PLAIN CAKE DEVELOPMENT ENRICHED WITH CHICKPEAS & HYACINTH BEAN SEED FLOUR

A PROJECT REPORT

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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 "**plain cake development enriched with chickpeas & hyacinth bean seed flour**" submitted by **Md. Zahedul Haque** 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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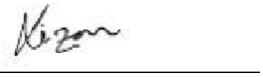

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DECLARATION

I hereby declare that this project has been done by us under the supervision of **Jewel Rana, Assistant Professor**, Department of Nutrition and Food Engineering, 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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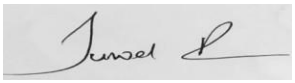

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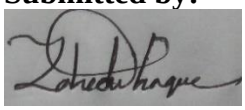

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ABSTRACT

In recent years, food researchers aimed to produce more nutritious food in affordable price. As the cost of animal protein has gone up in our country, vegetable protein can be a cheaper alternative. So in this study, chickpea and hyacinth bean seed flour were used to increase the nutrient value of plain cake as plant protein source. Chickpeas and hyacinth bean seed flour contain more nutrients than wheat flour. Five different proportions of chickpea and hyacinth bean seed flour have been used. 15 to 35 grams of chickpeas and 15 to 25 grams of hyacinth bean seed flour have been used. Chickpea and hyacinth bean seed flour can be used in a maximum ratio of 25:15. If more is used, the cake's quality tended to deteriorate. The main objective of this study was to develop a new type of cake using chickpeas and hyacinth bean seed flour as a source of plant's protein and to evaluate its consumer acceptability by evaluating its physiochemical and sensory properties.This cake contain 24.1% Moisture, 3.23% Ash, 31.23%Protein, 20% Crude Fat, 3.75% Crude Fiber and 21.44% Carbohydrate. Which are more than the commercial plain cake in the market. The cake had a shelf life of four days without the use of any chemical preservatives.

(**Keywords**: Cake, Chickpeas, Hyacinth bean seed flour, Nutrients, Shelf life)

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CHAPTER: I
INTRODUCTION

In a developing country like Bangladesh, the importance of readily available, affordable and highly nutritious food is immense. Because it is very difficult to provide accessible nutritious food for all at an affordable price in this country with the poorest population. Since a large proportion of the country's population is poor, there is no readily available cheap and nutritious food option to meet their nutritional needs. Bangladesh is well known for having a protein shortfall in human nutrition, as do other developing nations where there are not enough animal proteins. Numerous research are being conducted to determine how much traditional protein may be added to diets by utilizing alternative protein sources like vegetables or other sources. Legumes (Leguminosae or Fabaceae) are inexpensive sources of plant protein that are almost complete in all of the essential amino acids. Therefore, various food products made from chickpeas and hyacinth bean seed with high nutritional value can be substituted.

The chickpea (Cicer arietinum) is an annual legume in the Fabaceae family, subfamily faboideae. Its various varieties are known as gram or Bengal gram, garbanzo or garbanzo bean, or Egyptian pea. Chickpea seeds contain a lot of protein. It is one of the oldest cultivated legumes, with 9500-year-old remains discovered in the Middle East. Chickpeas are a nutrient-dense food, with a high content (20% or higher of the DV) of protein, dietary fiber, folate, and certain dietary minerals like iron and phosphorus in a 100gram serving (see adjacent nutrition table). Thiamin, vitamin B6, magnesium, and zinc levels are moderate, supplying 10-16% of the daily value. Proteins in cooked and germinated chickpeas are high in essential amino acids such as lysine, isoleucine, tryptophan, and total aromatic amino acids when compared to reference levels established by the United Nations Food and Agriculture Organization and World Health Organization. Chickpeas can be eaten in various ways like boiled, roasted,cooked as dal, soaked in water, raw and made into halwa. (Rachwa, 2015)

