Development of protein and fiber-riched ice cream by utilizing pumpkin seeds

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ABSTRACT

This study aimed to evaluate the nutritional and sensory properties of pumpkin seeds in ice cream. Pumpkin seeds (Cucurbita maxima) are commonly seen as a waste product; yet, they are high in essential nutrients such as healthy fats, protein, fiber, magnesium, iron, zinc, phosphorus, and copper. By incorporating these seeds into our ice cream, we not only reduce waste but also give it a delightful or slightly nutty flavor. At four different concentrations (0%, 5%, 10%, and 15%), we added pumpkin seed powder to the ice cream mixture. This addition considerably increased the fiber and protein content of the frozen dessert. The concentrations were chosen to span a range that would allow for a comprehensive analysis of the impact on both nutritional content and sensory characteristics. The ice cream with 10% pumpkin seed powder had the best sensory qualities, with the texture and flavor perfectly balanced, according to the results of sensory tests. This concentration not only improved the nutritional profile by adding more fiber and protein, but it also demonstrated the potential to keep the desired sensory attributes of standard ice cream. The incorporation of pumpkin seed powder, especially with elevated fiber and protein concentrations, supports digestive health, promotes a sense of fullness, and contributes to overall wellness. The nutritional composition per 100g of ice cream revealed an energy content of 233kcal, 13g of fat, 10.93g of protein, 17.96g of carbohydrates, 1.275g of fiber, and 1.76g of free fatty acids (FFA).Hence, this development reflects a broader trend in the food industry, in which the combination of taste and nutrition caters to health-conscious customers looking for mindful indulgences without sacrificing flavor or dietary goals.

Keywords: Pumpkin Seeds Powder, Ice Cream, Physiochemical, Protein, Fiber, Sensory Attributes

1. Introduction

These tiny nutritional powerhouses that are pumpkin seeds are incredible. In addition to being a tasty snack, they have other health advantages(1). To begin with, pumpkin seeds are a great provider of many important nutrients. Rich in fiber, healthy fats, and protein, they are an excellent complement to any diet. They also include a range of minerals and vitamins, such as iron, magnesium, zinc, and vitamin E(2) . The maintenance of general health and wellbeing is greatly aided by these nutrients. Antioxidants are also abundant in pumpkin seeds. Prolonged exposure to free radicals can cause damage to the body and increase the risk of chronic illnesses like cancer and heart disease. Antioxidants can help prevent this from happening(3). Vitamin E and carotenoids, two antioxidants found in pumpkin seeds, aid in scavenging these free radicals and lowering inflammatory responses in the body(4). In terms of fiber content, pumpkin seeds are an excellent option. In addition to encouraging regular

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bowel movements and keeping you feeling full and content after a meal, fiber is crucial for a healthy digestive tract (5). There are about 5 grams of fiber in only a quarter cup of pumpkin seeds, or roughly 20% of the daily recommended amount. They are therefore a fantastic choice for anyone trying to up their fiber intake(6). Protein is also abundant in pumpkin seeds. Protein is necessary for immune system maintenance, muscle growth support, and tissue construction and repair. Pumpkin seeds actually contain all the essential amino acids required by human bodies, making them a complete protein supply. For a plant-based snack, a quarter cup of pumpkin seeds has roughly 8 grams of protein, which is pretty good. Because they are high in protein and fiber, pumpkin seeds are an excellent option for increasing satiety and aiding in weight management(7). When you consume meals that are high in fiber and protein, they take longer to digest, keeping you feeling content for longer and lowering the likelihood of overeating (8).

