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Quality and Antioxidant Activity of Sweet Corn (*Zea mays saccharata*) Beverage Fermented with *Lactobacillus plantarum* B1765

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ABSTRACT

Sweet corn (*Zea mays saccharata*) has potential as a functional food because it contains bioactive compounds, including phenolics and flavonoids, that contribute to its antioxidant activity. Fermentation with lactic acid bacteria is one method to increase the availability of these bioactive compounds. This study aimed to determine the effect of fermentation duration on the quality and antioxidant activity of a fermented sweet corn kernel juice beverage using *Lactobacillus plantarum* B1765. Fermentation was conducted for 0, 6, 12, 18, and 24 hours, with the following parameters measured: total Lactic Acid Bacteria (LAB), pH, total acid titration (TTA), total flavonoids, total phenolics, antioxidant activity, and organoleptic properties. The results showed that fermentation duration increased total LAB, TTA, total flavonoids, total phenolics, and antioxidant activity, while decreasing pH. The highest total LAB count was observed after 6 hours of fermentation, at 9.48×10^8 CFU/mL. After 24 hours of fermentation, total flavonoids increased from 2.2378 to 3.4635 mg QE/g and total phenolics from 3.0006 to 13.5678 mg GAE/g, accompanied by a decrease in the IC_{50} value from 333.8692 to 90.3687 ppm. A fermented sweet corn kernel juice beverage using *L. plantarum* B1765 has the potential to be developed as a functional food from locally sourced ingredients.

Contribution to Sustainable Development Goals (SDGs):

SDG 3: Good Health and Well-being

SDG 9: Industry, Innovation, and Infrastructure

SDG 12: Responsible Consumption and Production

1. INTRODUCTION

1.1. Research Background

Sweet corn (*Zea mays saccharata*) is one of the most popular horticultural commodities worldwide, including in Indonesia [1]. In addition to being consumed directly or processed into various food products [2] [3], sweet corn has strong potential as a functional food ingredient due to its bioactive compounds, such as polyphenols, phenolic acids, flavonoids, carotenoids, and polysaccharides [4] [5]. Phenolic compounds and flavonoids are secondary metabolites that act as natural antioxidants through their ability to neutralize free radicals [6], while carotenoids also contribute to antioxidant activity [7].

However, most of the phenolic compounds in sweet corn kernels exist as glycosides [8], such as apigenin, luteolin, quercetin, and kaempferol glycosides [9]. These glycosides exhibit lower antioxidant activity compared to their aglycone forms [10]. Therefore, hydrolysis of the glycosidic bonds is necessary to produce free phenolic compounds that can enhance antioxidant activity. Fermentation using lactic acid bacteria (LAB) is an effective method for hydrolyzing glycosidic bonds through pH reduction and β -glucosidase activity [11] [12] [13].

Lactobacillus plantarum B1765 exhibits β -glucosidase activity of 0.868 U/mL at 18 hours of incubation [14] and shows potential as a probiotic culture [15]. Previous studies demonstrated that this strain successfully increases phenolic content and antioxidant activity in substrates like jicama [16] [17], cassava peel [18], and single-clove garlic [19], while



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simultaneously improving product characteristics such as pH, total LAB, and organoleptic properties [12] [13] [20].

However, the application of *L. plantarum* B1765 in fermenting sweet corn kernel juice has not yet been reported. To support part of an effort to innovate and diversify local food beverage products, this study aimed to determine the effect of fermentation duration on the product's quality and antioxidant activity in the fermented sweet corn kernel juice beverage.

1.2. Literature Review

Sweet corn (*Zea mays saccharata*) contains carbohydrates in the form of reducing sugars (glucose and fructose), sucrose, polysaccharides, and starch [21], which can be utilized by LAB as a source of carbon, energy, and nutrients during fermentation [22] [23]. Sweet corn contains several bioactive compounds, such as polyphenols, phenolic acids, flavonoids, carotenoids, and polysaccharides [4], which have the potential to support the development of functional foods. Phenolic compounds and flavonoids are secondary metabolites that act as natural antioxidants [6], but most of these compounds are still in the form of glycosides, such as apigenin, luteolin, quercetin, and kaempferol glycosides [9]. Compounds in glycoside form have lower antioxidant activity compared to aglycones in the form of free phenolics [8] [10].

