Exploring the use of plant-based ingredients to simulate salmon flavor

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Abstract

With the growing global emphasis on sustainable development, plant-based (PB) proteins have garnered increasing attention as alternatives to animal-derived proteins. Ingredients such as soybean (Glycine max), pea (Pisum sativum), and fava bean (Vicia faba) are widely used in PB meat products due to their high protein content. However, these PB protein sources often carry off-flavors that affect consumer acceptance. While significant technological advancements have been made in the texture and appearance of PB meats, research on flavor and aroma optimization remains limited—particularly in the domain of PB seafood alternatives (PBSA). This study aims to simulate the flavor profile of salmon using PB ingredients. First, volatile compounds from fresh and roasted real salmon were analyzed using Gas Chromatography-Mass Spectrometry (GC-MS), combined with lipidomic analysis. Results indicated that lipids undergo oxidative degradation during roasting, producing aroma compounds associated with roasted and fishy notes. Secondly, the sources of off-flavors in PB proteins were investigated. Gas Chromatography-Olfactometry (GC-O) identified key volatile compounds in pea protein isolate (PPI), primarily saturated aliphatic aldehydes such as pentanal and hexanal, which contribute to grassy, beany, and green off-notes. Finally, a PB formulation was developed to mimic salmon flavor, and its volatile profile was analyzed using Headspace Solid-Phase Microextraction-Gas Chromatography-Mass Spectrometry (HS-SPME-GC-MS), combined with sensory evaluation. The results revealed significant differences in volatile compounds between the simulated PB product and real salmon, suggesting that the combination of docosahexaenoic acid (DHA), free amino acids (FAAs), and betaine in the formulation may require further adjustment. Overall, this study provides a scientific foundation for flavor simulation in PB seafood alternatives and highlights the critical role of lipids and processing conditions in aroma formation.

References

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