
**PROCESS STANDARDIZATION OF DATES INCORPORATED
YOGURT**

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ABSTRACT

Yogurt is a widely consumed fermented dairy product valued for its nutritional and probiotic properties. The present study was carried out to standardize the processing parameters for the development of yogurt incorporated with date paste as a natural sweetener. Control yogurt and yogurt with 15% date paste were prepared and evaluated for physicochemical, nutritional, antioxidant, and microbiological properties, along with storage stability. The incorporation of date pastes increased total soluble solids, carbohydrate content, fat content, energy value, and iron content, while protein remained nearly unchanged. Antioxidant activity was also enhanced due to the presence of phenolic compounds. Microbiological analysis confirmed adequate lactic acid bacteria and absence of pathogenic organisms. The product remained stable and acceptable under refrigerated conditions for up to 10 days. The study indicates that date paste can be effectively used as a natural alternative to refined sugar in yogurt.

KEYWORDS: *Date paste; Yogurt; natural sweetener; functional dairy products; antioxidant activity; iron enrichment; lactic acid bacteria; shelf life.*

INTRODUCTION

Fermented dairy products are widely valued for their nutritional benefits and positive effects on human health. Among these products, yogurt is one of the most popular fermented foods, produced through the action of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus*, which improve its flavor, texture, digestibility, and shelf life. Increasing consumer demand for functional foods has led to the development of yogurts enriched with

fruits and other natural ingredients to enhance their nutritional and health-promoting properties (Fazilah et al., 2018).

Dates (*Phoenix dactylifera* L.) are rich in carbohydrates, dietary fiber, minerals, and bioactive compounds such as phenolics and flavonoids, making them a valuable functional food ingredient (Al-Farsi & Lee, 2008). In particular, Medjool dates are highly preferred due to their soft texture, natural sweetness, and high content of soluble solids and antioxidants, making them suitable for processing into date paste and incorporation into dairy products (Karasawa et al., 2019).

The addition of date paste to yogurt may improve its nutritional quality, antioxidant activity, and sensory characteristics while serving as a natural alternative to refined sugar. Fruit-enriched yogurts have been reported to exhibit enhanced functional and antioxidant properties (Pereira et al., 2013; Fazilah et al., 2018). However, studies on the complete replacement of sugar with date paste in yogurt are limited. Therefore, the present study was undertaken to evaluate the effects of Medjool date paste on the physicochemical, nutritional, antioxidant, and microbiological properties of yogurt during storage.

