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Editorial: Novel tools to improve food quality and shelf life: Advances and future perspectives

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Editorial on the Research Topic
Novel tools to improve food quality and shelf life: Advances and future perspectives

Worldwide, postharvest bio-deterioration of foodstuffs causes a substantial loss of products. Food commodities such as cereals and pulses, fruits and vegetables, dairy, bakery, meat, and seafood have substantial losses during their transit and postharvest. Insect pests, microbial pathogens, and oxidation reactions all contribute to these losses. The food supply chain must be controlled in an efficient manner in order to ensure a safer and sustainable supply of food commodities. Numerous food-preservation approaches have been developed recently to ensure food safety, nutritional value, and sensory attributes (Morales-de la Pena et al., 2019). Further, due to the negative health effects of some synthetic food preservatives, more research has been conducted to identify natural additives that may meet food safety regulations (namely natural antimicrobials, antioxidants, and insecticides). In the food supply chain, mitigation of postharvest diseases and insect pests, contamination of food commodities (by for instance mycotoxins, plant toxins, or pesticides residues) and post-harvest handling are all serious concerns, as these pose major challenges to both growers and processors. Physiological changes after harvest and microbial growth/insect multiplication, as well as a lack of cold storage facilities, all pose serious threats to the production of food commodities. Natural antimicrobials and insecticides are expected to grow in demand due to consumer concerns about commercial antimicrobials and insecticides (Connor et al., 2020). A number of technologies have been used to prevent these losses in recent years by food scientists and microbiologists, including modified/controlled atmospheres, nanoencapsulation, rapid methods for detecting food spoilage and pathogens, and other unconventional techniques such as omics involvements in food quality and safety.

The objectives of the Research Topic on Novel Tools to Improve Food Quality and Shelf Life: Advances and Future Perspectives are: to compile the advances in research toward preventing food spoilage, strengthening the shelf life, and monitoring storage conditions during food commodities preservation. The topic saw a tremendous retort from scholars, with four accepted articles contributed by various twenty-five authors worldwide.

Pucel et al. investigated the role of lactic acid bacteria (LAB), namely *Bifidobacterium longum* and *Lactobacillus helveticus* to enhance the phenolic bioactive compounds-linked T2D benefits in blackberry and pear fruits along with anti-hyperglycemic property relevant α-amylase, α-glucosidase enzyme inhibitory, total antioxidant activity, and anti-hypertensive relevant angiotensin-I-converting enzyme inhibitory activities using *in vitro* assay models. Besides, they reported that fermentation of 100% blackberry with LAB caused complete inhibition of *Helicobacter pylori*. Inhibitory activity against *H. pylori* was observed only with fermentation of 100% blackberry with LAB. They also investigated the biochemical reasons for developing blackberry: pear fruit synergy and beneficial LAB-based fermentation to improve T2D relevant health benefits while at the same time being able to improve or at least maintain quality.

Ankolekar et al. studied the effect of bio-elicitors to enhance the shelf life of apple fruits. Their paper report that dipping treatment of apple fruits with elicitors like water soluble chitosan oligosaccharide and phenol rich oregano extract enhanced antioxidant and anti-diabetic properties after 3 months of storage at 4°C. Further, they found that peel extracts of Cortland apples were rich in chlorogenic acid and quercetin derivatives, while pulp extracts were rich in gallic acids and chlorogenic acids. Therefore, in major apple growing countries these two bio elicitors can be used for preservation of apple fruits as well as for enhancement of its various enzymatic properties. Preservatives of this type can also be used to improve the shelf life and quality of some other fruits and for improving the quality of food targeted to people with type 2 diabetes.

Knowingly, *Streptomyces* is a viable option for the biocontrol of many phytopathogens and has a wide range of biotechnological potential. The potentiality of this bacterium is attributed due to production of several bioactive secondary metabolites and volatile organic compounds. A wide range of *Streptomyces* species have been used for the preservation of food commodities either free or non-encapsulated form. In this view, Pacios-Michelena et al. discussed in their review about multi-field use of this genus and its efficiency against various post-harvest pathogens. In addition to discussing some strategies and products based on *Streptomyces* and their application to the field, this article discusses the problems associated with its use. The summarized literature revealed that there are still gaps to develop novel formulations with the genus *Streptomyces* that could increase the shelf life of food commodities, ensuring their efficacy as a microbial pesticide. They concluded that encapsulation may be an alternative environmentally friendly option against synthetic preservatives.

In recent years, metallic nanoparticles having broad range of antimicrobial properties has gained attention in preservation of food commodities. Kumar et al. described in their review the green synthesis of metallic nanoparticles, physical, and chemical synthesis, their various physical properties and exploration to strengthened the shelf life of foodstuffs, and most importantly, the risk associated with these along with their quality and safety considerations. Metal nanoparticles can be used in developing products with antimicrobial activity, which improves the shelf life of agri-foods. MNPs are primarily used in the packaging industry due to their ability to combine with biopolymers. Various metal nanoparticles have been explored in recent years for use in active food packaging materials. Worldwide, researchers are still debating the method of production and the necessity of risk evaluation.

Research contributions to this topic highlighted the multiple dimensions of food safety and sustainability. Identifying and managing food spoilage agents can be accomplished using non-synthetic chemicals, nanomaterials, active packaging or other recent packaging concepts, decision support systems, as well as reducing mechanical damage, providing alternative food sources, and implementing efficient storage practices on-field. All of these factors contribute to a sustainable and safer food environment for future generations.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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