



Impact of Adding Different Sweet Potato Flour Types (*Ipomoea Batatas* L.) at Various Percentages on the Antioxidant Activity and Microbiological Quality of Probiotic Fermented Milk (*Pediococcus acidilactici* BK01)

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Abstract | Probiotics are live microorganisms that, when consumed in sufficient amounts, benefit the body's health. One such probiotic is *Pediococcus acidilactici* BK01. This study evaluates the impact of different types and amounts of sweet potato flour on the prebiotic and antioxidant properties of fermented milk. The objective is to determine the effects of different types and percentages of sweet potato flour on prebiotic and antioxidant properties. An experimental design was employed, preparing three types of sweet potato flour: white (A1), purple (A2), yellow (A3), and These flours were added to fermented milk in varying proportions: 0% (B1), 3% (B2), and 6% (B3), with three repetitions for each treatment. The results showed a significant effect ($P < 0.05$) of sweet potato type and flour percentage on increasing total lactic acid bacteria, decreasing pH value, increasing acidity, and antioxidant activity. The optimal treatment was fermented milk with 6% purple sweet potato flour, yielding 117.67×10^9 CFU/ml of lactic acid bacteria, a pH value of 3.75, titratable acidity of 1.40%, and antioxidant activity of 78.90%. This study suggests that fermented milk with added sweet potato flour can serve as a functional food, offering health benefits through its prebiotic and antioxidant properties.

Keywords | Antioxidant activity, Lactic acid bacteria, Acidity, Prebiotic, Probiotic, Functional food

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INTRODUCTION

The development of science and technology is growing more and more. One of them is the development of food products. In addition, high public awareness of eating healthy food encourages people to consume functional

foods. Milk is one of the food products from livestock favored by various groups of people and functional. Milk has a high nutritional content such as lactose, protein, fat, and minerals, making it susceptible to irreversible damage due to its nutrient-rich composition that supports microbial growth (Sujata *et al.*, 2022). Such microbial growth can alter

milk's taste, color, aroma, and texture, leading to milk spoilage. Various processing and preservation techniques can be carried out to improve milk quality so it is not easily damaged. One type of processing and preservation of milk is to process it into fermented milk products as a functional food.

Fermented milk is a dairy product produced from the fermentation process by lactic acid bacteria using processed milk raw materials or without the addition and modification of milk by breaking down lactose using lactase so that it decreases pH and without coagulation (Horiuchi *et al.*, 2022; Chairunnisa, 2006). The fermentation process in milk can inhibit pathogenic microorganisms to extend milk's shelf life (Nadirova *et al.*, 2023). Milk fermentation requires probiotic microorganisms to play a role. Probiotics are microorganisms that, when consumed in sufficient quantities, can have advantages such as increasing nutritional value and affecting body health by improving the balance of gut microbiota (Prem and Savitri, 2023). Probiotics will affect the gut microflora and provide health effects such as lowering the risk of colon cancer, anti-hypertension, enhancing immunity, and anti-carcinogenic (Zaib *et al.*, 2024). One type of probiotic used in fermented milk is *Pediococcus acidilactici* BK01.

Pediococcus acidilactici BK01 is a probiotic isolated from spontaneously fermented Bekasam or swamp sepat fish (*Tricopodus trichopterus*) from Banyuasin, South Sumatra. This bacterium can survive in stomach acid and bile salt conditions and has antimicrobial activity against *Escherichia coli* 0157:H7, *Staphylococcus aureus* ATTCC25923, and *Listeria monocytogenes* CFSAN0044330 (Melia *et al.*, 2019). These bacteria can be used as probiotics in fermented milk, where in previous studies, research has been carried out on *Pediococcus acidilactici* BK01 fermented milk with the addition of red ginger with 30 days of storage has an antioxidant content of 48.39%, pH 4.3%, titratable acidity 1.716%, moisture content 80%, protein 3%, fat 3%, syneresis 28%, and water holding capacity (WHC) 63% (Melia *et al.*, 2022). In another study, Melia *et al.* (2020) examined the quality of *Pediococcus acidilactici* BK01 fermented goat milk at refrigerator temperature for 28 days which had a probiotic count of 9,106 log CFU/ml, titratable acidity 1.73%, pH 4.28, total plate count (TPC) 4,012 log CFU/ml, protein 3.57%, fat 3.49%, and moisture content 85.51%. Synbiotic foods are an essential strategy in functional foods (Avila-Reyes *et al.*, 2014). Synbiotics are a combination of probiotics and prebiotics that affect body health (Lyon *et al.*, 2023). One type of prebiotic that can be added to fermented milk is sweet potato flour.

