Effect of incorporation of jute leaf (*Corchorus olitorius*) extract on the physicochemical, microbial and sensory properties of herbal yoghurt.

Chinazom Martina Eze, Jessica Eberechukwu Odo*, Chidinma Igbokwe, Patience Chinasa Omeje, Obianujunwa Okafor

Department of Food Science and Technology, University of Nigeria, Nsukka, Enugu State, Nigeria

Abstract

This study investigated the effect of the incorporation of jute leaf extract on the quality of herbal yoghurt. The jute leaves were cleaned, pulverized, and sieved to obtain the extract, which was incorporated into the yogurt and fermented at 42°C for 12 hours. The jute leaf extract was incorporated at concentrations of 95:5, 90:10, 85:15, and 80:20 and was coded JY_2, JY_3, JY_4, and JY_5, respectively, with the sample (JY_1) without jute leaf extract serving as the control. The samples were subjected to physicochemical, microbial, and sensory analysis following standard methods. Physicochemical analysis revealed that pH, viscosity, total solids, and total titratable acidity ranged from 4.25-4.41, 23.76-39.78 m.Pa.s., 14.00-21.50%, and 0.87-1.14%, respectively. The total viable count and lactic acid bacteria varied from 4.1×10^6-4.7×10^6 cfu/ml and 6.1×10^5-8.7×10^5 cfu/ml, respectively, with the incorporation of jute leaf having a significant ($p<0.05$) effect on the microbial profile of the herbal yoghurt. Sensory scores revealed that sample JY_2 was the most acceptable among the herbal yoghurts, although a decrease in acceptance with an increase in the incorporation of the jute leaf extract was observed. In conclusion, acceptable yoghurt with an improved nutritional profile could be produced with up to 20% incorporation of jute leaf extract. This research work contributes to the growing body of knowledge on the use of natural plant extracts as functional ingredients in yoghurt production.

Keywords: Fermented foods, Jute leaf, Herbal yoghurt, Microbial profile.

Introduction

Dairy and dairy products present important source of essential nutrients for many people. These products contain a variety of nutrients, including calcium, protein, vitamin D, vitamin B_{12}, and magnesium which are important for maintaining good health [1]. Yogurt is a popular milk product that is widely consumed worldwide. It is made by fermenting milk with lactic acid bacteria, which results in a thick, creamy texture and a tangy flavour. Yogurt is a nutrient-dense food and is a rich source of protein, calcium, potassium, and vitamin D [2]. It is also a good source of probiotics, which are beneficial bacteria that promote digestive health. Research suggests that consuming yogurt may have various health benefits. Several studies have found that yoghurt reduces the risk of developing type 2 diabetes [3]. Yogurt consumption has also been associated with lower blood pressure and a decreased risk of cardiovascular disease [4]. Additionally, yogurt has been shown to support healthy gut bacteria and may reduce the risk of certain digestive disorders such as inflammatory bowel disease. Yogurt starter culture, also known as lactic acid bacteria, is a crucial ingredient in the fermentation process that transforms milk into a creamy and tangy yogurt. These bacteria consume lactose, the natural sugar in milk, and produce lactic acid, which thickens the milk and gives yogurt its unique flavor and texture. The most common types of lactic acid bacteria used as yogurt starter cultures are *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, although other bacteria strains such as *L. acidophilus*, *L. casei*, and *Bifidobacterium lactis* may also be used [5].

Herbal yogurt is a type of yogurt infused with herbs such as mint, dill, cilantro, or basil. This type of yogurt adds a flavorful twist to the traditional yogurt, and the herbs may offer additional nutritional benefits and potential health benefits. Research has shown that the addition of the herbs improved the antioxidant profile of the resulting herbal yoghurts as the herbs are rich sources of phytochemicals [6]. Several researchers have studied yoghurts produced by incorporating herbs including moringa leaves, ginseng root extract, ginger and

***Correspondence to:** Jessica Eberechukwu Odo, Department of Food Science and Technology, University of Nigeria, Nsukka, Enugu State, Nigeria; E-mail: jessica.odo@unn.edu.ng

