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Study on the Identification of Optimal Conditions for Goat Milk Yogurt Production

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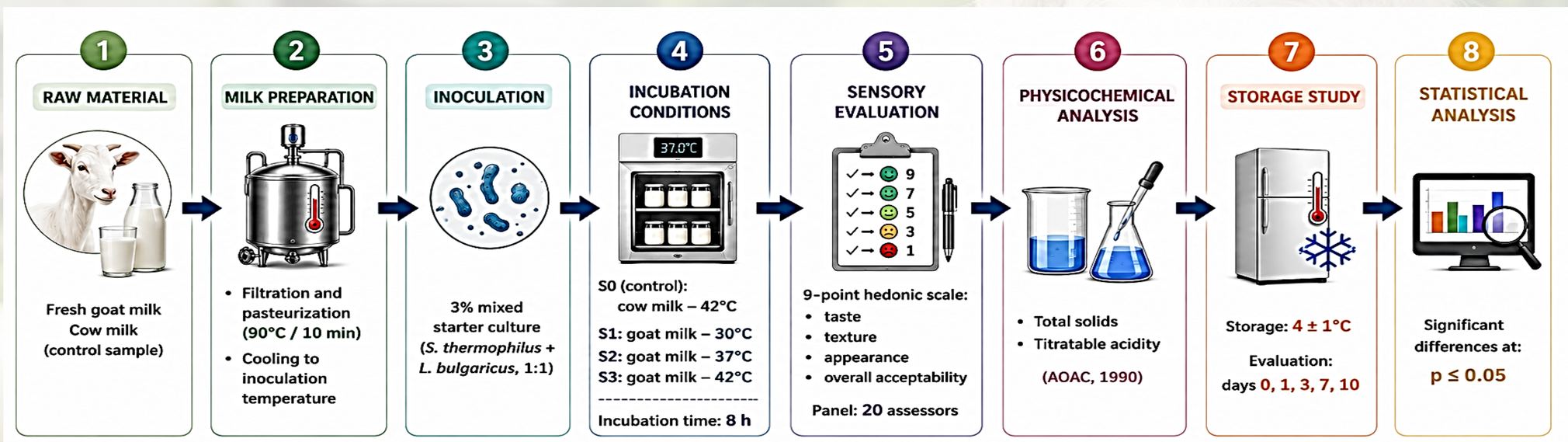
Abstract: ***This study aimed to optimize the technological conditions for goat milk yogurt production with good sensory and physicochemical characteristics. Goat milk yogurt samples were incubated at 30°C, 37°C, and 42°C, while cow milk yogurt incubated at 42°C served as the control. Samples were evaluated by a sensory panel using a 9-point hedonic scale, and physicochemical analyses included total solids and titratable acidity. Significant differences were observed among samples ($p \leq 0.05$). The yogurt incubated at 42°C showed the best sensory acceptability, balanced acidity, and improved storage stability, highlighting the technological potential of goat milk for fermented dairy products.***

Introduction

Goat milk is increasingly valued in the dairy industry due to its high nutritional value, improved digestibility, and beneficial effects on human health compared to cow milk. In recent years, consumer interest in functional and fermented dairy products has contributed to the growing demand for goat milk yogurt, appreciated for its nutritional properties, unique flavor, and potential health benefits.

Material and methods



The optimal incubation temperature (42°C) was selected based on sensory scores for the development of the final goat milk yogurt.

Results and discussions

Mean Sensory Scores of Yogurts Obtained from Cow and Goat Milk

Sample	Appearance, Color, Consistency	Odor	Taste	Total Mean Score
S0	4,20 ± 0,20^{c}	4.80 ± 0,20^{b}	4.60 ± 0,24^{b}	13.60 ± 0,20^{b}
S1	3.80 ± 0,20^{a}	4.00 ± 0,24^{a}	3.20 ± 0,20^{a}	11.00 ± 0.37^{a}
S2	4,20 ± 0,24^{b}	4,20 ± 0,31^{a}	4,00 ± 0,40^{a}	12,40 ± 0,24^{a}
S3	4.80 ± 0,20^{c}	4,60 ± 0,20^{b}	4,60 ± 0,24^{b}	13.80 ± 0,24^{b}

Values are expressed as mean ± standard deviation.

Values within the same column marked with different superscript letters differ significantly ($p < 0.05$), according to ANOVA followed by Tukey's HSD test.

Mean Values of Acidity and Total Solids (TS) Content in the Analyzed Yogurts

Sample	Acidity (°T)	TS (%)
S0	91.20 ± 3.03^{a}	13.60 ± 0.20^{a}
S1	84.20 ± 4.27^{b}	12.10 ± 0.37^{b}
S2	85.00 ± 3.61^{ab}	12.10 ± 0.24^{b}
S3	94.20 ± 3.19^{a}	12.15 ± 0.24^{b}

Values are expressed as mean ± standard deviation.

Values within the same column marked with different superscript letters differ significantly ($p < 0.05$), according to ANOVA followed by Tukey's HSD test.

