



FORMULATION AND EVALUATION OF PROBIOTIC NATURAL LEMON-FLAVOURED ICE CREAM WITH GUAVA-INFUSED TAPIOCA PEARLS

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ABSTRACT

This study explores the development of probiotic-infused ice cream with lemon and guava tapioca pearl, aimed at offering a nutritious dessert option in response to the increasing demand for functional foods. The study highlights the importance of incorporating probiotics endorsed by FSSAI for gut health benefits adhering to a minimum viable count of $\geq 10^8$ CFU per serving (Food Safety and Standards Authority of India, 2022). Through careful formulation and processing, the ice cream not only enhances its nutritional profile but also introduces innovative flavors, catering to diverse consumer preferences. The methodology involves the preparation of tapioca pearls infused with guava, alongside the creation of the ice cream mixture enriched with probiotic strains. Key steps include the utilization of serial dilution techniques to ensure probiotic viability and sensory evaluation using a 9-point hedonic scale. Statistical analysis aids in interpreting consumer preferences and acceptance. This study contributes to the understanding of functional food trends and the potential of probiotics in enhancing both the nutritional value and sensory appeal of ice cream products.

Keywords:

Probiotic lemon flavor ice cream, guava tapioca pearls, Functional foods.

1. INTRODUCTION

In recent years, there's been a surge in interest in functional foods also known as 'pharma foods or nutraceuticals' that have additional benefits, (Joshaline & Jeyasekaran et al., 2023) such as probiotics, which are live microorganisms known for their positive effects on gut health and are endorsed by FSSAI for gut health benefits, with a minimum viable count of $\geq 10^8$ CFU per serving. This trend reflects a shift towards healthier food choices without compromising taste, evident in the growing demand for fortified functional foods with probiotics (Doyon, M., Labrecque, J., et al.2022).

The study explores developing lemon icecream with guava tapioca pearls fortified with combinations of probiotics

Ice cream is a beloved indulgence for all age groups and an easily cherished food product that is accepted by everyone, however, in current times ice cream is considered unhealthy, junk, and health-concerning food with high sugar content, and unhealthy fats. In reaction, this study concentrates on transforming ice cream into a healthier option by being reimagined as a nutritious option by incorporating probiotics. (Aneja, et al. 2003) This innovative approach aligns with consumer preferences for health-conscious yet enjoyable food. (Cencic & Chingwaru, 2010). The addition of probiotics not only enhances the nutritional profile of ice cream but also opens avenues for flavor exploration and product diversification, catering to diverse tastes and preferences (Ergin et al., 2016). This innovative approach to ice cream production aligns with shifting consumer preferences, as more individuals prioritize health-conscious food choices

without sacrificing enjoyment. With probiotic ice cream, people can indulge in a guilt-free treat, confident in the knowledge that they are nourishing their bodies with beneficial bacteria that support digestion and immunity. This study focuses on developing probiotic-infused ice cream with lemon and guava tapioca pearl, offering a refreshing and nutritious dessert option. By creating awareness of the growing demand for functional foods, manufacturers can innovate and differentiate their products in the competitive market.(Cencic & Chingwaru, 2010).

Infusing guava flavor into traditional ice cream and incorporating it tapioca pearls, known for their chewy texture and distinctive flavor, offers a refreshing twist that appeals to a wider audience. This innovative blend adds a unique touch with its vibrant color, refreshing taste, and satisfying texture, potentially fostering product innovation and positive implications within the food industry. (Goff et al., 2016). From a health perspective, probiotics and guava tapioca pearl enhance the ice cream's nutritional value, supporting digestive health, and providing essential nutrients and antioxidants. (Dundar et al., 2022)In terms of food technology, careful formulation and processing are crucial to ensure the viability of probiotic cultures and preserve sensory qualities (khosrokhavar et al, 2011) Probiotics play a vital role in influencing gut health and may have implications beyond, such as in the gut-brain axis and mental well-being.(Cazorla et al., 2019). Serial dilution methods are essential for efficient probiotic delivery, and necessary for ongoing research to refine processes and determine optimal conditions. In laboratory settings, serial dilution involves systematically decreasing the concentration of a substance in a solution by repeatedly diluting a small volume of a concentrated solution with a specified amount of solvent. This gradual dilution process, commonly used in microbiology and biochemistry studies, allows for the preparation of samples with decreasing concentrations for analytical or experimental purposes (Gòral et al.,2018)

2. MATERIAL AND METHOD

2.1 Materials

2.1.1 Raw Materials

Milk, cream, sugar, condensed milk, tapioca starch, guava, lemon, and probiotic strains (*Lactobacillus plantarum*, *Lactobacillus acidophilus*, *Lactobacillus rhamnosus*, *Streptococcus thermophilus*) are used in the preparation of product

2.1 Methodology

2.1.1 Standardization of product

1. Preparation of Tapioca Pearls:

- Combine 30 ml of guava puree, 20 ml of water, and 20 g of sugar in a saucepan and bring to a boil.
- On boiling, gradually add 50 grams of tapioca starch while stirring continuously until the mixture becomes sticky.
- Remove from heat and add 50 grams of dry tapioca starch, mixing until the mixture is free from stickiness
- Allow the mixture to cool, then shape into 1/4 inch balls and set aside.
- Boil 20 ml of guava juice in 50 ml of water, then add the tapioca balls and cook until translucent.
- Remove from heat and transfer the cooked tapioca balls into cold water.

