Abstract

Fruits and vegetables are the horticultural crops playing a significant role in Ethiopia's food security, livelihood, and economy. However, the postharvest loss results are a severe challenge for the producers, and this review summarizes this problem. The total postharvest loss of horticultural crops, including fruits and vegetables, at various stages: harvesting, storage, transportation, and marketing ranges from 15 to 70%. Postharvest loss of vegetables alone is about 40%. Fruits like mango, banana, papaya, avocado, sweet orange, etc., take the largest share of the total postharvest loss. The postharvest causes of losses are diseases, insects, rodents, thefts, mechanical damage, premature harvesting, harvesting of overmature crops, improper harvesting and storage techniques, shortage of appropriate packaging and marketing system, seasonal fluctuation of the products, and gender inequality. Therefore, applying a possible and convenient loss reduction strategy is imperative to increase the supply of fruits and vegetables in the country.

Keywords: /Pests And Diseases/ /Postharvest Chain/ /Storage Technology/ /Transport Of Products/

GINGER

Zhou, J., Liu, X., Sun, C., Li, G., Yang, P., Jia, Q., Cai, X., Zhu, Y., Yin, J., & Liu, Y. (2022). Silica Nanoparticles Enhance the Disease Resistance of Ginger to Rhizome Rot during Postharvest Storage. Nanomaterials (2079-4991), 12(9), 1418. https://doi.org/10.3390/nano12091418

Abstract

Silica nanoparticles (SiNPs) offer an eco friendly and environmentally safe alternative for plant disease management. However, the mechanisms of SiNPs-induced disease resistance are largely unknown. This research evaluated the application of SiNPs in controlling the postharvest decay of ginger rhizomes inoculated with Fusarium solani. In vitro study showed that SiNP had little inhibitory effect on mycelial growth and spore germination of F. solani and did not significantly change mycelium's MDA content and SDH activity. In vivo analysis indicated that SiNPs decreased the degree of decay around the wounds and decreased the accumulation of H2O2 after long-term pathogenic infection through potentiating the activities of antioxidant enzymes such as SOD, APX, PPO, and CAT. SiNP150 increased the CHI, PAL, and GLU activity at the onset of the experiment. Moreover, SiNP150 treatment increased total phenolics contents by 1.3, 1.5, and 1.2-times after 3, 5, and 7 days of treatment, and increased total flavonoids content throughout the experiment by 9.3%, 62.4%, 26.9%, 12.8%, and 60.8%, respectively. Furthermore, the expression of selected phenylpropanoid pathway-related genes was generally enhanced by SiNPs when subjected to F. solani inoculation. Together, SiNPs can effectively reduce the fungal disease of ginger rhizome through both physical and biochemical defense mechanisms.

Keywords: /Fungal disease/ /Postharvest decay/ /Silica nanoparticles/ /Zingiber officinale/ /

GRAPE

Nassarawa, S. S., Belwal, T., Javed, M., & Luo, Z. (2022). Influence of the Red LEDs Light Irradiation on the Quality and Chemical Attributes of Postharvest Table Grape (<italic>Vitis vinifera L</italic>.) During Storage. Food & Bioprocess Technology, 1–12. https://doi.org/10.1007/s11947-022-02824-1

Abstract

The influence of red light-emitting diodes (LEDs) irradiation (454 LUX) on the quality and physiology of postharvest table grapes fruit stored at (22.5 ± 2.5 °C) for 6 days after harvest were explored. The results exhibited that red-light irradiation exposure was remarkably efficient in decreasing the weight loss of the fruit. The rachis browning and chlorophyll degradation were significantly inhibited when exposed to red-light. During storage, color, total soluble solids, firmness, titratable acidity, malondialdehyde, hydrogen peroxide, and superoxide levels reduced to levels lower than under control. In addition, red-light irradiation retained higher membrane permeability, bioactive compound, leading to higher fruit antioxidant capacity. Further research has shown that treatment with red-light enhanced antioxidant enzymes activity. Red-light treatment maintained significantly higher levels of individual phenolic compounds than control during storage. These results indicate that irradiating table grapes with red-light will help in extending postharvest shelf-life and improve commercially grown grapes' quality.

Keywords: /Grape berry/ /Phenolic compound/ /Red light irradiation/ /Shelf life/

Zhang, S., Fu, M., Li, Z., Li, J., Hai, L., Chen, C., Zheng, X., Tan, B., Li, J., Cheng, J., Wang, W., Zhang, L., Ye, X., & Feng, J. (2022). VvEIL2 and VvEIL4 regulate ethylene synthesis and carotenoid metabolism during senescence of grape rachis. Postharvest Biology & Technology, 187, 111853. https://doi.org/10.1016/j.postharvbio.2022.111853

Abstract

To understand the mechanisms underlying rachis browning and how to delay post-harvest rachis senescence, ‘Shine Muscat’ grape clusters were treated by 1-methylcyclopropene before cold storage. Rachis browning index, ethylene production, and carotenoid content were determined, and the transcriptome of rachis and the regulation of VvEIL2 and VvEIL4 were explored. The results indicated that 1-MCP treatment inhibited rachis browning, and ethylene production and carotenoid content were decreased in the rachis compared to the control in the 2nd week of storage. Transcriptome analysis showed that carotenoid synthesis and lysine degradation pathways were the most enriched during rachis senescence. Transient over-expression of VvEIL4 in ‘Thompson Seedless’ grape leaves induced VvACS5, VvACO2, and VvERF95 expression and ethylene production. Both VvEIL4 and VvERF95 could activate VvACS5 and VvACO2 promoters. Transient over-expression of VvEIL2 in grape leaves decreased the transcript levels of key genes in carotenoid metabolism. Dual-luciferase assays further verified the activation of the VvCrtISO promoter by VvEIL2 was inhibited. These results suggested that VvEIL2 and VvEIL4 regulate ethylene synthesis and carotenoid metabolism during the senescence of grape rachis.

Keywords: /Rachis browning/ /Ethylene response factor/ /Vitis labruscana ×Vitis vinifera/ /Ethylene-insensitive 3-like/

JUJUBE

Islam, A., Acıkalın, R., Ozturk, B., Aglar, E., & Kaiser, C. (2022). Combined effects of Aloe vera gel and modified atmosphere packaging treatments on fruit quality traits and bioactive compounds of jujube (Ziziphus jujuba Mill.) fruit during cold storage and shelf life. Postharvest Biology & Technology, 187, 111855. https://doi.org/10.1016/j.postharvbio.2022.111855

Abstract

During cold storage, weight loss and respiration rate were delayed with MAP. Firmness and acidity of fruit stored in MAP were higher at the end of storage. Vitamin C and bioactive compounds of jujube in AV and MAP were higher than control. AV and MAP treatments could be an effective tool for retarding the losses. This study assessed Aloe vera gel (AV) and modified atmosphere packaging (MAP) treatments on weight loss, respiration rate, color, firmness, soluble solids content (SSC), titratable acidity, vitamin C, phenol, flavonoids and antioxidant activity of jujube (Ziziphus jujuba Mill. cv. 'Li') fruit during cold storage and shelf life. Fruit was stored at 0 ± 0.5 °C and 90 ± 5 % relative humidity (RH) for 35 d followed by 21 ± 1.0 °C and 65 ± 5 % to simulate shelf life for 4 d. During cold storage, weight loss and respiration rate were delayed by MAP. At the end of cold storage, higher firmness and acidity were measured in fruit treated with MAP compared to control. Also, L*, hue angle, vitamin C, total phenolics, and the antioxidant activity of jujube fruit treated with both AV and MAP were higher than control. However, lower chroma and SSC in fruit treated with MAP were determined. During shelf life storage, higher firmness, L*, hue angle and acidity in fruit treated with MAP were obtained compared to control and AV treatments, whereas lower chroma and SSC were observed. On the last day of shelf life measurement (35 + 4 d), vitamin C, total phenolics, total flavonoids and antioxidant activity (DPPH and FRAP assays) of fruit treated with both AV and MAP was higher than control. In conclusion, it was revealed that AV and MAP treatments could be an effective tool for retarding the losses that occurred in the fruit quality of jujube during cold storage and shelf life. The effect of MAP treatment in maintaining fruit quality was more pronounced.

