PROXIMATE AND SENSORY ANALYSIS OF PREPARED SOY YOGURT

A PROJECT REPORT

BY

MD. SIAM AHAMED

ID: 191-34-902

Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of B.Sc. in Nutrition and Food Engineering

Supervised By

Dr. Nizam Uddin
Associate Professor and Head
Department of Nutrition and Food Engineering

Co-Supervised By

Abu Saeid
Lecturer (Senior Scale)
Department of Nutrition and Food Engineering

FACULTY OF HEALTH AND LIFE SCIENCES (FHLS)
DAFFODIL INTERNATIONAL UNIVERSITY
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APPROVAL

This Project titled "**Proximate and sensory analysis of prepared soy yogurt**", submitted by Md. Siam Ahamed to the Department of Nutrition and Food Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

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Dr. Nizam Uddin
Head
Nutrition and Food Engineering
Faculty of Health and Life Sciences
Daffodil International University

DECLARATION

My sincere declaration that the “Proximate and sensory analysis of prepared soy yogurt, this project has been done by us under the supervision of **Dr. Nizam Uddin, Associate professor and head, Department of NFE,** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised by:

Nizam

Dr. Nizam Uddin
Associate Professor and Head
Department of Nutrition and Food Engineering
Daffodil International University

Co-Supervised by:

Abu Saeid
Lecturer (Senior Scale)
Department of Nutrition and Food Engineering
Daffodil International University

Submitted by:

Siam

Md. Siam Ahamed
ID: 191-34-902
Department of Nutrition and Food Engineering
Daffodil International University.

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ABSTRACT

The findings of this research provide valuable insights into the quality criteria and consumer acceptance of soy yogurt compared to conventional yogurt. The formulated soy yogurt exhibited favorable properties, with a moisture content of 71.20%, ash content of 1.76%, fat content of 2.4%, pH level of 4.6, and a °Brix value of 24°. These parameters are indicative of the product's nutritional composition and sensory characteristics, which are crucial factors influencing consumer preference. Sensory evaluation results further emphasized the positive reception of soy yogurt among participants. A significant proportion of respondents expressed extreme liking for various attributes of soy yogurt, including its color (24.44%), flavor (39.02%), mouthfeel (16.36%), and taste (17.78%). Notably, 28% of participants exhibited extreme satisfaction with the overall acceptability of soy yogurt. These findings suggest that soy yogurt has promising potential as a viable alternative to conventional yogurt in the market. The favorable sensory characteristics, coupled with its nutritional profile, highlight its appeal to consumers seeking plant-based alternatives or those with dietary restrictions. Additionally, the high level of acceptance observed among participants underscores the potential for soy yogurt to gain traction and compete effectively in the yogurt market. Overall, these results contribute to the growing body of evidence supporting the viability and consumer acceptance of soy yogurt. Further research and market analysis will be valuable in exploring the commercial potential and broader implications of soy yogurt as a sustainable and appealing option in the dairy alternative market.

TABLE OF CONTENTS

LIST OF THE FIGURES

LIST OF THE TABLES

CHAPTER 1

INTRODUCTION

1. Introduction:

Soybean (*Glycine max*) cultivation is widely recognized as the primary global source of oil, valued for its nutritional richness and commercial significance. Its exceptional value as a source of vegetable oil and proteins has established it as a crucial crop worldwide. With anticipated increases in purchasing power and world population, particularly in developing Asian countries, there is significant potential for increased consumption. Thirty-six trillion metric tonnes of crops will be needed to feed the 9 billion people who will inhabit the planet by the year 2050. As the demand for grains is predicted to rise steadily in the future, beans are crucial for livestock nutrition in addition to their numerous commercial applications. Cultivated commercially as the primary oilseed crop in approximately 35 countries, soybean typically consists of 35 to 40% protein, 20% lipids, 9% dietary fiber, and around 8.5% moisture by dry weight of mature raw seeds. This composition varies based on location, climate, and soybean variety. In addition to being low in trans fats, soy foods are a great source of nutrients and fibre. A wide range of soy products, including roasted soybean, soymilk, tofu, and soy sauce, cater to diverse dietary preferences. Key bioactive components of soy, such as proteins and peptides, saponins, isoflavones, and protease inhibitors, contribute to its global recognition as a healthful dietary option rich in folate acid and isoflavanones. Items made from soy include regarded as significant places to find amino acids from plants due to their high content of essential amino acids and their various health benefits. (Dukariya, 2020)

