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Research on the utilization of fish oil into surimi
and surimi-based products

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[博士]

博士学位論文内容要約
Summary

専攻 Major	Applied Marine Biosciences	氏名 Name	NIU LIQIONG
論文題目 Title	Research on the utilization of fish oil into surimi and surimi-based products (すり身ならびに練り製品への魚油の混合利用に関する研究)		

Emulsified surimi seafood is increasingly popular in the food industry owing to their healthiness functionality, improved water-holding capacity, color, and special textural properties that meet consumer demands. In addition, it is now recognized that improving the emulsifying properties of myofibrillar proteins contributes to the manufacture of high-quality products and the development of novel and nutritious products. The emulsification of fish oil is expected to have a considerable influence on the textural quality and stability of newly formulated surimi-based products.

The main objectives of this research were aim to evaluate the effect of emulsifying fish oil on the texture properties of heat-induced surimi gels by physical, physiological, and psychophysical approaches; to investigate the effect of emulsifying fish oil on the quality changes of frozen surimi gels; to understand the mechanism of emulsification of fish oil on the quality changes of emulsified surimi gels, and the effects of compositions and various emulsification conditions on the physical and rheological properties, and water-holding capacity of emulsified surimi gels; to apply of emulsification fish oil technology in the industry, to fortify the nutritive value and functionality of products, and to minimize the frozen damage to commercial products.

This research focused on the textural properties of emulsified surimi-based products. We modeled emulsified surimi gels by fortifying them with fish oil and determined the correlations among instrumental methods, physiological approaches, and sensory properties of emulsified heat-induced surimi gels. We included evaluation from objective and subjective measurements, analysis from the fields of microstructure, physical properties and human oral processing, and provided a scientific basis for the development of emulsified surimi-based products with preferred texture properties and multiple health functions.

In addition, there was a focus on minimizing the frozen damage and quality deterioration caused by freezing and frozen storage in frozen surimi gels, and improving the manufacture and processing of high-quality, frozen surimi-based products.

It was found that fragment analysis approaches could be highly correlated to evaluate the texture properties of emulsified surimi gels using instrumental methods. The enhanced rheological properties were

consistent with texture changes investigated by instrumental and fragment analysis. The water-holding capacity of heat-induced surimi gels increases with fish oil enrichment, which is in agreement with sensory evaluation results. A similar tendency was obtained among dynamic rheology, mechanical, and fragment analysis on emulsified surimi gels.

Furthermore, the effect of stronger emulsification conditions on the texture properties of emulsified surimi gels is reflected by instrumental results and mastication effort; emulsification of fish oil into surimi has some positive effects on the water-holding capacity of heat-induced surimi gels, both before freezing and after frozen storage.

For application to the commercial products Sasa-kamaboko, it was found that emulsification of fish oil into Sasa-kamaboko significantly ($p < 0.05$) improved the water-holding capacity, whiteness, and breaking strength before freezing and after frozen storage. The above results indicate that emulsification with fish oil, used to fortifying the nutritive value and functionality, is also an effective method to minimize frozen damage of frozen Sasa-kamaboko.