Organoleptic characteristics of broiler chicken meat using juice of starfruit (*Averrhoa bilimbi* L)

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**Abstract.** The study aimed to determine the effect of using *Averrhoa bilimbi* L juice on the organoleptic characteristics of fresh chicken meat. The material used in this study is chicken meat and *Averrhoa bilimbi* L juice. The study used a completely randomized design with treatment without giving *Averrhoa bilimbi* L (P0) as a control, given juice and stored for 3 hours (P1), given juice and stored for 6 hours (P2), juiced and stored for 9 hours (P3). Testing of organoleptic characteristics using seven trained panellists from restaurant employees in Kendari. The results showed that the treatment of *Averrhoa bilimbi* L juice with different storage times had no significant effect (P > 0.05) on the organoleptic characteristics of aroma, colour, and tenderness of broiler chicken, but gave a significant effect (P < 0.05) on taste and showed very significant influence (P <0.01) on the texture of chicken meat. Conclusions in this study were the best treatment for using *Averrhoa bilimbi* L juice for nine hours.

1. **Introduction**

The culinary industry is overgrowing throughout the country, both in rural areas, especially in urban areas. This has an impact on the demand for livestock products, especially chicken meat products. Broiler chicken is one of the poultry commodities that are needed as a culinary ingredient. Broiler chickens are poultry that produces enough potential meat. The advantages of broiler chickens are their fast and efficient growth in utilizing feed [1] and the relatively affordable price of products that make broiler enthusiasts quite high [2]. The high nutrient content in meat is an excellent medium for the growth of microorganisms. So that causes meat easily damaged or perishable [3][4][5].

Damage to meat can be caused due to physical damage, chemical changes, and microbial activity, Soeparno [6] and [7]. Chicken meat can experience a decrease in both physical and chemical quality, so chicken meat is not suitable for consumption. Maintaining the quality of chicken meat to damage, it requires processing or preservation. One process of preserving broiler chicken is the marination method. Marination is the process of soaking meat in marinade ingredients before further processing. The marinade is a flavourful liquid that functions as a meat marinade ingredient, usually used to extend the shelf life of meat and maintain meat quality [8]. One of the ingredients that can be used as an ingredient at the same time as an antibacterial is *Averrhoa bilimbi* L. *Averrhoa bilimbi* L is a...
natural ingredient that can be used as a food preservative, especially meat. Ancestors have practiced this in ancient times. [9] states that Averrhoa bilimbi L juice contains active compounds in the form of flavonoids and triterpenoids, which act as antibacterial substances. [10] The original chemical content of Averrhoa bilimbi L has anti-bacterial properties, namely flavonoids and phenols.

Averrhoa bilimbi L can be used as a natural preservative because it is known to have an antimicrobial activity that can inhibit the growth and speed of the biochemical reaction of meat. Therefore, it is necessary to research the effect of storage time in the marination of Averrhoa bilimbi L juice on the physical and organoleptic qualities of broiler chicken meat.

2. Methods

2.1 Testing of organoleptic characteristics
In this study, the organoleptic parameters that will be observed are aroma, taste, texture, colour, and tenderness that will be carried out by seven trained panellists. The hedonic score is in the range of scores 1 to 5. Score 1 has a range of 1.0 - 1.5. Score 2 has a range of > 1.5 - 2.5. Score 3 has a range > 2.5 - 3.5. Score 4 has a range > 3.5 - 4.5. A score of 5 has a range of > 4.5. For more complete assessment scores and organoleptic quality test schemes in Table 1.

| Parameter | Hedonic score | Information         |
|-----------|---------------|---------------------|
| Colour    | 1             | Brown               |
|           | 2             | Brownish white      |
|           | 3             | Medium white        |
|           | 4             | White               |
|           | 5             | Very white          |
| Texture   | 1             | Extreme rough       |
|           | 2             | Rough               |
|           | 3             | Rather rough        |
|           | 4             | Smooth              |
|           | 5             | Extreme smooth      |
| Aroma     | 1             | Very dislike        |
|           | 2             | Do not like         |
|           | 3             | Quite like it       |
|           | 4             | Like it             |
|           | 5             | Really like         |
| Taste     | 1             | Very dislike        |
|           | 2             | Do not like         |
|           | 3             | Quite like it       |
|           | 4             | Like it             |
|           | 5             | Really like         |
| Tenderness| 1             | Very not soft       |
|           | 2             | Not soft            |
|           | 3             | Soft enough         |
|           | 4             | Soft                |
|           | 5             | Very soft           |

Library resources: Hafid and Syam (2007); Hafid et al. (2018) modified

This research was conducted from April to May 2019, which took place at the Laboratory of Animal Product Technology, Faculty of Animal Husbandry, Halu Oleo University, Kendari. The
materials used in this study were as many as ten broiler chickens, Averrhoa bilimbi L and laboratory equipment.