***Received:** 21-Dec-2023, Manuscript No. AAFMY-23-123258; **Editor assigned:** 23-December-2023, AAFMY-23-123258 (PQ); **Reviewed:** 06-Jan-2024, QC No. AAFMY-23-123258; **Revised:** 23-Jan-2025, Manuscript No. AAFMY-23-123258 (R); **Published:** 30-Jan-2025, DOI: 10.35841/aafmy-9.1.241*

***Citation:** Eze CM, Odo JE, Igbokwe C, et al. Effect of incorporation of jute leaf (Corchorus olitorius) extract on the physicochemical, microbial and sensory properties of herbal yoghurt. J Food Microbiol. 2025;9(1):241*

garlic extract, tea infusion, fenugreek seed flours, *Ocimum sanctum*, riceberry rice, utazi and *Aloe vera* [7-14].

Jute leaf (*Corchorus olitorius*) also known as saluyot is a leafy green herb commonly consumed in West African and Asian cuisine. It is a good source of vitamins, minerals, and antioxidants and has been associated with several potential health benefits [15]. Jute leaves have been shown to have anti-inflammatory properties, which may provide benefits for diseases such as rheumatoid arthritis and inflammatory bowel disease [16]. Incorporating jute leaves into the diet may provide a source of antioxidants and anti-inflammatory compounds, and may help prevent or manage certain diseases. Jute leaves have been employed in the fortification of soursop tart filling, pandesal [17]. There is paucity of knowledge on the incorporation of jute leaf in yoghurt. Therefore, the aim of this research was to produce an extract from jute leaf, incorporate the extract into yoghurt and evaluate the effect of the incorporation on the quality of yoghurt.

Materials and Methods

Raw materials and sample procurement

The materials used for the preparation of the herbal yoghurt include: Jute leaves, skimmed milk (Dano), sugar, CMC, and DVS (starter culture). The jute leaf was sourced from Udi LGA, Enugu State Nigeria, the starter culture was sourced from Onitsha main market, Anambra state, Nigeria, while the other listed items were sourced from Ogige main market in Nsukka, Nigeria.

Preparation of jute leaf extract

The jute leaf extract was prepared following the method described by Mbaeyi-Nwaoha IE, et al. Jute leaves were first properly cleaned to remove adhered impurities and thereafter washed with distilled water. The wet leaves were pulverized in a blender (Kenwood BL335) and then the slurry was filtered using a muslin cloth to obtain the extract (Figure 1) [18].

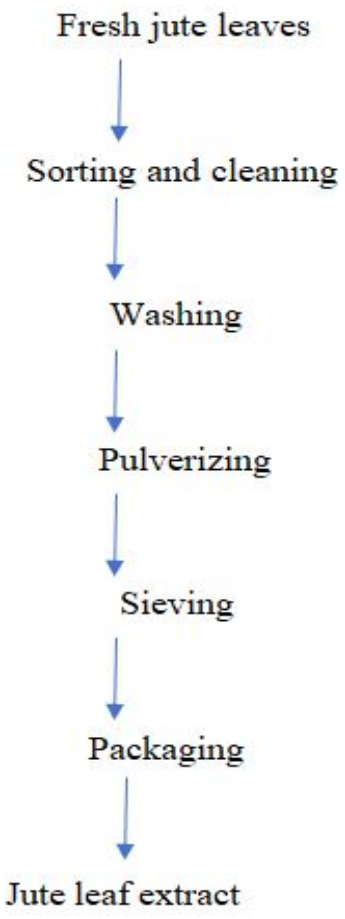

Figure 1. *Preparation of jute leaf extract.*

Ingredient formulation and design

To create the equivalent of fresh milk, 250 g dried milk sample was dissolved in 1 liter of water and used as the control (AB). Similar to sample AB, four other yoghurt mixtures were formulated with varying amounts of jute leaf extract (5, 10, 15 and 20%) of the total volume (Table 1).