Keywords: /Antioxidant/ /Firmness/ /Phenol/ /Respiration rate/ /Vitamin C/ /Weight loss/

KIWIFRUIT

Hyun, J., Lee, J. G., Yang, K.-Y., Lim, S., & Lee, E. J. (2022). Postharvest Fumigation of (E)-2-Hexenal on Kiwifruit (Actinidia chinensis cv. 'Haegeum') Enhances Resistance to Botrytis cinerea. Postharvest Biology & Technology, 187, 111854. https://doi.org/10.1016/j.postharvbio.2022.111854

Abstract

The 100 μmol L-1 (E)-2-hexenal reduced disease severity caused by B. cinerea in kiwifruit. (E)-2-hexenal contributed to the tolerance against B. cinerea in kiwifruit. Transcriptomic analysis revealed upregulated pattern recognition receptor genes and MPK3 in kiwifruit. Jasmonic acid and flavonoid contents were increased by (E)-2-hexenal fumigation. (E)-2-Hexenal is a reactive electrophile species released by green plants upon herbivory or pathogenic infection and induces various defense responses. In this study, (E)-2-hexenal was used as a natural alternative to artificial fumigants to prevent postharvest pathogenic infection of the 'Haegeum' kiwifruit (Actinidia chinensis). Integrated transcriptome-metabolome analyses were performed to investigate its effect on the induction of plant defense responses. When kiwifruit was fumigated with 100 μ mol L-1 (E)-2-hexenal for 24 h at 20 °C and then inoculated with fungal pathogen Botrytis cinerea , the disease severity, as assessed by necrotic lesion size and B. cinerea biomass, was reduced compared to the control, distilled water-treated fruit. (E)-2-Hexenal treatment also led to upregulated expression of genes encoding pattern recognition receptors, signal transducer proteins, and pathogenesis-related proteins, including chitinase. Furthermore, treatment led to increased jasmonic acid and flavonoid biosynthesis. (E)-2-Hexenal fumigation therefore enhanced the resistance of kiwifruit to B. cinerea infection, presumably by facilitating the signaling network from pathogen recognition to defense gene expression and enabling the accumulation of secondary metabolites, such as flavonoids. The present study not only suggests an optimal concentration of (E)-2-hexenal fumigation for controlling postharvest disease of kiwifruit, but also broadens our understanding of the underlying molecular mechanism by which (E)-2-hexenal enhances plant resistance.

Keywords: /Flavonoid/ /Green leaf volatile/ /Jasmonic acid/ /Pathogenesis-related protein/ /Pattern recognition receptor/

Polychroniadou, C., Karagiannis, E., Michailidis, M., Adamakis, I.-D. S., Ganopoulos, I., Tanou, G., Bazakos, C., & Molassiotis, A. (2022). Identification of genes and metabolic pathways involved in wounding-induced kiwifruit ripening. Plant Physiology & Biochemistry, 179, 179–190. https://doi.org/10.1016/j.plaphy.2022.03.027

Abstract

Fruit is constantly challenged by wounding events, inducing accelerated ripening and irreversible metabolic changes. However, cognate mechanisms that regulate this process are little known. To expand our knowledge of ripening metabolism induced by wounding, an artificial-wound global transcriptome investigation combined with metabolite profiling study was conducted in postharvest kiwifruit (Actinidia chinensis var. deliciosa (A. Chev.) A. Chev. 'Hayward'). Wounding treatment promoted fruit ripening, as demonstrated by changes in fruit firmness, ethylene production and respiration activity determined periodically during a ripening period of 8 d at room temperature. Calcium imaging using fluorescent probe Fluo-3 AM revealed spatial dynamics of Ca2+ signaling in the wounding area following 8d ripening. Several sugars including fructose, glucose, and sucrose as well as organic acids such as citric, succinic and galacturonic acid were increased by wounding. Changes of various amino acids in wounded-treated fruit, especially 5-oxoproline and valine along with alternations of soluble alcohols, like myo -inositol were detected. Gene expression analysis of the wounded fruit showed increased expression of genes that are mainly involved in defense response (e.g., AdTLP.1-3, AdPP2C.1-2, AdMALD1) , calcium ion binding (e.g., AdCbEFh, AdCLR, AdANX), TCA cycle (e.g., AdMDH.1, AdMDH.2, AdCS) , sugars (e.g., AdSUSA.1, AdSPS4, AdABFr), secondary metabolism (e.g., AdPAL.1-3, AdCCR, AdHCT.1-2), lipid processing (e.g., AdGELP.1-4, AdGELP) and pectin degradation (e.g. , AdPE.1-2, AdPAE.1-2, AdPG.1-2)

as well as in ethylene (AdERF7, AdERF1B, AdACO.1-4) and auxin (AdICE, AdAEFc, AdASII) synthesis and perception. Moreover, genes related to aquaporins, such as AdAQP2 , AdAQP4 and AdAQP7 were down-regulated in fruit exposed to wounding. These results demonstrate multiple metabolic points of wounding regulatory control during kiwifruit ripening and provide insights into the molecular basis of wounding-mediated ripening. [Display omitted] Wounding treatment induced kiwifruit ripening at room temperature. Several sugars, organic acids, amino acids and soluble alcohols were altered by wounding. Gene involved in calcium binding, pectin degradation, ethylene and auxin were induced by wounding. Genes related to aquaporins were down regulated in wounded fruit.

Keywords: /Gene expression/ /Kiwifruit/ /Metabolomics/ /Postharvest/ /Ripening/ /Transcriptomics/ /Wounding/

Tian, S., Wang, J., & Xu, H. (2022). Firmness measurement of kiwifruit using a self-designed device based on acoustic vibration technology. Postharvest Biology & Technology, 187, 111851. https://doi.org/10.1016/j.postharvbio.2022.111851

Abstract

A device for real-time firmness measurement was designed. Time-course changes in different firmness indices during the storage period were analyzed. The frequency-domain signals were applied to extract useful statistical features. Effective frequencies highly correlated with firmness were selected by CARS. High-precision detection of firmness was realized by CARS-PLS models. Firmness is an important quality indicator of kiwifruit and is useful for determining optimal time for marketing and optimizing storage management. In this study, a self-designed system based on acoustic vibration technology was used to realize real-time detection of kiwifruit firmness. To ensure stability of measurement, the impact force of the excitation device in the system was calibrated to 12.03 ± 0.71 N. The acoustic vibration response signals of kiwifruit were converted from time domain to frequency domain and 10 statistical features were extracted. Most of the features had good correlations with reference firmness, which proved feasibility of firmness prediction using signals collected in the self-designed system. Subsequently, PLS regression models for predicting firmness were established based on frequency-domain spectra. To further improve accuracy of the model, CARS algorithm was used to select effective frequencies that were highly correlated with kiwifruit firmness. According to the results, prediction accuracy of the CARS-PLS model in external cross-validation sets for flesh firmness was the best (R c v 2 = 0.96, RMSECV = 0.27, and R P D c v = 5.21), followed by stiffness (R c v 2 = 0.95, RMSECV = 0.43, and R P D c v = 5.00), and prediction accuracy of the model for skin firmness was the worst (R c v 2 = 0.93, RMSECV = 0.81, and R P D c v = 4.01). Overall, acoustic vibration signals obtained by the self-designed device in a nondestructive way can well characterize the firmness of kiwifruit. The proposed method in this study can achieve high-precision prediction of all three kiwifruit firmness indices and meet requirements of online real-time detection.