Hyacinth bean seed (Lablab purpureus seed) is a legume that is grown for its green pods. It is a member of the Fabaceae Leguminosae family. Egyptian Bean, Hyacinth Bean, Field Bean, Indian Bean, Lablab Bean, Musical Bean, Tonga Bean, Sweet Pulse, and Wild Bean are some other names for it.The tropical plant is widely grown in North Africa and Asia. It's a trailing or twining herb. The pods measure 4 to 5 cm in length. It is used to grow vegetables. It has a strong nutty aroma as well as a sweet flavor. Hyacinth beans come in four varieties: White Flower, Purple Flower, Asia Purple, and Asia White. It can be eaten by cooked as dal and roasted. Raw, immature hyacinth pods have 46 calories per 100 g, whereas dry mature seeds have 344 calories. Dry hyacinth beans have a protein content of 23.90 g, or 44% of the RDA. Among pole beans, dry lablab beans are very high in dietary fiber. 100 g dry beans contain 25.6 g of fiber, or 64% of the daily value. Dietary fiber acts as a bulk laxative, reducing the time the colon mucosa is exposed to toxic substances and binding to cancer-causing chemicals in the colon. Dietary fiber has been shown to lower blood cholesterol levels by reducing the

reabsorption of cholesterol-binding bile acids in the colon. Hyacinth beans are a gluten-free food. They are frequently recommended as a gluten-free protein alternative**.** (Ademola, 2017)

A balanced diet rich in nutrients plays an important role in protecting human health. Various components of food like proteins, carbohydrates, fats, vitamins and minerals provide energy to the human body, repair, and maintenance of body tissues and for the regulation of vital processes. Considering the increased demand, the importance of food production, processing and preservation is increasing in different countries of the world. Food technologists are constantly trying to introduce new food products to consumers in order to meet the increased demand. Food industries are constantly working to bring out new types of products with different flavors to there consumers.

Foods from bakeries are very well-liked worldwide. Popularly the world's largest food industry are those that produce baked goods. The demand for bakery goods (such as bread, cake, and biscuits) is rising daily. Cake is a very popular food in bakery industries. As a light snack, cakes are very popular with everyone from children to the elderly. Cake cutting is customary on various cultural occasions, birthdays and wedding anniversaries. Wheat flour is one of the major ingredients used for cake preparation.The common ingredients of cakes are flour, shortening agent, leavening agent, sweetener, egg, color, flavor and salt. Apart from this, chocolate and different types of dry fruits are also used in making cakes.

There are commercially available cakes enhanced with various functional ingredients.The slightly replacement of wheat flour with chickpeas and hyacinth bean flour results in significant changes in the quantitative and qualitative properties of finished baking products, which directly affect the functional properties. Alternative efforts can be made to increase the nutritional value of the cake by using chickpeas and hyacinth bean flour. Consumers not only eat to fill their stomachs but also expect their nutritional needs to increase immunity and performance by consuming foods. Chickpea and hyacinth bean flour contain substantial amounts of protein fiber and minerals, Which helps to keep the human body healthy by meeting its nutritional needs. Attempts have been made in the past to improve the quality of cake by using different ingredients. But making a cake with chickpeas and hyacinth bean flour s is an exceptional endeavor.

Aim And objectives

- To development of new variety of Cake.
- To increase the nutritional value.
- To learn about determining the nutrients by different proximate analysis.
- To verify overall acceptability.

CHAPTER: II
LITERATURE REVIEW

The history of cake spans many nations and civilizations and goes back thousands of years.The idea of creating sweet delicacies that resemble cakes can be seen in ancient civilizations. It is documented that honey, fruits, and nuts were used to sweeten breads in Egypt and Greece. These early "cakes" resembled current fruitcakes more than traditional cakes.

Influence of Rome: By perfecting baking methods, the ancient Romans made a contribution to the history of cakes. They began using eggs as a binding ingredient, which produced lighter, more delicate cakes. They also perfected the skill of creating multi-layered cakes, which are frequently served at weddings and other special events.

Middle Ages: During this time, the idea of cake changed in many parts of Europe. The word "cake" itself from an Old Norse word, "kaka." Honey was frequently used to sweeten cakes, and nuts, dried fruit, and spices were added for flavor. Renaissance: By the 17th century, ingredients and baking technology had advanced, and more recognizable cake recipes had appeared. Alcohol was frequently used to flavor cakes, and layers of fruits and nuts were added. Cake baking was significantly altered by the introduction of refined sugar.

18th and 19th Centuries: During these centuries: Innovations in baking powder and the availability of inexpensive cast iron furnaces changed baking. Butter cakes, sponge cakes, and pound cakes were popular as a result. Baking trays and molds also developed, allowing for a wider range of forms and dimensions.