For years, traditional foods in numerous cultures have included fermented dairy products like kefir and yogurt. An increasing number of people are interested in enhancing these goods' nutritional profile and health benefits by add-

ing different functional ingredients. The addition of sweet potato is one such change. The global demand for healthier functional food encourages this trend, which is observed in several regions.

Sweet potatoes are high in dietary fiber, minerals, and vitamins, particularly vitamin A. Sweet potatoes are a source of essential minerals and antioxidants that can be added to fermented dairy products to boost their nutritional value. Inulin, a prebiotic fiber found in sweet potatoes, can encourage the development of beneficial gut microbes. This suggests that sweet potato-based fermented milk products may improve intestinal health. Sweet potatoes' inherent sweetness can enhance the flavor of fermented dairy products, negating the need for additional sugar. Its fiber content could also affect the texture's creaminess and thickness. Several types of sweet potato that are quite familiar among the public include purple sweet potato (*Ipomoea batatas* var *Ayumurasaki*), yellow sweet potato (*Ipomoea batatas* var *Lam*), and white sweet potato (*Ipomoea batatas* *linneaus*). Purple sweet potato has 0.72% fructooligosaccharide and 2.73% inulin (Long *et al.*, 2014). In addition, purple sweet potatoes contain anthocyanins 61.85 mg/100 g (Husna *et al.*, 2013). Yellow sweet potato has oligosaccharide compounds of 2.165% and inulin of 4.6% (Afriani *et al.*, 2016). In addition, yellow sweet potatoes are rich in beta-carotene (pro-vitamin A), ranging from 1.3-3.9 mg/100g, and vitamin C (Bungan, 2016; Kammona *et al.*, 2015). White sweet potato contains 0.07% raffinose, 2.46% sucrose, 2.53% oligosaccharide, and 5.5% inulin (Lesmanawati *et al.*, 2013; Afriani *et al.*, 2016).

In a previous study, fermented goat milk *Levilactobacillus brevis* DSM02 with the addition of porang flour (*Amorphophallus oncophyllus*) as much as 0.25% had a total lactic acid bacteria of 19×10^9 CFU/mL, titratable acidity of 1.21%, pH value of 4.10%, dietary fibre of 0.18%, moisture content of 84.33%, protein content of 2.77% and viscosity of 6,114 cP (Mayasari *et al.*, 2024). Research by Rizki *et al.* (2019) showed that yogurt with the addition of 8% purple sweet potato flour had a total lactic acid bacteria content of $13.19 \log$ CFU/ml, pH 3.73, total acid titration of 1.23%, and antioxidant activity of 90.33%.

By investigating the impact of adding various kinds and percentages of sweet potato flour (*Ipomoea batatas* L.) on the antioxidant activity and microbiological quality of probiotic fermented milk (*P. acidilactici* BK01), this study attempts to fill this gap. This study investigates the impact of different types and percentages of sweet potato flour on the antioxidant activity and microbiological quality of probiotic fermented milk.

