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The Effects of Acetic Acid Concentration and Extraction Temperature on Physical and Chemical Properties of Pigskin Gelatin

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Abstract

This research was aimed to study the influence of acetic acid concentration and extraction temperature on physical and chemical properties of pigskin gelatin. The experiment used Completely Randomized Design (CRD) with two factors and three replicates of treatment. The first factor was concentration of acetic acid solution consisted of 3 levels (2, 4 and 6 %). The second factor was extraction temperature consisted of 3 levels (50, 55 and 60 ^{0}C). The result showed that interaction of acetic acid and extraction temperature had no significant effect (P>0.05) on the gel strength, viscocity, protein content and pH value of pigskin gelatin. Pigskin gelatin with acetic acid concentration 2, 4 and 6 % and extraction temperature up to 60^{0}C had similar characteristics to the commercial gelatin. The optimum production was obtained from 4 % acetic acid and temperature 55^{0}C such as gel strength 134.22 g/Bloom; viscocity.7.16 cP; protein content 88.56 % and pH value 5.21.

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Keywords: Pigskin, Gelatin, Extraction temperature, Acetic acid

INTRODUCTION

Gelatin is a hydrocolloid product obtained by hydrolyzing collagen protein found in skin, bone, and connective tissue [14]. Sobral [20] explained that 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. Its functional properties depend on processing conditions as well as the raw material. The quality of gelatin depends on its physichochemical properties, rheological properties and manufacturing method. Gelatin has been applied within the food as a gelling agent, thickener, emulsifier, pharmaceutical, medical, cosmetic and photographic industries because of its uniqe functional [1,7,8,9,11,16,17].

Extraction of gelatin from goat skin has been reported by Said *et al*., [18], gelatin from chicken legs skin [24], pig skin [20], [21], gelatin from fish skin [4], [5], [12] [16], and salmon [3]. The extraction conditions (temperature and time)

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can affect the polypeptide chain length and functional properties of gelatin [10] and concentration of acetic acid solution also affects the amount of soluble collagen extraction process [25]. Acetic acid concentration of 3.5% significantly affect the physical characteristics of skin gelatin chicken legs [24]. The different physical properties of gelatins are related not only to the amino acid composition but also to the relative α-chain, β- or γ- component, and higher molecular weight aggregate contents and to the presence of lower-molecular-weight protein fragments [6]. The process of gelatin production required a curing step to improve quality of gelatin [17]. Curing materials from the group of acids have been widely applied in gelatin production, particularly from the skin and bones of fish [8]. Lee *et al.* [11] mixed pigskin gelatin with gellan to obtain composite film for packing or coating materials. However, effects of alkali process from pigskin was limited information. The aim of the research was aimed to study the effect of concentration acetic acid solution and temperature extraction on physical and chemical properties of pigskin gelatin.

MATERIALS AND METHODS

Materials

Two hundred (200) g pigskin were used as a raw material and acetic acid (CH_3COOH 0.5M) as a curing material.

Preparation of gelatins

The skin used for gelatine extraction were obtained from pig at 7 months. The pigskin were weighed and washed in running water for 5 minutes and continued with the process of neutralization in a solution of HCOOH (pH~7). Pigskin without hair and meat attached cut into small pieces (approximately 2x2 cm). Gelatine was prepared by the acid extraction method [15]. Acetic acid 0.5M concentrations of 2%, 4% and 6% (v/v) were used as a treatments. The raw material were soaked at different concentrations of acetic acid solution 2%, 4% and 6% in accordance with the treatment for 24 hours. After soaked, samples were neutralized to pH 6, weighed and extracted. The extraction process were performed on three steps (each step for 3 hours), the first step at 50^0C, second step at 55^0C and then at 60^0C. Solubilized gelatin was separated from residual skin fragments by filtration through a nylon filter. The extracted gelatin was concentrated at 70^0C for 5 hours and it was stored in the refrigerator 5-10^0C for 30 minutes, and dried at 60^0C for 24-36 hours until the gelatin sheet solid. Gelatin sheets were milled and packaged in vacuum plastic and stored in a desiccator for subsequent process.

Method of Analysis

Gel Strength

Gel strength was determined with a Universal Testing Machine (Zwick/Z.0,5). Gelatin solution 6.67% w/v (6.67 grams to 100 ml distilled water) was heated at 60^0C to dissolve the particles. Solution in the container Ø5 cm and height 6 cm was stored at 5^0C for 16-18 hours. Gelatin was placed at the bootom of the plunger (Ø=13mm). Measurement was conducted at the temperature of 10^0C and the speed 10 mm/min as deep as 4 mm was used as plunger. The value of gel strength (g Bloom) use the formula = 20 + 2,86 x 10^{-3}D, where D = F/G x 980; F = height chart before fracture; G = constant 0.07 [11,13,18]

Viscosity

Viscosity was measured by gelatin powder dissolved in distilled water at a temperature of 40°C with a solution concentration of 6.67%. The values was measured by Stromer Viscosimeter Behlin CSR-10, It was obtained by expressed in centipoise according to the method Gomez.