INNOVATIVE POWDERED DRINK FORMULATION WITH PSYLLIUM HUSK AND CHIA SEED FOR ENHANCED HEALTH BENEFITS.

A THESIS 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 "**Innovative Powdered Drink Formulation with Psyllium Husk and Chia Seed for Enhanced Health Benefits.**", submitted by **Sumaiya Khatun** 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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DECLARATION

I hereby declare that this project has been done by me 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 the award of any degree or diploma.

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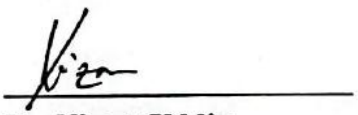

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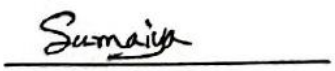

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ABSTRACT

The rapid lifestyle of contemporary civilization frequently affords individuals minimal opportunity to uphold balanced, nutritious diets, leading to prevalent nutritional deficiencies and heightened health risks. This study examines the efficacy of a nutrient-rich powdered beverage composed of superfoods, including psyllium husk, chia seeds, stevia, and a mixture of natural salts, to mitigate nutritional deficiencies. The powdered beverage supplies vital nutrients, such as fiber, antioxidants, and minerals, often absent in modern diets. The study investigates the beverage's effectiveness in enhancing overall health, emphasizing advancements in digestion, immunity, and energy levels. The study encompasses an examination of the powdered drink's proximate composition, emphasizing its carbohydrate, moisture, ash, fat, fiber, and pH levels. Furthermore, sensory evaluations indicate that the beverage was predominantly favorably received, with specific formulations, especially those with stevia, exhibiting significant acceptance owing to its flavor and texture. The results indicate that this powdered beverage may function as a viable, healthful substitute for sugary, carbonated drinks, assisting consumers in attaining improved nutritional equilibrium. This research provides significant insights into the advantages of superfood-based supplements and guides future innovations in the health and wellness industry to address customer expectations for accessible, healthy, and time-efficient dietary solutions.

Keywords: Organic drink powder, psyllium husk, chia seeds, stevia, Product development.

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CHAPTER 1

INTRODUCTION

1.1. Background

In an era of swift technical and industrial progress, personal development and productivity have become essential for numerous people. The escalating demands on time frequently result in insufficient attention to balanced dietary habits, contributing to premature health problems. This trend underscores the necessity of augmenting conventional diets with supplementary nutrients to address deficiencies and foster a healthier lifestyle. Contemporary diets frequently lack the requisite minerals, vitamins, and nutrients important for optimal health. The excessive intake of carbonated and sugary beverages as convenient refreshment alternatives has been associated with numerous health concerns, ranging from metabolic diseases to gastrointestinal troubles. These problems highlight the necessity for accessible, nutrient-dense options that accommodate a rapid lifestyle while fulfilling daily nutritional needs (RAHMAN, 2022).

This study presents a powdered drink designed to fill nutritional deficiencies by offering a handy source of important nutrients. It is composed of a blend of superfoods, including psyllium husk (isabgol) (Tripathi & Tiwari, 2019), chia seeds (Chen & Luo, 2024), stevia, and an assortment of natural salts, each providing distinct health advantages. Psyllium husk regulates bowel function, chia seeds are rich in protein and antioxidants, and stevia provides a calorie-free sweetness suitable for those controlling diabetes and hypertension. This powder readily dissolves in water, providing an immediate nutrient enhancement appropriate for everyday intake.

1.2. Problem Statement

The deficiency of adequate nutrition in contemporary diets, along with the excessive consumption of sugary and processed drinks, constitutes an escalating health issue. Numerous individuals experience deficits in vital minerals and nutrients, which are frequently unaddressed by standard meals. Furthermore, the prevalence of fast food and processed snacks significantly restricts the consumption of essential nutrients, including

vitamins, minerals, fiber, and antioxidants. This nutritional deficiency adversely impacts general health and elevates the risk of chronic diseases. Consequently, there is an urgent demand for readily available, nutritious alternatives that deliver essential nutrients to promote a healthy lifestyle, without necessitating significant time or preparation.

1.3. Research Questions or Hypothesis

This study seeks to examine the subsequent research inquiries:

- Can a powdered drink supplement adequately fulfill the daily nutritional deficiencies prevalent in contemporary diets?
- Does the consistent consumption of this powdered drink enhance general health indicators, including energy levels, digestion, and immunity, relative to non-consumers?
- What is the contribution of the specific superfoods in the formulation (e.g., psyllium husk, chia seeds, and stevia) to the health benefits of the drink?

1.4. Objectives

The principal aims of this research are:

- To examine the nutritional deficits prevalent in contemporary diets and evaluate the efficacy of the powdered drink supplement in mitigating these deficiencies.
- To assess the health advantages of the powdered drink derived from its constituents of psyllium husk, chia seeds, stevia, and mixed salts.
- To do a comparison examination of health indicators between persons who regularly consume the powdered drink and those who do not.

1.5. Significance of the Study

This work is significant in the domains of nutrition and preventative health. The powdered drink provides a nutrient-rich substitute for sugary and fizzy Drinks, potentially enhancing health and preventing nutrition-related disorders. This research provides significant insights into the advantages of superfoods in handy supplement formats, promoting a

transition to healthy dietary selections. The results may also inform future product development in the health and wellness sector, addressing consumers' demand for accessible, healthy, and time-efficient solutions.

1.6. Scope and Limitations

This study examines the health effects of powdered drinks as a dietary supplement. The scope encompasses assessing its efficacy in mitigating prevalent vitamin deficits and monitoring any enhancements in overall well-being among consumers. The study is constrained as it fails to consider long-term health effects or certain circumstances necessitating tailored dietary modifications. Furthermore, individual differences in metabolism, lifestyle, and genetic predispositions may affect the outcomes, which are beyond the scope of this study.

CHAPTER 2
LITERATURE REVIEW

2.1. Overview of Organic Drinks

The product is a blend of superfoods, including psyllium husk (isabgol), Chia Seed, Stevia, Mixed Salt, and Flavor. It is marketed in a food grade minipack of 5 g and can be mixed with 250 ml of water. psyllium husk (isabgol), made up of Plantago arenaria and Plantago psyllium seeds, is commonly used as an over-the-counter medication for constipation (Tripathi & Tiwari, 2019). Chia, also known as Salvia polystachya, Salvia hispanica, and Salvia columbariae, is a unique seed with ideal water absorption ability, water and oil holding capacity, emulsifying capabilities, ACE-inhibitory activity, and antioxidant activity (Chen & Luo, 2024). Stevia, a small shrub found in northeastern Paraguay and Brazil, is primarily found in the southern United States, Mexico, Argentina, Chile, and the Brazilian highlands. It contains stevioside, a glycoside 150–300 times sweeter than sucrose, and Rebaudioside-A and D, two additional glycoside fragments 50–120 times sweeter than sucrose. Stevia comes in various forms, including pills, powdered dry leaves, and crystals, and is beneficial for those with diabetes, hypoglycemia, high blood pressure, hypertension, and other conditions. It is recommended as an antigen for heartburn, hypertension, and obesity(Singh et al., 2007). Mixed salt (Sodium chloride, Potassium chloride, Rock salt) - Electrolyte, sodium chloride (NaCl) is commonly known as salt, a readily available, inexpensive commodity. A basic requirement for all life. Salt is the largest component of dissolved solids found in seawater. One cubic kilometer of seawater contains approximately 458× 10^6 tons of sodium chloride, 66× 10^6 of magnesium chloride, and 30× 10^6 of calcium sulfate. (&NA;, 2010)

Potassium is a mineral that is present in a wide variety of foods and is essential for numerous bodily processes, most notably heartbeat. Potassium chloride is used to treat or prevent hypokalaemia, or low potassium levels in the blood (McMahon & Bashir, 2023). Halite, sometimes referred to as rock salt, is a salt that is sodium chloride (NaCl) in its mineral (natural) form. Isometric crystals are formed from halite. The mineral is usually white or colourless, but depending on the presence of other materials, impurities, and structural or isotopic anomalies in the crystals, it can also be light blue, dark blue, purple,

pink, red, orange, yellow, or grey. It frequently coexists with other minerals found in evaporite deposits, including a number of sulphates, halides, and borates (*The History of Rock Salt | MaxiSalt*, n.d.). Mint, also known as pudina (Meantha spicata L.), is a popular home remedy for common stomach issues and plays a significant role in the medical systems of Ayurveda and Unani. It is used to treat stomachaches, dyspepsia, indigestion, and other conditions in its juice, paste, powder, flavor, extract, and distillate (Paul et al., 2019).

