SELECTIVE DISSEMINATION OF INFORMATION
As of July 2020

ARTICHOKE

Sanchez, M., Garcia, P., Almela, L., Delicado, E. N., & Gabaldo, J. A. (2020). Improvement of the shelf life of minimally processed artichoke through antimicrobial and antioxidants agents, 205–220. doi: 10.17660/ActaHortic.2020.1284.28

Abstract

A new method of artichoke slices preservation for refrigerated storage – as a minimally processed product – is presented in this paper. This methodology is based on the efficiency of the impregnation and/or the dip of the artichoke slices in different solutions such as bleach, potassium sorbate and proalium. The microbiological quality of the preserved artichoke was also studied to evaluate the efficiency of these treatments on the growth of several indicator microorganisms (mesophiles, anaerobic, psychrotrophs, mould and yeast, Salmonella spp. and Escherichia coli spp.). When the artichoke slices were immersed in a preservative solution containing proalium (16 g L-1) and GMII (25 g L-1), and packaged in propylene trays with a protective atmosphere (80% N2/20% CO2), it was possible to extend the useful life up to five days at 4°C, improving all the quality and sensory parameters tested for this product. Moreover, the proalium addition leads to a higher organoleptic quality of the artichoke slices than in the absence of this antimicrobial agent.

Keywords: /artichoke/ /minimally processed/ /preservation/ /antimicrobial/ /antioxidant/

BELL PEPPER

López-Gálvez, F., Truchado, P., Tudela, J. A., Gil, M. I., & Allende, A. (2020). Critical points affecting the microbiological safety of bell peppers washed with peroxyacetic acid in a commercial packinghouse. *Food Microbiology*, *88*, 103409. doi: 10.1016/j.fm.2019.103409

Abstract

The washing stage from a bell pepper commercial packinghouse was assessed to study some of the critical control points related to bacterial cross-contamination. The washing line comprised two overhead spray bars applications: a pre-wash step without peroxyacetic acid (PAA), and a wash step with PAA. The physicochemical characteristics of the wash water and the bacterial quality and safety of the wash water and bell peppers (including aerobic mesophilic bacteria (AMB), *Salmonella* spp., and Shiga-toxigenic *E. coli* (STEC)) were studied. Additionally, the performance of commercial test methods (reflectometry, amperometric probe, chronoamperometric sensor) for measuring the residual concentration of PAA was examined. The bacterial load of the pre-wash water (8.7 ± 1.3 log cfu/100 mL AMB) was very high and thus peppers after the pre-wash showed a significantly higher bacterial load (4.9 ± 0.9 log cfu/g AMB) than the unwashed (3.8 ± 0.7 log cfu/g AMB) or the washed peppers (3.3 ± 0.8 log cfu/g AMB) ($p < 0.05$). However, no pathogenic bacteria were detected in bell pepper samples ($n = 40$), and only one water sample was confirmed positive for STEC ($n = 64$, 1.6% prevalence). The chronoamperometric sensor (PAASense) and the online amperometric probe showed similar results, while the reflectometry (Quantofix) significantly sub estimated ($p < 0.05$) PAA concentration. The results obtained highlight the need for interventions to improve hygiene in the washing line to ensure the microbiological quality and safety of bell peppers. The maintenance of optimal PAA concentrations in all the washing steps is critical for reducing the chance of water-mediated cross-contamination.

Keywords: /Peracetic acid/ /Monitoring/ /Process water/ /Vegetable/ /Pathogenic bacteria/ /Bacterial contamination/

BLACK GOJi BERRIES

Zhang, C., Wu, W., Zhou, L., Cheng, H., Ye, X., & He, Y. (2020). Developing deep learning based regression approaches for determination of chemical compositions in dry black goji berries (Lycium ruthenicum Murr.) using near-infrared hyperspectral imaging. *Food Chemistry*, *319*, 126536. doi: 10.1016/j.foodchem.2020.126536

Abstract

Black goji berry (*Lycium ruthenicum* Murr.) has great commercial and nutritional values. Near-infrared hyperspectral imaging (NIR-HSI) was used to determine total phenolics, total flavonoids and total anthocyanins in dry black goji berries. Convolutional neural networks (CNN) were designed and developed to predict the chemical compositions. These CNN models and deep autoencoder were used as supervised and unsupervised feature extraction methods, respectively. Partial least squares (PLS) and least-squares support vector machine (LS-SVM) as modelling methods, successive projections algorithm and competitive adaptive reweighted sampling (CARS) as wavelength selection methods, and principal component analysis (PCA) and wavelet transform (WT) as feature extraction methods were studied as conventional approaches for comparison. Deep learning approaches as modelling methods and feature extraction methods obtained good and equivalent performances to the conventional methods. The results illustrated that deep learning had great potential as modelling and feature extraction methods for chemical compositions determination in NIR-HSI.

Keywords: /Black goji berry/ /Near-infrared hyperspectral imaging/ /Convolutional neural network/ /Deep autoencoder/ /Regression issue/ /Total phenolics/ /Total flavonoids/ /Total anthocyanins/

BROCCOLI

Miao, H., Zeng, W., Zhao, M., Wang, J., & Wang, Q. (2020). Effect of melatonin treatment on visual quality and health-promoting properties of broccoli florets under room temperature. *Food Chemistry*, *319*, 126498. doi: 10.1016/j.foodchem.2020.126498

Abstract

Effect of melatonin treatment on visual quality and contents of health-promoting compounds of broccoli florets under room temperature was investigated in the present study. Broccoli florets were treated with 1 μM melatonin and then stored at room temperature. Results showed that melatonin treatment could delay the post-harvest senescence of broccoli, and performed well in maintaining higher levels of antioxidants, such as carotenoids, vitamin C and total phenols, as well as higher antioxidant capacity than the control. Besides, 1 μM melatonin treatment sustained higher content of glucosinolates, and also resulted in increased percentage of the most potent anticarcinogenic profile, glucoraphanin. Further analysis revealed that 1 μM melatonin strongly induced the expression of glucosinolate biosynthesis-related genes *BoMYB28*, *BoMYB34*, *BoCYP79F1*, and *BoCYP79B2*, as well as *BoTGG1*, a gene involved in glucosinolate hydrolysis. In conclusion, post-harvest treatment with 1 μM melatonin is potential in maintaining visual quality and health-promoting properties of broccoli florets.

Keywords: /Broccoli florets/ /Melatonin/ /Post-harvest/ /Glucosinolates/ /Antioxidants/

Wang, Liang, Wang, F., Zhang, Y., Ma, Y., Guo, Y., & Zhang, X. (2020). Enhancing the ascorbate – glutathione cycle reduced fermentation by increasing NAD + levels during broccoli head storage under controlled atmosphere. *Postharvest Biology and Technology*, *165*, 111169. doi: 10.1016/j.postharvbio.2020.111169

Abstract

Broccoli is prone to adopting fermentation under inappropriate conditions, especially high−CO_2 atmospheres. In this study, broccoli stalks were soaked in 0.4 % reduced glutathione (GSH) for 3 h, before being maintained in 50 % O_2 + 50 % CO_2 or 30 % O_2 + 70 % CO_2 controlled atmosphere. We compared the samples with control broccoli heads soaked in distilled water and maintained in normal atmospheric conditions. Broccoli heads from all treatments were stored at 10 ± 1 °C with 90–95 % relative humidity. Under O_2/CO_2 conditions, GSH pre-soaking of broccoli stimulated the ascorbate–glutathione (AsA–GSH) cycle, elevated nicotinamide adenine dinucleotide (NAD^+) levels, improved the antioxidant capacity, enhanced the activities of respiratory metabolism enzymes, led to a higher adenosine triphosphate (ATP) status, and efficiently inhibited the accumulation of ethanol and acetaldehyde produced by fermentation, compared with control broccoli. Thus, GSH pre-soaking competitively inhibited fermentation by increasing NAD^+ levels by promoting the AsA–GSH cycle and electron transfer chain (ETC) pathway. In conclusion, this study provides a potential technology to prevent the occurrence of fermentation in postharvest product.

