PHYSICOCHEMICAL, MICROBIAL, AND SENSORY ANALYSIS OF WATERMELON YOGURT

A PROJECT REPORT

BY

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

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APPROVAL

This Project titled "**Physicochemical, microbial and sensory analysis of watermelon yogurt**", submitted by Maliha Parven 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.

EXAMINING COMMITTEE

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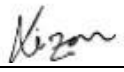

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DECLARATION

My sincere declaration that the "Physicochemical, microbial and sensory analysis of watermelon yogurt, this project has been done under the supervision of **Ms. Lipi Rani Mondal, Lecturer** and co-supervisor **Md. Shamsur Rahman**, **Lecturer (Senior Scale) 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.

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ABSTRACT

The research aimed to develop watermelon yogurt and evaluate its quality over a 7-day storage period, focusing on protein, fat, vitamin C, moisture, pH, and sensory attributes. Protein levels ranged from 3.48 % to 3.72 %, with the highest fat content (3.40% to 3.62%) observed in sample C. Sample C also had the highest vitamin C concentration, ranging from 16.35 to 16.46 mg/100 ml. Moisture content varied between 80.02% and 87.08%, peaking in sample C. pH levels fluctuated from 4.23 to 4.50, with the highest pH in sample C. All samples showed variations in their proximate compositions during the storage period. In the sensory analysis, participants used a 9-point hedonic scale to rate the yogurt's color, flavor, texture, taste, aroma, and overall acceptability. Sample A achieved an average score of (7.27) for color, (7.13) for flavor, (6.86) for texture, (7.47) for taste, (6) for aroma, and (7.6) for overall acceptability. In comparison, Sample B recorded higher averages (7.87) for color, (7.33) for flavor, (7.67) for texture, (7.6) for taste, (8.27) for aroma, and (7.87) for overall acceptability. Sample C, on the other hand, received lower scores, with an average of (6.47) for color, (5.93) for flavor, (5.87) for texture, (6) for taste, (5.07) for aroma, and (7.27) for overall acceptability. Initially, all samples had a microbial count of 3.0×10^5 CFU/ml, but by day 7, this count increased in all samples, with sample C showing the highest count of 6.0×10^5 CFU/ml. Therefore, while samples A and B are suitable for production, sample B is recommended as the better option.

Keywords: Milk, Watermelon, Sugar, Starter culture

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Watermelon *(Citrullus lanatus)* is a globally renowned and widely enjoyed horticultural product, particularly cultivated across Bangladesh (Mukul et al., 2013). Valued for its refreshing, sweet, and juicy qualities, it is extensively grown in the coastal regions of Bangladesh, including Khulna, Bagerhat, Barguna, and Patuakhali. This fruit, rich in nutrients, consists of approximately 95% water, which is why it is called "watermelon" (Mukul et al., 2013). In every 100 grams of watermelon, there is 0.5 grams of protein, 0.2 grams of fat, 0.2 grams of fiber, 6.5 grams of carbohydrates, 569 mg of vitamin A, 6 mg of vitamin C, 11 mg of calcium, and 12 mg of phosphorus. The potassium content helps regulate high blood pressure. Additionally, watermelon contains potent flavonoids and antioxidants, offering protection against cardiovascular diseases and certain types of cancer (Perkins-Veazie et al., 2007).

Yogurt, produced through the fermentation of milk, is renowned for its dense nutritional profile and health benefits (A.A. et al., 1994). The fermentation process, which involves lactic acid bacteria, improves digestibility and calcium absorption (Shahani & Chandan, 1979). Yogurts are delicious, but they're also a great source of nutrition, with 5-6% protein, 4.6–5.2% lactose, 0-3.5% fat, and a host of other minerals and vitamins, including zinc, sodium, potassium, calcium, magnesium, copper, iron, phosphorus, and vitamins A, B6, and C (Amellal-Chibane & Benamara, 2011). Additionally, yogurt serves as a carrier of probiotics and has a host of health benefits, such as cholesterol metabolism, immune modulation, antimicrobial activity, and anti-cancer properties (Hasan et al., 2021). According to (Aryana & Olson, 2017), the traditional starter culture is composed of *Lactobacillus bulgaricus* and *Streptococcus thermophiles*, which are important members of the yogurt microbiome and can thrive in low-pH environments. These cultures promote the development of additional advantageous organisms, which enhance the flavor, viscosity, and aroma of yoghurt. The live cultures in yogurt offer several health benefits, such as alleviating some intestinal disorders, reducing cancer risk, lowering cholesterol levels, and helping those with lactose intolerance digest lactose (De LeBlanc & Perdigón, 2004).

