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Comparative Analysis of the Physicochemical and Microbiological Properties of *Lactobacillus plantarum* and *Lactobacillus acidophilus* Fermented Milk with Prebiotic Kepok Banana (*Musa acuminata × balbisiana*)

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Abstract. *Probiotics are microbes that are alive and beneficial to their hosts. Some probiotic bacteria are Lactobacillus plantarum and Lactobacillus acidhopillus. The performance of these two bacteria will be optimal if prebiotics are added as a source of nutrition, namely kepok banana (Musa acuminata × balbisiana). The aim of the research was to analyze the comparative physicochemical and microbiological properties of fermented goat's milk using Lactobacillus plantarum and Lactobacillus acidhopillus with prebiotic kepok banana puree (Musa acuminata × balbisiana). The study used a completely randomized design with a factorial pattern, factor A percentage of kepok banana puree P1= 5% kepok banana puree, and P2= 15% kepok banana puree, factor B V1= Lactobacillus plantarum (5%) and V1= Lactobacillus acidhopillus (5%), done 3 times repetition. The results of the research were that adding 15% kepok banana puree to Lactobacillus plantarum was better at increasing lactic acid levels and bacterial growth in the Total Plate Count, and 15% kepok banana puree to Lactobacillus acidophilus was better at lowering pH, increasing protein levels, reducing syneresis and increase the viscosity value. The conclusion of this research is that the use of 15% can improve the performance of Lactobacillus plantarum and Lactobacillus acidhopillus, and in general all research parameters are still within the Indonesian National Standard range. These findings contribute to the advancement of food science and microbiology by demonstrating the potential of kepok banana puree in improving the quality of goat milk-based probiotic products.*

Keywords: *Banana kepok , fermented, goat's milk, lactobacillus acidhopillus, lactobacillus plantarum*

1. Introduction

Fermentation is the process of breaking down complex compounds into simpler substances involving microbial activity (1). One of the fermentation products widely known to the public is fermented milk (2). The fermentation process utilizes lactic acid bacteria (LAB) as probiotics, which can have beneficial effects on health (3).

Probiotics are live microorganisms that can improve the balance of other microorganisms in the digestive tract. For their host, probiotics can also enhance immune function and prevent diseases in the digestive tract (4). Generally, the microbes used as

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probiotics belong to the genus *Lactobacillus*, two of which are *Lactobacillus plantarum* and *Lactobacillus acidophilus*. These two bacteria are reported to be able to survive the digestive tract and live in acidic pH (5). Although *Lactobacillus plantarum* and *Lactobacillus acidophilus* can survive in acidic pH, their viability is low, so prebiotics are needed to enhance their effectiveness.

Prebiotics are complex carbohydrates or fibers that cannot be directly digested by humans but can serve as food and a source of nutrients for probiotics (6). One example of prebiotics is kepok banana (*Musa acuminata × balbisiana*). The potential of kepok banana as a prebiotic is based on its content of resistant starch at 2.58 grams/g (7), inulin 2.1% (8), and fructooligosaccharides 0.3% (8). Resistant starch is a type of starch that, after degradation, cannot be absorbed by the human small intestine and is classified as dietary fiber. Inulin is considered a prebiotic because it can pass through the upper digestive tract and reach the large intestine, thus it is also regarded as a "colonic food" for gut microflora (9). Fructooligosaccharides (FOS) are a group of oligosaccharides composed of several monosaccharide units of fructose, which cannot be broken down by digestive enzymes and will undergo fermentation in the large intestine (10).

Although *Lactobacillus plantarum* and *Lactobacillus acidophilus* belong to the same genus, their species differ and have different abilities in improving the quality of fermented milk (11)(12). The aim of this study is to compare *Lactobacillus plantarum* and *Lactobacillus acidophilus* in enhancing the physicochemical and microbiological qualities of fermented milk with prebiotic kepok banana puree.

This study introduces the use of *Musa acuminata × balbisiana* as a prebiotic in goat milk fermentation, an area that has not been widely explored. While previous research has examined various prebiotic sources, studies specifically investigating the effects of kepok banana on the growth and metabolic activity of *Lactobacillus plantarum* and *Lactobacillus acidophilus* in fermented milk remain limited. By evaluating its impact on physicochemical and microbiological properties, this research provides new insights into optimizing probiotic dairy products using locally available and underutilized ingredients.