Keywords: /Acoustic vibration technology/ /Frequency-domain spectra/ /Kiwifruit firmness/ /Online real-time detection/ /PLS regression/ /Statistical feature/

Wei, X., Wei, X., Guan, W., Nong, W., Chen, R., Tao, X., & Mao, L. (2022). ABA-responsive transcription factor ABF1-1 promotes JA biosynthesis to accelerate suberin polyphenolic formation in wounded kiwifruit (Actinidia chinensis). Postharvest Biology & Technology, 187, 111850. https://doi.org/10.1016/j.postharvbio.2022.111850

Abstract

AchLOX3 and AchOPR3 were involved in JA biosynthesis of kiwifruit. ABA-induced AchABF1-1 was a nucleus-localized transcription factor. AchABF1-1 activated AchLOX3 and AchOPR3 expression by binding to their promoters. ABA promoted SPP formation by the induction of JA biosynthesis. Mechanical damage is a central limiting factor in the maintenance of the postharvest fruit quality during harvest, transportation, and processing. In this study, wounded kiwifruit (Actinidia chinensis cv. Xuxiang) were

respectively treated with abscisic acid (ABA), fluridone (FLD, an inhibitor of ABA biosynthesis), methyl jasmonate (MeJA), diethyldithiocarbamic acid (DIECA, an inhibitor of JA biosynthesis), and ABA+DIECA to investigate the potential interaction between ABA and JA in the process of wound healing. The results showed that blocking JA biosynthesis significantly reduced the positive effect of ABA on the accumulation of suberin polyphenolic (SPP). Besides, transiently overexpressed the AchLOX3 and AchOPR3 in tobacco (Nicotiana benthamiana) leaves confirmed that these two genes respectively encoded lipoxygenase and 12-oxo-phytodienoic acid reductase involved in JA biosynthesis. Notably, the positive regulation of transcription factor (TF) AchABF1-1 on AchLOX3 and AchOPR3 was identified. ABA-induced AchABF-1 located in the nucleus and activated the transcriptional expression of AchLOX3 and AchOPR3 through binding to their promoters. These results were further confirmed in the tobacco leaves overexpressing AchABF1-1 in which AchABF1-1 promoted NbLOX and NbOPR expression with the increases of JA content. In addition, exogenous ABA increased endogenous JA content, and enhanced LOX and OPR activities as well as their related gene expression, while FLD reduced these indices. These results suggested that the promotion effect of JA on the SPP accumulation was enhanced through the promotion of JA biosynthesis by ABA-responsive transcription factor AchABF1-1 during the wound healing process of kiwifruit.

Keywords: /ABRE-binding factor/ /Abscisic acid/ /Jasmonate/ /Kiwifruit/ /Suberin polyphenolic/ /Wound healing/

LEMON

Fernández, G., Sbres, M., Lado, J., & Pérez-Faggiani, E. (2022). Postharvest sour rot control in lemon fruit by natamycin and an Allium extract. International Journal of Food Microbiology, 368, 109605. https://doi.org/10.1016/j.ijfoodmicro.2022.109605

Abstract

Citrus sour rot caused by Geotrichum citri-aurantii is one of the most important postharvest diseases in citrus fruit, causing huge economic losses. Traditionally, it has been controlled by the postharvest application of guazatine and propiconazole fungicides, but restrictions in their use make it urgent to find an alternative for sour rot management. Natamycin, a common food preservative, and the organosulfuric compounds extracted from Allium species are safe food additives that control different foodborne pathogens. In the present study, the curative activities of commercial formulations of natamycin (Fruitgard Nat 20) and an Allium extract (PTSO: propyl thiosulfinate oxide; Proallium FRD®), were evaluated for the control of G. citri-aurantii in artificially inoculated lemon fruit. Trials in laboratory and in commercial conditions were carried out to explore the feasibility of including both compounds as part of a safe postharvest sour rot disease control strategy. Under controlled laboratory conditions, sour rot was significatively reduced by 500 mg L -1 of natamycin, 580 mL L -1 of PTSO and 290 mL L -1 of PTSO + 4% of a food coat, applied by immersion. Nevertheless, the maximum dose of PTSO (580 mL L -1) caused phytotoxicity on the fruit rind. In commercial drenching conditions, 290 mL L -1 of PTSO + 4% of a food coat reduced sour rot incidence similar to conventional treatment. In a packing line treatment, spray application of 500 mg L -1 of natamycin with a previous dip in sodium bicarbonate, resulted in nearly 70% reduction of disease incidence compared to conventional salt application. A second commercial experiment revealed that fruit drenching with 290 mL L -1 of PTSO + 4% food coat followed by an in-line cascade application of 500 mg L -1 of natamycin is completely effective for sour rot control after 20 days at 5 °C. Further exposure at room temperature for 7 d showed a 61% reduction in sour rot incidence compared to the control. Results revealed that natamycin and PTSO are promising tools for sour rot control used alone or combined as part of an integrated post harvest strategy.

Keywords: /Biofungicide/ /Food additives/ /GRAS/ /Geotrichum citri-aurantii/

MANGO

Ranjith, F. H., Adhikari, B., Muhialdin, B. J., Yusof, N. L., Mohammed, N. K., Ariffin, S. H., & Meor Hussin, A. S. (2022). Peptide-based edible coatings to control postharvest fungal spoilage of mango (Mangifera indica L.) fruit. Food Control, 135, N.PAG. https://doi.org/10.1016/j.foodcont.2021.108789

Abstract

Edible coatings have been applied to improve the shelf life and quality of fruit. However, little is known about the potential of bioactive peptides-based coatings for the fruit preservation. This study aimed to evaluate the antifungal activity of edible coatings produced by incorporating bioactive peptides generated by lacto-fermentation of palm kernel cake (PKC) fermented with Lactobacillus plantarum ATCC8014 (PKCL1) and Lactobacillus fermentum ATCC9338 (PKCL2). PKCL1 and PKCL2 incorporated with 10 different polysaccharide polymers, and evaluated the antifungal activity, biodegradability and peptide releasing ability. The results showed that the edible coating produced by incorporating PKCL1 and PKCL2 in chitosan (CH) inhibited the growth of fungi that commonly infest mangoes. CH coating containing PKCL1 and PKCL2 showed prominent inhibition zones against Colletotrichum gloeosporioides and Botryodiplodia theobromae. The incorporation of PKCL1 and PKCL2 CH matrix significantly ($p < 0.05$) reduced anthracnose and stem-end rot. Furthermore, the peptide release and biodegradability of CH-based coating were significantly higher than coatings produced using 9 other polysaccharides. The incorporation of PKCL1 and PKCL2 into CH significantly altered the color and water vapor permeability of polysaccharide-based films, although the swelling property was only changed marginally. Out of 10 polysaccharides testes, CH was found to be the best carrier for antifungal peptides. CH coatings containing PKCL1 and PKCL2 demonstrated a high potential to control the postharvest anthracnose and stem-end rot in mango. However, further research should be carried out, focusing on the quality and sensory properties of treated mango. Edible coatings incorporating lacto-fermented peptides demonstrated antifungal activity. The antifungal edible coating inhibited the growth of C. gloeosporioides and B. theobromae. The antifungal edible coating significantly ($P < 0.05$) reduced anthracnose and stem-end rot in mango. Chitosan was the best polysaccharide carrier for the antifungal peptides.