In this research, yogurt and watermelon juice were mixed to create a novel product called watermelon yogurt. This product was thoroughly evaluated using sensory, physical, chemical, and microbiological tests. The goal of the study was to evaluate the effects of watermelon juice on taste, texture, and nutritional content while maintaining the probiotic benefits of yogurt.

1.2 Objectives

● To develop the watermelon yogurt according to a standard procedure.

● To assess the physicochemical and microbial characteristics of watermelon yogurt during storage.

● Evaluating the sensory acceptability of watermelon yogurt.

CHAPTER 2

LITERATURE REVIEW

2.1 Watermelon

Watermelons yield approximately 55.3% juice, 31.5% rind, and 10.4% pomace. The red and orange colors of the fruit are attributed to carotenoids like lycopene and β-carotene, respectively. The fruit's sweetness mainly comes from a mix of sucrose, glucose, and fructose, with sucrose and glucose comprising 20-40% and fructose making up 30-50% of the total sugar content in a ripe watermelon. The chemical makeup of watermelon enhances its ability to scavenge low-density lipoprotein (LDL) and high-density lipoprotein (HDL) within cell membranes. Numerous studies indicate that watermelon is effective for weight loss due to its low levels of sodium, saturated fat, and cholesterol. Additionally, various epidemiological and retrospective clinical studies have shown a strong link between a diet rich in phytochemicals and a reduced risk of cardiovascular disease (CVD). Consequently, watermelon consumption is associated with several health benefits, including a lower risk of heart disease, age-related degenerative conditions, and certain types of cancer. Furthermore, watermelon is a good source of citrulline, a nonessential amino acid. (Maoto et al., 2019)

2.2 Yogurt

Yogurt is a nutrient-dense food created through the bacterial fermentation of milk. Recent research highlights its significant health benefits and the essential nutrients it provides, which can support the well-being of vulnerable populations. It is rich in essential amino acids, calcium, vitamin D, riboflavin, vitamin B6, and vitamin B12. Yogurt aids in promoting gut health by serving as a source of probiotics, which help manage intestinal infections, lower serum cholesterol levels, reduce lactose intolerance, and decrease cancer risk. It may also help prevent osteoporosis, high blood pressure, and obesity. Additionally, yogurt has immune-modulating properties, which can be beneficial in treating inflammatory bowel diseases such as Crohn’s disease, ulcerative colitis, and pouchitis. Its consumption has been linked to a lower risk of Type 2 diabetes, improved insulin sensitivity, reduced glucose levels, and lower triglycerides. As a functional food and preventive medicine, yogurt's benefits underscore the need for ongoing and clear public education about its health advantages. (Halder et al., 2017)

2.3 Watermelon Yogurt

Watermelon yogurt, a novel dairy product blending the refreshing taste of watermelon with the creamy texture of yogurt, has been the focus of several studies examining its nutritional and sensory attributes. Research indicates that adding watermelon to yogurt can boost its nutritional value, especially in terms of vitamin C and antioxidant levels. The rise in popularity of fruit-flavored yogurts has led to increased consumption among various age groups. This increase

can be attributed to the enhanced health benefits perceived with fruit additions, as well as the variety in taste, color, and texture offered by fruit flavors, purees, and extracts. However, achieving the ideal balance of sweetness and tartness is essential to ensure the fruit flavor effectively masks the base yogurt. Despite watermelon's popularity and availability as a tropical fruit, it has not yet been utilized in fruit-flavored yogurt production. This study aims to create a watermelon-flavored yogurt with strong consumer appeal and to evaluate the impact of watermelon on the yogurt's physical, chemical, sensory, and microbiological properties. (Warakaulle et al., 2014)

