

# THE EFFECT OF ACETIC ACID ON CHARACTERISTICS OF TUNA FISH SKIN GELATIN

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## Abstract

This research was aimed to study the influence of acetic acid on characteristics of tuna fish skin gelatin. This study were used tuna fish skin which soaked in 1%, 2 % and 3 % CH<sub>3</sub>COOH (acetic acid). Statistical analysis were carried out by one Anova and the mean difference was tested using Duncan's Multiple Range Test. The result showed that acetic acid concentration had significant effect ( $P < 0.01$ ) on the gel strength 20.020 to 20.021g Bloom, yield 12 to 16%, viscosity :2.3 to 3.0 cP and pH value of tuna fish skin gelatin. It was concluded that tuna fish skin gelatin with acetic acid concentration 1%, 2% and 3 % had similar characteristics to the commercial gelatin but the optimum production was obtained from 3 % acetic acid.

Keywords: Tuna fish, skin, gelatin, curing, acetic acid

## 1. Introductions

Indonesia is an Archipelago Country lying between two Oceans the Pasific and the Indian Ocean. It consists of more than 17 000 island and about 70 % of the area is sea. Indonesia in 2009 produced 554 MT (Metric ton) of tuna fish ( Anonimous ,2009). North Sulawesi pass pelagic stream the habitat of tuna and cakalang fish, therefore tuna has always been potential export product for North Sulawesi especially at Bitung. The loin of tuna is from whole tuna after removing the head, tail bones and skin. The skin about 6-7 % is considered as a waste products. Tuna skin is still a waste products that has not been utilized. An approximate analysis of tuna skin observed by the author of this article revealed that tuna skin contain 26,9 % of protein, this relatively high content of protein are nutrient for proteolytic bacteria, which can cause quickly to decompose (as Perisable).

Gelatin is a denaturalized protein that is derived from collagen and is an important functional biopolymer that has a very broad application in many industrial fields. The quality of gelatin depends on its physicochemical properties, rheological properties and manufacturing method. Gelatin has been applied within the food, pharmaceutical, medical, cosmetic and photographic industries because of its unique functional ( Karim and Bath, 2008, Jamilah and Harvinder, 2002). Most gelatins are currently made from beef bone and hide, different species of fish (Gomez-Estaca *et al.*, 2009). Scientists has

been doing many research of gelatin from pigskin (Sompie *et al.*, 2012), from goat skin (Said *et al.*, 2011), and gelatin from chicken legs skin (Ulfah, 2011). To convert insoluble native collagen into gelatin requires pre-treatment to breakdown the non-covalent bonds and disorganize the protein structure, allowing swelling and cleavage of intra and intermolecular bonds to solubilize the collagen. Collagenous material from fish skins is characterized by a low degree of intra and interchain covalent cross-linking, mainly involving lysine and hydroxylysine (Hyl) residues, along with aldehyde derivatives. Gelatin production required a curing step to improve quality of gelatin (Said *et al.*, 2011). Curing materials from the group of acids have been widely applied in gelatin production.

## 2. Materials and Methods

**Material.** Samples were taken from tuna filet industry at Bitung North Sulawesi.

**Preparation of gelatins.** Gelatine was prepared by the acid extraction method ( Said, 2011 and Sompie, 2012). The raw material were soaked at different concentrations of acetic acid solution 1%, 2% and 3% (v/v) for 24 hours. The extraction process were performed on three steps (each step for 3 hours), the first step at 55°C, second step at 60°C and then at 65°C. The extracted gelatin was concentrated at 60°C for 6 hours and it was stored in the refrigerator 5-10°C for 30 minutes, then dried at 60°C for 24-48 hours until the gelatin solid. Gelatin sheets were milled and packaged in vacuum plastic and stored in a desiccator for

analysis.

**Statistical analysis** were carried out by one Anova and the mean difference was tested using Duncan's Multiple Range Test (Steel and Torrie, 1991).

### 3. Results and Discussions

#### Gel strength

The average gel strength of tunaskin gelatin is displayed in Table 1. Statistical analysis showed that the level concentration of acetic acid was significant effect ( $P < 0.01$ ) on tunaskin gelatin. The value of gel strength increase with increasing level of concentration acetic acid solution. Gel strength values was ranged 20 - 22 g Bloom. Arnesen and Gildberg (2002) reported that a high content of hydroxyproline caused the gel strength increased.

#### Yield

Statistical analysis showed that the differences in level of acetic acid concentration had highly significant effect ( $P < 0.01$ ) on yield tunaskin gelatin. It ranged was 12 to 16 %. That it was not different with commercial gelatin 91. 63% (Said *et al.*, 2011). The value of yield increase with increasing level of acetic acid concentration. Gómez-Estaca *et al* (2009) reported that the physical properties of gelatin films depend chiefly on the properties of the raw materials extracted from the different animal species and on the processing conditions of gelatin manufacturing. They also depend on the physical parameters used in film processing, such as temperature and drying time.

#### Viscosity

Statistical analysis indicated that the level of acetic acid gave high significant effect ( $P < 0.01$ ) on tunaskin gelatin. Table 1 showed that the higher concentration of acetic acid had cause decreased viscosity. Ulfah (2011) explained that viscosity is affected by molecular weight and amino acid chain length. Increased concentrations of acetic acid in the gelatin production process can reduce the viscosity, because the curing material has been breaking the peptide bonds of amino acids into short-chain molecule so that its viscosity decrease. Viscosity values from tunaskin gelatin was ranged 2.30 to 3.00 cP. It values is included in the ISO range 2.0 to 7.5 cP (Said *et al.*, 2011).

#### pH Value

The average pH value of tunaskin gelatin is ranged between 4.00 to 4.50. Statistical analysis indicated that concentration of acetic acid had no significant effect ( $P > 0.01$ ) on pH value of tunaskin

gelatin. Conditions in the range of neutral pH values indicate that the process of neutralizing and washing the raw material before the extraction process is running perfectly so that contamination can be minimized. Therefore that the acid tends to produce a low pH value of gelatin (Sompie *et al.*, 2012). The pH value of tunaskin still in the pH range of normal by the standards of GMIA is 4.5 to 6.5 (Said *et al.*, 2011).

### 4. Conclusions

Tuna fish skin gelatin with acetic acid concentration 1%, 2% and 3 % had similar characteristics to the commercial gelatin but the best characteristics was obtained from 3 % acetic acid.

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