Fermentation by LAB can increase the availability of bioactive compounds through microbial metabolic activity [24]. Some LAB strains can produce β -glucosidase, which hydrolyzes glycosidic bonds, yielding phenolic aglycones with higher antioxidant activity [14] [24]. During fermentation, hydrolysis can occur due to the low pH resulting from fermentation or through the action of β -glucosidase enzymes [11] [25] [26]. *L. plantarum* B1765 is a LAB strain that possesses β glucosidase activity [14] and is known to increase total phenolic content and enhance antioxidant activity during fermentation [16].

The development of plant-based fermented beverages has become an alternative for producing functional food products [27]. Thus, *L. plantarum* B1765 can be used to ferment plant-based food materials containing bioactive compounds. *L. plantarum* B1765 has been utilized in the development of various fermented products, such as fermented star fruit juice [28], jicama juice [29], tomato juice [30], purple sweet potato juice [31], jackfruit juice [32], gembili juice [33], and cassava peel extract [18]. Fermented products include pickles, such as yakon tuber pickles [34], gembili tuber pickles [35], and garlic pickles [19], as well as fermented flour products such as gembili tuber flour [36].

1.3. Research Objective

This study aims to determine the effect of fermentation duration using the *L. plantarum* B1765 starter culture on the quality and antioxidant activity of a fermented beverage made from sweet corn (*Zea mays saccharata*) kernel extract.

2. MATERIALS AND METHODS

2.1. Materials

The ingredients used in this study included sweet corn purchased from a local market in the Surabaya area, granulated sugar (Gulaku), starter culture *L. plantarum* B1765, MRS broth (Merck), NaCl (Merck), plain white powder (Satelit), CaCO₃

(Merck), aquades (Cleo), alcohol 70% (Onemed), NaOH (Merck), phenolphthalein indicator (Merck), quercetin (Sigma), AlCl₃ 10%, potassium acetate (SAP), galic acid (Sigma-Aldrich), Follin-Ciocalteu reagent (Merck), Na₂CO₃ 7,5% (Merck), methanol (Merck), and DPPH (Sigma).

2.2. Preparation of Starter Culture

A total of 1000 μ l of *L. plantarum* B1765 was inoculated into 9 mL of medium containing MRS broth (0.52 g/10 mL distilled water), then incubated for 24 hours at 37°C. The culture was centrifuged at 3500 rpm for 5 minutes; the supernatant was then decanted, while the pellet was resuspended in 9 mL of sterile 0.85% NaCl and centrifuged again. The resulting supernatant was decanted, and the pellet was resuspended in 10 mL of sterile 0.85% NaCl and vortexed to prepare a starter culture [37].

2.3. Preparation of Fermented Sweet Corn Juice

The preparation of sweet corn juice was based on the study in [38], with modifications. Sweet corn kernels were shelled, sorted, and weighed to yield 500 g; they were then washed under running water and steam-blanching for 10 minutes. Next, the sweet corn kernels were homogenized with distilled water at a 1:3 (w/v) ratio using a blender and shaken for 1 hour at 130 rpm. The mixture was filtered using a 200-mesh cloth filter, and 5% (v/v) sugar was added to the filtrate, which was then pasteurized at 70°C for 10 minutes. The sweet corn kernel extract was inoculated with a 1% (v/v) *L. plantarum* B1765 starter culture and fermented at 37°C for 0, 6, 12, 18, and 24 hours.

2.4. Determination of Total LAB

Total LAB was measured using the Total Plate Count (TPC) method [39]. A 1 mL sample was serially diluted with sterile 0.85% NaCl solution from 10⁻¹⁰ to 10⁻⁸. The diluted samples were inoculated onto MRS agar medium (5.2% MRS Broth, 1.5% plain white agar, and 1% CaCO₃), then incubated at 37°C for 48 hours with the Petri dishes inverted. LAB colonies were counted based on the formation of clear zones; the number of colonies that grew was then calculated and expressed in log CFU/mL.