2.4 Nutritional Value

A one-cup serving of watermelon (152 g) provides a carbohydrate content of 11.6 g, including natural sugars such as sucrose (1,863 mg), glucose (2,433 mg), fructose (5,174 mg), and maltose (92.4 mg). It also contains 0.9 g of protein per serving. In terms of vitamins, watermelon offers 0.467 mg of β-carotene, 0.12 mg of β-cryptoxanthin per 100 g, 6.9 mg of lycopene, 0.0125 mg of vitamin C, 0.5 mg of betaine, 0.3 mg of pantothenic acid, 6.3 mg of choline, and 0.0046 mg of folate. Watermelon contains trace amounts of monounsaturated and polyunsaturated fatty acids (0.1 g each) and 3.1 mg of phytosterols. For minerals, it includes 10.8 mg of calcium, 15.4 mg of magnesium, 16.9 mg of phosphorus, 173 mg of potassium, 1.5 mg of sodium, 0.2 mg of zinc, 0.1 mg of copper, 0.0006 mg of selenium, and 0.0023 mg of fluoride (Nadeem et al., 2022). Yoghurt is a good source of calcium, vitamin D, riboflavin, B6 and B12, and essential amino acids. Yoghurt helps lactose intolerant individuals digest it because lactose is broken down into glucose and galactose before being fermented to produce lactic acid. Yogurt's variable fat content allows for flexible consumption by various groups, both healthy and sick (Halder et al., 2017).

2.5 Health Benefits

Yogurt is known for its numerous health benefits, such as enhancing lactose tolerance, boosting the immune system, providing anti-carcinogenic effects, and helping prevent osteoporosis, along with other benefits linked to probiotic bacteria. Recent research suggests that combining yogurt with fruits may offer additional nutritional and health advantages by enhancing both prebiotic and probiotic effects. Fruit juice, in particular, is a more favorable medium than milk for the growth and sustainability of probiotic bacteria, due to its acidic pH, which supports the growth of these beneficial organisms. When fruit juices are added to fermented yogurts, they significantly encourage the proliferation of probiotic bacteria, acting as a cultivation medium. The high concentration of saccharides and prebiotic fibers found in fruits further aids in sustaining probiotic organisms. Additionally, fruits are rich in antioxidants and polyphenols, which play a crucial role in preventing degenerative diseases like cancer, heart disease, type 2 diabetes, and obesity. Therefore, consuming fruits together with yogurt offers substantial support for maintaining cardiometabolic health and preventing various diet-related diseases. (Jayasumana et al., 2020)

CHAPTER 3

MATERIALS AND METHOD

3. Materials and methods

3.1 Raw materials collection and product formulation

For preparing watermelon yogurt required ingredients including watermelon, milk, sugar, and starter culture were procured from a market located in Dhaka, Bangladesh. Three formulations (table 1) were used to develop three prototypes.

Table 1: Formulation of watermelon yogurt

Ingredients	Sample A	Sample B	Sample C
Milk	150ml	150ml	150gm
Watermelon juice	65ml	75ml	85gm
Sugar	30gm	20gm	10gm
Starter culture	1gm	1gm	1gm

3.2 Preparation of watermelon yogurt

First, the cow's milk was heated in a pot over medium heat until it reached approximately 180°F (82°C). This was the first step in making yogurt. After the milk had heated, the saucepan was taken off the burner and allowed to cool to about 110°F (43°C), which was the perfect temperature for waking up the yogurt culture. The fresh watermelon was prepared before making the yogurt. After the seeds were removed and the flesh was ground, the juice was strained through a cheesecloth or a fine-mesh screen to get rid of the pulp. The yogurt starter culture, watermelon juice, and chilled milk were combined in a mixing bowl. After all the ingredients were combined, the mixture was poured into one or more airtight jars and covered with a cloth or blanket to retain the heat. To cultivate, the containers were put in a preheated oven, which was then turned off with the light left on. After the yogurt reached the appropriate thickness, it was allowed to culture for six to eight hours. Before serving, the yogurt was allowed to cool in the refrigerator for at least four hours to allow the flavors to combine.

