

Different Materials Used For Edible Coating, Their Characteristics and Properties

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ABSTRACT

With the constant increment in the population and consumer demand, storage of food and their large shelf life is utmost important. Thus we need such coatings which not only avoid the contamination of the food products but also must not have any adverse impacts on human life. Thus we have the concept of edible coatings. Such coatings prevent food contamination and also decompose on cooking of the food. This paper reviews materials used in the coatings, their properties and characteristics of such coatings.

Keywords: Coating materials, Hydrocolloid, Polysaccharide, Contamination and Shelf life.

INTRODUCTION

Edible coatings are the coating which contains a skinny layer of substance and is formed as a film around, outside or between the food products (Krochta & Mulder, 1997). These coatings have antimicrobial and antioxidant additives. Such coating may be manufactured from a single gum or blends (Wisniewski et al., 2016). The edible covers are well suited for nutraceutical and function as a conveyor of texture emphasize and antioxidants (Montero-Calderón et al., 2008; Raghav et al., 2016). In last few decades, analysis on edible films on eatables is deployed because of the high customer's insistence for greater shelf-life and greater standards of fresh eatables as well as of

eco-friendly package work (Debeaufort et al., 1993; Tharanathan, 2003; Cha and Manjeet, 2004; Siracusa et al., 2008).

Since such coatings depend upon biodegradable and biocompatible materials, they react to market demand for secure and healthy foods, and in many cases may result in a suitable substitute to synthetic packaging and antimicrobial additives (Debeaufort et al., 1998). Edible coatings may prevent food products from microbial and mechanical damages, prevent the escape of probable volatiles, reduce food senescence processes and give them an esthetic appearance (Bourtoom, 2008).

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Natural polymers are mostly used in the manufacturing of these films namely fats, wax, resin, carbohydrates and proteins (Krochta & Mulder, 1997; Kester & Fennema, 1986). A single coating material can barely fulfill such variable requests. There is therefore latest advancement in developing compound edible coatings that has multiple advantages from their various components (Ogonek & Lenart, 2002; Falguera et al., 2011). Edible coatings is an eco friendly technique which is used for several products to regulate the transfer of the moisture, gaseous exchange etc. Hence these coverings are widely acceptable by consumers.

EDIBLE COATING MATERIALS :

Amalgamation of different substances in various proportions in the form of compound films are better with high functionality when compared to the single component coating. The basic materials that are normally used for the processing of consumable coatings are Hydrocolloids such as Lipids, Proteins and Carbohydrates (Li & Barth, 1998; Park et al., 1994; Guilbert et al., 1996; Mahmoud et al., 1992).