Before slaughtering the chicken fasted for 5 hours. Broiler chicken is slaughtered halal according to Islamic law by slaughtering the esophagus, trachea, jugular vein and carotid artery communis on the neck. Boiler chicken is soaked in hot water at 70 for 10 seconds. Carcass collection was carried out by slaughtering the head and both legs to the knees and removing the contents in broiler chicken and doing the finishing and continued with slaughtering to produce carcass parts. The processing of Averrhoa bilimbi L, which is the first step that will be done by choosing a quality Averrhoa bilimbi L, then cleaned using water and cut into small sizes to make it easier to blend into Averrhoa bilimbi L. Averrhoa bilimbi L is stored in a small bowl/pan with a dose 100 ml in treatments P1, P2 and P3.

2.2 Data analysis

The experimental design used in this study was Completely Randomized Design, consisting of four treatments and using seven trained panellist from restaurant employees in Kendari as tests. The treatment consisted of treatment without juice (P0) as a control, juice, and stored for 3 hours (P1), juice, and stored for 6 hours (P2), juice, and stored for 9 hours (P3). Data obtained in the study were tabulated and analysed using variance analysis. If there is a treatment that gives a real or genuine influence, it will be followed by the Duncan test [12].

3. Results and discussion

Organoleptic characteristics are one aspect of food quality assessment. This assessment uses the senses like the eyes. Sense of touch (finger skin), sense of smell (nose), and sense of taste (tongue). Organoleptic assessment is carried out by using a personal score ( hedonic score) using trained panellists, with member hedonic scores ranging in number from 1 to 5 according to variable items. Table 2 presents the average level of preference for colour, texture, aroma, flavour, and tenderness of chicken meat that has been given Averrhoa bilimbi L juice with different storage times.

### Table 2. The average score of favourite levels on colours, textures, scents, flavours, and tenderness of chicken meat given Averrhoa bilimbi L juice with different storage times

| Variable | Storage time |
|----------|--------------|
|          | 0            | 3            | 6            | 9            |
| Colour   | 3.20±0.28    | 3.75±0.50    | 3.75±0.25    | 3.85±0.10    |
| Texture  | 3.60±0.28    | 2.80±0.28    | 3.40±0.16    | 3.10±0.48    |
| Aroma    | 3.70±0.26    | 3.30±0.35    | 3.70±0.38    | 3.45±0.44    |
| Taste    | 3.75±0.10    | 2.95±0.10    | 2.95±0.25    | 3.45±0.19    |

Description: Different superscripts show very significant differences (P <0.01)

3.1 Colour of chicken meat

One of the factors that influence the perception of food ingredients is colour. White visually, colours will affect consumers' tastes. Meat colour varies depending on the type of animal genetically and age [13]. The results of the analysis of organoleptic characteristics in the form of colour can be seen in Table 2. The results of the variance analysis showed that the treatment of different lengths of storage in broiler chicken, which were marinated using the Averrhoa bilimbi L juice, had no significant effect (P> 0.05) on the colour of broiler chicken meat.

In Table 2, it can be seen that the level of preference for colour in broiler chicken marinated using Averrhoa bilimbi L juice has an average score that is quite like and like (3.20-3.85) with attractive colour criteria. This can be caused by a long storage distance. The change in pale white colour is caused by an acidic Averrhoa bilimbi L solution during the process of doing marination using
Averrhoa bilimbi L juice. As stated by [14], the colour of chicken meat is generally white to pale white.

3.2 Texture of meat chicken
The texture is the appearance of the outside to know the smooth or rough surface of the meat. The arrangement of broiler chicken texture is usually done with spices using hands/ fingers and also by licking or using the tongue, but generally, the panellist only use fingers to find out the texture of broiler chicken meat. The results of the analysis of organoleptic characteristics in the form of textures can be seen in Table 2. The results of the variance analysis showed that the length of storage of different 0, 3, 6, and 9 hours in broiler chicken marinated using Averrhoa bilimbi L juice had a significant effect (P <0.05) on the texture of broiler chicken meat. Duncan's further test results showed that between treatments P0, P2, and P3 were not significantly different. However, P2 is significantly higher compared to P0, P1, and P3. The average level of preference of panellists on the texture of broiler chicken is quite favourable (2.80-3.60) can be seen in Table 2.