2. Methods

2.1. Research Materials

The materials used include Etawa crossbred goat milk, kepok banana (Musa acuminata × balbisiana), *Lactobacillus plantarum* FNCC0027, Lactobacillus acidophilus FNCC0051, and various other tools.

The tools used include a laminar flow cabinet, autoclave, incubator, digital scale, water bath, blender, tweezers, petri dishes, test tubes, and other equipment.

2.2. Research Procedures

1) Preparation of Bacterial Starter

Weigh 200 ml of Etawa crossbred goat milk. Then, inoculate 5% of the *Lactobacillus plantarum* and *Lactobacillus acidophilus* mother starters into the milk and incubate at 37°C for 18 hours.

2) **Preparation of Kepok Banana Puree**

Peel 450 grams of level 2 kepok bananas, cut them, and wash with distilled water. The bananas are then blended with 600 ml of water (a 3:4 ratio). The banana puree is pasteurized at 60°C for 3 minutes using the double boiler method, while stirring gently.

3) **Preparation of Fermented Goat Milk**

Pasteurize the goat milk at 72°C for 15 seconds, then cool it down to 40°C. The pasteurized milk is then placed in sample bottles, and 5% of the starter is added according to the treatment. The kepok banana puree is added to each sample bottle according to the treatment, and the samples are incubated at 37°C for 18 hours.

4) **Lactic Acid Content Test**

Add 18 ml of the sample into an Erlenmeyer flask. Then, add 3-4 drops of phenolphthalein solution as an indicator, which will turn pink. Record how much NaOH is used.

5) **Total Plate Count Test**

Test the lactic acid bacteria from a 10^{-6} dilution and inoculate onto MRSA (deMan Rogosa Sharpe Agar) medium in duplicate. Additionally, petri dishes are rotated clockwise to homogenize the bacterial suspension and culture medium. After the agar solidifies, place the petri dishes upside down in an incubator at 37°C for 48 hours.

6) **Protein Test**

Add 10 ml of the milk sample into a sterilized Erlenmeyer flask. Then, add 0.4 ml of potassium oxalate and 0.5 ml of phenolphthalein. Let it stand for two minutes, then titrate with NaOH until the sample turns pink. Once the sample changes color, add 2 ml of formaldehyde and let it sit for one minute, until the pink color disappears. Then, titrate the solution with NaOH again until the solution turns pink. Record the volume of NaOH 0.1 N used (V1). A blank solution is prepared using the same method, except replace the 10 ml sample with 10 ml of distilled water (V2).

7) **pH Test**

First, calibrate the pH meter using buffer solutions of pH 6.8 and pH 4.0. Then, rinse the electrode with distilled water and dry it with tissue. Measure the sample's pH by dipping the electrode into 20 ml of the sample, and record the reading on the pH meter.

8) **Syneresis Test**

Weigh 10 grams of fermented goat milk and place it in a syneresis tube, then store it in the refrigerator at 5°C for 1 hour. After that, centrifuge the sample for 10 minutes at 3000 rpm.

9) **Viscosity Test**

Measure 30 ml of the sample using a Brookfield viscometer with spindle LV 4 at a speed of 100 rpm at room temperature. Observe the speed on the scale after every three rotations.

2.3. Research Design

This study is an experimental study using a completely randomized factorial design (CRFD). Factor A is the percentage of kepok banana puree, with P1 = 5% kepok banana puree and P2 = 15% kepok banana puree. Factor B is the type of lactic acid bacteria, with V1 = *Lactobacillus plantarum* (5%) and V2 = *Lactobacillus acidophilus* (5%).

2.4. Observed Variables

2.4. 1. Lactic Acid Content

The lactic acid content is measured using Mann's Acid Test titration method, with the following formula:

$$TAT = \frac{\text{ml NaOH} \times N \times 90}{\text{Sample weight} \times 1000} \times 100\%$$

2.4.2. Total Plate Count

Count the total lactic acid bacteria using the pour plate method, from dilutions 10^{-1} to 10^{-6}.

2.4.3. Protein Content

Protein content is analyzed using formal titration, with the formula: Protein Content = (V1 – V2) × FK

2.4.4. pH Test

The pH of the milk is measured using a pH meter.

2.4.5. Syneresis

The syneresis test uses the method of Harwalkar & Kalab (1983).

2.4.6. Viscosity

Viscosity is measured using a Brookfield viscometer.