Keywords: /Broccoli/ /AsA–GSH cycle/ /Fermentation/ /Respiratory metabolism/ /Controlled atmosphere/

Xu, D., Zuo, J., Li, P., Yan, Z., Gao, L., Wang, Q., & Jiang, A. (2020). Effect of methyl jasmonate on the quality of harvested broccoli after simulated transport. *Food Chemistry, 319*, 126561. doi:10.1016/j.foodchem.2020.126561

Abstract

The effect of simulated transport vibration on the quality of broccoli and the ability of methyl jasmonate (MeJA) to ameliorate vibration damage in broccoli were investigated. Results indicated that transport injury, simulated by vibrational stress, promoted the deterioration in broccoli quality during subsequent storage. Treatment of broccoli with methyl jasmonate (MeJA), however, effectively ameliorated the impact of vibrational injury, maintained the appearance quality and delayed the yellowing and senescence of florets after simulated transportation stress. The effect of the MeJA may be related to of its ability to suppress the accumulation of reactive oxygen species, enhance vitamin C content, and induce antioxidant gene expression and enzyme activity, as well as suppress chlorophyll-degrading enzyme activity and gene expression. Overall, the MeJA treatment inhibited the adverse physiological changes that occur in broccoli as a result of vibrational and mechanical injury. Thus, MeJA has the potential to be used to decrease stress-induced reductions in the postharvest quality of horticultural crops that occur during transport and storage, thus, prolonging their shelf life.

Keywords: /MeJA/ /Simulated transport vibration/ /Antioxidant enzymes/ /Chlorophyll-degrading enzymes/ /Gene expression/

CABBAGE

Wang, Ling, Wen, M., Chen, F., Luo, Z., Yin, J., & Chen, Y. (2020). High oxygen atmospheric packaging (HOAP) reduces H 2 O 2 production by regulating the accumulation of oxidative stress-related proteins in Chinese flowering cabbage. *Postharvest Biology and Technology, 165, 111183.* doi: 10.1016/j.postharvbio.2020.111183

Abstract

In this study, the impact of high oxygen atmospheric packaging (HOAP) on hydrogen peroxide (H_2O_2) production, and on the content of hemicellulose, cellulose, lignin, and protein accumulation in Chinese flowering cabbage (*Brassica campestris* L. ssp. *chinensis* Makino) was assessed by using air packages as a control. The results showed that HOAP efficiently reduced the H_2O_2 levels in the stem of Chinese flowering cabbage during the storage process. An increase in tissue firmness, and significant reduction in the content of hemicellulose, cellulose, and lignin in the stem were observed upon HOAP treatment. The activities of peroxidases (POD) and laccases were also suppressed. Furthermore, proteomic profiling revealed a total of 63 differentially expressed proteins, of which oxidative stress-related proteins (enzymes) were found to be the major proteins that were regulated by HOAP treatment. The reduction in hemicellulose, cellulose, and lignin biosynthesis regulated by H_2O_2 signal was probably related to the differential accumulation of oxidative stress-related proteins that were induced by the HOAP treatment.

Keywords: /Chinese flowering cabbage/ /High oxygen atmospheric packaging (HOAP)/ /Hydrogen peroxide (H_2O_2)/ /Stem lignification/ /Oxidative stress-related proteins/

Watanabe, T., Nakamura, N., Shiina, T., & Nagata, M. (2020). Relationships among expression of six representative genes, bacterial multiplication, color changes of fresh cut cabbages during storage with focus on accumulated storage temperature. *Food Control, 113*, 107190. doi:10.1016/j.foodcont.2020.107190

Abstract

Fresh cut cabbages are popular in Japanese cuisine. However, the quality of such cabbages declines rapidly. This study examined the potential of applying gene expression analysis for quality assessment of fresh cut cabbages during storage at different environmental conditions. Fresh cut samples were stored at temperatures of 0, 10, and 20 °C. At different time points, bacterial multiplication, color changes, and expression of six genes in the stored samples were evaluated, with a focus on the accumulated storage temperature. The bacterial population and color parameter of all the samples changed with increasing accumulated storage temperature value, irrespective of the actual storage temperature. Further, expression of the gene *endoglucanase* showed high correlation with the accumulated storage temperature values ($R2 > 0.95$), whereas that of *PR protein* was highly correlated with the multiplication of general bacteria ($R2 > 0.99$). Expression of the other genes was not stable under different storage temperature conditions. Our results indicate that at least partial assessment and estimation of quality changes of fresh cut cabbages under different storage conditions can be conducted by gene expression analysis.

Keywords: /Fresh cut cabbage/ /Accumulated storage temperature/ /Bacteria multiplication/ /Color changes/ /Gene expression analysis/

CARDOON

Melilli, M. G., Argento, S., Scandurra, S., Pagliaro, A., Bella, M. C. Di, & Branca, F. (2020). Shelf life and sensory properties of processed cardoon hearts, 201–204. doi: 10.17660/ActaHortic.2020.1284.27

Abstract

Cynara cardunculus L. var. sylvestris populations widespread in Sicily shows high nutraceutical and health properties and can represent a new product in agri-food markets to suggest for diversifying productive chains. However, their exploitation requires adequate protocols for the evaluation of the shelf

life of the produce. Previous studies permitted to individuate the best wild population suitable for this purpose and by it we have progressed evaluating the sensory properties that appeal to consumers of cooked globe artichoke hearts. Heads of the wild population of C. cardunculus var. sylvestris were collected at Polverello (ME, Italy) before the flowering stage. After washing them with tap water, the harvested capitula were subjected to a dipping at 0°C into a water solution of sodium hypochlorite 0.5% (v/v) for 30 min. A heating treatment until 8 min was performed, using distilled water in a ratio of 1 g heads:10 mL water. The capitula were packed after heating treatment in tinplate cans of 500 g containing a water solution of citric acid at 2% (w:w) and stored at 4±1°C. Each contained 3 capitula. At intervals of 4 days, for one month, 9 tinplates (experimental unit 3 tinplates) were analysed for colour of the external bracts (Minolta CR-400) and firmness (kg cm-2). The same number of crude capitula was stored in the same condition as control (CTRL). The cooked capitula presented good sensorial characteristics, in terms of colour and firmness until 16 days of storage. Microbiological analyses should be performed for the safety of the products.

Keywords: /cardoon hearth/ /firmness/ /browning/ storage/

CARNATION

Morimoto, H., Takamura, T., & Fukai, S. (2020). A bud sport from a bicolored carnation to a single-colored carnation is accompanied by low expression levels of cinnamoyl-CoA reductase-like genes, 1–8. doi: 10.17660/ActaHortic.2020.1283.1

Abstract

In continuously bud-sported carnation cultivars, namely the ‘MINAMI series’, ‘Feminine Minami’ (single deep pink-colored flower) was established by the spontaneous mutation of ‘Orange Minami’ (bicolored flower; the distal and proximal parts of the petals are pink and yellowish orange, respectively). To clarify the mechanisms of the bud sport, flavonoid amounts and expression levels of flavonoid biosynthesis-related genes were investigated in distal and proximal parts of the petals. These investigations were based on the hypothesis that the substrate availability for flavonoid biosynthesis was limited by the alternative upstream metabolic pathway, which branched from the flavonoid biosynthetic pathway. Thus, we isolated three cinnamoyl-CoA reductase-like genes (CRL1, CRL2 and CRL3), and investigated the expression levels of CRLs. The results indicated that the expression levels of CRL1/2 in the distal part of ‘Orange Minami’ petals and the whole petal of ‘Feminine Minami’ were remarkably lower, but remained high in the proximal part of ‘Orange Minami’. The expression level of CRL3 did not differ between the two cultivars. The results of this study suggest that suppression of CRL1/2 expression in the petals of ‘Orange Minami’ by a bud sport can lead to a reduction of substrate amounts for monolignol biosynthesis and a subsequent increase in flavonoids resulting in the flower phenotype of ‘Feminine Minami’.

