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AS OF JULY 2018

APPLE

dos Santos, I.D., Pizzutti, I.R., Dias, J.V., Fontana, M., Brackmann, A., Anese, R.O., Thewes, F.R., Marquez, L.N., Cardoso, C.D. (2018). Patulin accumulation in apples under dynamic controlled atmosphere storage. *Food Chemistry, 255: 275–281*.

Abstract

The goal of this study was to evaluate patulin contamination in ‘Galaxy’ and ‘Fuji Kiku’ apples subjected to controlled atmosphere (CA) and dynamic controlled atmosphere (DCA) conditions. Experiments were performed and fruit were stored for nine months under refrigeration plus 7 days shelf life at 20 °C. CA and DCA were not effective in preventing patulin production in either 'Galaxy' or 'Fuji Kiku' apples. Healthy fruit were not contaminated with patulin, even when stored together with decayed apples. For 'Galaxy' apples, application of 1- methylcyclopropene increased the percentage of fruit with decay and patulin contamination. Patulin concentrations were above the maximum limit (50 μg kg−1) established in the Brazilian legislation, meaning the use of CA and DCA conditions were not advantageous in preventing patulin accumulation. In 'Fuji Kiku' apples, there was no significant difference in patulin concentration among CA, DCA-CF and DCA-RQ 1.3 treatments, and all were below the maximum.

Keywords: /Mycotoxins/ /Fruit/ /Postharvest/ /Chlorophyll fluorescence/ /Respiratory quotient/ /1-Methylcyclopropene (1-MCP)/

Florian, V. C., Puia, C., Groza, R., Suciu, L. A., & Florian, T. (2018). Study of the major pathogens that lead to apple fruit decay during storage. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 46(2), 538-545.*

Abstract

Different pathogenic fungi (e.g. Penicillium spp., Monilinia fructigena, Venturia inaequalis, Glomerella cingulata, Diaporthe eres etc.) can cause apple rot by producing pectic enzymes that break down apple pectin to expose the nutrients of the cells to the fungi. This study aimed to identify the pathogens that lead to the degradation of apples from five different varieties (‘Granny Smith’, ‘Topaz’, ‘Imperial Gala’, ‘Jonagold’ and ‘Golden Reinders’) and also the incidence of those pathogens under different treatment conditions. The results reveal different frequent attacks on distinct varieties ranging from 5 to over 50%. Of the pathogens that infect and occur in vegetation and deposit it can be seen that Venturia inaequalis has been identified in all varieties in most test variants. The highest frequency was recorded in the variant where during the vegetation period no treatments with fungicides against apple diseases were applied. Of the pathogens that infected and appeared during storage, isolated on the fruits, only

Fusarium spp. and Penicillium spp. had a higher frequency. Applying treatments during the growing season reduced the rotting attack degree of apple fruits during storage. The best response to rot attack in the warehouse was ‘Topaz’ and ‘Jonagold’, the attack degree ranged between 0.3 and 10% on treated variants. By applying chemical treatments, the spectrum and the share of pathogens that lead to fruit degradation is different. This means that chemical treatments must be chosen depending on the nature of the pathogens and the apple variety.

Keywords: /Apple rot/ /Decay/ /Penicillium spp./ /Plant disease/ /treatment/ /Venturia inaequalis/

Ganai, A.S., Ahsan, H., Tak, A., Mir, M.A., Rather, A.H., Wani, S.M. (2018). Effect of maturity stages and postharvest treatments on physical properties of apple during storage. *Journal of the Saudi Society of Agricultural Sciences, 17: 310–316.*

Abstract

The objective of this study was to investigate the effect of harvest dates and postharvest treatments on physical properties of apple cv Red delicious during storage. Fruits from three harvest dates (H1, H2 and H3) were subjected to various treatments such as T1 (shade cooling), T2 (Hydrocooling), T3 (Hydrocooling + calcium chloride), T4 (Hydrocooling + wax) and T5 (Hydrocooling + calcium chloride + wax) and were stored under ambient and refrigerated conditions for 100 days. Results showed the significant differences in physical properties including fruit length, fruit diameter, length/diameter (L/D) ratio, fruit weight and firmness in various treatments. Maximum fruit length and fruit diameter were observed at harvest date 2nd (H2), whereas, L/D ratio and fruit weight were observed at harvest date 3rd (H3) on the storage at zero day. Among the treatments T5 showed the % maximum fruit length, fruit diameter, L/D ratio and fruit weight. The firmness was decreased in all treatments and harvest dates during storage. The% maximum fruit firmness was exhibited by early harvested fruit (H1) at zero (0) day of storage. However, changes were more pronounced under ambient conditions than cold storage.

Keywords: /Storage/ /Physical properties/ /Hydrocooling/ /CaCl2/

Mahunu, G., Zhang, H., Apaliya, M., Yang, Q., Zhang, X., and Zhao, L. (2018). Bamboo leaf flavonoid enhances the control effect of Pichia caribbica against Penicillium expansum growth and patulin accumulation in apples. *Postharvest Biology and Technology, 141: 1–7.*

Abstract

Patulin (PAT) mainly produced by *Penicillium expansum* is a very problematic mycotoxin, and its presence is often reported in different foods and food products. The prevention of these products from initial contamination and/or degradation is therefore of foremost importance in protecting consumer health. In this report, *Pichia caribbica*(1 × 108 cells mL−1) antagonistic

yeasts incorporated with bamboo leaf flavonoid (0.01% w/v) were assessed for PAT degradation capabilities in *in-vitro* and *in-vivo*. Also the effects of treatments on wound lesion diameter, lignification and pH level were investigated. Clearly, the combined biocontrol agent (*P. caribbica* and bamboo leaf flavonoid) had the ability to degrade PAT *in vitro* with undetected level at 96 h of incubation in NYDB media. In apple fruits, PAT accumulation was significantly lower at 20 d (at 20 °C) of storage. Wound lignification was significantly enhanced from 0.31 to 0.27 after 15 d of storage, whereas pH was modified (>4.0) in host; which might lead to an increase in PAT breakdown. *P. caribbica* combined with bamboo leaf flavonoid could be a promising biocontrol agent for PAT degradation processes in apple fruits.

Keywords: /Pichia caribbica/ /Bamboo leaf flavonoid/ /Blue mold/ /Biocontrol agent/ /Patulin/ /Postharvest storage/

Vicent, V., Ndoye, F.T., Verboven, P., Nicolai, B.M., Alvarez, G. (2018). Quality changes kinetics of apple tissue during frozen storage with temperature fluctuations. *International Journal of Refrigeration, 1-39.*

Abstract

Apple quality after freezing is affected by temperature fluctuations during cold storage. Ice recrystallization and sublimation occur slowly at a constant temperature over a long period of storage, and more rapidly during fluctuating temperatures. These phenomena impact fruit quality, thus reducing storage life. To this end, apple tissue samples were frozen and subsequently stored in three different freezers set at -12 ± 3 oC, -18 ± 3 oC, and -23 ± 3 °C. In each freezer, three different compartments were created to achieve different amplitudes of temperature fluctuations: (i) low (± 0.1 °C), (ii) medium (± 0.5 °C) and (iii) large (± 1.8 °C). Frost formation, drip loss, color changes and vitamin C (ascorbic acid) content were measured during five months of storage. The results revealed that apple quality was strongly affected by the temperature fluctuations during frozen storage. The kinetic models were calibrated using apple quality data collected at low and large amplitudes of fluctuations. The temperature dependency was successfully incorporated using an Arrhenius equation that integrates the temperature fluctuations. The kinetic models were validated using apple quality data gathered at a medium amplitude of fluctuation. In addition to a kinetic model, a physical model was applied to predict frost formation.

