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Physico-chemial Properties of Pacific Whiting Surimi by Acid-Aided Processing

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INTRODUCTION

Conventional surimi processing from white flesh fish, such as Pacific whiting and Alaska Pollock, utilizes only < 25% of the body (Toyoda and others 1992; Park and others 1997). Conventional surimi is refined myofibrillar proteins processed by removing unnecessary foreign materials such as fat, pigment, skin, and water soluble sarcoplasmic proteins. The acid-aided process demonstrated excellent gel forming ability for cod and mackerel with extremely higher yield (Hultin and Kelleher 1999). However, this process possesses a few fundamental questions including the role of sarcoplasmic protein on strength of fish gel, and gelation mechanism in regards to the presence of protease, especially in dealing with Pacific whiting surimi.

The status of proteolytic enzymes and other sarcoplasmic proteins (hemoglobin and myoglobin) is clearly different at two different processing protocols. In conventional process they are removed, while in the acid-aided process they are not removed and stayed with myofibrillar proteins. Therefore, our objectives were to characterize the proteolytic enzymes and to determine physicochemical properties and gel properties of Pacific whiting surimi prepared by acid-aided processing.

MATERIALS AND METHODS

Minced Pacific whiting muscle was homogenized at 1:9 (w/v) ratio with distilled water. The pH of homogenates was adjusted to 2.5 using 2 N HCl. Acid homogenates were centrifuged at 10,000 x g for 20 min. A middle phase obtained, after discarding top layer (fat) and bottom layer (connective tissue, membrane lipids), was adjusted to 5.0 using 2 N NaOH. After dewatering by centrifuging at 10,000 x g for 25 min, sediment was collected and adjust to pH 6.5-6.7 using 2 N NaOH. Cryoprotctants added Operating temperature was controlled under 5C. Gel was prepared as described by Park and others (1994) and cook immediately at 90 C for 15 min. The washing water and acid solution were used as samples for the determination of proteases activities during washing and acid aided processing.

Pellet after centrifugation was treated with 2 vol of 20 mM EDTA solution (pH 7.0) to measure residual enzymes. Activities of athepsin B, L, and H were analyzed using synthetic substrates, Z-Arg-Arg-NMec, Z-Phe-Arg-NMec, and Arg-NMec, respectively, according to the method of the method of Barrett and Kirschke (1981). Ca- and Mg ATPase activities were assayed in 5 mM CaCl2, 100 mM KCl, 20 mM Tris HCl (pH 7.0), 1 mM ATP and in 1 mM MgCl2, 100 mM KCl, 20 mM Tris-maleate (pH 7.0) and 1 mM ATP, respectively. The amount of inorganic phosphate released was measured by the method of Katoh and others (1979). Surface hydrophobicity of actomyosin was determined using hydrophobic fluorescence probe, 1-anilino-8-naphthalene-sulfonate (ANS) (Roura and others 1992). The SH group exposed on the surface of the protein molecule was defined as reactive SH group (R-SH). The R-SH content of actomyosin solution was determined by the method of Ellman (1959). The gel strength was measured by the puncture test using a rheometer (Sun Rheometer, Model CR-100D, Sun Scientific Co., Ltd, Tokyo, Japan) with a spherical plunger (5 mm in dia). A CIE Lab color scale was measured by Park(1994). SDS-PAGE was performed in 5% stacking and 12% polyacrylamide gel using Laemm

RESULTS AND CONCLUSION

The yield of surimi was higher than that of conventional surimi processing. Pacific whiting surimi was insoluble at pH 4-5 and slightly at pH 5-9.5. A sharp increase in solubility occurred at pH > 9.5 and pH < 3.0, reaching a maximum value. Cathespin B and L in acid surimi showed higher activities than conventional surimi, while cathepsin H did not show activities in both surimi. Ca- and Mg-ATPase activity was not detected in acid surimi. Surface hydrophobicity and sulfurhydryl group in acid surimi were lower than those of conventional surimi. Acid surimi processing affected force and deformation by punch test, and decreased whiteness greatly. Myosin heavy chain(MHC) and actin were degraded, and produced one major band below each MHC and actin. The components involved gelation of acid-aided surimi were different from those of conventional surimi.

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