Effect of Sweet Star Fruit (*Averrhoa carambola* L.) Juice Addition on the Physicochemical and Sensory Properties of Cow's Milk Yoghurt

Viola Tantri Kirana[1], Veronica Wanniatie[1,*], Maharani Pandala Putri[1], Nur Aini Agustin[1], Ali Husni[1], and Arif Qisthon[1]

[1] Department of Animal Husbandry, Faculty of Agriculture, University of Lampung, Bandar Lampung 34145, Indonesia
*veronica.wanniatie@fp.unila.ac.id

Abstract. This study aimed to evaluate the effect of adding sweet star fruit (*Averrhoa carambola* L.) juice on the physicochemical and sensory properties of cow's milk yoghurt. A Completely Randomized Design was applied with five treatment levels (0%, 2%, 4%, 6%, and 8% juice addition) and four replications. Parameters assessed included fat content, moisture, vitamin C, total acidity, pH, viscosity, and organoleptic attributes (color, aroma, texture, taste, and overall preference). The data were analyzed using ANOVA, Least Significant Difference (LSD) test, and Kruskal-Wallis test at a 95% confidence level. Results indicated that sweet star fruit juice significantly increased vitamin C content and influenced total acidity, taste, and preference ($P<0.05$), while having no significant effect ($P>0.05$) on fat content, moisture, pH, viscosity, or texture. The 6% juice addition yielded the most preferred yoghurt based on sensory evaluation. These findings suggest that incorporating sweet star fruit juice can enhance the nutritional and sensory qualities of cow's milk yoghurt, offering a novel functional dairy product

Keywords: Physicochemistry, organoleptic, sweet star fruit yogurt.

1 Introduction

This research was conducted in December 2023 at the Animal Production Laboratory, Department of Animal Husbandry, Faculty of Agriculture, University of Lampung. Physicochemical analysis was conducted at the Agricultural Product Technology Laboratory, Lampung State Polytechnic. Yogurt is a globally popular fermented milk product, widely appreciated for its nutritional benefits and positive effects on digestive and cardiovascular health. Based on the Regulation of the Food and Drug Supervisory Agency (BPOM) Number 30 of 2018 concerning Food Consumption Figures, the consumption of fermented milk such as yogurt by the Indonesian people per day is around 155 grams per person. Although this figure is lower than the consumption of yogurt in other countries, it is estimated that the consumption figure will increase every year. Data [1] showed that yogurt imports from 2012 to 2016 increased by 225.98%. This

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indicates that over time, the need for the Indonesian people to consume yogurt has increased.

The nutrients in yogurt are not much different from milk, but there are some nutrients that have higher content because they go through a fermentation process. The fermentation process that occurs in making yogurt results in a decrease in lactose levels, so yogurt can be an option for individuals who are sensitive to milk and has the ability to inhibit increased cholesterol levels in the blood if consumed regularly [2]. In the processing process, yogurt is fermented by lactic acid bacteria which convert lactose in milk into lactic acid, giving yogurt a sour taste. To improve the taste of this sour yogurt, additional treatment is needed in the manufacturing stage. Currently, there are many innovations that can be applied, such as through the use of variations in flavours from various types of fruit [3]. Research on yoghurt varied with various types of fruit has been widely conducted, such as Probolinggo grapes [4], longan [5], papaya [6] pineapple [7], red dragon fruit [8].

One alternative fruit that can be used to add variety to the flavour of fruit yoghurt is *Averrhoa carambola* L. *Averrhoa carambola* L. is a type of fruit-producing plant originating from tropical areas. Sweet star fruit cultivation is increasingly widespread in Indonesia and grows well. However, the use of *Averrhoa carambola* L. is still rarely found because in general people only consume star fruit in fresh form. [9] stated that star fruit production in Lampung Province reached 2,995 tons. The use *of Averrhoa carambola* L. is still rarely found, although now there are many cultivations in Indonesia because the fruit can grow well. The lack of utilization of sweet star fruit results in the selling price of the fruit being very cheap. Therefore, it is necessary to utilize the potential of *Averrhoa carambola* L. to be used as raw materials in various processed products. Not only in terms of potential which is quite high, star fruit also has good properties for body health such as maintaining the body's immune system, controlling blood sugar levels, relieving stomach ulcers, reducing the risk of cardiovascular disease and stroke [10]. Therefore, this study aims to investigate the effect of adding sweet star fruit juice on the physicochemical and organoleptic properties of cow's milk yogurt.

