

HARMONY IN PROGRESS:

**INTEGRATING SCIENCE, TECHNOLOGY,
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YST010 - MICROBIAL POTENTIAL OF BEE HONEY IN YOGURT PROCESSING

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ABSTRACT

Growing consumer health awareness of better food options and the demand for improved digestive well-being have spurred interest in maximizing the nutritional content and probiotic levels of yogurt. This study investigated the microbial potential of bee honey in yogurt processing. The three main objectives were to determine the antimicrobial activity of bee honey against common spoilage and pathogenic bacteria in yogurt, to monitor the microbial populations during yogurt fermentation and to examine the physicochemical properties of the resulting yogurt. Standard microbiological methods including total plate counts and disc-diffusion assays for assessing antimicrobial activity were employed alongside physicochemical analyses measuring pH, moisture content, Brix, protein and fat. The findings revealed that bee honey had strong antimicrobial activity at 50% and 100% concentrations with clear inhibition zones reaching up to 27.7 mm for *Staphylococcus aureus* and 15.7 mm for *Escherichia coli*. Incorporating bee honey into the yogurt fermentation process shows enhanced probiotic potential as yogurt containing 2% honey reached a bacterial count of $2.19 \pm 7.00 \times 10^7$ CFU/mL compared to control, $1.75 \pm 8.00 \times 10^9$ CFU/mL. Physicochemical analysis revealed that honey yogurt had pH values within the ideal range (4.14 - 4.35) for yogurt, reduced moisture content with more honey added (from 85.80% in control to 81.35% at 6% honey), increased Brix values (up to 13.7% with 6% honey) and slightly higher protein content (up to 3.93% at 2% honey). Notably, the fat content remained stable across all samples (about 4.4%). These observations indicate that bee honey is not only a natural sweetener but also plays an integral role in improving the safety, nutritional value and functional value of yogurt. Overall, the use of bee honey in yogurt production has great potential in developing novel functional dairy products that meet consumer demands for healthier food while supporting product safety.

Keywords – bee honey, yogurt, antimicrobial activity, lactic acid bacteria, functional food

INTRODUCTION

Yogurt is a fermented dairy product produced by lactic acid bacteria (LAB), commonly *Lactobacillus* and *Streptococcus* species, and is valued for its flavour, texture and probiotic properties. Consumer demand for healthier functional foods has spurred exploration of natural additives like bee honey, rich in sugars, enzymes, phenolics and bioactive compounds with antioxidant and antimicrobial properties. Previous research suggests honey may synergistically enhance probiotic viability in yogurt. This study addresses the

knowledge gap concerning bee honey's interaction with yogurt microbiota, especially lactic acid bacteria (LAB), and its impact on fermentation, microbial safety and yogurt quality.

OBJECTIVE

- To evaluate the antimicrobial properties of bee honey against spoilage and pathogenic bacteria commonly found in yogurt.
- To determine the microbial population in yogurt fermentation.
- To study the physicochemical properties of bee honey yogurt throughout the processing.

DESCRIPTION OF THE PROJECT

The product developed is a honey-fortified yogurt, produced by incorporating varying concentrations (2%, 4% and 6%) of *Apis Mellifera* bee honey into milk prior to fermentation. The study utilized microbiological assays to measure antimicrobial activity and bacterial counts, alongside analyses of key yogurt quality parameters including pH, moisture content, Brix value, protein and fat content. The bee honey addition enhanced fermentation kinetics, promoted LAB growth, and improved physicochemical properties without compromising product safety or fat content. The bee honey acts as a natural sweetener with added antimicrobial effects, supporting the development of yogurt that combines health benefits and food safety.

Table 1: Antibacterial activity of bee honey

Test organisms	Antibacterial activity (zone of inhibition in mm)					
	Bee honey concentrations					Positive control
	5%	10%	25%	50%	100%	FOX
<i>S. aureus</i>	n.d	n.d	n.d	15±3.00	22±2.65	27.7±0.58
<i>E. coli</i>	n.d	n.d	n.d	8.3±0.58	9.7±0.58	15.7±1.15

Table 2: Physicochemical properties of yogurt samples

Parameters	Yogurt samples			
	Control	2% bee honey	4% bee honey	6% bee honey
pH	4.35± 0.01	4.22± 0.01	4.20±0.00	4.14±0.00
Moisture (%)	85.80± 0.91	83.43± 0.30	81.81± 0.06	81.35± 0.40
Brix (%)	10.60± 0.14	10.90±0.00	12.50± 0.14	13.70± 0.21
Protein (%)	3.78± 0.07	3.93± 0.04	3.82± 0.05	3.68± 0.08
Fat (%)	4.44± 0.00	4.40± 0.05	4.41± 0.02	4.44± 0.01

NOVELTY

This work presents a novel approach by integrating the antimicrobial and probiotic-enhancing properties of bee honey into yogurt processing, creating a dairy product that naturally combines sweetness, microbial safety, and functional health benefits. Unlike conventional yogurts, this innovation leverages honey's complex bioactive compounds such as hydrogen peroxide, flavonoids, and phenolic acid to suppress spoilage bacteria while supporting beneficial LAB growth, contributing to novel natural preservation and probiotic enhancement strategies in dairy fermentation.

CONCLUSION

The findings affirm bee honey's significant potential to enhance yogurt's microbiological safety, nutritional value, and functional attributes. This innovative approach addresses consumer demand for healthier natural foods and supports the development of safe, nutrient-enriched dairy products. Future research should evaluate sensory acceptance and deploy molecular techniques to deepen understanding of microbial interactions involved. This innovation supports the advancement of health-promoting, innovative yogurt formulations for emerging markets.