INSIGHTS-JOURNAL OF
LIFE AND SOCIAL SCIENCES

STUDY ON THE QUALITY EVALUATION OF FRUIT FLAVORED YOGURT

Original Article

Zoya Parveen Soomro[1]*, Atta Hussain Shah[1], Ghulam Shabir Barham[1], Humaira Hanif[1], Aijaz Hussain Soomro[2], Jai Pirkash Goil[1], Reema Bughio[3], Abdul Wahid Solangi[1], Deepesh Kumar Bhuptani[4]

[1]Department of Animal Product Technology, Sindh Agriculture University, Tandojam, Pakistan.
[2]Institute of Food Science & Technology, Sindh Agriculture University, Tandojam, Pakistan.
[3]Department of Animal Breeding and Genetics, SBBUVAS, Sakrand, Pakistan.
[4]Department of Meat Technology, SBBUVAS, Sakrand, Pakistan.

Corresponding Author: Zoya Parveen Soomro, Department of Animal Product Technology, Sindh Agriculture University, Tandojam, Pakistan, zparveen713@gmail.com

Conflict of Interest: None
Grant Support & Financial Support: None

Acknowledgment: The authors acknowledge the Department of Animal Product Technology for providing laboratory facilities and technical support.

ABSTRACT

Background: Fermented dairy products, particularly yogurt, are widely consumed due to their nutritional richness and probiotic potential. Incorporation of fruit pulp into yogurt has gained increasing attention as a natural strategy to enhance nutritional quality, sensory appeal, and consumer acceptance. However, variations in fruit type and concentration may significantly influence the chemical composition and physicochemical behavior of yogurt, warranting systematic evaluation to guide optimized product development.

Objective: To evaluate the effect of different fruit pulps and concentrations on the chemical characteristics and fermentation behavior of fruit-flavored yogurt.

Methods: This experimental study was conducted at the Department of Animal Product Technology. Yogurt was prepared from fresh buffalo milk and supplemented with banana, strawberry, and pineapple pulps at concentrations of 5%, 10%, and 15%. A control yogurt without pulp was also prepared. The samples were analyzed in duplicate for pH changes during incubation, total solids, protein, fat, ash, total carbohydrates, and syneresis using standardized analytical procedures. Statistical analysis was performed to determine significant differences among treatments.

Results: At 0 hour, pH values increased significantly ($P<0.05$) with higher pulp concentrations, reaching maximum values at 15% pulp addition for banana (6.24), strawberry (6.14), and pineapple (6.30), followed by a gradual decline during fermentation, achieving optimal acidity by 3 hours. Total solids increased significantly with pulp concentration, with the highest values observed at 15% banana (27.11%), strawberry (24.95%), and pineapple (24.54%). Protein content ranged from 2.35% to 4.64%, fat content from 2.15% to 3.65%, and ash content from 0.34% to 0.95% across treatments. Total carbohydrate content varied between 9.18% and 18.84%. Syneresis was lowest in banana pulp yogurt, whereas strawberry and pineapple pulps showed concentration-dependent increases compared to controls.

Conclusion: Fruit pulp incorporation significantly improved the chemical composition of yogurt, with banana pulp demonstrating the most favorable nutritional profile. These findings support the use of banana pulp as a functional ingredient for enhancing the nutritional quality of fruit-flavored yogurt.

Keywords: Chemical Analysis, Dairy Products, Fermentation, Fruit Pulp, Nutritional Value, Probiotics, Yogurt.