Keywords: /bud sport/ cinnamoyl-CoA reductase, flavonoids, flavonoid biosynthesis-related genes, flower color

CHILI

Kumar, V., Ranjan, V., Muthukaliannan, K., & Pareek, S. (2019). Exogenous gibberellic acid treatment extends green chili shelf life and maintain quality under modified atmosphere packaging. *Scientia Horticulturae, 269, 108934*. doi: 10.1016/j.scienta.2019.108934

Abstract

An experiment was carried out to assess the impact of gibberellic acid (GA_3) and modified atmosphere

packaging (MAP) on quality attributes and shelf life of green chili cv. PKM-1. Out of 6 lots of sterilized chili samples, 3 lots were treated with 3 µM gibberellic acid (GA_3) for 10 min. Then treated and untreated chili samples were packed under different modified atmosphere packaging (MAP): anti fog film (RD 45) and low density polyethylene (LDPE), and stored under low temperatures (8 ± 2 °C) in BOD incubator for 30 days. Chili samples treated with GA + RD extended the shelf life up to 30 days as compared GA + LDPE treated (25 days), while control, GA and C + LDPE samples had 10, 15 and 12 days of shelf life. Further, GA + RD treatment was found more effective in preserving quality attributes (firmness, total phenolic content, total flavonoid content, antioxidant activity, total chlorophyll, total carotenoids, ascorbic acid, capsaicin content, pericarp color). Anti fog film RD 45 packed samples displayed optimal CO_2/O_2 gases composition and low respiration rate as compared to samples packed in LDPE film hence extending the shelf life of green chili. Principal component analysis also indicates the synergetic effect of GA_3 and MAP in improving the quality attributes of green chili.

Keywords: /Capsaicin/ /Chili/ /Gibberellic acid (GA_3)/ /Modified atmosphere packaging (MAP)/ /Quality attributes/ /Shelf life/

CITRUS

Cao, J., Kang, C., Chen, Y., Karim, N., Wang, Y., & Sun, C. (2020). Physiochemical changes in Citrus reticulata cv . Shatangju fruit during vesicle collapse. *Postharvest Biology and Technology*, *165*, 111180. doi: 10.1016/j.postharvbio.2020.111180

Abstract

'Shatangju' (*Citrus reticulate*) is a popular mandarin that easily develop vesicle drying, which is one of the most common internal physiological disorders of citrus fruit. The vesicle drying occurred firstly in the peel-side of the segment of 'Shatangju' fruit, and then the juice sac shrank gradually with the development of the syndrome, which finally resulted in the collapse and hollowing of the segments. The incidence of vesicle collapse increased with the storage temperature and the seed number. After storage at 10 °C and 20 °C for 90 d, over 80 % of the fruit developed vesicle collapse syndromes. The physiochemical characteristics of healthy segments and the vesicle collapsed segments were subsequently compared in detail. The results showed that, the physiochemical changes of 'Shatangju' fruit during vesicle collapse were characterized by the increase of H_2O_2, MDA, flavonoids and cell wall compounds, and by the decrease of carotenoids, ethanol, ethyl acetate, d-limonene and β-myrcene, as well as by the modest decrease of sugars and acids. In addition, the contents of amino acids in the vesicle collapsed segment changed slightly. Taken together, the results indicated that the vesicle collapse of 'Shatangju' fruit involved in the changes of primary metabolism, secondary metabolism as well as the peroxidation of the tissue. Present study provided detailed information about the physiochemical alterations occurring in the vesicle collapsed segment of 'Shatangju' mandarin.

Keywords: /Citrus reticulate cv. Shatangju/ /Vesicle collapse/ /Physiochemical characteristics/

CUCUMBER

Cheng-qian, J., & Ze-yu, C. (2020). A circular arc approximation algorithm for cucumber classification with image analysis. *Postharvest Biology and Technology, 165*. doi: 10.1016/j.postharvbio.2020.111184

Abstract

The cucumber is one of the most important consumer vegetables, and due to high freshness and appearance standards, it must be graded according to quality. One key metric for grading cucumbers is

curvature (arch height) relative to length. To date, this classification standard has not been implemented in a commercial automatic system because the curvature of the cucumber is related to its length. This paper presents and tests a circular arc approximation algorithm for measuring the curvature of a cucumber using image processing. By fitting the central axis of each cucumber to establish a curve equation, the approximate eigenvalue radius, R, and the radius of the section perpendicular to the curvature of cucumber, r, could be obtained quickly and efficiently. The curve of the cucumber was then transformed into a new characteristic, R' (R' = R – r), which was used as a threshold to classify each cucumber. The method was verified by theory and experiment, and the average error of 0.71 % corresponding to the coefficient R^2 = 0.9958 of the similarity index between the curve and central axis of the cucumber was verified. It was found that the fitted curve and the central axis of the cucumber were coincident. Moreover, we designed an algorithm that can detect S-shaped cucumbers based on the analysis of the contour, which can avoid the influence of S-shaped cucumbers on the results. In our tests, 148 cucumbers were classified using the circular arc approximation method, the elliptic approximation method, and a manual method. The results of the classifications were compared. According to China's standard evaluation, the classification error rate of the circular arc approximation method was 10.1 % lower than that of the elliptic approximation method. The incidence of cucumbers being classified into an adjacent grade was 0.7 % using the circular approximation method, and there were no cases of cucumbers being classified into non-adjacent grades. The classification error rate of the elliptic approximation was 10.8 %, of which 2.7 % was classified into non-adjacent grades. Under the European standard, the cucumber classification accuracy using the circular arc approximation algorithm reached 100 %. Therefore, the proposed method offers a more accurate classifier than the elliptic approximation method, and the circular arc approximation algorithm can be fully applied in the commercial cucumber classification process.

Keywords: /Vegetable/ /Curvature/ /Grading/ /Machine vision/ /Shape/

FRUITS AND VEGETABLES

Alabi, K. P., Zhu, Z., & Sun, D. W. (2020). Transport phenomena and their effect on microstructure of frozen fruits and vegetables. *Trends in Food Science and Technology*, *101*, 63–72. Doi: 10.1016/j.tifs.2020.04.016

Abstract

Fresh fruits and vegetables have a short shelf life. Freezing offers a solution to their long-term preservation. However, transport phenomena during freezing of fruits and vegetables pose significant changes in microstructure, affecting quality stability, shelf-life extension, and market value. Therefore, information on the microstructure of frozen fruits and vegetables is very critical for process design and quality control. In this review, transport phenomena and their effect on the microstructure of frozen fruits and vegetables are considered at the cell level. The effect of cell structure, freezing rates, and heat and mass transfer characteristics on the texture of cellular tissues are presented. Emerging techniques for controlling ice crystal growth are also discussed. The quality of frozen fruits and vegetables is hinged on the microstructure stability, which is highly dependent on phase change processes and the size of ice crystals. The proportion and characteristics of cellular water, heat and mass transfer parameters, freezing rate and thermal property of cells are considered as the main drivers for moisture migration and ice crystal formation. To produce frozen fruits and vegetables with high quality, more insightful study and accurate understanding of transport phenomena in cellular space and their corresponding effects on the microstructure is necessary. It is hoped that this review should provide critical information on preserving the microstructure and quality of fruits and vegetables as affected by moisture migration for future studies.

