

Physical and Organoleptic Quality of Balinese Beef with Pineapple Juice (*Ananas comosus L. Merr*) Marination

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ABSTRACT

Pineapple produces bromelain enzyme, which could hydrolyze protein used to tenderize meat. This study aims to determine the physical and organoleptic properties of Balinese beef which had been marinated using pineapple juice (*Ananas comosus L. Merr*). The study used Balinese beef with pineapple juice levels of 0%, 10%, 15%, 20%, and 25% marinated for 45 minutes. The experiment was designed according to completely randomized design with 5 treatments and 8 replications. The result shows that different levels of marination have a significant effect ($P < 0.05$) on the physical and organoleptic properties of Balinese beef.

Keywords: Balinese Beef, pineapple Juice, pH, Cooking Loss, Organoleptic

1. INTRODUCTION

Beef is one of the most widely consumed sources of animal protein in Indonesia. The development of beef consumption per capita of the Indonesian from 2002 to 2019 fluctuated and tended to increase by an average of 2.89% per year [1]. This was in line with the increasing public awareness of the benefits of consuming animal protein, such as faster growth, stronger immune system, increasing intelligence, as well as an energy reserve [2]. Animal protein needs could be fulfilled by consuming beef, which has high protein values. Nutritional substances found on beef are protein, fat, carbohydrate, water, and non-protein substance [3].

Cooking beef could be quite challenging, since if not processed properly; the cooked beef would be tough and hard to eat. Therefore, before cooking, beef is often marinated in some spices in order to tenderize the meat and to make it easier to eat, as well as to make it more appetizing. One such ingredient commonly used to tenderize meat is pineapple (*Ananas comosus L. Merr*).

Pineapple contains bromelain enzyme, a proteolytic enzyme which could hydrolyze protein into simpler amino acid. Marinating beef in pineapple would affect not only the physical properties of the meat, but also its organoleptic properties, especially the color and odor [4] as well as tenderness [5].

Consumers are more interested in beef with certain color and odor, and tend to prefer tender rather than hard beef. The color of fresh meat is an important quality parameter that determines a consumer's response and decision to buy or not to buy at retail [6]. Therefore, it is important to improve the meat quality by improving the color, odor or tenderness of the meat in order to make it more attractive to consumers, and bromelain enzyme found in pineapple can do just that. It is also equally important to find other meat properties that might be affected by pineapple juice. Therefore, this study aims to determine the physical and organoleptic properties of Balinese Beef which had been marinated in pineapple juice for a fixed duration.

2. MATERIALS AND METHODS

The materials used in this study were Balinese beef and pineapple juice obtained from traditional market. Meat samples were taken from the breast and the large muscle on the outer or lateral surface of the thigh. Tools used in this study were basins, pan, stove, water, knives, scales, polyethylene plastic, pH meter, color scorer, and meat presser.

2.1 Pineapple juice procedure

Pineapple juice was made by washing the pineapple with water, cutting the pineapple into small portions, then mashing the cut-up pineapple in a blender until it was turned into a mush, after which the mush was strained using fabric to get the pineapple juice extract.

2.2 Research design

The experiment was designed according to completely randomized design with five treatments, each consisted of 8 replications to test the physical and organoleptic quality. The treatment was the marination using pineapple juice as followed: P0 = without pineapple juice, P1 = 10% pineapple juice, P2 = 15% pineapple juice, P3 = 20% pineapple juice, and P4 = 25% pineapple juice by weight of meat.

2.3 The observed parameters

The parameters observed in this study were the physical and organoleptic properties of Balinese meat. Physical properties observed were pH and cooking loss [7],[8],[9]. while organoleptic qualities observed were color, odor, taste, tenderness, and juiciness [10],[11],[12].

2.3.1. pH measurement

The meat sample used for the experiment was measured to find its pH value, before being cleaned from its connective tissues and fat. The meat then was cut into 100 g pieces before it was immersed in pineapple juice treatment for 45 minutes.

2.3.2. Cooking Loss.

Cooking loss was determined by the degree of shrinkage during cooking process. Cooking loss was the value of weight difference before and after cooking divided by the sample weight before cooking multiplied by 100 percent.

2.3.3. Characteristic and criteria of the panels.

The organoleptic test used 15 trained panelists from a group of panelists at the Faculty of Animal Science at Halu Oleo University. The assessment criteria used a hedonic scale on each five-point scales [13]. The hedonic score table is presented in Table 1.