2 Materials and Methods

This research was conducted in December 2023 at the Animal Production Laboratory, Department of Animal Husbandry, Faculty of Agriculture, University of Lampung. Physicochemical analysis was conducted at the Agricultural Product Technology Laboratory, Lampung State Polytechnic.

2.1 Materials

Materials used are cow's milk, commercial starter (containing *Streptococcus thermophilus, Lactobacillus acidophilus, Bifidobacterium*), probiotics (containing *Lactobacillus casei bacteria*) and star fruit with a ripeness index of 5 (the fruit is evenly yellow and has the appropriate ripeness to be used as a processed product). The equipment used in this study were stove, pan, blender, autoclave, glass bottle, 500 ml and 1000 ml beaker

glass, 100 ml measuring cup, 100 ml measuring flask, stirrer, digital scale, dropper pipette, filter, Bunsen, fat flask, oven, Desiccator, filter paper, thermometer, heating mantle, Soxhlet, condenser, UV-Vis Spectrophotometer, pH meter, Brookfield Viscometer, and equipment for organoleptic testing (plastic cups and spoons).

2.2 Methods

This study used a Completely Randomized Design (CRD) method consisting of 5 treatments, 4 replications and 28 panelists for organoleptic tests. The treatments applied were P0: without the addition of sweet star fruit juice, P1: 2%, P2: 4%, P3: 6%, and P4: 8%.

The parameters measured are fat content, water content, vitamin C, pH, total acid, viscosity and organoleptic yogurt consisting of colour, aroma, texture, taste and liking in each treatment. The liking test is an overall assessment based on consideration of aroma, colour, taste, and texture of yogurt.

2.3 Procedures

This research was carried out in several stages, namely the stage of making sweet star fruit juice, the stage of making the parent starter, the stage of making yoghurt, and testing.

Stages of Making Sweet Starfruit Juice. The process of making fruit juice is done by cutting star fruit that has been cleaned and washed with distilled water. After that, the edges are cleaned and the seeds are removed. Finally, blend 600 g of star fruit pieces and filter them using a sieve with two filters (Utami et al., 2010 with modifications).

The process of making a broodstock starter. The steps in making the starter are pasteurizing 600mL of milk at a temperature of 72°C for 15 seconds, then cooling the milk until the temperature reaches 43-45°C. After that, add a commercial starter containing (*Streptococcus thermophilus, Lactobacillus acidophilus, Bifidobacterium*) as much as 450mL and *Lactobacillus casei* as much as 150mL. Then, incubate at room temperature for 48 hours [11].

The process of making a broodstock starter. The process of making yogurt is carried out by pasteurizing 250mL of fresh cow's milk at a temperature of 72°C for 15 seconds in each experimental unit, cooling the milk until the temperature reaches 43 to 45 °C, then adding 10% starter, then incubating the sample at room temperature for 24 to 48 hours, adding sweet star fruit juice with treatments of 0%, 2%, 4%, 6%, and 8% calculated from the volume that has been incubated, then incubating for 7 days in the refrigerator [3] with modifications, then analyzed the sample according to the parameters.

