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Studies on Characteristics of Yogurt Made with Addition of Various Plant Extracts for Education Purposes

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ABSTRACT

Numerous yogurt products have been developed in Indonesia with the addition of plant extracts. Plant extracts added to making yogurt affect yogurt quality and can increase the value of local Indonesian plants. The goal of this review is to investigate the characteristics of yogurt with the addition of various plant extracts based on pH, viscosity, aroma, and flavor. This review article adopts a comprehensive literature review strategy, investigating numerous studies and sources to assemble and present information on the manufacture of yogurt including plant extract for education purposes. Yogurt made with the addition of Indonesian plant extracts has a pH that complies with the Indonesian National Standard (SNI) and is liked by panelists because of its specific aroma. However, the addition of plant extracts can affect the viscosity of yogurt products and flavor, so it is necessary to formulate.

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1. INTRODUCTION

Yogurt is a fermented food that is widely available and popular among the people (McKinley, 2005). Yoghurt has a creamy texture, a slightly viscous, has a good flavor, and acidity from fermentation (Kılıç et al., 2022). The two main lactic acid bacteria used as a starter culture in yogurt fermentation are *L. bulgaricus* and *S. thermophilus* (Dave & Shah, 1997). Yogurt provides positive health benefits, especially from the content of probiotics or good bacteria that can aid in shielding the digestive system's health from a variety of illnesses. Probiotics are helpful bacteria that aid in better digestion and strengthen the immune system. Yogurt is a powerful source of protein, calcium, and these beneficial bacteria (Harshendra & Reddy, 2023). Yogurt is a popular choice for people who are attempting to maintain a healthy diet since it is low in fat and calories and helps to keep the pH levels of the mouth in a pleasant zone, where the survival of harmful bacteria is challenged (El-Abbadi et al., 2014). As a country that has biodiversity, especially traditional medicine and agriculture derived from local plants (Von Rintelen et al., 2017), utilization to process natural resources with application in biotechnology and pharmacy is needed to improve the progress of health and economy in Indonesia.

Numerous yogurt products have been developed in Indonesia with the addition of plant extracts from different parts of the plant, which include fruits, vegetables, flowers, etc. Plant extracts contain bioactive phytochemicals which have numerous health advantages. Currently, concentrates of bioactive phytochemicals derived using extraction techniques such as solvent extraction, steam distillation, or cold pressing with or without pretreatment are known as plant extracts (El-aziz et al., 2023). Plant extracts added to making yogurt have the benefit of increasing nutritional value. In addition, the typical substance content of each plant extract can affect the quality of yogurt in terms of taste, color, and aroma (Meilanie et al., 2012). The purpose of this review is to explore the characteristics of yogurt made with the addition of various plant extracts based on pH, viscosity, aroma, and flavor. This review is significant because it gives a thorough understanding of the effects of adding plant extracts in yogurt manufacture, emphasizing the potential of plant extracts for yogurt fortification.

2. METHODS

This review article adopts a comprehensive literature review strategy, investigating many studies and sources to assemble and provide information on yogurt manufacture. Yogurt was created with the inclusion of plant extract. The writing of this review was carried out by analyzing several scientific journals that have researched making yogurt with the addition of plant extracts are Fruit (*Pandanus considers* L.), Kelor leaf (*Moringa oleifera*), Manggo-fruit (*Mangifera indica*), Pondoh snakefruit (*Sallaca edulis Reinw cv Pondoh*), Aloe vera L., Rosella flower (*Hibiscus sabdariffa* L.) based on pH, viscosity, aroma, and flavor.

3. RESULTS AND DISCUSSION

The research that produced yogurt made with the addition of plant extracts was analyzed based on the following parameters The research that produced yogurt made with the addition of plant extracts was analyzed based on parameters. Based on the analysis of some literature, the following data was obtained in **Table 1**.

Table 1. Characteristics of yogurt made with the addition of various plant extracts.