Figure 1: Watermelon yogurt

3.3 Flow chart of watermelon yogurt

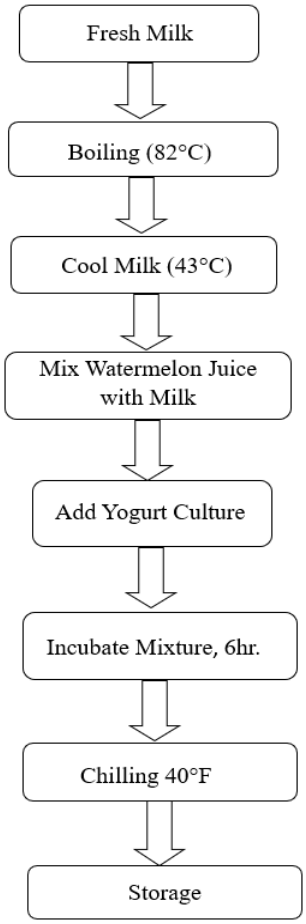

Figure 2: Flow diagram of watermelon yogurt

3.4 Physicochemical analysis

3.4.1 Determination of pH

To measure the pH of watermelon yogurt first, the light was turned on. A sample was taken and transferred to a beaker, ensuring that the pH electrode and temperature sensor were clean and dry. The calibration of the meter was conducted with buffers 1 and 2. Following that, a sample was collected, and the pH level was examined within a glass container. The pH meter was placed inside the measuring vessel, and the reading was taken after correcting the digits on the meter.(Matela et al., 2019)

Figure 3: Determination of pH

3.4.2 Determination of vitamin C

The quantification of Vitamin C in watermelon yogurt was conducted following the approach outlined by (Elgailani et al., 2017) with minimal modifications. Firstly, 0.1 g of starch was added to 100 ml of distilled water to make a 0.1% starch solution. It was mixed well. To prepare a solution of 100 mL, 10 mL of watermelon yogurt was used, and it was diluted with distilled water. 10 mL of the diluted mixture was added to an Erlenmeyer flask filled with a watermelon yogurt. To the Erlenmeyer flask, 5 mL of the 0.1 N iodine solution was added, and it was gently whirled to mix it. Applying a solution of sodium thiosulfate with a concentration of 0.1 normal (N), the mixture was titrated until the blue hue vanished. Titrating was maintained until the blue color disappeared when adding 1 mL of a solution containing 1% starch. The quantity of 0.1 N sodium thiosulphate utilized was noted down.

Calculation:

$$\text{Vitamin C content (mg/100ml)} = (V1 - V2) \times N \times 88W$$

3.4.3 Determination of moisture

Moisture monitoring is one of the most important and often utilized metrics in meal preparation and testing. Given that the quantity of moisture in a serving of food is inversely related to the amount of dry matter in it, the moisture content of food has direct economic implications for both the food processor and the customer. However, moisture has a considerably bigger impact on food quality and uniformity. An approach recommended by (Oyedunni, 2023) was used to determine the moisture content.