Table 1. *Ingredient mixes for the production of the herbal yoghurt samples.*

Sample code	Yoghurt (ml)	Jute leaf extract (ml)	Culture (g)	Sugar (g)	CMC (g)
JY_1	1000 ml	-	1	5	4
JY_2	950 ml	50	1	5	4
JY_3	900 ml	100	1	5	4
JY_4	850 ml	150	1	5	4
JY_5	800 ml	200	1	5	4
Note: Sample JY_1: Yoghurt control; Samples JY_2-JY_5: Herbal yoghurt with jute leaf extract at 5, 10, 15 and 20% concentrations.					

Preparation of yoghurt

The yoghurt was formulated following the method of Nguyen, et al. [19] with slight modification. Skimmed milk, sugar, and distilled water were combined to make 1 liter of yoghurt mix, which was then pasteurized for 30 minutes at 85°C to kill any pathogenic bacteria. Following pasteurization, the mix was cooled to a temperature of 42°C, which is the starter culture's optimal growth temperature. After that, the mixture was given a 12-hour incubation period. Jute leaf extract was added to the yoghurt after fermentation as shown in Table 1.

Citation: *Eze CM, Odo JE, Igbokwe C, et al. Effect of incorporation of jute leaf (Corchorus olitorius) extract on the physicochemical, microbial and sensory properties of herbal yoghurt. J Food Microbiol. 2025;9(1):241*

Physicochemical analysis

pH was analyzed using standard electrodes and pH meter as described by AOAC. Viscosity was determined according to the method described by Nkama I, et al. [20]. Total solids and total titratable acidity were carried out in accordance with the methods described by AOAC.

Microbial analysis

The Total Viable Count (TVC) test was carried out using the method. The Lactic Acid Bacteria (LAB) in the formulated yoghurt was determined using deMan Rogosa Shape (MRS) Agar (CM361) as described by Oxoid manual.

Sensory evaluation

The sensory evaluation was carried out according to Ihekoronye and Ngoddy using a 20-man semi trained panelist consisting of the students of food science and technology department, University of Nigeria, Nsukka. The panelists tested the yoghurt samples and scored each sample using a 9-point hedonic scale (where 1=extremely disliked and 9=extremely liked) for attributes including were color, taste, after taste, flavor, consistency and overall acceptability.

Data analysis

The experimental design used was Completely Randomized Design (CRD). The data generated were subjected to one-way Analysis of Variance (ANOVA) using Statistical Package for Service Solution (SPSS) version 20. Means were separated by Duncan's Multiple Range Test (DMRT).

Results and Discussion

The results for the physicochemical analysis of the yoghurt samples with jute leaf extract are presented in Table 2.

The pH value of the control sample JY_1 (100:0) was 4.24 and it differed significantly ($p<0.05$) from samples with jute leaf extract. The pH decreased progressively across the samples with increase in the concentration of the jute leaf extract. The decrease in pH of the yoghurt samples with graded levels of jute leaf extract could be attributed to the slight acidity of jute leaf largely due to the presence of uronic acid. The total titratable acidity was higher in the plain yoghurt control sample than the herbal yoghurt samples and could be due to the addition of jute leaf extract in increasing concentrations. Probably, the presence of organic acids in the jute leaf extract contributed to the overall acidity of the yogurt.

The viscosity of the control sample JY_1 (100:0) was 23.76 Ns/m^2 and it differed significantly ($p<0.05$) from other yoghurt samples produced with the incorporation of jute leaf extract. The viscosity was found to increase progressively across the samples as a result of the increase in concentration of the jute leaf extract. The increased viscosity may be due to the presence of mucilaginous polysaccharide in jute leaf extract which structured water, thus contributing to the texture of the yogurt.

The incorporation of jute leaf extract significantly ($p<0.05$) affected the total solid contents of the formulated yoghurt samples. Total Solids (TS) refer to the amount of solid matter present in a substance, including both organic and inorganic components. The total solid was lower in the herbal yoghurt than the plain yoghurt and could be due to the addition of jute leaf extract in increasing concentrations. This is in contrast with the findings of Lee HS, et al. who reported that yogurt with ginseng extract had a higher total solids content compared to the plain yogurt. The difference could be due to the different in composition of the herbal materials used.

