

The Mechanisms and Role of Edible Coatings in Preserving Fruits

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DESCRIPTION

Fruits are nature's bountiful gifts, packed with essential nutrients and vibrant flavors that enrich our diets and promote overall health. However, the journey from orchard to table can be fraught with challenges, including post-harvest losses, spoilage, and a decline in quality. In recent years, the application of edible coatings to fruits has emerged as a novel solution to extend shelf life, maintain freshness, and enhance the overall appeal of these precious commodities. This article delves into the world of edible coatings, exploring their composition, mechanisms, benefits, and their promising role in revolutionizing the preservation of fruits.

A brief overview of edible coatings

Edible coatings often referred to as "natural" or "biodegradable" coatings are thin layers of edible materials that are applied to the surface of fruits to create a protective barrier. These coatings are designed to mimic the natural peel of the fruit while providing additional benefits that contribute to increased shelf life and quality preservation.

Composition and types of edible coatings

Edible coatings are composed of various materials that can be categorized into different types based on their origin and properties:

Polysaccharide-based coatings: These coatings are derived from natural polysaccharides such as cellulose, chitosan, and pectin. Polysaccharide coatings offer a good balance of water vapor permeability and mechanical strength, which helps regulate moisture levels and minimize the risk of microbial growth.

Protein-based coatings: Coatings made from proteins like gelatin, whey, and soy protein isolate can form strong films that enhance fruit protection and maintain texture.

Lipid-based coatings: Lipid coatings are typically composed of natural lipids or waxes. These coatings provide a hydrophobic barrier that can reduce moisture loss and slow down the ripening process.

Composite coatings: These coatings combine different materials to harness the benefits of each component. For example, a composite coating might incorporate polysaccharides, proteins, and lipids to achieve optimal preservation and quality enhancement.

Mechanisms of edible coatings

The application of edible coatings involves several mechanisms that contribute to the preservation of fruits:

Reduced water loss: Edible coatings create a barrier that helps reduce water loss through the fruit's skin, minimizing dehydration and maintaining freshness.

Gas exchange regulation: The permeability of edible coatings can be controlled to manage the exchange of gases like oxygen and carbon dioxide. This can slow down the respiration rate of fruits, delaying the onset of ripening and senescence.

Microbial growth inhibition: Edible coatings can hinder the growth of spoilage microorganisms by creating a physical barrier and releasing antimicrobial compounds present in the coating material.

Enhanced aesthetic appeal: Coatings can improve the appearance of fruits by creating a glossy finish and preserving their natural color and texture.

Benefits of edible coatings

The adoption of edible coatings in fruit preservation offers a range of benefits:

Extended shelf life: Edible coatings can significantly extend the shelf life of fruits by slowing down the processes of ripening and decay.

Reduced post-harvest losses: By preserving the freshness and quality of fruits, edible coatings contribute to reduced post-harvest losses, which is crucial for addressing global food security challenges.

Environmentally friendly: Edible coatings are often derived from renewable and biodegradable sources, making them a more environmentally friendly alternative to synthetic coatings.

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Minimized chemical use: The use of edible coatings can potentially reduce the need for chemical preservatives and additives that are commonly used in post-harvest treatments.

Enhanced marketability: Fruits with improved appearance, texture, and extended shelf life are more appealing to consumers, leading to increased market demand.

Challenges and future prospects

While edible coatings hold immense promise, there are certain challenges that need to be addressed:

Standardization: The development of standardized coating formulations that work effectively across different types of fruits and environmental conditions is a complex task.

Application techniques: The application of coatings requires appropriate techniques to ensure uniform coverage and adhesion without causing damage to the fruit.

Quality maintenance: Coatings need to strike a delicate balance between preserving fruit quality and allowing for desirable changes during ripening.

Cost considerations: The cost of edible coating materials and application processes may influence their widespread adoption, particularly in regions with limited resources.

CONCLUSION

Edible coatings have emerged as a promising solution for enhancing the preservation, freshness, and quality of fruits. Their ability to extend shelf life, reduce post-harvest losses, and minimize the use of synthetic chemicals aligns with the growing demand for sustainable and eco-friendly food preservation methods. As researchers continue to explore innovative formulations and application techniques, edible coatings have the potential to revolutionize the way we approach fruit preservation, ensuring that these nutritional and flavorful treasures reach our tables in optimal condition.