Table 1. Hedonic score of meat quality

Sensory evaluation	Hedonic scale	Criteria
Color	1	Brownish pink
	2	Bright cherry red
	3	Red
	4	Dark red
	5	Brown
Flavor	1	Like extremely
	2	Like a little
	3	Neither like or dislike
	4	Dislike a little
	5	Dislike extremely
Taste	1	Like extremely
	2	Like a little
	3	Neither like or dislike
	4	Dislike a little
	5	Dislike extremely
Tenderness	1	Extremely tender
	2	Slightly tender
	3	Neither tough or tender
	4	Slightly tough
	5	Extremely tough
Juiciness	1	Extremely juiciness
	2	Slightly juiciness
	3	Normally
	4	dry
	5	Extremely dry

Source : [13]

3. RESULTS AND DISCUSSION

The average effect of pineapple juice marination on the average score of physical properties of meat like pH and cooking loss can be seen in Table 2, while the average effect of pineapple juice marination on the average score of organoleptic properties such as color, odor, taste, tenderness, and juiciness on the

Table 2. Physical properties on the effect of pineapple juice

Parameter	Pineapple Juice Level				
	P0	P1	P2	P3	P4
pH	5.70 ± 0.03 ^a	5.81±0.01 ^b	5.85± 0.02 ^{bc}	5.86±0.02 ^c	5.88±0.07 ^c
Cooking Loss (%)	39.47 ± 3.00 ^c	35.21 ± 1.74 ^b	33.47± 1.78 ^{ab}	32.46± 1.54 ^a	31.91 ± 1.10 ^a

^{a,b,c} Numbers with different superscripts show a significant effect (P<0.05)

Table 3. Organoleptic properties on the effect of pineapple juice

Parameter	Pineapple Juice Level				
	P0	P1	P2	P3	P4
Color	4.57±0.50 ^b	3.21±0.41 ^a	2.94±0.52 ^a	3.05±0.40 ^a	3.05±0.22 ^a
Flavor	3.94±0.22 ^c	3.31±0.47 ^b	3.10±0.45 ^{ab}	3.00±0.33 ^a	3.00±0.00 ^a
Taste	3.21±0.41 ^b	2.84±0.50 ^a	2.68±0.47 ^a	2.78±0.41 ^a	2.73±0.45 ^a
Tenderness	4.26±0.45 ^c	2.73±0.65 ^b	2.31±0.47 ^a	2.15±0.50 ^a	2.05±0.70 ^a
Juiciness	3.26±0.45 ^c	2.84±0.37 ^b	2.78±0.41 ^b	2.31±0.47 ^a	2.10±0.65 ^a

^{a,b,c} Numbers with different superscripts show a significant effect (P<0.05)

concentration level of pineapple juice can be seen in Table 3.

3.1. The Effect of Pineapple Juice on the pH of Balinese Meat

The pH in meat refers to the degree of acidity in the meat. Fresh meat has a pH value in the range of 5.3 to 6.0. Storage duration and temperature could affect a pH value, and microorganism growth could also cause an increase in pH value. The average pH value in Balinese meat that had been marinated in pineapple juice could be seen in Table 1.

Based on table 1, pineapple juice treatment with different levels 0%, 10%, 15%, 20%, and 25% has a significant effect (P>0.05) against the marinated Balinese beef. The result 25 % is classified as good result from level. Bromelain, an enzyme found in pineapple peel juice, can break down the structure of proteins, making them simpler. Based on the height, the higher the enzyme (acid) levels, the faster the process of tenderizing meat, but at the expense of changing the flesh's composition. According to the findings, the pH level of Tegal duck meat has a significant effect (P0.05) on dissolved protein concentration (Table 1). Connective tissue protein is degraded to certain hydrophilic amino acids when Pineapple juice was added. As a result, it can raise the pH of the meat. [5] An increase in pH can be influenced by changes in protein denaturation in the sarcoplasm, which is not dependent on the pinaeapple.

3.2. The Effect of Pineapple Juice on the Cooking Loss of Balinese Meat

Cooking loss is the degree of shrinkage during cooking process. The higher the temperature, the longer cooking duration, the bigger also the cooking loss percentage value. The average cooking loss value in Balinese meat that had been marinated in pineapple juice could be seen in Table 1.

Based on the table, pineapple juice treatment with different levels 0%, 10%, 15%, 20%, and 25% have a significant effect (P>0.05) on cooking loss percentage of Balinese beef. The higher the concentrate value, the bigger the percentage value of the cooking loss of marinated Balinese beef.

Genetics, age, management, gender, and stress, according to [14], are all ante mortem influences. Chilling, refrigeration, withering, freezing, cooking/processing, and the addition of a thickening agent are all post mortem aspects to consider.

According to study, average cooking losses on beef ranges from 31.91% to 39.47%. [7] report a larger cooking loss, ranging from 25.94% to 46.20 %. In this study, the cooking losses are classified as pretty good. This is consistent with the findings of Soeparno [23], who found that cooking loss ranges from 1.5 % to 54.5%.

