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Characteristics of Yoghurt Drink with Addition of Sweet Starfruit Extract (*Averrhoa carambola*)

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ABSTRACT
Sweet star fruit (Averrhoa carambola) is a horticultural product that is rich in fiber, potassium, phosphorus, and vitamin C. Sweet star fruit can be processed into derivative products to increase economic value, one of which is a yogurt drink. This study aimed to determine the effect of adding the concentration of sweet star fruit extract in yogurt drink on the characteristics of yogurt drink which includes organoleptic tests, pH, and total lactic acid bacteria. The organoleptic assessment in this study used a non-factorial Completely Randomized Design with treatments K0: without sweet star fruit extract, K1: addition of 5% star fruit extract, K2: addition of 10% sweet star fruit extract, and K3: addition of star fruit extract sweet 15%. Analysis of pH value and total lactic acid bacteria was carried out on all yogurt drink treatments. The results showed that yogurt drink with the addition of sweet star fruit extract 0%, 5%, 10%, and 15% did not have a significant effect on the organoleptic characters, namely the taste, smell, color, and texture of the yogurt drink. The higher the concentration of sweet star fruit extract in the yogurt drink increased the pH value but the total lactic acid bacteria contained in the yogurt drink was decreased.

Keywords: *Sweet star fruit, yogurt drink, organoleptic, pH, total lactic acid bacteria*

INTRODUCTION
Sweet starfruit (*Averrhoa carambola*) belonging to the Oxalidaceae family has been growing in Indonesia for a long time with various different varieties. Carambola is one of the various types of fruit-producing plants originating from the tropics. According to Mulyani et al. (2021) Currently, sweet star fruit is widely cultivated in Indonesia and can grow well, but the use of sweet star fruit as a food product is still rare. Star fruit is very useful in helping lower blood pressure because it contains fiber, potassium, phosphorus, and vitamin C in it (Berawi & Pasya, 2016).

Karangsari sweet starfruit is one of the superior varieties of star fruit that is often found in the Blitar City area. Karangsari starfruit has several advantages, especially the appearance of the fruit is very attractive, yellow-orange when it is optimally ripe, large fruit size of about 350-700 grams per fruit, sweet fruit taste, high water content, shelf life of more than 7 days. This star fruit is capable of flowering and fruiting throughout the year and harvesting can be done 3-4 times a year. Its productivity is 400-500 kg/tree/year (4 times harvested) with a plant age of more than 10 years (Baswarti, 2017).

Karangsari starfruit has received Prima 3 Certification, which is a statement that Karangsari starfruit is safe from pesticide residues, so it is feasible to produce and safe for processing. The sweet starfruit harvesting activities are always relatively simultaneous, so the supply side is excessive. This results in low star fruit prices during the main harvest season. Another problem that arises is the nature of star fruit that is easily rotten or has a short shelf life and the use of sweet star fruit in the manufacture of functional foods, especially for drinks, is still very little (Qomariyah *et al.,*2022). Therefore, there needs to be an effort to increase the economic value of sweet star fruit through processing sweet star fruit into derivative products, one of which is a yogurt drink product.

Yogurt is one of the fermented milk products that is in great demand by the public. There are various massive diversification efforts towards this product with the aim of following consumer tastes which are always changing from year to year. The form of diversification from yogurt is one of them is a yogurt drink, which is made because consumers prefer products that can be consumed practically. On the other hand, the public's desire to get health benefits from the products they consume encourages further

diversification in the form of yogurt drinks which are designed to use a combination of probiotic bacteria in addition to yogurt-forming bacteria only (Faizah *et al.,* 2022). This is due to the benefits of probiotics which can not only break down lactose into lactic acid but can also live in the digestive tract so that it can suppress the number of pathogenic bacteria found in the digestive tract.