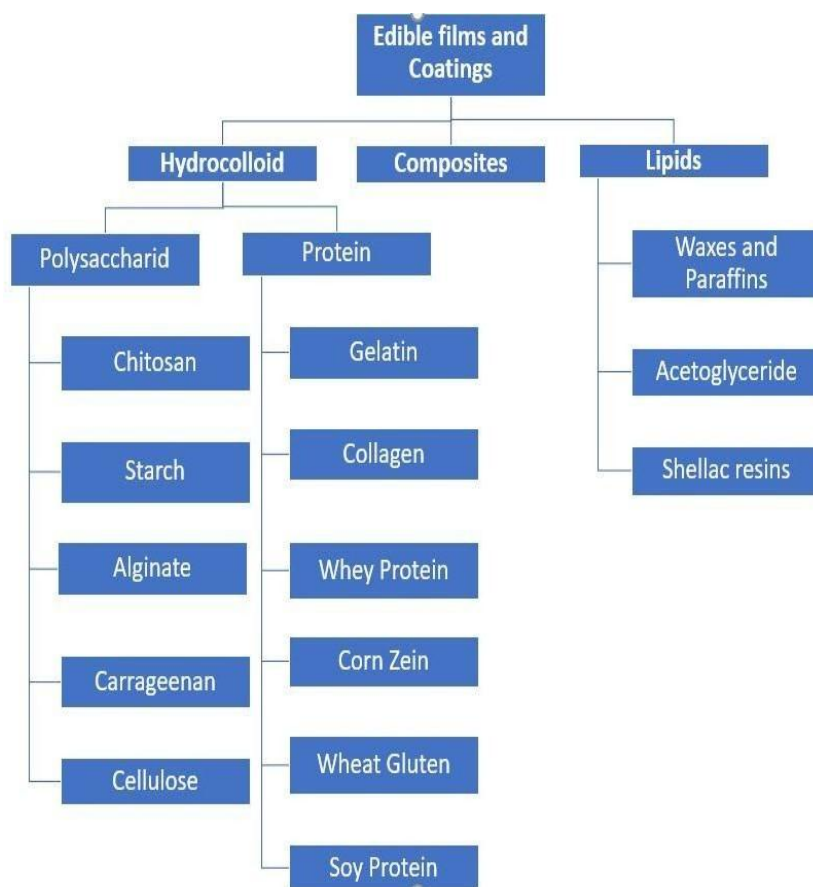


Fig. 1: Categorization of edible coating material
(Paul and Sanjib, 2019)

1. HYDROCOLLOID MATERIALS:

They are generally long chain polymers. These are such kinds of material which are hydrophilic in nature. This means that they are easily dissolved in water. They are obtained from microbes, vegetables and animals (Phillips et al., 2000).

They generally consist of ample number of hydroxyl (-OH) groups. Recent

studies have shown that these are mostly utilized as the prime substance for those solutions which result in the formation of films, to regulate or influence the flavour, enhance colour, durability and suitable texture of food products.

All kinds of hydrocolloids are completely or partially diffused in water and the major purpose of this is to have an

increment in the viscous nature of the aqueous phase i.e., suitable thickening caused by the gelling agent (Baldwin et al., 1995).

Due to their stabilising effect they function as an emulsifying agent. The hydrocolloids are broadly classified as-

◆ **Hydrocolloid based on Polysaccharides**

◆ **Hydrocolloid based on Proteins**

Hydrocolloid based on Polysaccharides: The usual polysaccharides utilized for coating of edible food substances are gellan gum and carrageenan (cold set gels), alginate, chitosan, cellulose, starch, etc (Han, 2014). Because of their inherent property to cause gel formation, high viscous nature and large adhesivity during the production of the coating, and their effectiveness to provide solidity, delicate nature and tightness (compact) to the desired product, these are highly used in the food industries (Baldwin et al., 1995). These coatings may reduce the ripening rate and can provide significant increment in storage life or durability of the edible food materials, generally for such fruits which show ripening even after harvesting (climacteric fruits) without producing anaerobiosis (Arvanitoyannis & Gorris, 1999).

Hydrocolloid based on Proteins: Hydrocolloid based on Proteins generally show similar properties to that of Hydrocolloid based on Polysaccharides films. These properties are magnificent oxygen, suitable smell, and oil resistant properties. Normally, they also have less water vapor resistance because of their hydrophilic characteristics (Baldwin & Baker, 2002).

They are obtained from plants and animals. The coatings which are composed of protein are inherently hydrophilic and thus they do not provide the resistance from the water vapour but they consist of good organoleptic and mechanical properties (Krochta, 2002).

2. COMPOSITE COATINGS:

To remove or eradicate the demerits of sole constituent edible films, we have an idea or

conviction of integrating the distinctive properties of different independent or discrete covering substances in wanted proportions. This concept or technology is named as Composite Coating (Kemper & Fennema, 1984).

3. LIPID COATINGS:

Lipid based coatings are generally preferred for keeping vegetables and fruits. They impart a lustrous and gleaming look to the edible substances. Paraffin, carnauba, beeswax, mineral oil and vegetable oil are mostly involved in lipid based coating materials (Morillon et al., 2002).

There are some demerits of these coatings (Guilbert et al., 1996).