MATERIALS AND METHODS

The materials used in this study were Etawa crossbreed goat milk (*Capra aegagrus circus*) for making starters obtained

from Dairy Goat Farm in Korong Gadang, Kuranji District, Padang City, West Sumatra, Indonesia. Diamond® Ultra High Temperature (UHT) milk as much as 2700 ml. The compotion of UHT milk (per 200ml): fat 7 g, protein 6 g, Carbohydrat 12 g, glukose 7 g. Probiotic microencapsulated powder *Pediococcus acidilactici* BK01 (The *P. acidilactici* starter was microencapsulated with a mixture of maltodextrin and whey protein isolate, and encapsulated microbes can thrive in fresh milk media in the fermentation process) from the Animal Product Technology Laboratory, Faculty of Animal Husbandry, Andalas University, Padang. White, purple, and yellow sweet potatoes were obtained from Bandar Buat traditional market in Padang City. In addition, the materials used were MRS Agar (*Neogen Culture Media*®), MRS Broth (*Neogen Culture Media*®), distilled water, NaOH 0.1N, *Phenolphthalein* Indicator, buffers 4.01 and 6.86, Folin Ciocalteu Reagent, Na₂CO₃, DPPH (*Diphenylpicryl-Hydrazy*), and Methanol.

This research was conducted with an experimental design This research was conducted with experimental design. The method was a 3 x 3 factorial complete randomized design (CRD) with 3 replicates. The treatments were sweet potato flour type, namely white sweet potato (A1), purple sweet potato (A2), yellow sweet potato (A3), and the percentage of sweet potato flour addition to fermented milk, namely 0% (B1), 3% (B2), and 6% (B3).

PREPARATION OF SWEET POTATO FLOUR (*IPOMOEA BATATAS* L.)

White, purple, and yellow sweet potatoes were peeled, washed, and sliced thinly, then dried using an Electric Food Dehydrator DHY-06X at 90° for 3 hours. Pureed the dried sweet potato with a blender, then sifted with a 60 mesh sieve to produce fine sweet potato flour (Santi et al., 2022; Hardoko et al., 2010). Table 1 shows the composition of sweet potatoes flour.

Table 1: Compoition of Sweet Potatoes Flour.

Component	Sweet Potatoes Flour		
	White	Purple	Yellow
Moisture	6,35 %	5,53%	7,00%
Protein	2,07%	1,39%	1,52%
Fat	0,26%	0,25%	0,30%
Total Phenol	7,39 mg GEA/g	124,78 mg GEA/g	35,65 mg GEA/g
Antioxidant Activity	44,94%	87,11%	85,18%

PREPARATION OF FERMENTED MILK STARTER

100 ml of goat's milk was pasteurized at 85°C for 15 minutes and reduced to room temperature. Microencapsulated probiotic powder *Pediococcus acidilactici* BK01 was put into goat milk as much as 1%. Milk was incubated at 37°C for 18 hours (Wakhidah et al., 2017).

PREPARATION OF FERMENTED MILK

UHT milk was put into each milk bottle. Sweet potato flour was added according to the treatment, and pasteurized milk was pasteurized at 85°C for 15 minutes. The milk temperature was lowered to room temperature. *Pediococcus acidilactici* BK01 starter was inoculated as much as 5% and homogenized. Incubation occurred at 37°C for 18 hours (Andriani et al., 2021).

TEST PARAMETERS

TOTAL COLONY OF LACTIC ACID BACTERIA: After preparing a 1.0 mL sample, it is diluted in 9 mL of de Man Rogosa Sharpe Broth (Neogen Culture Media) and homogenised by vortexing. Following this, the fluid is diluted to 10⁸. A hockey stick is used to level the dilution results after they have been planted using the spread method on a petri dish filled with de Man Rogosa Sharpe Agar (Neogen Culture Media). For 48 hours, the samples are incubated at 37°C. Colony Forming Units (CFU) are used to count colonies (Sivakumar and Kalairasu, 2010).