Technology advancements throughout the Industrial Revolution made ingredients more readily available and reasonably priced. Baking techniques grew more standardized, and cookbooks became a common source for cake recipes. Cakes were frequently offered at weddings and birthday parties and came to represent celebration.

Boxed cake mixes first became available in the 20th century, making baking easier for many households. In this time period, well-known cakes including the Black Forest cake, Red Velvet cake, and Angel Food cake also gained popularity.

In the present day, detailed fondant decorations, sculpted cakes, and sophisticated designs have made modern cake creation a form of art. Specialty cakes provide vegan, gluten-free, and allergen-free versions to accommodate different dietary requirements. Cakes have developed throughout history from straightforward bread-like sweets to the intricate and beautiful marvels we see today. They have contributed significantly to cultural festivities and traditions all around the world, reflecting changes in baking methods, ingredients, and social mores through the ages.

Various researches have been done on the nutritional development of cakes. Various studies have been conducted to improve the color, flavor and texture of cakes using different types of fruits, dry fruits, vegetables, chocolates, cream and other ingredients. However, the use of vegetable protein as an alternative is an exceptional initiative due to the rising cost of animal protein.There is very little research on the uses of whole grain pulses and bean seeds as sources of vegetable protein in cake as bakery product.

Subagio and Morita (2008) made an experiment on Effects of Protein Isolate from Hyacinth Beans (Lablab purpureus(L.)Sweet) Seeds on Cake Characteristics. They observed various characteristics of cake using 1% protein isolate of hyacinth bean seed. They used 0.5%,0.75%, and 1% of protein isolate of hyacinth bean seed. This increase the loaf volume, specific volume, soften the texture, and improve the overall preference. when protein isolate of more than 1% was added, these properties tended to decrease compared with the cake with 1% isolate.

Lofty,Nawar,Raslan(2020) They made another research on Nutritive Value, Protein Quality and Acceptability of Rice Cakes Fortified with Legumes. They used Rice, Chickpeas, Lentil, White Beans to increase the nutrient value like protein and acceptability. rice cakes were prepared by supplementing with 20%and 40% of chickpea, lentil, and white beans flours. Supplementation resulted a significant different increase in protein and amino acids contents especially in lysine and threonine contents, Very few studies are available where pulses have been used in cake preparation. By using different types of pulses such as chickpeas and hyacinth bean seed together, the nutritional value of the cake can be greatly changed.

Grain legumes known as chickpeas are often farmed in temperate and semiarid climates. It differs from wheat flour in that it has less glucose and more protein, fat, vitamins, and fiber. Increase the quantity of protein that is available for intestinal digestion by heating the protein. Chickpeas can improve a food's nutritional value and lower the amount of acrylamide it contains. A chemical known as acrylamide is antinutritional and can be found in meals like chips, bread, and snacks. A novel approach to lowering the amount of acrylamide in such goods may involve chickpea protein and flour. Chickpea flour is added, and this changes the sensory and texture qualities

Chickpeas' iron, calcium, and other nutrients can all help to maintain healthy bone structure and strength. Chickpeas, for example, can be included in the diet of people who want to prevent osteoporosis. Chickpeas contain fiber, potassium, B vitamins, iron, magnesium, and selenium, all of which promote heart health. A cup of chickpeas contains 70.2 mg of choline, which aids in the function of the brain and nervous system. Choline affects mood, muscle control, learning and memory, and the body's metabolism.

Table 1: Comparison between chickpeas and wheat flour

Chemical properties	Chickpeas flour	Wheat flour
Moisture %	9.35±0.09	12.92±1.82
Dry matter %	90.63±0.09	87.06±1.82
Protein %	21.7±1.75	14.88±0.75
Fat %	5.81±0.35	1.73±0.17
Ash %	3.46±0.33	0.98±0.55
Amylose %	20.78±0.28	15.54±0.18
Total carbohydrate %	59.66±1.63	69.47±3.01
pH	6.43±0.02	5.38±0.37

When wheat flour and chickpea flour are compared chemically, chickpea flour has a higher proportion of protein, fat, ash, and fiber. Additionally, the mineral content of chickpea flour is higher, both in the case of potassium, calcium, sodium, and other macronutrients, magnesium, as well as copper, iron, and zinc as micronutrients. According to certain sources, chickpea is also characterized by having a low glycemic index. The characteristics of chickpea flour include it contains carbs with a lesser availability, and after a meal made with chickpea flour had a lower blood glucose level than in the case of items made with wheat flour**.** (Parimalavalli, 2014)

