

Effect of Starter Amount to Sensory Characteristics Score of Fruit Yogurt

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ABSTRACT

*Fruit yogurt is a food product in the form of processed milk through a fermentation process using *Lactobacillus bulgaricus* and *Streptococcus thermophilus* bacteria, added with fruits. Yogurt quality is determined by the amount of starter added. This study aims to determine the effect of the amount of yogurt starter on the sensory characteristics score of watermelon, melon and golden melon yogurt. Three various amounts of yogurt starter were used in this research, namely 2%, 4%, and 6%. The starter was purchased from yogurt sold in the market. The starter consisted of *Streptococcus thermophilus*, *Lactobacillus bulgaricus*, *L. acidophilus*, and *Bifidobacterium*. Sensory properties consisting of color, aroma, texture and taste, were assessed by ten panelists by giving a score between 1-5. The results showed that the concentration of the starter could provide different scores of sensory characteristics. Watermelon yogurt made with 4% starter got the highest score for color, while the highest score for aroma was obtained by watermelon yogurt made with 6% starter. Watermelon yogurt made with 6% starter also got the highest score for texture, along with golden melon made with 4% starter. Based on the taste, the highest sensory characteristics score was obtained by yogurt without fruit that had been made with 4% starter.*

Keywords: Fruit yogurt; Sensory characteristics; Starter.

INTRODUCTION

Cow's milk is a food ingredient that has high nutritional value due to its complete nutrients such as lactose, fat, protein, various vitamins and minerals. Walther et al. (2022) stated that cow's milk contains 32.6 g/kg protein, 35.4 g/kg fat, 50.2 g/kg lactose, various vitamins such as vitamin C, B1, B2, B6, B12, A, E, K1, K2, biotin, niacin, pantothenic acid, and folic acids, as well as various minerals such as P, Na, Mg, K, Ca, Zn, Se, S, I, and Cl. Milk is easily damaged by microorganisms, because it is an excellent growth medium for bacteria and can be a potential medium for the spread of pathogenic bacteria. To extend the shelf life of milk, processing and preservation were carried out, including by fermenting milk into fruit yogurt (Intani and Swasono, 2022).

Fruit yogurt is a food product in the form of processed milk through a fermentation using *Lactobacillus bulgaricus* and *Streptococcus thermophilus* bacteria with fruits addition. The combination of these two bacteria in yogurt production, converts lactose (milk sugar) into lactic acid which can decrease the pH (Rahman et al., 2016; Yuliana et al., 2022). The fermentation causes milk proteins coagulation by acids produced by starter bacteria, causing yogurt to become thicker (Rahman et al., 2016). In addition to producing lactic acid, yogurt fermentation also produces aroma or aroma precursor compounds, such as diacetyl, acetaldehyde and ethanol (Chen et al., 2017).

Yogurt is rich in nutrients, such as phosphorus, potassium, vitamin A, B2 and B12 (Hadjimbei et al., 2022). Not only rich in nutrients, yogurt is also known to have various benefits for the health, for example preventing osteoporosis, diabetes and cardiovascular disease, as well as boosting immune and gut health (Hadjimbei et al., 2022). Due to its great benefit for health, it is not surprising that yogurt is widely consumed by the public. However, apart from being good for maintaining health, yogurt is also

consumed because of its unique sensory characteristics (Krastanov et al., 2023).

Sensory characteristics in the form of aroma and taste in yogurt are influenced by the starter culture used (Krastanov et al., 2023). Krastanov et al. (2023) stated that in yogurt fermentation, carried out by lactic acid bacteria, carbohydrates, fats and proteins contained in milk undergo a series of biochemical reactions, producing flavor compounds. The addition of starter to milk is very important in the process of making yogurt. Research conducted by Santoso et al. (2022) showed that different concentrations of starter cultures showed different pH values, viscosity, and lactic acid concentrations. The pH, viscosity, and concentrations of lactic acid could give different sensory characteristics of yogurt. This study aimed to get the best concentration of starter which must be added in the process of making yogurt with sliced fruit to produce fruit yogurt with the preferred sensory characteristics.