2.4 Sample Analysis

Fat content. Fat content testing is carried out using the Soxhlet method by weighing the sample as much as 2g to 5g carefully, then wrapping it with filter paper formed into a sleeve, tying it with fat-free cotton wool, inserting it into the Soxhlet extraction tube, flowing cooling water through the condenser, then attaching the extraction tube to the Soxhlet distillation apparatus with sufficient solvent. Extraction is carried out for 4 to 5 hours, the cup containing the fat is dried in an oven at a temperature of 100 ℃ to 105℃ for 30 minutes, cool the fat flask in a desiccator for 30 minutes then weigh it, the fat content is calculated using the formula according to [11], as follows:

$$\text{Fat Content (\%)} = (C-A) / B \times 100\% \quad (1)$$

Information:
A: Weight of empty fat flask (g)
B: Weight of sample (g)
C: Weight of fat flask + extracted fat (g).

Water content. Water content testing is carried out by weighing the sample 2 g to 3 g in a cup with a known constant weight and then oven at a temperature of 100℃ to 105° C for 3 to 5 hours. Next, cool in a desiccator for 0.5 hours and weigh it. Then heat it again in the oven for 30 minutes then cool it in a desiccator and weigh it. This treatment is repeated until a constant weight is achieved, then the water content is calculated using the formula according to [12], as follows:

$$\text{Water content (\%)} = (B-C) / A \times 100\% \quad (2)$$

Information:
A: Weight of empty cup (g)
B: Weight of sample (g)
C: Weight of cup + sample (g).

Vitamin C. Testing the levels of vitamin C in cow's milk yogurt with the addition of sweet star fruit is done by weighing the sample as much as 1 g then putting it into a measuring flask, adding 100 ml of distilled water and then homogenizing it. Then filter the solution with filter paper, pipette the sample solution that has been obtained as much as 35 ml into a 50 ml measuring flask then add distilled water to the limit mark. The levels of vitamin C are determined by putting the sample solution into a cuvette and measuring the absorbance at the maximum wavelength that has been obtained then calculating the levels of vitamin C by entering the absorbance value into the linear regression equation [13].
The formula for vitamin C levels is as follows:

$$\text{Vitamin C (\%)} = (\text{weight of vitamin C}) / (\text{weight of sample}) \times 100\% \quad (3)$$

pH. The pH value test is carried out using a pH meter. The pH meter is first calibrated using pH 4 buffer before being used to measure pH. The pH value is measured by dipping the electrode into the sample and the pH value is recorded on the screen.

Total acid. The total acid value test was carried out by calculating the amount of lactic acid using the titration method. A total of 2.5 grams of sample was put into a 100 ml Erlenmeyer flask and dissolved using distilled water, the solution was homogenized by shaking, the sample was added with 1% Phenolphthalein (PP) indicator as much as 2-3 drops and titrated with 0.1 N NaOH solution until a constant pink color was seen, recording the volume of NaOH used for titration and the acid content was calculated using the formula:

Viscosity. Viscosity testing is done using a Brookfield viscometer. Install the spindle on the viscometer, adjust the rotor and speed, dip the spindle into the sample to be tested and let it rotate, record the numbers that appear on the screen.

Organoleptic. The steps in organoleptic testing are weighing ±25g of yoghurt and putting it into a plastic cup that has been coded. Then, give 5 yoghurt samples to each panelist with different treatments. Then, the panelist test the colour, aroma, texture, taste, and liking. The test uses a 1 to 5 assessment scale. The assessment scores for the colour test are (1) very white, (2) white, (3) slightly yellowish white, (4) yellowish white, (5) the colour tends to be yellowish. The assessment scores for the aroma test are (1) very dislike, (2) dislike, (3) slightly like, (4) like, (5) very like. The assessment scores for the texture test are (1) very not thick, (2) not thick, (3) slightly thick, (4) thick, (5) very thick. The assessment scores for the taste test consist of (1) very dislike, (2) dislike, (3) slightly like, (4) like, (5) very like. The assessment scores for the liking test are (1) really dislike, (2) dislike, (3) somewhat like, (4) like, (5) really like.

