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Edible Food Filims and Coatings

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INTRODUCTION

Packaging is defined as a socio-scientific discipline that makes goods available to the end user in the best possible condition Any material used for enrobing (i.e., coating or wrapping) various foods in order to extend the shelf life of the product, which may be eaten with or without food. It is considered edible when the film or coating cannot be removed any further. As part of the respiration process, edible films replace and/or fortify natural layers to prevent moisture loss as well as allow for selective exchange of gases, including oxygen, carbon dioxide, and ethylene. In addition to providing surface sterility, a film or coating can prevent contamination.

What is edible packaging?

Edible packaging: All the materials used should be edible according to the legislation, both in the initial (packaging ingredients) and in the final (packaging) forms. The package is an integral part of the food which can be eaten as part of the whole food product.

Types of edible packaging: Types of edible packaging are described as: coatings and films.

The film-forming solution is considered a coating when it is applied directly to the food (by immersion, spray, brushing, or another method) and is allowed to dry on the food surface to form a thin film, which performs the desired function. Film is a dried film-forming solution that is applied to food products as a self-standing material. In order to be considered a film, the value of thickness should be below 254 gm.

Classification of edible films and coatings

The materials used to produce edible packaging consist of polysaccharides, proteins, and waxes that can form a continuous coating or film.

Polysaccharides based edible packaging: Polysaccharide films are formed by disrupting the interactions between long-chain polymer segments during the coacervation process and creating intermolecular hydrophilic and H-bonds upon evaporation of the solvent to form a film matrix. However, they also provide very little resistance to water migration. Hydrogen-bonded network structure and low solubility provide excellent oxygen barrier properties. The films using polysaccharides may delay in ripening and help in prolonging the shelf life of coated produce. Polysaccharide coating exhibit excellent aroma, oxygen, and oil barrier properties and they provide strength and structural integrity.

Protein-based edible films: The protein-based edible coating also offers excellent mechanical and barrier properties against oil, oxygen and aroma. But they are limited resistance to water vapours. Also, Protein-based edible films can be used inside foods to prevent inter-component deterioration at the interfaces between different layers of components.

Lipids based edible packaging material: Lipid compounds have been utilised as protective wrapping for many years, but since they are not polymers, they do not have a large number of repeating units connected by covalent bonds to form coherent, stand-alone films. Thus, they are fragile and do not generally build cohesive, self-supporting film structures. Lipid coating has excellent barrier properties for water vapour and oxygen. There are some disadvantages of employing lipids in edible packaging materials, such as their waxy taste and texture, greasy surface, and potential rancidity

Use of additives in edible films:

Several materials are incorporated into edible films to enhance structural, mechanical and handling properties or to provide active functions to the coating. The examples are mentioned below;

Plasticisers: Plasticisers are generally added to edible films for enhancement in flexibility and durability.

Emulsifiers: Emulsifiers are essential to attain sufficient surface wet-ability to ensure proper surface coverage and adhesion to the wrapped surface as well as for the formation and stabilization of well-dispersed lipid.

Antimicrobials: One of the significant emerging functions of edible coatings is their use as carriers of antifungal and antimicrobials agents to enhance the shelf life of foods products. Incorporation of both natural and synthetic antimicrobial agents into various edible packaging has been developed as a useful alternative for controlling the growth of microorganisms.

Antioxidants: Antioxidants are added to edible packaging materials to delay the rate of oxidation reactions.

Chitosan: Chitosan's antimicrobial activity is most effective against yeasts and molds, followed by gram-positive bacteria and gram-negative bacteria. Chitosan also chelates trace metals, thus preventing microbial growth and toxin production.

Plant extracts: Essential oil extracts from plants, which exhibit a broad range of biological effects, including antioxidant and antimicrobial activity. e.g., grapefruit seed, cinnamon, all spice, clove, thyme, rosemary, onion, garlic, radish, mustard, horseradish, and oregano.

Bacteriocins: Bacteriocins are protein-containing macromolecules produced by various bacteria and possessing different antibacterial spectra, modes of action, and chemical properties. They are generally heat stable, hypoallergenic, and readily degraded by proteolytic enzymes in the human intestinal tract. e.g., colicins (*Escherichia coli*), lacticin (*Lactococcus lactis*), pediocins (*Pediococcus acidilactici*), and nisin (*Lactococcus lactis*).

Enzyme: Lysozyme and lactoperoxidas are widely studied antimicrobial enzymes isolated from various natural sources, e.g., milk. Lysozyme is less effective against gram-negative bacteria, because of the lipid-based outer membrane over their cell walls.

ROLE AND FUNCTION OF EDIBLE PACKAGING

Edibility and biodegradability: To maintain their edibility and biodegradability, all film components should be made from food-grade ingredients and biodegradable (environmentally safe).

Physical and mechanical protection: The packaging of food can retard product deterioration, retain the beneficial effects of processing, enhance shelf-life, and maintain the quality and safety of food. In doing so, it protects three significant classes of external influences: physical, chemical and biological. Chemical protection reduces compositional changes triggered by environmental impacts such as exposure to gases (typically oxygen, carbon oxide), moisture (gain or loss), or light (visible, infrared, or ultraviolet).

Migration, permeation, and barrier functions: Barrier properties are affected by both material composition and environmental conditions (temperature and relative humidity).

Convenience and quality preservation: Using edible film or coating can prevent food from dehydrating, absorbing moisture, oxidizing, losing aroma, ripening, and microbially spoiling. Furthermore, they contribute to visual quality, flavor carriage, surface smoothness, edible color printing, and other marketing-related factors of quality.

Shelf-life extension and safety enhancement: Food with an increased protective function enhances shelf life and protects it from contamination.

Active substance carriers and controlled release: Films that can be used for food ingredients, agrochemicals, pharmaceuticals, and nutraceuticals. In the form of soluble strips, flexible pouches capsules, microcapsules, and covering on hard particles.

CONCLUSION

The concept of edible packaging material represents a stimulating route for creating new packaging material. Edible films and coating can be produced from materials with film-foaming ability. However potential applications and functions of the films and coatings warrant increased considerations. A good choice of coating formulation is necessary for the durability and maintenance of the coating on the food products.

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