Keywords: Freezing/ /Cold chain storage/ /Temperature oscillation/ /Quality loss/ /Modeling/

Yihui, G., Song, J., Du, L., Vinqvist, M., Palmer, L.C. Fillmore, S., Pang, X. and Zhang, Z. (2018). Characterization of laccase from apple fruit during postharvest storage and its response to diphenylamine and 1-methylcyclopropene treatments. ***Food Chemistry, 253: 314–321.***

Abstract

To gain better understanding on laccase in apples and reveal its role in browning color formation during storage, laccases in apples were investigated. The full-length complementary DNAs encoding laccase genes were obtained from different tissues of apple including flowers, calyx, leaves and fruit peel of 'Red Delicious' and 'Cortland'. The apple laccases were compared to those in other plant species and found to have up to 99% homology to Arabidopsis and litchi. qRT-PCR analysis revealed changes in transcript abundance of LAC genes (2, 7, 9, 12, 14, 15 and 16) during storage and in response to DPA and 1-MCP treatments. Enzyme activity of laccase protein in apple peel increased with storage in control fruit, while decreased significantly with DPA or 1-MCP. Changes in phenolic compounds in pericarp tissues decreased generally during storage, but no significant effect of DPA and 1-MCP treatments on the phenolic compounds was found.

Keywords: /Malus domestica/ /Gene cloning and expression/ /Enzyme activity/ /Superficial scald/

AVOCADO

Defilippi, B.G., Ejsmentewics, T., Covarrubias, M.P., Gudenschwager, O., Campos-Vargas, R. (2018). Changes in cell wall pectins and their relation to postharvest mesocarp softening of Hass avocados (Persea americana Mill.). ***Plant Physiology and Biochemistry, 128: 142–151.***

Abstract

The avocado is a climacteric fruit and begins a softening process after harvest. During ripening, the mesocarp changes in texture, and this affects fruit quality and cold storage capacity. Softening is commonly associated with cell wall disassembly in climacteric fruits. However, changes in the cell wall structure and composition during avocado softening are poorly understood. To understand this process, cell wall pectins in "Hass" avocado fruit were studied during ripening at 20 °C after harvest and after cold storage. Additionally, avocados were treated with 1-MCP to evaluate the delay in softening. Biochemical analysis showed a decrease in galacturonic acid (GalA) in alcohol-insoluble residues (AIR) and water-soluble pectin concomitant to softening, paralleled by an increase in polygalacturonase (PG) activity. In the same way, the β-galactosidase activity increased in soft avocado fruit, along with a reduction in galactose in cell wall material and the Na2CO3-soluble fraction. The arabinose content in the

cell wall material did not change during softening. However, there was a change in arabinose ratios between the different fractions of pectin, mainly in the fractions soluble in water and in Na2CO3. The cold storage of avocado fruit did not induce softening of the fruit, but the content of GalA showed a substantial decrease, accompanied by an increase in PG activity. Thus, our work supports the hypothesis that the solubilization of neutral sugars such as arabinose and rhamnose, as well as the loss of galactose content mediated by the enzyme β-galactosidase, were the main factors that began the coordinated action of cell wall remodeling enzymes that resulted in the loss of firmness of avocado fruit.

Keywords: /Avocado/ /Softening/ /Cold stored/ /Ethylene/ /Cell wall/ /Pectin/

BANANA

Alali, A., Awad, M.A., Al-Qurashi, A.D., Mohamed, S.A. (2018). Postharvest gum Arabic and salicylic acid dipping affect quality and biochemical changes of 'Grand Nain' bananas during shelf life. *Scientia Horticulturae, 237: 51-58.*

Abstract

Effects of gum Arabic (GA) (5 and 10%), salicylic acid (SA) (1 and 2 mM) and their combination (10% GA plus 1 mM SA) postharvest dipping on quality and biochemical changes of ‘Grand Nain’ bananas were studied during shelf life (SL) conditions (20 ± 2 °C, 60–70% RH) for 9 days. All treatments, especially 10% GA plus 1 mM SA, decreased weight loss than control. GA at both rates retained higher peel green color than other treatments during SL. GA at both rates and SA at high rate SA retained higher firmness only after 6 days of SL. Total soluble solids (TSS) concentration increased during SL and was lower at both rates of GA and high rate of SA than control. Titratable acidity (TA) concentration decreased during SL and was higher at both rates of GA, low rate of SA and GA plus SA treatments than control. Peel browning index gradually increased during SL and was lower at high rate of GA than control. Membrane stability index (MSI) decreased during SL and was higher at both rates of GA than other treatments after 6 and 9 days of SL. Total phenols and flavonoids concentrations in peel and pulp and vitamin C in pulp fluctuated during SL and showed no consistent response to applied treatments. As overall, GA retained higher total phenols and flavonoids concentrations, whilst SA showed no clear effects. Free radical scavenging capacity (FRSC) of both peel and pulp increased during SL and was higher at GA and SA treatments than control. The relations of such biochemical changes with α-amylase, xylanase, polygalacturonase, peroxidase and polyphenoloxidase activities were discussed. In conclusion, GA treatment especially at 10% retained quality of ‘Grand Nain’ bananas during SL and being suggested as natural alternatives to synthetic chemicals.

Keywords: /Banana/ /Gum Arabic/ /Quality/ /Salicylic acid/ /Shelf life/ /Storage/

CABBAGE

Kang, M., Kim, S., Lee, J.Y., Yoon, S., Kim, S., and Ha, J. (2018). Inactivation of Pectobacterium carotovorum subsp. carotovorum on Chinese cabbage (brassica rapa L. subsp. pekinensis) by wash treatments with phenolic compounds. ***LWT - Food Science and Technology, 93: 229–236.***

Abstract

This study evaluated bactericidal effects of chlorogenic acid (CGA), caffeic acid (CFA), coumaric acid (CMA), and ferulic acid (FA), against Pectobacterium carotovorum subsp. carotovorum (PCC) on Chinese cabbage using suspension and direct inoculation tests. Among suspension tests with four phenolic acids, CGA at 5–7 mM or CMA at 7–10 mM for 30 min effectively eliminated PCC, whereas CFA and FA effectiveness increased on prolonging treatment time to 60 min. For cabbage, CGA at 5–7 mM or CMA at 10 mM for 60 min achieved a log10 reduction of ≥3.98 log10 CFU/g. On comparison of soft rot development on Chinese cabbage after treatment with phosphate-buffered saline (negative control), 1% sodium hypochlorite (positive control), and 5 mM of CGA at 20 °C for 72 h, the first soft rot symptoms were observed after 12 h only for PBS treatment, and there were no significant differences between positive control and CGA treatment up to 36 h, after which the decay rate increased significantly. These results suggest that CGA at 5–10 mM for 60 min might allow significant shelf life extension of cabbage and prevent quality loss in kimchi by controlling the spread of the soft rot symptoms on cabbage.