3 Results and Discussion

The results of the study on the effect of the level added of Averrhoa carambola L on the physicochemical properties of yogurt are presented in **Table 1**. Meanwhile, the average score results for the addition of *Averrhoa carambola* L. on the organoleptic quality of cow's milk yoghurt can be seen in **Table 2**.

Table 1. Physicochemical quality of yogurt with the added of *Averrhoa carambola* L.

	Fat	Water	Vitamin C	pH	Total Acid	Viscosity
T0	3.50±0.34	87.79±0.32	0.0460±0.0026^{b}	4.46±0.06^{b}	1.02±0.05	11.086±2.993^{b}
T1	3.32±0.25	87.83±0.02	0.0450±0.0046^{ab}	4.44±0.06^{b}	1.06±0.03	4.988±1.314^{a}
T2	3.19±0.19	88.07±0.12	0.0435±0.0006^{ab}	4.52±0.05^{b}	0.99±0.05	5.523±0.441^{a}
T3	3.38±0.23	87.92±0.14	0.053±0.0069^{c}	4.46±0.04^{b}	0.99±0.02	3.915±1.225^{a}
T4	3.31±0.22	88.03±0.19	0.0395±0.004^{a}	4.18±0.11^{a}	0.99±0.04	5.855±0.854^{a}

Table 2. Average score of organoleptic test of yogurt with the added of *Averrhoa carambola* L (n=28 panelist)

	Colour	Aroma	Texture	Taste	Likely
T0	2.14±1.008^{a}	3.25±0.887^{a}	2.96±0.922^{b}	2.11±0.956	2.68±0.863
T1	2.89±0.786^{b}	3±1.054^{a}	2.46±0.838^{a}	2.07±1.120	2.54±1.071
T2	3.04±0.793^{b}	3.82±0.819^{b}	2.11±0.832^{a}	2.11±1.066	2.50±0.962
T3	3.71±0.535^{c}	3.43±1.034^{ab}	2.50±1.036^{a}	2.54±0.999	2.75±0.928
T4	4.14±0.803^{c}	3.36±1.026^{ab}	3.39±1.066^{b}	2.61±0.956	2.64±1.026

Description:
^{ab}: Different symbols indicate significant differences (P<0.05);
T0: Cow's milk yogurt without the addition of sweet star fruit juice;
T1: Cow's milk yogurt with the addition of sweet star fruit juice 2%;
T2: Cow's milk yogurt with the addition of sweet star fruit juice 4%;
T3: Cow's milk yogurt with the addition of sweet star fruit juice 6%;
T4: Cow's milk yogurt with the addition of sweet star fruit juice 8%.

3.1 Fat

The addition of *Averrhoa carambola* L didn't affect the fat content of yogurt (P>0.05). The fat content of yogurt is influenced by the fat content of milk as the basic ingredient.

Milk contains 3 to 4% fat [14]. [15]) stated that the fermentation process will result in an increase in lactic acid by lactic acid bacteria because they have lipolytic activity to reduce milk fat, so that the lipolysis process will reduce the fat content of milk. Lipolysis or fat breakdown is an important chemical reaction in developing flavours in making yogurt [16]. [17] added that the increasing proliferation of LAB in the product can cause more lipase enzymes, this will also cause more fat to be hydrolyzed so that the fat content in the fermentation results will decrease. According to [18] yogurt has a minimum fat content of 3.0. The results of [19] stated that the fat content of Greek yoghurt with the addition of star fruit jam (10%, 15%, and 20%) ranged from 3.40-3.46%. Star fruit has a fat content of 0.33% in 100g, so it hardly adds to the fat content of yoghurt. The presence of fat in yoghurt contributes to the organoleptic properties of the final product, especially in taste and aroma [20]. [21] stated that one of the important roles of fat components is to determine the physical characteristics of food, such as aroma, texture, taste, and appearance.

