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Manufacturing of yogurt with corn milk and added probiotics

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Abstract

This paper explores the innovative approach to yogurt production using corn milk as a base, supplemented with probiotics. The study evaluates the nutritional benefits, fermentation process, sensory characteristics, and consumer acceptance of corn milk yogurt. The integration of probiotics aims to enhance the health benefits, targeting gut health and lactose intolerance.

Keywords: Corn milk, dairy-free yogurt, probiotic supplementation, plant-based alternatives, fermentation process, nutritional analysis, sensory evaluation, consumer acceptance

Introduction

The global dietary landscape is witnessing a paradigm shift towards plant-based alternatives, prompted by a confluence of factors ranging from health consciousness to ethical and environmental concerns. Within this context, the innovation in dairy alternatives, especially in yogurt production, has garnered significant interest. Traditional yogurt, revered for its probiotic content and health benefits, poses dietary restrictions for individuals with lactose intolerance and those adhering to vegan diets. This paper delves into the manufacturing of yogurt utilizing corn milk, supplemented with probiotics, as a novel approach to cater to this demographic while aiming to retain, if not enhance, the nutritional and sensory attributes associated with traditional dairy-based yogurt Yasni S, *et al.* (2014) ^[4].

Yogurt's journey from a staple in certain cultures to a global dietary component underscores its health benefits, particularly in gut health, attributed to its probiotic content. However, the dairy base of traditional yogurt limits its consumption among individuals with lactose intolerance, a condition affecting a significant portion of the global population. Additionally, the rising vegan movement, driven by ethical, environmental, and health considerations, has escalated the demand for plant-based dairy alternatives Astawan M, *et al.* (2012) ^[5].

Corn milk emerges as an innovative base for yogurt production, drawn from its inherent nutritional benefits, including being naturally lactose-free, rich in vitamins, minerals, and antioxidants. Unlike almond or soy, corn is a widely cultivated crop, promising scalability and sustainability as a raw material for dairy alternatives. The primary objective of utilizing corn milk is to develop a yogurt that not only caters to dietary restrictions but also aligns with the nutritional expectations from a health supplement like yogurt.

The integration of probiotics into corn milk yogurt presents a scientific exploration into the fermentation viability of non-dairy bases. Probiotics, live microorganisms that confer health benefits to the host, are traditionally cultivated in dairy environments. This paper investigates the adaptability of these beneficial bacteria to a corn milk medium, examining the fermentation process, probiotic survival, and overall product stability (Trikoondun W, *et al.* (2016), Wang C, *et al.* (2017), Jagajjanani G, *et al.* (2021) ^[1, 2, 3].

This research aims to fill the gap in the market for dairy-free yogurt alternatives that do not compromise on nutritional value or sensory experience. By providing a comprehensive analysis of the manufacturing process, from corn milk preparation to probiotic incorporation and final product evaluation, this paper seeks to offer a viable, nutritious, and palatable alternative to traditional yogurt, thereby expanding the choices available to consumers with dietary restrictions or preferences.

Objective of the study

The main objective of this study is to develop a method for producing yogurt using corn milk as a base, supplemented with probiotics, to create a dairy-free, nutritious, and palatable product.

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Materials and Methods

1. Materials

- **Corn:** Non-GMO, organic sweet corn.
- **Water:** Filtered, for soaking and blending.
- **Probiotic Cultures:** Lactobacillus acidophilus, Bifidobacterium bifidum, and Streptococcus thermophilus.
- **Equipment:** Blender, strainer, pasteurizer, fermentation incubator, pH meter.

Methods

Corn Milk Preparation

1. **Cleaning and Soaking:** Sweet corn kernels were cleaned and soaked in filtered water overnight.
2. **Blending and Straining:** The softened kernels were blended with filtered water and strained to obtain corn milk.
3. **Pasteurization:** The corn milk was pasteurized at 85 °C for 30 minutes and then cooled to 43 °C.

Yogurt Manufacturing

1. **Inoculation:** The cooled corn milk was inoculated with a mix of probiotic cultures at a concentration of 10⁶ CFU/mL.
2. **Fermentation:** The inoculated milk was incubated at 43 °C for 6 hours, until a pH of 4.5 was achieved.
3. **Cooling:** The yogurt was cooled rapidly to 4 °C to halt fermentation.

Analysis

- **Nutritional Analysis:** Performed using standard food analysis methods.
- **Probiotic Viability:** Counted using plate culture methods at 0, 1, 2, and 3 weeks.
- **Sensory Evaluation:** Conducted by a panel of 10 volunteers using a 5-point hedonic scale.

- **Consumer Acceptance:** Surveyed 100 consumers using a structured questionnaire.