2.5. Data Analysis

The research uses analysis of variance (ANOVA). If there is a significant difference between treatments, Duncan's multiple range test (Steel & Torrie, 1995) is used.

The general model for the Completely Randomized Factorial Design (RALF) is as follows:

$$\mathbf{Yijk = \mu + Ai + Bj + ABij + \varepsilon ijk}$$

Description:

Yijk : Observation of factor A at level *i*, factor B at level *j*, and replication *k*
μ : Mean value
Ai : Effect of factor A at level *i*
Bj : Effect of factor B at level *j*
ABij : Interaction effect of factor A at level *i* and factor B at level *j*
εijk : Error effect on factor A at level *i*, factor B at level *j*, and replication *k*

3. Results and Discussion

3.1. Lactic Acid Content

Lactic acid is a byproduct of the fermentation process carried out by bacteria (13). The working principle of lactic acid bacteria (LAB) in this process is to break down complex compounds into simpler ones, making them easier for the body to absorb. The results of the study on lactic acid content with different percentages of *kepok* banana puree and different types of LAB can be seen in Table 1.

Table 1. Average lactic acid content of fermented goat milk with different percentages of kepok banana puree and different types of lactic acid bacteria (LAB)

Kepok banana puree	Lactic acid bacteria (5%)		Average
	V1	V2	
P1	1.68 ^{ab} ± 0.156	1.64 ^{ab} ± 0.026	1.66 ± 0.283
P2	1.74 ^{a} ± 0.051	1.54 ^{b} ± 0.006	1.64 ± 0.300
Average	1.71 ^{a} ± 0.120	1.59 ^{b} ± 0.19	

Note: Superscripts indicate that the interaction between different percentages of kepok banana puree and different types of lactic acid bacteria (LAB) significantly affects lactic acid content.

Based on the analysis of variance, there was a significant interaction ($P<0.05$) by the treatment of the percentage of addition of kepok banana puree and different types of LAB. Table 1 shows that the highest lactic acid content was produced by the treatment of 15% kepok banana puree + *Lactobacillus plantarum,* which was 1.74% and the lowest in 5% kepok banana puree + *Lactobacillus acidophilus,* which was 1.54%. All treatments met the standard for lactic acid content of fermented milk according to SNI 01-2981-1992, which was in the range of 0.5% to 2.0%.

Table 1 shows that the treatment with *Lactobacillus plantarum* always produces higher levels of lactic acid than *Lactobacillus acidophilus.* This is thought to be due to the different abilities of LAB in converting the fructooligosaccharide (FOS) content in kepok bananas into lactic acid and the result of different LAB activities in breaking down lactose in milk into organic acids, especially lactic acid, in line with what was conveyed by Rizal et al., 2016 that different types of LAB will produce different metabolisms (14). This opinion is also supported by Abdul et al., 2018 who stated that the rate of lactic acid formation and the high and low levels of lactic acid depend on the amount of starter, the type of starter and the ability of the starter used to form lactic acid (15) . The results of the study using *Lactobacillus plantarum* in this study were higher than the study conducted by Hanum et al., 2019 which obtained a lactic acid level of 1.53% in *Lactobacillus plantarum fermented milk* without the addition of prebiotics (16) . This is thought to occur because of the addition of prebiotics in the form of kepok banana puree which contains fructooligosaccharides and inulin which can be utilized by LAB for optimal growth, and optimal growth can increase its ability to change lactose into lactic acid in goat's milk. Another reason that causes the higher levels of lactic acid in the *Lactobacillus plantarum treatment is thought to be because Lactobacillus plantarum* is homofermentative bacteria, namely capable of producing lactic acid from carbohydrate metabolism through the Embden-Meyarhoff pathway and has advantages compared to other homofermentative bacteria (17) . This is also supported by research by Noor et al, 2017 which states that the growth rate of *Lactobacillus plantarum* can grow well on substrates rich in nutrients compared to other probiotic bacteria, thus producing higher levels of lactic acid.

In this study, the levels of lactic acid produced by *Lactobacillus acidophilus* were lower, this is thought to be because the performance of *Lactobacillus acidophilus* was less than optimal in utilizing the fructooligosaccharides and inulin provided by kepok banana puree so that it was slow in converting lactose into lactic acid, in accordance with the opinion of Mariana and Usman, 2019 that *Lactobacillus acidophilus* has a slower growth rate, is not suitable as a single starter and in general *Lactobacillus acidophilus* grows optimally in acidic media (18).