3.2 Water

The addition of *Averrhoa carambola* L juice has no effect on yogurt water content ($P > 0.05$). The treatment of the addition of starfruit juice causes water content to increase in yogurt so that the texture of yogurt becomes runny. The water content in this study was higher than [15] which was 83-84%. The water content will affect the thickness of yogurt produced after the fermentation process because the higher the water content of yogurt, the lower the thickness of the yogurt. According to [22], higher water content, the value of thickness is low. The results of this study, in accordance with the opinion of [23] in yogurt with the addition of carrot juice, that the more juice added, the water content of yogurt will increase. Water content is one of the important characteristics in food because it can affect the appearance, texture, and taste of food [24]. The maturity of starfruit used as a treatment in making yogurt also affects water content. According to [25], the more mature starfruit, the more water content will increase. Also added by [26] that the water content in sweet starfruit is 90.82%.

3.3 Vitamin C

The results of the analysis of variance of the addition of *Averrhoa carambola* L. juice had a significant effect ($P<0.05$) on the vitamin C content of cow's milk yoghurt. The results of the LSD further test showed that the control was different from cow's milk yoghurt with the addition of 2%, 4%, 6%, and 8% star fruit juice. The results of the study showed that the average vitamin C content in cow's milk yoghurt with the addition of *Averrhoa carambola* L. juice ranged from 0.0395% to 0.053. The results of this study were higher than the results of the study by [27] which stated that the average vitamin C content in yoghurt with the addition of *Averrhoa carambola* L. juice (10%, 15%, and 20%) and fermentation time (8, 10, and 12 hours) ranged from 0.014 to 0.020% with the iodine titration analysis method. The addition of fruit juice up to 6% was able to increase the vitamin C content. This is supported by the research of [28], the addition of beet juice up to 6% significantly increased the antioxidant activity of the

product, although it did not significantly affect the vitamin C content. This increase in antioxidant activity makes the yogurt potential as a functional food product that is attractive to health-conscious consumers.

The vitamin C content with the addition of *Averrhoa carambola* L. juice exceeds 6%, namely at T4 (8%), there can be a decrease in vitamin C levels. P4 has the lowest pH of 4.18 (Table 1) with the lowest vitamin C content of 0.0395 ± 0.004%. This shows that the lower the pH, the vitamin C levels also decrease. [29] stated that lemon juice concentrate with a pH of 1.82 showed the highest destruction of ascorbic acid, this shows that ascorbic acid is easily decomposed in acidic solutions. In addition to pH, high water content affects vitamin C content. [30] stated that vitamin C will be easily degraded in a food that has a highwater content. The addition of nutrient content in the ingredients will affect the total nutrients. Fresh *Averrhoa carambola* L. contains 35 mg/100 g of vitamin C, 52.81 mg/100 g [31], 0.29 mg/g [27], and 22.3 mg [32]. Added by [33] *Averrhoa carambola* L. juice contains 1.232 mg/ml of vitamin C, while [34] stated that *Averrhoa carambola* L. juice contains 4.49 mg/g of vitamin C. This difference is thought to occur due to differences in the type and level of ripeness of the Averrhoa carambola L. used. There is a possibility of differences in the compound content of each variety although there is no literature explaining the differences in content or antibacterial properties between each variety.

3.4 pH

The addition of *Averrhoa carambola* L. juice influenced the pH of yogurt ($P<0.05$). Treatment T4 influenced the pH value which was different from T0, T1, T2, and T3. T4 has the lowest pH value which is 4.18. This is because the addition of 8% of Averrhoa carambola L. juice concentration increases the carbohydrate content in milk which will be converted into lactic acid by LAB. [35] stated that every 100 g of *Averrhoa carambola* L. contains 8.8 grams of carbohydrates, these carbohydrates will be utilized by lactic acid bacteria as a source of energy and metabolism. This is in accordance with the opinion of [3] who stated that the more sugar sources metabolized by lactic acid bacteria, the more organic acids produced will increase which causes the pH to be low. [36] stated that during fermentation, the organic acids formed are dissociated acids in the form of H+ ions. If the acid produced increases, the more H+ ions are formed. As a result, the resulting pH value will be lower.

