Effect of Skin Cow Immersion Time in Pineapples Peel Extract Solution on Yield, Viscosity, and Gelatin Color

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ABSTRACT
This research aims to study the effect of immersion time on yield, viscosity, and color of skin cow gelatines. Twenty-four thousand grams of skin cow, twelve thousand grams pineapples peel, and ten thousand two hundred millilitre an aquadest were used in this research. The Experiment method that used in this research was the completely randomized design, as the treatment is immersion time of skin cow in 15% pineapple peel extract (T_1= 2 hours, T_2= 4 hours, T_3= 6 hours). Each treatment was eight replicated. Rendemen (yield), viscosity, and color of gelatine were measured as variables. Data were analysed by variance analysis. The result of the analysis showed that immersion time significant effect on yield and viscosity but no significant effect on the color of gelatine. The average of yield, viscosity, and color of gelatine with 2 hours, 4 hours, and 6 hours immersion time respectively were 2.51 ± 0.07 percent; 2.62 ± 0.10 percent; 2.98 ± 0.04 percent, 2.50 ± 0.19 cP; 2.73 ± 0.15 cP; 3.38 ± 0.17 cP and 66.71 ± 5.15; 68.41 ± 3.73; 70.18 ± 5.83. The conclusion is with 6 hour immersion time would produce gelatines with the best yield and viscosity.

Keywords: *Yield, Viscosity, Gelatine Color, Pineapples Peel, Skin Cow.*

1. INTRODUCTION

Gelatin is a product that converts collagen from the skin or bones using acids or alkalis or enzymatic as a catalyst in the hydrolysis process [1]. Raw skin is divided into two groups, namely the group of hiding derived from large animals such as cattle, buffaloes, horses, known as skin, and the group of skin derived from small animals such as goats, rabbits, and reptiles, known as hiding. The skin from the large animals has more protein content than the hide of small animals [2]. The potential of skin cow as raw material for making gelatin still needs to be studied to provide a touch of added value which is higher than this by product.

Generally, catalysts that are used in the manufacture of gelatin are acids or alkaline from inorganic chemicals, while the use of catalysts from organic materials is still rarely studied. The use of catalysts from organic materials for making gelatin tends to be safer than use catalysts from inorganic chemicals. One of the sources of organic acid catalysts is pineapple. Pineapple fruit, both the edible part of the fruit and its skin, contains bromelain which is a proteolytic enzyme that can break down the triple helical bonds in collagen from bones or skin to be converted into gelatin. Pineapple peel is a waste that is rarely used and thrown away so its use as a catalyst for making gelatin is very appropriate because it does not compete with humans. The quality of gelatin products, especially yield, viscosity, and color, depending on the work of enzymes as a catalyst during the hydrolysis process. The longer catalyst contact with the raw material for making gelatin, the more it affects the yield, viscosity, and color of the gelatin produced.

This research aims to study the effect of immersion time cowskin in pineapple peel solution on the quality gelatines, especially yield, viscosity, and color.

2. MATERIALS AND METHODS

Twenty-four thousand grams of skin cow was used in this research from the slaughterhouse in Purwokerto with slaughtering method according to Islamic law. Twelve thousand grams of pineapple peel are taken from pineapple fruit from a farmer in the Pemalang area.

The Experiment method was used in this research with the design completely randomized design, as the treatment is immersion time of skin cow in 15% pineapple peel extract, namely T_1= 2 hours, T_2= 4 hours, T_3= 6 hours. Each treatment was eight replicated. Yield, viscosity, and color of gelatin were measured as variables. Data were analyzed by variance analysis and to be continued with Turkey test if the treatment significant effect on the variable

2.1 Research Procedures and Data Analysis

2.1.1. Preparation of skin cow

The skin cow was cleaned by using water and then continued to remove the hair by burning it with small fire on the surface of the skin, after that removed the meat and lipid in the skin. Then, the skin was cut into small cubes and finally, the small cubes were rinsed by the water repeatedly until clean.

2.1.2 Preparation of pineapple peel extract

Pineapple peel was cleaned from dirt by using water. Then, the pineapple peel was cut into small pieces. The pieces of peel were put into a blender and followed by grinding for about 3 minutes. Furthermore, the pineapple peel juice of the blended pineapple peel is put into the filter cloth and then squeeze to get the filtrate of pineapple peel. The filtrate was dissolved in distilled water according to the treatment namely 15 percent

2.1.3 Degreasing process

The procedure of gelatin extraction from cowskin was carried out as follows: for each reputation was used 3000 g of the cleaned cowskin, then divided 3 and respectively was immersed in 15 percent pineapple peel solution as long as 2 hours, 4 hours and 6 hours according to the research treatment. Comparison between cowskin with pineapple peel extract is 1: 1 (w/v). Cowskin will be immersed by pineapple peel solution with a temperature of 50^{o}C in the water bath. Cowskin that has been immersed in the pineapple peel solution then separated by filtering using a filter cloth.

2.1.4 Washing Process

At this stage, the cowskin from the degreasing stage then was washed using running water until the washing water pH 6.9 to pH 7 (neutral).