Calculation:

Following is how the percentage of moisture was determined:

$$\% \text{ Moisture} = \frac{w - w1}{w} \times 100$$

W= weight dry sample

W1 = weight of dried matter

3.4.4 Determination of fat

A well-stirred yogurt sample was collected and allowed to reach room temperature. Using a pipette, 10 mL of 90-91% sulphuric acid was added to the Gerber butyrometer. Then, 11 grams of yogurt were carefully inserted into the butyrometer, making sure that no yogurt stuck to the neck. The next step was to add 1 mL of amyl alcohol. The butyrometer was tightly sealed and gently shaken to thoroughly mix the contents, allowing the yogurt, sulphuric acid, and amyl alcohol to properly combine. The butyrometer was then placed in a Gerber centrifuge, with tubes on opposite sides for balance. It was centrifuged at 1100 RPM for 5 minutes, or until a white separation line appeared around two-thirds of the way up the fat column inside the tube. Following centrifugation, the tube was immersed in a 65°C water bath for five minutes to keep the fat liquid. The tube was immediately removed from the water bath, and the fat reading was obtained directly from the top-mounted scale.

Figure 4: Garber test procedure for fat analysis

3.4.5 Determination of protein

The Kjeldahl process uses sulphuric acid and catalysts to break down proteins and other organic components in the sample. The process converts all organic nitrogen to ammonium sulphate. Following digestion, the mixture is neutralized with an alkali and distilled into a boric acid solution (direct titration). The borate anions formed during the process are titrated with standardized acid, and the acid content is used to determine the sample's nitrogen concentration. For digestion, a 0.5-gram sample was collected along with 2 grams of the digesting mixture and 10 mL of H_2SO_4. The digestion flask was set on top of a heating device. To get an average value, two digestion flasks were utilized. The sample was heated for three to four hours at first, and then the temperature was raised. The procedure was carried out repeatedly until the solution became totally transparent and there was no longer any visible white H3SO4 smoke. After that, the solution was let to cool. The digested solution was transferred into a volumetric flask and diluted with distilled water to a volume of 100 ml. A volume of 10 milliliters of the solution was then moved to the distillation flask. 150 mL of distilled water and 10 mL of 40% NaOH were added to the distillation flask. Two drops of 1% methyl red indicator, 10 mL of 0.1N HCl, and 50 mL of distilled water were used to prepare a trapping conical flask. Three distillation flasks two of which were used as a blank, holding only 150 mL of distilled water and 10 mL of 40% NaOH were utilized. To ensure consistency, the three trapping solutions were each set up in separate conical flasks. After the distillation unit was set up, the condenser was operated for half an hour. 0.1N NaOH was put into a burette. Three distinct trapping solutions were used for the titration. A shift in hue from pink to pale yellow was noted as the endpoint.

Calculation:

$$\text{Nitrogen} = \frac{(Ts - Tb) \times N \text{ of Acid} \times \text{meq. of N2}}{\text{weight of sample taken}} \times 100$$

Here,

Ts = Titrate volume of the sample (ml),

Tb = Titrate volume of the blank (ml),

Meq. of N2 = 0.014.

% Protein = % nitrogen × conversion factor (6.25).

Figure 5: Kjeldahl method for protein analysis

3.4.6 Total plate count

The total plate count for watermelon yogurt was determined following the procedure outlined by (Ally-Charles et al., 2024) with minor adjustments. To make dilutions of 10^{-1},10^{-2},10^{-3},10^{-4},10^{-5} and 10^{-6} for the watermelon yogurt samples, a 1 ml sample was well mixed with 9 ml of distilled water for the serial dilution process. Next, from every dilution, 0.1 ml aliquots were taken and placed on agar plates. After that, the petri dishes were 48-hour incubated at 37°C. The plates were then set on a colony counter from which the bacterial count was noted.

Calculation:

$$\text{Total Plate Count (CFU/ml)} = \frac{\text{No. of Colonies} \times \text{Dilution factor}}{\text{factor ml aliquote taken}}$$

Figure 6: Total plate count

3.4.7 Sensory analysis

The overall extent of consumer satisfaction with the resultant product was determined through sensory evaluation. A sensory panel assessed the acceptability of the produced product. There were 15 panelists, and the products were presented to each one. Three various formulae were coded, which were labeled as Samples A, B, and C. The panel evaluated the three samples blind, and at this point, the panelists did not know what the objective was. The panelists rated every sensory attribute in that yogurt, including appearance, color, taste, texture, sweetness, and overall liking. This directly implies the characteristics that a good product is supposed to have even though it is not in agreement with the real perception of the customers. They individually evaluated each of the four products they used. They carried out the sensory evaluation of the qualitative characteristics of the samples: color, appearance, texture, taste, aroma, and overall acceptability by using a nine-point Hedonic scale (Roy et al., 2018).

