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Edible Packaging: Function and Film Forming Materials

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Introduction

To ensure quality, safety, and to extend the packaged food's shelf life, packaging systems are designed to shield the food from its surroundings. They do this by acting as a physical/mechanical, chemical, and microbiological barrier. When food interacts with its surroundings, acquiring or losing moisture and odour, or taking in oxygen, resulting in oxidative rancidity, the food's quality and average shelf life are reduced (Regalado *et al.,* 2006). By using edible packaging, such as proteins, polysaccharides, lipids and/or resins, and other edible components, generated from various renewable sources, edible packaging is quickly advancing. Such edible packaging materials are naturally biodegradable in composting and other biological recycling processes because they are meant to be consumed alongside food products and as integral parts of them (Janjarasskul and Krocta, 2010).

Function of edible packaging

1. The use of edible packaging can prevent finished food products from losing moisture to the environment.
2. The control of mass transfer between food and the surrounding environment is accomplished by using the application of edible films and coatings.
3. Utilizing edible packaging with low oxygen permeability (OP) helps keep O_2-sensitive foods in good condition and extends their shelf life while using less expensive, no recyclable O_2-barrier polymers.\
4. Barriers to volatile organic compounds stop the migration of extraneous off-flavors into packaged food during storage and distribution as well as the loss of distinctive volatile flavor or aroma.
5. Edible packaging can provide grease resistance to any lipid-containing products.
6. A promising active food packaging feature is edible packaging's capacity to transport and regulate the release of active chemicals.

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7. Structural reinforcement of fragile food products by edible coatings is a means to improve yield, facilitate handling, and protect food product from mechanical damage during the processing, transportation, storage, marketing, and end use.
8. Edible coatings can enhance sensory attributes, including visual quality (e.g., color,glossiness) and tactile features (e.g., surface smoothness, nongreasy/sticky surface).

Fig.1: Figure of edible packaging of kiwi fruit

Film-forming materials

1. **Protein-based edible film**

Peptide bonds connect the amino acid chains that make up proteins to generate their primary structure. It can be described in terms of its native molecular configuration shape, surface polarity, solubility, molecular weight, amino acid content, geometric conformation, and solubility. Proteins are frequently grouped in one of the following two groups: fibrous or globular proteins. Protein-based films have been extensively exploited due to their relative abundance and good film-forming ability, include high nutritional value, as well as have favorable mechanical, gas barrier, and transparency features. Other than that, protein-based films also showed better mechanical properties than polysaccharide and lipid-based films due to their unique structure that provides wider range of functional properties especially exhibiting a high intermolecular binding potential that is able to form a bond at a different position (Kaewprachu *et al.,* 2014).

2. **Polysaccharides based edible film**

Long-chain polymers called polysaccharides are created from repeated mono- or disaccharide units that are connected by glycosidic linkages. H-bonds are important in the creation and properties of films due to the abundance of hydroxyl groups and other hydrophilic moieties in their structure. Due to their availability, affordability, and ease of

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handling, a range of polysaccharides and their derivatives have been investigated for potential use as edible packaging. With a wide variety of coating solution viscosities, polysaccharides have effective film-forming characteristics. Polysaccharide films are effective barriers against oil and lipids and have good mechanical and gas barrier qualities, however they have weak water migration resistance.

3. Lipidsbased edible film

Many edible lipid compounds have been used as coatings to prevent moisture absorption and to provide sparkle. Lipid and resin molecules are not biopolymers, in contrast to other macromolecules. There aren't many repeating units joined by covalent bonds to give them a larger molecular structure. As a result, they are brittle and typically do not form coherent, self-supporting film structures. Lipids and resins have been mixed with edible film-forming materials to create composite films that have a moisture barrier because of their low polarity. Neutral esters of glycerol and fatty acids, including mono-, di-, and triacylglycerides have been used alone or in combination with other edible ingredients to coat food products. The properties, e.g., solubility and resistance to water vapor, of fatty acids and the lipids derived from them are markedly dependent on their physical state, chain length, and degree of saturation.

Regulation

Materials used in formation of edible packaging must be generally recognized as safe (GRAS)for intended use or sanctioned by the United States Food and Drug Administration (FDA) Code of Federal Regulations or the U.S. Pharmacopoeia/National Formulary.

The edible packaging materials and additives must be used in accordance with good manufacturing practice (GMP) (i.e., food grade, prepared and handled as a food ingredient) and within any limitations specified by the FDA.

Conclusion

Since edible packaging materials are naturally biodegradable, they only maintain their protective properties for a fraction of the time of conventional packaging. Therefore, it is necessary to investigate the stability and security of edible packaging under the desired storage/use conditions.

References

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