Yogurt, a fermented dairy product derived from milk, owes its texture and acidity to lactic acid produced by bacteria. While predominantly sourced from bovine milk, yogurt can also be made from milk of various animals such as water buffalo, goats, ewes, mares, camels, and yaks. In the United States, yogurt production adheres to specific bacterial cultures, notably *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus*, to meet regulatory standards. Additional *lactobacilli* and *bifidobacterial* strains may be incorporated during or after the fermentation process. Originating around 6000 BCE, yogurt's creation is attributed to the Neolithic peoples of central Asia, who likely stumbled upon its production through the accidental curdling of sheep's milk in animal stomach containers. This ancient practice extended milk's shelf life and potentially improved digestibility by reducing lactose content. Yogurt and similar soured-milk products have since been integral components of early Middle Eastern civilizations' diets, showcasing its enduring significance in human culinary history. (Donovan, 2014)

1.2 Objective

- To create a soy yogurt recipe that is standardised.
- To examine soy yogurt's physicochemical characteristics, including elements like pH, moisture, ash, fat, and sugar content as determined by degree brix.
- To carry out a consumer acceptability study in order to evaluate participants overall acceptance of soy yoghurt as well as its sensory qualities.

CHAPTER 2

LITERATURE REVIEW

2.1 Soy

Soy, an essential crop originating from Asia, holds considerable significance both in nutrition and economics. Its global utilization stems from its rich content of iso-flavonoids and folic acid, contributing to its reputation as a staple in healthy diets. Scientific interest in dietary soy products has surged due to their perceived positive effects on human health. The biological activities of key bioactive components found in soy, such as polypeptide, saponins, chemicals, and enzyme inhibitors, have drawn attention. These components exhibit antioxidant, antidiabetic, antiproliferative, anti-obesity, and anti-inflammatory properties, suggesting potential benefits for various chronic illnesses such such as diabetes, weight gain, inflammatory problems, heart disease, and some cancers. Studies have shown that soy products rich in protein may contribute to cholesterol reduction. This brief review examines the potential benefits and uses of soy products and their derivatives in the management and prevention of long-term illnesses. Researchers may be able to develop functional foods and drugs by examining the distinct biological agents found in soy beans, which would offer a safer alternative to synthesised drugs. (Dukariya, 2020)

2.2 Yogurt

Yogurt, a nutrient-rich product resulting from milk fermentation by bacteria, has garnered significant attention for its potential health benefits. It provides essential amino acids, calcium, vitamin D, riboflavin, vitamin B6, and vitamin B12, which contribute to overall health. Studies suggest that yogurt promotes a healthy gut microbiome, potentially reducing intestinal infections, serum cholesterol levels, lactose intolerance, and the risk of cancer. Additionally, yogurt consumption may help prevent osteoporosis, high blood pressure, obesity, and Type 2 diabetes, while improving insulin resistance and lowering circulating glucose and triglyceride levels. Emerging research also indicates immune-modulatory effects of yogurt, beneficial for treating gastrointestinal disorders like Crohn's disease, ulcerative colitis, and pouchitis. Recognized as a functional food and preventive measure, yogurt underscores the importance of transparent public education for optimizing health outcomes. (Banerjee, 2017)

2.3 Soy Yogurt

Soy yogurt, a plant-based alternative to traditional dairy yogurt, is produced by fermenting soy milk with bacteria. It has gained popularity for its unique nutritional profile, including high antioxidant activity and potential health benefits such as reducing the risk of diabetes and chronic inflammation. However, the production of soy yogurt presents challenges related to stability, particularly in terms of appearance and texture. Issues such as whey separation often occur, attributed to the physical interactions governing soy protein's structure, such as hydrophobic interaction and hydrogen bonding. Variations in ion strength and pH can disrupt these interactions, leading to undesirable texture and water retention. Additionally, factors like disordered aggregate structure and low disulfide bond content contribute to a coarse taste and lack of compactness in soy protein gel products. To address these challenges, current approaches focus on creating protein-polysaccharide composite gels, where polysaccharides play a vital role in controlling texture and enhancing sensory attributes to improve consumer acceptance of soy yogurt products. (Kong, 2022)