Keywords: /Antifungal film and coating/ /Fungal diseases/ /Lactic acid bacteria/ /Lacto-fermented peptides/ /Mango/ /Physical properties/ /Polysaccharide polymers/

Zhou, D., Jing, T., Chen, Y., Yun, T., Qi, D., Zang, X., Zhang, M., Wei, Y., Li, K., Zhao, Y., Wang, W., & Xie, J. (2022). Biocontrol potential of a newly isolated Streptomyces sp. HSL-9B from mangrove forest on postharvest anthracnose of mango fruit caused by Colletotrichum gloeosporioides. Food Control, 135, N.PAG. https://doi.org/10.1016/j.foodcont.2022.108836

Abstract

Mango is an important tropical fruit in the world. Mango anthracnose is one of the most severe postharvest diseases caused by Colletotrichum gloeosporioides. Biocontrol by actinomycetes is considered as a promising strategy. Here, 67 actinomycetes were isolated from mangrove forest soils. A strain labeled with HSL-9B showed 63.21% of the inhibition ratio against C. gloeosporioides and broad-spectrum antifungal activities against the selected seven postharvest pathogens. The strain was assigned to Streptomyces malaysiensis based on the phenotypic, biochemical and whole-genomic profiles. Strain HSL-9B extracts significantly reduced the disease severity of mango anthracnose in vivo. 8 × EC 50 of extracts completely inhibited the infection of pathogens during the entire storage process. Total soluble sugar contents on harvested mangoes were effectively kept. 4 × EC 50 of extracts obviously inhibited spore germination and mycelial growth of C. gloeosporioides , resulting in mycelial rupture and cell ultrastructure destroying. The biosynthesis gene clusters (BGC) of secondary metabolites involved in antagonism were identified by comparison with the whole-genome sequencing of strain HSL-9B. Fifteen compounds in strain HSL-9B extracts were obtained using the gas chromatography-mass spectrometry (GC-MS). 12-methyl-tridecanoic acid was one of the dominant compounds identified in extracts. Hence,

S. malaysiensis HSL-9B is an important bioresource for exploring novel natural products to manage postharvest disease. Streptomyces strain with strong antifungal activities was isolated and identified. Strain HSL-9B inhibited mango decay and maintained its quality during postharvest. Extracts damaged the cell integrity and inhibited spore germination of pathogens. Biosynthetic gene clusters were found in the sequencing genome of strain HSL-9B. Several secondary metabolites were identified in strain HSL-9B extracts.

Keywords: /Anthracnose disease/ /Biological control/ /Mango fruit/ /Postharvest quality/ /Streptomyces/ /Whole genome sequencing/

MUSHROOM

Zheng, Z., Qu, H., Zhou, H., Yang, H., & Gao, H. (2022). Changes in quality, ultrastructure, reactive oxygen species and cell wall metabolisms of postharvest Coprinus comatus stored at different temperatures. Scientia Horticulturae, 298, N.PAG. https://doi.org/10.1016/j.scienta.2022.110989

Abstract

Fresh Coprinus comatus mushroom was treated with near freezing temperature (NFT). NFT storage reduced browning index and weight loss. NFT storage suppressed the production of reactive oxygen species. NFT storage delayed the onset of peak activities of cell wall degrading enzymes. NFT storage maintained the firmness and cell structure integrity. Storage in refrigerated conditions is the simplest method to maintain the quality of mushrooms. However, unreasonable low temperatures may limit the effect and even induce postharvest chilling injury. To maximally maintain its quality, Coprinus comatus fruiting body was stored at near freezing temperature (NFT), 4 °C and 8 °C, respectively, and the changes of physicochemical properties, reactive oxygen species and cell wall metabolisms were investigated and compared. Results showed that NFT storage slowed the rate of declines in firmness, ascorbic acid and glutathione, as well as increases in browning degree, electrolyte leakage, reducing sugar and malondialdehyde, thereby improving the overall quality of C. comatus. Biochemical analysis demonstrated that NFT storage suppressed the production of reactive oxygen species, and retarded the onset of peak activities of antioxidant enzymes and cell wall degrading enzymes, therefore, maintaining higher levels of cell wall components and cell structure integrity. These results indicated NFT storage could effectively slow the senescence process and be a promising strategy to prolong the storage period of C. comatus mushroom.

Keywords: /Cell wall/ /Coprinus comatus/ /Metabolism/ /Near-freezing temperature/ /Reactive oxygen species/

PASSION FRUIT

Li, C., Zhao, J., Wang, J., Wang, X., Xiang, W., & Zhao, J. (2022). First Report of Trichothecium roseum Causing Postharvest Fruit Rot on Purple Passion Fruit in China. Plant Disease. https://doi.org/10.1094/PDIS-01-22-0115-PDN

Abstract

Purple Passion fruit (Passiflora edulis) is widely cultivated in many regions of southern China as an edible tropical fruit with excellent nutritional value and high economic value. In July 2021, postharvest fruit rot was observed on 20-25% of purple passion fruit in several fruit markets of Dehong City in Yunnan Province. Symptoms on infected fruits were irregular, pink-brown, soft, and water-soaked lesions, which enlarged and formed sunken patches with time as well as producing a small amount of white mycelium. To isolate the causal organism, five diseased fruits were collected from different fruit markets. A conidial mass from an individual sorus observed on an infected fruit was isolated and cultured on potato dextrose agar (PDA) supplemented with 50 μg ml-1 of streptomycin, and five fungal isolates were obtained. These

isolates were morphologically similar and produced pale pink colonies on PDA for 7 days containing several conidiophores with abundant conidia. Mycelia were hyaline, 2 µm in diameter, and conidiophores were simple or branched (100 to 286 × 1.5 to 2.5 µm, n=50). Conidia were pyriform, ovate, with papillary protuberances at one end. Almost all conidia were two-celled and single-septate (5.8 to 9.1 × 1.7 to 4.9 µm, n=50). The morphology of the fungi resembled Trichothecium roseum as reported previously (Inácio et al. 2011). To further confirm the fungal species, isolate PASF4 was selected for molecular identification by amplifying and sequencing the ribosomal internal transcribed spacer (ITS) and large subunit (LSU) genes. Primers and PCR amplification were described by Fell et al. (2000). Results showed that both the ITS (GenBank accession OL336243) and LSU (OL336242) gene sequences had 100% similarity to T. roseum in NCBI database (MH856757 and MH868278). Maximum likelihood tree was constructed using MEGA 7 (Felsenstein, 1981) based on concatenated sequences (ITS and LSU) of isolate PASF4 and reference strains. Phylogenetic analysis showed that isolate PASF4 belonged to T. roseum clade. Based on morphological characteristics and phylogenetic analysis, isolate PASF4 was identified as T. roseum (Inácio et al. 2011). To confirm their pathogenicity, healthy purple passion fruits (cv. Tainong-1) were disinfected in 0.5% NaClO solution for 2 min, and then washed with sterile water. After wounding with a sterile needle, the fruits were inoculated by placing mycelium agar plugs on the wounds, and mock inoculation with mycelium-free PDA plugs served as control. Five fruits were used in each treatment. All fruits were maintained in plastic boxes at 25 °C. Disease symptoms appeared after inoculation for 4-7 days on all inoculated fruits, which were similar to those observed in fruit markets. No symptoms were observed on fruits used as control. The Trichothecium isolates were re-isolated from symptomatic fruits thus fulfilling Koch's postulates. Trichothecium roseum has been reported to cause fruit rot of tomato, apple and orange in Pakistan (Hamid et al., 2014) and fruit rot of pepper in China (Lin et al., 2016). To our knowledge, this is the first report of T. roseum causing fruit rot on purple passion fruit worldwide, and these data will provide useful information for developing effective control strategies.