Keywords: /Fruits and vegetables/ /Freezing/ /Transport phenomena/ /Microstructure stability/ /Phase change/ /Cellular water/

Amamou, S., Lazreg, H., Hafsa, J., Majdoub, H., Rihouey, C., Le Cerf, D., & Achour, L. (2020). Effect of extraction condition on the antioxidant, antiglycation and α-amylase inhibitory activities of Opuntia macrorhiza fruit peels polysaccharides. *Lwt*, *127*. doi: 10.1016/j.lwt.2020.109411

Abstract

In this study, the effect of acidic, neutral and alkaline medium extraction of polysaccharides from *Opuntia macrorhiza* fruit peels was evaluated. The extraction yields ranged from 6.8 to 13.7%, and the highest content in uronic acid was observed in the acidic extract (50.5%). Likewise, Fourier transform infrared (FT-IR) spectroscopy showed the presence of uronic acids in the methyl ester and free forms, with a degree of esterification of 46.9, 39.3 and 48.3% for the acidic, neutral and alkaline extracts. Monosaccharide composition showed that the extracted polysaccharides were principally composed of arabinose, rhamnose, galactose and glucose, with an average molecular weight of 208,000, 1460,000 and 1380,000 g/mol, respectively. Therefore, this finding indicates that extracts are a low methoxyl pectic polysaccharides. Finally, all polysaccharides exhibited good antioxidant activity, especially acid extract significantly inhibits lipid peroxidation and *in vitro* protein glycation in BSA-glucose glycation model and alkaline extract inhibits α-amylase with a competitive type.

Keywords: /Pectic polysaccharides/ /*Opuntia macrorhiza*/ /Antioxidant/ /Protein glycation/ /*α*-Amylase/

Narenderan, S. T., Meyyanathan, S. N., & Babu, B. (2020). Review of pesticide residue analysis in fruits and vegetables. Pre-treatment, extraction and detection techniques. In *Food Research International* (Vol. 133). doi: 10.1016/j.foodres.2020.109141

Abstract

A wide variety of pesticides have been used in agriculture to increase the yield, quality and extend the storage life of crops. However, the use of pesticide has been increased now a day due to the ever-increasing population and rapid urbanization. The continuous uses of these pesticides have resulted in contamination of the environment, crops and also caused potential risk to human health. For this reason, strict regulations are developed and regulated to monitor these compounds. To date, several techniques have been developed for the extraction and detection of pesticides, from traditional to advanced detection techniques. The present study delineates a comprehensive up to date overview of the available traditional methods (*gas chromatography and high-performance liquid chromatography coupled with various detector*) to advanced pre-treatment (*polystyrene-coated magnetic nanoparticle*) and detection (*sensor development and nanotechnology*) techniques used in the analysis of pesticides residue in various fruits and vegetables. Also, categorization of pesticides and its toxicity have been discussed.

Keywords: /Pesticides/ /Chromatography/ /Fruits and vegetables/ /Traditional methods/ /Advanced methods/

Piva, C. A. G., Bogo, A., Gomes, B., Milcheski, V., Klabunde, G. H. F., Nodari, R. O., … Welter, L. J. (2020). Pestalotiopsis spp. causing grapevine leaf spot and postharvest berry rot in southern Brazil . *Acta Horticulturae*, (1280), 209–216. doi: 10.17660/actahortic.2020.1280.29

Abstract

Pestalotiopsis species were associated with grapevine leaf spot and postharvest fruit rot diseases in many countries worldwide. Pestalotiopsis spp. was isolated from grapevine leaves and berries in 21 municipalities of Rio Grande Sul, Santa Catarina and Parana states, southern Brazil. The isolates were characterized using a combined analysis of morphological features (colony appearances and conidia

characters), sequencing the internal transcribed spacer (ITS) region, and pathogenicity test. Five morphological groups were identified based on genetic dissimilarity of coupled conidia size, apical appendage number and size, mycelial growth index (MGI) and final colony diameter (FCD). The universal primers ITS1 and ITS4 amplified a 496 and 450-bp fragment from genomic rDNA of isolates belonging to Pestalotiopsis spp. The comparison of the isolates combining nucleotide sequence obtained by BLAST coupled with morphological criteria (colony appearances and conidia characters) distinguished P. trachicarpicola and Neopestalotiopsis vitis from all other known species in the genera. All isolates were pathogenic to Hungarian grape cultivar 'Poeloeskei Muskotaly' causing necrotic leaf spot and postharvest berry rot. This is the first report of P. trachicarpicola and N. vitis associated with necrotic leaf spot and postharvest rot diseases on grapevine in southern Brazil.

Keywords: /Vitis vinifera/ /morphology/ /sequence analysis/ /pathogenicity/

Shezi, S., Samukelo, L., Mditshwa, A., & Zeray, S. (2020). Changes in biochemistry of fresh produce in response to ozone postharvest treatment. *Scientia Horticulturae*, *269*, 109397. doi: 10.1016/j.scienta.2020.109397

Abstract

Ozone is a triatomic molecule of oxygen well-known as a powerful disinfectant because of its higher oxidation potential. Ozone has recently gained more interest especially from producers of organic fresh horticultural products. This happened after it was recognized as a generally safe disinfectant of fresh fruits and vegetables. One of the major properties of ozone that makes it an effective postharvest treatment is its ability to disinfect fresh produce effectively without leaving residues on the surface, mainly because it decomposes to form oxygen. Ozone is one of the successful postharvest treatments, however; its mode of action is not well documented. The currently understood mode of action of ozone is linked with antimicrobial properties, however, several studies revealed the biochemical impact of ozone as a postharvest treatment of horticultural fresh produce. Little has been done in terms of critically reviewing the biochemical impact of ozone as a postharvest treatment. Furthermore, among the few reviews on ozone, there is little or no detailed information regarding the effect of ozone on antioxidants, as the major components of the human diet in fruit and vegetables. Therefore, in this review, the mode of action of ozone as a postharvest treatment has been discussed, with a more focus on its biochemical impact on antioxidants as major components of fresh produce diet.

Keywords: /Ozone/ /Postharvest treatment/ /Quality/ /Antioxidants/

LICHI

Tang, R., Zhou, Y., Chen, Z., Zeng, J., & Huang, H. (2020). Involvement of miRNA-mediated anthocyanin and energy metabolism in the storability of litchi fruit. *Postharvest Biology and Technology*, *165*, 111200. doi: 10.1016/j.postharvbio.2020.111200

Abstract

Litchi (*Litchi chinensis* Sonn.) has a short shelf life and its storability varies greatly among different cultivars. In this study, four litchi cultivars of different storability were used to investigate the possible roles of microRNAs and their targets in litchi fruit senescence. Slower pericarp browning in 'Jingganghongnuo' and 'Huaizhi' was observed compared with that in 'Guiwei' and 'Nuomici', which was correlated with higher levels of ATP, energy charge, and anthocyanin but lower activity of anthocyanase that oxidizes anthocyanin. A phylogenic analysis of *Arabidopsis*, tomato (*Solanum lycopersicum*), and litchi, using totally 40 *LcMYB*s, categorized certain *LcMYB*s into the anthocyanin biosynthesis-related R2R3 MYB subfamilies as previously described in *Arabidopsis*. In addition, the expression of a group of litchi

miRNAs, including miR159/319, miR828 and miR858 that jointly target multiple *LcMYB* genes, was found to decrease fast in 'Jingganghongnuo' and 'Huaizhi'. A group of R2R3-type *LcMYB*s was validated as authentic targets of these miRNAs. Accordingly, these *MYB*s were induced in 'Jingganghongnuo' and 'Huaizhi' whereas largely suppressed in 'Guiwei' and 'Nuomici'. Moreover, litchi miR2118 targeting energy-related genes displayed a similar expression pattern to those of the *MYB*-targeting miRNAs in the different cultivars, and two of the miR2118 targets exhibited opposite expression pattern with miR2118. Finally, a miRNA-mediated anthocyanin and energy metabolism network underlying the regulation of cultivar-specific fruit senescence in litchi is proposed. We conclude that miRNA-mediated regulation can account for the differential storability of specific litchi cultivars.