Mean Scores for Appearance, Color and Consistency of Yogurts During Storage

Sample	Storage time (days)				
	0	1	3	7	10
S0	4,20 ± 0,20^{c}	4,750 ± 0,073^{a}	4,983 ± 0,069^{a}	4,900 ± 0,069^{a}	4,683 ± 0,069^{a}
S1	3,80 ± 0,20^{a}	3,650 ± 0,065^{b}	3,623 ± 0,063^{b}	3,250 ± 0,048^{b}	3,183 ± 0,039^{b}
S2	4,20 ± 0,24^{b}	3,950 ± 0,063^{b}	3,900 ± 0,099^{ab}	3,980 ± 0,062^{ab}	3,883 ± 0,089^{a}
S3	4,80 ± 0,20^{c}	4,583 ± 0,079^{a}	4,450 ± 0,079^{a}	4,367 ± 0,079^{a}	4,183 ± 0,079^{a}

Values are expressed as mean ± standard deviation.

Values within the same column marked with different superscript letters differ significantly ($p < 0.05$), according to ANOVA followed by Tukey's HSD test.

Mean Scores for Taste of Yogurts During Storage

Sample	Storage time (days)				
	0	1	3	7	10
S0	4,60 ± 0,24^{b}	4,883 ± 0,075^{a}	4,820 ± 0,075^{a}	4,550 ± 0,075^{a}	4,467 ± 0,075^{a}
S1	3,20 ± 0,20^{a}	3,680 ± 0,063^{b}	3,850 ± 0,065^{b}	3,450 ± 0,078^{b}	3,100 ± 0,085^{b}
S2	4,00 ± 0,40^{a}	3,950 ± 0,089^{b}	3,950 ± 0,068^{b}	3,850 ± 0,095^{b}	4,105 ± 0,095^{a}
S3	4,60 ± 0,24^{b}	4,633 ± 0,065^{a}	4,567 ± 0,065^{a}	4,900 ± 0,065^{a}	4,583 ± 0,065^{a}

Values are expressed as mean ± standard deviation.

Values within the same column marked with different superscript letters differ significantly ($p < 0.05$), according to ANOVA followed by Tukey's HSD test.

Mean Scores for Odor of Yogurts During Storage

Sample	Storage time (days)				
	0	1	3	7	10
S0	4,80 ± 0,20^{b}	4,267 ± 0,069^{a}	4,983 ± 0,069^{a}	4,900 ± 0,069^{a}	4,683 ± 0,069^{a}
S1	4,00 ± 0,24^{a}	3,583 ± 0,079^{b}	3,450 ± 0,079^{b}	3,367 ± 0,079^{b}	3,183 ± 0,079^{b}
S2	4,20 ± 0,31^{a}	3,705 ± 0,070^{b}	3,880 ± 0,070^{b}	3,780 ± 0,070^{b}	3,590 ± 0,070^{b}
S3	4,60 ± 0,20^{b}	4,633 ± 0,075^{a}	4,510 ± 0,075^{a}	4,420 ± 0,075^{ab}	4,250 ± 0,075^{a}

Values are expressed as mean ± standard deviation.

Values within the same column marked with different superscript letters differ significantly ($p < 0.05$), according to ANOVA followed by Tukey's HSD test.

Mean Total Score for Overall Acceptability of Yogurts During Storage

Sample	Storage time (days)				
	0	1	3	7	10
S0	13,60 ± 0,20^{b}	13,9 ± 0,18^{a}	14,786 ± 0,12^{a}	14,35 ± 0,14^{a}	13,833 ± 0,17^{a}
S1	11,00 ± 0,37^{a}	10,913 ± 0,15^{b}	10,923 ± 0,13^{b}	10,067 ± 0,16^{b}	9,866 ± 0,14^{b}
S2	12,40 ± 0,24^{a}	11,605 ± 0,14^{c}	11,73 ± 0,11^{c}	11,61 ± 0,13^{c}	11,778 ± 0,15^{c}
S3	13,80 ± 0,24^{b}	13,849 ± 0,17^{d}	13,527 ± 0,12^{d}	13,687 ± 0,15^{d}	13,016 ± 0,13^{d}

Values are expressed as mean ± standard deviation.

Values within the same column marked with different superscript letters differ significantly ($p < 0.05$), according to ANOVA followed by Tukey's HSD test.

Dynamics of Acidity of Yogurts During Storage

Sample	Storage time (days)				
	0	1	3	7	10
S0	91,20 ± 3,03^{a}	105 ± 3,49^{a}	125 ± 4,15^{a}	136 ± 3, 69^{a}	145 ± 4,81^{a}
S1	84,20 ± 4,27^{b}	95 ± 4,82^{b}	112 ± 5,68^{b}	120 ± 3,48^{b}	125 ± 6,34^{b}
S2	85,00 ± 3,61^{ab}	90 ± 3,83^{b}	115 ± 4,89^{b}	119 ± 3, 62^{b}	125 ± 5,31^{b}
S3	94,20 ± 3,19^{a}	115 ± 3,90^{a}	124 ± 4,21^{a}	132 ± 3,09^{a}	140 ± 4,68^{a}

Values are expressed as mean ± standard deviation.

Values within the same column marked with different superscript letters differ significantly ($p < 0.05$), according to ANOVA followed by Tukey's HSD test.

CONCLUSIONS

Both goat and cow milk showed good quality characteristics and suitability for yogurt production.

The optimization of incubation temperature at 42°C improved the sensory quality and overall acceptability of goat milk yogurt.

Sample S3 showed higher titratable acidity, indicating enhanced starter culture activity and lactic acid production during fermentation.

The incubation temperature of 42°C proved optimal for obtaining goat milk yogurt with balanced sensory properties, good stability during storage, and technological characteristics comparable to cow milk yogurt.