The interaction obtained between kepok banana puree and different types of LAB can be observed in the treatment of *Lactobacillus plantarum* with the addition of 15% kepok banana puree resulting in a higher percentage of lactic acid levels compared to the addition of 5% kepok banana, this is thought to be due to the higher and greater concentration of fructooligosaccharides (FOS) in kepok banana puree, the more the total number of lactic acid bacteria will increase and the lactic acid levels will also increase. This opinion is also supported by the statement from Setiarto et al., 2017 which states that the more prebiotics are added to fermented milk, the more it can increase probiotic function, namely helping to increase the growth and viability of one or more probiotic bacteria so that the lactic acid formed is higher (19). However, in contrast to the levels of lactic acid produced by *Lactobacillus acidophilus,* from this study it can be seen that the higher the percentage of kepok banana puree added, the more it reduces the ability of *Lactobacillus acidophilus* to produce lactic acid, in line with that conveyed by (Setiarto et al., 2016) that *Lactobacillus acidophilus* experiences fluctuations caused by lactic acid as a short chain fatty acid which is also used as a food source by *Lactobacillus acidophilus* for its growth, so that the lactic acid resulting from metabolism is directly used as a source of nutrition for *Lactobacillus acidophilus* (20).

3.2. Total Plate Count

The Total Plate Count (TPC) method is used to determine the number of microbes. This method involves cultivating living microbial cells in a growth medium, allowing them to multiply and form visible colonies. The results of the Total Plate Count analysis are presented in Table 2.

Table 2. Total Colony Count of Lactic Acid Bacteria (cfu/ml) with Different Percentages of Kepok Banana Puree and Types of LAB

Kepok banana puree	Lactic Acid Bacteria (5%)		Average
	V1	V2	
P1	8.53 ± 0.129	8.21 ± 0.015	8.37 ± 0.151
P2	8.46 ± 0.036	8.24 ± 0.059	8.35 ± 0.105
Average	8.49 ± 0.092 ^{a}	8.23 ± 0.041 ^{b}	

Note: Superscripts indicate that the interaction between different percentages of kepok banana puree and different types of lactic acid bacteria (LAB) significantly affects the total colony count.

Based on Table 2, the total lactic acid bacteria count in this study ranged from 8.213 log cfu/ml^{-1} to 8.53 log cfu/ml^{-1}. The obtained values comply with the Indonesian National Standard (SNI 7552:2018), which states that the minimum required total lactic acid bacteria count is 10^6 cfu/ml.

Based on variance analysis, the results showed that the addition of kepok banana puree at different concentrations did not affect the total lactic acid bacteria count. However, the type of lactic acid bacteria used as a starter had a highly significant effect on the total lactic acid bacteria count (P<0.01), and there was no interaction between the combination of kepok banana puree addition and the type of lactic acid bacteria used as a starter. In general, differences in puree concentration did not cause variations in the growth rate of lactic acid bacteria used as a starter. This may be due to the low concentration of banana puree used. The FOS (fructooligosaccharide) content in bananas is 0.3%, so the use of kepok banana puree at both 5% and 15% has not provided optimal results for lactic acid bacteria growth (8).

Furthermore, based on Duncan's multiple range test, the results showed that *Lactobacillus plantarum* had a significantly higher total bacterial count (P<0.01) compared to *Lactobacillus acidophilus*. This is likely due to *Lactobacillus plantarum* having a faster growth ability, whereas *Lactobacillus acidophilus* is less able to thrive optimally as a single starter (18). Bacterial growth is influenced by several factors, such as the chemical composition of milk, temperature, inoculum quantity, incubation time, and milk cooling time. To produce good-quality fermented milk, it is necessary to consider the appropriate starter culture, the availability of nutrients in the fermentation medium, and high-quality milk (21)(22).

3.3. Protein Content

The results of the study on protein content can be seen in Table 3.

Table 3. Protein content of fermented milk with different percentages of banana puree and different types of LAB.

Kepok banana puree	Lactic Acid Bacteria (5%)		Average
	V1	V2	
P1	5.133±0.300 ^{b}	4.030±0.225 ^{b}	5.11±0.960
P2	5,330±0,596 ^{b}	3.513±0.195 ^{a}	5.22±1.480
Average	5.23±0.435 ^{B}	3.77±0.339 ^{A}	

Note: Superscripts indicate that the interaction between different percentages of kepok banana puree and different types of lactic acid bacteria (LAB) significantly affects protein content.

