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Edible Coating Materials: To Enhance Shelf Life of Horticultural Crops

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SUMMARY

Low shelf life is the major problem in horticultural crops, which affects consumer preference and marketability. Transpiration process starts after harvesting of horticultural crops from plant, which lead to loss of quality along with shriveling, and ultimately shortens the life of the horticultural crops. Coatings provide an extra protection layer to the fruit and help in increasing shelf life. Edible coatings made with edible materials that act as a barrier to water vapor and gases. These coatings act as the best alternatives to natural coverings by improving external appearance and changing internal atmosphere, which ultimately influences the shelf life. Application of semipermeable coatings reduces moisture loss, respiration, and transpiration, which increases the storage life of the commodity.

INTRODUCTION

A potential awareness among the consumers concerning health aspect has raised consumer's attention towards natural plant extracts, to be used as coating material (Bhat *et al*., 2011). Such kind of post-harvest technology, aims at encompassing storage or shelf life of fruits by using natural plant-products. These edible coatings have drawn substantial attention in recent times as they have lot of advantages over synthetic/chemicals ones. They offer good alternative as they improve external appearance, and adjust the internal atmosphere of fruits. Moreover, such kind of postharvest losses can be lessened by stretching shelf life by checking microbial infection, transpiration and respiration rate and preventing disorganization of cell membranes (Bisen and Pandey, 2008). Such coatings act as decent oxygen and lipid blockade at lower RH because the polymers can efficiently make hydrogen bonds. These coatings also have antimicrobial or antioxidants property that reduces the decay without influencing quality.

Ideal Edible Film should have the Following Characteristics

- Edible coatings have good barrier properties to water, moisture, O_2, CO_2, and ethylene.
- It improves appearance and mechanical handling to maintain structure and colour of fruits and vegetables.
- These coatings provide a protective covering on fruits and vegetables and enhance their shelf life.
- Contain no toxic, allergic and non-digestible components.
- Have good adhesion to surface of food to be protected providing uniform coverage.
- Prevent loss or uptake of components that stabilize aroma, flavour, nutritional and organoleptic characteristics necessary for consumer acceptance while not adversely altering the taste or appearance.
- Provide biochemical and microbial surface stability while protecting against contamination, pest infestation, microbe proliferation, and other types of decay.
- Incorporation of antioxidants and antimicrobial agents can be limited to the surface through use of edible films, thus minimizing cost and intrusive taste.
- Be easily manufactured and economically viable.

Classification of Edible Coatings

Polysaccharides Derived Edible Coatings

Polysaccharide based coatings are highly used edible coatings in fruits and vegetables. These polysaccharides are prepared from various plant species. These coatings have ability to prevent gases exchange, ability to reduce the water loss, and controls ripening and senescence. Crystalline property of some polysaccharides is reason for cross linkage which helps in a better coating. The most commonly used polysaccharide-based coatings include cellulose, chitosan and gums prepared from various plant species.

a. Cellulose Based Edible Films

Cellulose is the polysaccharide produced from plants. Like methylcellulose, hydroxypropyl cellulose, carboxymethyl cellulose, and hydroxypropyl methylcellulose have good film-forming properties. These are usually transparent, tasteless, odorless, flexible, and of moderate strength, water-soluble, resistant to fats and oil, and resistant to oxygen and moisture transmission. The properties of cellulose edible coating affected due to the molecular weight, higher the molecular weight or concentration better are the quality of coating.

b. Starch Based Edible Films

Starch is a complex form of carbohydrate which is made up of long chain of sugar or glucose molecules. Starch is the storage polysaccharide found in legumes, cereals, and tubers vegetables, like potato, cassava, corn, rice, banana etc. It is a good barrier to oxygen transmission but poor to water vapour. It used for coating vegetables and fruits which shows high respiration rates.

c. Gum Based Edible Films

The gums are formulated from polysaccharide. They include exudate gums (gum Arabic), extractive gums (guar and locust bean) and microbial fermentation gums (Gellan and Xanthan).