The lablab bean, Lablab purpureus , formerly known as Dolichos lablab L., is a member of the Fabaceae family of legumes, which attracts the interest of researchers due to the fact that its seeds and pods contain 20%–28% protein. This is popularly known as the hyacinth bean, Sim bean, Tonga bean, Val bean, horse bean, "Indian butter bean," and "Egyptian kidney bean" and is thought to have originated in India . A good supply of carbs, proteins, vital amino acids, and fiber is lablab beans. In Southeast Asian nations, the dry bean seeds are frequently used to make a variety of meals, including hot curries, dahl, and boiled and mashed sweet dishes with bananas. roasted beans

are employed in restaurants, homes, and food processing businesses. Due to the fact that dry beans have more nutrients per volume than cereals in recent years, the researcher has become increasingly interested in their functional qualities in order to better understand how different processing parameters interact with one another. Bakery goods can use the dry bean seed flour.

Table 2: Comparison between hyacinth bean seed flour and wheat flour

Parameters	Dry bean seed flour(g /100g)a	Wheat flour (g /100 g) a
Moisture	10.96 ± 0.18	11.2 ± 0.08
Protein	23.2 ± 0.22	11.6 ± 0.5
Fat	1.2 ± 0.17	1.4 ± 0.09
Crude fiber	1.8 ± 0.08	0.78 ± 0.02
Ash	3.1 ± 0.03	0.7 ± 0.06
Carbohydrate	59.74 ± 0.09	74.32 ± 0.03

The table displays the approximate composition of wheat flour and dry lablab bean seed flour (BSF). The majority of the lablab bean seed flour is made up of wheat flour carbohydrates, which make up roughly 59.74 0.09% of the total. Protein and moisture come in second and third, respectively, with 23.2 0.22% and 10.96 0.18%. These findings concur with those of other research. By including several baked goods, the higher protein content in seed flour could offer a significant remedy for malnutrition issues. The ash level of dry bean seed flour was 3.1 0.03, which is greater than wheat flour and indicates more macro- and micronutrient (Rana, 2021)

CHAPTER: III

MATERIALS & METHODS

This study was conducted in the laboratory of Department of the Nutrition And Food Engineering at Daffodil International University (Daffodil Smart City, Ashulia, Savar, Dhaka)

Best quality raw materials was collected from different specialized shop such as Flour, Roosted Chickpeas Flour, Roosted Hyacinth bean seed Flour, Baking powder, Milk from Prince Bazar and Sugar, Vanilla Essence, Egg, Salt, Soybean Oil from Shwapno Super Shop.

3.1.1 List of Ingredients

Wheat Flour**,** Roosted Chickpeas Flour**,** Roosted Hyacinth Bean Seed Flour**,** Sugar**,** Baking Powder**,** Salt**,** Milk (boiled)**,** Vanilla Essence**,** Egg, Soybean Oil

3.1.2 List of Equipments and Apparatus

- Hand Beater
- Dough Mixture
- Oven
- Bowl
- Weighing Machine
- Spoon
- Cake Mold
- Butter paper / Baking paper
- Knife
- Tong
- Strainer
- Toothpick

3.1.3 Procedure

The process was started by cleaning all equipments and apparatus to maintain hygiene. All ingredients were measured according to the recipe. Dry materials such as wheat flour, roosted Chickpeas Flour, Roosted Hyacinth Bean seed Flour, Baking Powder, salt were sieved for several times into a bowl by using a strainer. Took two eggs and separate egg white & egg yolk then put into two different bowl. That was beat separately for sometimes. In egg white bowl sugar was added for three times and beat until that get foamy. Soybean oil and three drops vanilla essence was added in the egg yolk, then beat for well mixing.

