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Edible coatings and films : a novel strategy for enhancing food shelf life.

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Introduction

In the food industry, increasing the shelf life of perishable products is a significant challenge. Conventional packaging materials such as plastics, while effective in preserving food, contribute to environmental pollution. To address these concerns, edible coatings and films have emerged as an innovative and sustainable alternative. These materials not only extend the freshness of food but also provide an eco-friendly solution to packaging waste [1].

Edible coatings and films are thin layers of edible materials applied directly to food products or used as packaging. Unlike traditional packaging, these coatings are safe for consumption and can enhance food quality by serving as barriers against moisture, gases, and microbial contamination. They are made from natural polymers, including proteins, polysaccharides, lipids, and composite materials, which are often enriched with antimicrobial and antioxidant agents [2].

Proteins such as gelatin, whey protein, and soy protein isolate are commonly used in edible films due to their excellent film-forming abilities and barrier properties. These proteins improve the mechanical strength of films and enhance food stability. Polysaccharides, including cellulose, starch, chitosan, and alginate, are widely utilized for their film-forming capabilities and water resistance. Chitosan, derived from chitin in crustacean shells, is particularly valued for its antimicrobial properties [3].

Lipid-based coatings, such as waxes, fatty acids, and oils, are used primarily to prevent moisture loss and oxygen transfer, making them ideal for fruits, vegetables, and meat products. Combining proteins, polysaccharides, and lipids can enhance the performance of edible coatings by integrating the benefits of each component. These blends improve mechanical strength, water resistance, and functional properties such as antioxidant and antimicrobial effects.

Shelf Life Extension By acting as a protective barrier against external factors such as humidity and oxygen, edible coatings help maintain food freshness, delaying spoilage and microbial growth. Reduction of Synthetic Packaging Since edible coatings replace synthetic materials, they contribute to reducing plastic waste and environmental pollution [4].

Enhanced Food Safety and Quality Many coatings are infused with natural antimicrobial agents such as essential oils and organic acids, preventing the growth of harmful microorganisms. Improved Aesthetic Appeal Coatings can enhance the visual appearance of food products, making them more attractive to consumers. They provide a glossy finish and help maintain color, texture, and flavor. Biodegradability Unlike conventional plastics, edible films decompose naturally, making them an eco-friendly alternative.

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Fruits and Vegetables Coatings delay ripening and prevent dehydration, enhancingthe post-harvest life of produce. Dairy Products Used in cheese and yogurt coatings, these films improve texture and prevent contamination. Meat and Seafood Edible films with antimicrobial agents help reduce oxidation and microbial spoilage. Bakery Products Coatings made from natural waxes prevent staling and moisture loss in bread and pastries [5].

Conclusion

Edible coatings and films represent a novel and sustainable strategy for food preservation. They offer significant benefits in extending shelf life, maintaining food quality, and reducing environmental impact. As research advances, the potential for integrating nanotechnology and bioactive compounds into edible coatings could further revolutionize the food industry, paving the way for safer and more sustainable packaging solutions.

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