Plant extract	pH	Viscosity (cPa)	Aroma	Flavor	References
<i>Pandanus conoideus</i> L.	4.55-4.65	7.90-8.50	Recommended	Not Recommended	Jonathan et al., 2022
<i>Moringa oleifera</i>	5.19	6.70-11.80	Recommended	Recommended	Fajaratri and Ismawati, 2022
<i>Mangifera indica</i>	4.54-4.79	2.20-2.96	Recommended	Recommended	Hidayat et al., 2013
<i>Sallaca edulis Reinw cv Pondoh</i>	3.72-3.81	56.36-73.43	Recommended	Not Recommended	Setianto et al., 2014
<i>Aloe vera</i> L.	3.71 – 4.74	30.00-50.00	Recommended	Recommended	Rusanti et al., 2016
<i>Hibiscus sabdariffa</i> L.	3.65 - 4.40	12.70 - 30.70	Recommended	Recommended	Meilanie et al., 2018

3.1. pH Overview

According to Indonesian National Standard (SNI) 2009, good quality yogurt has a pH value ranging from 3.80-4.50. Based on the data above, the addition of plant extracts is still by the pH of yogurt determined by SNI. The addition of Pondoh snake-fruit extract is the SNI pH's lower limit, meaning that adding it to the yogurt makes it more acidic than adding other plant extracts; nevertheless, adding Rosella flower extract raises the SNI pH to its upper limit. For the addition of other extracts, the pH is still around the SNI pH. Although each plant extract has its acidity level, it does not significantly affect the pH of yogurt. That means the addition of plant extracts does not change the quality of yogurt, so it does not affect the viability of probiotics in yogurt.

3.2. Viscosity Overview

The random movement of liquid molecules causes viscosity, which is an impediment that retains the liquid molecularly. Fermented products referring to yogurt have a viscosity between 8.28-13.00 cP. The smaller the value presents the less, and otherwise. Yogurt with the addition of Mango fruit has a value below the viscosity standard. Thus, the yogurt produced tends to be liquid, while yogurt with the addition of Pondoh snake fruit and *Aloe vera* extracts has a value far above the yogurt viscosity standard. Thus, the yogurt produced is very thick. For the viscosity of yogurt with the addition of red fruit, Kelor leaf, and Rosella flower, the results are still within the viscosity standard. Each plant extract has a specific pH, that has an impact on yogurt products' viscosity. Thus, it is required to produce formulations in which the addition of plant extracts is adjusted. Then, the viscosity is by the standard viscosity value of a yogurt drink. The pH value affects the viscosity of yogurt. The smaller the pH value the higher the viscosity higher, and otherwise. Milk casein would coagulate in response to an increase in total acid, giving the mixture a gel-like consistency.

3.3. Aroma and Flavour Overview

In response to consumer demand, yogurt has undergone numerous modifications and varieties. Many flavors were taken from plant extract to accommodate product differences, and numerous fruit taste variations as well as mixtures of fruit and vegetable flavours have been produced. Customers were therefore less bored and were able to increase their daily intake of yogurt (Pertiwi et al., 2022). Based on literature reviews, panelists liked all the aromas of yogurt added with plant extracts because the aroma produced becomes richer and more signature of plant extracts. According to Jannah et al. (2014), the formation of lactic acid, acetaldehyde, acetic acid, and diacetyl gives yogurt its characteristic aroma. As a result of the yogurt fermentation process, LAB creates these chemicals. Yogurt's distinctive acidity and aroma are attributed to this volatile component (Latifasari et al., 2023). As for the taste, panelists did not like yogurt with the addition of red fruit extract and Pondoh snake fruit because there was still tartness and bitterness in the yogurt. Based on the results of several studies conducted, it is necessary to make formulations in adjusting the addition of plant extracts. Thus, the taste can be liked. In general, consumers prefer yogurt with added flavor at a certain level (Jannah et al., 2014). Flavor and aroma are included in sensorial characteristics. According to Vinderola et al. (2002), sensorial characteristics are among the factors that significantly influence a consumer's approval or preference of a product. In this case, almost all processed dairy products are always chosen by consumers mainly because of flavor.

4. CONCLUSION

Yogurt made with the addition of Indonesian plant extracts has a pH that complies with SNI and is liked by panelists because of its distinctive aroma. However, the addition of plant extracts can affect the viscosity of yogurt products. It is necessary to formulate the viscosity value according to the standard. Formulation is also needed to find a yogurt flavor that is liked by panelists. Thus, it can attract consumers to consume yogurt drinks with the addition of Indonesian plant extracts. This review can be a reference for modifying yogurt-making experiments in biotechnology material for natural science teachers and other stakeholders.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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