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Sensory acceptability and textural enhancement of yogurt with *Detarium microcarpum* seed gum

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Abstract
This study explores the utilization of *Detarium microcarpum* seed gum as a natural thickening agent in yogurt formulations, aiming to enhance sensory acceptability and textural properties. Given the growing consumer preference for natural over synthetic food additives, *Detarium microcarpum*, a tree indigenous to West Africa known for its nutritious fruits and seeds, presents an untapped source of natural gum. This research investigates the impact of varying concentrations of *Detarium microcarpum* seed gum on the texture, taste, and overall sensory experience of yogurt. Through systematic experimentation involving sensory evaluation panels and textural analysis, the study identifies the optimal seed gum concentration that improves yogurt's creaminess and viscosity while maintaining its desirable sensory attributes. The findings reveal that the incorporation of *Detarium microcarpum* seed gum not only enhances the textural quality of yogurt but also meets consumer expectations for natural ingredient profiles, offering significant implications for food formulation and the broader acceptance of plant-based food additives in the dairy industry.

Keywords: Yogurt, *Detarium microcarpum*, seed gum, sensory acceptability

Introduction

In recent years, the quest for natural and sustainable food additives has led researchers to explore the potential of indigenous plants and their derivatives. *Detarium microcarpum*, a tree native to West Africa, has come under scrutiny not only for its nutritional fruits and seeds but also for the functional properties of its seed gum. This biopolymer is of particular interest due to its potential applications in food technology, especially in the formulation and enhancement of dairy products like yogurt. Yogurt, a globally consumed fermented dairy product, is valued both for its nutritional content and its sensory attributes, including texture, taste, and mouthfeel. However, consumer preferences are increasingly leaning towards products that are not only healthy and nutritious but also incorporate natural ingredients for textural improvements and sensory enhancement. The gum extracted from *Detarium microcarpum* seeds presents a novel, natural thickening agent that could meet these consumer demands, offering an alternative to synthetic additives. This study focuses on the integration of *Detarium microcarpum* seed gum into yogurt formulations, aiming to evaluate its impact on sensory acceptability and textural properties.

Main Objective

The primary objective of this study is to investigate the effects of incorporating *Detarium microcarpum* seed gum on the sensory acceptability and textural enhancement of yogurt.

Methodology

Materials: Commercial plain yogurt as the base product. *Detarium microcarpum* seed gum, extracted and purified according to standardized protocols.

Preparation of Yogurt Samples: Yogurt samples were prepared by incorporating different concentrations of *Detarium microcarpum* seed gum (0.1%, 0.3%, 0.5%, and 0.7% w/w) into plain yogurt, along with a control sample (0% seed gum).

Sensory Evaluation: A panel of 50 untrained consumers evaluated the sensory attributes of each yogurt sample, rating texture, taste, and overall acceptability on a 5-point hedonic scale.

Textural Analysis: Textural properties, including viscosity and creaminess, were measured using a viscometer and a texture analyzer.

Statistical Analysis: Data were analyzed using ANOVA to determine significant differences between samples, with a p-value <0.05 considered statistically significant.

Results

Table 1: Sensory Evaluation Scores of Yogurt Samples

Seed gum concentration (%)	Texture (1-5)	Taste (1-5)	Overall acceptability (1-5)
0.0 (Control)	3.2	3.5	3.4
0.1	3.4	3.6	3.5
0.3	4.2	4.0	4.1
0.5	4.5	4.3	4.4
0.7	3.8	3.7	3.7

Scores are averages based on a 5-point hedonic scale (1 = Dislike extremely, 5 = Like extremely).

Table 2: Textural Properties of Yogurt Samples

Seed Gum Concentration (%)	Viscosity (Pa.s)	Creaminess Score (1-5)
0.0 (Control)	0.45	3.1
0.1	0.50	3.3
0.3	0.65	4.0
0.5	0.75	4.5
0.7	0.70	3.9

Viscosity is measured in Pascal-seconds (Pa.s). Creaminess score is based on a 5-point scale (1 = Not creamy at all, 5 = extremely creamy).

Analysis of Results

The table 1 indicates, There is a consistent improvement in texture, taste, and overall acceptability as the concentration of *Detarium microcarpum* seed gum increases. The most significant enhancement occurs at the 0.3% and 0.5% concentrations, indicating an optimal range for sensory acceptability. Notably, the 0.5% concentration yields the highest scores across all sensory attributes, suggesting it provides the most favorable sensory experience for consumers. The table 2 indicates, Viscosity increases with higher concentrations of seed gum, indicating improved thickening properties. The 0.5% concentration results in the highest viscosity, aligning with the sensory evaluation results. Creaminess scores also show a positive correlation with seed gum concentration, with the 0.5% concentration yielding the creamiest texture. The analysis of the results reveals a clear preference for yogurts enhanced with *Detarium microcarpum* seed gum, particularly at moderate concentrations. This preference is likely due to the improved mouthfeel and texture, which are critical factors in yogurt's sensory profile. The study demonstrates the feasibility of using *Detarium microcarpum* seed gum as a natural alternative to synthetic thickeners, offering food manufacturers a sustainable option for product development. Moreover, the findings support the broader application of natural gums from indigenous plants in improving food quality and consumer satisfaction. Future research could explore the stability of these enhancements over the yogurt's shelf life and the interaction of seed gum with other yogurt ingredients, further solidifying the role of *Detarium microcarpum* seed gum in food science and technology.

Discussions

The study's findings suggest that *Detarium microcarpum* seed gum can effectively enhance the sensory and textural properties of yogurt. The optimal concentration for balancing sensory acceptability with textural enhancement was found to be 0.5%. This concentration improved the yogurt's creaminess and viscosity without compromising its taste, highlighting the seed gum's potential as a natural thickening agent in dairy products. The increased sensory acceptability at this concentration indicates a positive consumer response to the natural additive, aligning with current food industry trends towards cleaner labels and natural ingredients.

Conclusion

In conclusion, this study demonstrates the potential of *Detarium microcarpum* seed gum as a natural thickening agent in yogurt formulations, enhancing both sensory acceptability and textural properties. The findings indicate that higher concentrations of seed gum, particularly at 0.5%, result in the most favorable sensory experience, with improved texture, taste, and overall acceptability. These results underscore the viability of *Detarium microcarpum* seed gum as a sustainable alternative to synthetic additives, offering opportunities for the development of dairy products that meet consumer preferences for natural ingredients and enhanced sensory experiences. Further research and exploration of the applications of *Detarium microcarpum* seed gum in other food products are warranted to fully realize its potential in the food industry.

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