Table 2: Hedonic scale rating

Like extremely = 9	Dislike slightly = 4
Like very much = 8	Dislike moderately = 3
Like moderately = 7	Dislike very much = 2
Like slightly = 6	Dislike extremely = 1
Neither like nor dislike = 5	

CHAPTER 4

RESULT AND DISCUSSION

4. Result and Discussion

4.1 Physicochemical characteristics of watermelon yogurt

Table 3: Physicochemical characteristics of watermelon yogurt under 4°C in refrigerator temperature with 7 days storage condition.

Storage period (days)	Sample	Protein (%)	Fat (%)	Vitamin C (mg/100g)	Moisture (%)	pH
0	A	3.65 ±0.1	3.52±0.02	16.40±0.03	82.08±0.04	4.38±0.01
	B	3.70 ±0.1	3.56±0.01	16.42±0.05	85.20±0.03	4.46±0.01
	C	3.72 ±0.1	3.62±0.02	16.46±0.07	87.08±0.06	4.50±0.01
3	A	3.56 ±0.1	3.48±0.02	16.38±0.02	82.05±0.04	4.32±0.01
	B	3.60 ±0.1	3.50±0.02	16.40±0.03	84.82±0.04	4.35±0.01
	C	3.65 ±0.1	3.51±0.02	16.43±0.05	85.90±0.04	4.38±0.01
7	A	3.48 ±0.1	3.40±0.02	16.35±0.01	80.02±0.04	4.23±0.01
	B	3.50 ±0.1	3.41±0.02	16.38±0.02	82.82±0.04	4.26±0.01
	C	3.53 ±0.1	3.43±0.02	16.40±0.03	84.15±0.04	4.27±0.01

The physicochemical characteristics of watermelon yogurt under 3°C in refrigerator temperature with 7 days storage condition. At 0-day, sample C had the highest protein value 3.65 %, followed by sample B (3.70%) and sample A (3.72 %). This indicates that sample C had the highest initial protein content among the three samples. After 3 days, the protein percentage values decreased for all three samples. Sample C had the highest value (3.65%), followed by sample B, (3.60%) and sample A (3.56%). However, it is important to note that the standard deviation for sample A is high, indicating that the values for this sample are variable and may not be reliable. At 7 days, sample C had the highest protein value (3.53%), followed by sample B (3.50%) and sample C (3.48). In brief, the protein content of all samples ranged from 3.48% to 3.72% throughout the 7-day storage. These values were supported by the work of (Kumar Dutta Roy, 2015). According to this study, the standard protein content for yogurt supplemented with fruit pulp is ranging from 3.53% to 3.72%, respectively.

At 0 days, the fat content ranged from 3.52% to 3.62%, with sample A having the lowest fat content and sample C having the highest. At 7 days, the fat content of sample A, samples B, and C decreased slightly to 3.48%, 3.50%, and 3.51%, respectively. At 7 days, there was again variability in fat content, with sample C having the highest fat content at 3.43%, and sample 1 having the lowest fat content at 3.40%, followed by sample B at 3.41%. In summary, the fat content of all samples ranged from the lowest 3.40% to the highest 3.62% throughout the 7-day storage. Our work is comparable with the results of (Jayasumana et al., 2020) who investigated watermelon yogurt ranged from 3.32% to 3.62%.