TESTING pH AND TOTAL ACID TITRATION: The pH value was tested using a digital pH meter (HANNA Instrument) that was calibrated using buffers pH 4.01 and pH 6.86 (AOAC, 2012). Total acid titration was measured by mixing yogurt samples with 10 mL sterile distilled water and titrated using 0.1 N NaOH using phenolphthalein indicator (AOAC, 2005).

$$\text{Titrateable acidity (\%)} = \frac{\text{Vol. NaOH used (ml)} \times 0.1\text{N NaOH} \times \text{milliequivalent factor}}{\text{Mass of sample (g)}} \times 100$$

ANTIOXIDANT ACTIVITY: 1 ml sample was mixed with 1 ml methanol solution containing 80 ppm DPPH. Then homogenized and allowed to stand for 30 minutes in a dark room. Measurements were made with a spectrophotometer (Shimadzu UV-1800®) with an absorbance reading of 517 nm (Huang et al., 2005).

STATISTICAL ANALYSIS

All data obtained in this study were analyzed using SPSS 26 statistical analysis. Data were analyzed using SPSS version 26 statistics, and if there was a significant difference from the treatment, it was continued with the Duncan Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

TOTAL COLONY OF LACTIC ACID BACTERIA

The results show that the significant difference (P<0.05) was due to the type of sweet potato used and the percentage of sweet potato flour addition that could increase lactic acid bacteria in *Pediococcus acidilactici* BK01 fermented milk. The average colonies of lactic acid bacteria of each treatment are presented in Table 2.

In the A3B3, A2B3, and A1B3 treatments, the addition of yellow, purple, and white sweet potato flour as much as 6% has the highest total lactic acid bacteria in *Pediococcus acidilactici* BK01 fermented milk. This is due to the prebiotic content contained in sweet potato flour, such as dietary fiber, oligosaccharides, fructooligosaccharides, inulin, raffinose, and resistant starch, which can stimulate the growth of *Pediococcus acidilactici* BK 01 bacteria in fermented milk. The addition of sweet potato flour, both yellow, purple, and white yam, as much as 6% in fermented milk, experienced an average LAB increase of 40% when compared to fermented milk without the addition of yam flour.

Table 2: Average total lactic acid bacteria (10^9 CFU/mL) of fermented milk.

Type of Sweet Potato Flour	Percentages of Sweet Potato Flour Addition			Average
	0% (B1)	3% (B2)	6% (B3)	
White (A1)	70.00 ^a	88.00 ^{ab}	117.00 ^{bc}	91.67
Purple (A2)	73.00 ^a	113.33 ^b	117.67 ^{bc}	101.33
Yellow (A3)	82.67 ^{ab}	113.67 ^b	149.33 ^c	115.22
Average	75.22	105.00	128.00	

Note: ^{abc} Different superscripts in the columns indicate significant differences ($P < 0.05$).

Adding sweet potato flour can increase LAB growth because sweet potatoes have prebiotic sources found in sweet potatoes, such as dietary fiber, oligosaccharides, fructooligosaccharides, inulin, raffinose, and resistant starch. Prebiotic components such as fructooligosaccharides (FOS), inulin, raffinose, fiber, oligosaccharides, and resistant starch can selectively stimulate probiotic growth (de Albuquerque *et al.*, 2020; Muchiri *et al.*, 2017; Lestari *et al.*, 2013). This follows the opinion of (Celestin *et al.*, 2017), which states that fructooligosaccharides, oligosaccharides, and inulin play an essential role in fermented dairy products by encouraging the growth of probiotics. Gouveia *et al.* (2020) and Alam (2021), added that apart from being rich in carbohydrates, sweet potato (*Ipomoea batatas* L.) also contains other bioactive components such as protein, minerals, ruberenoids (yellow sweet potato), flavonoids, anthocyanins (purple sweet potato), phenolic acids, and ascorbic acid. Sancho *et al.* (2017) added that fructooligosaccharides in sweet potatoes have a 29.08 mg/100g concentration. According to Yuliansar (2020), the starch content of sweet potatoes in white, orange, and purple is 85.15%, 78.14%, and 46.98%, respectively. Furthermore, according to Nindiyarani *et al.* (2011), Saman *et al.* (2019) and Correa *et al.* (2018), the fiber content of purple, white, and yellow sweet potatoes is 2.40%, 0.62%, and 1.92%, respectively.