Keywords: /Bactericidal effect/ /Chinese cabbage/ /Chlorogenic acid/ /Coumaric acid/ /Pectobacterium carotovorum subsp. carotovorum/

CITRUS

da Cunha, T., Ferraz, L.P., Wehr, P.P., Kupper, K.C. (2018). Antifungal activity and action mechanism of yeasts isolates from citrus against Penicillium italicum. ***International Journal of Food Microbiology, 276: 20–27.***

Abstract

Penicillium italicum (Blue mold) is a major postharvest disease of citrus. An alternative to controlling the disease is through the use of yeasts. The purpose of the present study was to screen effective yeast antagonists against P. italicum, isolated from soil, leaves, flowers, and citrus fruits, to assess the action mechanisms of the yeast isolates that were demonstrated to be effective for biocontrol, and to identify the most effective yeast isolates for the biocontrol of blue mold. The in vitro assays showed that six yeast strains inhibited up to 90% of the pathogen's mycelial growth. In vivo assays, evaluating the incidence of blue mold on sweet oranges, the strains ACBL-04, ACBL-05, ACBL-10 and ACBL-11 were effective, demonstrating the potential for the blue mold control when preventively applied, whereas the ACBL-08 strain showed a high

potential to preventive and curative applications. Additional studies on the modes of action of these yeast strains showed that most of the evaluated yeast strains did not produce antifungal substances, in sufficient quantities to inhibit the pathogen growth. Competition for nutrients was not a biocontrol strategy used by the yeast strains. The 'killer' activity might be the main action mechanism involved in P. italicum biocontrol. This study indicated that the multiple modes of action against the pathogen presented by yeasts may explain why these strains provided P. italicum control under in vitro and in vivoconditions. However, further studies in future might be able to elucidate the 'killer' activity and its interaction with pathogen cells and the bioproduct production using Candida stellimalicola strains for control postharvest diseases.

Keywords: /Blue mold/ /*Citrus sinensis*/ /Hydrolytic enzymes/ /'*Killer*' factor/ /Yeast antagonists/

DRAGON FRUIT

Castro, J.C., Avincola, A.S., Endo, E.H., Silva, M.V., Filho, B.P., Junior, M., Pilau, E.J., Filho, B.A. (2018). Mycotoxigenic potential of Alternaria alternata isolated from dragon fruit (Hylocereus undatus Haw.) using UHPLC-Qtof-MS. *Postharvest Biology and Technology, 141: 71–76.*

Abstract

The occurrence of mycotoxins synthesized by spoilage fungi has been reported in various crops. Despite being a crop susceptible to attack by microorganisms, such as Alternaria alternata, there are no reports on the production of mycotoxins in Hylocereus undatus (Haw.). The objective of the present study was to identify mycotoxins produced by A. alternata previously isolated from Hylocereus undatus (Haw.) fruit in the postharvest phase, and A. alternata ATCC 46,582, in vitro and in vivo. The compounds were identified using liquid chromatography-mass spectrometry (LC–MS/MS). Alternariol (AOH), alternariol monomethyl ether (AME), tentoxin (TEN), altertoxins (ATX) I, II and III were detected in vitro for A. alternata, and ATX I and II were identified for the reference strain, A. alternata ATCC 46,582, which was used as a positive control. Mycotoxins characteristic of A. alternata were not detected in vivo in the fruit stored for 8 d, which is its estimated shelf life. The use of LC–MS/MS facilitated rapid and efficient mycotoxin identification, contributing significantly to the evaluation of food safety.

Keywords: /Alternaria alternata/ /Mycotoxins/ /Hylocereus undatus (Haw.)/ /LC–MS/MS/ /Food safety/

EGGPLANT

Shi, J., Zuo, J., Zhou, F., Gao, L., Wang, Q., and Jiang, A. (2018). Low -temperature conditioning enhances chilling tolerance and reduces damage in cold-stored eggplant (Solanum melongena L.) fruit. *Postharvest Biology and Technology, 141: 33–38.*

Abstract

Eggplant fruit are vulnerable to chilling injury (CI) after prolonged storage at temperatures below 12 °C. Here, we tested the effect of low-temperature conditioning (LTC) on chilling tolerance in eggplant fruit, in which fruit were stored at 13 °C for 2 d, and then held at 4 °C. Our results indicated that LTC maintained the appearance of eggplant fruit, and retarded the development of CI; the effect of LTC was characterized by inhibited sepal browning, and reduced loss of anthocyanins, and total phenolic compounds. The activity and relative gene expression of peroxidase (POD) and catalase (CAT) were increased by LTC, whereas the activity and relative gene expression of polyphenol oxidase (PPO) was reduced. In addition, the level of malondialdehyde (MDA) was significantly reduced. Our results suggest that LTC induces a range of physiological and molecular responses that enhance chilling tolerance in eggplant fruit.

Keywords: /Appearance/ /Chilling injury/ /Antioxidants/ /Gene expression/

GENERAL

Colla, G., Kim, H., Kyriacou, M.C., Rouphael, Y. (2018). Nitrate in fruits and vegetables. *Scientia Horticulturae, 237: 221–238.*

Abstract

The current article provides an updated review of scientific advances regarding nitrate accumulation in plant tissues and a critical examination of the genetic, agroenvironmental and postharvest factors that can modulate nitrate levels in a wide range of horticultural crops, including herbs, roots and tubers, inflorescences, buds, seeds, stems, and leafy vegetables, fungi as well as fruits. A refined classification of horticultural crops is presented according to the nitrate content of their edible product. The role of plant cultivar/morphotype and tissue age in nitrate accumulation is discussed along with the physiological role of nitrate as osmoticum in maintaining turgor and driving leaf expansion under conditions of variable photosynthetic capacity. Nitrate accumulation is examined in respect to key cultural practices, such as the timing-rate-form of N application and the use of plant biostimulants (natural substances and microbial inoculants), as well as the potential interaction with other nutrients (e.g., P, Ca, Mo and Cl). The influence of environmental conditions during plant growth (light intensity, spectral quality, photoperiod, air and root-zone temperature and atmospheric CO2 concentration), harvest stage and diurnal timing of harvest is assessed. Postharvest storage conditions (temperature, light, and duration) are discussed in respect to their effects on the putative endogenous conversion of nitrate residues to nitrites. Several approaches that may be adopted to reduce nitrate content in vegetables, fruits and herbs are analysed and warranted future research subjects are identified.

