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A Comprehensive Review of Storage Temperature, Product Specifications, Antioxidant Properties and Coating Efficiency for Edible Coatings in Fish Preservation

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Introduction

Fish is one of the most widely consumed sources of animal protein globally, offering a rich supply of essential nutrients. However, its perishable nature, coupled with its susceptibility to microbial contamination, oxidation, and spoilage, poses a significant challenge for its preservation. As the demand for fish continues to rise, there is an increasing need to improve preservation techniques that maintain the quality and safety of fish during storage and transportation. One innovative and sustainable approach is the use of edible coatings, which have garnered significant attention for their potential to extend the shelf life of fish products. Edible coatings, typically composed of natural ingredients such as polysaccharides, proteins, lipids, or a combination of these, are applied to fish surfaces to act as a protective barrier against environmental factors that contribute to spoilage. Edible coatings can be particularly beneficial at controlling temperature-related spoilage. Coatings that are applied to fish help to regulate moisture loss, which in turn prevents the fish from drying out and losing its quality during storage. The barrier formed by the coating can reduce the exposure of fish to air, limiting oxygen availability and slowing down the rate of oxidation, which is one of the main causes of off-flavors and discoloration in fish. Oxidation is one of the primary causes of spoilage in fish, leading to rancidity, off-flavors, and the loss of nutritional value [1-3].

Description

Antioxidants play a critical role in mitigating oxidative damage by neutralizing free radicals and preventing the degradation of lipids and other sensitive nutrients in fish. The incorporation of antioxidant compounds into edible coatings is a highly effective strategy to improve the preservation of fish. Common natural antioxidants used in edible coatings include vitamin E, polyphenols, flavonoids, and essential oils from plants like rosemary, thyme, and oregano. These natural antioxidants are incorporated into the coating matrix to offer dual protection: they act on the fish surface to prevent oxidative degradation while simultaneously promoting the quality of the fish during storage. Recent studies have highlighted the effectiveness of coatings with antioxidant properties in maintaining the freshness of fish. For example, coatings containing rosemary extract have been shown to extend the shelf life of fish by reducing lipid oxidation and preserving the overall quality of the product. Similarly, the use of green tea polyphenols has demonstrated promising results in preserving fish by reducing both oxidation and microbial contamination. The inclusion of antioxidants in edible coatings also improves the nutritional profile of the fish. Antioxidant-rich coatings can contribute additional health benefits to consumers, making the fish more appealing from a functional food perspective [4,5].

Conclusion

These films provide an effective moisture barrier and are often combined with antimicrobial agents to enhance their preservation capabilities. Proteins, such as gelatin and whey protein, are also used in coatings due to their film-forming abilities and biocompatibility with food products. One of the challenges with edible coatings is ensuring that they maintain their integrity during storage. The coating must not peel off, crack, or lose its protective qualities over time, especially under fluctuating temperature conditions. The addition of plasticizers, such as glycerol or sorbitol, can improve the flexibility and durability of the coatings, helping them to withstand physical stress during handling and transport. Coating thickness is another important factor in determining performance. A thicker coating may provide better protection against spoilage, but it must not alter the sensory properties of the fish, such as its taste or texture. Studies suggest that optimal coating thickness is crucial for balancing protective effects and maintaining the fish's desirable qualities.

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Conflict of Interest

None.

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