3.5 Total Acid

The addition of *Averrhoa carambola* L juice did not affect the total acidity of yogurt ($P>0.05$). Total acid in this study ranged from 0.99-1.06% (Table 1). The treatment of 2-8% star fruit juice addition did not cause differences in the total acid content of yogurt. This was thought to be influenced by the low concentration of star fruit juice, interaction with LAB, variation in star fruit composition and non-optimal fermentation process. According to [3], the addition of small amounts of star fruit juice may not contribute significantly to the increase in acidity of yogurt. The acid content in star fruit can vary depending on factors such as variety, maturity level, and growth conditions.

The addition of star fruit juice concentration gives a very significant effect on changes in total acid in yoghurt. However, if the concentration of star fruit juice added is low, the increase in total acid in yogurt may not be significant [37]. In addition to star fruit juice concentration, the content of certain compounds in star fruit juice can affect the activity of lactic acid bacteria in the yogurt fermentation process. Star fruit juice contains bioactive compounds such as oxalic acid, phenolic compounds, and organic acids which, depending on the concentration, can inhibit the growth or activity of LAB [38].

3.6 Viscosity

The addition of *Averrhoa carambola* L. juice affected the viscosity of yogurt ($P<0.05$). The results showed that the average viscosity value of cow's milk yogurt with the addition of *Averrhoa carambola* L extract ranged from 3.915-11.086 cP (Table 1). The results showed that the addition of *Averrhoa carambola* L extract reduced the viscosity of yogurt. This decrease in viscosity was due to the addition of fruit juice in the form of a liquid, not a solid, which caused an increase in the volume of liquid in yogurt. This was also influenced by the water content contained in sweet star fruit of around 89% which was able to increase the volume of fruit juice. [39] stated that star fruit contains 89% water. [40] stated that the relatively highwater content makes the viscosity value low.

The viscosity of yoghurt is influenced by differences in acidity levels and pH values of the product [27] because it plays a role in the coagulation process of casein and protein. The lower the pH, the viscosity will increase because at low pH conditions, the protein in the material will coagulate, increasing the viscosity. In addition, viscosity is influenced by the addition of fruit juice in the form of a liquid rather than a solid so that the resulting viscosity tends to be low. This can also be caused by the fact that in each treatment of making yoghurt, no stabilizer is added. As a result, the protein in yoghurt is not hydrophilic and has a lower water binding capacity. [41] stated that the viscosity of yoghurt can be influenced by several factors, including the length of incubation, the type of starter culture used, the total amount of solids in the yoghurt, the addition of thickening agents, and the pH of the milk.

3.7 Organoleptic

The results of the Kruskal Wallis analysis showed that the addition of *Averrhoa carambola* L extract had a significant effect ($P <0.05$) on the colour of yoghurt (Table 2). T0 showed a colour like yoghurt in general, namely white (score 2.14 ± 1.008). T1 and T2 showed a slightly yellowish white colour (2.89 ± 0.786 & 3.04 ± 0.793). While T3 and T4 showed a yellowish white colour. The difference in colour in each treatment can be caused by the level of addition of the concentration of *Averrhoa carambola* L juice given. Star fruit juice has a yellow colour tending to orange, so that if the juice is added to cow's milk yoghurt with a high concentration, it will cause the yoghurt colour to become yellowish white. This study used a ripeness index of 5 which means that the fruit is evenly yellow. *Averrhoa carambola* L contains carotenoids. Carotenoids function as producers of colour pigments in the form of yellow, orange, to red in food ingredients [42]. This indicates that if *Averrhoa carambola* L extract is added to cow's

milk yoghurt, it will cause an increase in the yellow colour of the yoghurt. This increase in yellow colour occurs due to the process of carotenoid degradation during the fermentation of cow's milk yoghurt [27].