MATERIALS AND METHODS

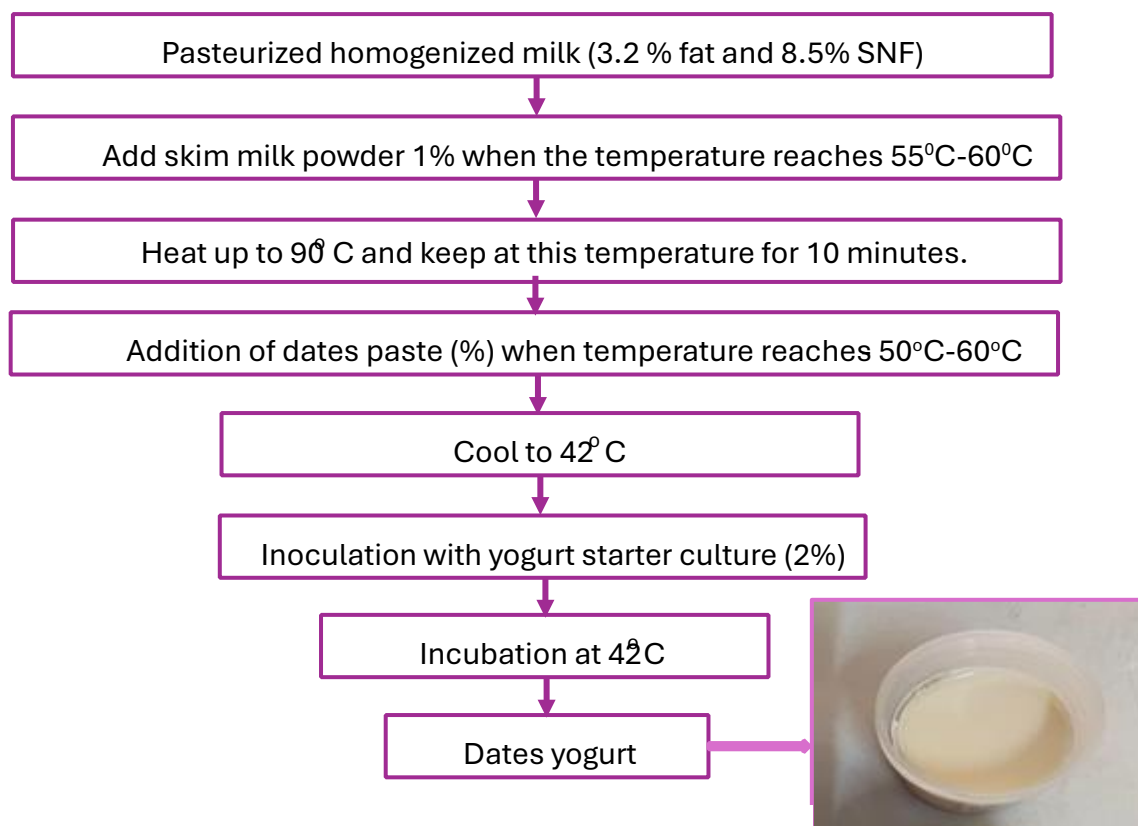


Figure 1: Flow Chart - Dates Incorporated

Yogurt starter culture containing *Streptococcus thermophilus* and *Lactobacillus bulgaricus* was obtained from VKIDFT. Medjool dates were washed, scalded at 80°C for 3 minutes, deseeded, peeled, and blended into a homogeneous paste, which was pasteurized at 85°C before use.

Date-incorporated yogurt was prepared using standardized milk (3.2% fat, 8.5% SNF). The milk was heated to 90°C for 10 minutes with the addition of 1% skim milk powder, cooled, and mixed with 15% date paste. After cooling to 42°C, 2% starter culture was added, and the mixture was incubated at 42°C for 4–5 hours.

Physicochemical analyses included protein (Lowry method), fat (Soxhlet extraction), carbohydrate (Anthrone method), moisture (hot air oven method), total soluble solids (°Brix), iron content (AAS), pH, and titratable acidity. Antioxidant activity was determined using the DPPH radical scavenging assay and expressed as IC₅₀ values.

Sensory evaluation was conducted by a panel of judges using a 9-point hedonic scale. Microbiological quality was assessed by serial dilution and pour plating on selective media following FSSAI guidelines. Shelf-life studies were carried out at 4°C, with sensory, physicochemical, and microbiological analyses performed on days 0, 5, and 10.

RESULTS

Proximate Composition

Table 1: Proximate Composition of Both Control and Dates Paste Incorporated Yogurts.

% Constituent	Sample 1 control	Sample 2 Dates Yogurt
Moisture	79.60 %	80.95 %
Fat	0.68 %	1.29 %
Total soluble solids	8.0 °Bx	15.0 °Bx
Protein	9.70 %	9.78 %
Carbohydrate	6.41 %	13.41 %

Antioxidant Activity and iron content Value

Table 2: Antioxidant Activity Value and iron content of Control and Dates Yogurt.

Parameter	Control Yogurt	Dates Yogurt
Antioxidant activity (IC ₅₀)	11.24 mg/mL	1.39 mg/mL
Mineral – Iron (mg)	0.55 ppm	1.12 ppm

Sensory Score Table

Yogurt samples with 3-20% date paste (without sugar) were evaluated by a three-member panel for smell, texture, flavor, and overall acceptability.

Table 4: Sensory Evaluation of Yogurt Samples Prepared with Varying Concentrations of Dates Paste: 3% (S1), 5% (S2), 10% (S3), 15% (S4), and 20% (S5)

Panelist No.	Smell/ odour					Taste/ flavour					Body& texture					Overall acceptability				
	S1	S2	S3	S4	S5	S1	S2	S3	S4	S5	S1	S2	S3	S4	S5	S1	S2	S3	S4	S5
Panelist No. 1	7	8	8	9	9	6	6	8	9	9	8	8	8	8	6	6	6	7	9	8
Panelist No.2	7	8	9	9	8	6	6	7	9	9	8	8	7	9	7	6	6	8	9	9
Panelist No.3	7	8	9	9	8	6	7	7	9	7	8	8	7	8	7	6	6	8	9	8
Mean	7	8	8.6	9	8.3	6	6.3	7.3	9	8.3	8	8	7.3	8.3	6.6	6	6	7.6	9	8.3

Table 5: Sensory Scores of yogurts prepared with 15 % Dates Paste and Control Yogurt. (0 % Dates Paste and 0% Sugar)

Panelist	Sample 1 Control				Sample 2 Dates yogurt			
	Smell / odour	Taste / flavour	Body & texture	Overall accept ability	Smell/ odour	Taste/ flavour	Body & texture	Overall acceptability
Panelist No. 1	8	7	7	7	8	9	7	9
Panelist No.2	8	6	9	7	8	9	7	8
Panelist No.3	8	7	9	8	8	9	7	9
Panelist No. 4	8	7	9	7	9	9	7	8

Shelf-life study – microbial analysis

Table 6: Impact of Storage on the Microbiological Quality of Control and Set Yogurt at Refrigerated Temperatures. (5±2 °C)

Tests	Days	Sample: 1 Control (cfu/ml)	Sample: 2 Dates Yogurt (cfu/ml)
LAB count (cfu/ml)	0	5x10 ⁸	8x10 ⁸
	5	9x10 ⁸	11x10 ⁸
	10	12x10 ⁸	18x10 ⁸
Coliform count (cfu/ml)	0	Absent	Absent
	5	Absent	Absent
	10	Absent	Absent
Yeast and Mold count (cfu/ml)	0	Absent	Absent
	5	Absent	Absent
	10	Absent	Absent
S. aureus count (cfu/ml)	0	Absent	Absent
	5	Absent	Absent
	10	Absent	Absent