- Poor mechanical strength
- Low structural rigidity
- Inflexibility
- They are generally impenetrable

PROPERTIES OF EDIBLE FILMS

☐ **Mechanical properties:** Young's modulus and Tensile strength are the salient features to analyze various characteristics of such coatings, however for the films these parameters are indeterminate. Various other properties of edible films and coating are directly or indirectly linked with these parameters and characteristics. Conclusively we can say that these properties affect product quality (Paul & Sanjib, 2019).

☐ **Optical properties:** These properties influence some key features such as the esthetics of food. Color, luster and transparent nature are the major optical characteristics of such coatings. These characteristics are properties of the surface which are deduced by the vision of humans. The amount of light reflected by the coating is decided according to the light directly reflected by the air and the food coating interface, which is responsible for the glossy appearance of the eatables (Nikolova et al., 2005; Villalobos et al., 2005; Das et al., 2013).

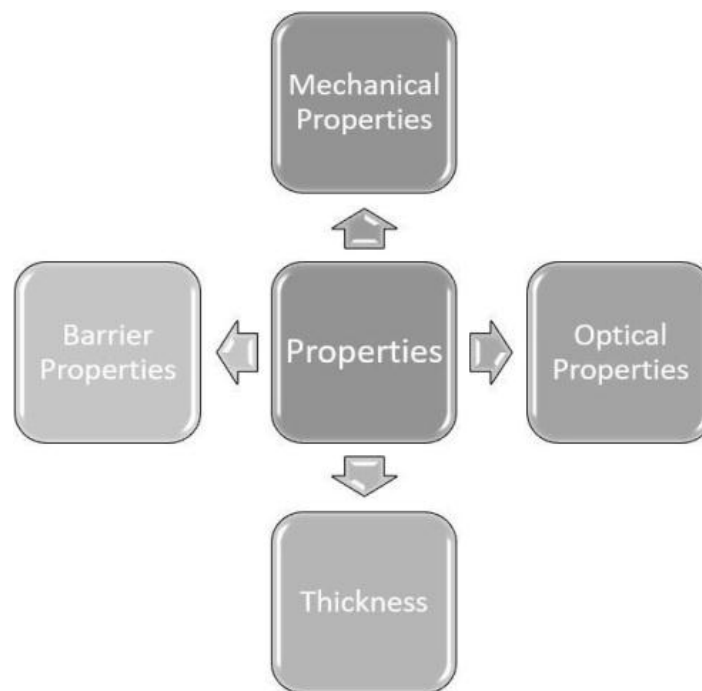


Fig. 2: Features of Edible covering

- ❑ **Thickness:** Suitable thickness of the covering directly influences the biotic characteristics and the longer storage life of the food coatings by affecting absorptivity and transparency. The amount of light scattered by the coating solution.
- ❑ Controls the thickness of the films and the thickness further monitors the efficiency of such films (Paul & Sanjib, 2019).
- ❑ **Barrier properties:** This feature protects the food from the suffusion of gases, aromatic compounds, oil and water. Which are the major parameters for balancing the standard of food items during storage and for longer durability. It also decides the potential value of the covering (Paul et al., 2014; Paul et al., 2018).

CHARACTERISTICS OF EDIBLE FILMS:

- Eatable covering have to be present on the food surfaces while they are stored for a long period of time and when these products are being consumed or cooked the coating should dissolve away

(Longares et al., 2004).

- Substantial features of edible films are (Gontard et al., 1993)
 1. Obstruction to gases, water and other substances
 2. Water soluble and fat soluble
 3. Suitable appearance and color
 4. These films should not be harmful for consumption
- Many coatings have a shortcoming that they may decrease the item's unique characteristics to an unwanted value. The features of these films can be enhanced by incrementing the width or depth of the covering to a suitable degree (Kim & Ustunol, 2001).
- The type of chemical compounds such as plasticizer, and other substances involved in the formation of coatings to stop or decrease the development of unwanted bacterias and some other harmful materials may decrease the effectiveness of the coatings (Gontard et al., 1993).