2.4 Nutrition value of Soy Yogurt

Soy yogurt represents a nutritionally rich option characterized by its absence of cholesterol and high protein content. A typical composition per 100g serving includes 89.0g of water, providing 59 kcal (or 245 kJ) of energy. Its macronutrient profile comprises 4.7g of protein, 2.7g of total fat, with 0.5g of saturated, 0.6g of monounsaturated, and 1.6g of polyunsaturated fatty acids. Carbohydrates are present at 3.2g, along with 0.2g of fiber. Sodium content is negligible at 0.0mg, and there is no cholesterol. Notably, fresh soy yogurt has been identified as optimal in terms of nutritional content, boasting maximum protein content at 8.6%, carbohydrates at 14.17%, and minerals at 0.19%. Fat content is relatively low at 8%, positioning it as a healthy probiotic product. Furthermore, its antioxidant level is notably high, reaching up to 63.11%. In scientific literature, the nutritional composition of soy yogurt has been extensively evaluated for its health implications. Studies have highlighted its advantageous profile, particularly its high protein content and absence of cholesterol, making it a favorable option for individuals seeking a nutrient-rich diet while managing cholesterol levels. The low-fat content further enhances its appeal as a healthy alternative to traditional dairy products. Moreover, the presence of probiotic cultures in soy yogurt contributes to its functional attributes, potentially offering benefits such as improved gut health and immune function (Sharma, 2016).

2.5 Benefits of Soy Yogurt

Soy yogurt offers numerous health advantages, including the potential to mitigate cardiovascular issues, alleviate menopausal symptoms, aid in weight loss, manage arthritis, and enhance brain function. Its nutritional composition includes beneficial phytochemicals like isoflavones, saponins, and phytosterols, which contribute to overall well-being. Incorporating probiotic cultures further enhances the functional properties of soy yogurt. Compared to animal protein, soy protein intake has been linked to notable reductions in total cholesterol, LDL cholesterol, and triglyceride levels, with minimal impact on HDL cholesterol. Additionally, the presence of isoflavones, such as daidzein and genistein, in soy yogurt provides natural antioxidative properties, potentially protecting against vascular damage and disease by inhibiting the oxidation of LDL. Research indicates promising outcomes regarding the positive effects of soy isoflavones on bone health, suggesting potential applications in functional foods aimed at reducing osteoporosis risks, as observed in vitro studies, animal trials, and initial human research findings. (Vij, 2011)

CHAPTER 3

MATERIALS AND METHODS

3.1 Materials

3.1.1 Preparation of Soy Yogurt

I made it in Food Processing Lab of the Department of Nutrition and Food Engineering, Daffodil International University.

3.1.2 Raw Materials

Soya Seed, Sugar, Water, Culture.