2.1.5. Extraction Process

The extraction process is carried out in 3 stages. Stages 1, 2, and 3 were used temperature and the same time namely 60^{o}C in the water bath for 3 hours. Cowskin that already soft put in Becker glass and added with distilled water with a ratio 1: 2 (w/v) and then extracted in a water bath and filtered. Gelatin solution from the extraction filter of the first, second, and third extraction stages was weighted and put in one container.

2.1.6. Concentration and Drying Process

The gelatin solution from the extraction process was heated at a temperature of 70^{o}C in a water bath and stirred until it becomes a gel [3]. After that gel was oven dried at 60^{o}C for 5 days [4] and then was pounded

2.1.7. The parameter observed

The yield was obtained from the ratio of gelatin dry weight produced with the weight of fresh skin cow [5]. Gelatin viscosity was measured using the method of [6] with modification. Gelatin solution with a concentration of 6.67% was heated on a hot plate to temperature 80° C and stirred until dissolved. A total of 20 g of the solution is measured for its viscosity using a viscometer. Gelatin color was measured using the CR-10 series Color reader using the L (Lightness) value which indicates the brightness level

2.2 Data Analysis

Yield, viscosity, and color data were analysed by analysis of variance to know the effect of the treatment on the parameter observed. If the treatment showed a significant effect, it will be continued to Turkey test at α 0.05 reference.

3. RESULTS AND DISCUSSION

The average and standard deviation of yield, viscosity and color of gelatin from cowskin that was immersed in pineapple peel extract with different immersion time were shown in Table 1.

The results of the analysis variance showed that the different immersion time of skin cow in pineapple peel solutions had a significant effect on yield and viscosity,

Table 1. Average and Standard deviation of Yield, Viscosity and Color of Gelatin from Skin Cow that was Immersed in Pineapple peel Solution with Different Immersion Time

Treatment	Yield (%)	Viscosity (cP)	Color
T_1 (Immersion time 2 hours)	$2.51^a \pm 0.07$	$2.50^a \pm 0.19$	$66.71^a \pm 5.15$
T_2 (Immersion time 4 hours)	$2.62^a \pm 0.10$	$2.73^a \pm 0.15$	$68.41^a \pm 3.73$
T_3 (Immersion time 6 hours)	$2.98^b \pm 0.04$	$3.38^b \pm 0.17$	$70.18^a \pm 5.83$

Note: Different superscripts in the same column showed significant effect (P <0.05)

but no significant effect on the color of gelatine.

3.1 Effect immersion time on yield

Based on Table 1, gelatin production increase with increasing contact time between skin cow and pineapple peel solution as a catalyst. The Turkey test shows that 6 hours of immersing skin cow in a solution of pineapple peel can produce the most gelatin. This showed that the solution from pineapple peel can hydrolyze collagen perfect. Pineapple peel solution containing proteolytic enzymes as a catalyst can break down fiber collagen more, faster and convert collagen fibers into gelatin. According to opinion [7] that the function of a catalyst in making gelatin are to break down the fibers in collagen into gelatin.

The highest increase gelatin products at immersion for 6 hours in a pineapple peel solution, showed that also the pineapple peel solution as a catalyst could break the triple helix bonds present in collagen into simple bonds (gelatin). The hydrolysis rate the sooner tends to increase conversion of collagen to gelatin and it can increase the yield value. According to opinion [8] if the hydrolysis rate is getting bigger so splitting the triple helix into α, β and γ chains is also bigger and leads to gelatin conversion a lot.

3.2. Effect immersion time on viscosity

Viscosity analysis was done to determine the level of viscosity of gelatin as a solution at certain concentrations and temperatures [9]. The average value of viscosity in this research increases with increasing immersion time. The longer immersion, the higher its viscosity. Based on the Turkey test, it was found that the immersion time which produced the highest viscosity was 6 hours immersion. It means that the longer contact time of the pineapple peel solution with cowskin so enzyme from pineapple peel will hydrolyze a lot the bonds in the cowskin collagen into smaller pieces and it still include a good viscosity. The viscosity of gelatin in this research (Table 1) has met the standards determined by [10] (SNI 01-3735-1995) and [1] namely 1.5 - 7 cP and this research is still higher than the viscosity of gelatin from a beef hide that was soaked in hydrogen chloride acid at 3% and 5%, which showed the maximum viscosity of 1.79 cP [2]. According to [11] stated that the greater viscosity value, the higher it's quality.

3.3. Effect immersion time on color

Color of gelatine (Table 1) that made by different immersion time in pineapple peel solution resulted not significantly different, but the color of gelatine tends to be whiter with the longer immersion. This is in accordance with [13] and [14] who studied making gelatine using bones, the longer contact time of bones with immersion solution resulted in whiter gelatine because the compounds that caused the darker gelatine were dissolved in immerse solution and lost during washing process before extraction. Furthermore [1] stated that color does not influence the properties of gelatine or reduce its functions.

4. CONCLUSION

Based on the research could be concluded that immersion time cowskin in pineapple peel solution as long as 6 hours would produce gelatine with the best yield and viscosity.

AUTHORS' CONTRIBUTIONS

R.Singgih Sugeng Santosa compiled the research ideas, designed the main framework, and composed the manuscript. Arif Prashadi Santosa conducted the statistical analysis, review, and revised the manuscript from errors.

ACKNOWLEDGMENTS

The authors thank the head of institutional research and developing applied technology Purwokerto that have been fund support for this research.

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