



## Amino Acid Profile on Shank Skin of Livestock and Antibacterial Potential Study



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### Abstract

The objective of this study is to identify amino acids in the skin character shank of livestock i.e. broiler chicken, cattle and goat which has been hydrolyzed to gelatin. Besides that, also to observe morphology gelatin product with the approach of Scanning Electron Microscope (SEM) and identify potential gelatin-based on livestock against shank skin as the antibacterial ability on the type of *Salmonella typhii*, *Escherichia coli* and *Staphylococcus aureus*. The results showed that the gelatin of the broiler chicken, cattle and goat were dominated by a kind of essential amino acid histidine and arginine. While the type of non-essential amino acids was dominated by glutamic and serine. Morphology analysis of the surface of gelatin with SEM approach showed that the surface structure of the gelatin molecule extraction chicken shank skin was more smooth and flat. While at the shank of the extracted skin of cattle and goat were still many bundles detectable binding collagen protein extracted was not perfect. Potential skin gelatin of various livestock shank was conducted testing of potential antibacterial. The results showed that the gelatin of the broiler chicken, cattle and goat had no ability as pathogen antibacterial against *Salmonella typhii*, *Escherichia coli* and *Staphylococcus aureus*. The conclusion of the study that the dominant gelatin amino acid profile is detected the essential amino acid histidine and arginine as well as types of non-essential amino acid glutamic acid and serine type. Gelatin morphology analysis with SEM approach is going on a smooth surface on the broiler chicken. Gelatin test results on the ability of pathogenic bacteria inhibition showed negative results (not found inhibitory zone).

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**1. Introduction**

Shank skin of livestock are by product of their slaughter and during years their potentiality is not used maximally yet. For example, shank skin of broiler chicken, goat, and cattle where all their histology structure is *sesame*, compose of *epidermis* and corium. This corium is the main component of the skin particularly on livestock shank skin and dominated by collagen protein (Brown *et al.*, 1977), although in different percentage (Miwada & Simpen, 2014). Djoyowidagdo (1988) said that the older the animals, their skin composition particularly collagen protein and fat concentrations are higher, but their ash concentration is getting lower. Soeparno (1998) said that amount and collagen physical strengthen can increase as the increases of animal age. Swatland (1984) explained that diameter collagen fiber is 1 – 12  $\mu\text{m}$ , but parallel fibril connection that composes it is 20 – 100 nm. Furthermore, it is said that growth rate of collagen fiber is getting decreases until a certain constant age is richer. Sarkar (1995) reported that collagen small animal is about 30 – 33% (dry weight/dw), calf skin (84% dw), steers (87.2% dw) and bulls (91.1% dw).

During years, there is no any study about protein potential on livestock shank skin of Broiler chicken, cattle and goat particularly about profile amino acid that compose protein on animal shank skin which was hydrolyzed become gelatin product. This study is important due to the potential of collagen protein hydrolysis become *gellatin* is a potential product which is determined by its amino acid compositor. Miwada *et al.*, (2015) explained that advantages of livestock shank skin are as *gellatin* and its uses as *adible* to increase the extra value of this by product. This matter is supported by Apriantono (2003) that gelatin can be made from materials rich in collagen i.e. skin. Furthermore, he said that the advantages of gelatin are very flexible, can be functioned as material content of drug capsule, emulsion, binder, depositor, to increase nutritive value and to form an elastic thin layer and also to form transparent film layer, strong and high digestibility. The objective of the study is to identify the character of amino acid on shank skin of Broiler chicken, cattle and goat which were hydrolyzed became gelatin. Besides that, it is also observed the morphology of gelatin product that was resulted with SEM approach and identify gelatin potential base on livestock shank skin to their ability as an antibacterial on Salmonella typhii, Escherichia coli and Staphylococcus aureus.

**2. Materials and Methods***Materials*

The main materials used in this study were shanked skin of broiler chicken, shank skin of goat and shank skin of cattle for 1 kg each. Chemicals matter were including acetic acid (1.5%), ethanol, buffer pH 4.00, 7.00, 9.00 and distilled water. Test matter of microbiology including gelatin nutrient, PDA and others were deionized water, ordinary filter paper, Whatman 42 filter paper.

*Method*

The first step of study implementation is started with made 1.5% concentration of the acetic acid solution. Furthermore, shank skin of Broiler chicken, goat, and cattle that were provided with a method of conventional skinned and protein hydrolysis of livestock shank skin with Miwada & Simpen modification methods (2007 and 2013) including steps of curing with 1.5% concentration acetic acid with 1: 8 ratio. Curing was conducted for 3 days, then it was continued with minimalized of fat content with using 65% ethanol solution (gelatine: ethanol ratio i.e. 1: 2) soaked for 1 hour. The result of fat minimalization was continued with extraction i.e. additional of water distillation (1: 1 ratio) then *morm* up performed in a water bath at a temperature of 61°C – 65°C for 1 hour, then continued for washing up, filtering, evaporating of extract solution for congealing gelatin product that was obtained. Gelatin characteristic examination of different skin matter was performed through HPLC method, gelatin

morphology observation (with SEM approach) and obstruct ability test to *Salmonella typhii*, *Escherichia coli*, and *Staphylococcus aureus*.