2.5. Determination of pH and TTA

A 20 mL sample was measured using a calibrated pH meter. The TTA test was performed using the acid-base titration method. 10 mL sample was placed in a 100 mL volumetric flask, and distilled water was added to the mark. Then, 20 mL was transferred to an Erlenmeyer flask, 3 drops of phenolphthalein indicator were added, and the solution was titrated with NaOH. The titration was stopped when a stable pink color was observed [17].

2.6. Determination of Total Flavonoid

The total flavonoid assay was performed using a UV-Vis spectrophotometer with quercetin as the standard. A standard solution was prepared by dissolving 10 mg of quercetin in 10 mL of methanol and used as the stock solution. The stock solution was then diluted to concentrations of 20, 40, 60, 80, and 100 ppm. The samples for the total flavonoid assay consisted of a concentrated extract obtained by concentrating sweet corn kernel juice using a rotary evaporator. A total of 20 mg of the concentrated extract was dissolved in 10 mL of methanol. One milliliter of each standard solution and sample solution was pipetted into a 10-mL volumetric flask, to which 3 mL of

methanol, 0.2 mL of 10% AlCl_3 , and 0.2 mL of 1 M potassium acetate were added; the mixture was then brought to volume with distilled water. The samples were then incubated at room temperature for 45 minutes [40]. The standard solution was used to determine the maximum wavelength; then the absorbance of both the standard and sample solutions was measured at 439 nm. Total flavonoids were calculated using the standard curve equation and expressed in mg/g quercetin equivalent (mg QE/g).

2.7. Determination of Total Phenolic

The total phenolic content was determined using the Folin-Ciocalteu method, which is based on the absorbance curve of a gallic acid standard solution. The standard solution was prepared by dissolving 10 mg of gallic acid in 10 mL of methanol and diluting it to concentrations of 20, 40, 60, 80, and 100 ppm. Samples for phenolic analysis were prepared by dissolving 10 mg of concentrated extract in 10 mL of methanol. 0.5 mL of each standard solution and sample solution was pipetted, then 2.5 mL of 10-fold diluted Folin-Ciocalteu reagent was added; the mixture was vortexed and allowed to stand for 4–8 minutes. Next, 2 mL of 7.5% Na_2CO_3 was added; the mixture was vortexed and then allowed to stand in the dark for 45 minutes [41]. The standard solution was used to determine the maximum wavelength; subsequently, the absorbance of both the standard and sample solutions was measured at 750 nm. Total phenolic were calculated using the standard curve equation and expressed as mg gallic acid equivalents (GAE)/g.

2.8. Determination of Antioxidant Activity

Antioxidant activity was assessed by scavenging DPPH free radicals. A total of 10 mg of concentrated extract was dissolved in 10 mL of methanol and then diluted to concentrations of 100, 150, 200, 250, and 300 ppm. Methanol served as the control solution; 1 mL of each sample concentration was pipetted, then 1 mL of 40 ppm DPPH solution was added. The mixtures were homogenized using a vortex mixer and allowed to stand for 30 minutes in the dark [42]. Absorbance was measured at a wavelength of 516 nm. Antioxidant activity was calculated based on the IC_{50} value by plotting a regression curve of sample concentration versus percentage inhibition.

2.9. Organoleptic Quality Test

Organoleptic testing followed standard, food-grade, hygienic, and panelist consent-based. A total of 30 untrained panelists evaluated color, aroma, and taste using a 4-point hedonic scale ranging from 1 (strongly dislike) to 4 (strongly like).

2.10. Data Analysis

The research data were then analyzed using IBM SPSS Statistics 26. The data on total LAB, pH, TTA, total flavonoids, total phenolics, and antioxidant activity were analyzed using one-way ANOVA with post-hoc tests. Meanwhile, the organoleptic results were analyzed using the Kruskal-Wallis test with the Mann-Whitney post-hoc test.

3. RESULT AND DISCUSSION

3.1. The Effect of Fermentation on Total LAB, pH, and TTA

Tests for total LAB, pH, and TTA were conducted to determine the effect of fermentation duration on changes in the characteristics of the fermented sweet corn kernel juice beverage. The statistical analysis showed that fermentation duration had a significant effect on changes in total LAB, pH, and TTA.