0th Day Microbial Analysis



Figure 2: Dates Incorporated Yogurt - Lab Count

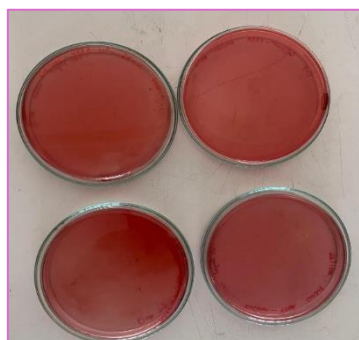


Figure 3 : Dates Incorporated Yogurt - Coliform Count

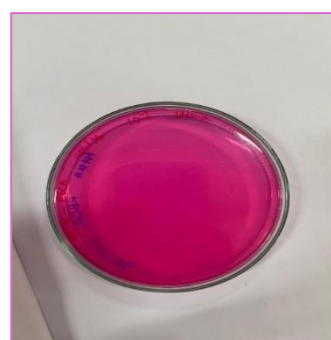


Figure 4 : Dates Incorporated Yogurt - Yeast and Mold Count

5th Day Microbial Analysis

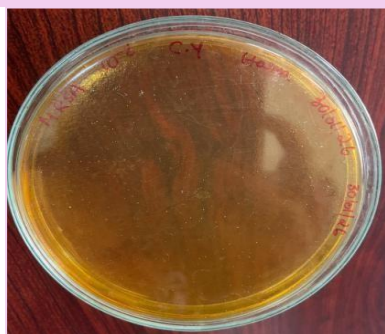


Figure 5: Dates Incorporated



figure 6: Dates Incorporated Yogurt
Yeast and Mold Count



Figur7: Dates Incorporated
Yogurt Coliform Count



Figur8:: Dates Incorporated
Yogurt *S. aureus* Count

10th Day Microbial Analysis



Figure 9 : Dates Incorporate
Yogurt Lab Count

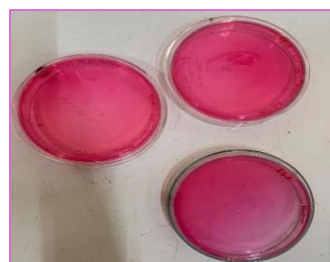


Figure 10: Dates Incorporated
Yogurt Yeast and Mold



Figure 11: Dates Incorporated
Yogurt- coliform count

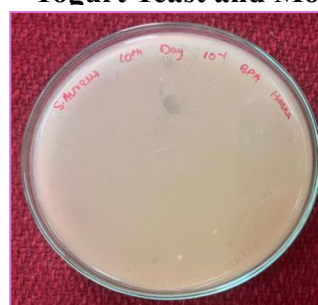


Figure 12: Dates Incorporated
yogurt- *S. aureus* count

Table :7 Effect of Storage on pH and titratable acidity of Control and Dates Incorporated Yogurt.

Tests	Days	Sample 1 Control	Sample 2 Dates Yogurt
pH	0	4.58	4.55
	5	4.47	4.40
	10	4.35	4.28
Titratable acidity (% of lactic acid)	0	0.81	0.80
	5	0.84	0.92
	10	0.90	1.01

DISCUSSION

The present study demonstrated that date paste can be successfully incorporated into yogurt as a natural sweetener and functional ingredient. Among the tested formulations, yogurt containing 15% date paste showed the highest overall sensory acceptability. The addition of date paste improved total soluble solids, carbohydrate content, iron levels, and antioxidant activity, while protein content remained relatively unchanged. These findings are consistent with earlier reports on the nutritional benefits of date-enriched yogurt (Arfaoui, 2020).

The enhanced antioxidant activity can be attributed to the phenolic compounds naturally present in dates (Al-Farsi & Lee, 2008). Microbiological analysis confirmed the presence of beneficial lactic acid bacteria and the absence of pathogenic microorganisms, indicating good product safety and quality. Similar studies have reported that date-based ingredients support the growth and viability of probiotic cultures in yogurt (Ghafoor et al., 2023).

Although slight decreases in pH and increases in acidity were observed during refrigerated storage, the yogurt remained stable and acceptable for up to 10 days, which agrees with previous findings on yogurt storage behavior (Getsemani et al., 2025). Overall, the results suggest that 15% date paste is an effective natural alternative to refined sugar, enhancing the nutritional, antioxidant, and sensory properties of yogurt.

CONCLUSION

The present study successfully standardized the preparation of yogurt incorporated with date paste as a natural sweetener and functional ingredient. The addition of 15% date paste resulted in improved sensory acceptability, enhanced antioxidant activity, and a significant increase in iron content, while maintaining the nutritional quality and protein levels of yogurt. The product also showed good microbiological safety and remained stable under refrigerated storage for up to 10 days. These findings indicate that date paste can effectively replace

refined sugar and can be utilized to develop a nutritionally enriched and functional yogurt with added health benefits.

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