Currently, the discovery of yogurt is not only in the variety of bacteria, but also by improving the taste. The taste of yogurt in general is sour which is less liked by consumers. The sour taste of yogurt comes from the lactose in the milk which is converted to lactic acid during the fermentation process. This study aims to determine the effect of adding the concentration of sweet star fruit extract in yogurt drink on the characteristics of yogurt drink which includes organoleptic tests, pH, and total lactic acid bacteria. The results of this study are expected to provide an alternative diversification of yogurt products that can be applied to the community as a fermented milk product that has functional value using sweet star fruit.

METHOD

The research was conducted from June to July 2022 in Ngadirejo Village, Kepanjen Kidul District, Blitar City. The location was chosen because the location is a producer of sweet star fruit varieties, bangkok red or Karangsari. The materials used in this study were fresh milk, plain yogurt biokul, honey and extracts of sweet star fruit. The tools used in this study were lemon juice, pots, tablespoons, stoves, basins, measuring cups, gas cylinders, and 100 ml bottles.

The experimental design used in this study was a non-factorial Completely Randomized Design (CRD) with 4 treatments and 4 repetitions. The treatment given is as follows: K0 : 100% milk, without the addition of sweet star fruit extract (control); K1 : 95% milk with 5% addition of sweet star fruit extract; K2 : 90% milk with the addition of 10% sweet star fruit extract; and K3 : 85% milk with the addition of 15% sweet star fruit extract.

Organoleptic test was conducted to determine the level of acceptance of yogurt drink products produced by 10 untrained panelists based on the preferences of each panelist. Panelists were randomly selected from various age groups and genders with the provisions to carry out organoleptic tests, namely having normal sensitivity (not color blind), panelists not being hungry, and not smoking, sick or not in conditions that interfere with the panelists' senses. The parameters measured in the organoleptic test include the taste, aroma, color, and texture of the yogurt drink. Organoleptic data analysis used analysis of variance (F test) at the level of 5%. The results of the analysis of significant variance were continued with the Least Significant Difference test at the 5% level.

In addition to organoleptic tests, yogurt drink products were also tested on a laboratory scale, namely pH and total lactic acid bacteria tests. The pH testing of yogurt drink was carried out at the Integrated Laboratory and Halal Center of the Islamic University of Malang, while the total test of lactic acid bacteria was carried out at the Central Laboratory of Biological Sciences, Universitas Brawijaya Malang. The results of the pH test and total lactic acid bacteria were then analyzed descriptively.

RESULT AND DISCUSSION

The stages in making yogurt drink with the addition of sweet star fruit using 4 treatments, namely K0 (without star fruit extract), K1 (sweet star fruit extract 5%), K2 (sweet star fruit extract 10%), and K3 (15% sweet star fruit extract). Furthermore, each treatment of the yogurt drink was carried out by organoleptic tests. The results showed differences in the concentration of sweet star fruit extract in treatment K0; K1; K2; and K3 did not have a significant effect on the organoleptic test results of yogurt drink, namely taste, aroma, color, and texture (Table 1).

Based on laboratory analysis showed that the effect of the concentration of sweet star fruit extract on yogurt drink made a difference to the pH value and total lactic acid bacteria (Table 2). The highest pH can be seen in the K3 treatment with the addition of 15% sweet star fruit extract with a score of 5,055 and the lowest score can be seen in the control treatment (K3) with a score of 4,89. Analysis of total lactic acid bacteria showed that the total lactic acid bacteria ranged from $2{,}9 \times 10^4$ Cfu/mL to $4{,}7 \times 10^5$ Cfu/mL.

Table 1. Average Score of Yogurt Drink Organoleptic Test.