Nutritional Evaluation of Fruit Yogurt
Objective
Evaluate the effect of fruit pulps on yogurt composition
Key Findings
pH with time
Total Solids
Protein, Fat & Ash
Syneresis with Banana
METHODS
Buffalo Milk
Yogurt
Banana
Strawberry
Pineapple
5% • 10% • 15%
pH
Protein
Fat
Carbohydrates
Conclusion
Banana Yogurt
Strawberry Yogurt
Pineapple Yogurt
Banana Pulp Yogurt Shows Best Nutritional Profile

INTRODUCTION

Fermented foods constitute a substantial component of the human diet across cultures, with fermented milk products occupying a particularly important place due to their nutritional density and long-standing association with health promotion. Among these, yogurt is one of the oldest and most widely consumed fermented dairy products globally. The term "yogurt" originates from the Turkish language and refers to milk curdled through the action of lactic acid–producing starter cultures, reflecting both its traditional roots and microbiological basis (1). Over centuries, yogurt has transitioned from a region-specific staple to a universally accepted functional food, valued not only for its palatability but also for its physiological benefits. Nutritionally, yogurt is recognized as a rich source of high-quality protein, carbohydrates, essential vitamins, lipids, phosphorus, and bioavailable minerals. Of particular clinical relevance is calcium absorption, which is enhanced in yogurt compared with milk due to the acidic environment created during fermentation that facilitates calcium ionization and uptake (2-4). In addition, yogurt contains live active microorganisms with probiotic potential; when consumed in adequate amounts, these microorganisms have been shown to confer measurable health benefits, including improved gut health and metabolic modulation (5). These attributes have strengthened yogurt's reputation as a food associated with overall well-being, contributing to its steadily increasing global consumption. Beyond its nutritional and probiotic value, yogurt is widely appreciated for its sensory qualities, including its pleasant aroma, mild acidity, and thick, creamy texture. These characteristics, combined with growing consumer awareness of diet–health relationships, have driven innovation within the dairy industry (6,7).

One such innovation is fruit-flavored yogurt, commonly prepared through the incorporation of seasonal fruits in the form of pieces or pulp. This product, often referred to as fruit-stirred yogurt, combines the nutritional benefits of fermented milk with the refreshing taste, natural sweetness, and added micronutrients of fruits, thereby enhancing consumer appeal (8). Commercially, fruit yogurts are produced in two principal forms: sundae-style yogurt, in which fruit is layered at the bottom of the container, and Swiss-style yogurt, where fruit is uniformly distributed throughout the product matrix (3,9). Despite the widespread popularity of fruit-flavored yogurt and its perception as a nutritious functional food, variations in formulation, fruit type, and processing conditions can substantially influence its final nutritional quality. Existing literature has largely focused on sensory acceptance or probiotic viability, while comparatively fewer studies have systematically evaluated how fruit incorporation affects the overall nutritional profile of yogurt. This represents an important gap, particularly in the context of increasing consumer demand for foods that are both health-promoting and sensorially appealing. In light of these considerations, the present study is designed to evaluate the nutritional quality of fruit-flavored yogurt. The objective is to systematically assess its nutritional composition in comparison to conventional yogurt, thereby providing evidence-based insights that can guide both consumers and manufacturers toward informed dietary and product development decisions.

METHODS

This experimental laboratory-based study was conducted to prepare and evaluate the chemical characteristics of fruit-flavored yogurt produced from buffalo milk. Fresh raw buffalo milk was procured from the Livestock Experimental Station, Department of Livestock Management, and transported under hygienic conditions to prevent microbial or compositional alterations. Prior to yogurt manufacture, the raw milk was subjected to baseline chemical analysis to determine its compositional quality, including standard parameters such as moisture, protein, fat, ash, and acidity, in order to ensure suitability for fermentation and to establish reference values for subsequent comparisons. Yogurt preparation was carried out at the Department of Animal Products Technology, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam. The manufacturing process followed the standardized method described by Tamime and Robinson, ensuring consistency with established dairy science protocols. Following pasteurization and cooling to inoculation temperature, milk was fermented using an appropriate lactic starter culture under controlled conditions until the desired coagulation and acidity were achieved. The prepared yogurt samples were systematically divided into six experimental batches. Three batches were flavored using commercially available food-grade flavors—strawberry, banana, and pineapple—while the remaining three batches were treated with freshly prepared fruit pulp of the corresponding fruits. The incorporation of fruit pulp and commercial flavoring was performed at standardized concentrations to allow meaningful comparison between treatments. Each batch was prepared and analyzed in duplicate to improve analytical reliability and reduce experimental variability.