3.1.3 List of Equipment

1. Incubator
2. Blender
3. Bowl
4. Muslin cloth
5. Plastic Pot (500ml)

Figure 3.1: Final Products

Table 3.1: Formulation of Yogurt preparation

Ingredients	Sample (%)
Soya Seed	50%
Sugar	35%
Water	125%
Culture	7.5%

3.2 Methods:

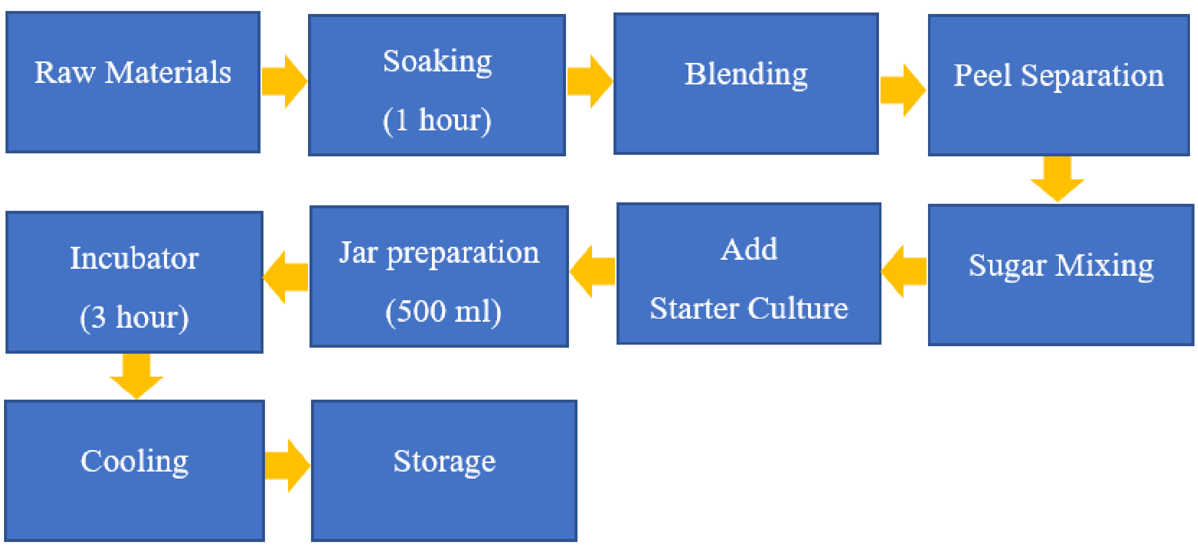

Figure 3.2: Flow Diagram of Soy Yogurt

3.2.2 Physicochemical Properties Analysis

3.2.2.1 Degree Brix:

The degree brix was measured using a hand refractometer. 8-10g of sample was taken and entered into the hand refractometer. The refractometer required some light to measure the phase. Inside, there was a scale to measure the °brix, and it turned blue to give the brix result.

Figure 3.3: Hand Refractometer

3.2.2.2 pH:

Apparatus & Material:

1. Digital pH meter
2. Beaker
3. Sample (SY)

Method:

An electronic pH tester was utilized to measure the soy yogurt's acidity, which serves as a method for assessing the acidity or alkalinity of liquids. Acids typically exhibit pH values ranging from 0 to 6.5, while alkalis fall within the range of 7.5 to 14.

Figure 3.4: pH Meter

First, a mini beaker was taken, and it was ensured that it was clean and dry. Then, some yogurt sample was taken into the beaker. Next, a digital pH meter was taken, its head was opened, and the switch was pressed to power it on. Then, the meter was placed on the curd sample, and it immediately started to read the pH of the curd sample. After 3-4 minutes of reading, the result was obtained.

3.2.2.3 Determination of Moisture:

Apparatus:

1. Moisture Analyser
2. Balance Machine

Raw Materials:

1. Soy yogurt

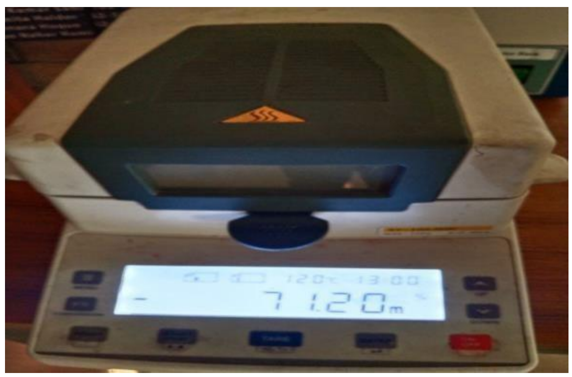

Figure 3.5: Moisture analyzer

Method:

Firstly, the lid of the analyzer was opened, and the pan was taken out from the pan handler. The pan was cleaned and reinserted. Then, 10g of yogurt sample was taken, distributed on the pan, and spread evenly. The lid was closed, and the start button was pressed. The analyzer began to heat, and a noticeable halogen lamp surrounded the inside. There were indicators displayed to show the result in percentage, temperature, and time. After a few minutes, the analyzer showed the result on the display of moisture content in soy yogurt.

3.3.2.2.4 Determination of Ash:

Ash was specified as the inorganic residue remaining after either ignition or whole oxidation of organic matter in a food sample. Determining the ash content of a food was part of proximate analysis for nutritional evaluation, and it was considered an important quality attribute for some food ingredients.