In the A1B1, A2B1, and A3B1 treatments, the treatment with the addition of 0% white, purple, and yellow sweet potato flour (control) had the lowest value because there

was no addition of sweet potato flour, which could be used as a source of prebiotics to increase lactic acid bacteria in fermented milk. This is the opinion of Perez *et al.* (2022), which states that adding tuber flour to fermented milk increases total lactic acid bacteria. In contrast, the addition of sweet potato flour (*Ullucus tuberosus*) to low-fat yogurt can increase total LAB so that it can produce acid production during the fermentation process. Pramono *et al.* (2020) added ganyong flour (*Dioscorea esculenta* L) as much as 2% in yogurt produced a total LAB of 9.2×10^9 CFU / ml. Added research by Rizki *et al.* (2019) fermented milk with 8% purple sweet potato flour produced a total LAB of log 13.19 CFU/ml. In this study, the total LAB of fermented milk with the addition of sweet potato flour total LAB of $70-149.33 \times 10^9$ CFU/ml, which has met the probiotic drink standard and the WHO (2001) standard of 10^9 CFU/ml.

Table 3: Average pH value of fermented milk.

Type of Sweet Potato Flour	Percentages of Sweet Potato Flour Addition			Average
	0% (B1)	3% (B2)	6% (B3)	
White (A1)	4.49 ^e	3.96 ^{bcd}	3.80 ^{ab}	4.08
Purple (A2)	4.52 ^e	3.97 ^{cd}	3.75 ^a	4.08
Yellow (A3)	4.54 ^e	4.07 ^d	3.89 ^{abc}	4.17
Average	4.52	4.00	3.81	

Note: ^{abcd} Different column superscripts indicate significant differences ($P < 0.05$).

PH VALUE

Table 3 shows that fermented milk with several types of sweet potatoes with different percentages of sweet potatoes have a significant effect ($P < 0.05$) on the pH value of *Pediococcus acidilactici* BK01 fermented milk. The average pH value of *Pediococcus acidilactici* BK01 fermented milk was 3.75-4.54. The average pH value of each treatment is presented in Table 3.

Fermented milk containing 6% purple, white, and yellow sweet potato flour exhibited the lowest pH value in the A2B3, A1B3, and A3B3 treatments. Compared to fermented milk without adding sweet potato flour, the average pH decreased by 15%. This is because lactic acid bacteria use prebiotic sources higher than lower percentages of sweet potato flour to make lactic acid, which can lower the pH of fermented milk.

The more lactic acid is a metabolite produced by LAB, so with more lactic acid metabolites the lactic acid can dissociate into H^+ ions so that the pH becomes lower. This follows the opinion of Purwati *et al.* (2018), which states that the more acid produced, the more H^+ ions are formed, so the pH meter electrode's pH measurement shows a decreasing value. Abouloifa *et al.* (2020) stated that the addition of prebiotics such as fructooligosaccharides (FOS) and oligosaccharides can cause a decrease in pH during fermentation.

This follows the opinion of [Jenimat et al. \(2023\)](#), which states that sweet potatoes contain polyphenol compounds, chlorogenic acid, caffeoylquinic acid, and oxalic acid 77.66–197.90 mg/100g. Added opinion [Aboyeji et al. \(2020\)](#) state that sweet potatoes, as a carbon source, can produce acids through simultaneous saccharification and fermentation processes. In addition, according to [Li et al. \(2019\)](#), the presence of inulin in milk causes the growth of *Lactococcus lactis* bacteria, thus reducing the pH value. In the research of [Melia et al. \(2022\)](#) on fermented goat milk, *Pediococcus acidilactici* BK01, with red ginger extract, produced a pH value of 4.07–4.43.