Keywords: /Litchi (*Litchi chinensis* Sonn.)/ /Storability/ /miRNAs/ /Anthocyanin metabolism/ /Energy status/

LOQUAT

Li, Z., Wang, L., Xie, B., Hu, S., Zheng, Y., & Jin, P. (2020). Effects of exogenous calcium and calcium chelant on cold tolerance of postharvest loquat fruit. *Scientia Horticulturae*, *269*, 109391. doi: 10.1016/j.scienta.2020.109391

Abstract

The effect of calcium chloride ($CaCl_2$) and calcium chelant-ethylene glycol bis (2-aminoethyl ether) tetraacetic acid (EGTA) on chilling injury (CI) of postharvest loquat fruit (*Eriobotrya japonica* L. cv. 'Changhong') during cold storage was investigated. The results showed that $CaCl_2$ treatment significantly prevented CI and maintained the membrane integrity resulting in the reduction of ion leakage and malondialdehyde (MDA) content. The exogenous calcium increased energy charge (EC) and the content of adenosine triphosphate (ATP), adenosine diphosphate (ADP). Meanwhile, $CaCl_2$ treatment effectively enhanced the enzyme activities associated with energy metabolism including H^+-adenosine triphosphatase (H^+-ATPaese), Ca^{2+}-adenosine triphosphatase (Ca^{2+}-APTase), succinic dehydrogenase (SDH), cytochrome c oxidase (CCO). Furthermore, the activities of Δ^1-pyrroline-5-carboxylic acid synthase (P5CS), ornithine-ὰ-aminotransferase (OAT), glutamic acid decarboxylase (GAD), diamine oxidase (DAO) and polyamine oxidase (PAO) were enhanced by $CaCl_2$ treatment, which contributed to the accumulation of osmotic substances γ-aminobutyric acid (GABA), proline and polyamines (PAs). However, EGTA treatment significantly promoted CI index, increased MDA content and ion leakage. Moreover, low level of EC and GABA were also found in EGTA-treated loquat fruit. These results suggested that exogenous calcium could effectively enhance the chilling tolerance due to the high energy level and promoted accumulation of endogenous osmotic substances proline, GABA and PAs in loquat fruit.

Keywords: /Loquat/ /Calcium chloride/ /Chilling injury/ /Energy/ /GABA/ /Polyamines/

MANDARIN

Lu, Y., Li, D., Li, L., Belwal, T., Xu, Y., Lin, X., . . . Luo, Z. (2020). Effects of elevated CO2 on pigment metabolism of postharvest mandarin fruit for degreening. *Food Chemistry, 318*, 126462. doi:10.1016/j.foodchem.2020.126462

Abstract

Degreening is widely used in citrus fruit to extend the market season for economic gains and increase the consumer acceptance. Elevated CO2 was exogenously applied to Satsuma mandarins (*Citrus unshiu Marc.*) for degreening and its effect on pigment metabolism was investigated. The results revealed 15%

CO2 treatment accelerated the citrus fruit peel color change along with the chlorophyll degradation, β-cryptoxanthin and flavonoids accumulation. The expression of *CitSGR*, *CitNYC*, *CitChlase*, *CitPPH*, *CitPAO* and *CitRCCR* genes involved in chlorophyll metabolism and a set of genes involved in producing β, β-xanthophylls were up-regulated by elevated CO2. For flavonoid metabolism, the up-regulated expressions of *CitPAL*, *CitCHS* and *CitCHI* partly explained the increased total flavonoids content. These results showed that 15% CO2 treatment improved the visual appearance of citrus fruits due to its impact on pigment metabolism and also maintained their nutritional value, thus could be employed as a potential commercial technique for citrus degreening.

Keywords: /Elevated CO2/ /Degreening/ /Citrus fruit/ /Pigment metabolism/

MUSHROOM

Zhang, H., Huang, D., Pu, D., Zhang, Y., Chen, H., Sun, B., & Ren, F. (2020). Multivariate relationships among sensory attributes and volatile components in commercial dry porcini mushrooms (Boletus edulis). *Food Research International*, *133*, 109112. doi: 10.1016/j.foodres.2020.109112

Abstract

The present research investigated the relationships among sensory attributes and volatile components in dry porcini mushrooms by multivariate statistical analyses. The sensory characteristics were based on quantitative descriptive analysis and consumer hedonic assessment. The volatile compounds were extracted by solid-phase microextraction, then were identified using gas chromatography-mass spectrometry and gas chromatography-olfactometry. The results showed that the high hedonic rating of porcini mushrooms was due in part to its aroma notes such as seasoning-like, roasted, cacao-like and smoky. High hedonic liking and positive aromas of porcini mushrooms could be responsible for the volatiles including 3-(methylthio)propanal, 3-(methylthio)propanol, pyrazines, phenolic and furanone components. On the other hand, raw mushroom-like, cardboard-like, as well as sweaty attributes were attributed to the relatively low hedonic liking of porcini mushrooms, which correlated with high contents of 1-octen-3-ol, octanal, 2-pentylfuran and 3-methylbutanoic acid. The information reported here could be important for the quality control of commercial porcini mushrooms by providing an approach to strengthen the interpretation of sensory data by showing how they were affected by the chemical properties.

Keywords: /Dry porcini mushroom/ /Aroma characteristic/ /Hedonic rating/ /Volatile compound/ /Relative odor activity value/ /Multivariate analysis/

PEACH

Cai, H., Han, S., Yu, M., Ma, R., & Yu, Z. (2020). Exogenous nitric oxide fumigation promoted the emission of volatile organic compounds in peach fruit during shelf life after long-term cold storage. *Food Research International*, *133*, 109135. doi: 10.1016/j.foodres.2020.109135

Abstract

Cold temperature is a common method to store peach after harvest. While long-term cold storage leads to the occurrence of chilling injury and loss of volatile organic compounds (VOCs) after transferring peach to shelf life. Nitric oxide (NO) treatment has been proven to alleviate peach chilling injury. However, the effect of NO treatment on peach VOCs during cold storage plus shelf life is still unknown. In this study, 10 μL L^{-1} NO was used to fumigate peach before 4 °C cold storage. After cold storage for 21 days, peach were transferred to 20 °C for 3 days to simulate shelf life. Results showed that NO treatment promoted the emission of main VOCs including C6 aldehydes, C6 alcohols, straight-chain esters and lactones after

cold storage, supported by the changes of fatty acids and genes expression of *PpFADs*, *PpLOXs*, *PpHPL*, *PpADH*, *PpAATs* and *PpACXs*. Besides, NO also alleviated the occurrence of chilling injury and promoted the recovery of respiration rate and ethylene production during shelf life. In conclusion, treatment with NO effectively prevented the loss of VOCs when transferring peach from cold temperature to shelf life in “Xiahui 6” peach and the possible mechanisms were discussed.

Keywords: /Fruit/ /Postharvest treatment/ /Aroma/ /Refrigeration storage/ /Shelf life/ /Genes expression/

Sortino, G., Saletta, F., Puccio, S., Scuderi, D., Allegra, A., Inglese, P., & Farina, V. (2020). Extending the shelf life of white peach fruit with 1-methylcyclopropene and aloe arborescens edible coating. *Agriculture (Switzerland)*, *10*(5), 1–18. doi: /10.3390/agriculture10050151

Abstract

The maintenance of high-quality standards for prolonging the shelf life of fruit and preserving sensory and nutritional quality is a priority for horticultural products. The aim of this work is to test the effectiveness of a single treatment of edible coating based on Aloe arborescens (EC) and a combined treatment of 1-methylcyclopropene (1-MCP) and edible coating to prolong the shelf life of “Settembrina” white flesh peach fruit. White flesh peach fruit were harvested at the commercial ripening stage, treated with an edible coating (EC) or 1-MCP + EC or 1-MCP, and stored for 28 days at 1 ◦C. After 7, 14, 21, and 28 days, fruits were removed from cold storage, transferred at 20 ◦C and then analyzed immediately (cold out) and after 6 days (shelf life) to evaluate the combined effect of cold storage and room temperature. The fruits were tested for carotenoids content, phenolic content, reducing activity (ABTS). The physicochemical traits were measured in terms of the titratable acidity, total soluble content, weight loss, and vitamin C content. Moreover, their sensory profile was analyzed by a semi-trained panel. Fruit treated with EC and 1-MCP + EC kept their marketing values better than control after 14 days of storage and 6 days of simulated shelf life in terms of flesh firmness, total soluble solids and titratable acidity, as well as sensory parameters. After 21 days of storage, all treatments showed a deterioration of all the quality parameters. The single and combined application of Aloe-based coating (with 1-MCP) slowed down the maturation processes of the fruit, limited the weight loss, and preserved its organoleptic characteristics.