The results of the Kruskal Wallis analysis showed that the addition of *Averrhoa carambola* L extract had a significant effect ($P<0.05$) on the aroma of yoghurt (Table 2). T0, T1, T3 and T4 showed the same aroma, namely slightly preferred (3.25±0.887; 3±1.054; 3.43±1.034; and 3.36±1.026). While T2 showed a preferred aroma (3.82±0.819). The addition of 4% *Averrhoa carambola* L extract (P2) was well accepted by the panelists' sense of smell. Based on the research results of [43], the panelists' assessment of the aroma of cow's milk yoghurt with the addition of star fruit extract was categorized as liking to really liking. This is because the aroma of the yoghurt produced is fresh sour. [15] stated that yoghurt has a characteristic aroma, namely sour. The addition of fruit juice to yogurt will affect the aroma, so the higher the concentration of *Averrhoa carambola* L juice given, the more the aroma of the resulting yogurt will have a distinctive *Averrhoa carambola* L aroma. Star fruit contains volatile compounds that function as producers of sour aroma in fruit. According to [44], the aroma will be detected after the volatile compound enters through the respiratory tract which will then be received by the olfactory system and then forwarded to the brain. Aroma can be one of the characteristics or distinctive features of each product so that aroma testing is very important to do because it is a factor in consumer assessment and determines consumer acceptance of a product [45].

The results of the Kruskal Wallis analysis showed that the addition of *Averrhoa carambola* L extract had a significant effect ($P<0.05$) on the texture of yoghurt (Table 2). T0 and T4 showed the same texture, which was slightly thick (2.96±0.922 and 3.39±1.066). While T1, T2 and T3 showed a runny texture (2.46±0.838; 2.11±0.832 and 2.50±1.036). One of the characteristics of good yoghurt is a thick to solid liquid texture [14]. The texture of yoghurt can be slightly thick to thick or semi-solid with homogeneous viscosity resulting from protein coagulation due to organic acids produced by the starter culture [45]. The texture of cow's milk yoghurt produced can be caused by the amount of starter used and the pectin content of star fruit. The starter used in this study was a commercial starter containing *(Streptococcus thermophilus, Lactobacillus acidophilus, Bifidobacterium,* and *Lactobacillus casei*). The bacterial starter used will produce lactic acid after the fermentation process which will result in a decrease in pH and an increase in acidity, then the casein becomes unstable and coagulation occurs to form a yoghurt gel until the viscosity is higher [47]. The amount of bacterial starter added not only affects the texture but also affects the acidity level. In addition, the texture can be influenced by the pectin content in star fruit because pectin functions as a stabilizing gel that can make the texture thick [48]. If the provision of high star fruit juice will affect the texture of the resulting yoghurt.

The results showed that the addition of *Averrhoa carambola* L extract had no significant effect ($P>0.05$) on the taste of cow's milk yoghurt (Table 2). Panelists gave a slightly liked value for each treatment. This can be caused by the level of acidity in yoghurt. The results of the study by [3] showed that the yoghurt drink produced after the addition of *Averrhoa carambola* L extract had a taste that tended to be sour, with the category of slightly liked by panelists. The acidity was caused by the acid level of *Averrhoa carambola* L and the fermentation of lactose produced. However, despite

having a slightly sour taste, the yoghurt can be liked by consumers if the concentration level given is appropriate.

The results showed that the addition of *Averrhoa carambola* L extract had no significant effect (P>0.05) on the liking of cow's milk yoghurt (Table 2). The difference in the concentration of *Averrhoa carambola* L extract in the treatment was not able to increase the panelists' liking for yoghurt.

4 Conclusion

The addition of *Averrhoa carambola* L. cannot increase the fat content and moisture content of cow's milk yogurt, on the other hand, the treatment of adding sweet star fruit juice can increase vitamin C content in the treatment of adding 6% juice. The concentration of *Averrhoa carambola* L. can reduce the pH value and viscosity but cannot increase the total acid of yogurt. The most preferred addition of *Averrhoa carambola* L. is 6% based on color (yellowish white), aroma (somewhat preferred), and texture (tends to runny).

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