Hindawi
Journal of Food Quality
Volume 2022, Article ID 9805934, 3 pages
https://doi.org/10.1155/2022/9805934

Editorial

Biomaterials for Food Preservation

Chunpeng (Craig) Wan,[1] **Kannan R. R. Rengasamy**,[2] **and Chuying Chen**[1]

[1]*Jiangxi Key Laboratory for Postharvest Technology and Nondestructive Testing of Fruits & Vegetables, College of Agronomy, Jiangxi Agricultural University, Nanchang 330045, China*
[2]*Centre for Transdisciplinary Research, Department of Pharmacology, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai 600077, India*

Correspondence should be addressed to Chunpeng (Craig) Wan; chunpengwan@jxau.edu.cn

Received 22 April 2022; Accepted 22 April 2022; Published 31 May 2022

Food, as such, is the most basic need of all life forms. However, its direct production is limited due to climatic conditions, limited resources, and skills. Thus, most postharvested produce are stored and transported from one region to another. Various agrochemical treatments were employed to maintain the quality characteristics and avoid damages to the postharvested food. These agrochemical preservative treatments provide safety, maintain quality, and long shelf life. However, due to their chemical nature, these have also exerted lethal health and environmental problems. Agrochemical residues in food have been recorded, and various health issues such as cardiac arrest, liver, kidney failure, and neurological disorders were also reported [1, 2]. Moreover, these residues are commonly escalated to the environment, mostly to water bodies, soil, and air, and raise various environmental and ecological issues [3]. This has resulted in a reduction of the acceptability of agrochemicals, which has led to the development of alternatives to agrochemicals. The use of biomaterials for postharvest quality preservation of foods has been reported as a significant means to provide an ecofriendly alternative to agrochemicals [4, 5]. These biomaterials commonly include chitosan, carboxyl methylcellulose, polysaccharides, alginate, and plant extracts, including essential oils, phytohormones, antioxidants, organic acids, and salts. The development and use of these biomaterials in the postharvest preservation of foods improve agricultural production sustainability, global food security, and environmental resilience.