At 0 days, all three samples had relatively high vitamin c content, with sample C having the highest at 16.46 mg/100g and lowest at 16.40 mg/100g. By 3 days, there was a decrease in vitamin C content across all samples. Sample A had the decrease, dropping from 16.40 mg/100g to 16.38 mg/100g, while sample 3 remained the highest at 16.43 mg/100g. At 7 days, sample A had the lowest vitamin C content at 16.35 mg/100g, while sample B and sample C had relatively lower content than their initial measurements at 16.38 mg/100g and 16.40 mg/100g, respectively. After a 7-day storage period, the vitamin C content of all samples varied from (16.35-16.46) mg/100g. In the research of (Warakaulle et al., 2014), the standard fat content of yogurt incorporated with watermelon is 16.46 mg/100g.

At 0 days, the moisture content ranged from 82.08% to 87.08%, with sample A having the lowest acidity value and sample C having the highest. At 3 days, the moisture content of samples A, samples B, and C decreased slightly to 82.05%, 84.82%, and 85.90%, respectively. At 7 days, there was again variability in acidity value, with sample C having the highest acidity value at 84.15%, and sample A having the lowest moisture content at 80.02%, followed by sample B at 82.82%. According to (Sengupta et al., 2014), these values were validated by their work. Yogurt with watermelon juice has a standard ash value of 87.08%, according to this study.

At 0 days, the pH values ranged from (4.38) to (4.50), with sample A having the lowest pH value and sample C having the highest, the pH decreased for all three samples. On day 3, the pH of sample C was found to be the highest at (4.38). By day 3, the pH of all three samples decreased, with sample A having the lowest pH at (4.32). On day 7, the trend of reducing pH continued, with sample A having the lowest pH at (4.23) and sample C having the highest pH at (4.27), followed by sample B (4.26). Our work is comparable with the results of (Kumar Dutta Roy, 2015). According to this study, the standard pH for yogurt supplemented with fruit pulp is ranging from (4.27) to (4.49), respectively.

4.2 Total Plate Count

Table 4: Total plate count (TPC) of watermelon yogurt under the incubator with 7 days storage condition.

Days	Sample	TPC (CFU/ml)
0	1	3.0×10^5
	2	3.3×10^5
	3	3.5×10^5
3	1	4.0×10^5
	2	4.5×10^5
	3	5×10^5
7	1	5.4×10^5
	2	5.65×10^5
	3	6.0×10^5

The data provided appears to track bacterial growth in a storage sample over a 7-day period, using the Total Plate Count (TPC) method to quantify the number of viable bacteria. The data is arranged in a table with three columns, detailing the days of storage, sample numbers (1, 2, and 3), and the corresponding TPC counts. The TPC results show a clear trend of increasing bacterial counts over time. On day 0, the TPC count ranged between 3.0×10^5 to 3.5×10^5 CFU/ml for the three samples. By day 3, this range had risen to between 4.0×10^5 and 5.0×10^5 CFU/ml. At the end of the 7-day period, the TPC count further increased, reaching a range of 5.4×10^5 to 6.0×10^5 CFU/ml. This data indicates that bacterial populations grew as storage time increased. However, it's essential to consider that factors like the type of bacteria and storage conditions could also influence the rate and extent of this bacterial growth (Warakaulle et al., 2014).