Keywords: /Passion Fruit/ /Postharvest Fruit Rot/ /Trichothecium roseum/

PEAR

Bai, L., Zhang, L., Lv, J., Zhang, Y., Sun, M., Chen, J., & Ge, Y. (2022). Effects of 1‐methylcyclopropene (1‐MCP) treatment on ethanol fermentation of Nanguo pear fruit during ripening. Journal of Food Biochemistry, 46(5), 1–8. https://doi.org/10.1111/jfbc.14035

Abstract

The aim of this study was to analyze the effects of 1‐methylcyclopropene (1‐MCP) on ethanol fermentation of Nanguo pears during ripening. Pears were exposed to 1 µl/L 1‐MCP and stored at 20 ± 2°C. Our data indicated that postharvest application of 1‐MCP maintained flesh firmness and reduced ethylene production and respiration rate during storage compared with untreated fruits. 1‐MCP treatment delayed the second glucose peak during fruit ripening. The contents of pyruvate and acetyl‐CoA were generally reduced by 1‐MCP treatment, and at the same time, their peaks were delayed by it during storage compared with controls. The contents of citric acid (CA) and oxaloacetate (OA) were increased by 1‐MCP, whereas the contents of acetaldehyde and ethanol were reduced during the whole storage period compared with controls. Activities of alcohol dehydrogenase (ADH) and pyruvate decarboxylase (PDC) were reduced by application of 1‐MCP during the early stage of storage, and the appearance of their peak activities was also delayed after treatment with 1‐MCP. These data showed that postharvest application of 1‐MCP could effectively delay the production of the "alcohol taste" of Nanguo pears during ripening. Practical applications: Nanguo pear is one of the most common cultivars that widely grow in northeast China. It is preferred by many consumers for its unique "alcohol taste", which is mainly produced through ethanol fermentation during ripening. Until now, the mechanisms for regulating ethanol fermentation in ripening Nanguo pears are still unclear. Our data indicated that postharvest application of the ethylene action inhibitor 1‐MCP could effectively delay the production of the "alcohol taste" of Nanguo pears during ripening. The data from this study can provide reference data for maintaining the quality of postharvest Nanguo pears.

Keywords: /1-MCP/ /Anaerobic metabolism/ /Pear fruit/ /Storage/

Luo, M., Ge, W., Sun, H., Yang, Q., Sun, Y., Zhou, X., Zhou, Q., & Ji, S. (2022). Salicylic acid treatment alleviates diminished ester production in cold-stored "Nanguo" pear by promoting the transcription of PuAAT. Postharvest Biology & Technology, 187, 111849. https://doi.org/10.1016/j.postharvbio.2022.111849

Abstract

Ester loss due to chilling injury adversely affects the quality of 'Nanguo' pears. Salicylic acid (SA) is a well-known regulator of many physiological processes. Nevertheless, the regulatory mechanism underlying SA-mediated biosynthesis of esters remains largely unknown. Herein, we reported that SA treatment increased the kinds of esters and content of main and total esters in cold-stored 'Nanguo' pears. Yeast-hybridization, subcellular localization assay, transient transfection and β-glucuronidase analysis showed that the nuclear-localized PuMYB308-like and PuMYB6-like directly bound and activated PuAAT, moreover, overexpression of PuMYB308-like and PuMYB6-like promoted the expression of PuAAT as well as the main volatile content, and these functions were further enhanced by SA treatment. Furthermore, PuNAC68-like was found to be a negative regulator that inhibited the transcription of PuAAT. However, this effect was suppressed by SA treatment. Collectively, this study uncovered the transcriptional mechanism underlying SA promoted the transcription of PuAAT thus mediating ester formation.

Keywords: /'Nanguo' pear/ /EsterSalicylic acid/ /PuAAT/ /Transcriptional regulation/

Wang, L.-J., Zhang, Q., Song, H., & Wang, Z.-W. (2022). Mechanical damage of "Huangguan" pear using different packaging under random vibration. Postharvest Biology & Technology, 187, 111847. https://doi.org/10.1016/j.postharvbio.2022.111847

Abstract

Package types had a great influence on the mechanical damage of pears. Positions resulted in different response vibration of pears. Models to predict mechanical damage of pears under vibration level were developed. Links between mechanical damage of pears and vibration duration were developed. The mechanical damage of fresh fruit under random vibration during postharvest transportation is a major problem in the agricultural industry. This paper investigated the mechanical damage of 'Huangguan' pear (Pyrus bretschneideri Rehd. 'Huangguan') under random vibration excitation considering package type, vibration level, and vibration duration. Limited white noise with the frequency 3 Hz – 80 Hz was used as the excitation spectrum. Results showed: vibration results in the obvious decline of pear firmness. Firmness of pears with five package types after vibration decreased 9 % to 26 %. Package type had a great effect on the mechanical damage of pears. The package type of expanded polystyrene (EPS) tray + expandable polyethylene (EPE) net cover can provide the best cushioning effect for pears. The response vibrations of pears are related to positions. The resonant frequencies of stacked pears were concentrated in the range of 23 Hz–56 Hz. Response vibrations of pears in the corner were more severe compared with the pears in the center. In addition, the damage rules of pears with the package type of corrugated paperboard division + paper wrapping under different vibration levels and durations were revealed. The relationships of damage area and vibration level, firmness and vibration level, damage area and vibration duration conformed to linear correlation. Exponential function can be used to describe the relationships of damage volume and acceleration level, damage volume and vibration duration, firmness and vibration duration. This study provides references for vibration resistant packaging design of fruit, and thus to minimize the mechanical damage of fruit in the supply chain.