Results

Table 1: Nutritional Analysis of Corn Milk Yogurt vs. Traditional Dairy Yogurt

Nutrient	Corn Milk Yogurt (per 100g)	Traditional Dairy Yogurt (per 100g)
Energy (kcal)	98	59
Protein (g)	3.2	3.5
Fat (g)	4.0	3.3
Carbohydrates (g)	12.5	4.7
Dietary Fiber (g)	0.5	0
Sugars (g)	8.0	4.0
Calcium (mg)	120	110
Vitamin D (IU)	100	80
Probiotic Count (CFU/g)	1.5×10 ⁷	Not Applicable

Table 2: Probiotic Viability in Corn Milk Yogurt over Time

Time Point	Probiotic Count (CFU/g)
Immediately after production	1.5×10 ⁷
After 1 week at 4 °C	1.2×10 ⁷
After 2 weeks at 4 °C	9.0×10 ⁶
After 3 weeks at 4 °C	7.5×10 ⁶

Table 3: Sensory Evaluation Scores of Corn Milk Yogurt

Attribute	Mean Score (1-5)
Appearance	4.2
Texture	3.8
Flavor	4.0
Overall Acceptability	4.1

Table 4: Consumer Acceptance Survey Results

Question	Positive Response (%)	Neutral Response (%)	Negative Response (%)
Would you purchase this product?	75	15	10
Do you find the taste of this yogurt acceptable?	80	10	10
Is the texture of this yogurt to your liking?	70	20	10

Analysis and Discussion

The corn milk yogurt shows a competitive nutritional profile compared to traditional dairy yogurt, with higher energy, carbohydrate, and dietary fiber content. This suggests that corn milk yogurt can be a good energy source, suitable for individuals looking for dairy-free, high-energy, and fiber-rich alternatives Allgeyer LC, *et al.* (2010) [6]. The presence of significant levels of calcium and vitamin D also indicates that the product can contribute to meeting daily nutritional requirements for these nutrients, which are crucial for bone health. The data on probiotic viability (CFU/g) immediately after production and over three weeks at refrigeration indicates a gradual decrease in probiotic counts. However, the counts remain above the generally accepted threshold for probiotic foods (10⁶ CFU/g) by the end of the third week. This suggests that the corn milk yogurt can maintain a beneficial level of probiotics over its shelf life, potentially offering health benefits associated with probiotics, such as improved gut health and immune function Ordonez A, *et al.* (2000) [7]. The sensory evaluation scores for appearance,

texture, flavor, and overall acceptability are all above 3.5 on a 5-point scale, with flavor and overall acceptability scoring particularly high. This indicates a positive reception to the product's sensory attributes, suggesting that the corn milk yogurt is palatable and could be well-accepted by consumers who are accustomed to the sensory profiles of traditional yogurt Ateteallah AH, *et al.* (2019) [8]. The consumer acceptance survey results show a majority positive response, with 75% of participants indicating they would purchase the product, and 80% finding the taste acceptable. The slightly lower positive response rate for texture (70%) could indicate an area for improvement. Nonetheless, the overall positive response suggests good market potential for corn milk yogurt among consumers, especially those seeking plant-based or lactose-free alternatives. The analysis of the data suggests that yogurt made from corn milk with added probiotics has a promising nutritional profile, maintains sufficient probiotic viability over its proposed shelf life, and is well-received in terms of taste and overall acceptability. While the texture received

slightly lower scores, it remains within the range of acceptability, indicating a minor area for improvement in future product development Supavititpatana P, *et al.* (2008)^[9]. This study's findings support the potential for corn milk yogurt as a viable, nutritious, and consumer-accepted alternative to traditional dairy yogurt, aligning with current trends towards plant-based diets and functional foods.

Conclusion

The study on the "Manufacturing of Yogurt with Corn Milk and Added Probiotics" presents a comprehensive exploration into the feasibility, nutritional benefits, and consumer acceptance of a novel, dairy-free yogurt alternative. Through meticulous preparation of corn milk and careful incorporation of selected probiotic strains, this research demonstrates the potential of corn milk as a viable base for yogurt production, catering to the growing demand for plant-based and lactose-free dairy alternatives. The nutritional analysis revealed that corn milk yogurt offers a competitive profile, with higher energy, carbohydrate, and dietary fiber levels compared to traditional dairy yogurt. The inclusion of fortification strategies also ensured that the product met essential nutrient requirements, such as calcium and vitamin D, highlighting its potential contribution to a balanced diet. Probiotic viability assessment indicated that the chosen strains could maintain beneficial levels throughout the product's proposed shelf life, ensuring that consumers receive the health benefits associated with probiotic consumption, such as improved digestive health and immune support. This aspect is crucial for positioning corn milk yogurt not just as a dietary alternative but as a functional food product. Sensory evaluation and consumer acceptance surveys further underscored the product's market viability, with high scores in taste and overall acceptability. While the texture was identified as an area for potential improvement, the positive feedback suggests that corn milk yogurt could indeed find a receptive audience, especially among those with dietary restrictions or preferences that exclude traditional dairy products. In conclusion, the study substantiates the feasibility of producing yogurt from corn milk supplemented with probiotics, offering a nutritious, palatable, and acceptable alternative to dairy-based yogurts. This research not only contributes to the diversification of dairy-free product offerings but also aligns with the evolving consumer preferences towards sustainable, plant-based, and health-promoting foods. Future work could focus on refining the texture to enhance consumer satisfaction further and exploring the scalability of production processes to meet commercial demands, thereby supporting the broader adoption of corn milk yogurt as a staple in health-conscious diets.

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