Pumpkin seeds provide a number of additional vital elements in addition to fiber and protein. Healthy fats, such as omega-3 and omega-6 fatty acids, which are advantageous for heart health and brain function, are abundant in them(9). They also include a range of vitamins and minerals, including vitamin E, magnesium, zinc, iron, and zinc, all of which are crucial for preserving general health and wellbeing(10). It's simple and adaptable to incorporate pumpkin seeds into your diet. They can be eaten on their own as a snack, added as a crunch to salads or soups, or mixed into baked products like granola bars or muffins. Pumpkin seeds can also be roasted to further develop their flavor and make them even more(11) Therefore, pumpkin seeds are a great option if you're wanting to up your protein and fiber consumption or just enjoy a tasty and nutritious snack. A wonderful flavor sensation is produced by the delicate nuttiness of pumpkin seeds combined with smooth ice cream (12).

2. Material and Methods

2.1 Assemblage Material

All of raw materials that are the part of research were bought from a shop of local market of Karachi, Pakistan.

2.2 Procurement of Raw Material

The materials used in this are divided into two groups; the main ingredients and additional ingredients. The major material used are pumpkin seeds. While the additional ingredients used are condensed milk, vanilla essence, cinnamon powder and whipping cream.

2.3 Preparation of Pumpkin Seeds Powder

Pumpkin seeds were purchased from the local market after that they are deskinned to remove their outer cover or shell. The seeds are then washed with tap water and oven dry for 1 hour at 105oC. The dry seeds are then ground into fine powder by using electric grinder. After grinding the received powder is passed through standard mesh screen of mesh size 60. Lastly the prepared powder was transferred in an airtight container for analysis.

2.4 Ice Cream Formulation

Weigh the dry and wet ingredients individually for the pumpkin seed ice cream using a digital weight machine. Set aside all the ingredients after weighing them all. Then take a large, refrigerated container pour cream pack and begin homogenizing it with an electric hand mixer. Whipped until stiff peak form. In the same container, combine 100 ml of condensed milk with a few drops of vanilla extract and a pinch of cinnamon spice. Last but not least, stir in three different ratios of pumpkin seed powder (5%, 10%, and 15%). The medium-strength mixer first performs the homogenization process, which is subsequently speed up with increased strength until the ice cream is completely blended. Following homogenization, the mixture was pasteurized for 45 seconds at 80°C and then aged for 4 to 6 hours at 0°C. The prepared ice cream was put into 100 mL single-use cups and frozen for 24 hours at -30oC. For 40 days, the

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prepared ice cream was kept in a freezer at a temperature of -25oC.

2.5 Physicochemical Analysis of Pumpkin Seeds

2.5.1 Quantitative Analysis

The chemical composition of the pumpkin seeds (whole pumpkin seeds and kernels), including the contents of moisture, crude protein, ash, crude fiber, crude fat, and carbohydrate, was determined using the recommended methods of the Association of Official Analytical Chemists (AOAC, 2000). The weight of the sample was dried to a consistent weight in a hot air oven at 105°C to ascertain the moisture content of the seeds. Utilizing the Micro-Kjeldahl method, the percentage of nitrogen was calculated, and the amount of crude protein was determined by multiplying by 6.25. Ash content was calculated by first burning the sample on a slow flame burner and then lighting it at 550°C in a muffle furnace for 4 to 6 hours, or until light grey ash was formed. Hexane was used as the solvent for a continuous extraction in a Soxhlet device for five hours in order to measure the crude fat content. The solvent was evaporated, and then gravimetric analysis was used to estimate the fat content(13, 14). The amount of total carbohydrates was calculated by deducting the sum of the crude protein, crude fat, ash content, and moisture contents from 100.

2.5.2 Qualitative Analysis

The objective of the phytochemical analysis was to identify the presence of different active compounds in the aqueous and alcoholic extracts of Cucurbita maxima seeds.

2.5.2.1 Test for Alkaloids

ml of 1.5% hydrochloric acid (v/v) and Whatman's filter paper No. 1 were used to filter a small amount of extract. To test alkaloids, the filtrate was employed.Wagner's Reagent: To make Wagner's reagent, 1.27 g of iodine and 2.0 g of potassium iodide were dissolved in 100 ml of distilled water. Take 5 ml of the extract's acid solution, and then stir in 2 ml of Wagner's reagent. Alkaloids are present when a brown flocculent precipitate appears.