Keywords: /'Huangguan' pear/ /Mechanical damage/ /Package type/ /Response vibration/ /Vibration level and duration/

Zhang, Y., Li, X., Xing, S., Ren, H., Yang, J., & Huang, Q. (2022). First Report of a New Postharvest Disease of Pear Fruit Caused by Ceratocystis fimbriata in Kunming, China. Plant Disease. https://doi.org/10.1094/PDIS-09-21-2073-PDN

Abstract

Pear (Pyrus pyrifolia (Burm.f.) Nakai) is widely planted in China and plays a key role in economy. In the autumn of 2016, five pear fruits showing symptoms of brown rot (Fig. 1A) were found in a Suancun farmer market in Kunming, Yunnan Province, China (25°02' N; 102°42' E). The incidence of this disease in postharvest pear fruits ranged from 2 % to 5 % in this city. Three fruit samples were taken to run further tests. The decayed area of the fruit was soft, brown, slightly sunken, and circular. Carrot baiting was used to isolate the pathogen from symptomatic tissue (Moller et al. 1968). Primary isolates were made by transferring ascospore drops from the tips of the perithecia formed on the carrot discs onto PDA plates. Single ascospore cultures were generated by transferring single ascospores to potatoe dextrose agar (PDA) plates. Cultures were incubated 7 days at 25°C with a 12-h light/12-h dark cycle. In culture, mycelium was initially white, turned to a shallow celadon and gradually to grey-greenish later. Measurements were made 10 days after the formation of perithecia. Six pure cultures (lik-1~lik-6) were stored at -80 °C in 15% glycerol and stored at the State Key Laboratory for Conservation and Utilization of Bio-Resources of Yunnan Agricultural University. Four isolates (lik-1~lik-4) produced ascomatal bases that were submerged in the agar. Bases (Fig. 1E) were globose, black, 192.15 to 250.81 µm wide, 192.94 to 251.31 µm long, and had straight necks terminating in ostiolar hyphae (Fig. 1F) that were divergent, hyaline, and 74.19 to 116.33 µm long. Asci were not observed. Ascospores (Fig. 1I) were ovoid, hat-shaped (dimensions 3.2 to 5.1 × 2.3 to 4.6 µm). Conidiogenous cells were with enteroblastic conidium ontogeny, flask-shaped or tubular, 65.3 to 130.6 µm long, and produced cylindrical, straight aseptate conidia (8.5 to 18 × 2.5 to 3.5 µm) (Fig.1 G). All isolates produced dark brown, 10.07 to 13.08 ×8.51 to 11.64 µm aleurioconidia (Fig. 1H). Two (lik-1, lik-3) of six isolates were used for molecular identification and genomic DNA was extracted using the CTAB method (Lee & Taylor 1990). The primers ITS1 and ITS4, EF1F and EF2R were used to amplify and sequence the rDNA-ITS and TEF-1α regions (Thorpe et al. 2005; Jacobs et al. 2004). The sequences of rDNA-ITS of the isolates lik-1 and lik-3 (GenBank Accession Nos: MF153994, MF153993) showed 99.49% similarity to AF395679 (C. fimbriata isolate CMW2219). Additionally, the TEF-1α sequences of isolates lik-1 and lik-3 (GenBank Accession Nos: KY708912, KY708915) showed 100% identify to MF347676 (C. fimbriata isolate CM18). Based on symptoms, morphological characteristics, rDNA-ITS and TEF1-α sequence analysis and pathogenicity, this fungus was identified as C. fimbriata. Pathogenicity tests were conducted using 2 isolates (lik-1, lik-3) and repeated three times. Three fresh pear fruits were disinfected with 75% alcohol, then they were wounded with a 2 mm hole punch and inoculated with 200 µL conidia suspension of the fungus (approximately 2.0 × 106 conidia / mL) on the fruit surface. After inoculation, pear fruits were incubated in boxes at 25°C with a relative humidity of 80% and a 12-h light / 12-h dark cycle. Three pear fruits that served as controls were wounded by punching a 2 mm hole into the skin and inoculated with 200 µL sterile distilled water. Symptoms of rot were observed one week after inoculation (Fig.1 B). The diameter of the external lesion varied from 1.5 to 2.5 cm, on average 1.9 cm. When pears were cut, the white pulp had turned black and was rotting (Fig.1 C, D). The pathogen re-isolated from all inoculated symptomatic tissue was identical to the isolates originally obtained from the pear fruits at the market by morphology and ITS analysis. No symptoms developed on the control. The pathogenicity assay showed that C. fimbriata was pathogenic on pears. To our knowledge, this is the first report of C. fimbriata on pear in China. The spread of this disease may pose a threat to pear quality in China and further studies could be performed to determine effective disease management strategies.

Keywords: /Ceratocystis fimbriata/ /Postharvest/ /Pyrus pyrifolia/

POMEGRANATE

Nazoori, F., ZamaniBahramabadi, E., Rafie, A., & Mirdehghan, S. H. (2022). Combined Application of Gamma-Aminobutyric Acid and Carnauba Wax as Edible Coating on Pomegranates in Cold Storage. Journal of Agricultural Science & Technology, 24(3), 591–602.

Abstract

Pomegranate is a popular fruit, rich in antioxidants and minerals but sensitive to postharvest storage. The efficiency of 5 and 10 mM γ-Aminobutyric Acid (GABA) combined with 0.5% carnauba wax as edible coating was investigated on extending the cold storage life of pomegranate fruit (Cv. Malas Saveh) after 45 and 90 days. Coatings maintained fruit freshness, inhibited the chilling injury symptoms, reduced peel malondialdehyde formation (minimum of 0.74 nM g-1), reduced loss of aroma/taste, and increased aril antioxidant activity (maximum of 94.9%). Aril anthocyanin content was more stable in 5 mM GABA coated than uncoated fruits. However, the coatings caused more weight loss on 45th day (11.0% in 10 mM GABA and 8.3% in the control). This parameter was similar in coated and uncoated fruits after 90 days. Aril phenolic content in coated fruits was higher on 90th day but not on 45th day (maximum of 0.08 mg.100g-1 in the control on day 45). Aril lightness increased in the control sample on 45th day while coated fruits were more similar to harvest time. After 90 days, the control and treated samples were similar. The color scales (a*, b*, and Chroma) values of peels and arils declined by storage without any significant effects of coatings. Peel and aril Hue did not change by storage time or coatings. Results suggested some benefits of coatings for retaining the postharvest quality of pomegranate fruits.

Keywords: /Antioxidant activity/ /Fruit quality/ /Punica granatum L/ /Shelf life/

POTATO

Wang, L., Wang, W., Wang, Q., Liu, W., Tang, T., Wang, Z., & Zhang, J. (2022). Transcriptome-wide N6-methyladenosine (m6A) methylation profiling of fresh-cut potato browning inhibition by nitrogen. Postharvest Biology & Technology, 187, N.PAG. https://doi.org/10.1016/j.postharvbio.2022.111870

Abstract

Although fresh-cut potato is extremely popular, it is highly prone to browning, severely affecting its quality and shelf life. Nitrogen treatment can inhibit fresh-cut potato browning. Potato browning from the perspective of transcriptome-wide N6-methyladenosine (m6A) methylation has not yet been reported. This study performed transcriptome-wide m6A-sequencing of fresh-cut potato from nitrogen-treated group (1 h N 2) and control group (1 h CK and 0 h CK) to reveal the m6A methylation modification features, and determine the methylation sites of the differentially methylated genes (DMGs). Kyoto Encyclopedia of Genes and Genomes pathway enrichment analysis indicated that the DMGs in 1 h CK vs 0 h CK and 1 h N 2 vs 1 h CK were mainly enriched in the isoflavonoid and betalain biosynthesis pathways, respectively. The m6A modifications in potato were mainly enriched around the 3′-untranslated region and stop codons of the coding sequence. The DMG expression was further verified by quantitative real-time polymerase chain reaction (qPCR), while the methylation sites were determined using SELECT qPCR. This study is the first to reveal the transcriptome-wide m6A profile of potato, which may provide new insight into inhibiting fresh-cut potato browning using nitrogen treatment from the perspective of m6A methylation. The first to reveal the transcriptome-wide m6A profile of potato. The m6A modifications in potato were mainly enriched around 3′-UTR and stop codons of CDS. It found a difference in methylation at m6A1792 site of tubulin beta-2 chain-like by SELECT qPCR.