3.3. The Effect of Pineapple Juice on the Color of Balinese Meat

Based on table 2, pineapple juice treatment with different levels 0%, 10%, 15%, 20%, and 25% has a significant effect ($P > 0.05$) on the color of Balinese beef. According to the results of organoleptic tests, color on the flesh with the preference test method with 15 people panelists meat color with the immersion process at the control level 0 % (4.57) indicating Dark red color, whereas pineapple juice which increases to level 10 % (3.21), 15 % (2.94), and 25 % (3.05) indicates Red color. This is owing to the fact that color intensity is nearly identical between products, resulting in color value. The level of immersion of the raw material has an impact on the goal. Meat pigment altered this, according to [15] Pigment Hemoglobin and myoglobin are two types of protein found in meat. The number of myoglobin molecules in an animal's blood varies based on the species, age, and physical activity.

3.4. The Effect of Pineapple Juice on the Odor of Balinese Meat

Based on the table, pineapple juice treatment with different levels 0%, 10%, 15%, 20%, and 25% has a significant effect ($P > 0.05$) on the odor of Balinese beef. Table 2 shows the average effect of pineapple juice on odor. The fragrance of cooked meat is influenced by animal age, kind of diet, species, sex, poultry, race, length of time and storage conditions of meat after being cut, and type, duration, and temperature while cooking is among other factors. The provision of pineapple juice does not have a significant effect, according to the results of the analysis of variance. This is due to the influence of cooking meat and meat processing processes, which can cause tissue damage to the meat. According to [10], the length of storage period and the storage quality have a significant impact on the odor of cooked meat.

3.5. The Effect of Pineapple Juice on the Taste of Balinese Meat

Based on the table, pineapple juice treatment with different levels 0%, 10%, 15%, 20%, and 25% has a significant effect ($P > 0.05$) on the taste of Balinese beef. Table 2 shows the average influence of pineapple juice on the taste of meat. Pineapple juice does not have a significant effect, according to the analysis of variance. This is due to the influence of cooking meat and meat processing processes that might harm the meat's tissue. The major taste senses are bitter, sweet, sour, and salty, as well as fragrance. Taste is also influenced by the age, race, and length of time. The types, duration, temperature of cooking, as well as the storage

conditions for meat are slaughters. The addition of pineapple juice to the meat can alter its flavor as follows [14].

3.6. The Effect of Pineapple Juice on the Tenderness of Balinese Meat

Based on the table, pineapple juice treatment with different levels 0%, 10%, 15%, 20%, and 25% has a significant effect ($P > 0.05$) on the tenderness of Balinese beef. The availability of pineapple juice has a very significant effect ($P > 0.05$) on meat softness, according to the results of the analysis of variance. There is a highly significant difference between the meat providing 10%, 15%, and 25% pineapple juice which generate tender meat qualities with a score of (2.73; 2.31; 2.15) classified as slightly tender . When compared to beef that has not been fed pineapple juice (P1), this meat is slightly tough (4.26). This difference is due to the use of pineapple fruit juice, which contains the proteolytic enzyme bromelain, which can break down protein molecules into smaller amino acid molecules also damaging chemical bonds in the meat, softening it [10].

3.7. The Effect of Pineapple Juice on the Juiciness of Balinese Meat

Juiciness in a meat depends on the amount of water left in a cooked meat product. Juiciness could also increase flavor as well as soften the meat texture.

Several factors influence the juiciness of meat for example the age of slaughter, amount of fat and connective tissue contained in a cut, storage method and duration, as well as cooking method[7]. Based on the table, pineapple juice treatments with different levels 0%, 10%, 15%, 20%, and 25% have a very significant effect ($P > 0.05$) on the juiciness of Balinese beef. Meat that has not been exposed to pineapple juice produces meat that is sufficiently juicy. Meat that is given pineapple juice with a concentration makes an impression with a score of 3.26. With a score of 2.10 - 2.84, it creates meat that has the appearance of juicy juice. As a result, the panel score lowers as the amount of Biceps Femoris muscle meat juice increases. This distinction is due to the quantity of the proteolytic enzyme bromelain, which can break down protein intramuscular lipid molecules into smaller amino acid molecules In accordance with the opinions [12] which states that the perception of meat juice is a combination of the two effects, namely the impression of meat juice and the impression of meat juice.

4. CONCLUSION

Based on the results obtained, it can be concluded that marination using 25% pineapple juice has a significant effect on pH, cooking loss, color, odor, taste, tenderness, and juiciness. Further research is needed regarding the properties of Balinese meat using other ingredients.

AUTHORS' CONTRIBUTIONS

Harapin Hafid designed the experiment, supervised, and participated in the preparation and execution of the experiment, and in writing of the manuscript. Arby' in Pratiwi and Fitrianiingsih conducted sample preparation and participated in writing the manuscript. Asma Bio Kimestri and Siti Hadrayanti Ananda conducted the data analysis, manuscript structure reviewing and language editing. All authors read and approved the final manuscript.

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