Figure No:1 External appearance of Cake

Figure No:2 Internal appearance of Cake

This two mixture was mixed together into a bowl. Than all dry materials was added gradually and mixed them very carefully by using dough mixture. Boiled liquid milk added and mixed them until the dough gets smooth. A cleaned cake mold took and brushed oil it's internal surface then baking paper was inserted. The previously prepared dough poured into the mold and shake several times for removing of air bubbles. The mold was placed a pre- heated baking oven at 180℃ for 35 to 40 minutes. After 35 minutes a toothpick inserted into the middle of the cake to check if the cake properly baked .When the cake was properly baked ,it brought out from the oven and cooled at room temperat. After cooling the cake cut into required size and put into zipper bag then store this at room temperature

3.2 Flow Chart of Cake Making Procedure

Measuring of all dry and liquid ingredients

⇩

Separation of egg white & egg yolk

⇩

Beating
(Both separately)

⇩

Adding soybean oil and vanilla essence into egg yolk (mixing)

⇩

Adding sugar into egg white
(keep mixing until foamy)

⇩

Mixing of that two mixture

⇩

Adding all dry ingredients (mixing)

⇩

Adding Boiled liquid milk (Keep mixing until smooth texture)

⇩

Molding

⇩

Baking at 180 ℃ for 35 minutes

⇩

De-molding

⇩

Cooling

⇩

Slicing

⇩

Packing
(Zipper bag)

⇩

Storing
(Room temperature)

Table 3: Composition of five different Cake Sample

Ingredients	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Wheat Flour	65 gm	62 gm	60 gm	50 gm	40 gm
Chickpeas flour	15 gm	20 gm	25 gm	30 gm	35 gm
Hyacinth bean seed flour	20 gm	18 gm	15 gm	20 gm	25 gm
Sugar	125 gm	125 gm	125 gm	125 gm	125 gm
Baking powder	10 gm	10 gm	10 gm	10 gm	10 gm
Salt	1 gm	1gm	1gm	1gm	1gm
Boiled Liquid milk	70 ml	70 ml	70 ml	70 ml	70 ml
Egg	2piece	2piece	2piece	2piece	2piece
Soybean oil	12 ml	12 ml	12 ml	12 ml	12 ml
Vanilla essence	0.5ml	0.5ml	0.5ml	0.5ml	0.5ml

3.4 Figure of five different Cake Samples

Sample 1

Sample 2

Sample 3

Sample 4

Sample 5

3.5 Sensory characteristics of five different cake sample

Five cake samples were prepared with different compositions. Acceptability was verified by sensory evaluation based on appearance, taste, texture and smell. Appearance, taste, texture and smell of sample number one was fairly good and sample number two was better and three was the best. From sample number four to five its appearance, taste, texture and smell started getting worse. Therefore sample number three is taken as the final product and its necessary proximate analysis is done.

3.6 Proximate Analysis

Proximate analysis stand for a method determine different nutrients value in cake sample. This value shows the nutritional level of final cake sample. This analysis consist of determination of Moisture content by rapid moisture analyzer, Ash content determination by Muffle furnace, Fat content determination by Soxhlet method, Protein content determination by Kjeldahl method, Crude Fiber determination**.** And carbohydrate determination.

3.7 Moisture content determination.

Equipment: Rapid Moisture Analyzer

Figure No:4 Rapid Moisture Analyzer

Procedure

First all the instruments and materials were collected and cleaned. Then on the moisture analyzer and put 2gm of cake sample on sample pan. Closed the machine and run the machine at 100 ℃. When the analyzer beeped, the analysis was complete. Result was noted after finishing the process. When the analysis was done three times by same sample. The reading was noted and the final result was determined by averaging the three reading.

3.8 Ash Content Determination

Materials and Equipment

- Muffle Furnace
- Analytical balance
- Crucible
- Tong
- Desiccator
- Pencil

Figure No:5 Muffle Furnace

Procedure

Muffle furnace were on for pre- heating at 600 ℃. Three pre -dried crucible were taken and marked by pencil like sample A (A1,A2,A3). This crucible measured by analytical balance and note the weight. Then 3gm sample put into that three crucible. When the furnace temperature reached at 600 ℃ the crucibles placed into the muffle furnace for 6 hours for ashing. After 6 hours when the sample being ash completely, the crucibles brought out from muffle furnace by using tong and put into desiccator for cooling. when the cooling was done, the crucibles brought out from the desiccator and took weight by using analytical balance. This reading was noted.