There are lot of researcher also worked about different type of drink powder like banana and ginger another combination of drink powder for instant nutrient of our health (Ramadani Fitri & Puspitarini Siswanto, 2023). Another researcher developed a powder drink of Avocado, a nutritious fruit, presents a preservation challenge for the food industry. Spray drying of avocado powder blends can generate high nutritional value and stable products. Higher drying temperatures and smaller droplets result in higher yields and less moisture. Maltodextrin helps preserve protein, ascorbic acid, and phenolic compounds, maintaining their high nutritional value (Dantas et al., 2018). This thesis studied well about drink and food powder and its nutritional values.

2.2. Health Benefits

This Research explore about drink powder and its nutritional benefits. In this research we developed a product with combination of psyllium husk (isabgol), chia seeds, stevia, and mix salts. The health advantages of nutrient-dense powdered drinks arise from their capacity to deliver vital vitamins, minerals, and other bioactive substances frequently deficient in contemporary diets. These drinks, composed of superfoods such as psyllium husk, chia seeds, stevia, and natural salts, provide a comprehensive array of nutrients vital for good health. Psyllium husk facilitates digestive regulation and enhances gut health by supplying soluble fiber, which aids in preventing constipation and promotes bowel function. Chia seeds are abundant in omega-3 fatty acids, protein, antioxidants, and fiber, promoting cardiovascular health, diminishing inflammation, and providing sustained energy levels. Stevia, a natural sweetener, offers a calorie-free substitute for sugar,

rendering it appropriate for persons controlling diabetes or hypertension. Moreover, minerals like potassium, magnesium, and sodium are essential for sustaining electrolyte equilibrium, muscular function, and neurological well-being. This drink enhances general well-being, supports digestive health, and offers a better alternative to sugary and carbonated beverages by integrating essential nutrients into a simple, easily consumable powder.

2.3. Market Analysis

The global health and wellness industry has experienced significant expansion in recent years, propelled by heightened consumer awareness of nutrition, the rise of lifestyle-related health issues, and a transition towards preventative treatment. There exists a significant demand for functional foods and beverages that deliver key nutrients efficiently and conveniently. Recent market research indicates that the demand for dietary supplements, health beverages, and nutritionally enhanced products is projected to expand at a compounded annual growth rate (CAGR) as customers increasingly pursue items that provide immediate health advantages with minimal preparation time.

The powdered drink market is enhanced by advancements in superfood ingredients, such chia seeds, psyllium husk, and stevia, which attract health-conscious consumers seeking plant-based nutrient sources. These substances are prevalent in the wellness sector owing to their acknowledged health advantages, encompassing digestive assistance, antioxidant characteristics, and blood glucose regulation. Brands that emphasize transparency, natural ingredients, and sustainability appeal to contemporary consumers, who are progressively attentive to the quality and sourcing of their food and drinks.

CHAPTER 3
METHODOLOGY

3.1. Samples Collections

First of all, we collected psyllium husk (isabgol), Chia Seed, Stevia, Mix Salt (Sodium Chloride, Potassium Chloride, Rock Salt) as raw material and mint leaves for flavor. Picked stevia and pudina leaves from the garden and washed well with clean water. Now put the mint and stevia leaves in a tray and dry them at a regular sun temperature. Along with psyllium husk (isabgol), chia seed, sodium chloride, potassium chloride, and rock salt collected from the market. So, we needed to refine them, then we dried the chia seeds in the heat of the sun for 1 hour. That drying procedure can dry and remove any dust from the chia seed.

Then collect all the dry ingredients in a zipper bag or an air-tight bag. Since psyllium husk (isabgol) is a dry husk-like material, we cannot melt it directly and it cannot mixed with water directly. So we need to grind all the ingredients one by one with the help of a blender. And Sieve all the blended ingredients with a stainer. For the preparation of experiment, To make 100gm mix salt we used sodium chloride 33.33% potassium chloride 20% and rock salt 46.76%. of another ingredient.

Flowchart For Sample Processing:

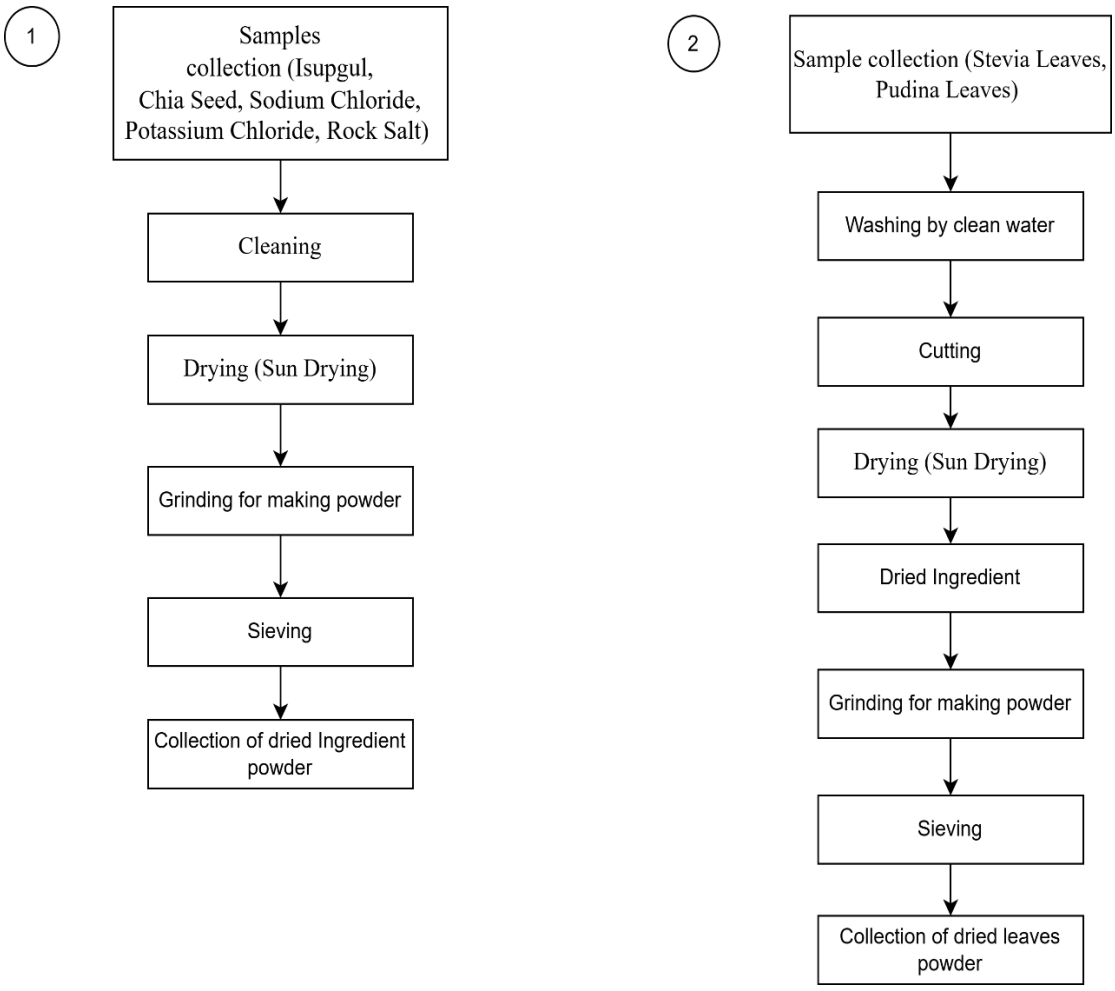


Figure 1: Flow Chart of Sample processing

3.2. Preparation of mixed Organic Powder

We prepared a total of two samples, one unflavored and one flavored. First used to prepare the unflavored sample, A mini packet of psyllium husk (isabgol) 1.5g, Chia Seed 2g, Stevia 1g, Mix Salt 0.5g for a total of 5g. Now it is ready. The packet can be mixed with 250 grams of water and consumed instantly. Then, to prepare the flavored sample, 1 gm of isupgul, 2 gm of chia seed, 1 gm of stevia, 0.5 gm of mix salt were used. Flavor (mint leaf powder) 0.5 gm. Now it is ready. The packet can be mixed with 250 grams of water and consumed instantly.