2.5.2.2 Test for Reducing Sugars

Benedict's Test: The Benedict's reagent was heated with approximately 5 ml of dissolved extract. The presence of reducing sugars was shown by the development of a brownish-red precipitate (reduction).

2.5.2.3 Test for Glycosides

Benedict's Reagent Test: To hydrolyze the glycosides, 1 ml of diluted hydrochloric acid was added to the solution produced by the Benedict's test for reducing sugars. It was mixed with an equal amount of Benedict's solution and heated in a water bath before boiling. The presence of glycosides was indicated by the brownish precipitate's appearance(15).

2.5.2.4 Test for Sterol

Salkowski Reaction Test: In a test tube, 2 ml of concentrated chloroform were added to 0.5 g of extract to dissolve it. Then 2ml of concentrated sulfuric acid was slowly add drop by drop introduced to it via the test tube's side wall. Sterols may be present in extracts as evidenced by the development of a red color in the chloroform layer and a greenish florescence in the lower section of the solution.

2.5.2.5 Test for Protein

Biuret Test: One gram of extract was injected into a tube containing one milliliter of distilled water. Following that, 1 ml of a 1% sodium hydroxide solution was added to it. This was then mixed with one or two drops of a 1% copper sulphate solution. Protein is present when violet color development occurs.

2.5.2.6 Test for Tannins

Ferric Chloride Test: A small amount of the filtrate from the previous step was mixed with a few drops of ferric chloride

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solution. Tannins are present when the filtrate turns green, indicating their existence.

2.5.2.7 Test for Flavonoids

Lead Acetate Test: Extract was given a quick treatment with a few drops of lead acetate solution. The presence of flavonoids is shown by the formation of a yellow-colored precipitate.

2.5.2.8 Test for Saponins

Foam Test: One gram of extract was added to a test tube with five milliliters of sodium bicarbonate and five milliliters of water, and the mixture was forcefully agitated. The development of a steady foam indicates saponins are present(16).

2.5.2.9 Test for Anthraquinones

Bontrager's Test: 0.5g of extract was heated in a test tube with 5 ml of 10% Sulphuric acid for 1–2 minutes, and then the mixture was promptly filtered. After cooling, benzene was mixed into the filtrate. After being separated, the benzene layer was shaken with half of its volume of 10% ammonia. The presence of anthraquinones is shown by the formation of a pink ring in the ammonical layer.

2.5.2.10 Test for Phenols

Ferric Cyanide Test: Two ml of distilled water were mixed with one ml of plant extract and a few drops of 10% ferric chloride were added. The development of a blue/green color shows the presence of phenols.

2.5.2.11Test for Carbohydrate

Molish Test: Two ml of aqueous extract put in test tube, add few drop of molish agent, add drop of concentrated H2SO4 on the wall slowly in test tube. The presences of violet ring layer its means carbohydrate is present.

2.5.2.12Test for Terpenoids

Salkowski Reaction Test: 1 ml of the extract and 2ml of chloroform were mixed together to perform a terpenoids test. Formation of red-brown color shows that terpenoids are present.

2.6 Physiochemical Analysis of Ice Cream

2.6.1 Quantitative Analysis

Based on the highest sensory score, the ice cream sample was chemically analyzed for carbohydrate, protein, fat, crude fiber, and ash by using conventional procedures (AOAC 2005). However, the protein level of the ice cream was assessed using the Kjeldahl method and the fat content was assessed using the Gerber method (AOAC 2005). Ash content was evaluated using the gravimetric method, and the total solids content was determined using the forced draft oven method (AOAC 2005). The SNF was estimated by difference method. It was calculated using Equation. According to AOAC 937.05, the titratable acidity of ice creams was calculated and expressed as a percentage of lactic acid (LA %). A pH meter (Mettler Toledo Seven Compact S220) was used to measure the pH of ice creams made with pumpkin seeds (4 °C). A modified version of Johnson and Gould's solvent extraction method was used to ascertain the amount of free fatty acids present in the pumpkin seed ice cream. The Energy values of ice cream calculated by uses of specific energy factors for protein, fat, and carbohydrate(17).