Further analysis of total LAB revealed significant differences at fermentation durations of 0, 18, and 24 hours, while fermentation durations of 6 and 12 hours showed no significant differences. pH values showed significant differences at fermentation durations of 0, 6, and 12 hours, while fermentation durations of 18 and 24 hours did not show significant differences; TTA, on the other hand, showed significant differences across all fermentation duration treatments (0, 6, 12, 18, and 24 hours). The results of the analysis of total LAB, pH, and TTA are presented in Figure 1.

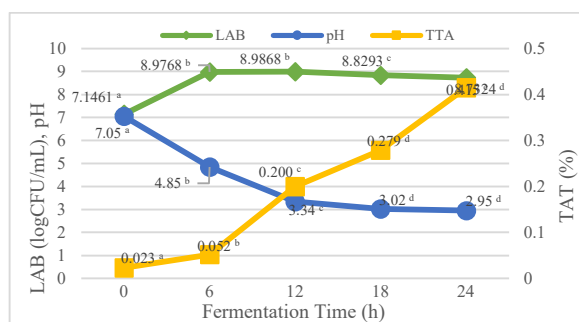


Figure 1. Total LAB, pH, and TTA of sweet corn kernels during fermentation

Note: Different letters after the numbers indicate significant differences ($p < 0.05$)

Figure 1 shows the relationship between total LAB, pH, and TTA during fermentation. An increase in total LAB was followed by a decrease in pH and an increase in TTA. Total LAB increased during the first 0–6 hours of fermentation, showed no significant increase during the 6–12-hour period, and then decreased during the 18–24-hour period. During the 0–6-hour fermentation period, total LAB increased from 1.4×10^7 CFU/mL to 9.48×10^8 CFU/mL—a rise of 1 log cycle—indicating the exponential phase. During this phase, LAB experienced rapid growth due to the availability of energy and nutrients. A previous study using *L. plantarum* B1765 at a 5% concentration in cassava peel showed a 1-log increase during the exponential phase, which was reached at 24 hours of fermentation [18]. This indicates that *L. plantarum* B1765 grows more readily during fermentation of sweet corn juice than of cassava peel juice because sweet corn contains simple sugars such as sucrose, glucose, and fructose, which are more readily utilized by the bacteria as an energy source for growth [43]. Meanwhile, the carbohydrates in cassava peel are primarily complex polysaccharides, such as starch, cellulose, and hemicellulose, so they take longer for bacteria to utilize [44]. Another study showed that fermenting purple sweet potato juice with *L. plantarum* B1765 at a concentration of 2.5% resulted in a population increase of up to 1.86×10^9 during the exponential phase after 12 hours of fermentation [37]. This difference is attributed to the use of a higher starter culture concentration than

in this study. Additionally, purple sweet potatoes have a relatively higher soluble fiber content, although sweet potatoes and sweet corn kernels have relatively similar carbohydrate contents [45] [46].

After the exponential phase, the total number of LAB did not differ significantly during the 6–12-hour fermentation period, indicating the stationary phase. During this phase, the number of growing bacteria balanced the number of bacteria dying off as nutrients in the medium and energy reserves began to deplete [47]. Subsequently, LAB entered the death phase during the 18–24-hour fermentation period, marked by a decrease in total LAB from 6.75×10^8 CFU/mL to 5.4×10^8 CFU/mL.

An increase in total LAB was associated with a decrease in pH and an increase in TTA during fermentation. In this study, as fermentation time increased from 0 to 24 hours, the pH decreased from 7.05 to 2.95, while the TTA increased from 0.023% to 0.415%. The decrease in pH, followed by an increase in TTA, indicates a rise in acidity in the product during fermentation. These changes occur because LAB ferments carbohydrates homofermentatively, producing lactic acid as the primary product, thereby making the environment increasingly acidic [44]. The total LAB count of 9.48×10^8 CFU/mL at the 6-hour fermentation mark met the SNI 7552:2009 standard for fermented beverages, which requires a minimum of 1×10^6 CFU/mL, while the highest TTA value of 0.415% was recorded at the 24-hour fermentation mark, which remains within the standard range of 0.2–0.9%.