After completion of fermentation and flavor incorporation, both plain and fruit-flavored yogurt samples were analyzed for their chemical properties using established analytical procedures as described by Khatoon (10). All analyses were conducted under controlled laboratory conditions using calibrated instruments, following standard quality control measures. The results obtained from duplicate analyses were averaged and used for comparative evaluation of nutritional parameters across different treatments. Data analysis was primarily descriptive, focusing on comparative assessment of chemical composition between yogurt prepared with commercial flavors and that prepared with fresh fruit pulp. As this study involved food product development and laboratory-based chemical analysis without the involvement of human or animal participants, ethical approval from an institutional review board was not required, and informed consent procedures were not applicable. However, all experimental procedures were conducted in accordance with institutional laboratory safety guidelines and standard food handling practices to ensure research integrity and product safety.

RESULTS

The raw buffalo milk used for yogurt preparation exhibited acceptable physico-chemical quality. The measured pH was 6.77 with titratable acidity of 0.15%, while moisture and total solids were recorded as 85.83% and 14.17%, respectively. The milk contained 5.20% fat, 3.26% protein, 0.804% ash, and 4.91% lactose, indicating its suitability for fermented dairy production. Analysis of fruit pulps demonstrated marked compositional variability. Banana pulp showed moderate acidity (0.32%) with relatively high total solids (20.96%) and carbohydrate content (16.91%). Strawberry pulp exhibited the lowest pH (3.43) and highest moisture content (90.26%) with comparatively lower total solids (9.74%). Pineapple pulp presented the highest acidity (0.99%) and intermediate moisture (80.2%) and total solids (19.8%). These compositional differences provided a distinct nutritional contribution to the yogurt matrix. In fruit-flavored yogurt, total solids increased significantly ($P<0.05$) with rising fruit pulp concentration across all treatments. Yogurts containing banana pulp demonstrated the highest increase, reaching 27.11% at 15% pulp inclusion, followed by strawberry (24.95%) and pineapple (22.87%) at the same concentration. All pulp-enriched yogurts showed higher total solids than their respective controls, reflecting the solids contribution of fruit pulp. Fermentation behavior, assessed through pH changes during incubation, showed a consistent decline in pH with increasing incubation time in all treatments. At the initial stage, pH values ranged from approximately 5.73 to 6.30 depending on fruit type and concentration. Progressive acidification was observed over four hours, with final pH values stabilizing between 4.70 and 4.79. Fruit pulp concentration significantly influenced the rate of acidification ($P<0.05$), particularly in strawberry- and pineapple-treated yogurts, which demonstrated more pronounced pH reductions compared with controls.

The fat content of yogurt increased significantly ($P<0.05$) with higher fruit pulp concentrations. In banana-based yogurt, fat content increased from 2.64% in the control to 3.65% at 15% pulp addition. Strawberry-flavored yogurt showed a rise from 3.04% to 3.65%, while pineapple-flavored yogurt increased from 3.14% to 3.45%. Similar trends were observed for protein content, which increased proportionally with pulp concentration. Banana pulp increased protein from 2.35% in the control to 3.81% at 15%, strawberry pulp from 3.54% to 4.64%, and pineapple pulp from 2.65% to 3.75%, with all increases being statistically significant ($P<0.05$). Mineral content, represented by ash percentage, also showed significant enhancement with fruit pulp addition. Banana-based yogurt increased from 0.74% in the control to 0.83% at the highest concentration. Strawberry-based yogurt increased from 0.64% to 0.83%, while pineapple-based yogurt demonstrated the most pronounced increase, reaching 0.95% compared with 0.34% in the control ($P<0.05$). Total carbohydrate content was significantly influenced by fruit pulp concentration, with banana-treated yogurt showing values between 17.57% and 18.84%, strawberry-treated yogurt between 9.18% and 11.51%, and pineapple-treated yogurt between 13.57% and 15.21%, all differing significantly from controls ($P<0.05$). Syneresis was significantly affected by both fruit type and concentration ($P<0.05$). Banana pulp reduced whey separation compared with the control value of 17.35%, indicating improved water-holding capacity. In contrast, strawberry and pineapple pulps increased syneresis in a concentration-dependent manner, reflecting differences in fruit fiber composition and acidity.