2.6.2 Qualitative Analysis

2.6.2.1 Test for Carbohydrate

Molish Test: 2ml of sample put in test tube, add few drop of molish agent, add drop of concentrated H2SO4 on the wall slowly slowly in test tube. The presences of violet ring layer its means carbohydrate is present.

Test for Protein

Biuret Test**:** 1ml of sample was injected into a tube containing one milliliter of distilled water. Following that, 1 ml of a 1% sodium hydroxide solution was added to it. This

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was then mixed with one or two drops of a 1% copper sulphate solution. Protein is present when violet color development occurs.

2.7 Rheological Analysis of Ice Cream

Overrun is the amount of ice cream that is absorbed by air during freezing in order to cause the product to expand. This growth is reliant on both the quality of the cream and the ice cream-making procedure(18). The amount of air absorbed into it increases as the proportion of overrun increases, making the ice cream lighter. However, the technique produces dense ice cream since there is less air absorbed into the cream. Using spindle R2, the viscometer was used to measure the ice cream's viscosity. The ice cream mixture was placed into a 200 ml container and aged for 24 hours at 4 ^{0}C to determine its apparent viscosity. A refractometer was used to determine the brix of an ice cream, Bostwick Consistometer was used to assess the consistency of an ice cream(19). Relative density (RD) bottle was used to assess the specific gravity of an ice cream(20, 21).

2.8 Antimicrobial Test of Ice Cream

To evaluate and analyze the antimicrobial activity of ice cream, the spread plate technique. It was a well-known antimicrobial test used to calculate the viable microbial load by counting the CFU/ml.

2.9 Sensory Analysis of Ice Cream

15 semi-trained panelists evaluated the freshly made ice cream samples on a sensory level. A 9- point hedonic scale was employed, with 9 denoting extreme like, 4 denoting neither like nor do dislike, and 1 denoting extreme dislike. As a result, the ice cream's color, flavor, taste, mouth feel, consistency, after taste and overall acceptance have all been assessed.

3.Result and Discussion

The physicochemical analysis of pumpkin seeds revealed notable compositional attributes, showcasing their potential for nutritional and functional applications. Table.1 presents the quantitative analysis of pumpkin seeds, showcasing key parameters such as moisture, ash, crude fiber, fat, protein, and carbohydrate content. According to the quantitative analysis, pumpkin seeds exhibited a moisture content of 4%, ash content of 6.2%, crude fiber content of 4.2%, fat content of 29%, protein content of 28.4%, and carbohydrate content of 32.3% (22). These findings, obtained through standardized methods recommended by the Association of Official Analytical Chemists (AOAC), provide crucial insights into the nutritional profile of pumpkin seeds.

Table .2 provides a qualitative assessment of the phytochemical properties present in pumpkin seeds, identified through various chemical tests. Phytochemicals are bioactive compounds found in plants that have been associated with numerous health benefits. The presence or absence of each phytochemical in pumpkin seeds was determined using specific chemical tests, as listed in the table(23).

Alkaloids, which are nitrogen-containing compounds, were detected in pumpkin seeds using Wagner's test, indicated by a positive result. Similarly, the presence of reducing sugars, glycosides, sterols, proteins, tannins, flavonoids, phenols, and carbohydrates was confirmed through specific tests, such as Benedict's test, Salkowski reaction test, Biuret test, Ferric chloride test, Lead acetate test, and Ferric cyanide test, respectively.

Interestingly, certain phytochemicals like saponins and anthraquinones were found to be absent in pumpkin seeds, as indicated by negative results in the foam test and Bontrager's test, respectively. Saponins are known for their soap-like properties and have been studied for their potential health benefits, but they were not detected in pumpkin seeds in this analysis. Similarly, anthraquinones, which are often associated with laxative effects, were not found in pumpkin seeds(23).