Table 1: Ingredient and quantity

	ST		SNF	
No	Ingredient	Quantity(gm)	Ingredient	Quantity(gm)
1.	psyllium husk (isabgol)	1.5	psyllium husk (isabgol)	1.5
2.	Chia Seed	2	Chia Seed	2
3.	Stevia	1	Sugar	5.5
4.	Mixed Salt	0.5	Mixed Salt	1
Total		5gm		10 gm

	STF		SF	
No	Ingredient	Quantity(gm)	Ingredient	Quantity(gm)
1.	psyllium husk (isabgol)	1	psyllium husk (isabgol)	1.5
2.	Chia Seed	2	Chia Seed	2
3.	Stevia	1	Sugar	5.2
4.	Mixed Salt	0.5	Mixed Salt	0.8
5.	Flavor (Pudina)	0.5	Flavor (Pudina)	0.5
Total		5gm		10 gm

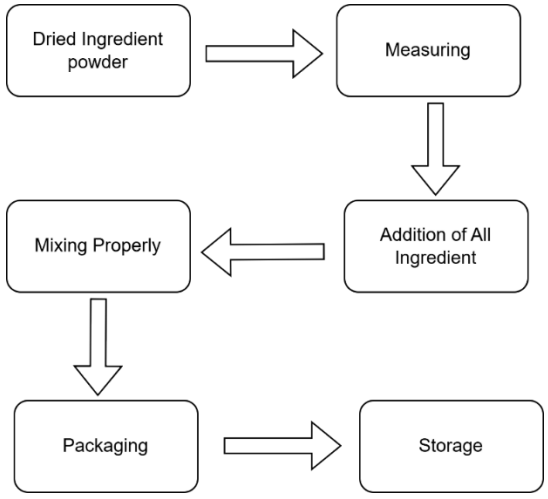


Figure 2: Flow Chart of Organic Powder processing

a) Pudina

b) Stevia

c) Chia Seeds

d) Psyllium husk (isabgol)

e) Sugar

f) Mixed Salt (Rock Salt + Potassum Cloride + Sodium Cloride)

Figure 3: Ingredients of powder drinks

Figure 4: Prepared Sample of ingredients

3.3. Preparation of Drinks

We prepared our mini packet of powdered drinks from the sample, mixed all the ingredients, and made a dry packet. Take any clean water bottle or glass. Now, put 250 grams of water in it and the organic powder drinks with it. Mix it very well, and organic instant dings will be made.

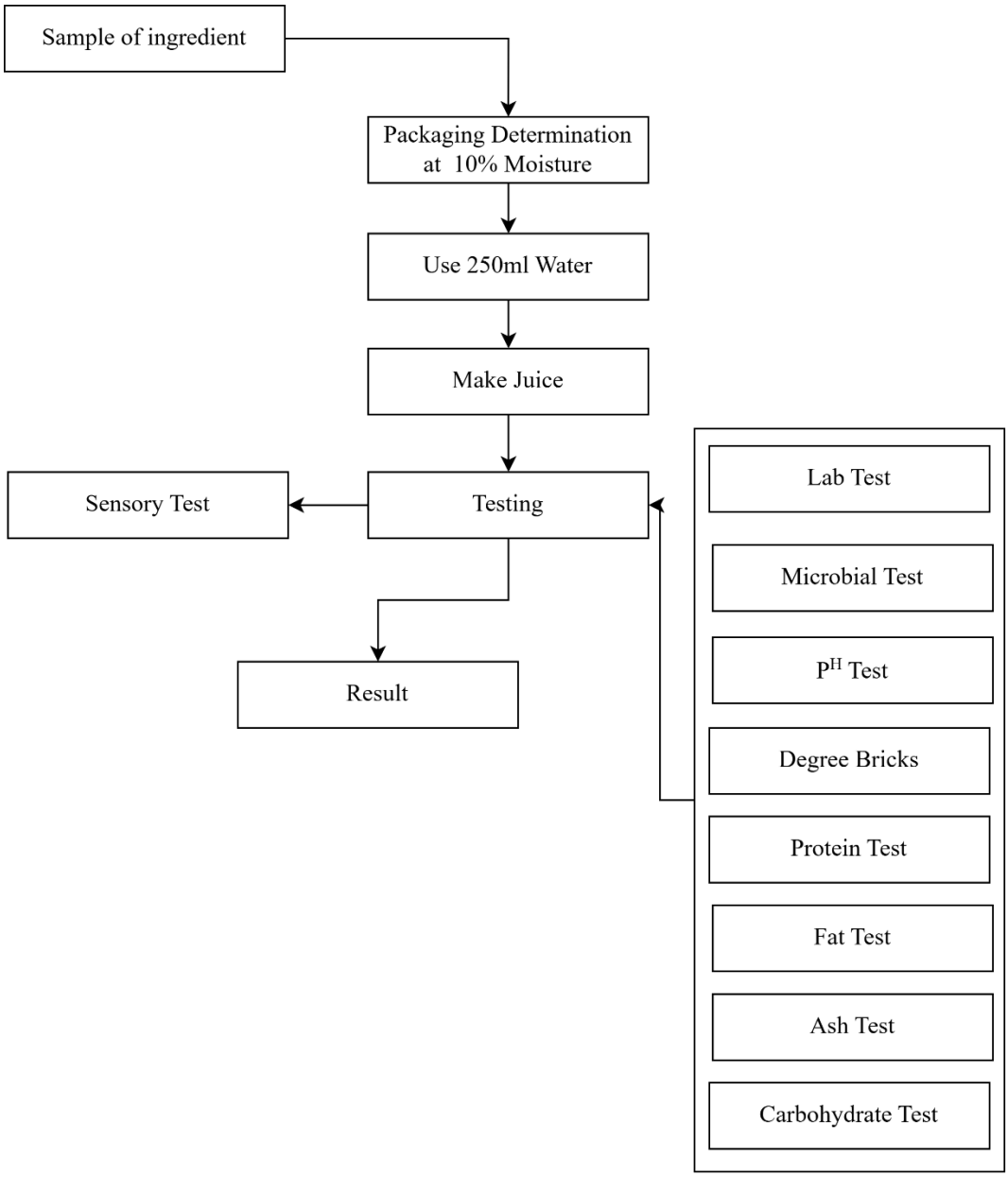


Figure 5: Proposed Method

3.4. Physicochemical Analysis

The proximate analysis includes pH, moisture, ash, microbial content, protein, and lipids, conducted in accordance with the AOAC (2019) method (A.O.A.C, 2001). The carbohydrate content was calculated by deducting total ash, protein, lipids, fibre, and moisture from the overall composition.

3.4.1. Determination of Carbohydrate Content:

The energy value of our Organic Powder was ascertained utilizing the calorific value of the fundamental elements, while the carbohydrate content was evaluated by the differential approach.

$$\textbf{\textit{Total carbohydrate content}}\ (\%) = \mathbf{100} - \textbf{\textit{total values}}\ (\textbf{\textit{moisture}}\ (\%) + \textbf{\textit{ash}}\ (\%) + \textbf{\textit{fat}}\ (\%) + \textbf{\textit{fiber}}\ (\%) + \textbf{\textit{protein}}\ (\%))$$

3.4.2. Analysis of moisture

A moisture analyzer of type MA100 (Sartorius AG, Germany) is used to determine the food powders' moisture content. Each substance is measured three times, with around 2 g of the materials being measured at 105 °C until the weight remains consistent. The samples are kept at room temperature (20 ◦C ± 3 ◦C) with a relative humidity of 60% ± 4%.

Figure 6: Moisture Analyzer

3.4.3 Determination of pH

To ascertain the pH, extract a sample and introduce it into a test tube containing distilled water to form a suspension. The machine then automatically shows the results after the pH

electrode has been inserted into the test tube. For each sample, follow the same steps and record the readings.

Figure 7: PH Meter

3.4.4. Determination of Brix

Use distilled water to clean the prism of the refractometer. A few drops of distilled water should be placed on the prism. To ensure that the water is distributed evenly, close the cover plate. Examine the eyepiece and turn the calibration screw until the Brix value is zero. Put one drop of the candy's solution onto the prism of the refractometer. To distribute the solution across the prism, close the cover plate. Take note of each sample's Brix reading after looking through the eyepiece. To prevent cross-contamination when measuring another sample, rinse the refractometer prism with distilled water in between measurements. I used a hand refractometer that was calibrated to 100.

Figure 8: Refractometer

3.4.5. Assessment of Ash Content

The ash content was analysed using the AOAC 942.05 technique. Position the sanitized crucible in a hot air oven. Dry the crucible at (100-120°C) for 20 min. Place the crucible in a desiccator for 30 min. Weight of the blank crucible and note down. Take 2 gm of sample in the crucible. Now cover the sample with the lid. Position the crucible containing the sample in a muffle furnace at a temperature of 600°C for a duration of 4 hours to eliminate any moisture. Keep the lid slightly in a desiccator to allow moisture to escape. Maintain this temperature until complete combustion of the organic material occurs, leaving behind white or light gray ash. Allow the crucible to cool in a desiccator to prevent environmental moisture absorption. Weight the crucible with the ash using the analytical balance.