Table 1: Physico-chemical characteristics of buffalo milk

pH	Acidity (%)	Moisture (%)	Total solids (%)	Fat (%)	Protein (%)	Ash (%)	Lactose (%)
6.77	0.15	85.83	14.17	5.20	3.26	0.804	4.91

Table 2: Physico-chemical analysis of fruits

	pH	Acidity (%)	Moisture (%)	Total solids (%)	Fat (%)	Protein (%)	Ash (%)	Total (%)	CHO
Banana	5.30	0.32	79.04	20.96	0.80	2.15	1.10	16.91	
Strawberry	3.43	0.51	90.26	9.74	0.37	0.60	0.43	8.34	
Pineapple	4.50	0.99	80.2	19.8	1.78	2.00	0.36	10.66	

Table 3: Effect of Fruit Pulp Type and Concentration on pH Changes of Yogurt During Incubation

Incubation time	Concentration	pH trend		
		Banana pulp	Strawberry pulp	Pineapple pulp
0 hours	Control (0%)	6.14d	5.73g	6.22c
	5%	6.16d	5.80f	6.25bc
	10%	6.17d	6.04e	6.28ab
	15%	6.24bc	6.14d	6.30a
	S.E ± = 0.0206 LSD = 0.0407			
1 hour	Control (0%)	5.81g	5.41k	5.56j
	5%	5.90e	5.61i	5.91d
	10%	5.93c	5.68h	5.92c
	15%	6.06a	5.83f	5.95b
	S.E ± = 0.4556 LSD = 0.8984			
2 hours	Control (0%)	5.15j	5.21i	5.32g
	5%	5.29h	5.21i	5.47d
	10%	5.36e	5.34f	5.51c
	15%	5.54b	4.92k	5.62a
	S.E ± = 0.269 LSD = 0.531			
3 hours	Control (0%)	5.24a	4.70i	4.70i
	5%	4.78d	4.72e	5.10b
	10%	4.70i	4.78d	5.08c
	15%	4.76g	4.70i	4.72e
	S.E ± = 0.437 LSD = 0.862			
4 hours	Control (0%)	4.79d	4.70i	4.70i
	5%	4.78d	4.72e	4.77d

Incubation time	Concentration	pH trend		
	10%	4.70i	4.78d	4.72e
	15%	4.76g	4.70i	4.72e