### 3. Results and Discussions

Activities of the study were begun with profile determination of amino acid in gelatin of some livestock shank skin production. This production process was performed with [Miwada & Simpen methods \(2007 and 2013\)](#) with a little modification. The result of dry gelatin production, in this case, their amino acids were examined with HPLC method each. Description of each amino acid in every gelatin of livestock shank skin is presented as follows.

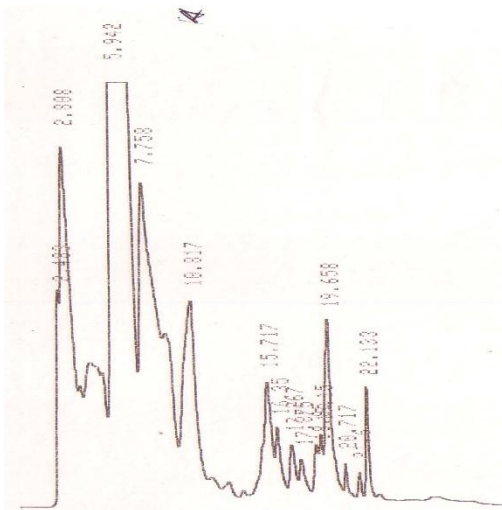


Figure 1. Amino Acid Profile of Broiler Chicken Shank Skin Gelatin

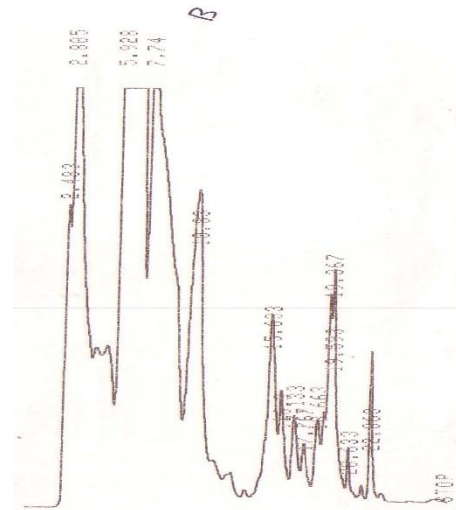


Figure 2. Amino Acid Profile of Cattle Shank Skin Gelatin Acid

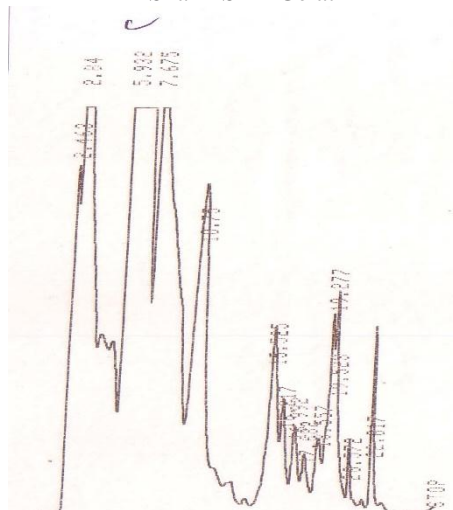


Figure 3. Amino Acid Profile of Goat Shank Skin Gelatin Acid

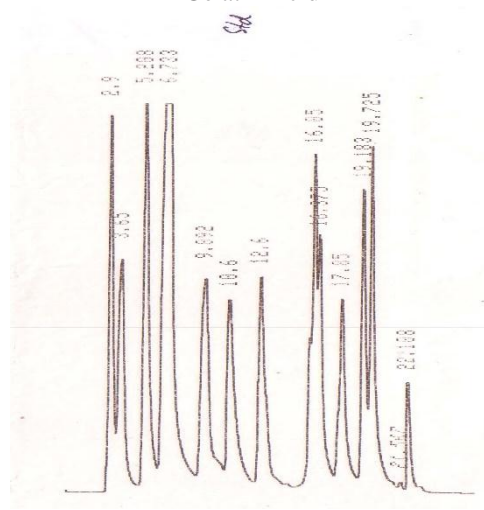


Figure 4. Standard of Amino Acid Profile

Quantitatively, amino acid component figure in gelatin of various livestock shank skin can be presented in Table 1 as follows.