The qualitative determination of phytochemical properties provides valuable insights into the bioactive compounds present in pumpkin seeds, which contribute to their

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potential health-promoting properties. For instance, the presence of flavonoids and phenols suggests antioxidant activity, while the detection of proteins indicates their nutritional value. Furthermore, the absence of certain phytochemicals, such as saponins and anthraquinones, distinguishes pumpkin seeds from other plant sources and provides a comprehensive profile of their phytochemical composition.

Table .3 presents the qualitative analysis results for different concentrations of pumpkin seed ice cream samples, focusing on the presence of specific phytochemicals detected through chemical tests.

The Biuret test was conducted to detect the presence of proteins in the ice cream samples. Across all concentrations (0%, 5%, 10%, and 15% pumpkin seed inclusion), a positive result (+) was observed, indicating the presence of proteins in each sample. This suggests that the ice cream formulations contain proteinaceous compounds, likely derived from both the dairy ingredients and the added pumpkin seeds.

Similarly, the Molish test was employed to identify the presence of carbohydrates in the ice cream samples. A positive result (+) was obtained for all concentrations tested (0%, 5%, 10%, and 15% pumpkin seed inclusion), indicating the presence of carbohydrates in each sample. This indicates that the ice cream formulations contain carbohydrate compounds, which are commonly found in dairy products like ice cream as well as in added ingredients such as pumpkin seeds(24). These results underscore the nutritional richness and bioactive potential of pumpkin seeds, highlighting their suitability for incorporation into various food products to enhance their health-promoting properties. With their balanced macronutrient composition and diverse phytochemical profile, pumpkin seeds offer a valuable ingredient for formulating functional foods aimed at promoting overall health and well-being. Moreover, the presence of bioactive compounds like flavonoids and phenols underscores the antioxidant capacity of pumpkin seeds, which may confer protective effects against oxidative stress-related diseases. The absence of anthraquinones and saponins eliminates potential adverse effects associated with these compounds, further affirming the safety and desirability of incorporating pumpkin seeds into dietary regimens(25).

The quantitative analysis of ice cream samples aimed to assess various parameters, including carbohydrate, protein, fat, crude fiber, and ash content, using conventional methods recommended by AOAC 2005. Protein levels were determined via the Kjeldahl method, while fat content was assessed using the Gerber method. Ash content was evaluated gravimetrically, and total solids content was determined using the forced draft oven method. Solids-nonfat (SNF) were estimated by the difference method, and titratable acidity was calculated as a percentage of lactic acid (LA %) according to AOAC 937.05 guidelines. Additionally, a modified version of Johnson and Gould's solvent extraction method was employed to measure the free fatty acid content in the ice cream samples. The energy values of the ice cream were calculated using specific energy factors for protein, fat, and carbohydrate.

Table 3 provides a comprehensive overview of the physicochemical properties of ice cream samples, delineating various parameters across different concentrations of pumpkin seed inclusion (0%, 5%, 10%, and 15%). Moisture content decreases gradually with increasing pumpkin seed concentration, ranging from 62.844% to 54.666%. Conversely, ash content exhibits an upward trend from 0.842% to 2.3404%, suggesting an elevated mineral content in samples with higher pumpkin seed concentrations. Crude fiber content, though minimal, increases with greater seed inclusion, indicating a potential source of dietary fiber. Fat and protein levels rise consistently with increasing pumpkin seed content, offering enhanced nutritional value. Conversely, carbohydrate content declines from 20.7515% to 14.8686%, indicative of the dilution effect caused by pumpkin seed addition. The energy value of the ice cream escalates from 190 to 246 calories, reflecting the augmented nutritional density of samples with higher seed concentrations. Notably, parameters such as total solids, solid-nonfat, pH, titratable acidity, free fatty acids, overrun,

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viscosity, Brix, consistency, and specific gravity also demonstrate varying trends across the samples, suggesting complex interactions between pumpkin seed addition and the physicochemical attributes of ice cream. These findings underscore the importance of understanding the physicochemical characteristics of ice cream formulations with varying pumpkin seed concentrations, offering insights into their nutritional composition and sensory properties. Adjusting pumpkin seed concentrations can provide opportunities to tailor ice cream formulations to meet specific dietary preferences and enhance their nutritional profile.