Table 2. *Physicochemical composition of herbal yoghurt incorporated with jute leaf extract.*

Sample	pH	Viscosity (mPa.s)	Total solids (%)	TTA (% lactic acid)
JY_1	$4.41^{d} \pm 0.00$	$23.76^{a} \pm 0.47$	$21.50^{c} \pm 0.70$	$1.14^{d} \pm 0.21$
JY_2	$4.29^{c} \pm 0.00$	$27.73^{b} \pm 0.49$	$17.00^{b} \pm 1.41$	$1.03^{c} \pm 0.02$
JY_3	$4.28^{c} \pm 0.00$	$32.11^{c} \pm 0.44$	$17.00^{b} \pm 1.41$	$0.94^{b} \pm 0.03$
JY_4	$4.26^{b} \pm 0.00$	$35.24^{d} \pm 0.05$	$14.00^{a} \pm 0.00$	$0.89^{ab} \pm 0.00$
JY_5	$4.24^{a} \pm 0.00$	$39.78^{e} \pm 0.91$	$14.00^{a} \pm 0.00$	$0.87^{a} \pm 0.01$
Note: Values are mean ± standard deviation of duplicate readings. Means on the same columns with different superscript are significantly different ($p<0.05$).				
Sample JY_1: Yoghurt control; Samples JY_2-JY_5: Herbal yoghurt with jute leaf extract at 5, 10, 15 and 20% concentrations.				

The microbial profile (cfu/ml) of the yoghurt samples with jute leaf extract are presented in Table 3. From Table 3, sample JY_1 (100:0), the control, has the highest total viable count of 4.7×10^6 (cfu/ml) while sample JY_5 has the lowest total viable count of 4.1×10^6 cfu/ml. It can be seen from Table 3 that the microbial count for the herbal yoghurt samples decreased progressively with increase in the concentration of the jute leaf extract. This trend can be attributed to the antimicrobial activity of the jute leaf extract on the yoghurt. A similar study conducted by Mbaeyi-Nwaoha IE, et al. reported that the total viable count of herbal yoghurt incorporated with utazi leaf (*Gongronema latifolium*) and *Aloe vera* extract were significantly lower compared to the control without the extract. The lower microbial count observed in this study could imply that the addition of jute leaf extract to herbal yoghurt has the potential to improve the safety and shelf life of the product.

Citation: *Eze CM, Odo JE, Igbokwe C, et al. Effect of incorporation of jute leaf (Corchorus olitorius) extract on the physicochemical, microbial and sensory properties of herbal yoghurt. J Food Microbiol. 2025;9(1):241*

Sample JY_1 (100:0) had the highest LAB count of 8.7 $\times 10^5$ (cfu/ml) while sample JY_5 has the lowest LAB count of 6.1 $\times$ 10^5 cfu/ml. It can be seen from Table 3 that the control sample had the highest LAB count while the LAB count for the herbal yoghurt samples decreased progressively with increase in the concentration of the jute leaf extract. This decline can be attributed to the antimicrobial activity of the jute leaf extract on the yoghurt.

Table 3. *Microbial count (cfu/ml) of herbal yoghurt incorporated with jute leaf extract.*

Sample	TVC (cfu/ml)	LAB (cfu/ml)
JY_1	4.7×10^6	8.7×10^5
JY_2	4.3×10^6	8.5×10^5
JY_3	4.4×10^6	6.9×10^5
JY_4	4.2×10^6	6.7×10^5
JY_5	4.1×10^6	6.1×10^5
Note: Values are mean ± standard deviation of duplicate readings. Means on the same columns with different superscript are significantly different ($p<0.05$).		
Sample JY_1: Yoghurt control; Samples JY_2-JY_5: Herbal yoghurt with jute leaf extract at 5, 10, 15 and 20% concentrations.		

