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RESEARCH ARTICLE

THE EFFECT OF CONCENTRATION AND DURATION OF SOAKING ONION EXTRACT OF BATAK (Allium chinense G. Don) ON THE QUALITY OF LAMB MEAT

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Abstract

This study aims to determine the effect of the concentration of Batak onion extract (A. chinense G. Don) and storage time on the quality, quality and concentration of the best Batak onion extract in lamb. The samples used in this study were Batak onions (A. chinense G. Don) and lamb. This study used an experimental method with a factorial completely randomized design with a 4 x 4 x 2 pattern. Factor A was the concentration of Batak onion extract (BOE), namely A0: without treatment, A1: 10%, A2: 20% and A3: 30%, while factor B is the length of immersion, namely B0: 0 hours, B1: 1 hour, B2: 2 hours and B3: 3 hours. Parameters observed in this study were water content, pH value, cooking loss and total bacterial colonies of lamb. The results obtained in this study showed that the analysis of variance for each variable was very significantly different ($P<0.01$) so it was continued using the Duncan Multiple Range's Test (DMRT) further test. Further test results showed a significant interaction ($P<0.05$) between Batak onion extract and soaking time on the observed parameters. The best values of water content, pH and total colony were in treatment A2B1 with a value of 76.92%, 6.9 and A2B1 6 x 103 CFU/g, while the best cooking loss value was in treatment A3B2 with a value of 48.4%.

Introduction:-

Foodstuffs are materials that can be consumed by the community and can provide good nutrition for consumers. Foodstuffs consist of plant and animal foods. Vegetable food is a source of protein, fat, fiber, vitamins, minerals or amino acids, as is the case with animal foods. These foodstuffs are food ingredients obtained from healthy livestock and suitable for consumption such as milk, eggs or meat.

Meat is one of the animal foods that have high nutritional value, especially protein and amino acids. In addition, the nutrients contained in meat is water. Due to the complex content of nutrients, this animal product is very easily damaged, especially by bacteria. Bacteria are the contaminants that most often contaminate livestock products, thereby reducing the nutritional value contained therein. In addition, storage also greatly affects the quality and durability of livestock products.

Livestock products such as milk and meat have a very short shelf life, especially when stored at room temperature. This storage method also greatly affects the growth of microorganisms in the product. Storage of livestock products

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is usually done by storing at low temperatures such as refrigerators or freezers. In addition, to extend the shelf life can also be done with preservation.

Preservation is an action taken to extend the shelf life such as salting, smoking, processing, cooling or by using natural and synthetic ingredients. The preservation process can be carried out using antimicrobial or antioxidant substances that aim to inhibit the growth of microorganisms so as to minimize product damage. One of the natural ingredients that can be used is Batak onion (Allium chinense G. Don).

Batak onion (A. chinense G. Don) is one of the endemic plants in North Sumatra Province. This plant is usually used by the community as a spice for several types of cuisine. This plant has good antioxidant and antimicrobial content [1] and [2] regarding antimicrobial activity that can inhibit the growth of several types of microbes such as Eschericia coli, Staphylococcus aureus, Salmonella thypii. and others.The ability of Batak onion (A. chinense G. Don) to inhibit the growth of microorganisms can be used as a basis for use as a natural preservative for food, especially animal products which tend to have high water and protein content, such as meat.

Material and Methods:-

Extraction of Batak Onion (A. chinense G. Don) (Modification of [1])

Batak onion bulbs (A. chinense G. Don) were cleaned of dirt and adhering to clean. The tubers were sliced to a thickness of ± 5 mm, then dried in an oven at 50^{o}C for 6 hours to obtain a constant final weight. Batak onion tubers that have been dried are then mashed using a blender and filtered until they become powder (simplicia). Simplicia was extracted by maceration method using 70% ethanol (v/v) and distilled water for 3 days at room temperature. Then filtered and concentrated with a vacuum rotary evaporator at a temperature of 60^{o}C. The extract is ready to be used as a soaking treatment with fresh meat.

Soaking Fresh Meat with Batak Onion Extract (A. chinense G. Don)

After the extract was obtained, it was diluted using distilled water in a ratio of 1:10 according to the treatment that had been determined. Fresh meat is washed using running water until there is no dirt on the surface of the meat. The meat is separated according to the treatment (4x4x2) on PE plastic. Next, the extract solution was put into plastic and homogenized. After that, the meat was allowed to stand for 0 hours, 1 hour, 2 hours and 3 hours (factor B) at room temperature. After that, the observed variables were analyzed in the laboratory.