Keywords: /Nitrates/ /Genotypes/ /Fertilization/ /Salinity/ /Light/ /Horticultural crops/ /Mushrooms/

KIWIFRUIT

Gambi, F., Pilkington, S.M., McAtee, P.A., Donati, I., Schaffer, R.J., Montefiori, M., Spinelli, F., and Burdon, J. (2018). Fruit of the three kiwifruit (Actinidia Chinensis) cultivars differ in their degreening response to temperature after harvest. *Postharvest Biology and Technology, 141: 16–23.*

Abstract

Commercial kiwifruit (Actinidia chinensis) cultivars include both green-fleshed and yellow-fleshed fruit. While both types are green-fleshed during the early stages of fruit development, the yellow-fleshed fruit undergo a marked green to yellow transition associated with degradation of chlorophyll (degreening). To better understand the postharvest temperature sensitivity of the degreening process on off-vine fruit, three kiwifruit cultivars were selected: 'Zesy003', 'Zesh004' and 'Hayward', each having a different degreening behaviour. 'Zesy003' is marketed as a yellow-fleshed fruit and 'Hayward' and 'Zesh004'as green-fleshed, despite the significant degreening of the last cultivar late in development. The degreening responses of harvested fruit of the three cultivars to a range of temperatures (1 °C–15 °C) were quantified both by flesh-colour measurement and by analysing the expression of the genes for the main enzymes involved in the chlorophyll degradation pathway. Using the newly annotated kiwifruit genome, sequences for genes involved in chlorophyll metabolism were determined, including STAY GREEN 2 (SGR2), PHEOPHORBIDE HYDROLASE 1 (PPH1), PHEOPHORBIDE A OXYGENASE (PAO1) and RED CHOROPHYLL CATABOLITE REDUCTASE (RCCR) and their expression compared. In spite of the inherently different degreening patterns of the three cultivars, all responded similarly to temperature, showing a faster flesh-colour change at high temperature and a slower or absent colour change at low temperature. In absolute terms, fruit of 'Zesy003' degreened faster than 'Zesh004' or 'Hayward'. Expression of two genes involved in the chlorophyll degradation pathway, PAO1 and SGR2, was higher in 'Zesy003' than in 'Zesh004' or 'Hayward'. SGR2 expression in 'Zesy003' was temperature sensitive: it decreased rapidly following harvest, with colder temperatures causing a more rapid down regulation. Likewise PAO1 expression was reduced at lower temperatures. Given the demonstrated activity of SGR2 (and PAO1), this suggests that these genes are important in regulating chlorophyll degradation in yellow-fleshed kiwifruit and partially account for temperature sensitivity.

Keywords: /Fruit colour/ /Chlorophyll degradation/ /Pheophorbide a oxygenase/ /Stay-green/

LONGKONG

Venkatachalam, K., (2018). Exogenous nitric oxide treatment impacts antioxidant response and alleciates chilling injuries in longkong pericarp. *Scientia Horticulturae, 237: 311–317.*

Abstract

Nitric oxide (NO) is an important exogenous signaling molecule used to protect plants against abiotic stress induced damages. Sodium nitroprusside (SNP) is a key exogenously applied NO donor to plants. Longkong fruit is susceptible to chilling injuries (CI) during prolonged low-temperature stress and causes the higher economic losses. The present study was aimed to control the CI and assess the ROS production and antioxidant responses in longkong pericarp by treating with SNP at various concentrations (0, 10, 20, 30 mM/L). The fruit was immersed in SNP solution for 20 min at room temperature and was then stored at 13 °C and at an 85% RH for 18 days. Chilling injury index, electrolytic leakage, MDA content, O2%− and H2O2 contents, and activities of the enzymes such as phenylalanine lyase (PAL), polyphenol oxidase (PPO), peroxidase (POD), superoxide dismutase (SOD), catalase (CAT) and ascorbate peroxidase (GPX) were measured at 3-day intervals. The results show that increasing the SNP concentration effectively increased the NO level and decreased the chilling injuries to longkong fruit pericarp. Treatment at 30 mM/L controlled the CI index, electrolytic leakage and regulated the production of MDA, O2%− and H2O2. NO treated fruit pericarp had lower activities of browning related enzymes (PAL and PPO) and higher activities of antioxidant enzymes (POD, SOD, CAT, and GPX) than the control. The SNP treatment of longkong fruit could significantly control the chilling injuries and prolong the resistance against chilling stress.

Keywords: /Longkong/ /Pericarp/ /Chilling injury/ /Nitric oxide/ /SNP/ /Browning/ /ROS/ /Antioxidant enzymes/

MANGO

Naeem, A., Abbas, T., Ali, T.M., Hasnain, A. (2018). Effect of guar gum coatings containing essential oils on shelf life and nutritional quality of green-unripe mangoes during low temperature storage. *International Journal of Biological Macromolecules, 113: 403–410.*

Abstract

This study investigated the effect of treatment of guar gum coating coupled with essential oils. Harvested unripe green mangoes (UGM) were preserved using edible coatings containing essential oils of Nigella sativa, Coriandrum sativum, Foeniculum vulgare and Laurus nobilis derived using two different solvents (methanol and ethanol) and stored at refrigeration temperature (10 °C, 80–85% relative humidity). Physiological and biochemical parameters that assess the quality of fruits were determined. Microbiological analysis was also performed at the start and end of shelf life. Generally, it was observed that ethanolic essential oils supplemented coatings conferred a greater retention of fruit quality as compared to both controls. Bacterial counts were significantly reduced in fruits that were coated with ethanolic essential oil edible coatings. Secondly, the coatings supplemented with ethanolic and methanolic essential oils extended shelf life up to 24 days whereas treated and untreated control decayed after 10 and 6 days respectively (P b 0.05). These results suggested the application of these edible coatings for preservation of unripe green mangoes during cold storage.

Keywords: /Galactomannan/ /Preservation/ /Unripe green mangoes/ /Cold temperature/ /Essential oils/

MELON

Hua-Li, X., Yang, B., Raza, H., Hu-Jun, W., Lu-Mei, P., Mi-Na, N., Xiao-Yan, C., Yi, W., Yong-Cai, L. (2018). Detection of NEO in muskmelon fruits inoculated with Fusarium sulphureum and its control by postharvest treatment. *Food Chemistry, 254: 193–200.*

Abstract

Fusarium rot of muskmelon, caused by Fusarium spp., is one of the most important postharvest decays, that not only causes economic losses but leads to trichothecenes contamination. A rapid and sensitive method was developed for neosolaniol (NEO) analysis in muskmelon inoculated with F. sulphureum, utilizing acetonitrile/water (84:16, v/v) extraction and PriboFast M270 columns purification and UPLC-MS/MS detection. Method validation was evaluated by linearity (R ≥ 0.9990), recovery (88.1–136.9%), precision (RSD ≤ 3.97%) and sensitivity (LOD, 0.5 μg/kg; LOQ, 1.5 μg/kg). The effect of ozone treatment on Fusarium rot development and NEO accumulation in inoculated muskmelon was also evaluated. The results showed that UPLC-MS/MS method was suitable for analyzing NEO in inoculated muskmelon, and 1.10 mg/l ozone treatment for 120 min significantly controlled Fusarium rot development and NEO accumulation in fruits after 5, 8 and 11 days. In vivo tests showed that ozone at 1.10 mg/l effectively degraded NEO in acetonitrile.