2. Ice Cream Preparation:

- In a mixing bowl, combine 50 ml of cream, 50 ml of milk, 20 ml of condensed milk, 30 grams of sugar, 5 grams of lemon zest, and 15 ml of lemon juice.
- Whip the mixture until it becomes thick and fluffy.
- Dilute the probiotic strains via serial dilution to find the correct consistency and viability in acidic conditions.
- Mix the diluted probiotics into the ice cream mixture.
- Transfer the ice cream mixture into a container and store it in the freezer at -5°C for 12 hours.

Ingredients	Quantity (%)
Tapioca starch	10%
Sugar	5%
Cream	5%
Milk	5%

Guava	5%
Condensed milk	2%
Lemon juice	1.5%
Lemon zest	0.5%

Table 1: Formulation of Probiotic lemon ice cream with guava tapioca pearl

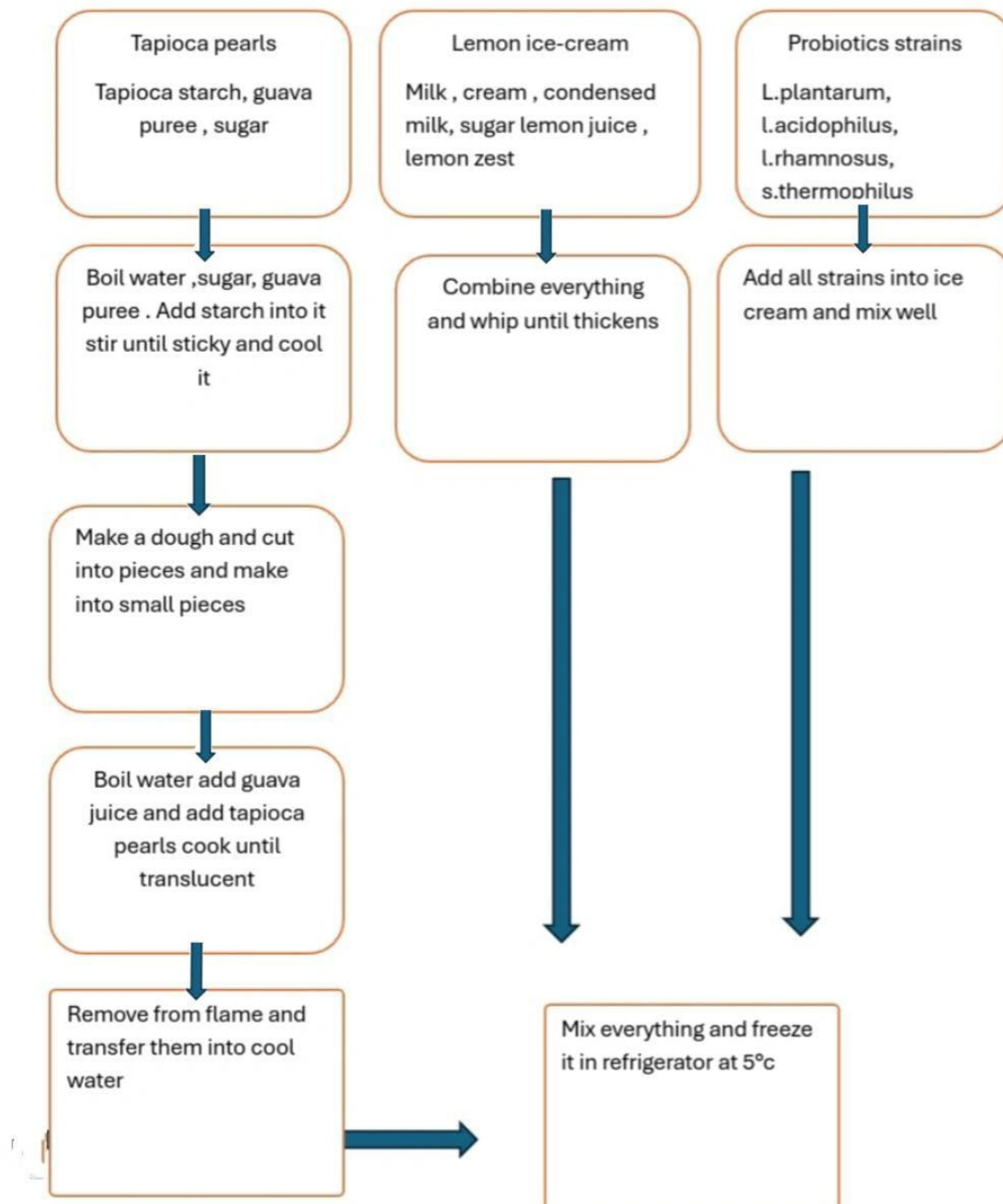


Figure 1: Process flow sheet for preparation of probiotic lemon ice cream with guava tapioca pearl

2.2.2 Sensory evaluation

Sensory evaluation of prepared probiotic lemon ice cream with guava tapioca pearl samples is to be evaluated using a 9-point hedonic scale for 30 participants.