Sensory evaluation

The sensory attributes of the yoghurt samples incorporated with jute leaf extract are presented in Table 4.

The sensory scores for appearance and colour of the herbal yoghurt varied from 4.40 to 7.60 and from 4.20 to 7.95 respectively. The highest score (7.60) for appearance was recorded in sample JY_1 (100% yoghurt) while the lowest score (4.40) was recorded in sample JY_5 (80% yoghurt and 20% jute leaf extract). From Table 4, it appeared that the scores for appearance of the yoghurt samples were not affected by 5% addition of jute leaf extract. However, progressive decrease in the scores for appearance across the samples with increase in the concentration of the jute leaf extract was observed. Similar decrease in acceptability was reported by Lee HS, et al., who supplemented yoghurt with ginseng extract for yoghurt samples with more than 1.0% of the extract. Moreso, investigated the effect of different concentrations of *Moringa* leaf powder on the colour and appearance of yoghurt. Their study found that the color of herbal yogurt became less acceptable with an increase in the concentration of *Moringa* leaf powder. The decrease in acceptability in terms of appearance and colour in this study could be attributed to the progressive green colouration, the foamy and slimy characteristics imparted by the jute leaf extract on the yoghurt samples.

The sensory scores for taste and flavour of the herbal yoghurt varied from 3.45 to 6.00 and 3.65 to 6.55 respectively. For flavour, it appeared that the addition of jute leaf did not significantly affect the acceptability of the yoghurt samples with 5% addition of jute leaf extract as it was not significantly ($p<0.05$) different from the control (Table 4). In terms of taste, the highest score (6.00) was recorded in sample JY_1 (100% yoghurt) while the lowest score (3.45) was recorded in sample JY_5 (80% yoghurt and 20% jute leaf extract). The highest eating for the plain yoghurt could be because of the familiarity of the judges with conventional plain yoghurt. There was significant difference ($p<0.05$) observed between the control sample JY_1 and the other samples JY_2, JY_3, JY_4, and JY_5. The rating for taste was observed to progressively decrease with increase in the concentration of the jute leaves. The reason for the decrease could be due to increased bitterness as a result of several herbal aromatic compounds in the jute leaf extract. Similar decrease in acceptability in the taste score of yoghurt was reported by Akajiaku LO, et al. for yoghurt enriched with *Moringa* leaf powder. The finding contradicts with Oric P, et al. who reported that the student panelists highly rated the pandesal enriched with jute leaf powder.

As regards, consistency, no significant ($p>0.05$) difference was observed between the control and the yoghurt with 5% addition of jute leaf extract. A decline in the scores for consistency across the yoghurt samples with jute leaf extract was observed. The jute leaf extract having a very slimy nature which was observed in the herbal yoghurt samples could be responsible for this decline.

The sensory scores for aftertaste of the herbal yoghurt varied from 4.20 to 6.25. The highest score (6.25) was recorded in sample JY_1 (100% yoghurt) while the lowest score (4.20) was recorded in sample JY_5 (80% yoghurt and 20% jute leaf extract). The incorporation of jute leaf extract did not significantly affect the aftertaste of the yoghurt samples up to 10% addition. The rating for aftertaste was observed to progressively decrease with increase in the concentration of the jute leaves. The bitterness of the jute leaf extract can be traced to be responsible for this trend.

The sensory scores for overall acceptability of the herbal yoghurt varied from 4.25 to 6.55. The highest score (6.55) was recorded in sample JY_1 (100% yoghurt) while the lowest score (4.25) was recorded in sample JY_5 (80% yoghurt and 20% jute leaf extract). The addition of the jute leaf extract significantly ($p<0.05$) affected the acceptability of the yoghurt samples. This could be because the panelists were not accustomed to an herbal yoghurt containing jute leaf extract and thus rated the plain yoghurt control sample higher than the herbal yoghurts in

Citation: *Eze CM, Odo JE, Igbokwe C, et al. Effect of incorporation of jute leaf (Corchorus olitorius) extract on the physicochemical, microbial and sensory properties of herbal yoghurt. J Food Microbiol. 2025;9(1):241*

terms of overall acceptability. However, all the values were within acceptable range.