Calculation

% of ash (wet basis) = $\frac{M\ ash}{M\ wet} \times 100$

M ash = mass of the ash sample

M wet = mass of the wet sample

3.9 Fat content Determination

Apparatus and Equipments

- Soxhlet Apparatus
- Heating Mantle
- Analytical Balance
- Draying Oven
- Spatula
- Cotton
- Desiccator
- Tong
- Thimble
- Beaker
- Funnel

Figure No:6 Extraction of fat by Soxhlet apparatus

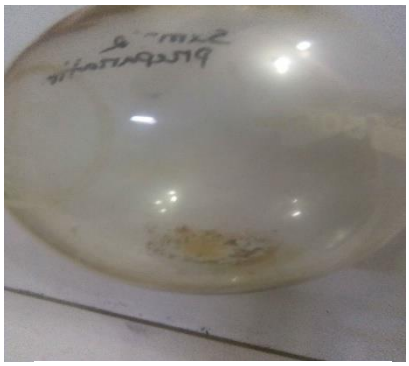


Figure No:7 Fat sample

Chemicals and reagents

- N-Hexane

Procedure

For determination of fat, soxhlet method (AOAC2003.05) was used. The analytical process began with the collection and cleaning of all equipment and instruments. Round bottom flask and thimble was measured after drying and it was noted. Then 2 grams of pre-dried sample was taken inside of thimble and it was closed by cotton. In 500 ml round bottom flask poured 250ml of n-hexane and it placed on a heating mantle. Thimble put inside of extraction chamber and it was placed on round bottom flask. After inserting the condenser on extraction chamber, It was stuck with the help of stand and holder. Then the water flow and the heating mantle turned on. When the heat reach the boiling point of n-hexane, it turns into vapor and run inside the side tube of extraction chamber. Then turns back into liquid by the contact of condenser. Solvent (n -hexane) drop on the food sample and dissolve the fat of food sample. In this way, when the solvent filled a certain area of the extraction chamber, it turns back into round bottom flask by siphon tube. This process continues for 6 hours. After 6 hours when the extraction is complete, Excess solvent is collected by distillation. Some amount of solvent along with the fat retain at the bottom of the round bottom flask. Then the round bottom flask and thimble was dried by drying oven and cooled by using desiccator. It was reweigh and note down the reading.

Calculation

Crude Fat %= $\frac{W2-W1}{Ws} \times 100$

Ws= Weight of sample W1= Weight of flask W2= Weight of flask with fat

3.10 Protein content determination

Apparatus and Equipments

- Kjeldahl apparatus
- Analytical balance
- Pipette
- Burette
- Spatula
- Conical flask
- Dropper
- Beaker
- Funnel
- Acid proof hand gloves
- Mask
- Safety Goggles

Figure No:8 Digestion of cake sample

Chemicals/reagents

- Sulfuric Acid
- Digestion Mix (2%CuSo4+98%K2So4)
- 40% NaOH Solution
- 0.1N HCL
- Methyl Red Indicator
- 0.1 N NaOH Solution
- Distilled Water

Procedure

For determination of protein content, kjeldahl method was used and this method consists of three steps such as digestion, distillation and titration.

Digestion

All equipment was collected and cleaned for analysis. 0.4 gm cake sample and 2 gm digestion mix (2%CuSo4+98%K2So4) measured by using analytical balance. that poured into the digestion flask. 10ml concentrated H2SO4 (98%) measured by pipette and poured into digestion flask. Three digestion flask were placed on heating block so that average value can be taken. First the heat was applied at a low temperature and then the temperature was gradually increased. After 3-4 hours or when the end point have no white smoke and the solution gets crystal clear, off the process and the flask was left for cooling.

Distillation

Digested sample poured into a volumetric flask and were make 100ml by adding distilled water. 150 ml distilled water, 10 ml 40% NaOH solution taken into trapping flask. Took 10 ml digested dilute solution into distillation flask. 50 ml distilled water, 10 ml 0.1N HCl solution and 2 drops of methyl red (1%)in the trapping conical flask. Three distillation flask used for this procedure where one of them was blank, no sample, only took 150 ml 40%NaOH. Used three trapping solution in 3 trapping conical flasks remaining the same thing. After placing the distillation flask and trapping conical flask in place the condenser was installed. The process was then run for 30 minutes with the heating block turned on.

Titration

A burette was taken for titration and filled with 0.1 normal sodium hydroxide solution. Titration were performed three time with three trapping solution and the endpoint color change from Pink to light yellow.