Apparatus:

1. Crucible and lid
2. Balance meter
3. Spatula
4. Electric muffle furnace

5 Desiccator

6. Hand gloves
7. Tongs.

Sample:

1. Soy Yogurt

Procedure:

i. The muffle furnace was prepared to work.

ii. An empty silica crucible was taken and transferred to the muffle furnace chamber for ignition. The door of the furnace was closed, and the temperature was set at 600°C.

iii. After 15 minutes, the ignited empty crucible was removed from the furnace using tongs.

iv. The ignited empty crucible was inserted into a desiccator for 20 minutes.

v. After 20 minutes, the crucible was taken out from the desiccator, and the weight of the empty crucible was measured and noted properly.

vi. 5g of the sample was taken, and its weight was measured again. Then, the sample was spread into the crucible using a spatula, and the sample crucible was inserted into the muffle furnace set at 600°C.

vii. After 6 hours of ignition, the crucible was taken out and cooled in a desiccator.

viii. After cooling, the weight of the crucible was measured again.

Figure 3.6: Muffle furnace

Calculation:

$$\text{Ash (\%)} = (W3 - W1) / (W2 - W1)$$

Here,

Empty crucible weight (W1)

Ash with crucible (W2)

Sample with crucible (W3)

3.2.2.5 Fat Content (%):

Apparatus:

1. Butyrometer
2. Centrifuge
3. Pipette 10.75 ml, 10ml & 1 ml
4. Pipette Filler

Required Chemicals:

1. Sulphuric acid solution (93%)
2. Amyl alcohol
3. Milk sample

Method:

i. A 10 ml pipette was used to transfer 10 ml of sulfuric acid into the butyrometer.
ii. Then, a 10.75 ml pipette was filled with milk, and the sample was delivered into the butyrometer.
iii. 1 ml of amyl alcohol was added using a 1 ml pipette, and the butyrometer cap was closed.
iv. The butyrometer was shaken in the shaker stand until no white particles were observed, and it was inverted a few times.
v. Two butyrometers were placed diametrically opposite each other in the centrifuge, and they were centrifuged at maximum speed for 5 minutes.
vi. For balance in the centrifuge, two butyrometers were placed oppositely at a time during processing.
vii. After 5 minutes, the butyrometers were taken out from the centrifuge.
viii. The color of the fat in the butyrometer should have appeared straw yellow, and the ends of the fat column should have been clear and sharply defined.

3.2.2.6 Sensory Analysis

The tasting jury, comprised of 15 semi-trained panelists, evaluated various sensory parameters such as color, taste, texture, flavor, and general acceptability of bread varieties. Each parameter was assessed on a pleasure scale ranging from 1 to 9 points. In the sensory evaluation of foods, a ranking test was required, wherein each individual from a defined group of panelists ranked three or more products based on personal preference or perceived intensity of an attribute. To evaluate the acceptability of complex bread, a ranking test was performed. The hedonic rating scale used for this assessment was organized as follows: 9 = I liked it very much, 8 = I liked it a lot, 7 = moderately liked, 6 = somewhat liked, 5 = neither liked nor disliked, 4 = slightly disliked, 3 = I disliked moderately, 2 = I disliked a lot, and 1 = I disliked a lot.

CHAPTER 4

RESULT & DISCUSSION

4.0 Result and discussion

4.1 Physico-chemical composition of soy yogurt (SY)

Sample	°Brix	pH	Moisture (%)	Ash (%)	Fat (%)
SY	**24**	**4.6**	**71.20**	**1.76**	**2.4**