3.2. Total Flavonoid and Phenolic Content

The total flavonoid and total phenolic contents were determined to assess the effect of fermentation duration on the total flavonoid and phenolic contents in sweet corn kernel juice. Based on the results of statistical analysis, fermentation duration had a significant effect on total flavonoid and total phenolic content. Further analysis revealed significant differences across all fermentation duration treatments (0, 6, 12, 18, and 24 hours). Changes in TFC and TPC values during the fermentation of sweet corn kernel juice are presented in Figure 2

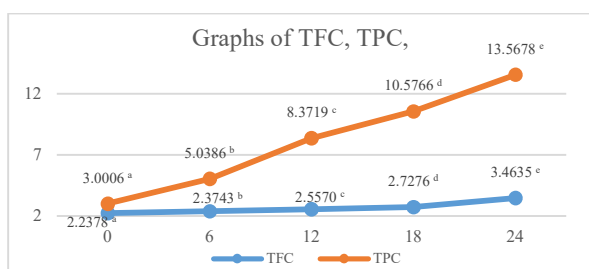


Figure 2. Total flavonoid and phenolic content of sweet corn kernels

Note: Different letters after the numbers indicate significant differences ($p < 0.05$)

Figure 2 shows that longer fermentation times increase the total flavonoid content (TFC) and total phenolic content (TPC) in sweet corn kernel extracts. At fermentation times of 0 and 24 hours, the TFC value increased from 2.2378 mg QE/g to 3.4635 mg QE/g, while the TPC value increased from 3.0006 mg GAE/g to 13.5678 mg GAE/g. The increase in TFC and TPC values is likely due to the β -glucosidase activity produced by *L. plantarum* B1765. This enzyme hydrolyzes glycosidic bonds into free sugars

and phenolic compounds, thereby increasing the TFC and TPC values. In sweet corn kernels, several phenolic compounds and flavonoids are still present in the form of glycosides, such as apigenin-8-C-glucoside, apigenin-6-C-glucoside, luteolin-8-C-glucoside, apigenin-7-O-glucoside, luteolin-7-O-glucoside, quercetin-3-O-glucoside, and kaempferol-3-O-glucoside [9]. The hydrolysis of these compounds during fermentation leads to an increase in the content of free phenolic and flavonoid compounds.

In addition, the production of organic acids by LAB during fermentation can lower the pH, thereby helping break down the material matrix and increasing the release of previously bound bioactive compounds. This decrease in pH promotes the hydrolysis of glycosidic bonds, releasing flavonoid and phenolic compounds bound to glucose and increasing the antioxidant activity of the fermented product.

The results of this study are consistent with those of [48] on silverberry cherries fermented using a mixed culture of *Lactobacillus plantarum* and *Lactobacillus casei* for 72 hours, yielding TPC values of 3.78 ± 0.22 mg GAE/g and TFC values of 0.66 ± 0.12 mg QE/g. The TPC and TFC values in this study were higher than those in silverberry cherries, likely due to differences in raw material characteristics. Sweet corn has a relatively high carbohydrate and sugar content, making it a suitable carbon source for the growth of *L. plantarum* B1765. Consequently, the bacterial culture grows rapidly, leading to the production of β -glucosidase, an enzyme that facilitates the release of phenolic compounds and flavonoids during fermentation.

However, the results of this study are still lower than those reported for the fermentation of jicama juice using *L. plantarum* B1765 [17], in which TPC increased from 6.01 ± 0.093 to 16.22 ± 0.312 mg GAE/g and TFC from 7.232 ± 0.669 to 29.01 ± 0.641 mg QE/g after 24 hours of fermentation. These differences are thought to be influenced by the higher phenolic content of sweet corn kernels. In addition, the inulin content of jicama can lower the pH during fermentation by *L. plantarum* B1765, leading to the production of short-chain fatty acids, which in turn increase the hydrolysis of glycosides into flavonoids and free phenolics.

3.3. Antioxidant Activity

Antioxidant activity in this study was calculated by measuring the percentage of inhibition and expressed as the IC_{50} value. The statistical results show significant differences across all fermentation durations (0, 6, 12, 18, and 24 hours). The results of the analysis are presented in Figure 3.