Keywords: /Prunus persica/ /edible coating/ /1-methylcyclopropene/ /Aloe spp/ /bio-compound content/ /post-harvest quality/ /consumer acceptability/

Sun, Y., Lu, R., & Wang, X. (2020). Evaluation of fungal infection in peaches based on optical and microstructural properties. *Postharvest Biology and Technology*, *165*, 111181. doi: 10.1016/j.postharvbio.2020.111181

Abstract

The objective of this research was to measure the changes of optical properties and quality or microstructural properties of peaches during fungal infection, and classify the fungal infected peaches based on the optical parameters. Spectra of the absorption (μ_a) and reduced scattering coefficients (μ_s') over 600-1000 nm for healthy and fungal infected peaches over a period of four days were measured by using a spatially-resolved spectroscopic technique. The color and microstructural features of fruit pulp and peel were measured and evaluated, using colorimetry and scanning electron microscopy (SEM), as indicators of the changes in tissue appearance and internal quality in infected peaches. The μ_a and μ_s' spectra exhibited a pattern of decrease during the fungal infection, and their values at wavelengths of 670 nm and 970 nm were correlated with the microstructural parameters of fruit peel and pulp (i.e., mycelial area, intrusion rate, and the energy, entropy and contrast extracted from the SEM images). Significant differences in the quality parameters between healthy and infected peaches were found after 3 d of

inoculation for the peel tissues and after 2 d for pulp tissues. Significant differences between the healthy and infected peaches after 1 d of inoculation were also observed for both μ_a and μ_s'. The optical parameters were more sensitive to disease infection than some of the quality parameters. Partial least squares discriminant analysis (PLSDA) models were developed, based on the two optical parameters and their combinations, for classifying diseased and healthy peaches. The PLSDA model for the optical parameter of $\mu_a \times \mu_s'$ achieved better overall classification accuracies of 70–88 %, when the peaches were classified into four (based on infection days) and two (i.e., healthy and diseased) classes, respectively. This research demonstrated that optical properties can be used to assess quality or structural changes and detecting disease infection in peach fruit.

Keywords: /Absorption/ /Scattering/ /Peaches/ /Fungal infection/ /Microstructure/

PEARS

Xu, M., Yang, Q., Adwoa, N., Boateng, S., Ahima, J., Dou, Y., & Zhang, H. (2020). Ultrastructure observation and transcriptome analysis of Penicillium expansum invasion in postharvest pears. *Postharvest Biology and Technology*, *165*, 111198. doi: postharvbio.2020.111198

Abstract

Pears are one of the most essential fruit worldwide, they are susceptible to Penicillium expansum infection during postharvest storage, which results in high economic losses. Due to the dearth of information involving the mechanisms of infection ofP.expansum in pear fruit it is very important to clarify its pathogenicity. In this study, the fungus strain was isolated from rotten pears and identified as P. expansum, which has strong pathogenicity. The results from SEM revealed that P. expansum relies on the growth of spores or the secretion of filamentous materials to degrade the cell wall of infected pear tissues. In addition, it was found that tissues were completely damaged after 24h of infection. The RNA-seq results of P. expansum in infected pear tissue suggested that total differentially expressed genes (DEGs) were grouped into 4 profiles due to an upward trend in their gene expression patterns using the STEM software. The DEGs of the 4 profiles were involved in extracellular enzyme activity, cellular response to reactive oxygen, glutathione metabolic species, and polysaccharide metabolic process particularly the plant cell wall degrading enzyme (CWDEs)synthesis pathway.Insummary, this research provides a piece of new information with regards to the infection mechanisms of P. expansum on pears, which could be useful in understanding the phenomenon of pathogen -host -fruit interaction and the development of new measures for the control of fungal diseases.

Keywords: /Penicillium expansum/ /Pear/ /Scanning electron microscope/ /Infection process/ /Transcriptome/

POSTHARVEST TECHNOLOGY

Rehman, A., Jafari, S. M., Aadil, R. M., Assadpour, E., Randhawa, M. A., & Mahmood, S. (2020). Development of active food packaging via incorporation of biopolymeric nanocarriers containing essential oils. *Trends in Food Science & Technology*. https://doi.org/10.1016/j.tifs.2020.05.001

Abstract

Essential oils (EOs) have received much attention owing to their remarkable biological activities and health promoting benefits, but they are easily oxidized and chemically unstable as well as having a low resistance to environmental stresses like light, oxygen, and temperature. Furthermore, their physiochemical properties may limit their application as active compounds in food and pharmaceuticals due to some restrictions such as less solubility, poor bioavailability and quick release. Nanoencapsulation

techniques can be used for entrapment of essential oils to uphold their original characteristics during processing and to improve their physiochemical properties as well as to enhance their health promoting effects. The prominence of nanocarriers in the arena of nanotechnology cannot be denied. The present article focuses specifically on loading of EOs into biopolymeric nanocarriers, their functionalities and innovative developments in preparation approaches. Additionally, the present state of the art loading of numerous essential oils via biopolymeric nanocarriers have been enclosed and tabulated well. This review highlights the application of EO-loaded biopolymeric nanocarriers into active food packaging being promising antimicrobial and antioxidant agents which have shown practical results in order to retard the oxidation phenomenon as well as microbial growth in different food products. Further studies are needed for exploring the application of EO-loaded biopolymeric nanocarriers into active food packaging to assure their commercial exploitation.

Keywords: /Essential oils/ /Biopolymers/ /Nanocarriers/ /Delivery/ /Active food packaging/ /Antimicrobial/ /Shelf life/

Van De Looverbosch, T., Rahman Bhuiyan, M. H., Verboven, P., Dierick, M., Van Loo, D., De Beenbouwer, J., Sijbers, J., & Nicolaï, B. (2020). Nondestructive internal quality inspection of pear fruit by X-ray CT using machine learning. *Food Control*, *113*. Doi: 10.1016/j.foodcont.2020.107170

Abstract

To preserve the quality of fresh pear fruit after harvest and deliver quality fruit year-round a controlled supply chain and long-term storage are applied. During storage, however, internal disorders can develop due to suboptimal storage conditions that may not cause externally visible symptoms. This makes them impossible to be detected by current commercial quality grading systems in a reliable and non-destructive way. A combination of a Support Vector Machine coupled with a feature extraction algorithm and X-ray Computed Tomography is proposed to successfully detect internal disorders in ‘Conference’ and ‘Cepuna’ pear fruit nondestructively. Classifiers were able to distinguish defective from sound fruit with classification accuracies ranging between 90.2 and 95.1% depending on the cultivar and number of used features. Moreover, low false positive and negative rates were obtained, respectively ranging between 0.0 and 6.7%, and 5.7 and 13.3%. Classifiers trained on ‘Conference’ data were transferred effectively to the ‘Cepuna’ cultivar, suggesting generalizability to other cultivars as well. With continuing developments in both hardware and software to increase inspection speed and reduce equipment costs, the method can be implemented in industrial applications, *e.g.,* inline translational X-ray CT.