Table 4. *Sensory evaluation of herbal yoghurt incorporated with jute leaf extract.*

Sample	Appearance	Colour	Flavour	Taste	Consistency	Aftertaste	Aroma	Overall acc.
JY_1	$7.60^{d} \pm 0.82$	$7.95^{d} \pm 0.88$	$6.55^{c} \pm 1.46$	$6.00^{c} \pm 1.48$	$6.85^{c} \pm 1.72$	$6.25^{c} \pm 1.58$	$6.60^{c} \pm 1.35$	$6.55^{c} \pm 1.50$
JY_2	$6.90^{cd} \pm 0.85$	$6.90^{c} \pm 1.16$	$5.55^{bc} \pm 1.96$	$4.80^{b} \pm 1.70$	$5.90^{bc} \pm 1.16$	$5.55^{bc} \pm 1.95$	$5.50^{b} \pm 1.87$	$5.40^{bc} \pm 1.50$
JY_3	$6.20^{bc} \pm 1.10$	$6.10^{bc} \pm 1.58$	$5.15^{b} \pm 1.53$	$4.80^{b} \pm 1.67$	$5.50^{ab} \pm 1.35$	$5.10^{abc} \pm 1.48$	$5.15^{b} \pm 1.38$	$5.10^{ab} \pm 1.65$
JY_4	$5.55^{b} \pm 1.35$	$5.55^{b} \pm 1.53$	$4.50^{ab} \pm 1.84$	$4.10^{ab} \pm 1.83$	$5.20^{ab} \pm 1.70$	$4.55^{ab} \pm 1.90$	$4.50^{ab} \pm 1.35$	$4.35^{a} \pm 1.38$
JY_5	$4.40^{a} \pm 1.78$	$4.20^{a} \pm 1.70$	$3.65^{a} \pm 2.20$	$3.45^{a} \pm 2.06$	$4.80^{a} \pm 1.68$	$4.20^{a} \pm 1.79$	$3.85^{a} \pm 1.75$	$4.25^{a} \pm 1.75$
Note: Values are mean ± standard deviation of duplicate readings. Means on the same columns with different superscript are significantly different ($p<0.05$).								
Sample JY_1: Yoghurt control; Samples JY_2-JY_5: Herbal yoghurt with jute leaf extract at 5, 10, 15 and 20% concentrations.								

Conclusion

This study demonstrated that jute leaf extract can be utilized in the production of herbal yogurt. Addition of jute leaf extract improved the viscosity as well as decreased the pH of the herbal yoghurt suggesting that its inclusion could contribute to the keeping quality of the product. Microbial analysis revealed that the incorporation of jute leaf extract resulted in a decrease in the total viable count, confirming its antimicrobial potential and suggesting that it could improve the safety and keeping quality of yogurt. Sensory evaluation showed that the scores for all sensory attributes assessed were high and comparable to the control, although there was a slight decrease in preference with increase in the concentration of jute leaf extract. Overall, the study suggests that jute leaf extract can be incorporated into yogurt up to 10% concentration to enhance its quality attributes and provide additional health benefits.