The following formula determined the moisture content of the samples:

$$Ash(\%) = weight\ of\ crucible\ with\ ash - weight\ of\ crucible \times 100\ weight\ of\ sample$$

Figure 9: Muffle Furnace

3.4.6. Protein Determination

Digestion: Take 0.5 g of the sample, 10 ml of H_2SO_4, and 2 g of the digestion mixture. Place it in the flask for digestion. Utilise two digestive flasks to ascertain the average value. Heat gradually at first, then gradually for three to four hours. The solution will be completely clear, and there won't be any white smoke from H_2SO_4. Let it cool for a while.

Distillation:

Pour the mixture into a conical flask and add sufficient distilled water to attain the 100 ml mark. Transfer 10 millilitres from the conical flask to the distillation flask, along with 150 millilitres of distilled water and 10 millilitres of 40% sodium hydroxide. Subsequently, fill the trapping conical flask with 50 ml of distilled water, 10 ml of 0.1N HCl, and two drops of 1% methyl red. Utilise three distillation flasks for this procedure, one of which will serve as a blank, meaning it contains no sample. Utilize three trapping solutions in three conical trapping flasks while keeping everything the same. Install the condenser and turn it on. Turn on the distillation unit and let it run for half an hour.

Titration:

Fill 0.1N NaOH into the burette. Titrate three times using three different trapping solutions. Color shifts from pink to light yellow will be the endpoint.

$$Protein\ (\%)\ = \frac{(B - S) \times 1.4 \times 10 \times 6.25 \times 0.1}{Sample\ weight}$$

Where,

B is the titration volume of base.

S is the titration volume of the standard solution.

One factor that explains how nitrogen is converted to protein is 1.4.

When converting the result to a percentage, 10 is a factor.

Because protein contains about sixteen percent nitrogen, a conversion factor of 6.25 is used.

The standard solution used in the titration has a molarity (concentration) of 0.1.

3.4.7. Fat Determination

Finding the Fat: Initially, rinse all glass apparatus with petroleum either, dry it in an oven at 102°C, and subsequently store it in a desiccator. After weighing five grams of the sample, put it in the thimble. The thimble should be put inside the Soxhlet extractor. After cleaning a 150-round-bottom flask, fill it with 90 milliliters of petroleum ether. Place all components on a heating mantle and allow the petroleum ether to reach its boiling point. For several hours, nearly six hours, keep up the extraction process. Let the sample cool after removing the extraction unit's condensing unit. Ultimately, it eliminates all lipids. Almost all of the solvent should be collected after distillation. Insert the sample into the oven.

Then,

$$Fat\ percentage\ (\%) = \frac{W_2 - W_1}{W_S} \times 100$$

Where,

W_s = Weight of sample

W_1 = weight of an empty container

W_2 = weight of an empty container with sample

3.4.8 Determination of Crude Fiber

The fiber content of the formulated sweets was assessed using the AOAC 978.10 technique. Two grams of fatless oven-dehydrated sample were placed in a 1-liter beaker, and 1.25% H_2SO_4 was added until the 200 ml threshold was reached. The mixture was heated on the hotplate with constant agitation for 30 minutes. Distilled water was periodically added to sustain a volume of 200 ml. The solution was filtered using a Buchner funnel and muslin cloth, subsequently washed with distilled water to eliminate acids. The residue was transferred to a 1-liter flask, and 0.33N $NaOH$ solution was added until the volume reached 200 ml. The substances were heated on the hotplate with continuous stirring. The solution was filtered and washed with hot water to eliminate the alkali. The material underwent two alcohol cleanses, three acetone washes, and was then dehydrated at 100°C for 6-7 hours.

The residue was positioned in a crucible and subjected to a muffle furnace for one hour at a temperature of 550°C. The solution was cooled in a desiccator and then reweighed.

$$Fiber\ (\%)\ = \frac{W_1 - W_2}{W_s} \times\ 100$$

Where,

W_s = weight of the sample

W_1 = Weight of unsolvable ingredient (crucible weight + unsolvable ingredient- crucible weight)

W_2 = Ash weight (crucible weight + Ash weight – crucible weight)

3.4.9. Microbial Test

Below the FDA-recommended threshold of 1000 CFU/ml. The concentration of coliform bacteria in the samples varied from 0 to below the 100 CFU/ml threshold mandated by the FDA. The minimal presence of TPC and E. coli in the samples suggests that the raw materials were managed and processed hygienically, yielding favorable outcomes (Marriot, 1997). The results, along with minimal water activity, suggest that the nuts were manufactured under acceptable criteria to guarantee adequate microbiological purity of the product. The sample is hence appropriate for consumption. Food and Drug Administration (FDA), 2013.

The CFU/ml calculation is based on the formula

$$CFU/ml\ = \frac{Number\ of\ Colonies\ \times Dilution\ Factor}{Volume\ Plated\ (ml)}$$

Figure 10: Microbial Test

3.5. Sensory Test

The symmetry and properties of the organic powder were assessed and documented. Drinks were assessed organoleptically for appearance, color, flavor, texture, taste, odor, sweetness, sourness, and overall acceptability. To eliminate biases in sensory evaluation, I employ random coding. These are SNF, ST, SF, and STF. A 1-9 point hedonic rating test was

conducted to evaluate the acceptability of an organic drinks including psyllium husk, chia seeds, stevia, and mixed salts. A cohort of 50 panelists was chosen from among teachers, students, and staff of the Department of Nutrition and Food Engineering at Daffodil International University and was informed about the evaluation approach prior to assessment. Sixty participants were supplied with one glass drink apiece, served as randomly coded samples. The taste panelists were instructed to evaluate the sample based on appearance, color, flavor, texture, taste, odor, sweetness, sourness, and overall acceptability using a 1-9 point hedonic scale, where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely.

CHAPTER 4
RESULTS AND DISCUSSION

4.1. Analysis of Proximate composition of Organic powder drink

Table 2: Physicochemical Analysis

Components	SF	SNF	ST	STF
CHO	67%	52.59%	7.93%	11.53%
Moisture	10.85%	10.36%	9.67%	9.72%
Ash	5.4%	30.8%	67.4%	65.9%
Protein	0	0	0	0
Fat	5.75%	7.25%	14.4%	13.85%
Brix	3	4	1	1
P^H	6.73	6.36	6.36	6.3
Fiber	12%	10%	11%	9%

Microbial Test Report:

Table 3: Microbial Test Report

Sample	10^{-1} (dilution)	10^{-2}	10^{-3}	10^{-4}	10^{-5}
SF	2500	250	25	2	0
SNF	3000	300	30	3	0
ST	2000	200	20	2	0
STF	1800	180	18	2	0

Calculating CFU/mL

The CFU/mL calculation is based on the formula:

$$\frac{CFU}{mL} = \frac{Number\ of\ Colonies \times Dilution\ Factor}{Volume\ Plated\ (mL)}$$

Assuming plated 1mL from each dilution, the CFU/mL for each sample at an ideal countable dilution calculated as follows:

1. SF: CFU/mL = $25 \times 10^3 = 2.5 \times 10^4$

2. SNF: CFU/mL = $30 \times 10^3 = 30 \times 10^4$
3. ST: CFU/mL = $20 \times 10^3 = 2.0 \times 10^4$
4. STF: CFU/mL = $18 \times 10^3 = 1.8 \times 10^4$

4.2. Sensory Test Analysis

The statistically studied outcomes of sensory evolution are presented in Table 4. The findings indicated the approval of the integration of organic powdered beverage. The results reveal that the hue of the drink sample SF was more preferable than that of the other samples. Figure 9 provides a more explicit comparison of the beverage. Regarding flavor, sample SF was equally satisfactory. The green tint of stevia and mint results in considerably poorer acceptability. The texture of the SF was satisfactory. The overall acceptance test indicated that drink sample STF had the best score for healthiness and was similarly acceptable as SNF, whereas drink samples SF and ST received the lowest scores among the beverages. The outcomes of the sensory evaluation of candies are presented in the table below:

Table 4: Sensory Test Analysis

	Appearance (1-9)	Color (1-9)	Flavor (1-9)	Texture (1-9)	Taste (1-9)	Odor (1-9)	Sweetness (1-9)	Sourness (1-9)	Overall Acceptability (1-9)
SF	7.9	8.4	8.4	8.2	8.1	8.2	8.4	1	8.6
SNF	7.7	8.2	8	8	8.4	8.3	8.5	1	8.7
ST	8.1	8.2	8.1	8.1	8.6	8.4	8.6	1	8.8
STF	8.3	8.3	8.3	8.2	8.4	8.3	8.7	1	8.9

SF = Sugar with Flavor, SNF = Sugar with not Flavor, ST=Stevia, STF= Stevia with flavor

Sensory Quality of Organic drinks:

Figure 11: Sensory Test

4.2.1. Appearance

In appearance, it has the highest mean value of 8.3 whereas SNF has the lowest mean value of 7.7 so STF was more acceptable by the panelists in terms of their appearance.