4.3 Sensory Quality

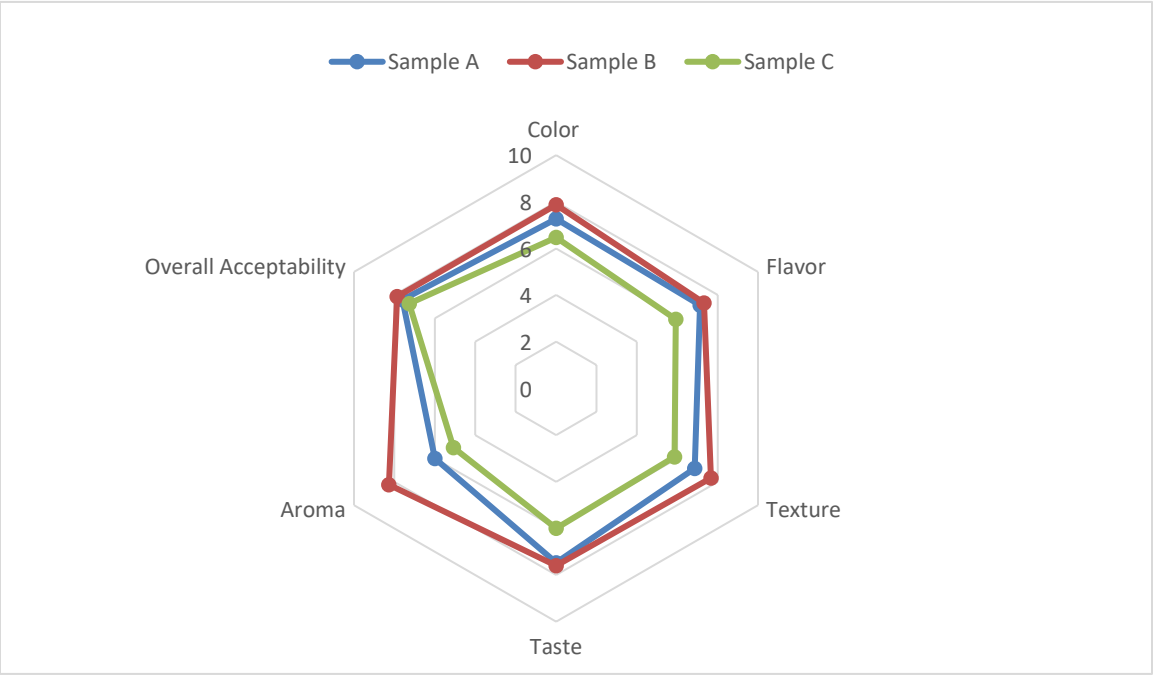

Figure 7: Sensory evaluation (n=15)

According to the data provided, Sample A achieved an average score of (7.27) for color, (7.13) for flavor, (6.86) for texture, (7.47) for taste, (6) for aroma, and (7.6) for overall acceptability. In comparison, Sample B recorded higher averages (7.87) for color, (7.33) for flavor, (7.67) for texture, (7.6) for taste, (8.27) for aroma, and (7.87) for overall acceptability. Sample C, on the other hand, received lower scores, with an average of (6.47) for color, (5.93) for flavor, (5.87) for texture, (6) for taste, (5.07) for aroma, and (7.27) for overall acceptability. Overall, Sample B outperformed the others in every category, while Samples A and C received lower scores. Our research is similar to the findings of (Kumar Dutta Roy, 2015). This study shows that sample W3 (yogurt with 15% watermelon pulp) received an average score of 7.69 for color, 7.62 for flavor, 7.48 for taste, and 7.06 for overall acceptability in the sensory evaluation of yogurt supplemented with fruit pulp.

CHAPTER 5

CONCLUSION

5. Conclusion

In conclusion, our study of three watermelon yogurt samples (A, B, and C) over time (0, 3, and 7 days) revealed significant variations in physicochemical and sensory properties. Protein content ranged from 3.48% to 3.72%, with the highest value in Sample C on day 0. Fat content fluctuated between 3.40% and 3.62%, also peaking on day 0 for Sample C. Vitamin C levels varied from 16.35 to 16.46 mg/100 ml, with Sample C showing the highest concentration at day 0. Moisture content ranged from 80.02% to 87.08%, with the highest level in Sample C on day 0, suggesting an effect on acidity. pH values decreased over time, with Sample A reaching the lowest value (4.23) by day 7. Sensory analysis showed that Sample B was most preferred for its color, taste, and texture, while Samples A and C received lower ratings. The Total Plate Count (TPC) ranged from 3.0×10^5 CFU/ml to 6.0×10^5CFU/ml across samples and time points, reflecting changes in the bacterial population. These results highlight the impact of watermelon juice supplementation on yogurt physicochemical properties and sensory analysis as well as the importance of monitoring changes over time for quality control and product development.

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