2.2.3 Statistical analysis

Statistical analysis was done in a descriptive method using mean and standard deviation in an Excel sheet. (Negar et al., 2021)

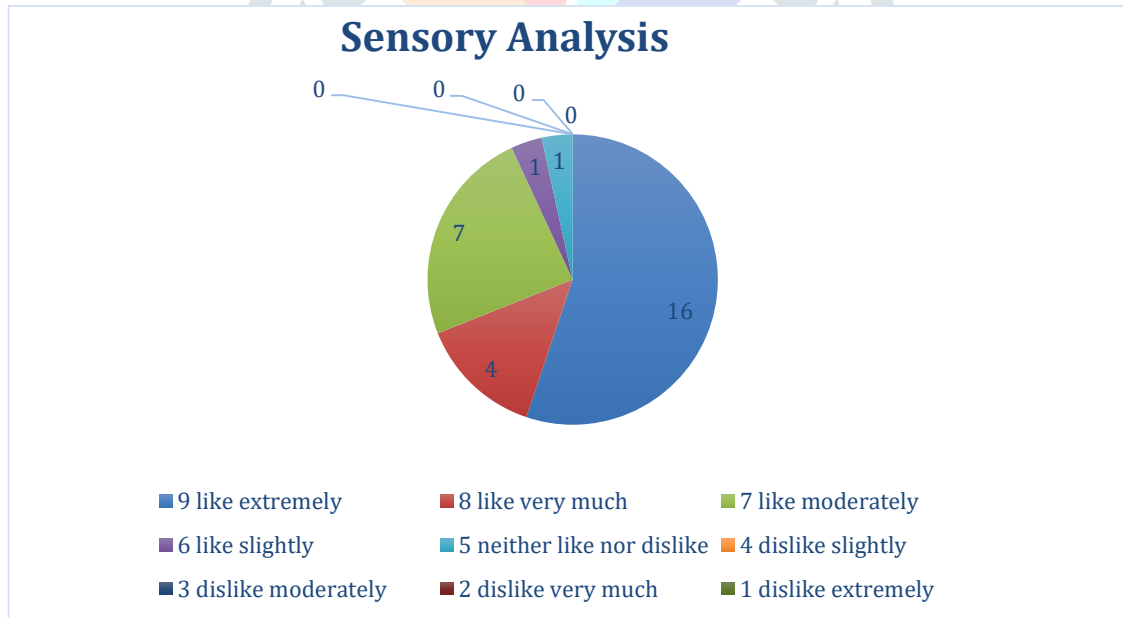
3 RESULTS AND DISCUSSION

3.1 Organoleptic Characteristics of probiotic lemon ice cream with guava tapioca pearls

Data on the organoleptic characteristics of the product is considered via appearance, taste, consistency, mouthfeel, aroma, and overall acceptability with the 9 hedonic scale ratings, The statistical ratings of appearance are the highest(8.5) in the ice cream product, the taste and flavor of the ice cream are up to (8.7), the consistency of the product in the ice cream product which is (8.2), the mouthfeel of the product is bit higher than that of an aroma which is (8.8), the aroma of the product is of the lowest statistical rating where it is given (8.83) by all the participants, the overall acceptability of the product rating would be (8.6). The ice cream product's appearance, flavor, consistency, mouth feel, aroma and overall acceptability have proved to be suitable with the desired organoleptic ratings.

	Appearance	Taste	Aroma	Texture	Mouth feel	Overall acceptability
Ice Cream Sample	0.73±8.5	0.43±8.7	0.82±8.2	0.37±8.8	0.37±8.8	0.54±8.6

Table 2: Organoleptic characteristics of probiotic lemon ice cream with guava tapioca pearls



Graph 1: Sensory evaluation graph chart

CONCLUSION

This study successfully developed a probiotic-infused ice cream with lemon and guava tapioca pearl, addressing the demand for nutritious yet flavorful products. By incorporating probiotics endorsed by FSSAI, the ice cream not only enhances gut health but also introduces innovative flavors, appealing to diverse consumer preferences. The sensory evaluation confirmed the product's suitability, with high ratings across various characteristics. Overall, this research contributes to understanding the potential of functional foods in enhancing nutrition and sensory appeal, paving the way for further innovation in the food industry.

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