Calculation

$$N\% = \frac{V1 \times N1 \times F1 \times Mwn}{Ws \times 10}$$

Crude Protein %= N%Factor× $F2$

Ws=Weight of Sample

V1=Volume of HCL

N1=Normality of HCL

F1=Acid Factor

F2=Dilution Factor

Mwn=Molecular Mass of Nitrogen

or $\{(B-S) \times 1.4 \times 10 \times 5.95 \times 0.1)\} \div$Sample Weight

3.11 Crude fiber determination

Step 1 Boiling in acid

Step 2 Boiling in base

Step 3 Drying Fiber

Step 4 Incineration of fiber

Figure No:9 Boiling of Fiber

Apparatus And Equipments

- Analytical Balance
- Muffle Furnace
- Hot plate
- Hot air oven
- Measuring Cylinder
- Funnel
- Conical flask
- Beaker
- Crucible
- Spatula
- Muslin cloth /Cotton cloth
- Marker pen
- Mask
- Safety Goggles

Figure No:10 Filtering of Fiber

Chemicals/reagents

- 0.128 M H_2SO_4 Solution
- 0.313 M NaOH Solution

Procedure

To determine the crude fiber of cake sample AOAC: 978.10 method was used. This method consists of four steps.

Boiling in Acid

200 ml 0.128M H_2SO_4 solution were taken into a conical flask. 2 gm sample took into that conical flask and mixed well. Then boiled for 30 minutes by using hot plate. That was shake sometimes. A funnel was placed on a conical flask with muslin cloth. After 30 minutes that boiled solution poured on that funnel for filtration. Rinsed that conical flask with hot water and poured on that funnel.

Boiling in Base

200ml 0.313 M of sodium hydroxide solution was taken in a conical flask. This is sodium hydroxide solution poured slowly on previously filtered fiber, so that it enters into a conical flask. Again that conical flask was boiled for 30 minutes. Sometimes it stirred. After 30 minutes again that was filtered by using muslin cloth. Rinsed that conical flask by hot water and poured on that muslin cloth that was used for filter. Some hot water poured on that filter cloth cause of removing of sodium hydroxide residue.Then the fiber was collected into a previously measured crucible.

Drying of Fiber

A hot air oven was introduced for drying of fiber. when the temperature reach 130 ℃ the crucible was placed into that hot air oven for 2 hours. After 2 hours when the fiber was completely dried, it brought out from oven and placed into a desiccator for cooling. After cooling it was measured by using analytical balance.

Incineration of fiber

Then the crucible was placed into a pre-heated muffle furnace at 550 ℃ for 2 hours. After 2 hours the crucible was brought out from muffle furnace buy using tong. Then it placed into a desiccator again for cooling. When it was properly cooled, that measured by an analytical balance.

Calculation

% of Crude Fiber $= \frac{W1-W2}{Ws} \times 100$

Weight of sample = Ws

Weight of crucible with fiber = W1

Weight of crucible with ash =W2

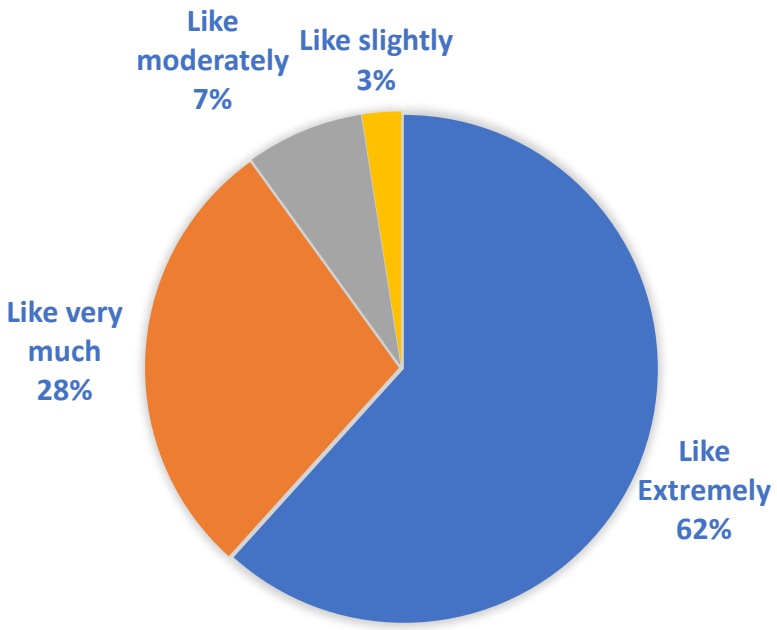
3.12 Carbohydrate

The carbohydrate was calculated using a subtract approach.
% of total carbohydrate =100 – (Protein + Fat + Ash + Moisture)