Overrun, a crucial parameter in ice cream production, denotes the volume expansion resulting from air incorporation during freezing. Higher overrun typically leads to lighter, fluffier ice cream, influenced by the cream's quality and the manufacturing process. Conversely, lower overrun produces denser ice cream due to less air incorporation. Measurement of viscosity using spindle R2 viscometer provides insights into the ice cream's flow characteristics. The ice cream mixture's apparent viscosity, determined after 24-hour aging at 4°C, aids in assessing its texture and consistency (Trgo et al., 1999). The refractometer assesses the Brix value, indicating the sugar concentration in the ice cream. Bostwick Consistometer evaluates ice cream consistency, influencing its spread ability and scoop ability (Silva Junior and Silva Lannes, 2011). Additionally, the relative density (RD) bottle determines the ice cream's specific gravity, crucial for understanding its density relative to water. These rheological analyses offer comprehensive insights into various aspects of ice cream texture, consistency, and structure, facilitating quality control and optimization of production processes.

Table 4 presents the microbial analysis of ice cream samples, indicating the total plate count (TPC) in logarithmic colony-forming units per milliliter (log CFU/mL) at different concentrations of pumpkin seed inclusion (0%, 5%, 10%, and 15%). The results reveal varying levels of microbial contamination across the samples. At lower dilutions (10^4 CFU/mL), the TPC ranges from 1.9x10^7 to 3.9x10^7 CFU/mL, indicating a moderate microbial load. As the dilution increases to 10^5 CFU/mL, the TPC shows a wider range from 2.36x10^8 to 5.8x10^8 CFU/mL, suggesting a higher level of microbial contamination in some samples. The highest dilution (10^6 CFU/mL) exhibits TPC values ranging from 3.01x10^9 to 4.12x10^9 CFU/mL, indicating a significant microbial presence across all samples. These findings underscore the importance of monitoring and controlling microbial contamination during ice cream production to ensure product safety and quality. Further investigation into the specific microbial species present and their potential impact on consumer health would provide valuable insights for maintaining food safety standards. Table 5 presents the sensory evaluation results for ice-cream samples with different concentrations of pumpkin seeds. Various attributes including color, flavor, taste, mouth feel, consistency, aftertaste, and overall acceptability were assessed on a scale from 1 to 10, with higher scores indicating better sensory characteristics.

The sensory evaluation indicates that as the concentration of pumpkin seeds in the ice cream increases, there is generally an improvement in attributes such as flavor, taste, mouth feel, consistency, and overall acceptability. Ice cream samples with 10% pumpkin seed concentration received the highest scores across most attributes, suggesting that this concentration level offers the most favorable sensory experience. However, at 15% concentration, some attributes such as flavor and overall acceptability slightly declined compared to the 10% concentration, indicating a possible saturation point beyond which the addition of pumpkin seeds may not further enhance sensory characteristics. Overall, these results provide valuable insights for optimizing the formulation of pumpkin seed ice cream to achieve desirable sensory attributes.