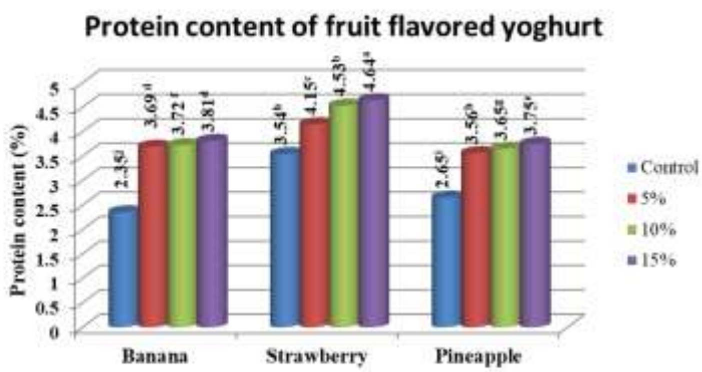

Figure 1 Protein Content of Fruit Flavored Yoghurt

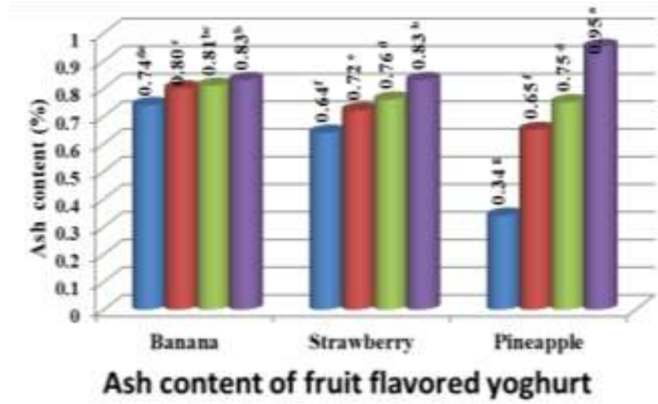

Figure 2 Ash Content of Fruit Flavored Yoghurt

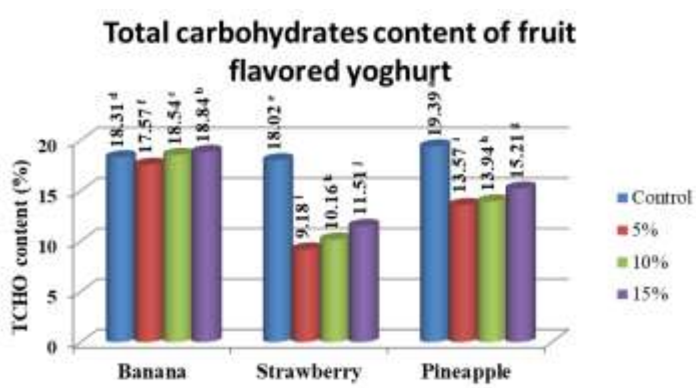

Figure 3 Total Carbohydrates Content of Fruit Flavored Yoghurt

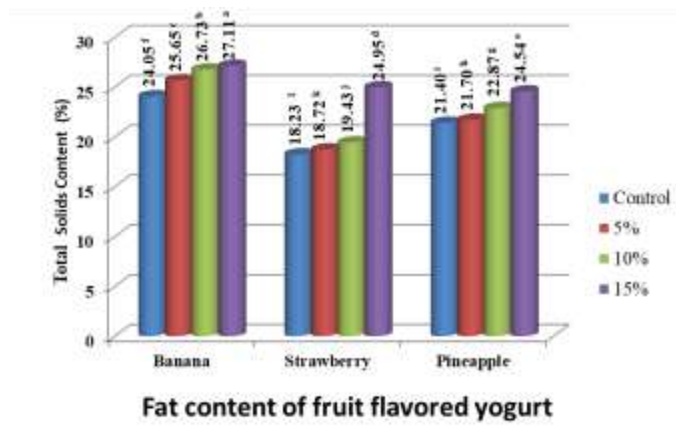

Figure 4 Fat Content of Fruit Flavored Yogurt

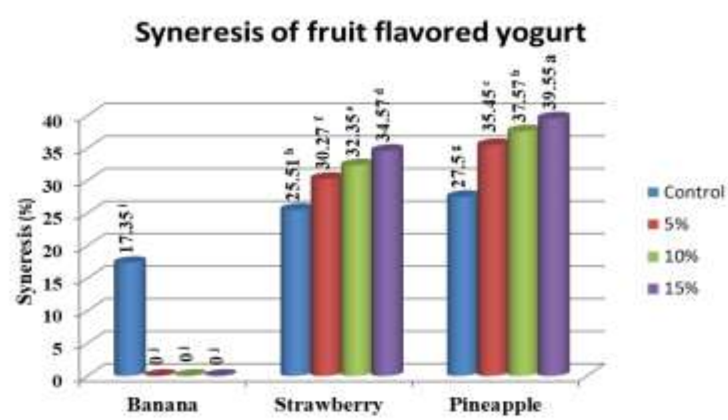

Figure 5 Syneresis of Fruit Flavored Yogurt

DISCUSSION

Fermented dairy products have long been recognized as effective carriers for delivering probiotics to consumers, and yogurt in particular occupies a central position due to its dense nutritional profile and established health benefits (11). The findings of the present study reinforce this perspective by demonstrating that fruit-flavored yogurt not only retained the fundamental nutritional advantages of conventional yogurt but also exhibited measurable improvements in several compositional parameters following fruit pulp incorporation. These observations are clinically and nutritionally relevant, as yogurt is widely acknowledged for its contribution to dietary protein, calcium, phosphorus, magnesium, zinc, and B-complex vitamins, along with its documented role in improving lactose tolerance, lipid metabolism, bone health, and protection against certain infections and malignancies (12,13). A consistent reduction in pH was observed with increasing concentrations of banana, strawberry, and pineapple pulp, reflecting enhanced acidification during fermentation. This trend is in agreement with earlier experimental findings reporting similar pH declines following fruit pulp addition to yogurt matrices (14,15). The reduction in pH can be attributed to increased fermentable substrates and altered total solids content, which collectively stimulate lactic acid bacterial activity and organic acid production (16). In addition, environmental and processing-related factors such as temperature, humidity, and exposure to light have been reported to influence fermentation dynamics and pH stability, which may partly explain inter-study variability (17). Lactose availability also plays a contributory role in acid development, linking carbohydrate metabolism directly to final product acidity. The progressive increase in total solids with higher fruit pulp concentrations observed in this study is nutritionally advantageous, as it is closely associated with improved yogurt body, texture, and firmness. This finding aligns with reports indicating that fruit enrichment enhances total solids content through the addition of dietary fiber, sugars, and structural polysaccharides (18). However, some investigations have reported non-significant or fruit-specific effects on total solids at comparable inclusion levels, suggesting that variations in milk composition, fruit cultivar, maturity stage, and processing conditions may influence outcomes (12,15). Such variability highlights the importance of standardizing raw materials in comparative dairy research. The observed