3.13 Sensory Evaluation

A nine-point hedonic scale was used to evaluate the sensory characteristics of numerous cake samples. Sensory aspects of cakes such as texture, flavor, color, taste, appearance and general acceptability are rated by a pannel of five faculty members and twenty five students from Daffodil International University's Department of Nutrition and Food Technology. Each assessor was asked to rate the sample on a scale of " like extremely" to " Dislike extremely. Assessor provide their feedback by observing the Appearance, Flavor, texture and taste of the cake sample.

3.14 Overall Acceptability



CHAPTER: IV
RESULTS & DISCUSSION

Table 4 shows the moisture, ash, protein, crude fat, crude fiber and total carbohydrate content of cake sample. In this cake the moisture content was 24.1% (According to the BDS, the moisture content range from 15% to 25% for plain cake). Ash content was 3.23%. The use of chickpeas and hyacinth bean seed, made this cake higher in protein than other cakes. The protein content was 31.23%. An attempt has been made to keep the fat content of the cake low, So only 12ml soybean oil was used as shortening agent. Also milk and eggs were used so the total crude fat content was 20%. Total crude fiber content was 3.75% in this cake due to the crude fiber content of chickpeas, hyacinth bean seed and wheat flour. Total carbohydrate was 21.44%. And the Table 5 shows the mean score of sensory attributes, This are Appearance 8.1, Taste 7.9, Texture 7.7, Smell 7.6 and the overall acceptability 7.5.

Table 4: The proximate composition of cake sample

Parameters	Sample 3 (% of nutrients)
Moisture	24.1%
Ash	3.23%
Protein	31.23%
Crude Fat	20%
Crude Fiber	3.75%
Carbohydrate	21.44%

Table 5: The mean score of Appearance, Taste, Texture, Smell and Overall Acceptability of cake sample

Particular	Score
Appearance	8.1
Taste	7.9
Texture	7.7
Smell	7.6
Overall Acceptability	7.5

CHAPTER: V
CONCLUSION

Cake is a very popular food product among bakery food products in Bangladesh and all over the world. Weddings, birthdays and various cultural events start with cake cutting and cakes ware widely consumed as a snack. Hence cake is in great demand and has great importance in economy. In increasing the nutritional value of cake considering human health aspects, various additional food ingredients can be added to increase the nutrient value of cake. Cakes may be a useful food item for incorporation of different nutritionally rich functional ingredients in the diet. Addition of fiber and protein to bakery products increase dietary fiber and protein intake and decrease calorie density and total carbohydrate in the bakery products.This research the physio-chemical, nutritional and functional properties of chickpeas and hyacinth bean seed flour cake is studied and replaces wheat flour by chickpeas and hyacinth bean seed flour. It was found that the chickpeas and hyacinth bean seed flour are very good source of protein, mineral and dietary fiber and other nutrients.Therefore, cakes made with chickpeas and hyacinth bean seed flour will play an important role as bakery food products considering the consumer health.

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APPENDICES

Appendix 1: Sensory Evaluation Data Sheet

Panelists	Appearance	Taste	Texture	Smell	Overall Acceptability
1	8	8	8	8	8
2	9	8	7	8	8
3	8	8	7	8	7
4	8	9	8	7	8
5	9	8	8	8	8
6	8	8	7	8	7
7	9	7	8	8	8
8	8	9	7	7	7
9	8	8	7	8	7
10	9	8	7	8	8
11	8	7	8	7	7
12	7	8	7	8	8
13	8	7	8	7	7
14	8	8	7	8	8
15	9	8	8	7	8
16	8	7	7	8	7
17	8	8	8	7	8
18	8	7	8	8	7
19	9	8	9	8	8
20	9	8	8	8	7
21	8	8	7	8	7
22	8	9	8	8	8
23	8	9	8	7	8
24	9	8	7	8	7
25	8	9	8	8	8
26	8	8	8	7	7
27	8	7	8	8	8
28	7	8	8	7	7
29	7	8	8	7	8
30	8	8	8	7	8