Table 1  
Profile of Gelatin Amino Acid of Various Livestock Shank Skin

Number	Amino Acid	Various Livestock Shank skin			References Schrieber and Gareis (2007)
		Gelatin of Broiler Chicken Shank Skin	Gelatin of Cattle Shank Skin	Gelatin of Goat shank Skin	
1	Aspartic Acid	3.018	3.038	3.668	2.900
2	Glutamic	10.169	10.796	11.782	4.800
3	Serine	9.470	9.604	9.903	3.500
4	Histidine	11.185	11.553	11.775	0.400
5	Glycine	2.754	3.019	3.205	33.000
6	Threonine	6.353	6.777	6.947	1.800
7	Arginine	6.094	6.508	6.815	4.900
8	Alanine	1.387	1.359	1.450	11.200
9	Tyrosine	1.486	1.682	1.801	0.260
10	Methionine	1.205	1.471	1.545	0.360
11	Valine	1.553	1.498	1.492	2.600
12	Phenylalanine	1.111	1.111	1.165	1.400
13	Isoleusine	3.114	3.156	2.871	1.00
14	Leucine	12.554	11.472	12.351	-
15	Lysine	7.516	7.336	7.117	2.700

Results of the study showed that gelatin of the *ssb*, *ssc* and *ssg* were dominated by essential amino acid i.e. histidine and arginine. On the other hand that non-essential amino acid was dominated by glutamic and serine. Pearson & Dutson (1992) reported that at curing process, change happen as result of skin collagen protein and some certain amino acids denaturation changed chemically. But, an interesting matter that found in this study (Table 1), essential and non-essential amino acids detected same high on the broiler chicken, cattle and goat compare to references of (Cshrieber & Gareis, 2007).

Morphology analysis of gelatin surface as result of extraction with acetic acid (1.5% concentration) was studied for 3 days through SEM approach. Results of analysis can be seen in Figure 1 completely. Base on SEM test showed that gelatin molecule surface structure of shank skin Broiler chicken extract is softer and *flate*. But, on shank skin cattle extraction, there is still many bundles of collagen protein detected not extracted completely. Collagen protein extraction of goat shank skin in Figure 1 tends more vicious, and even it is soaked in 1.5% acetic acid concentration for 3 days it still not is able to rich maximum amount of gelatin from shank skin of goat for extracting completely. Result of gelatin surface analysis on shank skin of livestock with SEM approach and this also support by Miwada *et al.*, (2015) that livestock shank skin extract with acetic acid curing method (1.5%) for 3 days resulted in the highest gelatin extraction volume of collagen protein on Broiler chicken shank skin then followed by cattle and goat respectively.

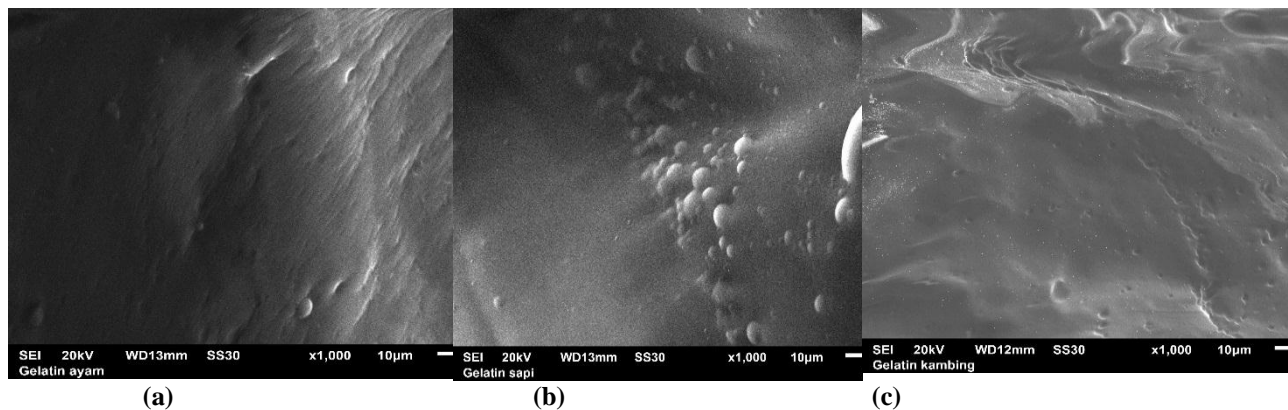


Figure 1. Scanning Electron Microscope Gelatin of The Broiler Chicken Shank Skin (a), Cattle (b) and Goat (c) with 1000 Times Magnificence

Gelatin potential of various livestock shank skin was tested to their anti bacteria potential. The result of the study showed that gelatin of shank skin of the broiler chicken shank, cattle and goat were had no ability as pathogen antibacterial to *Salmonella typhii*, *Escherichia coli*, and *Staphylococcus aureus*. Those approved by [Miwada & Simpen \(2014\)](#) that bacteria and total colly from *Meatballs* are still high during their preserves in natural packed (edible coating) of this gelatin type and as an indication that there is no potency to pursue bacteria growth rate.

#### 4. Conclusion

The result of the study showed that dominant profile of amino acid detected on gelatin of shank skin of Broiler chicken, cattle and goat were essential amino acid i.e. histidine and arginine and non-essential amino acid i.e. glutamic and serine. The result of gelatin morphology analysis with SEM approach produced a soft surface on the gelatin of broiler chicken shank skin. While gelatin of the cattle shank skin was seen no extracted completely yet, and the gelatin of goat shank skin was seen more viscous. The result of gelatin test to pursue ability of pathogen bacteria showed negative (no pursue zone).

#### *Conflict of interest statement and funding sources*

The author(s) declared that (s)he/they have no competing interest. The study was financed by Udayana University and *Dirjen Dikti*.

#### *Statement of authorship*

The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

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