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Composite Edible Coating: A New Concept for Preservation of Mango

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SUMMARY

Edible coatings is an additional thin protective coating applied on the mango which can be consumed along safely. The current state-of-the-art of coating lies in the formulation of composite edible films and coatings from biomolecules such as carbohydrate, protein, and lipids. Composite films and coatings refer to systems where multiple biopolymers have been combined to achieve beneficial properties. The main objective of this article is to discuss various new and innovative composite materials and techniques developed regarding composite edible coatings for the preservation of mango that could be considered as sustainable.

INTRODUCTION

Mangoes are of great economic importance to the international market, however, a reduction in post-harvest losses represents an enormous challenge. To overcome the drawbacks of simple coatings, composite coatings are developed to achieve a synergistic effect of the combined features of basic components. Composites or Multicomponent films and coatings contain combination of protein, polysaccharides and lipid based material. This is used to enhance and improve mechanical strength, moisture and gas barrier properties of edible coatings and films. According to reviews, thecomposites are divided into following categories as given below:

- Bilayer composites
- Ternary composites
- Quadruple composites
- Conglomerates/ Functional coatings
- Herbal coatings
- Combined with other technology

Bilayer composites

The bilayer composites consist two layers combined with same or different coating materials such as protein/protein, polysaccharides/protein, lipid/lipid, lipid/polysaccharides etc. In this type of coating materials include Sucrose, propylene, monoglycerides, proteins, water, waxes and fatty acids.

Ternary composites

A triple layered film with same or different coating materials such as protein/protein, polysaccharides/protein, lipid/lipid, lipid/polysaccharides etc can be formulated and applied on fruit. For example a terenary film was prepared from glucomannan, chitosan and soy protein isolate using glycerol as the plasticizer. Different physicochemical properties were measured including water vapor permeability, tensile strength, and percentage elongation at break.

Quadruple composites

Quadruple edible films were formulated from polycaprolactone, methylcellulose, polycaprolactone in combination with different antimicrobial compounds such as organic acids, rosmarinic acid, Asian essential oil and Italian essential oil mixture. These films were inserted into containers hosting broccoli and stored at 4˚C for 12 days

Conglomerates/ Functional coatings

Coatings when combined with plasticizers, emulsifiers, surfactants, texture enhancers antioxidants and antimicrobials are known as Conglomerates/ Functional coatings. These components are mixed in solution of edible coatingsfor increasing mechanical properties. These contain low molecular weight and it is mixed with coating material to enhance and change its structural ability. Water is a natural and effective plasticizer. The most common plasticizers added in coatings are Glycerol, fatty acids, Sorbitol, propylene glycol, sucrose polyethylene glycol and monoglycerides. Edible coatings incorporated with essential oils, pure aqueous Aloe vera extracts, etc. have been used since it proves to be an antimicrobial agent. Some examples of texture enhancers are calcium

gluconate, calcium chloride etc. Citric acid, α-tocopherol are the examples of antioxidants. Glycerol monosterate acts as an emulsifier and tween 80 as a surfactant.

Herbal coatings

Herbal edible coating is a new technique for food industry. It is made from herbs or combination of other edible coatings and herbs, most common herbs used in Edible coatings are such as Aloe vera gel, Neem, Lemon grass, Rosemary, Tulsi and Turmeric. Herbs have antimicrobial properties, it consists vitamins, antioxidants and essential minerals.

Combined with other technology

According to a review of published scientific reports over the past five years, the recent advancements in edible coatings such as the combination of an edible coating with irradiation treatment, pulse electric field treatment and nano technology has produced a ground breaking coating with the potential to preserve the physicochemical properties of fruits during storage. One of the most efficient current trends is the use of nanotechnology.In nanotechnology, the bioactive compounds are applied into the edible films and coatings in the form of nanomaterials with a size that ranges between 10 and 100 nm, and having unique characteristics, like large surface area-to-volume ratio, distinct optical behaviour and high mechanical strength, which give them physical and chemical advantages compared to microstructure and macrostructure. Also for climacteric fruits, such as mango, losses have been reported from harvest to fruit consumption. Thus, controlled refrigeration and passive modified atmosphere have been used in combination with edible and biodegradable coatings or plastic packaging to minimise these losses. The application of edible coatings (EC) in combination with pulsed light (PL) treatments represents an emerging approach for extending the shelf life of highly perishable but high value-added products such as mango. The surface of these products would benefit from the protective effects of ECs and the PL decontamination capability.

CONCLUSIONS

The field of edible films and coatings has seen great advancements in recent times. There is a major focus on the development of composite edible films and coatings where multiple biopolymers have been combined. These coating materials should be easily available, eco-friendly, powerful at low concentrations and resistant to chemical and biological damages and present low price of manufacturing.The main concern is to ensure the maintenance of an optimal concentration and activity of these compounds, without occurring their degradation.The effectiveness of a particular composite film or coating depends on the selection of the individual biopolymer and the compatibility between them. These composite coatings prepared from various sources of polysaccharides, proteins, and lipids can also be used as delivery vehicles for the protection and controlled release of a multitude of bioactive compounds including antimicrobials, antioxidants, probiotics and vitamins within different food matrices.

REFRENCES

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