Keywords: /Muskmelon/ /Fusarium sulphureum/ /Trichothecenes/ /Ozone Control/

MUSHROOM

Karimirad, R., Behnamian, M., and Dezhsetan, S. (2018). Development and characterization of nano biopolymer containing cumin oil as a new approach to enhance antioxidant properties of button mushroom. *International Journal of Biological Macromolecules, 113: 662–668.*

Abstract

The aim of present study was to design a controlled release system using *Cuminum cyminum* essential **oil** loaded chitosan nanoparticles (CEO-CSNPs) and evaluate its effect on catalase (CAT), glutathione reductase (GR), peroxidase (POD) activity and ascorbic acid content of *Agaricus bisporus* fruit bodies during 20days of storage at 4°C. The success of encapsulation was evaluated through TEM, DLS, FT-IR and spectrophotometry and its release behavior was studied in buffer solutions with different pH. The CEO-CSNPs exhibited an average size of 30 to

80nm with a spherical shape. Encapsulation efficiency (EE) and loading capacity (LC) were 4.46 to 17.89% and 2.47 to 6.68%, respectively. The highest CAT and GR activity was observed in samples packed with CEO-CSNPs after 15days of storage. In contrast, POD activity reached a peak at the end of storage in control samples. Interestingly, after 20days the level of POD increased 17.13% in CEO-CSNPs treatment, as compared with the initial level of the mentioned enzyme. At the end of storage, ascorbic acid content in samples treated with CEO-CSNPs was significantly higher than that detected in the control samples. In brief, application of CEO loaded chitosan nanoparticles in packages effectively increased the antioxidant activity in white button mushroom and showed promising results for extending the shelf life of treated samples.

The particle size of synthesized CEO-CSNPs ranged from 30 to 80nm.•The highest encapsulation efficiency and loading capacity were obtained from chitosan to CEO ratio of 1:0.25.•Controlled release of CEO from CSNPs leads to increase in CAT and GR levels in samples.•Application of CEO-CSNPs decelerates loss of AA in **mushroom** samples.•Application of CEO-CSNPs in packages preserve quality of *A. bisporus* until 15 days at 4°C by induction of CAT, GR and ascorbic acid synthesis and deceleration of increase in POD activity.

Keywords: /Ascorbic acid/ /Agaricus bisporus/ /Chitosan nanoparticles/ /Cuminum cyminum/ /Shelf life/

ORANGE

Rehman, M., Singh, Z., and Khurshid, T. (2018). Methyl jasmonate alleviates chilling injury and regulates fruit quality in 'Midnight' Valencia orange. *Postharvest Biology and Technology 141: 58–62.*

Abstract

Susceptibility of sweet oranges to chilling injury (CI) restricts the utilisation of cold storage to its full potential to extend storage life and maintain fruit quality. The present investigation examined the role of postharvest methyl jasmonate (MJ) dips and different cold storage temperatures on the incidence of CI and fruit quality of ‘Midknight’ Valencia over two years. The fruit were dipped for 1 min in aqueous emulsions containing different concentrations 0.10, 0.25 or 0.50 mM of MJ and ‘Tween 20’ (0.01%) as a surfactant. The untreated fruit were used as the control. The fruit were stored at 4 °C or 7 °C for 90 d followed by 10 d simulated shelf conditions. MJ treatments, irrespective of the concentration applied, reduced CI in the fruit. The fruit treated with 0.25 mM MJ followed by 90 d cold storage and 10 d simulated shelf conditions were free from CI, irrespective of the cold storage temperatures. Dip treatments of 0.25 or 0.50 mM MJ reduced soluble solids concentration (SSC) and titratable acidity (TA); however, the SCC/TA ratio was

higher when fruit was dipped in 0.25 mM MJ as compared with all other treatments. 0.25 or 0.50 mM MJ reduced concentrations of vitamin C and total antioxidants compared with all other treatments. Overall, 0.25 mM MJ is recommended as a treatment to reduce CI, while maintaining fruit quality attributes.

Keywords: /MJ/ /Storage temperatures/ /CI/ /Fruit quality/

PEACH

Cai, H., An, X., Han, S., Jiang, L., Yu, M., Ma, R., and Yu, Z. (2018). Effect of 1-MCP on the production of volatiles and biosynthesis-related gene expression in peach fruit during cold storage. *Postharvest Biology and Technology 141: 50–57.*

Abstract

As an effective ethylene action inhibitor, 1-Methylcyclopropene (1-MCP) can delay fruit ripening and senescence. However, little is known about the effect of 1-MCP on peach fruit aroma-related volatiles and their biosynthesis-related gene expression during cold storage. Peaches (cv. Xiahui 6) were treated with 1-MCP (10 μL L−1 for 12 h) to investigate the influence of 1-MCP on aromatic volatile biosynthesis and involved genes expression during cold storage. 1-MCP treatment significantly decreased ethylene production and delayed the ripening and senescence of peach at cold storage. A lower production of esters was found in 1-MCP treated fruit, while there were higher alcohol acyltransferase (AAT) activity and PpaAAT1/2 expression in treated fruit during the early storage. The performance patterns of both aldehydes and alcohols were different between 1-MCP and control fruit accompanied by lower lipoxygenase (LOX), alcohol dehydrogenase (ADH), hydroperoxide lyase (HPL) activities in accordance with the expression of PpaLOX3, PpaADH1 and PpaHPL1 in 1-MCP treated fruit compared with the control in the late storage. All in all, the role of 1-MCP on the volatiles and its related genes expression in peach fruits was discussed, and 1-MCP affected the formation of aroma volatile by functioning in the expression of pivotal enzyme genes including LOX, HPL, ADH and AAT.

Keywords: /Aromatic volatile/ /Lipoxygenase/ /Alcohol dehydrogenase/ /Hydroperoxide lyase/ /Alcohol acyltransferase/

PEAR

Shi, F., Zhou, X., Zhou, Q., Tan, Z., Yao, M., Wei, B, Ji, S. (2018). Transcriptome analyses provide new possible mechanism of aroma ester weakening of 'Nanguo' Pear after cold storage. *Scientia Horticulturae, 237: 247–256.*

Abstract

‘Nanguo’ pear are popular for their unique aroma ester. However, we found that the fragrance faded undergoing long term low temperature (LT) storage, and the aroma-weakening mechanism has not been well understood. To this end, the transcriptome of the fruit on 0 d and optimum tasting period (OTP) during shelf life at room temperature (RT) and after cold storage were analyzed, respectively. On the OTP, the kind of volatile esters decreased to 18 and the total content of aroma ester decreased significantly after cold storage. A total of 2441 and 7513 genes were differentially expressed between 0 d and the OTP during shelf life and after cold storage, respectively. These genes were categorized into various functional groups and pathways according to the bioinformation analysis. Notably, genes demonstrated significant differential expression only in the fruit after LT storage included several from the plant hormone signal transduction category such as DELLA and JAR, as well as some related to fatty acid metabolism such as fadD, fabG, SCD, FAD, LOX2S and HPL and transcription factors (TFs) MYBP, NFYA, and ERF1. These results revealed that the signal transduction of abscisic acid, salicylic acid, fatty acid metabolism, as well as TFs plays important roles in the aroma weakening after cold storage.