4.2 Physico-chemical Properties

The table 4.1 physiochemical composition of soy yogurt. The °brix content found our sample was 24. Our findings were higher according to the work of (Trindade, 2001) who reported the soy yogurt contained 9°brix. According to this study, °brix of the baobab-coconut yoghurt ranged from 22.12 to 24.88°brix. Our obtained value was closely related the findings of (AO, 2023). The pH value found our sample was 4.6. Our research results showed similar values compared to those reported by (Stephen, 2017) where the soy yogurt was found to contain 4.53. Another research paper published in the journal of the science of food and agriculture indicated that the pH level of soy yogurt was measured at 4.76 (Gupta, 2022). The moisture content of the sample was 71.20%. According to (Ugwona, 2019), our findings revealed a reduced measurement in contrast to their research, suggesting that soymilk yogurt exhibited a moisture content of 93.58%. As per the findings of this study, the moisture content in Aloe vera-fortified yogurt is reported to be 83.44%. (Kamruzzaman, 2002). The ash content of sample was 1.76%. Our research findings yielded comparable values to those documented by (Çetinkaya, 2020), indicating that the ash content of yogurt samples produced from buffalo milk was 1.73%. The ash content of soy yoghurt was found to be 0.17%, as per (Ashaye, 2001), although our measurement was lower than that of their study. The fat content of sample was 2.4%. In comparison to (Othman, 2019) study, our results demonstrated a higher measurement, meaning that the fat content of the papaya-enriched yoghurt was 1.80%. According to (Stephen, 2017), our findings revealed a reduced measurement in contrast to their research, suggesting that the fat content in soymilk yogurt was determined to be 4.44%.

4.3 Sensory Quality

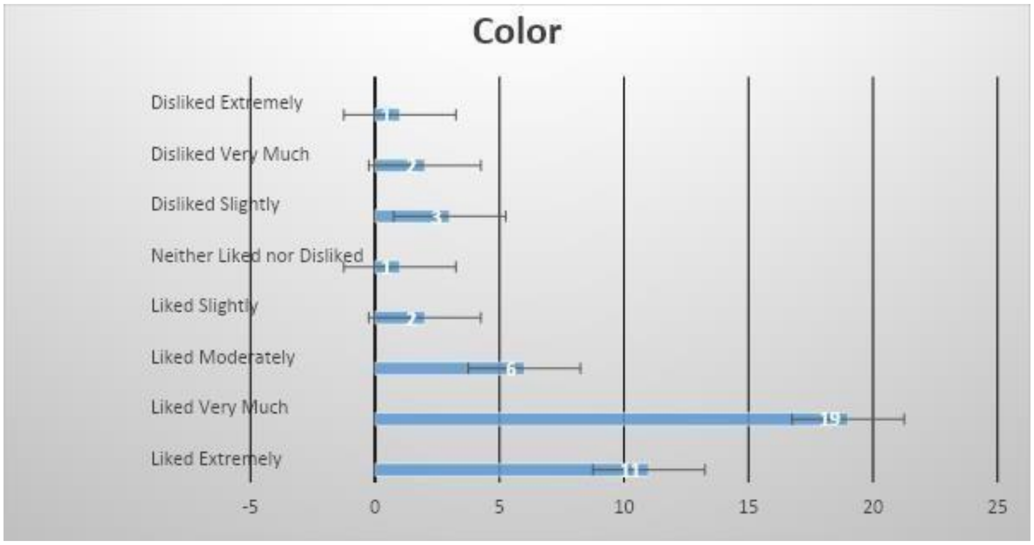

Figure 3.7: Color sensory quality (n=45)

In this figure, 45 individuals expressed their preferences for the color of soy yogurt as follows: 24.44% of them liked it extremely, 42.22% liked it very much, 13.33% liked it moderately, 4.44% liked it slightly, 2.22% neither liked nor disliked it, 6.67% disliked it slightly, 4.44% disliked it very much, and 2.22% disliked it extremely.