Keywords: /Support vector machine/ /3D imaging/ /Image processing/ /Postharvest technology/ /Disorder detection/ /Food grading/

ROSE

Kaneeda, R., Yamamoto, S., & Handa, T. (2020). Seasonal difference of soluble carbohydrate metabolism in incurved malformed flowers of cut rose cultivar ‘ Yves Piaget ,’ 33–38. Doi: 10.17660/ActaHortic.2020.1283.6

Abstract

Rosa hybrida ‘Yves Piaget’ is a fragrant cut rose cultivar that sometimes bears malformed flower designated as ‘incurved flowering’. This ‘incurved flowering’ is characterized by adaxial curving of the petals, however its physiology is not clear. The flower was harvested at three different flowering stages: stage 1, tight bud; stage 2, mature bud; stage 3, five opened petals. Their petals were separated into two parts; edge part including the petal periphery and other part including the petal base. The petal fresh weight and growth rate were measured and calculated. Ten outer petals were used to analyze soluble

carbohydrate content by HPLC, and acid invertase activity. This experiment was conducted from April to June in 2017 (spring) and December to March in 2018 (winter). In winter, acid invertase activity of malformed flower was higher at stage 2 than normal flower, but tended to be lower at stage 3 than normal flower. However, at stage 3, growth rate in the edge of malformed flower petals was decreased. In spring, acid invertase activity of malformed flower was lower at all stages than normal flower. Because of the low invertase activity, it is possible that the hexose content at the end of the malformed flower petals have become lower than in stages 2 and 3 of the normal flower petals. Thus, at stage 3, the growth rate at the end of the malformed petal may have decreased. Our results indicate the cause of 'incurved flowering' is different in winter and spring.

Keywords: /Rosa × hybrid/ /petal growth/ /invertase activity/ /hexose/ /sucrose/ /osmoregulation/

STRAWBERRY

Peris-Felipo, F. J., Benavent-Gil, Y., & Hernández-Apaolaza, L. (2020). Silicon beneficial effects on yield, fruit quality and shelf-life of strawberries grown in different culture substrates under different iron status. *Plant Physiology and Biochemistry, 152*, 23-31. doi:10.1016/j.plaphy.2020.04.026

Abstract

The silicon application either as foliar or to the radicular system of strawberry plants was investigated. Fortuna strawberry plants were grown in two different substrates (coconut fibre and organic substrate) under optimal (20 μM) or low (5 μM) iron (Fe) conditions. During the study, crop parameters including leaf area, SPAD and fruit yield were measured. At harvest, fruit quality and post-harvest shelf-life were evaluated. Results indicated that "Fortuna" strawberries plants had a poor development in coconut fibre and excellent growth and yield in the organic substrate. In the coconut fibre substrate, no differences in foliar area, fruit diameter, colour, pH and shelf-life were observed related to the Si addition under deficient Fe conditions, but an increased in weight and the firmness of the fruits, as well as in fructose content was shown. However, when 20 μM Fe were supplied, the root application of Si significantly increases: protein, mineral and sugar content, as well as fruit shelf-life by an average of 1.5 days. Likewise, the radicular silicon application to the organic substrate considerably improved yield, fruit diameter, fruit weight, glucose and fructose fruit content and the fruit shelf-life without causing distinguishable chemical or physicochemical changes. In summary, Si application to Fortuna strawberries through the roots could be a good solution to increase fruit quality and yield and to increase benefits from the agronomical point of view. Further studies in other strawberry varieties and dose rates will allow knowing with better precision how the radicular application of silicon contributes to yield and fruit shelf-life.

Keywords: /Strawberries/ /Silicon/ /Iron/ /Postharvest shelf-life/ /Fruit quality/

Siebeneichler, T. J., Crizel, R. L., Camozatto, G. H., Paim, B. T., da Silva Messias, R., Rombaldi, C. V., & Galli, V. (2020). The postharvest ripening of strawberry fruits induced by abscisic acid and sucrose differs from their in vivo ripening. *Food Chemistry*, *317*, 126407. doi:10.1016/j.foodchem.2020.126407

Abstract

In this study, we compared the chemical composition of strawberry (*Fragaria* × *ananassa*) fruits that were ripened *in vivo* (attached to plant) to those ripened during postharvest storage. The effects of the application of abscisic acid (ABA) and sucrose on the postharvest ripening were also evaluated. The results suggested that the postharvest ripening process was dependent on the signal triggered by ABA and differed from *in vivo* ripening, resulting in fruits with altered chemical composition and firmness. The

application of sucrose in unripe strawberries resulted in the induction of ripening, which is dependent on ABA and its derivatives. This induction was more pronounced during the first days of storage and associated with the application of mannitol rather than water, suggesting that mannitol negatively regulated the postharvest strawberry ripening. These results provide further insights into the role of ABA and sucrose in the regulation of postharvest ripening of strawberry.

Keywords: /Non-climacteric fruit/ /Fruit maturation/ /Anthocyanins/ /Phytohormone/ /Sugar/

SWEET CHERRY

Miranda, S., Vilches, P., Suazo, M., Pavez, L., García, K., Méndez, M. A., . . . Pozo, T. D. (2020). Melatonin triggers metabolic and gene expression changes leading to improved quality traits of two sweet cherry cultivars during cold storage. *Food Chemistry, 319*, 126360. doi:10.1016/j.foodchem.2020.126360

Abstract

Sweet cherry is a valuable non-climacteric fruit with elevated phytonutrients, whose fruit quality attributes are prone to rapid deterioration after harvest, especially peel damage and water loss of stem. Here the metabolic and transcriptional response of exogenous melatonin was assessed in two commercial cultivars of sweet cherry (Santina and Royal Rainier) during cold storage. Gene expression profiling revealed that cuticle composition and water movement may underlie the effect of melatonin in delaying weight loss. An effect of melatonin on total soluble solids and lower respiration rate was observed in both cultivars. Melatonin induces overexpression of genes related to anthocyanin biosynthesis, which correlates with increased anthocyanin levels and changes in skin color (Chroma). Our results indicate that along with modulating antioxidant metabolism, melatonin improves fruit quality traits by triggering a range of metabolic and gene expression changes, which ultimately contribute to extend sweet cherry postharvest storability.

Keywords: /Melatonin/ /Sweet cherry/ /Fruit quality/ /Cold storage/

Martínez-Hernández, G. B., Blanco, V., Blaya-Ros, P. J., Torres-Sánchez, R., Domingo, R., & Artés-Hernández, F. (2020). Effects Of Uv–C On Bioactive Compounds And Quality Changes During Shelf Life Of Sweet Cherry Grown Under Conventional Or Regulated Deficit Irrigation. *Scientia Horticulturae, 269*, 109398. doi:10.1016/j.scienta.2020.109398

Abstract

The effect of a UV–C postharvest treatment (4 kJ m–2) on physicochemical quality, phenolic contents and total antioxidant capacity of ‘Prime Giant’ sweet cherry throughout 20 d at 2 °C (simulated cold storage during transportation period) plus 5 d at 15 °C (additional shelf life period) was studied. Furthermore, the effect of two regulated deficit irrigation strategies, with 36–39 % water savings, was also studied on such quality parameters. In general, physicochemical quality at harvest (soluble solids content: 16–18 %; titratable acidity: 11.2–12.4 g L–1) was unaffected throughout the storage periods, independently on storage time, regulated deficit irrigation or postharvest treatments. As observed from the darker red colour, cherry skin showed ≈ 9–10–fold higher phenolic contents and total antioxidant capacity than cherry flesh. Cyanidin–3–rutinoside was the major anthocyanin. Generally, phenolic compounds of cherry skin decreased during storage. However, UV–C treatment lowered such reductions, even increasing total phenolic content by 21–36 % after shelf life in fruit grown under regulated deficit irrigation. Conclusively, a UV–C pre–treatment can be considered as an excellent postharvest tool to increase sweet cherry phenolic compounds. Furthermore, a UV–C pre–treatment can be even combined with regulated deficit irrigation strategies to reduce natural resources consumption without affecting fruit quality, which is

particularly interesting in Regions with scarce water availability.