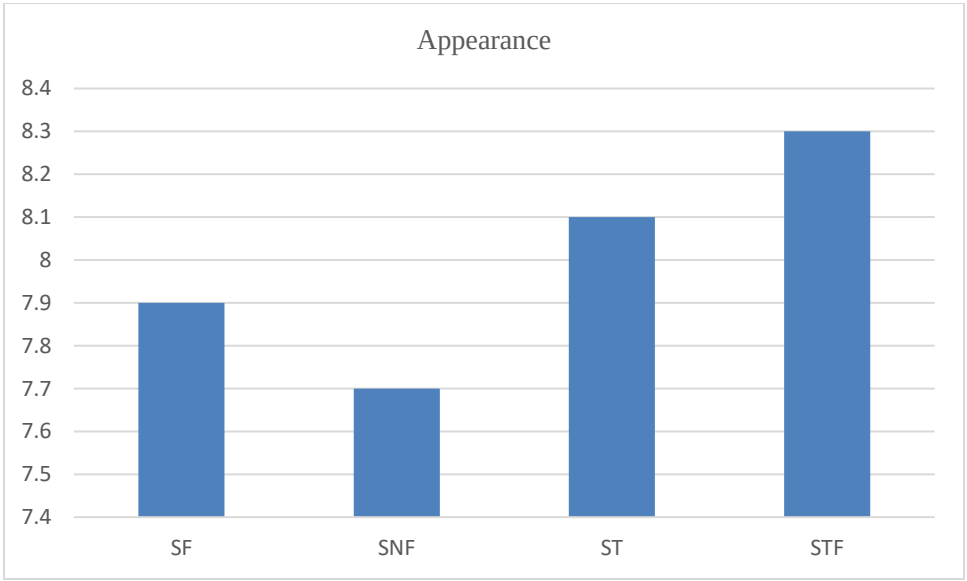


Figure 12: Column indicating discrepancies in appearance

4.2.2. Color

The color exhibited the greatest mean value of 8.4, while SNF and ST recorded the lowest mean value of 8.2, indicating that SF was better favored by the panelists for color acceptance.

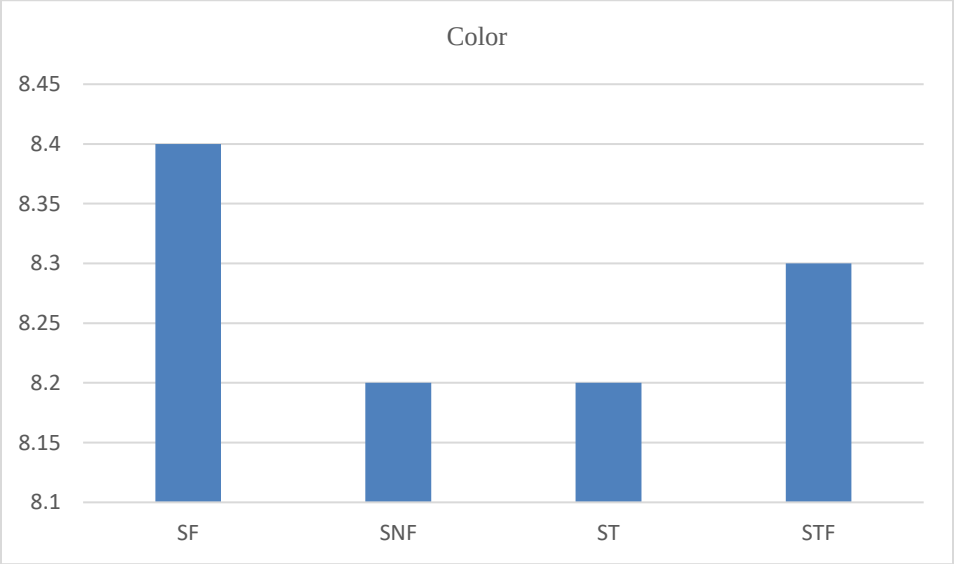


Figure 13: Column displaying color variation

4.2.3. Flavor

Flavor exhibits the greatest mean value of 8.4, while SNF records the lowest mean value of 8; thus, SF was deemed more acceptable by the panelists regarding looks.

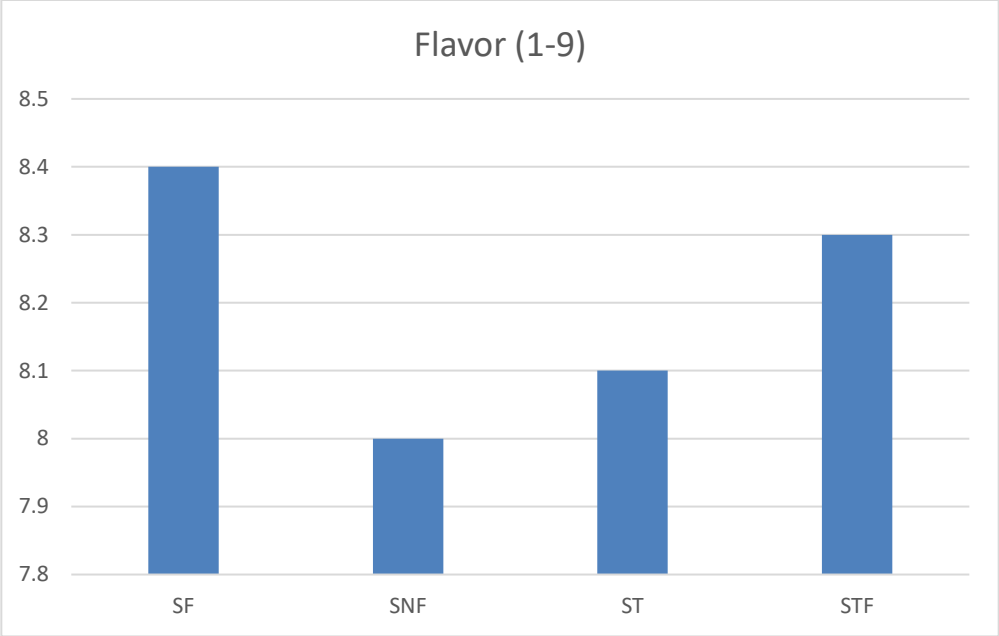


Figure 14: Column showing variation in Flavor

4.2.4 Texture

Texture exhibits the greatest mean value of 8.2, while SNF has the lowest mean value of 8, indicating that SF and STF were more favorably received by the panelists for their texture.

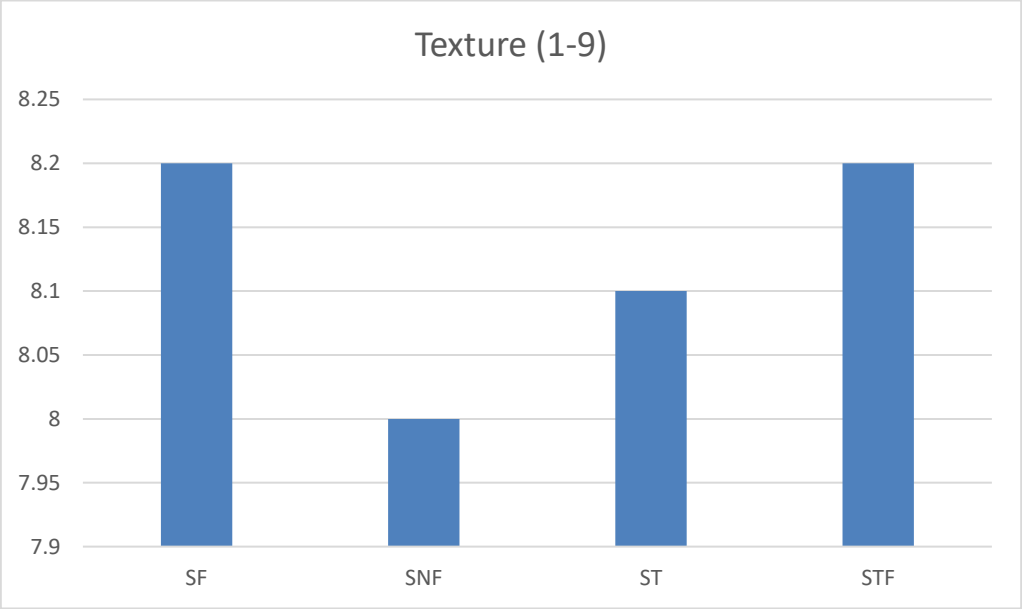


Figure 15: Column displaying variety in texture

4.2.5. Taste

The flavor of ST received the greatest mean value of 8.6, whereas SF attained the lowest mean value of 8.1, indicating that ST was better favored by the panelists for taste.