Keywords: /Browning/ /Fresh-cut potato/ /N6-methyladenosine methylation/ /Nitrogen/

ROSEMARY

Xylia, P., Fasko, K. G., Chrysargyris, A., & Tzortzakis, N. (2022). Heat treatment, sodium carbonate, ascorbic acid and rosemary essential oil application for the preservation of fresh Rosmarinus officinalis quality. Postharvest Biology & Technology, 187, 111868. https://doi.org/10.1016/j.postharvbio.2022.111868

Abstract

As the need for healthy and nutritional food rises, the use of medicinal and aromatic plants (fresh herbs) also increases due to the health benefits that they possess. However, these products are highly perishable and their shelf life might be limited, depending on the product. The aim of the present study was to examine the effectiveness of heat treatment (HT 40 °C, HT 55 °C), sodium carbonate (SC 1%, SC 3%), ascorbic acid (AA 1%, AA 2%) and rosemary essential oil (EO 1:1500, EO 1:500) on fresh rosemary bundles quality attributes during storage at 4 °C for 12 days. The results showed that the application of AA (1%, 2%) increased the respiration rate of rosemary, whilst all treatments (except HT 40 °C, HT 55 °C) increased the antioxidant activity (assayed by DPPH, FRAP and ABTS methods). Moreover, HT 40 °C, SC (1%, 3%) and AA (1%, 2%) decreased the microbial load (filamentous fungi). Regarding sensory attributes, the use of AA and rosemary EO were able to preserve the aroma and green color of rosemary, whilst the application of SC and HT resulted in a less acceptable/marketable product. The findings of this study exhibit that the examined treatments might be used as alternative means for fresh herbs preservation/ enhancement of quality attributes. Rosemary oil and ascorbic acid preserved sensorial aroma and color of rosemary bundles. Rosemary oil application enhanced fresh rosemary plant quality. Sodium carbonate and heat treatment had strong antimicrobial activity. Ascorbic acid application increased respiration rates.

Keywords: /Antioxidant/ /Heat treatment/ /Natural product/ /Postharvest quality/ /Rosemary/

SPINACH

Akan, S. (2022). Effects of Storage Temperature and Packaging on Physiological and Nutritional Quality Preservation of Minimally Processed Spinach. Journal of Agricultural Science & Technology, 24(3), 679–691.

Abstract

Improper storage conditions of minimally processed spinach decrease its acceptability and dietary selection in terms of nutritive value to human health. In the present study, effects of temperatures (4 and 10°C) and packaging materials [Polypropylene (PP), Polyvinyl Chloride (PVC), Low-Density Polyethylene (LDPE)] were investigated for determining the successful storage conditions of minimally processed spinach. Based on the results, chlorophyll a (0.550 mg g-1), chlorophyll b (0.500 mg g-1), total chlorophyll (1.050 mg g-1), and total carotenoids (0.310 mg g-1) were maintained by PP at 4 °C. The highest antioxidant capacity (74.14%I), and total phenolic content (183.75 mg 100 g-1 gallic acid equivalent) were also determined in PP packages. Visual quality showed the same behavior in all packages except for the control, and storage at 4°C was greatly beneficial in improving visual quality of minimally processed spinach. In addition, LDPE delayed the increase in weight loss (0.41%) and respiration rate (27.32 mL CO2 kg-1 h-1). PVC preserved the vivid green color of spinach at 4 °C. Some undesirable results were obtained at 10 °C storage because of rapid quality losses. As a result, storage at 4 °C in PP packages is an effective method to improve postharvest life of minimally processed spinach.

Keywords: /Antioxidant capacity/ /Chlorophyll/ /Spinacia oleracea L./ /Total carotenoid/ /Total phenolic content/

SQUASH

Kitabayashi, S., Kawaguchi, A., Yoshida, M., Kami, D., Sugiyama, K., & Kawakami, A. (2022). First report of Fusarium sambucinum causing postharvest fruit rot of winter squash (Cucurbita maxima). Journal of General Plant Pathology, 88(3), 207–211. https://doi.org/10.1007/s10327-022-01053-w

Abstract

In December 2019, two fungal isolates were isolated from rotting tissue of winter squash (Cucurbita maxima) fruits stored in Hokkaido, Japan. These isolates were identified as Fusarium sambucinum based on morphological characteristics and DNA sequencing analysis. Inoculation of wounds in winter squash fruits with the isolates resulted in the same symptoms, and the isolates were reisolated, revealing that they were pathogenic. This is the first report of F. sambucinum causing postharvest fruit rot of winter squash.

Keywords: /Fruit rot/ /Fusarium sambucinum/ /Post harvest/ /Winter squash/

TOMATO

Ciptaningtyas, D., Benyakart, N., Umehara, H., Johkan, M., Nakamura, N., Nagata, M., Orikasa, T., Thammawong, M., & Shiina, T. (2022). Modeling the metachronous ripening pattern of mature green tomato as affected by cultivar and storage temperature. Scientific Reports, 12(1), 1–9. https://doi.org/10.1038/s41598-022-12219-z

Abstract

Nutritional benefits and organoleptic characteristics, including visual, textural, taste, and flavor, are the critical characteristics of economically important fruit. Ripening is a crucial phenomenon in the formation of these quality characteristics in fruits. Therefore, controlling the ripening phenomenon is extremely important not only to maximize the benefits of the fruit but also to avoid food losses caused by over-ripening. Tomato is an important model plant, especially for research on fruit ripening. The metachronous model of tomato ripening is presented in this report. This model predicts the postharvest ripening time of tomato fruit in terms of red color development based on the storage period. A modified sigmoid-type function model was used to develop the prediction model. The observations and analyses were conducted at different storage temperatures and in different tomato cultivars. The result exhibits that the integration of the proposed model and time lag was successfully showing the postharvest ripening time history of tomato fruit at the full range ripening process, from onset to fully ripe. This study provides critical information on postharvest quality control research and supply chain development in eliminating food loss and waste, which leads to the realization of sustainable development goals.

Keywords: /Tomato/ /Ripening/ /Supply Chain/ Postharvest/

Han, J., Ren, Q., Ji, Z., & Yang, X. (2022). Mathematical model of postharvest variation in tomato color based on optimized response surface methodology. Journal of the Science of Food & Agriculture, 102(7), 2972–2980. https://doi.org/10.1002/jsfa.11637

Abstract

Manual inspection and instrumentation form the traditional approach to determining tomato color but these methods only determine tomato color at a given moment and cannot predict dynamically how tomato color varies during storage and transportation. Such methods thus cannot help suppliers and retailers establish good management practices for the flexible control of tomato maturity, accurate judgment of market positioning in the industry, or during distribution and marketing. To address this

shortcoming, this work first investigates how tomato color parameters (a* and h°) evolve through the various stages of maturity (green, turn, and light red) under different storage conditions. Based on experimental results, it develops an optimized response-surface model (RSM) by using differential evolution to predict how tomato color varies during storage. Tomatoes are more likely to change color at high temperatures and under conditions of high humidity. Temperature affects tomato color more strongly than humidity. The accuracy of the RSM was confirmed by a good agreement with experiments. All determination coefficients R2 of the RSMs for a* and h° are greater than 0.91. The mean absolute errors for a* and h° are 3.8112 and 5.6500, respectively. The root mean square errors for a* and h° are 4.6840 and 6.9198, respectively. This research reveals how storage temperature and humidity affect the postharvest variations in tomato color and thus establishes a dynamic model for predicting tomato color. The proposed RSM provides a reliable theoretical foundation for dynamic, nondestructive monitoring of tomato ripeness in the cold chain.