Keywords: /Phenolic compounds/ /anthocyanins/ /antioxidants/ /quality/ /UV–C radiation/ /drought/

SNAPDRAGON

Rabiza-świder, J., Skutnik, E., Jędrzejuk, A., & Rochala-wojciechowska, J. (2020). Nanosilver and sucrose delay the senescence of cut snapdragon flowers. *Postharvest Biology and Technology*, *165*, 111165. doi: 10.1016/j.postharvbio.2020.111165

Abstract

Snapdragon (*Antirrhinum majus* L.) is one of the most important annuals grown for cut flowers, but its vase life in water is relatively short. In this study, the effects of nanosilver (NS) on the vase life of cut snapdragon and effects on physiology, biochemical and morphology levels were investigated. Xylem vessel blockages started to appear soon after harvest. NS prevented tylose formation, but not the blockages caused by bacteria. Cut flowers treated with 1 mg L^{-1} NS with 2 % sucrose had a longer vase life than those held in water or in NS alone, and improved flower opening, coloration and higher relative water content of flowers in the lower (older) part of the spike. Carbohydrate accumulated in flowers in the NS solution. NS limited increased electric conductivity, and with sucrose decreased the pH of cell sap. NS also limited the increase in the malondialdehyde content, especially in the upper (younger) part of spikes where also the hydrogen peroxide content was much lower than in flowers from the lower spike parts. The activities of antioxidative enzymes were higher in the NS-treated flowers, especially when the NS solution was supplemented with sucrose, and the nuclei and epidermis degradation was delayed. It is evident that the presence of NS in the holding solution, especially when supplemented with sucrose, delays and reduces the severity of all senescence symptoms, thereby extending the useful vase life of snapdragon.

Keywords: /Cell sap/ /Epidermis/ /Nuclei degradation/ /Oxidative stress/ /Programmed cell death/ /Xylem blockages/

SWEET PEA FLOWER

Hirose, T., Kawasumi, Y., Kaneeda, R., & Handa, T. (2020). Glucose treatment extends the vase life of cut sweet pea flowers compared to sucrose corresponding to improved water uptake, 27–32. doi: 10.17660/ActaHortic.2020.1283.5

Abstract

Sweet pea (Lathyrus odoratus L.) has a wide range of flower color and great fragrance, however its short vase life limits its commercial value. Cut flowers of fragrant sweet pea cultivar ‘Sweet pink’ were treated with 40 g L-1 (117 mM) sucrose or 21 g L-1 (117 mM) glucose solutions with 200 mg L-1 8-hydroxyquinoline and kept at 23°C, 70% relative humidity, under 20-40 µmol m-2 s-1 photon flux density and 12 h photoperiod. Solution uptake, petal water potential and relative water content of petals were measured. The vase life of cut flowers was seven days under sucrose treatment and nine days under glucose treatment, respectively. From 3 days after harvest (DAH), solution uptake of cut flowers was decreased by sucrose treatment. Thus, petal water potential was also decreased by sucrose treatment on 3 DAH. On the other hand, under glucose treatment, relative water content of petals was increased on 3 DAH and petals were kept high water potential. Under sucrose treatment, low solution uptake may result in water shortage in petals. High solution uptake was kept by glucose treatment and subsequent water relation of petals was improved; thus, vase life of cut flowers supposed to be extended.

Keywords: /Lathyrus odoratus L./ /longevity/ /sugar/ /water potential/

TEA PLANT

Li, H., Liu, J. X., Wang, Y., & Zhuang, J. (2020). The ascorbate peroxidase 1 regulates ascorbic acid metabolism in fresh-cut leaves of tea plant during postharvest storage under light/dark conditions. *Plant Science*, *296*, 110500. doi: 10.1016/j.plantsci.2020.110500

Abstract

Postharvest storage conditions affect the ascorbic acid (AsA) levels in fresh-cut leaves of horticultural crops. However, the detailed mechanism of AsA metabolism in the fresh-cut leaves of tea plant (*Camellia sinensis*) during postharvest storage under light/dark conditions remains unclear. To investigate the AsA mechanism, we treated fresh-cut tea leaves with light/dark during postharvest storage. An ascorbate peroxidase 1 (CsAPX1) protein involved in AsA metabolism was identified by iTRAQ analysis. Gene expression profile of *CsAPX1* encoding ascorbate peroxidase (APX) was regulated by light/dark conditions. AsA accumulation and APX activity were suppressed by light/dark conditions. SDS-PAGE analysis showed that the molecular mass of recombinant CsAPX1 protein was about 34.45 kDa. Subcellular localization indicated that CsAPX1 protein was a cytosol ascorbate peroxidase. Overexpression *CsAPX1* in *Arabidopsis* indicated that the decrease of AsA content and APX activity in transgenic lines were less significant than that of WT during postharvest storage under light/dark conditions. These data suggested that CsAPX1 involved in regulating AsA metabolism through effecting on the changes of AsA accumulation and APX activity in fresh-cut tea leaves during postharvest storage under light/dark conditions.

Keywords: /Ascorbic acid/ /Ascorbate peroxidase/ /Postharvest storage/ /Subcellular localization/ /*Arabidopsis*/ /Tea plant/

TOMATO

Liu, X., Gao, Y., Yang, H., Li, L., Jiang, Y., Li, Y., & Zheng, J. (2020). Pichia kudriavzevii retards fungal decay by influencing the fungal community succession during cherry tomato fruit storage. *Food Microbiology*, *88*, 103404. doi: 10.1016/j.fm.2019.103404

Abstract

In this study, *P. kudriavzevii* was isolated and identified as an effective antagonistic yeast, which could significantly inhibit the rotting rate, weight loss, and delay the color change, with no effect on total soluble solids (TSS), titratable acid (TA), or firmness during cherry tomato storage. High-throughput sequencing was used to survey the effect of *P. kudriavzevii* on fungal community throughout cold storage. The results showed that the biological succession of predominant pathogens was disrupted by *P. kudriavzevii*. The abundance of *Botrytis* and *Alternaria* was higher in the control than upon *P. kudriavzevii* treatment at 28 d, but some yeast genera such as *Naganishia*, *Wickerhamomyces,* and *Cutaneotrichosporon* at 14 d, *Pichia* and *Sporidiobolus* at 21 d, and Cystofilobasidium at 28 d, had relatively higher abundances in *P. kudriavzevii* treatments than the control. Oddly, as an antagonist agent, *P. kudriavzevii* was not the dominant population, indicating that altering the course of succession of the fungal community may be an effective mechanism of antagonistic yeast. Furthermore, the total network correlation analysis of fungal community revealed that the community development was more dependent on similarities in function than on taxonomic relationships.

Keywords: /Biological control/ /Cherry tomato/ /Antagonistic yeast/ /Microbial communities/ /Microbiome/

Lu, C., Ding, J., Park, H. K., & Feng, H. (2020). High intensity ultrasound as a physical elicitor affects secondary metabolites and antioxidant capacity of tomato fruits. *Food Control*, *113*, 107176. doi: 10.1016/j.foodcont.2020.107176

Abstract

The aim of this study was to evaluate the effect of ultrasound on secondary metabolites and antioxidant capacity of commercially mature tomato fruits. Ultrasound treatment (25 kHz, acoustic power density of 26 W/L) was applied to tomatoes submerged in a treatment tank filled with water for 1–4 min. Afterwards, the tomatoes were stored at room temperature for up to 48 h. Selected secondary metabolites, antioxidant capacity (1,1-diphenyl-2-picryl-hydrazyl (DPPH) and 2,2′-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid) (ABTS)), and phenylalanine ammonia-lyase (PAL) activity of the ultrasound-treated tomatoes were analyzed at 2 h, 24 h, and 48 h. The ultrasound treatment increased the accumulation of secondary metabolites, including total phenolic, lycopene, carotenoids and ascorbic acid during storage. After a 48-h storage, the DPPH and ABTS antioxidant activity of the tomatoes treated with ultrasound for 2 min increased 22.69% and 11.55% compared with the control, respectively. The PAL activity of the ultrasound-treated tomatoes (2 min) was 16.25% higher than the control after storage for 48 h. These results indicate that ultrasound treatment could enhance the beneficial health effect of tomatoes. The enhancement could be attributed to the eliciting effect of ultrasound, which may have regulated the metabolic responses of the tomato fruits.

Keywords: /Ultrasound/ /Tomato/ /Secondary metabolites/ /Antioxidant capacity/ /Lycopene/