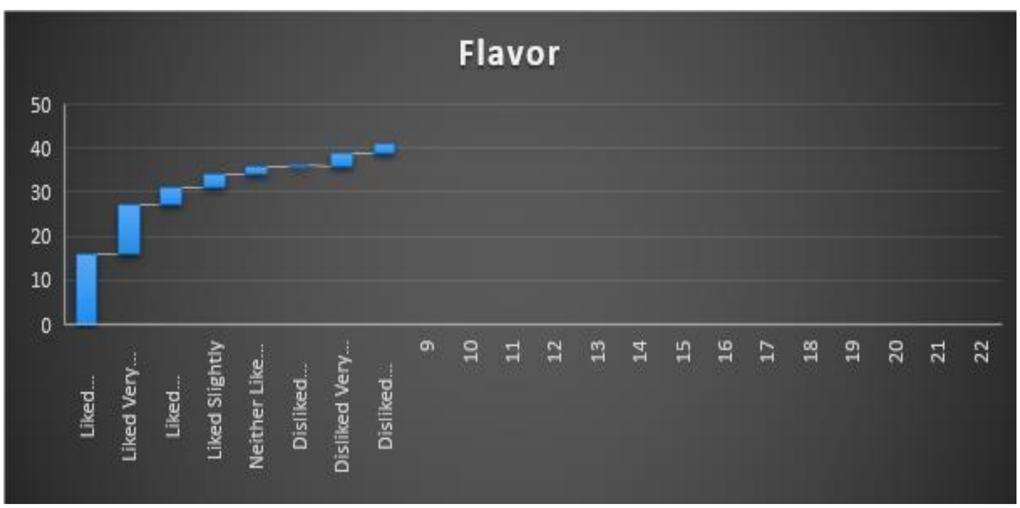

Figure 3.8: Flavor sensory quality (n=45)

In this figure, 45 individuals expressed their preferences for the flavor of soy yogurt as follows: 39.02% of them liked it extremely, 26.83% liked it very much, 9.76% liked it moderately, 7.32% liked it slightly, 4.88% neither liked nor disliked it, 0% disliked it slightly, 7.32% disliked it very much, and 4.88% disliked it extremely.

Figure 3.9: Mouth feel sensory quality (n=45)

In this figure, 45 individuals expressed their preferences for the mouth feel of soy yogurt as follows: 16.36% of them liked it extremely, 30.91% liked it very much, 27.27% liked it moderately, 5.45% liked it slightly, 7.27% neither liked nor disliked it, 3.64% disliked it slightly, 5.45% disliked it very much, and 3.64% disliked it extremely.

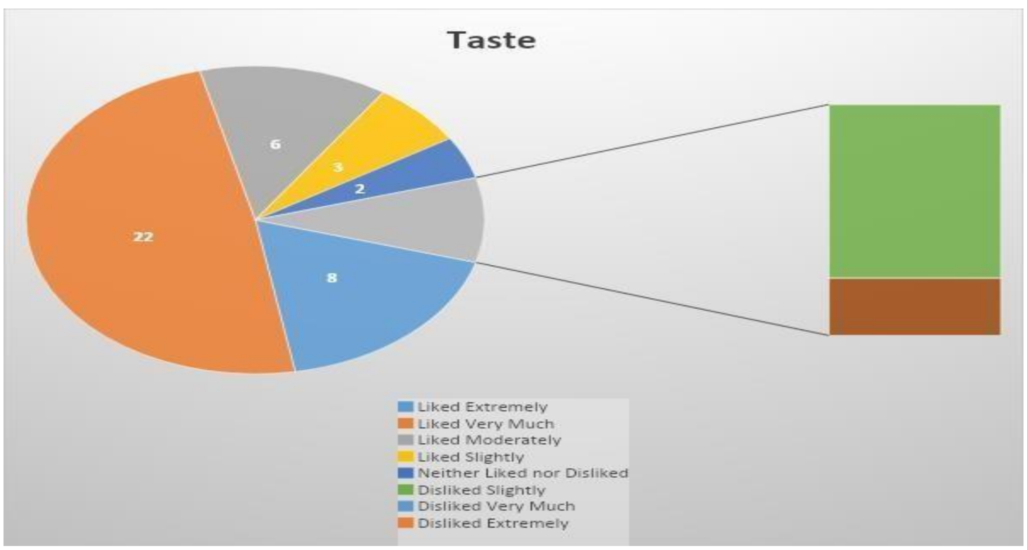

Figure 4: Taste sensory quality (n=45)

In this figure, 45 individuals expressed their preferences for the taste of soy yogurt as follows: 17.78% of them liked it extremely, 48.89% liked it very much, 13.33% liked it moderately, 6.67% liked it slightly, 4.44% neither liked nor disliked it, 6.67% disliked it slightly, 0% disliked it very much, and 2.22% disliked it extremely.