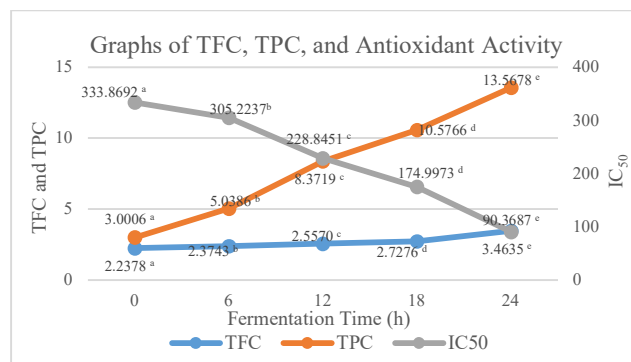


Figure 3. Total Flavonoid, Total Phenolic, and IC_{50} of sweet corn kernels during fermentation

Note: Different letters after the numbers indicate significant differences ($p < 0.05$)

Figure 3 shows the relationship between total flavonoids, total phenolics, and antioxidant activity during fermentation. The increase in total flavonoids and total phenolics was consistent with the increase in antioxidant activity, as indicated by a decrease in IC_{50} with increasing fermentation time. A lower IC_{50} value indicates a higher ability to scavenge free radicals. In this study, the lowest antioxidant activity was observed at 0 hours of fermentation, with an IC_{50} of 333.8692 ppm (weak), and increased to the highest at 24 hours of fermentation, with an IC_{50} of 90.3687 ppm (strong). The decrease in the IC_{50} value indicates that the samples' ability to inhibit free radicals increased as fermentation time increased.

The results of this study are consistent with a study [16] on the fermentation of jicama extract using *L. plantarum* B1765, which reported a decrease in the IC_{50} value to 106.52 ppm after 24 hours of fermentation and to 83.88 ppm after 36 hours of fermentation. At the same fermentation duration of 24 hours, the sweet corn kernel juice probiotic beverage exhibited higher antioxidant activity with an IC_{50} value of 90.3687 ppm. This difference is thought to be influenced by the composition of bioactive compounds in each ingredient. Although the total phenolic content of the jicama extract was higher, the antioxidant activity of the fermented sweet corn kernel juice was greater because sweet corn also contains carotenoids, which contribute to antioxidant activity [7].

3.4. Organoleptic Quality Test

The organoleptic test was conducted to determine the panelists' preference for the fermented sweet corn kernel juice beverage based on color, aroma, and taste. The organoleptic results for the fermented sweet corn kernel juice beverage are shown in Figure 4. Evaluations were conducted using a numerical scale: 1 (strongly dislike), 2 (dislike), 3 (like), and 4 (strongly like).

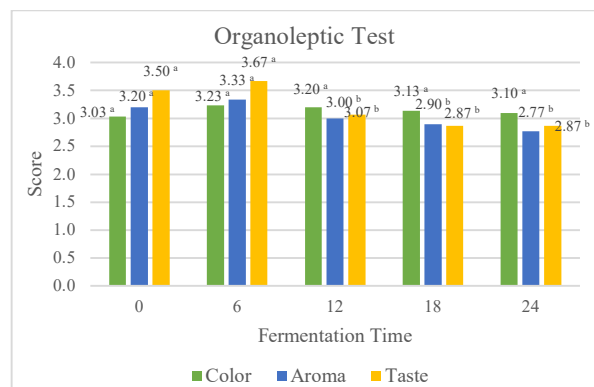


Figure 4. Organoleptic assessment of fermented beverage from sweet corn kernels

Note: Different letters after the numbers indicate significant differences ($p < 0.05$)

Based on Figure 4, the statistical analysis showed that fermentation duration did not significantly affect color acceptability ($p > 0.05$). For the color parameter, all treatments received the same letter code, indicating no significant differences among the fermentation treatments. This suggests that 24 hours of fermentation did not result in color changes distinguishable to the panelists.

For the aroma parameter, the statistical test results showed that the 0- and 6-hour fermentation treatments were not

significantly different from each other but were significantly different from the 12-, 18-, and 24-hour fermentation treatments. Meanwhile, the 12-, 18-, and 24-hour fermentation treatments did not differ significantly from one another. This indicates that an increase in fermentation duration alters the product's aroma characteristics through bacterial metabolic activity.