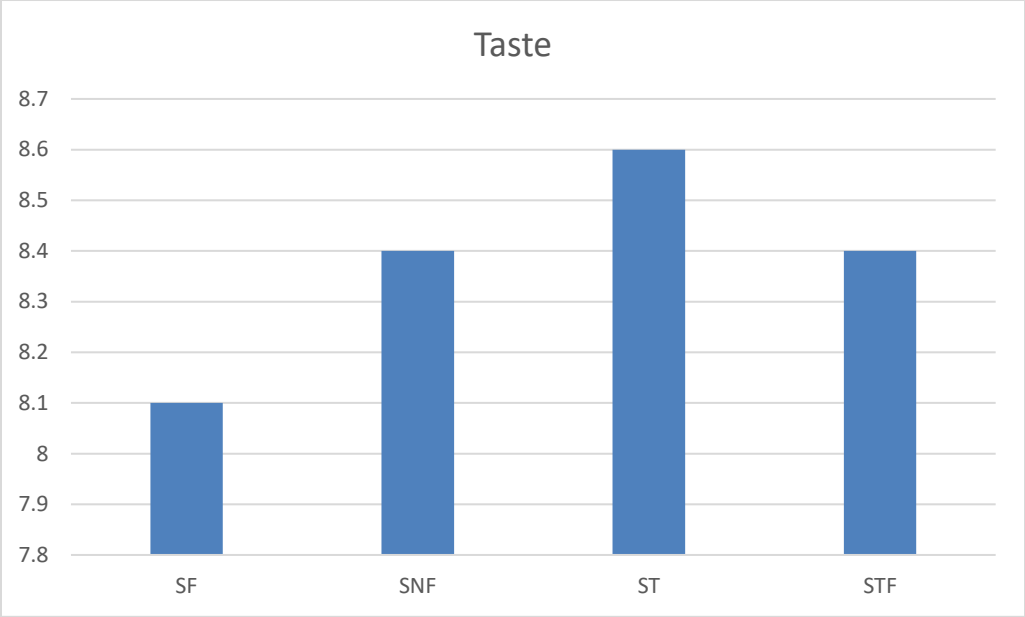


Figure 16: Column indicating fluctuations in flavour

4.2.6. Odor

The odor of ST had the highest mean value of 8.4, whereas SF obtained the lowest mean value of 8.2, indicating that ST was better favored by the panelists for its odor.

Figure 17: Column showing variation in odor

4.2.7. Sweetness

In terms of sweetness, STF exhibited the greatest mean value of 8.7, whereas SF recorded the lowest mean value of 8.4, indicating greater acceptability of STF among the panelists.

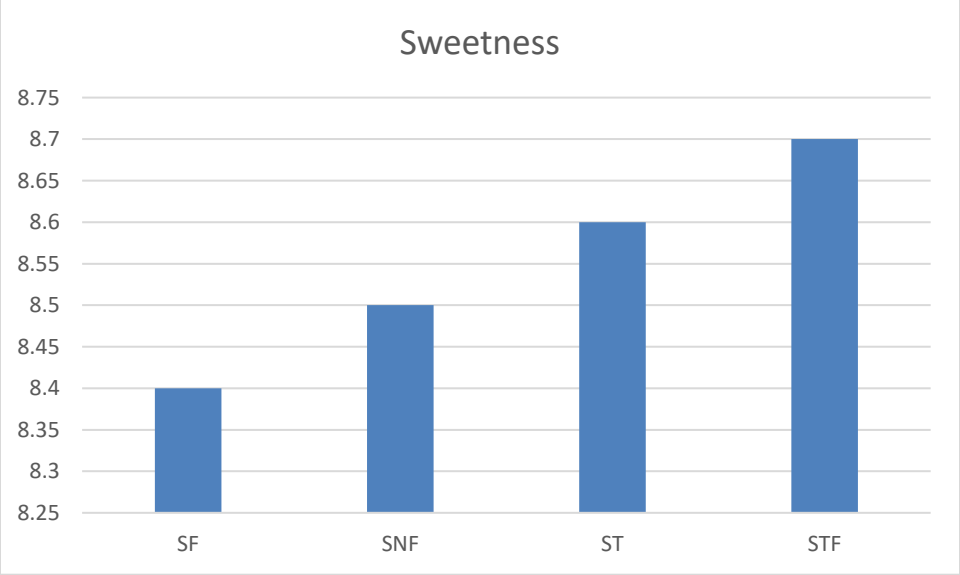


Figure 18: Column indicating fluctuations in sweetness

4.2.8. Sourness

In Sourness, panelists rated the product as 1, as our drink is entirely sweet and contains no sourness.

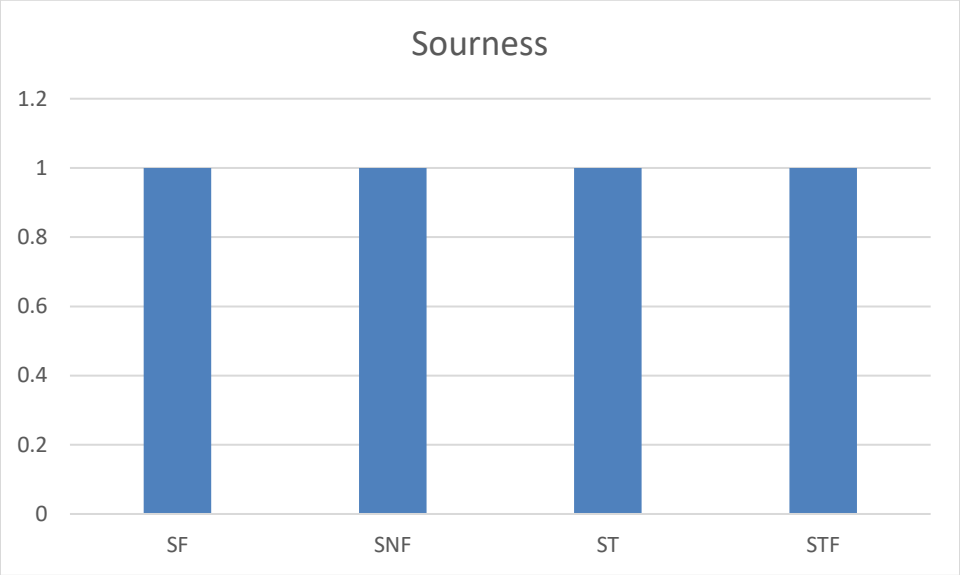


Figure 19: Column showing variation in Sourness

4.2.9 Overall Acceptability

In terms of Overall Acceptability, sugar received a higher value than stevia. The typical mean value for sugar is 8.7 from SNF, while stevia has a mean value of 8.9 STF, indicating flavour. Health-conscious individuals should select STF to avoid sugar for the sake of their well-being. However, individuals engaged in sensory tasting are often unaware of the underlying code.

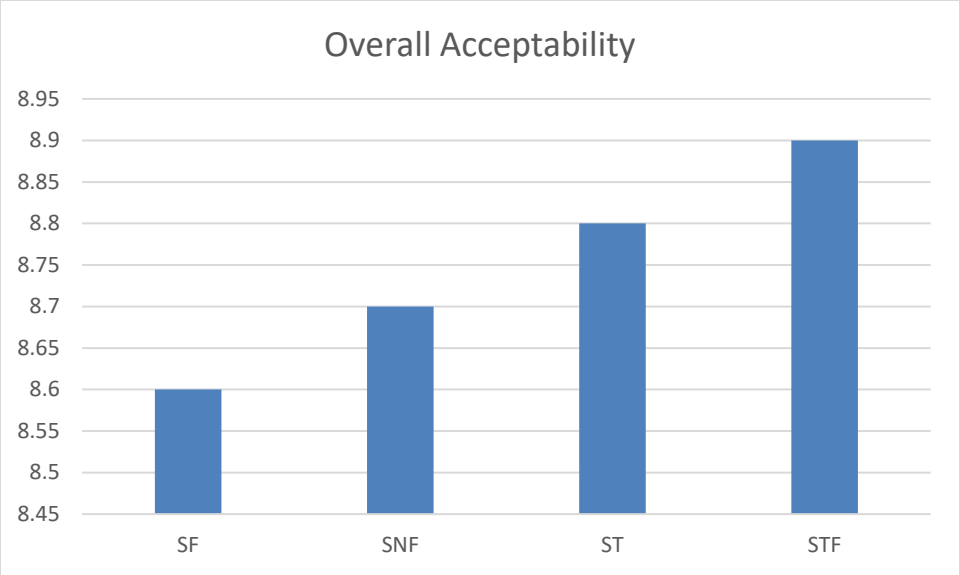


Figure 20: Column indicating fluctuations in Overall Acceptability

CHAPTER 5
CONCLUSION

5.1. Conclusion

The research reveals that the nutrient-dense powdered drinks composed of psyllium husk, chia seeds, stevia, and natural salts effectively address nutritional deficiencies prevalent in modern diets. The beverage offers several health advantages, including digestive management, antioxidant consumption, and enhanced energy levels, serving as a viable substitute for conventional sugary drinks. The analysis of its proximate composition verifies that the beverage is a well-balanced supply of carbohydrates, fiber, and important minerals, rendering it appropriate for daily intake. Sensory evaluations indicate that the stevia formulation with added flavor (STF) attained the highest overall approval, with consumers valuing its flavor, texture, and claimed health benefits. The findings highlight the need for accessible, plant-based nutrient supplements and endorse the powdered drink's capacity to promote improved eating habits and mitigate health issues associated with nutrient deficits and suboptimal dietary selections. This study recommends additional investigation into the long-term health effects of drinks and promotes product innovations in the wellness sector that address contemporary customers' dietary requirements and lifestyle preferences.