Differences in meat texture are caused by age, activity, sex, and feed [15]. Textures are related to muscle fibres (fascia), which are encased in rough and soft perimysium. Texture size is determined by the number of muscle fibres, size, and a number of perimysium wrapping. These things are influenced by the age and nationality of livestock [16].

3.3 Aroma of chicken meat
The results of the variance analysis showed that the treatment of different lengths of storage in broiler chicken, which were marinated using the Averrhoa bilimbi L had no significant effect (P> 0.05) on the aroma of broiler chicken meat. The average level of preference of panellists for aroma ranges from quite enough like it and likes (3.30-3.70). This shows that the average panellist quite likes the aroma of broiler chicken. Acid compounds contained in Averrhoa bilimbi L can disguise the odor arising from broiler chicken meat caused by the reduction of microbes and the presence of anti-microbial compounds. Anti microbe compounds in the Averrhoa bilimbi L, which inhibits microbial growth in broiler chicken meat.

The aroma in the cooking process is the aroma of chemical compounds that participate in evaporating with free water contained in food ingredients. Proteins contained in food will decrease during cooking to form amino acids and fat will decrease into fatty acids, and decomposed compounds will interact to produce aromas [17].

3.4 Taste of chicken meat
Taste is something that greatly affects the level or number of interested people in a product that is produced. In general, foodstuffs or processed products do not only consist of one flavour but are a combination of various kinds of flavours in an integrated manner, which gives rise to intact taste [18]. The results of the analysis of organoleptic characteristics in the form of flavours can be seen in Table 2.

The results of the variance analysis showed that the treatment of different lengths of storage in broiler chicken marinated using Averrhoa bilimbi L had a very significant effect (P <0.01) on the taste of broiler chicken meat. Duncan's further test results show that P1 and P2 are not significantly different. However, P0 and P3 are significantly different compared to P1 and P2. The average level of preference of the panellists for the taste of broiler chicken is quite like and like (2.95-3.75). The results showed that the highest value of panellists' preference for broiler chicken which was marinated using Averrhoa bilimbi L juice was found in treatments P0 and P3. This is caused by the Averrhoa bilimbi L can neutralize fishy taste in broiler chicken meat. Acid from Averrhoa bilimbi L helps to release volatile substances (volatiles) contained in meat.

Consumer acceptance of food products is usually influenced by several factors, namely acidity, tantrum, and taste of meat. Panellist acceptance of taste is influenced by several factors, including temperature, chemical compounds, concentration, and interaction with other components [19], and
[20] changes in taste can be caused by the degradation of the macro compounds of broiler meat molecules. Among them, the degradation of short carbon chain fatty acids becomes longer, which can cause the taste to change, and the intensity decrease.

3.5 Tenderness of chicken meat

Tenderness and quality of meat after cooking are assessed based on the ease of chewing without losing proper properties and tissue [21]. Assessment of meat tenderness can be done objectively and subjectively. Subjective assessment using the panel test method, while objectively includes physical and chemical testing methods. The results of the analysis of organoleptic characteristics in the form of tenderness can be seen in Table 2.

The results of the variance analysis showed that the length of storage of different 0, 3, 6, and 9 hours in broiler chicken which was marinated using Averrhoa bilimbi L juice had no significant effect (P> 0.05) on the tenderness of broiler chicken meat. The average level of preference for panellists for tenderness is quite favourable, which ranges between (3.10 -3.50). This is because the length of storage carried out has a time span that is not too different for each storage. Three components of meat that play a role in tenderness, namely connective tissue, muscle fibres, and adipose tissue. Differences in the tenderness of meat-related to age, muscle location, and sex, among others, are determined by differences in the amount of connective tissue [22].

4. Conclusions

In this study, it was concluded the different storage times had a significant effect (P <0.05) on physical properties (pH and water binding capacity) and were very significant (P <0.01) for cooking losses. Similarly, it has a significant effect (P <0.05) on organoleptic properties, which is very real to taste and has a significant effect on texture. Other parameters, such as aroma, colour, and tenderness, showed no significant effect (P> 0.05). Overall, the best treatment of this study is at P3, which is the storage time in marinating starfruit for nine hours. It is recommended to obtain broiler chicken with good quality and organoleptic characteristics; it can be applied for storage time in the marination of Averrhoa bilimbi L for nine hours.

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