Statistical Analysis

Completely randomized factorial design (CRFD) was used in this study with 2 factors (A: concentration of Batak Onion Extract, B: Duration of Soaking) and 2 replications. ANOVA was used to analyzed the data and if were significan effect of treatments continued by DMRT.

Results:-

The water content, pH value, cooking loss and total bacterial colonies of lamb meat by soaking using Batak onion extract (Allium chinense G. Don) is shown in Table 1, 2, 3 and 4 below.

Table 1:- The Water Content of Lamb Meat (%).

A (Concenration)	B (Duration of Soaking)			
	B0	B1	B2	B3
A0	78,15^{b}	77,43^{b}	77,53^{d}	75,81^{c}
A1	78,49^{a}	79,62^{b}	77,94^{b}	76,94^{b}
A2	77,00^{b}	76,92^{b}	77,87^{b}	78,63^{b}
A3	77,20^{b}	77,52^{b}	77,82^{b}	78,03^{b}

Table 2:- pH Value of Lamb Meat.

A (Concentration)	B (Duration of Soaking)			
	B0	B1	B2	B3
A0	7,6^{a}	7,1^{c}	7,1^{c}	7,0^{d}
A1	6,8^{f}	7,0^{d}	6,9^{e}	6,7^{g}
A2	7,5^{b}	6,9^{e}	6,8^{f}	6,7^{g}
A3	6,8^{f}	7,1^{c}	6,6^{f}	6,6^{g}

Table 3:- Cooking Loss of Lamb Meat (%).

A (Konsentrasi BOE)	B (Lama Perendaman)			
	B0	B1	B2	B3
A0	$58,8^{m}$	$55,9^{j}$	$54,7^{f}$	$55,4^{i}$
A1	$56,7^{k}$	$48,0^{b}$	$53,2^{d}$	$55,3^{h}$
A2	$58,0^{l}$	$55,9^{j}$	$53,2^{f}$	$55,3^{h}$
A3	$54,3^{e}$	$53,1^{a}$	$48,4^{c}$	$54,8^{g}$

Table 4:- Total Bacterial Colonies (10^3 CFU/g).

A (Konsentrasi BOE)	B (Lama Perendaman)			
	B0	B1	B2	B3
A0	31^{f}	81^{c}	100^{b}	120^{a}
A1	26^{g}	16^{i}	18^{h}	32^{e}
A2	20^{h}	6^{k}	19^{h}	20^{h}
A3	18^{h}	12^{j}	34^{d}	34^{d}

Discussion:-

Water content

The results showed that the interaction between BOE and soaking time had an inverse relationship, namely the more the amount of Batak onion extract (BOE) added, the lower the water content of the lamb, while the longer the sample soaked in BOE, the water content increased compared to the control. . This is due to the water content in Batak onions reaching >10%. In accordance with the results of [3] research which found the water content of Batak onions was 12.72%. Based on the results obtained, it can be seen that the longer the product is immersed in BOE, the higher the water content will be. This is in line with the research of [4] which got the same result, namely the longer the storage of meat in garlic extract, the rate of increase in water content in the sample increased. The rate of application of the control moisture content was higher than the rate of increase in the water content of the meat given garlic extract.

In addition, the amount of water content in a product is also influenced by the condition of the livestock. In accordance with the opinion of [5] that the water content decreases with increasing age of livestock, on the contrary the fat content tends to increase until the maturity stage is reached. The water content of meat reaches 75% in the body of livestock, also influenced by the treatment of livestock. If the transportation is not good (rough), it will affect the water and glycogen content. Reinforced [6] that meat has carbohydrates in the form of glycogen in small amounts. Microbes will break down carbohydrates with large molecules such as polysaccharides into glucose (monosaccharides) or maltose (disaccharides). Monosaccharides in the glycolysis process will be converted into pyruvic acid, then converted into tricarboxylic acid in the Krebs cycle and finally split into CO_2 and H_2O, so that the water content increases.

pH Value

The results show that the interaction between BOE and soaking time has a perpendicular relationship, namely the more the amount of Batak onion extract (BOE) added, the pH value will decrease, while the longer the sample is immersed in BOE, the pH value will also decrease. This was due to the decrease in the water content of the sample, resulting in increased water holding capacity and the extract used had acidic properties. In accordance with the opinion of [7] that marinating meat in an acid-type phosphate salt solution causes the pH value to decrease, resulting in a decrease in water holding capacity and yield. In line with [8] which stated that the increase in taste and tenderness of meat due to the marinating process was caused by a decrease in pH and an increase in water holding capacity.