Treatment	Organoleptic Test			
	Color	Taste	Aroma	Texture
K0	4,100	4,000	3,475	3,800
K1	4,175	3,725	3,375	3,630
K2	3,725	4,050	3,675	3,830
K3	3,425	3,750	3,625	3,550
LSD 5%	ns	ns	ns	ns

Note: ns shows that the effect is not significantly different based on the 5% LSD test (p = 0.05)

Table 2. Laboratory Test Results

Treatment	pH	total lactic acid bacteria
K0	4,890	$4,7 \times 10^5$ Cfu/mL.
K1	4,955	$3,2 \times 10^5$ Cfu/mL
K2	5,005	$4,6 \times 10^4$ Cfu/mL
K3	5,055	$2,9 \times 10^4$ Cfu/mL

Discussion

The organoleptic test results on the color variable showed that the difference in the concentration of the sweet star fruit extract did not give significant results (Table 1). Yoghurt drinks made with different treatments produced similar colors, because the use of the main ingredients in this yogurt drink had the same composition so that it did not have a significant effect on color formation. The color produced from the yogurt drink is yellowish white (Figure 1). According to Siahaan et al. (2021), sometimes milk is yellowish white caused by carotene. Carotene is the main pigment of milk fat, which when metabolized in the human body will form two vitamin A molecules.

Figure 1. Color Character In Yogurt Drink Treatment.

The results of organoleptic tests on the aroma character showed that the differences in the concentration levels of the sweet starfruit extract in the K0, K1, K2, and K3 treatments did not significantly affect the differences in the sweet starfruit extract yogurt drink (Table 1). The average preference for aroma obtained ranges from 3.375 to 3.675 with the criteria of being delicious. The aroma produced from each treatment tends to be milky. Siti et al. (2022) stated that the aroma of yogurt is produced from the fermentation process in the form of lactic acid, acetaldehyde, acetone and diacetyl so that it gives a distinctive aroma to yogurt. Bacteria that play a more role in the formation of sour aroma in yogurt are L. bulgaricus bacteria. Sweet star fruit has a distinctive aroma but not so overpowering and not everyone easily recognizes the distinctive aroma of the sweet star fruit.

Organoleptic test on the taste character showed that the difference in concentration of the sweet star fruit extract did not produce a significant effect on the taste of the yogurt drink with the sweet star fruit extract (Table 1). The panelists' average preference for taste ranged from 3,725-4,050 with the criteria of liking. This was due to the taste produced from treatments K1, K2, and K3 which had the same taste as the control treatment (K0), although they had different concentrations of sweet star fruit extract. According to Zakaria et al. (2013), among the changes that occur in milk due to microbial activity and growth, there are also changes that give rise to a distinctive and popular taste.

Organoleptic test of texture characters showed that there was no significant difference in each treatment K0, K1, K2, and K3 (Table 1). The panelists' average preference for texture ranges from 3.55 to 3.83 with thick criteria. Texture is one of the important factors to determine the quality of food. The texture of yogurt can also be influenced by the type and number of microorganisms in the starter used, which plays a very important role in the formation and texture of yogurt. In addition, fermentation time and environmental temperature also affect the manufacture of yogurt, and the formation of texture in yogurt is also influenced by the protein content contained in the yogurt raw material (Anastasia, 2017).

The results of laboratory analysis showed that the difference in the concentration of sweet star fruit extract in yogurt drink gave a difference to the pH value and total lactic acid bacteria in yogurt drink (Table 2). The higher the concentration of sweet star fruit extract, the pH value of the yogurt drink will be higher but the total value of lactic acid bacteria in the yogurt drink is decreasing. Meanwhile, all treatments of yogurt drink with sweet star fruit extract did not meet the minimum requirement for total lactic acid bacteria, which was 1×10^7 Cfu/mL (SNI, 2009). This shows that the decrease in the number of lactic acid bacteria is due to the concentration of sucrose added is too high, so it can cause the fermentation medium to become hypertonic and cause the lactic acid bacteria to die. Pradipta et al. (2020) explained that increasing the concentration of sucrose will change the bacterial growth environment so that it will reduce the total lactic acid bacteria.

CONCLUSIONS

The results showed that yogurt drink with the addition of 5%, 10%, and 15% sweet star fruit extract did not have a significant effect on the taste, aroma, texture, and color of the yogurt drink. The greater the addition of the concentration of sweet star fruit extract in the yogurt drink, the pH value will increase but the total lactic acid bacteria in the yogurt drink will decrease. It is recommended for further researchers to use the concentration of star fruit extract and sugar variations so that it can meet the required quality standards.

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