

# Extraction of Protein Isolate from Salmon Frames as well as Properties and Characteristics of Biodegradable Film from Salmon Frame Protein Isolate Incorporated with Squalene

## ABSTRACT

By:

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Protein recovery from salmon frame (SF) via alkaline solubilization process at various extraction conditions including form of SF used (ground and unground), SF:water ratio (1:5, 1:7 and 1:9 w/w) as well as extraction time (30 – 60 min) was investigated. Extraction using ground SF at the SF:water ratio of 1:9 with extraction time of 60 min showed the highest protein recovery ( $p < 0.05$ ). Salmon frame protein isolate (SFPI) was then prepared by means of pH shift method with and without defatting process using isopropanol. SFPI prepared from ground SF sample had higher yield than that from unground SF ( $p < 0.05$ ), regardless of defatting process. However, defatted SFPI possessed significantly decreased lipid content especially that obtained from ground sample, with concomitant increase in protein content. In addition, films fabricated from defatted ground SFPI exhibited considerably less yellow discoloration and low rancidity as indicated by low TBARS value, compared to those prepared from un-defatted SFPI. Incorporation of squalene in the studied range could significantly increase Young's modulus, tensile strength and elongation at break of SFPI films ( $p < 0.05$ ), irrespective of glycerol levels. This suggested that SFPI films incorporated with squalene were simultaneously stronger and tougher than those without squalene. Addition of hydrophobic squalene could increase hydrophobicity and water-vapor barrier ability of SFPI films as indicated by increased water contact angle and decreased water-vapor permeability. Moreover, SFPI films added with squalene possessed lower oxygen permeability, but increased yellowness and opacity. SFPI films containing 30% squalene exhibited lower thermal degradation temperature than did SFPI films without squalene. Fish squalene at appropriate level could effectively enhance the mechanical performance and barrier properties of SFPI-based films.

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**Keywords:** Fish protein isolate, salmon frame, biodegradable film, squalene

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## ABSTRAK

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Hasil ekstraksi protein dari *salmon frame* (SF) dengan proses solubilisasi secara alkali dipengaruhi oleh kondisi ekstraksi yang meliputi bentuk SF (digiling dan tidak digiling), perbandingan SF:air (1:5, 1:7 and 1:9 b/v), dan lama ekstraksi (30-60 menit). Ekstraksi dengan SF yang digiling dengan perbandingan 1:9 selama 60 menit memberikan hasil yang terbaik. Pengaturan pH digunakan dalam pembuatan *Salmon frame protein isolate* (SFPI) melalui proses presipitasi pada titik isoelektrik untuk kedua bentuk SF, digiling dan tidak digiling serta yang dengan dan tanpa proses *defatting* menggunakan isopropanol. SFPI dari SF yang digiling memiliki *yield* yang lebih tinggi dibanding SF yang tidak digiling ( $p < 0.05$ ). Proses *defatting* dapat menurunkan kandungan lipid dalam SFPI secara signifikan, khususnya pada SF yang digiling dan meningkatkan kandungan protein didalamnya. Film yang dibuat dari *defatted* SFPI yang digiling memiliki tingkat warna kuning dan ketengikan yang lebih rendah ditinjau dari nilai TBARS dibanding film dari *un-defatted* SFPI. Penambahan *squalene* dapat meningkatkan *Young's modulus*, *tensile strength*, dan *elongation at break* dari SFPI film ( $p < 0.05$ ). Penambahan *squalene* dengan sifat hidrofobik dapat meningkatkan sifat hidrofobik dan *water vapor permeability* yang dapat dilihat dari naiknya angka *water contact angle* dan menurunnya *water vapor permeability*. Disamping itu, SFPI film yang ditambahkan *squalene* memiliki *oxygen permeability* yang lebih rendah namun memiliki tingkat warna kuning dan kekeruhan yang lebih tinggi. SFPI film yang mengandung 30% *squalene* memiliki suhu *thermal degradation* yang lebih rendah dibandingkan SFPI yang tidak mengandung *squalene*. Selain itu, SF yang merupakan limbah industri cukup baik untuk dijadikan film. *Squalene* dari ikan dengan konsentrasi yang sesuai dapat secara meningkatkan performa mekanis dan sifat barrier dari SFPI film.

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