Pectin Based Edible Films

Pectin is common compound found in plant mainly in fruits and vegetables like Guava, Apple etc. Pectin is a polysaccharide made up of galactouronic acids. Pectin is used as coating because of its thickening property and resistant lipids migration and moisture loss.

Chitosan Based Edible Films

Chitosan is derived from chitin; it is an edible polymer, which is made by treating the chitin shells of shrimp and other crustaceans with an alkaline substance, like sodium hydroxide. It is a natural product which is non-toxic and eco-friendly. Chitosan has an antibacterial and antifungal property which helps in food protection. These films are flexible, tough, high durable and very difficult to tear. Chitosan is easily blend with starch and other essential oils; in different combinations it is helpful in increasing shelf life of fruits and vegetables. Chitosan coating regulate gas exchange, reduce transpiration losses thus delays the ripening, modify the fruit internal atmosphere. Rayees *et al*., (2013) observed that chitosan not only retains firmness but also increases the postharvest quality during cold storage.

Proteins Derived Edible Coatings

Protein based edible coatings are generally combined with plasticizers or other compounds to increase the physical properties of that films. Proteins are used as coating material to avoid the moisture loss and to improve the shelf life of the product. Certain examples include casein, collagen, gelatin, whey protein, egg white protein, keratin, soy protein, wheat gluten, peanut protein, and corn-zein and cotton seed protein.

Algae Derived Edible Coatings

Alginate is a polysaccharide which is naturally derived from brown algae. These algae based edible coatings helps in increasing fruit quality and extending shelf life of the products. Alginate is excellent barrier to moisture, water vapour and oxygen by which it controls respiration.

Applying Methods of Edible Coating

Edible coatings should be applied on fruits and vegetables by different methods. These methods are

- Dipping
- Brushing
- Extrusion
- Spraying
- Solvent casting

The dipping method is used widely for applying edible coatings on fruits and vegetables, in this method Fruits and Vegetables are dipped in coating solution for 5-30 sec. It is easy to apply on mostly fruits. While brushing method gives good result, edible coatings applied on generally, beans and highly perishable horticultural crops. Other three methods spraying, extrusion and solvent castings are also used in food industry.

CONCLUSION

Edible coatings alone or as carriers of useful additives serve many functions for all types of food products. They improve the external and internal quality characteristics of diverse commodities. Coatings can reduce dehydration and oxidation as well as the resulting undesirable changes in color, flavor, and texture. Waxes and other coatings delay ripening and senescence of fresh produce and can increase the microbial stability of lightly processed fruits, vegetables, and some processed products. Coatings show promise as environment-friendly quarantine treatments. Most coating materials are produced from renewable, edible resources and can even be manufactured from waste products that represent disposal problems for other industries. (Valverde *et al*., 2005)

REFERENCES

Bhat, R., A. K. Alias and G. Paliyath. 2011. Essential Oils and Other Plant Extracts as Food Preservatives, Progress in Food Preservation. New Jersey, John Wiley and Sons. 539-580.

Bisen. A and S. K. Pandey. 2008. Effect of postharvest treatment on biochemical composition and organoleptic quality in Kagzi lime fruit during storage. *Journal of Horti Sci*. 3 (1): 53-56.

Rayees Ahmad Shiekh., Maqsood Ahmad Malik., Shaeel Ahmed al-ThabaiTi and Muneer Ahmad Shiekh. 2013. Chitosan as a Novel Edible Coating for Fresh Fruits. *Food Sci. Technol. Res*. 19 (2):139-155

Valero D, Diaz-mula H. M., Zapata, P. J., Guillen, F., Martmez-Romero, D., Casteillo, S., Serrano, M. 2013. Effect of alginate edible coating on preserving fruit quality in four plum cultivars during postharvest storage. *Postharvest biology and tech*. 77:1-6.