5.2. Recommendations

The powdered drink's long-term health benefits and potential dangers should be assessed through extensive clinical research. To cater to diverse consumer tastes and dietary needs, the product should be developed with plant-based flavors, ingredients, and formulations. Targeted consumer education should be implemented to increase awareness of the health benefits of nutrient-dense substitutes. Market accessibility should be increased to cater to high nutritional deficiencies in geography. Sustainability practices should be implemented, reducing manufacturing carbon footprint and using biodegradable materials. Regulatory compliance and quality assurance are crucial for market success and consumer trust.

REFERENCES

Sodium chloride. *Reactions Weekly*, *NA;*(1297), 46. https://doi.org/10.2165/00128415-201012970-00140

A.O.A.C. (2001). Analytical Methods 1 . Moisture content (AOAC , 1999) Method 3 . Biuret method (Robinson and Hodgen , 1940) Reagents. *Wood Chemistry and Wood Biotechnology*, 124–130.

Chen, S., & Luo, X. (2024). Chia seed protein as a promising source for plant-based foods: Functional properties, processing methods and potential food applications. *Applied Food Research*, *4*(2), 100459. https://doi.org/10.1016/j.afres.2024.100459

Dantas, D., Pasquali, M. A., Cavalcanti-Mata, M., Duarte, M. E., & Lisboa, H. M. (2018). Influence of spray drying conditions on the properties of avocado powder drink. *Food Chemistry*, *266*(June), 284–291. https://doi.org/10.1016/j.foodchem.2018.06.016

McMahon, R. S., & Bashir, K. (2023). Potassium Chloride. *Journal of the American Medical Association*, *VII*(4), 91–92. https://doi.org/10.1001/jama.1886.04250070099003

Paul, S., Sharma, K., & Suresh, P. (2019). Study on Pudina (mint) arka prepared by three different methods. *International Journal of Ayurvedic Medicine*, *10*(2), 207–210. https://doi.org/10.47552/ijam.v10i2.1216

RAHMAN, S. (2022). *Development and Quality Evaluation of Mixed Fruits Drinks Powder*. *July*. http://dspace.cvasu.ac.bd/handle/123456789/1357

Ramadani Fitri, N., & Puspitarini Siswanto, A. (2023). Formulation of instant powder drink combination of red ginger and banana peel. *Materials Today: Proceedings*, *87*, 101–105. https://doi.org/10.1016/j.matpr.2023.02.379

Singh, S. P., Soni, R. K., Kumar, R., Breeding, P., & Charan, C. (2007). History , characteristics and chemistry of a nature ’ s sweetener , Stevia (Stevia rebaudiana Bertoni). *Crop Science*, *2*(2), 259–265.

The History of Rock Salt | MaxiSalt. (n.d.). Retrieved November 10, 2024, from https://maxisalt.com/the-history-of-rock-salt/

Tripathi, D., & Tiwari, R. K. (2019). Formulation and Utilization of Isabgol Dietetic

Cookies for Boosting the Digestive Process. *Asian Food Science Journal*, *10*(2), 1–7. https://doi.org/10.9734/afsj/2019/v10i230030

APPENDICES

Appendix 1: Sensory Evaluation Data Set

Department of Nutrition and Food Engineering (NFE)

Thesis Title: **Innovative Powdered Drink Formulation with Psyllium Husk and Chia Seed for Enhanced Health Benefits**

Sensory Evaluation

Gender

☐ Male

☐ Female

Age Group:

☐ 18-25

☐ 26-30

☐ 31-40

☐ 40 Above

Date:

Sample Code:

ST, SNF, SF, STF

Evaluation Parameter	9-Liked Extremely	8-Like very much	7- Like moderately	6- Like slightly	5-Neither like or dislike	4-Dislike slightly	3- Dislike moderately	2-Dislike very much	1-Dislike extremely
Appearance									
Color									
Flavor									
Texture									
Taste									
Odor									
Sweetness									
Sourness									
Overall acceptability									

Signature

Appendix 2: Synopsis

Department of Nutrition and Food Engineering (NFE) Faculty of Health and Life Sciences (FHLS) Daffodil International University (DIU) Daffodil Smart City, Birulia, Savar, Dhaka – 1216, Bangladesh

Synopsis of the thesis: Innovative Powdered Drink Formulation with Psyllium Husk and Chia Seed for Enhanced Health Benefits.

Name: Sumaiya Khatun

ID: 213-34-463

Project title: Innovative Powdered Drink Formulation with Psyllium Husk and Chia Seed for Enhanced Health Benefits.

1. Introduction

In an era of swift technical and industrial progress, personal development and productivity have become essential for numerous people. The escalating demands on time frequently result in insufficient attention to balanced dietary habits, contributing to premature health problems. This trend underscores the necessity of augmenting conventional diets with supplementary nutrients to address deficiencies and foster a healthier lifestyle. Contemporary diets frequently lack the requisite minerals, vitamins, and nutrients important for optimal health. The excessive intake of carbonated and sugary beverages as convenient refreshment alternatives has been associated with numerous health concerns, ranging from metabolic diseases to gastrointestinal troubles. These problems highlight the necessity for accessible, nutrient-dense options that accommodate a rapid lifestyle while fulfilling daily nutritional needs (RAHMAN, 2022).

This study presents a powdered drink designed to fill nutritional deficiencies by offering a handy source of important nutrients. It is composed of a blend of superfoods, including psyllium husk (isabgol) (Tripathi & Tiwari, 2019), chia seeds (Chen & Luo, 2024), stevia, and an assortment of natural salts, each providing distinct health advantages. Psyllium husk regulates bowel function, chia seeds are rich in protein and antioxidants, and stevia provides a calorie-free sweetness suitable for those controlling diabetes and hypertension. This powder readily dissolves in water, providing an immediate nutrient enhancement appropriate for everyday intake.

1.1. Problem Statement

The deficiency of adequate nutrition in contemporary diets, along with the excessive consumption of sugary and processed drinks, constitutes an escalating health issue. Numerous individuals experience deficits in vital minerals and nutrients, which are frequently unaddressed by standard meals. Furthermore, the prevalence of fast food and processed snacks significantly restricts the consumption of essential nutrients, including vitamins, minerals, fiber, and antioxidants. This nutritional deficiency adversely impacts general health and elevates the risk of chronic diseases. Consequently, there is an urgent demand for readily available, nutritious alternatives that deliver essential nutrients to promote a healthy lifestyle, without necessitating significant time or preparation.

1.2. Research Questions or Hypothesis

This study seeks to examine the subsequent research inquiries:

- Can a powdered drink supplement adequately fulfill the daily nutritional deficiencies prevalent in contemporary diets?
- Does the consistent consumption of this powdered drink enhance general health indicators, including energy levels, digestion, and immunity, relative to non-consumers?
- What is the contribution of the specific superfoods in the formulation (e.g., psyllium husk, chia seeds, and stevia) to the health benefits of the drink?

1.3. Objectives

The principal aims of this research are:

- To examine the nutritional deficits prevalent in contemporary diets and evaluate the efficacy of the powdered drink supplement in mitigating these deficiencies.
- To assess the health advantages of the powdered drink derived from its constituents of psyllium husk, chia seeds, stevia, and mixed salts.
- To do a comparison examination of health indicators between people who regularly consume powdered drinks and those who do not.

2. Materials:

2.1. Ingredients

The following materials were collected and prepared for the study:

Raw Materials:

- Psyllium husk (Isabgol): Collected from the market.
- Chia Seed: Purchased from the market and dried in sunlight for 1 hour to ensure cleanliness.
- Stevia Leaves: Picked fresh from the garden, washed thoroughly, and sun-dried.
- Mint Leaves (Pudina): Harvested fresh, washed thoroughly, and sun-dried for flavor.
- Mixed Salt: Comprised of the following salts in specific proportions:
- Sodium Chloride: 33.33%
- Potassium Chloride: 20%
- Rock Salt: 46.76%

Final Preparation:

All ingredients were dried, refined, and ground using a blender. Each powdered ingredient was sieved to ensure uniform consistency before packaging.