The protein content obtained in this study ranged from 3.513 g to 6.827 g. The obtained protein content complies with SNI 01-2891-1992, which sets a minimum requirement of 3.2%.

Based on variance analysis, the addition of kepok banana puree at different concentrations did not affect protein content. However, the type of lactic acid bacteria used as a starter had a highly significant effect on protein content (P<0.01), and there was an interaction between the combination of kepok banana puree addition and the type of lactic acid bacteria used as a starter (P<0.05). An increase in total lactic acid leads to a decrease in pH and casein coagulation, as most microbial components are composed of protein (23)(24).

Based on Table 3, it can be seen that the protein content in the treatment with *Lactobacillus plantarum* was higher than in the treatment with *Lactobacillus acidophilus*. This is likely due to *Lactobacillus acidophilus* requiring more nutrients to survive, which are sourced from milk. As a result, the initially high protein content decreases over time during fermentation. This aligns with the findings of Elmy and Usman (2019) and Hanum et al. (2016), who stated that *Lactobacillus acidophilus* grows optimally in an acidic medium and utilizes protein as one of its nutrient sources (16) (18).

Table 3 also shows that in the treatment with *Lactobacillus plantarum*, a higher percentage of kepok banana puree led to an increase in protein content in fermented milk. This is likely because *Lactobacillus plantarum* can efficiently utilize the available protein in kepok banana puree. This finding is consistent with the study by Santoso et al. (2015), which states that high protein content can be influenced by the addition of bananas to fermented milk products. The more protein that dissolves in food ingredients, the higher the final protein content of the product (25).

3.4. pH

The acidity level can affect the pH value of fermented milk due to the increase in hydrogen ions. The average pH values are presented in Table 4.

Table 4. Average pH Values of Fermented Milk with Different Percentages of Kepok Banana Puree and Types of LAB

Kepok banana puree	Lactic Acid Bacteria (5%)		Average
	V1	V2	
P1	2.98±0.046^{b}	2.94±0.006^{bc}	3.01^{a} ±0.259
P2	2.91±0.035^{bc}	2.91±0.006^{bc}	2.90^{b} ±0.078
Average	2.95±0.148	2.93±0.049	

Note: Superscripts indicate that the interaction between different percentages of kepok banana puree and different types of lactic acid bacteria (LAB) significantly affects pH.

Based on variance analysis, the addition of kepok banana puree at different percentages had a significant effect on pH ($P<0.05$), while different types of lactic acid bacteria (LAB) had no significant effect ($P>0.05$). A significant interaction ($P<0.05$) was observed between the combination of kepok banana puree addition and different types of LAB. According to the Indonesian National Standard (SNI 2981:2009), the standard pH value for fermented milk is between 4 and 5. Yurliasi et al. (2020) also stated that a good fermented milk product should have a pH ranging from 3.8 to 4.6. However, in this study, the obtained pH values ranged from 2.91 to 2.98, which did not meet the standard (26).

This result is likely due to the fact that *Lactobacillus plantarum* and *Lactobacillus acidophilus* are homofermentative bacteria, meaning they produce acid during fermentation, leading to a highly acidic environment and a low pH. This finding is consistent with Wardhani et al. (2015), who stated that an increase in lactic acid levels in fermented products results in a decrease in pH (27)(28).

Table 4 also shows that as the percentage of kepok banana puree increases, the resulting pH decreases. This may be due to the fact that a higher concentration of kepok banana puree allows bacteria to more efficiently convert lactose into lactic acid, leading to a drop in pH. Kintaki et al. (2018) explained that during the fermentation process, LAB utilize available carbohydrates, producing lactic acid, which lowers the pH and increases acidity (29). Energy production in bacterial cells is directed towards cell formation, and in addition to generating energy, lactose breakdown also produces lactic acid. The accumulation of this acid leads to a decrease in pH (30)(31).

3.5. Syneresis

The research results table regarding syneresis can be seen in Table 5 below.

Table 5. Average syneresis value of fermented milk with different percentages of banana puree and different types of LAB.

Kepok banana puree	Lactic Acid Bacteria (5%)		Average
	V1	V2	
P1	21.7 0 ± 6.65 ^{a}	1.73 ± 0.32 1 ^{b}	16.8 3 ^{a} ± 40. 04
P2	8.5 3 ± 8.533 ^{b}	0.40 ± 0.36 1 ^{b}	4.4 5 ^{b} ± 12,200
Average	15.1 1 ^{a} ± 7.93	1.06 ^{b} ± 2,828	

Note: Superscripts indicate that the interaction between different percentages of kepok banana puree and different types of lactic acid bacteria (LAB) significantly affects syneresis.