TITRATABLE ACIDITY

Table 4 shows that fermented milk with several types of sweet potatoes with different percentages has a significant effect ($P < 0.05$) on the titratable acidity of *Pediococcus acidilactici* BK01 fermented milk. The average titratable acidity of *Pediococcus acidilactici* BK01 fermented milk is 1.03–1.56. This shows that the increase in titratable acidity in fermented milk is in line with the decrease in the pH value of fermented milk, along with the addition of the percentage of several types of sweet potato flour.

Compared to fermented milk without the addition of sweet potato flour, there was a 33% increase in titratable acidity in the fermented milk of *P. acidilactici* BK01 in the A1B3, A2B3, and A3B3 treatments. This rise was caused by the addition of numerous forms of sweet potato flour, up to 6%. The titratable acidity of the fermented milk of *P. acidilactici* BK01 in the A1B3, A2B3, and A3B3 treatments increased by 33% compared to fermented milk without adding sweet potato fluoride. The addition of several types of sweet potato flour, up to 6%, was the cause of this surge.

This follows the research findings of [Imelda et al. \(2020\)](#), who claim that the higher the sweet potato content, the lower the pH value. Lactic acid bacteria use lactose and prebiotic sources as a substrate for their metabolism, converting them into organic acids and lactic acid, the main acid component. [Novelina et al. \(2012\)](#) conducted more research on fermented beverage products, including red sweet potato extract, which has a pH of 3.55–4.47, titratable acidity of 1.56–1.97%, and total LAB of 6.1–8.3 x 10⁸ CFU/ml.

[Phahlane et al. \(2022\)](#) state that sweet potatoes primarily contain chlorogenic acid (CGA). However, they also include other types of acids. Where the many forms of chlorogenic acid, including chlorogenic acid and 3,5-, 3,4-, and 4,5-dicaffeoylquinic acids, are found. According to [Lebot et al. \(2021\)](#), yellow sweet potatoes had an average of 0.95 µg/mg of chlorogenic acid (CGA), 0.86 µg/mg of 3,5-caffeoylquinic, 0.09 µg/mg of 3,4-caffeoylquinic, and 0.16 µg/mg of 4,5-caffeoylquinic. This study found that the average titratable acidity of yellow sweet potato (A3), pur-

ple sweet potato (A2), and white sweet potato (A1) was 1.29%, 1.23%, and 1.31%, respectively. According to [Codex Alimentarius \(2003\)](#), the standard for titratable acidity is a minimum of 0.3%.

Table 4: Average titratable acidity (%) of fermented milk.

Type of Sweet Potato Flour	Percentages of Sweet Potato Flour Addition			Average
	0% (B1)	3% (B2)	6% (B3)	
White (A1)	1.08 ^a	1.30 ^b	1.56 ^d	1.31
Purple (A2)	1.03 ^a	1.26 ^b	1.40 ^{bc}	1.23
Yellow (A3)	1.10 ^a	1.30 ^b	1.48 ^{cd}	1.29
Average	1.07	1.29	1.48	

Note: ^{abcd} Different superscripts in the columns indicate significant differences ($P < 0.05$).

ANTIOXIDANT ACTIVITY

The statistical analysis results showed a significant effect ($P < 0.05$) between several types of sweet potato and the percentage of sweet potato flour addition on the antioxidant activity of *Pediococcus acidilactici* BK01 fermented milk. The average antioxidant activity of each treatment is presented in Table 5.

Table 5: Average antioxidant activity (%) of fermented.