METHOD

In this study, yogurt was made with the addition of sliced fruit, namely watermelon, melon and golden melon. This research was quantitative experimental research. In this research, the independent variable was the amount of yogurt starter (2%, 4%, 6% v/v), while the dependent variable was the sensory characteristics of fruit yogurt which includes color, aroma, texture and taste. The research was conducted on 13-15 November 2022 at the Integrated Laboratory of Universitas KH. A. Wahab Hasbullah. The milk used in this study was ultra high temperature (UHT) milk, with the Ultramilk brand, obtained from the market. The starter used in this study was Biokul plain yogurt containing *Streptococcus thermophilus*, *Lactobacillus bulgaricus*, *L. acidophilus*, and *Bifidobacterium* bacteria purchased from the market.

Making of Fruit Yogurt

Making fruit yogurt was begun by heating the milk at 90°C for 15-30 minutes, then incubated at the room temperature until its temperature reaches 40°C. Next, the fruits were cut into small pieces. After the milk reaches a temperature of 40°C, the yogurt starter was added as much as 2%, 4% and 6% (v/v). The mixture of milk and starter is poured into a container for each concentration. The pieces of fruits (watermelon, melon golden and melon) was added into the milk, as many as 25 g/L. For each amount of starter, yogurt with no added fruits was also made. The inoculated milk then incubated in a room temperature for 12-24 hours. All of yogurt were made in triplicate.

Assessment of Sensory Characteristics

Fruit yogurt that had been incubated for 12-24 hours was observed for its organoleptic characteristics, including color, aroma, texture and taste. Sensory characters evaluation was carried out by the untrained panelists by giving a score 1 (dislike extremely) to 5 (like extremely) for each sensory characteristics. Besides assessed the sensory characteristics, the pH value of fruit yogurts at the end of the observation was also measured using pH indicator.

RESULT AND DISCUSSION

Result

This study assessed the sensory characteristics of yogurt with sliced fruit made with variations in the number of starters. Assessment of sensory characteristics was carried out to determine the panelists' acceptance of fruit yogurt made at various starter concentrations. In this study, besides the sensory characteristics assesment, the pH value of the yogurt was also measured. The results of sensory characteristics assesment and pH of fruit yogurt are shown in Table 1.

Discussion

Sensory characteristics score results varied for each sensory characteristics. In terms of color, Table 1 shows that panelists prefer the color produced in fruit yogurt made at a concentration of 4%, compared to the same fruit yogurt made with 2% or 6% starter. The highest score given by the panelists was for watermelon yogurt, which was 4.1. Yogurt with watermelon slices has a pink color, making it more attractive. The pink color produced by watermelon yogurt comes from the red color of the watermelon. Yogurt without pieces of fruit, melon and golden melon, did not show an attractive color like watermelon yogurt.

In terms of aroma, the aroma generated of the yogurt was the typical fresh sour aroma of yogurt. Assessment of aroma showed that in yogurt without fruit, panelists preferred yogurt made with 4% starter with a score of 3.6. In watermelon yogurt, the panelists preferred yogurt made with 6% starter, as indicated by the resulting score of 3.7. Watermelon yogurt with 6% starter was also the yogurt that the panelists liked the most in terms of aroma. In melon and golden melon yogurt, panelists preferred yogurt made with 2% starter, with score of 3.5 and 3.6 respectively. The aroma of yogurt comes from the

metabolic process of lactic acid bacteria in converting lactose into lactic acid (Chen et al., 2017). In this metabolic process various aroma compounds or aroma precursors are produced, for example acetaldehyde, ethanol, and diacetyl (Chen et al., 2017). The distinctive aroma of yogurt is characterized by acetaldehyde which has a green apple or nut taste (Chen et al., 2017).

Table 1 Sensory characteristics score and pH value of fruit yogurt made with different amount of starter

Starter amount (%)	Fruits	Color	Aroma	Texture	Taste	pH
2	No fruit	3.5	3.3	3.3	2.4	4
	Watermelon	3.1	3.3	3.1	2.7	4
	Melon	3.4	3.5	3.3	2.1	5
	Golden melon	3.3	3.6	3.1	2.3	4
4	No fruit	3.7	3.6	3.3	3.1	4
	Watermelon	4.1	3.3	3.1	3.0	4
	Melon	3.5	3.4	2.9	2.5	4
	Golden melon	3.7	3.2	3.8	2.5	4
6	No fruit	3.5	3.5	3.5	2.9	4
	Watermelon	3.6	3.7	3.8	2.7	4
	Melon	3.3	3.0	3.3	2.5	4
	Golden melon	3.5	3.3	3.8	2.5	4