4.Conclusion

This study explored the incorporation of pumpkin seeds into ice cream to enhance nutritional content and sensory

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attributes. The analysis revealed that pumpkin seeds are rich in essential nutrients, and adding pumpkin seed powder at different concentrations (0%, 5%, 10%, and 15%) significantly increased fiber and protein content. The 10% concentration achieved an optimal balance between texture and flavor while maintaining the desired sensory attributes of standard ice cream. The resulting ice cream had an energy content of 233kcal per 100g, with various macronutrients. Qualitative phytochemical analysis highlighted the presence of bioactive compounds in pumpkin seeds, contributing to potential health benefits. The physicochemical analysis of ice cream samples provided insights into adjusting pumpkin seed concentrations to tailor nutritional composition. Rheological analyses offered a comprehensive understanding of ice cream texture, consistency, and structure, aiding quality control. Antimicrobial analysis emphasized the need to monitor and control microbial presence for product safety. Sensory evaluation indicated that a 10% concentration yielded the most favorable attributes. Incorporating pumpkin seeds into ice cream offers a solution for waste reduction and provides a nutritious and flavorful frozen dessert. This study aligns with the industry trend of combining taste and nutrition to cater to health-conscious consumers seeking mindful indulgences without compromising flavor or dietary goals.

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Table.1: Composition of pumpkin seeds

Parameter	Pumpkin Seed
Moisture (%)	4
Ash (%)	6.2
Crude Fiber (%)	4.2
Fat (%)	29
Protein (%)	28.4
Carbohydrate (%)	32.3
Moisture (%)	4
Ash (%)	6.2
Crude Fiber (%)	4.2
Fat (%)	29
Protein (%)	28.4
Carbohydrate (%)	32.3

Table 2: Phytochemical Screening of Pumpkin seeds

Parameter	0%	5%	10%	15%
Moisture (%)	62.844	58.246	56.246	54.666
Ash (%)	0.842	1.4288	1.8498	2.3404
Crude Fiber (%)	-	0.4607	1.275	1.9387
Fat (%)	9	12	13	15
Protein (%)	6.5625	8.75	10.9375	13.125
Carbohydrate (%)	20.7515	19.5752	17.9667	14.8686
Energy Value (Cal)	190	221	233	246
Total solid (%)	37.156	41.754	43.7541	45.334
Solid-nonfat (%)	28.15	29.75	30.75	30.33
pH	5.8	5.85	5.96	5.97
Titratable Acidity (LA %)	0.15	0.19	0.2	0.21
Free fatty Acid (%)	0.42	1.6	1.76	1.84
Overrun (%)	45.16	34.62	29.8	25.57
Viscosity (mpa.s.)	861.1	1073	1563	1783
Brix (°Bx)	36	37	38	38
Consistency (m/s)	2.591	4	3.0444	4.2792
Specific gravity (g/ml)	0.776	0.7255	0.8824	0.8145

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Table 3 : Proximate and physicochemical analysis of pumpkin seeds

Phytochemicals	Name of the Test	Pumpkin Seed
Alkaloids	Wagner's test	+
Reducing Sugars	Benedict's Test	+
Glycosides	Benedict's reagent test	+
Sterol	Salkowski Reaction Test	+
Protein	Biuret Test	+
Tannins	Ferric Chloride Test	+
Flavonoid	Lead Acetate Test	+
Saponins	Foam Test	-
Anthraquinones	Bontrager's Test	-
Phenol	Ferric Cyanide Test	+
Carbohydrate	Molish Test	+
Terpenoids	Salkowski Reaction Test	+

Table 4: Microbial analysis of pumpkin seed Icecream

Ice Cream Samples				
TPC (log CFU/mL)	0%	**5%**	**10%**	**15%**
104	$3.24x10^7$	$1.9x10^7$	$3.9x10^7$	$3.81x10^7$
105	$2.36x10^8$	$2.47x10^8$	$5.8x10^8$	$3.92\ x10^8$
106	$3.48x10^9$	$3.01x10^9$	$3.060x10^9$	$4.12x10^9$

Table 5: Sensory Analysis of pumpkin seed Ice cream

Sample	Color	Flavor	Taste	Mouth Feel	Consistency	After Taste	Overall Acceptability
0%	7	7	6.5	7	7.5	7	7
5%	8	7.5	7.5	7.5	8	7.5	7.6
10%	8	8.5	8	8	8.5	8.5	8.25
15%	8	7	7	7	8	7	7.33