increases in fat and protein contents with escalating fruit pulp concentrations are notable, particularly from a nutritional enhancement perspective. Similar trends have been reported previously, indicating that fruit incorporation can modestly elevate macronutrient density in yogurt (19,20). The increase in protein content may also reflect indirect microbial effects, where fermentable sugars support microbial growth and biomass formation, thereby contributing to measured protein levels (16). These changes, while statistically significant, remained within physiologically acceptable ranges and are unlikely to compromise product suitability for routine consumption.

Mineral content, reflected by ash percentage, increased with fruit pulp concentration across all treatments, with banana-based yogurt showing comparatively higher values. This observation is consistent with prior evidence indicating that fruits contribute essential minerals that enhance the micronutrient profile of fermented dairy products (12,14). Similarly, total carbohydrate content increased proportionally with fruit pulp addition, primarily due to the presence of reducing sugars inherent to fruits, which has been widely documented in fruit-fortified yogurt formulations (8,13,16). Syneresis behavior varied depending on fruit type, with banana pulp reducing whey separation, while strawberry and pineapple pulps increased it. This differential response is likely related to differences in fiber composition, pectin content, and water-binding capacity of the fruits. Banana pulp, characterized by higher total solids and starch-like components, may enhance water retention within the gel matrix, thereby reducing syneresis, whereas the higher acidity and lower water-binding capacity of strawberry and pineapple may destabilize the protein network (21,22). From a product quality standpoint, reduced syneresis is desirable, suggesting that fruit selection plays a critical role in optimizing yogurt stability. The strengths of this study include the controlled experimental design, comparative evaluation of multiple fruit types and concentrations, and comprehensive assessment of key nutritional and physicochemical parameters. However, several limitations should be acknowledged. The study did not evaluate probiotic viability, sensory acceptability, micronutrient bioavailability, or storage stability, all of which are critical determinants of consumer acceptance and functional efficacy. Additionally, the absence of instrumental texture analysis and rheological measurements limited deeper insight into structural changes associated with fruit incorporation. Future research should therefore integrate microbiological profiling, sensory evaluation, shelf-life assessment, and bioavailability studies to provide a more holistic evaluation of fruit-flavored yogurt as a functional food. Exploring a wider range of fruits, fiber fractions, and processing conditions may further refine formulation strategies aimed at maximizing both nutritional value and consumer appeal.