2.2. Instrument:

The following instruments and tools were used in the preparation and processing of the samples:

- Blender: Used for grinding psyllium husk, chia seeds, stevia, mint leaves, and mixed salt into fine powders.
- Sieve/Strainer: Utilized to ensure the powder's uniform texture by sieving out any coarse particles.
- Measuring Scale: Used to measure precise quantities of each ingredient for consistency and accuracy in the formulation.
- Tray: For spreading and drying stevia and mint leaves under sunlight.
- Zipper Bags/Air-Tight Containers: For storing dry ingredients and final powder mixtures to maintain freshness and prevent contamination.

- Glass/Water Bottle: For mixing the prepared powder with water during drink preparation.
- Spoon/Stirrer: Used for mixing the powdered drink with water to ensure homogeneity.

3. Methodology:

3.1. Sample Collection

- Psyllium husk (isabgol), chia seeds, and mixed salts (sodium chloride, potassium chloride, rock salt) were procured from the market.
- Fresh stevia and mint leaves were picked from the garden, washed thoroughly with clean water, and sun-dried.
- Chia seeds were additionally dried in sunlight for 1 hour to remove any dust particles.

3.2. Preparation of Ingredients

Drying:

Mint and stevia leaves were dried under sunlight until moisture was fully removed.

All other ingredients were used in their dry form as purchased or after minimal treatment (e.g., sun-drying of chia seeds).

Grinding:

Each ingredient (psyllium husk, chia seeds, stevia leaves, mint leaves, and mixed salts) was ground separately into a fine powder using a blender.

Sieving:

The ground ingredients were passed through a sieve to ensure a uniform and smooth texture.

3.3. Preparation of Powder Mixes

Two samples were prepared:

Unflavored Mix:

Ingredients: 1.5 g psyllium husk, 2 g chia seed, 1 g stevia, 0.5 g mixed salt.

All ingredients were mixed thoroughly to ensure uniformity.

Flavored Mix:

Ingredients: 1 g psyllium husk, 2 g chia seed, 1 g stevia, 0.5 g mixed salt, and 0.5 g mint leaf powder.

The ingredients were combined and mixed uniformly.

3.4. Packaging

The prepared powder mixes were packed in 5 g portions into air-tight zipper bags for storage and ease of use.

3.5. Preparation of Instant Drink

- Take a packet of the prepared powder mix (5 g).
- Add the powder to 250 g of clean water in a glass or bottle.
- Stir or shake well to dissolve the powder completely.
- The organic instant drink is now ready for consumption.

4. Place of the Study:

Food Processing Lab, Department of Nutrition and Food Engineering, Daffodil International University.

5. Period of the Study:

I started my project work on 15 February 2024.

6. Supervisions:

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

7. Expected Outcome:

- Development of Organic Instant Drinks
- Preparation and Consumption
- Health Benefits
- Consistency and Stability
- Consumer Appeal

8. Conclusion:

The study successfully developed two variations of an organic instant drink mix, one unflavored and the other flavored with mint. By using natural and minimally processed ingredients such as psyllium husk, chia seeds, stevia, and mixed salts, the products

emphasize health and convenience. The preparation process ensured uniform consistency and stability through careful drying, grinding, and sieving.

The unflavored drink offers a simple, functional option, while the mint-flavored variant adds a refreshing taste. Both mixes can be easily dissolved in water, making them ideal for busy lifestyles. This project demonstrates the potential of combining traditional, natural ingredients with modern convenience, offering a health-oriented, organic alternative to commercially available instant drinks.

Future research could explore consumer preferences, shelf-life testing, and scaling production for market availability.

References

S. RAHMAN, "Development and Quality Evaluation of Mixed Fruits Drinks Powder," no. July, 2022, [Online]. Available: http://dspace.cvasu.ac.bd/handle/123456789/1357

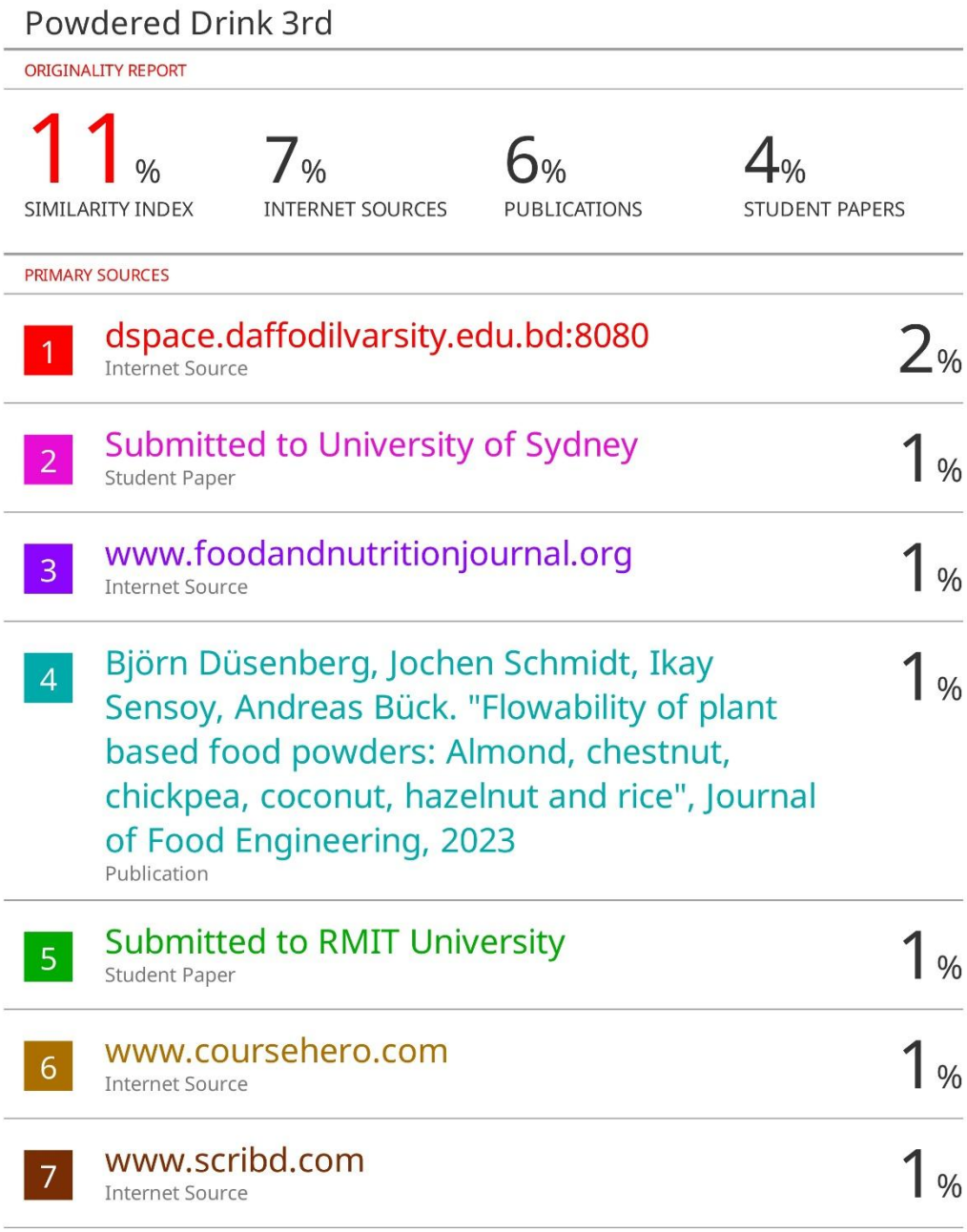
D. Tripathi and R. K. Tiwari, "Formulation and Utilization of Isabgol Dietetic Cookies for Boosting the Digestive Process," *Asian Food Sci. J.*, vol. 10, no. 2, pp. 1–7, 2019, doi: 10.9734/afsj/2019/v10i230030.

S. Chen and X. Luo, "Chia seed protein as a promising source for plant-based foods: Functional properties, processing methods and potential food applications," *Appl. Food Res.*, vol. 4, no. 2, p. 100459, 2024, doi: 10.1016/j.afres.2024.100459.

Signature of Supervisor and Student

…… **Signature of Supervisor** **Dr. Nizam Uddin** Associate Professor & Head Department of Nutrition and Food Engineering (NFE) Faculty of Health and Life Sciences (FHLS) Daffodil International University	…… **Signature of Student** **Sumaiya Khatun** ID: 213-34-463 Department of Nutrition and Food Engineering (NFE) Faculty of Health and Life Sciences (FHLS) Daffodil International University

Appendix 3: Plagiarism Report



Powdered Drink 3rd

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