The oils derived from plants may also have more useful properties beyond being just "edible." As such, essential oils extracted from the fruits and leaves of *Litsea cubeba* have been tested for antimicrobial properties. In an experimental and toxicity study, the inhibitory effects of *Litsea cubeba* oil, citral, citronellal, α-terpineol, and linalool were tested on *Aspergillus flavus* CGMCC 3.4408. Then, the effects of citral on the colony growth, the biomass, toxicity, and microstructure of *A. flavus* CGMCC 3.4408 were also investigated. The inhibitory effect of *Litsea cubeba* oil and its active components showed that citral had the best inhibitory effect on *A. flavus* 3.4408 growth. Furthermore, the inhibition of bacterial growth rate, biomass, and AFB1 synthesis showed the good bacteriostatic ability of citral to *A. flavus* strains isolated from moldy Chinese medicinal materials. Therefore, it should be encouraged to use citral as a mildew preventive agent for Chinese medicinal materials. Among fruits, pomegranate is rich in phenolic compounds and has the antioxidant capacity and the potential to inhibit free radicals. Besides its direct consumption as fruit and as juice, it has been tested to prepare cheese to provide a more nutritious and preservative effect. To produce Feta-type cheese with pomegranate juice, replacing part of the milk with pomegranate juice is necessary. The addition of pomegranate juice to the optimal whey-less Feta cheese changed its physicochemical and textural properties. The prepared cheese has better antioxidant properties and oxidative stability; however, its texture was weaker than the control and needed further study. Moreover, pomegranate and its peel waste exhibit excellent antimicrobial activity against several food-borne pathogens and improve the postharvest storability of food products. The high antioxidant activity, inhibition of lipid peroxidation, and broad-spectrum antimicrobial efficiency of pomegranate peel play an intrinsic quality foundation for its development as a food preservative. Cinnamaldehyde (CA) is a major component of cinnamon essential oils extracted from the tree bark. Unlike many other natural compounds, cinnamaldehyde has been used as a potential antifungal agent, but its volatile nature and pungent smell limit its application. To mask this, multiple derivatives of cinnamaldehyde, namely, 4-nitro CA, 4-chloro CA, 4-bromo CA, 4-methyl CA, 4-methoxy CA, and 2,4-dimethoxy CA have been synthesized and tested for their antifungal potential against *Penicillium digitatum*, the major citrus fruit-rotting fungi. Among them, 4-methoxy CA showed the highest antifungal activity against citrus fruit postharvest-rotting fungi *Penicillium digitatum* (green mold). Moreover, 4-methoxy CA reduces the spore germination and growth by damaging the fungal cell membrane and declining the levels of reducing sugars. It appears that 4-methoxy CA is an excellent antifungal agent and can be used for postharvest storage of citrus fruits. Meat and meat products undergo quality loss due to oxymyoglobin and lipid oxidation and microbial growth. These phenomena cause adverse effects on the meat's nutritional, taste, color, and textural properties and thus need a natural preservative to meat. The effect of Shahpouri orange juice on lipid oxidation, color parameters, pH, and sensory properties of stacked and ground meat has been investigated. The incorporation of Shahpouri orange juice in stacked and ground meat decreased lipid oxidation due to antioxidant compounds and prevented decreasing redness. It was also revealed that the addition of Shahpouri orange juice at different levels could improve the sensory properties of meat. Considering these results, Shahpouri orange juice can be used as a natural additive in meat products to improve their quality during chilled storage. Organic acids are also used for the preservation of meat products. They inhibit or delay a wide range of spoilage and pathogenic microorganisms, improve the physicochemical properties of meats, and improve their organoleptic attributes (stability of red color, enhancement of flavour, suppression of rancidity and undesirable off-odor, inhibition of slime formation and gas production, and improvement of tenderness and juiciness). Besides these excellent properties, the use of organic acid for meat preservation is limited due to several factors implicating organic acid/salt characteristics (form, concentration, and antimicrobial activity), meat (type, composition, microbial loads, pH, and A_w), and environmental conditions (temperature, humidity, storage, and packaging). In addition, extensive use of organic acids could result in bacterial adaptation, making some microorganisms acid-tolerant and resistant in other ways, which represent challenges for their use as food preservatives, particularly in meats. Combining organic acids/salts with other control or preservative techniques (e.g., chemical, physical, and biological) needs to be tested based on potent synergistic activities or additional effects that could effectively reduce the challenges and improve the preservation properties and quality of the stored food. The food itself contains many preservative chemicals and identifying such novel natural chemicals is in demand. As such, the bioactive antioxidant peptides from potato protein hydrolysate have been identified. Three prominent peptides, namely, Phe-Tyr, Tyr-Phe-Glu, and Pro-Pro-His-Tyr-Phe, which matched the sequence of patatin and were made up of Phe and Tyr, were identified. Furthermore, the peptide Tyr-Phe-Glu demonstrated higher antioxidant activity against Caco-2 cell oxidation induced by H_2O_2. These identified bioactive peptides could be further used as a biomaterial agent for food preservation. Nonbiodegradable and synthetic polymeric substances are vastly used as food packaging materials that have caused significant environmental concerns. In contrast to synthetic and semisynthetic polymers, fruit polysaccharides are for sure vastly available, cheap in processing costs, nontoxic, biodegradable, and not dangerous to the environment, and these features make them be applied more rather than synthetic agrochemicals. Lastly, *Cordia* species has been investigated for its effects on apple jelly's physicochemical, color, textural, rheological, microstructural, and sensory properties. The results showed that gum cordia had a significant effect on apple jelly's physicochemical properties (ash, protein, phenolic content, degree of esterification, and color). The total phenol content of the sample significantly increased with the addition of gums. The rheological properties showed that a sample containing 75% gum cordia was similar to control and had the highest apparent viscosity, loss moduli (G''), storage moduli (G'), and complex viscosity. Also, the sensory properties showed that a sample containing 75% gum cordia had a high score in texture, taste, appearance, and overall acceptability. These results suggested that gum cordia as a polymer can be successfully employed to formulate jelly and further improve the technofunctional properties of jelly, thus improving the storage properties.

In conclusion, this special issue provides advances in biomaterials research for food preservation, specifically on the identification, synthesis, and applications of biomaterials. Their prospective use in food preservation has the potential to lead towards the production of safer and healthier foods, improve the postharvest quality attributes, and provide a long shelf life. Besides these, the use of biomaterials for food preservation would also limit environmental toxicity by replacing toxic synthetic chemicals.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this special issue.

Acknowledgments

The authors would like to give their sincere thanks to the Editorial Board for inviting them to edit this special issue.

Chunpeng (Craig) Wan
Kannan R. R. Rengasamy
Chuying Chen

References

[1] R. A. Carnevale, W. A. Johnson, C. A. Reed, and A. Post, "Agricultural chemical residues in food: Evaluating the risks," *Agriculture and the Environment*, pp. 227–233, 1991, https://naldc.nal.usda.gov/download/IND20394149/PDF.

[2] F. P. Carvalho, "Pesticides, environment, and food safety," *Food and energy security*, vol. 6, no. 2, pp. 48–60, 2017.

[3] I. Horak, S. Horn, and R. Pieters, "Agrochemicals in freshwater systems and their potential as endocrine disrupting chemicals: a South African context," *Environmental Pollution*, vol. 268, p. 115718, 2021.

[4] İ. Kahramanoğlu, C. Chen, K. R. Rengasamy, and C. Wan, "The safety future of fruit preservation with biomaterials," *Horticulture International Journal*, vol. 4, no. 6, pp. 232–234, 2020.

[5] T. Ghosh, D. Das, and V. Katiyar, "Edible food packaging: targeted biomaterials and synthesis strategies," in *Nanotechnology in Edible Food Packaging*, pp. 25–63, Springer, Singapore, 2021.