Keywords: /‘Nanguo’ pear/ /Aroma/ /Cold storage/ /Transcriptome/ /Differentially expressed genes (DEGs)/

Yu, X., Lu, H., Wu, D. (2018). Development of deep learning method for predicting firmness and soluble solid content of postharvest Korla fragrant pear using Vis/NIR hyperspectral reflectance imaging. ***Postharvest Biology and Technology, 141: 39-49.***

Abstract

The objective of this research was to develop a deep learning method which consisted of stacked auto-encoders (SAE) and fully-connected neural network (FNN) for predicting firmness and soluble solid content (SSC) of postharvest Korla fragrant pear (Pyrus bretschneideri Rehd). Firstly, deep spectral features in visible and near infrared (380–1030 nm) hyperspectral reflectance image data of pear were extracted by SAE, and then these features were used as input data to predict firmness and SSC by FNN. The SAE-FNN model achieved reasonable prediction performance with R2 P = 0.890, RMSEP = 1.81 N and RPDP = 3.05 for firmness, and R2 P = 0.921, RMSEP = 0.22% and RPDP = 3.68 for SSC. This research demonstrated that deep learning method coupled with hyperspectral imaging technique can be used for rapid and nondestructive detecting firmness and SSC in Korla fragrant pear, which would be useful for postharvest fruit quality inspections.

Keywords: /Stacked auto-encoders/ /Fully-connected neural network/ /Pixel-level spectral features/ /Fruit quality/ /Non-destructive detection/

Yan, Y., Zheng, X., Apaliya, M.T., Yang, H., Zhang, H. (2018). Transcriptome characterization and expression profile of defense-related genes in pear induced by Meyerozyma guilliermondii. ***Postharvest Biology and Technology 141: 63–70.***

Abstract

Meyerozyma guilliermondii significantly inhibited natural decay of stored pears without adverse effects on storage qualities and induced resistance of pears. It was noticed that M. guilliermondii had a significant effect on the induction of several defense-related genes compared to the control, such as genes coding for phenylalanine ammonia lyase (PAL), peroxidase(POD)and β-1, 3 glucanase (GLU). Furthermore, the expression level of GLU in pears treated with M. guilliermondii increased 105-fold compared to the control at 0 d. These findings indicated that M. guilliermondii enhanced the defense-related mechanism of pears. The transcriptome of pears treated with M. guilliermondii and the control were explored after 3 days, the result showed that 144 genes (Log2 fold change ≥ 2, FDR ＜ 0.05) were significantly up-regulated by the induction of M. guilliermondii, some of which include genes of defense-related enzymes such as G-protein coupled receptor 1-like, cationic peroxidase 1-like and beta-glucosidase 12-like were induced corresponding to PAL, POD and GLU respectively. Defense-related transcription factors such as WRKY9, WRKY31 and some other pathogenesis-related genes like Major allergen Pyr c 1, major allergen Pru ar 1-like and major allergen Pru av 1-like were also induced. These results provided a new insight into the biocontrol mechanism of the antagonist yeast in pears.

Keywords: /Meyerozyma guilliermondii/ /Defense-related gene/ /Transcriptome/ /Pear /RT-qPCR/

PLUM

Thakur, R., Pristinjono, P., Golding, J.B., Stathopoulos, C.E., Scarlett, C.J., Bowyer, M., Singh, S.P., Vuong, Q.V. (2018). Development and application of rice starch based edible coating to improve the postharvest storage potential and quality of plum fruit (Prunus Salicina). ***Scientia Horticulturae, 237: 59–66.***

Abstract

The study investigated the possibility of enhancing the shelf life of plum fruit coated with rice starch-ι-carrageenan (RS-ι-car) composite coating blended with sucrose fatty acid esters (FAEs). Film solution (starch 3%, carrageenan 1.5% and FAEs 2%) was prepared by mixing the ingredients and properties of stand-alone films (physical, mechanical, barrier and surface morphology) were studied before applying the coating on fruit surface. Fruit were stored at 20 °C for 3 weeks and analyzed for weight loss, ethylene production, respiration rate, color change, firmness, and titratable acidity (TA) and soluble solid content (SSC). Surface morphology of standalone film and fruit surface (after applying on the plum fruit) was studied using scanning electron microscopy (SEM). Phytochemical analysis was performed during the storage period and total phenolic content (TPC), total antioxidant capacity (TAC), flavonoid content (FC) and free radical scavenging activity were determined. The rice starch composite coating was shown

to be effective in reducing both weight loss (WL) and respiration rate and inhibiting the endogenous ethylene production when compared to the uncoated control fruit stored at room temperature ($p < 0.05$). TPC, TAC, FC and free radical scavenging activity was unaffected in the coated fruit throughout the storage period ($p < 0.05$). The findings reported in this study indicate that the RS-ι-car-FAEs coating prolongs the shelf life and maintains the overall quality of plum fruit during storage and could potentially be commercialized as a new edible coating for the plum fruit industry.

Keywords: /Starch/ /Coating/ /Plum/ /Fruit/ /Postharvest/ /Shelf-life/

Wang, R., Wang, L., Yuan, S., Li, Q., Pan, H., Cao, J., Jiang, W. (2018). Compositional modifications of bioactive compounds and changes in the edible quality and antioxidant activity of 'Friar' plum fruit during flesh reddening at intermediate temperatures. ***Food Chemistry, 254: 26–35.***

Abstract

Flesh reddening of ‘Friar’ plum (Prunus salicina Lindl.) fruit developed rapidly during storage at intermediate temperatures of 5 and 15 °C in comparison to flesh turning yellow at 25 °C and almost no colour change at 0 °C. Thus, modifications of phytochemicals and antioxidant activity during flesh reddening were investigated. Anthocyanins accumulated rapidly in reddening flesh tissue and cyanidin-3-O-glucoside was identified as the absolutely predominant individual anthocyanin. Anthocyanins contributed greatly to the antioxidant activity at 5 °C, and especially at 15 °C by combining with non-anthocyanin phenolics, including protocatechuic, syringic, trans-p-coumaric and caffeic acids. Storage at 15 °C impeded the hydrolysis of sucrose to glucose and fructose, while storage at 5 °C maintained sucrose and accumulated fructose. Intermediate temperatures altered organic acid compositions helping to produce reasonable SSC/TA ratios. These results would provide a postharvest approach for fruit to meet the consumer’s demand for diverse tastes and health promoting effects.

