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A Review of the Literature on Storage Temperature, Product Requirements, Antioxidant Activity and Coating Performance for Edible Coatings for Fish Preservation

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Introduction

Fish preservation is a critical aspect of food safety and quality management in the seafood industry. The perishable nature of fish, with its high moisture content and rapid microbial activity, necessitates the use of effective preservation techniques. Edible coatings have emerged as a promising strategy to extend the shelf life of fish products by reducing spoilage, improving antioxidant protection, and maintaining the nutritional and sensory qualities of the fish. This article reviews the literature on key factors affecting the performance of edible coatings for fish preservation, focusing on storage temperature, product requirements, antioxidant activity, and the overall coating performance. Edible coatings are thin layers of biopolymers, such as proteins, polysaccharides, or lipids, applied to the surface of food products. These coatings can serve as a barrier to moisture loss, oxidation, microbial contamination, and spoilage, while also maintaining the appearance, texture, and flavor of the food. In the context of fish preservation, edible coatings are used to prolong the freshness of fish by slowing down the deteriorative processes, including oxidation of lipids and proteins, microbial growth, and dehydration [1-3].

Description

Several factors impact the effectiveness of edible coatings in preserving fish. These include the storage temperature, the specific requirements of the fish product (e.g., fat content, moisture, texture), antioxidant properties, and the formulation of the coating itself. Storage temperature plays a pivotal role in the preservation of coated fish products. The shelf life of fish is highly temperature-dependent, with lower temperatures generally slowing down the rate of spoilage. Refrigeration and freezing are common methods used to store fish, but they present different challenges when combined with edible coatings. When fish is stored at refrigeration temperatures, the rate of microbial growth is reduced, and biochemical reactions such as lipid oxidation are slowed down. However, even at these temperatures, the shelf life of fish can be limited to just a few days. Edible coatings help in extending shelf life by providing a barrier to moisture loss and oxygen transmission. For example, edible coatings made from chitosan, alginate, or whey protein have been shown to delay lipid oxidation and preserve the sensory qualities of refrigerated fish. The effectiveness of these coatings is influenced by the moisture content of the fish and the permeability of the coating material. Freezing is another common preservation method, but it can negatively affect the texture and quality of fish due to ice crystal formation within muscle tissues. Edible coatings can act as a protective barrier during freezing by reducing water migration and minimizing ice crystal formation. Coatings formulated with hydrophilic and hydrophobic components, such as cellulose derivatives combined with lipids, have demonstrated success in preventing ice damage and maintaining the texture of fish during frozen storage. However, thawing and refreezing can lead to the degradation of the coating's protective properties, reducing its effectiveness. The fish species being preserved, its fat content, moisture levels, and the desired texture and flavor all influence the type of edible coating used. Fish species such as salmon, mackerel, and tuna, which have higher fat content, are more susceptible to oxidation, while lean fish like cod and haddock may require coatings that protect against dehydration and texture changes [4,5].

Conclusion

Edible coatings are a promising and sustainable approach for extending the shelf life of fish while maintaining its quality. Factors such as storage temperature, fish product characteristics, antioxidant activity, and coating performance all play a critical role in determining the effectiveness of these coatings. Refrigeration and freezing are the primary storage methods for fish, but edible coatings can enhance the preservation of fish products by providing moisture and oxygen barriers, inhibiting oxidation, and offering antimicrobial protection. The antimicrobial properties of edible coatings are also important in fish preservation. Several coatings have been designed to incorporate antimicrobial agents such as essential oils, bacteriocins, or silver nanoparticles to inhibit the growth of spoilage and pathogenic microorganisms. Chitosan, for instance, has demonstrated antimicrobial activity against a wide range of bacteria and fungi, making it an ideal candidate for fish preservation.

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Conflict of Interest

None.

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