CONCLUSION

The findings of this study demonstrated that the incorporation of fruit pulp into yogurt meaningfully influenced its nutritional profile, with banana pulp–enriched yogurt showing the most favorable overall chemical composition. Compared with other fruit treatments, banana pulp contributed to improved macronutrient density and mineral content, indicating its suitability for developing nutritionally enhanced fruit-flavored yogurt. These results directly addressed the study objective by identifying a fruit option that optimizes the chemical quality of yogurt without compromising its fundamental characteristics. From a practical standpoint, the use of banana pulp offers a promising, natural approach for dairy processors seeking to enhance the nutritional value of fermented milk products while aligning with consumer preferences for fruit-based, health-oriented foods.

AUTHOR CONTRIBUTIONS

Author	Contribution
Zoya Parveen Soomro*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Atta Hussain Shah	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Ghulam Shabir Barham	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Humaira Hanif	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Aijaz Hussain Soomro	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Jai Pirkash Goil	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Reema Bughio	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Abdul Wahid Solangi	Writing - Review & Editing, Assistance with Data Curation
Deepesh Kumar Bhuptani	Writing - Review & Editing, Assistance with Data Curation

REFERENCES

1. Zhang X, Zheng Y, Zhou C, Cao J, Zhang Y, Wu Z, et al. Combining thermosonication microstress and pineapple peel extract addition to achieve quality and post-acidification control in yogurt fermentation. Ultrason Sonochem. 2024;105:106857.

2. Cais-Sokolińska D, Walkowiak-Tomczak D. Consumer-perception, nutritional, and functional studies of a yogurt with restructured elderberry juice. J Dairy Sci. 2021;104(2):1318-35.

3. Costa RS, Oliveira RF, Henry FC, Mello WAO, Gaspar CR. Development of prebiotic yogurt with addition of green-banana biomass (Musa spp.). An Acad Bras Cienc. 2023;95(suppl 1):e20220532.

4. Ścibisz I, Ziarno M. Effect of Fermented Matrix on the Color and Stability of Strawberry and Blueberry Anthocyanins during the Storage of Fruit Yogurts and Soy-Based and Bean-Based Fruit Yogurt Alternatives. Molecules. 2023;28(17).

5. Ban Q, Sun X, Jiang Y, Cheng J, Guo M. Effect of synbiotic yogurt fortified with monk fruit extract on hepatic lipid biomarkers and metabolism in rats with type 2 diabetes. J Dairy Sci. 2022;105(5):3758-69.

6. Merenstein D, Sparenborg J, Tan T, D'Amico F, Kumar A, Herbin Smith K. Efficacy and Safety of BB-12 Supplemented Strawberry Yogurt For Healthy Children on Antibiotics (PLAY ON). Ann Fam Med. 2024;21(Suppl 3).

7. Rao SSC, Brenner DM. Efficacy and Safety of Over-the-Counter Therapies for Chronic Constipation: An Updated Systematic Review. Am J Gastroenterol. 2021;116(6):1156-81.

8. Kong CY, Li ZM, Chen HL, Mao YQ, Han B, Guo JJ, et al. An Energy-Restricted Diet Including Yogurt, Fruit, and Vegetables Alleviates High-Fat Diet-Induced Metabolic Syndrome in Mice by Modulating the Gut Microbiota. J Nutr. 2022;152(11):2429-40.