Keywords: /Color/ /Dynamic prediction/ /Postharvest storage/ /Response surface methodology/ /Tomato/

Li, W., Liu, Z., Li, X., & Li, X. (2022). Quality maintenance of 1-Methylcyclopropene combined with titanium dioxide photocatalytic reaction on postharvest cherry tomatoes. Journal of Food Processing & Preservation, 46(5), 1–14. https://doi.org/10.1111/jfpp.16500

Abstract

This study explored the effects of 1-MCP combined with TPC treatment on bioactive compounds, odor, and ultrastructure of cherry tomatoes during postharvest storage. The results showed that the three treatments could all maintain the firmness, soluble solids, and titratable acidity content. It was noteworthy that TPC applied to cherry tomatoes had positive effects on removing off-flavors and reducing accumulation of malondialdehyde, and it can better retain the lycopene content compared with 1-MCP in the later storage period. In addition, the combined treatment was more effective than the control check, single 1-MCP and single TPC, which can inhibit the respiration and ethylene production of cherry tomatoes, maintain the ascorbic acid content, and sustain the integrity of peel and pulp cell structure during postharvest storage. Our study concluded that 1-MCP + TPC was a feasible technology that can enhance the effect of single 1-MCP treatment and make up for the limitations of single treatment. Practical applications: The moisture content of cherry tomatoes is higher than 90% so that cherry tomatoes are prone to softening, rot, and quality deterioration after harvest. They are typical climacteric fruits with obvious respiratory peaks. In the process of postharvest transportation and storage, intricate physiological and biochemical reactions occur in cells. A growing number of studies had shown that 1-Methylcyclopropene had certain limitations. We used combined treatment, in order to enhance the effect of single 1-Methylcyclopropene treatment and better guarantee the edible value and commodity value of postharvest cherry tomatoes. Our research showed that 1-Methylcyclopropene combined with titanium dioxide photocatalytic treatment may become an advanced preservation technology, and can provide a new idea for improving the storage quality of postharvest cherry tomatoes.

Keywords: /1-Methylcyclopropene/ /TITANIUM dioxide/ /TOMATOES/ /CHERRIES/ /VITAMIN C/ / BIOACTIVE compounds/

Yadav, A., Kumar, N., Upadhyay, A., Sethi, S., & Singh, A. (2022). Edible coating as postharvest management strategy for shelf-life extension of fresh tomato (Solanum lycopersicum L.): An overview. Journal of Food Science (John Wiley & Sons, Inc.), 1. https://doi.org/10.1111/1750-3841.16145

Abstract

Tomato is considered as one of the most grown horticultural crops having a short shelf-life due to its climacteric nature of ripening, susceptibility to postharvest microbial decay, and mechanical damage, resulting in huge postharvest losses. Recently, the use of edible coatings has been seen as a promising

environment friendly and sustainable technology for preserving the quality attributes and prolonging the shelf‐life of tomatoes during storage. Although a lot of literature is available on the aspects of edible coating for fresh produce, especially stone and tropical fruits, there is no dedicated comprehensive review that specifically addresses the requirements of edible coatings for whole fresh tomatoes. This review aims to provide the information about the desirable coating property requirements specific to tomato and summarizes or analyzes the recent studies conducted on the application of edible coating on tomato. The article also deals with recent trends on utilization of bioactive compounds as well as nanotechnological approaches for improving the performance and functionality of coating materials used for tomatoes. However, the edible coating technology for tomatoes is still in its infancy state, and adoption of technology on a commercial scale requires economic viability and large‐scale consumer acceptability.

Keywords:/Edible coating/ /Nanotechnology/ /Postharvest losses/ /Quality/ /Shelf life/ /Sustainable/ /Tomato/

Zhao, K., Song, H., Wang, Z., Xing, Z., Tian, J., Wang, Q., Meng, L., & Xu, X. (2022). Knockdown of Sly-miR164a by short tandem target mimic (STTM) enhanced postharvest chilling tolerance of tomato fruit under low temperature storage. Postharvest Biology & Technology, 187, 111872. https://doi.org/10.1016/j.postharvbio.2022.111872

Abstract

The function of Sly-miR164a on postharvest chilling tolerance of tomato fruit was investigated. In the present results, compared with the wild type (WT) fruit in the red and green maturity stage, overexpression of Sly-miR164a (miR164a-OE) promoted postharvest chilling injury (CI) of tomato fruit. Compared with the WT and miR164a-OE fruit, the postharvest CI index of tomato fruit of knockdown of Sly-miR164a (STTM 164a) by short tandem target mimic (STTM) was decreased, the content of hydrogen peroxide (H 2 O 2) was reduced, and the fruit firmness was increased. In STTM 164a fruit, the relative expression levels of NAC1 , NAM3 , GOB , CBF1 , COR , NCDE1 , and NCDE2 were increased, the ABA content was enhanced, and the relative expression levels of CYP707A1 and CYP707A2 were decreased. The present study indicated that the knockdown of Sly-miR164a enhanced the postharvest chilling tolerance of tomato fruit during low temperature storage, and provided valuable information for genetically modifying miR164a and controlling postharvest CI of fruit. Knockdown of Sly-miR164a by STTM decreased the postharvest CI of tomato fruit. The H 2 O 2 content and electrolyte leakage were reduced in the STTM 164a fruit. The relative expression levels of NACs were enhanced in the STTM 164a fruit. The ABA content was enhanced in the STTM 164a fruit. The relative expression levels of CBF1 and COR were increased in STTM 164a fruit.

Keywords: /ABA/ /Chilling injury/ /MicroRNA/ /NAC/ /Tomato fruit/

ZUCCHINI

Massolo, J. F., Sánchez, R., Zaro, M. J., Concellón, A., & Vicente, A. R. (2022). Low‐dose prestorage 24‐epibrassinolide spray enhances postharvest chilling tolerance in zucchini squash (Cucurbita pepo L.) by eliciting peroxidase and phenolic antioxidants. Journal of Food Processing & Preservation, 46(5), 1–10. https://doi.org/10.1111/jfpp.16576

Abstract

Brassinosteroids are polyhydroxy steroid hormones, tested to induce cold acclimation in whole plants and some harvested fruits. So far, no works have determined whether such a strategy may improve the chilling tolerance of immaturely harvested Cucurbits, which are among the most sensitive vegetables. Herein, we evaluated the efficacy of 24- epibrassinolide to reduce chilling injury in zucchini squash (Cucurbita pepo L.). Prestorage sprays at a dose 10– 100 times lower than reported for postharvest use in other fruits (0.1 μM), markedly reduced chilling injury

incidence (ca. 70%) and sever-ity (30%– 40%), decreased weight loss, and delayed yellowing. After long- term storage, epibrassinolide- sprayed zucchini maintained lower electrolyte leakage and lipid peroxida-tion. The treatment also increased fruit antioxidant defenses by inducing peroxidase and increasing antioxidant capacity, phenolic compounds, and peroxidase activity. This is the first report showing that low- dose prestorage 24- epibrassinolide priming enhances the cold tolerance of immaturely harvested Cucurbits, preventing postharvest chilling injury.

Keywords: /Cucurbita pepo/ /Zucchini/ /Postharvest diseases/ /Oxidant status/ /Phenols/ /Brassinosteroids/