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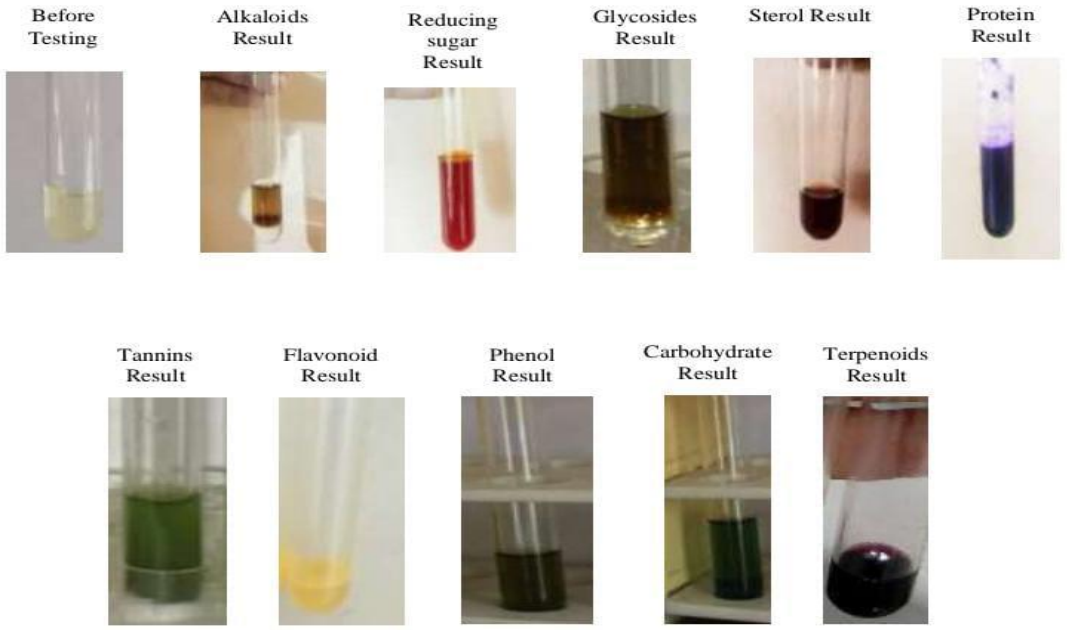


FIG 1. Physicochemical analysis of pumpkin seeds

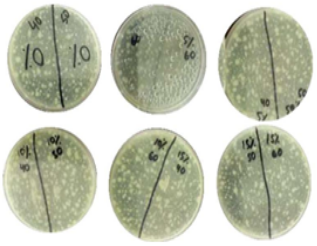


FIG 2.Microbial analysis of pumpkin seed Ice cream

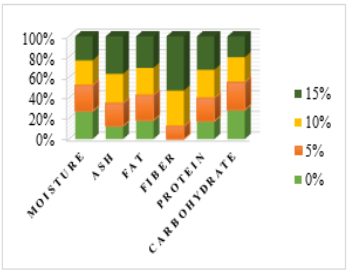


FIG 3. Proximate analysis of pumpkin seeds ice cream

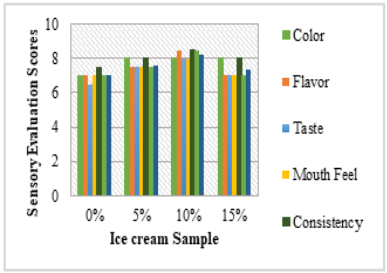


FIG 4. Sensory Analysis of pumpkin seed Ice cream

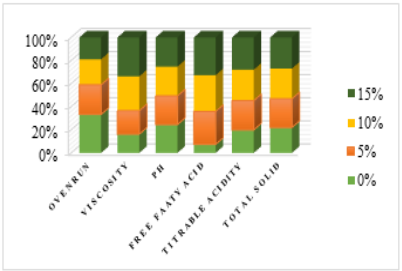


FIG 5. Physicochemical analysis of pumpkin seeds icecream

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