9. Muñoz-Tebar N, Botella-Martínez C, Lucas-González R, Lorenzo JM, Pérez-Álvarez J, Fernández-López J, et al. Enhancing sheep milk yogurt with prickly pear (Opuntia ficus-indica L.) flours (peel and pulp): nutritional, techno-functional, and sensory evaluation. J Sci Food Agric. 2025;105(13):7404-16.

10. Khatoon, N., Ali, S., Liu, N., & Muzammil, H. S. (2021). Preparation and quality assessment of fruit yoghurt with persimmon (Diospyros kaki): quality assessment of fruit yoghurt with persimmon. Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences, 58(1), 111-128.

11. Muñoz-Tebar N, Muñoz-Bas C, Viuda-Martos M, Sayas-Barberá E, Pérez-Alvarez JA, Fernández-López J. Fortification of goat milk yogurts with date palm (Phoenix dactylifera L.) coproducts: Impact on their quality during cold storage. Food Chem. 2024;454:139800.

12. Graça JS, Furtado MM, Freire L, Watanabe CA, Rocha RS, Sant'Ana AS. Impact of pre-exposure stress on the growth and viability of Lactobacillus acidophilus in regular, buriti pulp and orange byproduct fermented milk products. Food Microbiol. 2025;125:104660.

13. Ogrodowczyk AM, Markiewicz L, Szmatowicz B, Koźniewski B, Wróblewska B. Improved quality, sensory properties and nutraceutical potential of the fermented beverages fortified with freeze-dried berries and acacia honey. Food Chem. 2025;486:144469.

14. de Morais JL, Bezerril FF, Viera VB, Dantas CEA, de Figueirêdo RMF, Dos Santos Moreira I, et al. Incorporation of mixed strawberry and acerola jam into Greek-style goat yogurt with autochthonous adjunct culture of Limosilactobacillus mucosae CNPC007: Impact on technological, nutritional, bioactive, and microbiological properties. Food Res Int. 2024;196:115130.

15. Shishir MRI, Suo H, Taip FS, Cheng KW. Lactoferrin-chia seed mucilage complex coacervates for intestinal delivery of quercetin and fortification of set yogurt. Food Chem. 2024;456:139818.

16. Babich JS, Patel J, Dupuis L, Goldfarb DS, Loeb S, Borin J, et al. Phosphorus Content of Several Plant-Based Yogurts. J Ren Nutr. 2025;35(1):234-8.

17. Buchilina A, Aryana K. Physicochemical and microbiological characteristics of camel milk yogurt as influenced by monk fruit sweetener. J Dairy Sci. 2021;104(2):1484-93.

18. Falah F, Vasiee A, Yazdi FT, Behbahani BA. Preparation and Functional Properties of Synbiotic Yogurt Fermented with Lactobacillus brevis PML1 Derived from a Fermented Cereal-Dairy Product. Biomed Res Int. 2021;2021:1057531.

19. Najgebauer-Lejko D, Liszka K, Tabaszewska M, Domagała J. Probiotic Yoghurts with Sea Buckthorn, Elderberry, and Sloe Fruit Purees. Molecules. 2021;26(8).

20. O'Mahony S, O'Donovan CB, Collins N, Burke K, Doyle G, Gibney ER. Reformulation of Processed Yogurt and Breakfast Cereals over Time: A Scoping Review. Int J Environ Res Public Health. 2023;20(4).

21. Cai Z, Zhou S, Zhang T, Du Q, Tu M, Wu Z, et al. Synergistic enhancement of bio-yogurt properties by Lactiplantibacillus plantarum NUC08 and mulberry fruit extract. Food Chem. 2025;468:142447.

22. E PRP, Ferreira BM, Freire L, Angélica Neri-Numa I, Guimarães JT, Rocha RS, et al. Enhancing the functionality of yogurt: Impact of exotic fruit pulps addition on probiotic viability and metabolites during processing and storage. Food Res Int. 2024;196:115057.