Keywords: /Plum fruit/ /Flesh reddening/ /Anthocyanins/ /Phenolics/ /Antioxidant activity/ /Cyanidin-3-O-glucoside/

POSTHARVEST

Fadiji, T., Berry, T.M., Coetzee, C.J., and Opara, U.L. (2018). Mechanical design and performance testing of corrugated paperboard packaging for the postharvest handling of horticultural produce. ***Biosystems Engineering, 171: 220-224.***

Abstract

Corrugated paperboard is the primary material used in the transportation, distribution and storage of many products, particularly horticultural produce. Corrugated paperboard packages provide protection to packed produce against mechanical loadings at all phases of distribution. These packages filled with produce are exposed to different hazards such as being dropped from height, transportation shocks, compression during stacking and exposure to the weight of other packed produce, all of which can damage produce. This review discusses performance testing of corrugated paperboard packaging, and highlights the manufacturing process and cold chain environment factors affecting the strength of corrugated paperboard packaging. The performance requirements for corrugated paperboard packages include appearance, structural stability and protection of contents. Testing the quality of corrugated paperboard and its various components, maintaining good control of manufacturing operations and environmental factors such as moisture, humidity and temperature are necessary for better understanding the performance of corrugated paperboard packaging. Advances in numerical techniques such as finite element analysis (FEA) offer new prospects and opportunities for replacing tedious, time-consuming and expensive experiments to improve the performance of corrugated paperboard packaging.

Keywords: /Corrugated paperboard packaging/ /Cold chain/ /Horticultural produce/ /Box compression test/ /Tensile test/

Luo, Y., Liu, X., and Li, J. (2018). Updating techniques on controlling mycotoxins - a review. *Food Control, 89: 123-132.*

Abstract

Mycotoxins are secondary metabolites produced by fungal species and have been reported to be carcinogenic, genotoxic, teratogenic, nephro- and hepatotoxic. Economic losses and health concerns due to mycotoxins occur at all levels of food and feed production, and this has attracted research interest towards exploring novel approaches to decontaminate and/or detoxify mycotoxin-contaminated food and feed. Therefore, we reviewed various strategies for the detoxification of mycotoxins, including preharvest prevention strategies and post-harvest detoxification procedures. Strategies for pre-harvest prevention include appropriate environmental factors, good agricultural and manufacturing practices, and favourable storage practices. For post-harvest detoxification strategies, physical, chemical, biological and other developing innovative strategies are discussed. This review is meant to be beneficial to the food industry and to contribute to assuring pre- and post-harvest management and processing practices that maximize consumer safety

Keywords: /Mycotoxin/ /Detoxification/ /Adsorption/ /Biodegradation/ /Innovative strategies/ /Magnetic materials/

Zhao, H., Lv, W., Fan, Y., Li, H. (2018). Gibberellic acid enhances postharvest toon sprout tolerance to chilling stress by increasing the antioxidant capacity. *Scientia Horticulturae, 237: 184–191.*

Abstract

Gibberellic acid (GA3) has been known as an important phytohormone signal in plants. Here, we investigated the physiology responses underlying GA3-induced postharvest toon sprout tolerance to chilling stress for 5 d. Results showed that exogenous application of GA3 remarkably decreased the browning and decay index of toon sprout. GA3 treatment prevented anthocyanin breakdown and inhibited the decreases of the total flavonoid, Vitamin C and titratable acidity in toon sprout during postharvest cold storage. In comparison to distilled water treatment, exogenous GA3 application maintained significantly higher levels of reducing sugar, soluble sugar and proline in toon sprout. Meanwhile, GA3 significantly reduced the accumulation of malondialdehyde (MDA) and hydrogen peroxide (H2O2) in toon sprout. Furthemore, GA3 enhanced the activities of antioxidant enzymes catalase (CAT) and superoxide dismutase (SOD) and reduced those of peroxidase (POD) and polyphenol oxidase (PPO). Taken together, our results suggested that exogenous application of GA3 effectively enhanced postharvest toon sprout tolerance to chilling stress by regulating antioxidant enzymes and weakening lipid peroxidation.

Keywords: /Antioxidant enzymes/ /Low temperature storage/ /Gibberellic acid/ /Toona sinensis/ /Total flavonoid/

POTATO

Lin, X., Negenborn, R.R., and Lodewijks, G. (2018). Predictive quality-aware control for scheduling of potato starch production. *Computers and Electronics in Agriculture, 150: 266–278*

Abstract

Modern technologies have enabled approaches to estimate freshness of perishable products during production and distribution. This allows supply chains to apply more advanced decision support systems in order to further reduce the loss of perishable products. In this paper we focus on the postharvest scheduling of starch potatoes. In particular we propose a quality-aware scheduling method that can be used in a decision support system for starch potato postharvest operations. Considering the quality of stored potatoes in real-time, the method determines when and how many potatoes should be harvested, sent for starch production, or stored. A centralized and a distributed control strategy are developed, with the aim of minimizing total starch loss in dynamic environments. Simulation experiments illustrate how the proposed

approaches deal with disturbances, and that the total starch loss can be reduced when real-time quality information of potatoes is taken into account.

Keywords: /Postharvest scheduling/ /Perishable goods/ /Starch potatoes/ /Model predictive control/ /Quality-aware modeling/

TOMATO

Kayode, R.M., Azubuike, C.U., Laba, S.A., Dauda, A.O., Balogun, M.A., and Ajala, S.A. (2018). Chemical composition and anti-microbial activities of the essential oil of Adansonia digitata stem-bark and leaf on post-harvest control of tomato spoilage. *LWT - Food Science and Technology, 93: 58–63.*

Abstract

The mirage of bioactive compounds in essential oil (EO) has raised its prospects as an alternative to synthetic chemicals preservatives. The yields of the hydro-distilled EO from the leaf and stem-bark of Adansonia digitata were: 0.302% and 0.403%; while identified compounds were: 23 and 40 respectively. The principal chemical constituents of the EO were: hydrocarbons, alkene alcohol, cyclic ketonic ether, terpenoids, amides, esters. Tetramethyl-2-hexadecen-1-ol (26.31%), 8-dimethyl-2-(1-methylethenyl) (8.20%), Tetracosan (6.54%), Heptacosane (5.81%) and Tetratetracontane (5.59%) were dominant compounds in the leaves EO. While, the major compounds of the stem-bark EO were: Octadecane (9.30%), Cyclopentane (8.81%), 1- Octadecanesulphonyl chloride (8.73%), Heptadecane (8.50%), Eicosane (8.34%), and Tetracosan (7.12%). The antimicrobial activity of the EO against post-harvest decay of tomato fruits stored at room temperature (27 ± 2 °C) indicated significant ($P < 0.05$) reduction of bacterial and fungal loads at 2000 ppm when compared with control. The lethality assay of leaf and stem-bark EOs showed significant toxicity against brine shrimps, with LC50 values of 1750 µg/ml and 1932 µg/ml respectively. These values were greater than 1000 µg/ mL as recommended index for non-toxicity in human. Thus, the study suggested application of the EO as possible antimicrobial agent as possible alternative to synthetic chemicals for the preservation of fresh tomato fruits.