In terms of texture parameters, the texture preferred by the panelists for all yogurt was yogurt that had been made with 6% starter, but melon yogurt made at a 2% starter also gave the same organoleptic value as yogurt made at a 6% starter. The texture produced by fruit yogurt in this study was thick. The change in the texture of liquid milk to become thick in yogurt was caused by the conversion of lactose into lactic acid by starter cultures, causing the pH to drop about 4. This low pH can coagulate the remaining protein that is still in the milk, causing a thick yogurt texture (Rahman et al. al., 2016)

The last sensory characteristic to be assessed was the taste. Based on the taste, the best score obtained was yogurt without fruit that had been made with 4% starter, with score 3.1, while the fruit yogurt that received the highest score based on taste was watermelon yogurt, with score 3.0. Yogurt has a distinctive sour taste. The sour taste of yogurt is caused by the activity of a lactic acid starter which converts lactose into lactic acid (Chen et al., 2017). The presence of an acidic compound produced in the fermentation in this study was supported by the acidic pH of the yogurt which was measured at the end of the incubation process. In this study, all of the pH value was around 4-5. In milk fermentation, diacetyl, a C4 compounds derived from metabolism, is important compounds that contribute to the taste of yogurt (Chen et al., 2017). In addition, compounds formed from the proteolysis of casein, including amines, aldehydes, phenols, indole, and alcohols, contribute to the taste of yogurt (Chen et al., 2017).

CONCLUSION

This study showed that the concentration of yogurt starter gives different sensory characteristic values in fruit yogurt. Based on the color, the panelists preferred watermelon yogurt made with 4% starter. Based on the aroma, panelists preferred watermelon yogurt made with 6% starter. Based on the texture, the panelists preferred watermelon and golden melon yogurt which was made with 6% starter, and golden melon which was made with 4% starter. Based on taste, the panelists preferred yogurt without fruit made with 4% culture.

REFERENCES

- Chen, C., Zhao, S., Hao, G., Yu, H., Tian, H., & Zhao, G. (2017). Role of lactic acid bacteria on the yogurt flavour: A review. *International Journal of Food Properties*, 20(sup1), S316-S330. <https://doi.org/10.1080/10942912.2017.1295988>
- Hadjimbei, E., Botsaris, G., & Chrysostomou, S. (2022). Beneficial effects of yoghurts and probiotic fermented milks and their functional food potential. *Foods*, 11(17), 2691. <https://doi.org/10.3390/foods11172691>
- Intani, V. L. C., Swasono, M. A. H. 2022. Pengaruh konsentrasi ekstrak daun bambu (*Gigantochloa apus*) dan konsentrasi starter terhadap kadar total flavonoid, pH dan organoleptic pada yoghurt. *Teknologi Pangan*, 13(1), 111-120.

- Krastanov A, Georgiev M, Slavchev A, Blazheva D, Goranov B, Ibrahim SA. Design and Volatile Compound Profiling of Starter Cultures for Yogurt Preparation. *Foods*. 2023; 12(2):379. <https://doi.org/10.3390/foods12020379>
- Rahman, S. R., Alam, M. Z., & Mukta, S. (2016). Studies on yogurt production using *Lactobacillus bulgaricus* and *Streptococcus thermophilus* isolated from market yogurt. *Journal of Sylhet Agricultural University*, 3(2), 307-313.
- Santoso, A., Retnosari, R., Pramudita, V., Wijaya, A. R., Anisa, T. N., & Sanjaya, E. H. (2021). The effect of starter concentration and incubation time on yogurt characteristics. *AIP Conference Proceedings*, 2353, 030080. <https://doi.org/10.1063/5.0052694>
- Walther, B., Guggisberg, D., Badertscher, R., Egger, L., Portmann, R., Dubois, S., Haldimann, M., Kopf-Bolan, K., Rhyn, P., Zoller, O., Veraguth, R., & Rezzi, S. (2022). Comparison of nutritional composition between plant-based drinks and cow's milk. *Frontiers in Nutrition*, 2645. <https://doi.org/10.3389/fnut.2022.988707>
- Yuliana, A. I., Azlina, V. N., & Chusnah, M. (2022). Characteristics of Yoghurt Drink With Addition of Sweet Starfruit Extract (*Averrhoa carambola*). *AGARICUS: Advances Agriculture Science & Farming*, 2(2), 46-49.