References

1. Thorning TK, Raben A, Tholstrup T, et al. Milk and dairy products: Good or bad for human health? An assessment of the totality of scientific evidence. Food Nutr Res. 2016;60(1):32527.
2. Wang H, Livingston KA, Fox CS, et al. Yogurt consumption is associated with better diet quality and metabolic profile in American men and women. Nutr Res. 2013;33(1):18-26.
3. Drouin-Chartier JP, Cote JA, Labonte ME, et al. Comprehensive review of the impact of dairy foods and dairy fat on cardiometabolic risk. Adv Nutr. 2016;7(6): 1041-51.
4. Otolowo DT, Omosebi OM, Araoye KT, et al. Effects of the substitution of cow's milk with soymilk on the micronutrients, microbial, and sensory qualities of yoghurt. Food Prod Process Nutr. 2022;4(1):15.
5. Champagne CP. Development of fermented milk products containing probiotics. Dairy Microbiology and Biochemistry: CRC Press. 2014.
6. Dabija A, Codină GG, Ropciuc S, et al. Assessment of the antioxidant activity and quality attributes of yogurt enhanced with wild herbs extracts. J Food Qual. 2018;2018(1):5329386.
7. Akajiaku LO, Kabuo NO, Omeire GC, et al. Production and evaluation of *Moringa oleifera* leaves powder enriched yogurt. Nutr Food Toxicol. 2018;2(5):459-66.
8. Lee HS, Song MW, Kim KT, et al. Antioxidant effect and sensory evaluation of yogurt supplemented with hydroponic ginseng root extract. Food. 2021;10(3):639.
9. Simon HP, Chandra R, Shukla S, et al. Sensory evaluation of probiotic herbal yoghurt with ginger and garlic extract. Pharm Innov J. 2018;7(4):605-7.
10. Świąder K, Florowska A, Konisiewicz Z, et al. Functional tea-infused set yoghurt development by evaluation of sensory quality and textural properties. Food. 2020;9(12):1848.
11. Dhawi F, El-Beltagi HS, Aly E, et al. Antioxidant, antibacterial activities and mineral content of buffalo yoghurt fortified with fenugreek and *Moringa oleifera* seed flours. Food. 2020;9(9):1157.
12. Mittal M, Thakur A, Kaushik R, et al. Physicochemical properties of *Ocimum sanctum* enriched herbal fruit yoghurt. J Food Process Preserv. 2020;44(12):e14976.
13. Anuyahong T, Chusak C, Adisakwattana S. Incorporation of anthocyanin-rich riceberry rice in yogurts: Effect on physicochemical properties, antioxidant activity and *in vitro* gastrointestinal digestion. LWT Food Sci Technol. 2020;129:109571.
14. Mbaeyi-Nwaoha IE, Ojochegbe AF, Nnamani CJ. Effects of Utazi leaf (*Gongronema latifolium*) and *Aloe vera* (A*loe barbadensis*) on the quality attribute of formulated herbal yoghurt. Braz J Sci. 2023;2(7):62-75.
15. Ahmed Z, Sarkar S. Review on jute leaf: A powerful biological tool. Int J Sci Res Update. 2022;4(1):64-85.
16. Islam MM. Biochemistry, medicinal and food values of jute (*Corchorus capsularis* L. and *C. olitorius* L.) leaf: A review. Int J Enhanc Res Sci Technol Eng. 2013;2(11):35-44.
17. Eusala DC, Pendon GP. Palatability and sensory perception of Soursop (*Annona muricata*) tart filling with Jute (*Corchorus olitorious*) leaves. IRA Int J Educ Multidiscip Stud. 2016;3(3):436-45.

Citation: *Eze CM, Odo JE, Igbokwe C, et al. Effect of incorporation of jute leaf (Corchorus olitorius) extract on the physicochemical, microbial and sensory properties of herbal yoghurt. J Food Microbiol. 2025;9(1):241*

18. Oric P, Delima JB, Jao JH. Sensory evaluation of pandesal with dried saluyot (*Corchorus olitorius*) leaves. Multidiscip Sci J. 2023;5(3).

19. Nguyen PT, Kravchuk O, Bhandari B, et al. Effect of different hydrocolloids on texture, rheology, tribology and sensory perception of texture and mouthfeel of low-fat pot-set yoghurt. Food Hydrocoll. 2017;72:90-104.

20. Nkama I, Badau MH. Rheological properties of reconstituted kilishi ingredient mix powder. J Food Eng. 2000;44(1):1-4.

Citation: *Eze CM, Odo JE, Igbokwe C, et al. Effect of incorporation of jute leaf (Corchorus olitorius) extract on the physicochemical, microbial and sensory properties of herbal yoghurt. J Food Microbiol. 2025;9(1):241*