Regarding taste parameters, the statistical test results showed that the 0- and 6-hour fermentation treatments did not differ significantly from one another, but differed significantly from the 12-, 18-, and 24-hour fermentation treatments. Meanwhile, the 12-, 18-, and 24-hour fermentation treatments did not differ significantly from one another. Panelists preferred the fermented products from the 0–6-hour range, with the highest likability score of 3.67 for the 6-hour fermentation. The decrease in likability for the 12–24-hour fermentations is likely due to longer fermentation increasing organic acid production, making the sour taste more dominant.



Figure 5. Fermented beverage from sweet corn kernels

Based on Figure 5, fermentation duration did not significantly affect the likability of the color of the fermented sweet corn kernel juice beverage. The resulting color is the characteristic yellow of sweet corn, which comes from natural pigments, particularly carotenoids. During fermentation, changes in environmental conditions resulting from the activity of *Lactobacillus plantarum* B1765 did not cause any color changes in the product. This is likely because polyphenol oxidase (PPO) activity in sweet corn kernels is relatively low [49]. In addition, the blanching treatment prior to fermentation is believed to have inactivated most PPO enzymes, thereby minimizing enzymatic browning [50]. The results of the color organoleptic test showed preference scores ranging from 3.03 to 3.23, falling into the "like" category.

Fermentation duration had a significant effect on the aroma likability of the fermented sweet corn kernel juice beverage. Changes in aroma during fermentation are thought to be related to the metabolic activity of *L. plantarum* B1765. The resulting aroma is a combination of the characteristic sweet corn aroma and the fermentation aroma arising from metabolite formation during LAB growth. During fermentation, LAB uses the sugars in sweet corn kernel juice as an energy source and produces organic acids that can influence the product's aroma [50]. The longer the fermentation, the higher the bacterial metabolic activity, resulting in a more pronounced sour fermentation aroma and causing panelists preference ratings to decrease. Based on the organoleptic test results, the aroma preference ratings averaged 2.77 to 3.33, falling into the "like" category.

The taste profile changed during the fermentation process. The taste of the fermented sweet corn kernel juice beverage is a combination of the natural sweetness of corn and the sourness resulting from the metabolism of *L. plantarum* B1765. The natural sugars in sweet corn serve as a substrate for *L. plantarum* B1765 to produce lactic acid and other organic acids. Increasing fermentation duration increases organic acid accumulation, making the sour taste more dominant and decreasing panelists preference for the 12–24-hour fermentations. Nevertheless, all treatments were considered acceptable by the panelists however, they tended to prefer products with a lower level of acidity.

Considering the primary goal of this beverage's creation was to produce a functional, antioxidant-rich drink, a 24-hour fermentation was chosen as the optimal treatment, as it yielded the highest total phenolic content and free radical scavenging activity. Although the results of the organoleptic evaluation showed that panelists preferred the 6-hour fermentation sample due to its milder sourness and balanced sweetness, the higher acidity in the 24-hour product does not diminish its functional value. At an industrial level, this sensory challenge can be effectively addressed through formulation adjustments specifically by adding zero-calorie natural sweeteners like stevia. This strategy aims to mask the sour taste for greater consumer acceptance, without altering the nutritional profile, adding calories, or reducing the maximum bioactive benefits derived from the 24-hour fermentation process.

4. CONCLUSION

Fermentation duration affects the characteristics of a fermented sweet corn kernel juice beverage produced using the *L. plantarum* B1765 starter culture. During fermentation, total LAB increased until reaching the stationary phase, followed by a decrease in pH and an increase in TTA. Fermentation also increased the total phenolic and total flavonoid contents, thereby enhancing antioxidant activity, as indicated by a decrease in the IC₅₀ value from 333.87 ppm (weak) to 90.37 ppm (strong) after 24 hours of fermentation. Furthermore, fermentation duration did not affect color acceptability but did influence aroma and taste, with the highest acceptability among panelists at 6 hours. Overall, 24-hour fermentation yielded the best functional characteristics, as indicated by bioactive compound content and antioxidant activity, while 6-hour fermentation provided the best sensory acceptability.

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