Keywords: /Essential oil/ /Tomato spoilage/ /Adansonia digitata/ /Stem-bark/ /Leaves/

Lai, J., Cao, X., Yu, T., Wang, Q., Zhang, Y., Zheng, X., and Lu, H. (2018). Effect of cryptococcus laurentii on inducing disease resistance in cherry tomato fruit with focus on the expression of defense-related genes. *Food Chemistry, 254: 208–216.*

Abstract

The objective of this study was to prove and explain the disease resistance-inducing ability of Cryptococcus laurentii on cherry tomato, as well as assay its effect on fruit quality. Apart from

disease incidence, activities of defense-related enzymes and expression of critical genes were studied. With pre-treatment of C. laurentii, disease incidences of Botrytis cinerea and Alternaria alternate infected fruits were both significantly reduced. Corresponding mechanism could be explained as C. laurentii can induce resistance in cherry tomato by activating the expression of important defense-related genes, such as genes involved in salicylic acid (SA) and jasmonic acid (JA) signaling pathways and genes encoding pathogenesis related proteins, thus activating comprehensive defense reaction against pathogen invasion. Coupled with the results that fruit color was improved and other physicochemical parameters remained uninfluenced, our study suggests that pre-treatment with C. laurentii can be a promising method to preserve cherry tomato fruits.

Keywords: /Cryptococcus laurentii/ /Induced disease resistance/ /Defense-related proteins/ /Gene expression/ /Hormone signaling pathway/ /Fruit quality/

Zhang, B., Zhou, J., Meng, Y., Zhang, N., Gu, B., Yan, Z., and Idris, S. 2018. Comparative study of mechanical damage caused by a two-finger tomato gripper with different robotic grasping patterns for harvesting robots. *Biosystems Engineering 171: 245-257.*

Abstract

The fragile structure of the tomato fruit body leads to susceptibility to bruising caused by the aggressiveness of harvest and postharvest processes. Thus, grasping without damaging the tomato fruits is a key barrier to the replacement of manual labour by robotic harvesting. In this study, a four-element Burger model was used to express reversible viscoelastic behaviour and deformation characteristics of tomatoes at early and middle red ripening stages. Additionally, creep tests were conducted to obtain the viscoelastic parameters of the Burger model. The model for plastic deformation of tomato during grasping was finally developed based on input force, contact time, and viscoelastic parameters. In order to explore the least damaging grasping pattern, plastic deformation caused by three grasping patterns (denoted as Pattern I, Pattern II, and Pattern III) were investigated and compared in our study. A linear function, a Butterworth amplitude square function, and an exponential function were used to represent the velocity variations in the three grasping patterns during the robot grasping operation. This was used to solve the model of plastic deformation of tomato, and the changing rules of tomato plastic deformations under different grasping patterns were analysed under constant grasping time. The results indicate that grasping Pattern III is the optimal grasping strategy, the lowest plastic deformation of tomatoes is obtained with grasping time t0 ¼ 1s and grasping velocity v0 ¼ 1mm s1 and the plastic deformations correspond to 0.0026 mm and 0.0098 mm for tomatoes at early and middle red-ripening stages, respectively. A grasping control experiment was also conducted under grasping Pattern III, and the correlation coefficient of 0.99 for the simulation and measured results indicated the rationality and feasibility of grasping Pattern III as the optimal grasping strategy. Our study provides a theoretical basis to optimise agricultural robot grasping.

Keywords: /Robotic gripper/ /Tomato grasping/ /Harvesting robot/ /Plastic deformation/ /Mechanical damage/ /Grasping pattern/

VEGETABLE

Zhang, Y., Kong, J., Huang, F., Xie, Y., Guo, Y., Cheng, Y., Qian, H., Yao, W. (2018). Hexanal as a QS inhinitor of extracellular enzyme activity of Erwinia carotovora and Pseudomonas fluorescens and its application in vegetables. Food Chemistry 255: 1–7.

Abstract

To prevent the postharvest disease of Chinese cabbage and lettuce, hexanal was used as a control measure to inhibit N-acyl homoserine lactone (AHL) production and extracellular enzymes regulated by quorum-sensing (QS) in their main spoilage strains of Erwinia carotovora and Pseudomonas fluorescens. Firstly, the QS inhibition of hexanal was verified by significantly inhibiting violacein production ($p < 0.05$) in Chromobacterium violaceum CV026 at sub-MICs. β-Galactosidase activities which reflected AHL production, were significantly inhibited by hexanal, its inhibitory effect was concentration-dependent under minimal inhibitory concentration (MIC) ($p < 0.05$). The detected extracellular enzymes activities decreased with the increase of hexanal concentration ($p < 0.05$), including cellulase, xylanase, pectate lyase, polygalacturonase, and protease. Chinese cabbage soft rot and lettuce leaf scorch could be significantly inhibited by hexanal ($p < 0.05$) without any phytotoxicity effect, the 1/2 MIC of hexanal showed the best inhibitory effect. And all the above effects showed a dose dependent. A novel preservation technique in reducing the loss of vegetables due to spoilage based on the QS inhibitor was developed.

Keywords: /Hexanal/ /Quorum-sensing inhibitor/ /Extracellular enzyme activity/ /Erwinia carotovora Pseudomonas fluorescens/ /Chinese cabbage/ /Lettuce/

WATERCRESS

Pinela, J., Barros, L., Barreira, J., Carvalho, A., Oliveira, M., Santos-Buelga, C., Ferreira, I. (2018). Postharvest changes in the phenolic of watercress induced by post-packaging irradiation and modified atmosphere packaging. Food Chemistry, 254: 70–77.

Abstract

The effects of γ-ray irradiation and modified atmosphere packaging (MAP) on watercress (Nasturtium officinale R. Br.) phenolic compounds were evaluated after 7-day storage at 4 °C. Irradiation doses of 1, 2 and 5 kGy were tested, as well as vacuum-packaging and MAP enriched with 100% N2 and Ar. A non-irradiated, air-packaged control was included in all experiments. p-Coumaric acid was the most abundant compound in fresh watercress, followed

by quercetin-3-O-sophoroside and isorhamnetin-O-hydroxyferuloylhexoside-O-hexoside. Four kaempferol glycoside derivatives were identified for the first time in this species. In general, flavonoids predominated over phenolic acids. Samples stored under vacuum and irradiated at 2 kGy revealed lower phenolic levels. Arenriched MAP and control conditions preserved the initial phenolic content. The 5 kGy dose also maintained concentrations of flavonoids and total phenolic compounds, but increased the phenolic acids content. Additionally, flavonoids were found strongly correlated to DPPH% scavenging activity and β-carotene bleaching inhibition capacity.

Keywords: /Nasturtium officinale/ /Phenolic compounds/ /HPLC-DAD-ESI/MS/ /Modified atmosphere packaging/ /Post-packaging irradiation/ /Refrigerated storage/