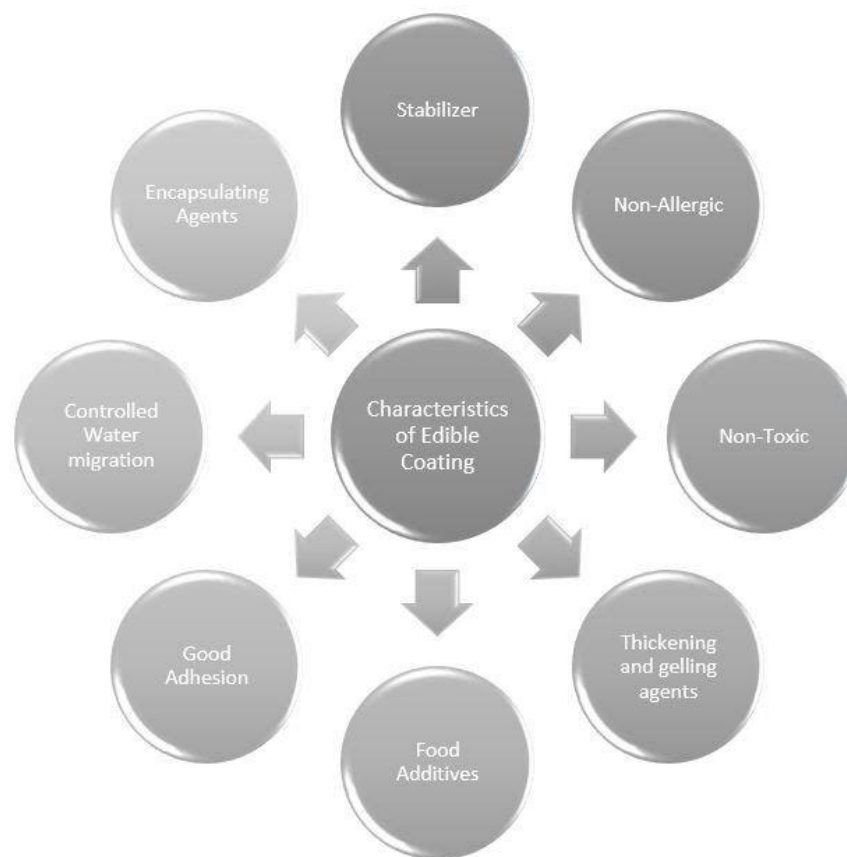


Fig. 3: Characteristics of coating material

HERBAL EDIBLE COATINGS: A NEW CONCEPT

Natural Herbs works as antioxidants, vitamins and minerals which are highly advantageous for human health and perform as a nutraceutical. Various other substances utilized for the development of such coatings are, clove bud oil, mint oil, turmeric and neem extract etc. Nowadays Aloe vera plant gel is extensively been a part of the coating (Chauhan et al., 2014; Martínez-Romero et al., 2006; Nasution et al., 2015). Herbs have antibacterial properties as they consist of essential minerals, antioxidants and vitamins. Herbal edible coating is a recent advancement in the food industry (Douglas et al., 2005).

CONCLUSION

Edible Coating is globally utilized for the prevention of contamination of food products from harmful microorganisms and pathogens. They should be formulated in a manner that they are easily degradable while consumption

and cooking. Generally coating is classified as Hydrocolloid coating, Composite Coating and Lipid based Coatings. These categories can be further classified. These films enhance the storage duration by retarding the ripening rate of the product.

Edible Coating should not contain such chemical constituents which decrease the unique nutrients of the food substances below a desired level. Edible Coating also controls the moisture loss, provides fresh and glossy appearance to the food product. Recent studies and researches in this field have given a rise to the Herbal Edible Coating. Such Coatings are more environmentally friendly and cause less risk to the health of the individual. The field is still unexplored and thus the scientists are analysing and researching the impossible possibilities.

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