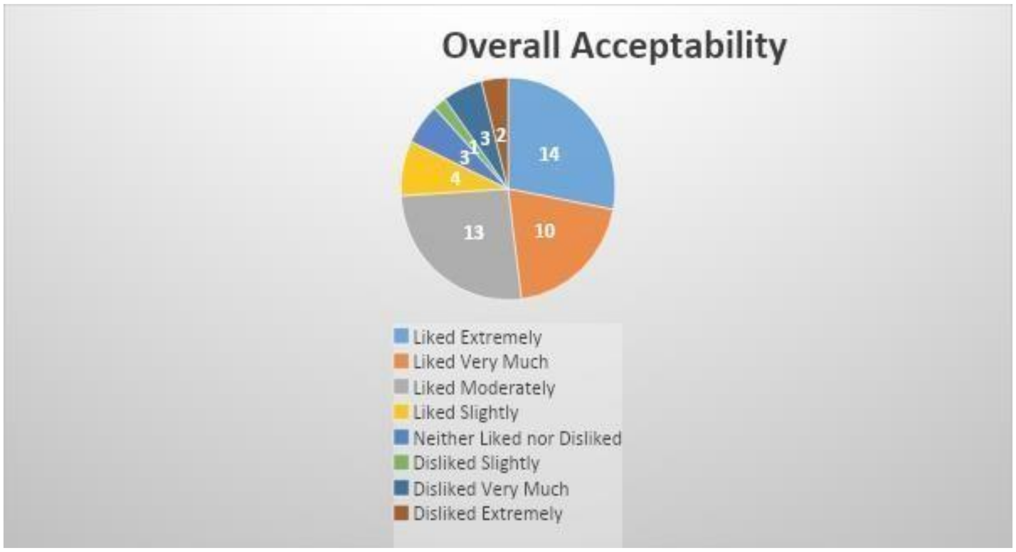

Figure 4.1: Overall Acceptability sensory quality (n=45)

In this figure shows that the total 45 peoples expressed their preferences for the overall acceptability of soy yogurt as follows: 28% of them liked it extremely, 20% liked it very much, 26% liked it moderately, 8% liked it slightly, 6% neither liked nor disliked it, 2% disliked it slightly, 6% disliked it very much, and 4% disliked it extremely.

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CHAPTER 5

CONCLUSION

5. Conclusion:

The research conducted on soy yogurt presents a thorough investigation into the development of a healthful and nourishing substitute for traditional dairy-based yogurts. The method employed in producing soy yogurt entails a straightforward three-step process, followed by laboratory assessments aimed at identifying key parameters for evaluation. Notably, the degree brix, serving as an indicator of sugar content, was measured at 24, suggesting a well-balanced sweetness. Additionally, the pH level of 4.6 indicates a mildly acidic environment, contributing to the characteristic tanginess associated with yogurt. The recorded moisture content of 71.20% signifies its classification as a liquid-based food, while the ash content measured at 1.76% provides further insight into its nutritional profile. Moreover, the observed fat content of 2.4% aligns with standards suitable for consumers with varying dietary preferences or restrictions. These parameters collectively offer valuable insights into the nutritional composition and sensory attributes of soy yogurt, pivotal factors influencing consumer preference. Subsequent sensory evaluations revealed a notably positive reception among participants, with a significant proportion expressing strong preference for various attributes of soy yogurt, including color (24.44%), flavor (39.02%), mouthfeel (16.36%), and taste (17.78%). Remarkably, 28% of participants expressed extreme satisfaction with the overall acceptability of soy yogurt. Such findings underscore the promising potential of soy yogurt as a viable alternative to conventional yogurt varieties in the market. Furthermore, the research highlights the simplicity and effectiveness of the manufacturing process, rendering soy yogurt an accessible option for individuals seeking plant-based, nutritious alternatives. The well-balanced dietary composition, combined with the ease of preparation, positions soy yogurt as an appealing choice for both men and women with diverse dietary preferences or restrictions. Additionally, the exploration of potential flavor enhancements or fortifications could further enrich the soy yogurt landscape, catering to a broader spectrum of consumer tastes and preferences. In conclusion, this study contributes significant insights into the domain of plant-based yogurt alternatives, offering a promising avenue for both health-conscious consumers and those inclined towards sustainable dietary choices. The comprehensive examination of soy yogurt's production process, nutritional composition, and sensory characteristics underscores its potential as a viable and attractive option in the evolving landscape of dietary preferences.

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