Based on variance analysis, the addition of kepok banana puree had a highly significant effect (P<0.01) on syneresis. A highly significant interaction (P<0.01) was also observed between the combination of kepok banana puree addition and different types of lactic acid bacteria (LAB). Table 5 shows that the syneresis values obtained in this study ranged from 0.40% to 21.70%. A decrease in syneresis occurred as the concentration of kepok banana puree increased. This is likely due to the FOS and inulin content in kepok bananas, which enhances water-binding capacity. This finding aligns with Baguna et al. (2022), who stated that increasing the concentration of thickening agents significantly reduces syneresis, meaning that viscosity increases (32). The reduction in syneresis may also be due to protein coagulation during fermentation, triggered by lactic acid produced by *Lactobacillus plantarum* and *Lactobacillus acidophilus*, resulting in a thicker product.

The treatment with 5% kepok banana puree + 5% *Lactobacillus plantarum* had a high syneresis value. This is likely because *Lactobacillus plantarum* is amylolytic, meaning it utilizes carbon and nitrogen sources from kepok banana puree by fermenting carbohydrates into lactic acid. This weakens curd formation, leading to low protein stability. Consequently, the water-binding capacity decreases, causing syneresis in the fermented milk product. This finding is supported by Pinem et al. (2017), who stated that *Lactobacillus plantarum* is amylolytic and capable of fermenting or utilizing starch as a substrate (22).

Furthermore, Table 5 also shows that *Lactobacillus acidophilus* (5%) resulted in the lowest syneresis value at 0.40%. This is likely due to its ability to produce exopolysaccharides (EPS), which are mucous-like polysaccharides found outside the cell wall. The exopolysaccharides produced can increase the viscosity of fermented goat milk and reduce syneresis, thereby improving the physical quality of the product (17)(16).

3.6. Viscosity

Viscose in bags there is a measure thick on the product milk ferment Which produced , The results of the research on Viscosity can be seen in Table 6.

Table 6. Average viscosity value of fermented milk with different percentages of banana puree and different types of LAB.

Kepok banana puree	Lactic Acid Bacteria (5%)		Average
	V1	V2	
P1	841.37±61.635	939.37±54.000	874.94 4 ±167.424
P2	716.60 ± 62.277	971.97±143.633	862.88 9 ±395.061
Average	778.98 ^{b} ± 64.670	955.66 ^{a} ±69.155	

Note: Superscripts indicate that the interaction between different percentages of kepok banana puree and different types of lactic acid bacteria (LAB) significantly affects viscosity.

Based on the analysis results, the type of lactic acid bacteria (LAB) used in fermented goat milk with the addition of kepok banana puree at different percentages had a significant effect (P<0.05) on the viscosity of the fermented milk. However, the concentration of kepok banana puree had no significant effect (P>0.05), and there was no interaction between these two factors.

Table 6 shows that the viscosity values obtained were relatively high. This is likely because, during fermentation, bacteria produce lactic acid, leading to a decrease in pH. In these acidic conditions, milk proteins undergo coagulation and form globular structures, which increase the viscosity of fermented goat milk. The decrease in pH reduces protein solubility, triggering hydrophobic interactions between casein micelles, which form the structure and consistency of fermented milk, making it thicker and increasing viscosity (33)(34).

The addition of *Lactobacillus acidophilus* as a 5% starter in fermented goat milk with kepok banana puree resulted in the highest viscosity. This is likely due to the ability of *Lactobacillus acidophilus* to produce exopolysaccharides (EPS), which are extracellular polysaccharides synthesized by microbes. The formation of exopolysaccharides is influenced by the media conditions, where excess carbohydrates and low temperatures can stimulate their production, leading to a thicker fermented milk consistency (17)(35).

Conclusions

The conclusion of this study is that the use of 15% kepok banana puree can enhance the performance of *Lactobacillus plantarum* and *Lactobacillus acidophilus*. In general, all research parameters fall within the range of the Indonesian National Standard, except for pH. *Lactobacillus plantarum* was found to be more effective in improving the quality of fermented milk.

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Conflicts of Interest

The authors declare no conflict of interest.

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