Type of Sweet Potato Flour	Percentages of Sweet Potato Flour Addition			Average
	0% (B1)	3% (B2)	6% (B3)	
White (A1)	20.06 ^{ab}	22.09 ^{abc}	25.26 ^{bc}	22.47
Purple (A2)	19.42 ^{ab}	58.85 ^d	78.90 ^e	52.39
Yellow (A3)	18.75 ^a	23.23 ^{abc}	27.06 ^c	23.01
Average	19.41	34.72	43.74	

Note: ^{abcde} Different superscripts in the columns indicate significant differences ($P < 0.05$).

Compared to fermented milk without flour addition, the highest antioxidant activity was found in fermented milk with 6% purple sweet potato flour addition, as revealed by a 75.38% increase in antioxidant activity. This may be because, as compared to other flours, purple sweet potato flour had higher total phenol content (124.78 mg GEA/g) and antioxidant activity (87.11%) than the different flours.

According to [Winardi et al. \(2020\)](#), purple sweet potato flour has an anthocyanin content of 20.196–62.138 mg/100g. [Lee et al. \(2021\)](#) add that purple sweet potatoes have been shown to boost the antioxidant content of fermented milk products like yogurt. Similarly, fermented milk containing Changsey purple sweet potato added by *Lactobacillus acidophilus*, *Lactobacillus delbrueckii subsp Lactis*, and *Lactobacillus gasseri* bacteria has a high concentration of butyric amino acids (GABA), organic acids, and antioxidant content, as indicated by the additional opinion of [Wu et al. \(2012\)](#). On

the other hand, the abundance of antioxidants in Ching-shey Purple Sweet Potatoes may increase the antioxidant activity of functional meals.

The high antioxidant activity in the A2B2 and A2B3 treatments is due to flavonoids such as anthocyanins in the purple sweet potato flour added to the fermented milk of *Pediococcus acidilactici* BK01. This is following Lee *et al.* (2021), which states that purple sweet potatoes are proven to increase antioxidants in fermented products such as yogurt. Winardi *et al.* (2020) stated that the anthocyanin content in purple sweet potato flour ranged from 20,196 mg/100g to 62,138 mg/100g. *Pediococcus acidilactici* BK01 fermented milk with white sweet potato did not differ significantly ($P>0.05$) from fermented milk with yellow sweet potato. This is due to the relatively low beta carotene content. This follows the opinion of Nogueira *et al.* (2018) that the beta-carotene content in sweet bread with yellow sweet potato flour ranges from 0.1656-0.4715 µg/g. Ishiguro *et al.* (2010) added that yellow sweet potato flesh contains beta carotene 1.3-3.9 mg/100g. In addition, the beta-carotene content is prone to degradation when exposed to heat, so although there is an increase in antioxidant activity, it is not significant. This follows the statement of Ospina *et al.* (2023), where exposure to high temperatures causes a decrease in carotenoid compounds in sweet potatoes with a significantly decreased retention rate at cooking temperatures of 75°C, 85°C, and 95°C.

CONCLUSIONS AND RECOMMENDATIONS

The optimal sweet potato type addition to the fermented milk of *P. acidilactici* BK01 was purple sweet potato flour (*Ipomoea batatas* var Ayumurasaki), added at a percentage of sweet potato flour addition of 6%. The fermented milk had a pH value of 3.75, a total acid content of 1.40%, and a 78.90% antioxidant activity. *P. acidilactici* BK01 fermented milk can be made with several types of sweet potato flour (*Ipomoea batatas* L.), a source of prebiotics and antioxidants that is functional foods.

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NOVELTY STATEMENT

The addition of several types of sweet potato flour (*Ipomoea batatas* L.) to the fermented milk of *P. acidilactici* BK01 still meets the criteria of probiotics that have the potential to be functional food and are beneficial for health.

Sri Melia and Doni Supadil: Data conceptualization and curation.

Doni Supadil: Data Curation, formal analysis, and writing of the original manuscript.

Sri Melia and Indri Juliyarsi: Validation and writing editor.

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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