The results obtained are different from those of [9] which showed a decrease in the pH value of beef marinated in garlic juice from a pH value of 6.31 to 6.54 with a marinating time of 5-20 minutes. Meanwhile, the results of this study are the same as [10], namely the longer the marinade time causes the water holding capacity to increase and the pH value of the meat samples marinated using theobromine decreases. This is in line with [11] who stated that a lack of muscle glycogen in livestock can cause a limited and slow post-mortem glycolysis process, so that the resulting meat has a high pH with a dark red color, hard and dry texture known as DFD meat (Dark, Firm). and

Dry). [12] also added that the different final pH values were caused by differences in the response of livestock at the time of slaughter, therefore the pH value after slaughter was determined by the lactic acid content in the muscles.

Cooking Loss

The results showed that as the Batak onion extract was added, the cooking loss value also decreased. According to [13] the higher the water holding capacity, when the water is heated, less nutrient liquid will be wasted so that the mass of the meat is reduced, the low water holding capacity affects the cooking loss value.

The cooking loss value can also be affected by the pH value. The results showed that the pH value of the sample obtained seemed to decrease as the concentration was increased. In accordance with the opinion of [14] which states that the pH value is directly proportional to the water holding value, a low water holding capacitty value causes the cooking loss of meat to be quite high. This is due to the ability of the meat to bind water is low so that the water in the meat will be released.

The results of this study were higher than [15] who conducted a study of soaking beef in kecombrang flower extract (Etlingera elatior) which obtained a cooking loss value of 37-41% at 6 hours of observation. The lowest cooking loss value in this study was still within normal limits. In accordance with the opinion of [16] which states that the cooking loss value of normal beef ranges from 1.5-54.5%. [6] added that the cooking loss value of meat ranges from 15-40%. The best meat cooking loss was in the A1B1 treatment with a value of 48%. In accordance with the opinion of [17] that meat that has smaller cooking milk has better quality compared to large cooking losses because during cooking, less nutritional value is lost.

Total Bacterial Colonies

Table 4 shows that the administration of 20% BOE gave better results with a lower total bacterial colony value with 1 hour immersion in open space. This is because the Batak onion extract contains antibacterial properties that can affect microbial growth. This is in line with the research of [1] which stated that all extracts used could inhibit microbial growth at a concentration of 1000 mg/ml.

The variation in the total bacterial colonies of the sample with the use of BOE as a preservative was due to the condition of the tested sample being placed at room temperature open (without being closed). This condition resulted in the longer immersion of the sample, the higher the total bacterial colonies obtained. This is in line with [18] which states that food storage is one of the 6 principles of food hygiene and sanitation. Storage of foodstuffs that are not good, especially in large quantities (for catering and catering services) can cause damage to these foodstuffs.

In addition, the content of BOE used as a preservative also affects the total bacterial colonies observed in the samples. In accordance with the research of [1] that Batak onions are positive for saponins, flavonoids, triterpenoids and steroids. These antimicrobial properties have the potential to inhibit the growth of microorganisms in the sample. The results also showed that the aroma of lamb for 3 hours of immersion in BOE was not as strong as rotten meat. This is in line with Naidu (2000) that triterpenoids are compounds that have a carbon skeleton derived from six isoprene units and are derived biosynthetically from acyclic hydrocarbons, namely squalene. Saponins are triterpene and sterol glycosides which are surface active compounds and have soap-like properties and can be detected based on their ability to form foam. The mechanism of saponins as antimicrobials is by interacting with sterol membranes. Bacteria with cell membranes containing low cholesterol levels will not be sensitive to saponins. The general effect of saponin activity on bacteria is cell leakage so that cells lose proteins and enzymes. Meanwhile, flavonoid compounds can melignify bacterial cell walls, so that these compounds can inhibit bacterial growth (Harborne, 1996).

Conclusion:-

The best values of water content, pH and total colony were in treatment A2B1 with a value of 76.92%, 6.9 and A2B1 6 x 10^3 CFU/g, while the best cooking loss value was in treatment A3B2 with a value of 48.4%.

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