



## PROXIMATE ANALYSIS AND CONTRIVANCE OF SALVIA HISPANICA IN VARIOUS RECIPES

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### Abstract

Chia (*Salvia Hispanica L.*) is a little seed which comes from the annual blossoming plant. In recent times, the utilization of chia seeds has stupendously grown because of the increased nutritional and medicinal values. Chia seeds consist of the nutria components such as  $\omega$ -3 fatty acids, polyunsaturated fatty acids, dietary fiber, proteins, vitamins, and some of the minerals. The biological stuffs like antioxidants, such as caffeic acid, rosmarinic acid, myricetin, quercetin, and others also presented in it. The above mentioned components are prevented from the damage of cells of the various body parts, which can yield in disparate types of cancer includes breast, colorectal, liver, and pancreatic. Around the world, the researches were involved in the investigation in benefits of chia seeds in the medicinal, pharmaceutical, Nutraceuticals and food industry. The extraction of chia seeds oil involves various methods, which high lightens the importance of chia seeds in current market. Components presented in chia seeds are obliging in cardio vascular diseases via reducing the blood pressure, platelet assemblage, level of cholesterol and oxidation. Chia seeds also involve in gastro intestinal tract related diseases like diabetes mellitus and constipation, chia seed fiber decreases the blood sugar level and produce bulk to stool. In the present study, considerable overview about the chemical, nutritional composition, antioxidant and anti-microbial activities, alongside the incorporation of chia seeds in various food items were analyzed via the usage of various evaluation methods.

**Keywords:** Chia seeds, Anti-oxidants, Nutria components, Nutraceuticals and Phenolic compounds.

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**Introduction:**

Commonly the seeds were all being cultivated for their beauty and fragrance, as well as their importance in the development of the substances in the medicinal field. Seeds are the entire product from the full grown ovule, after conception by microspores and some thrive within the mother plant. Generally seed plants have a large ascendancy on regular human life. Not only are plants the considerable source of food and medicine, they also determine many other facet of the society, from clothing to industry. Major part of the human calories comes from the seeds category such as cereals, legumes and nuts. Biggest part of the edible oils derived from the seeds category and also some of the beverages, spices and important food additives. Most of the nutrients obtained from the seed's embryo or endosperm of the seeds. Amino acid content and physical properties of the embryo and endosperm of the seeds differs. Chia is the terminology obtained from the word "chain" means "oily" from the Nahuatl Language which is spoken by the central Mexico people. Generally the seeds were all traditionally used as flour, pressed for the oil content.

Chia seeds are fit to be eaten seeds belongs to the *Salvia hispanica*. This seeds were all belongs to the mint family (*Lamiaceae*). Chia seeds were egg shaped and it's out layer looks in gray with black and white stains, having a width about 2 millimeters (Madaan et al., 2020). Chia (*Salvia hispanica*) is an annual blooming plant. These seeds were all called as super foods. Nowadays, black chia seeds cultivated in a huge amount characterized by spiral and barred coloring. Meanwhile the white chia seeds are present in a lower quantity and a bit considerable than black seeds. Chemically chia seed is composed of vegan protein, lipids, carbohydrates and dietary fibers. The latest outcome of various researches shows the result that chia seeds have a extra ordinary nutritional profile and wide health-boosting characteristics (Grancieri et al., 2019).

This present study carried out with the chia seed, which was rich in healthy fats, protein and dietary fiber. Seeds were all purchased from the local supermarkets presented in Madurai District. For the maintenance of quality throughout the study the same seeds were used. The purchased chia seeds (*Salvia Hispanica*) was crushed into powder through the range of mechanical grinding machine. Raw & powdered chia seeds partially took place in this study because of the human's digestive system's capacity.

**1. Functional Composition of the Chia seeds:**

**1.1 Fiber:** It is an insoluble form of carbohydrate which is essential for our body. It's generally presented in food sources such as fruits, vegetables, grains and legumes. Fiber is presented in two forms which includes soluble and insoluble form. Cellulose is also a

type of fiber which is being presented in food substances such as grains, fruits, vegetables, nuts and beans which can't be digested by the body (Gidley & Yakubov, 2019). Fiber is being passed through the body without getting digested and reduces the risk of constipation or deals in maintaining the healthy gastrointestinal tract. Fiber is also aid in splashing out the cholesterol and cancer causing chemicals from the body (Holscher, 2017). Chia seed is consisting about 40% fiber that brings them in the highly considerable fiber providing food category. Soaked chia seeds the increased amount of dietary fiber. Same time while soaking the chia seeds phytic acid content is getting removed from the seeds. It's present in the gel form which helps to escape from the constipation issues and the stool in its movement. Fiber raises the bulkiness and volume of feces which regulates the blood glucose level, body weight, cholesterol level and also maintaining the health of colon by acting as the antiaging component (Grancieri et al., 2019 and Rahim et al., 2021). Due to the mucilage and digestible fiber chia seeds were are sticky in nature. Chia seeds are beneficial in controlling the blood glucose level after consuming and also provide the satiety. Earlier researches declared that consistency of the digestive material can be upgraded because of the fibers presented in the chia seeds. Lazaro et al., 2018 summarized in their study that, they used three quantity of mucilage were used 3, 5, and 8g/kg to assess the differences in the digestion process. This step was carried out because of the mucilage have a tremendous capacity to hold water.

**1.2 Antioxidants:** These are the components that slow down the oxidation process. A process that produces free radicals which could also harm the cells. The phytochemicals including antioxidants, phenolic compounds and ascorbic acid which province to cease the oxidation process (Aversa et al., 2016). Food substances including vegetables and fruits are the worthier sources of phytochemicals which known to be beneficial for health. A chia seed is a practicable source of phytochemicals having the chlorogenic acid, caffeic acid, myricetin, quercetin and kaempferol, which are all assumed to have a protective reaction for the cardiac and hepatic and also having age-defying and anti-cancerous properties. (Melo et al., 2019 and Ullah et al., 2016). Small quantity chia seeds have immune enhancing effects by consisting micro-chemicals and omega-3-fatty acids. It also slowdowns the sensitivity and swelling conditions through maintenance (Lokhande et al., 2019). Pellegrini et al., 2018 research showcased that, these chemicals have a protective reaction against the formation of injurious substances of cells.

**1.3 Phenolic Compounds:** These are the bunch of chemical components having one or more hydroxyl groups (OH) linked to an aromatic hydrocarbon. These are classified on the basis of a count of phenolic groups presented in a compound. These are the major component of plant derivatives and are isolated as phenolic acids and polyphenols. These compounds are presented in the combination with mono and polysaccharides, consisting one or more phenolic groups, which could turn out as ester or methyl esters (Kumar & Goel, 2019). In 2017 Oliveira-Alves et al., 2017 resulted that phenolic compounds from profit-based samples of chia seeds, flour, dietary fiber and oil were isolated using different processing technologies. The fusion of raw and compounded were assessed, major components present were phenolic and caffeic acid, and dhanshesu and their secondary metabolites such as rosmarinic and salvianolic acids. These results updated the knowledge about chia seeds and their phenolic profile, which was majorly phytochemicals and fibers for blocking oxidative stress and disorders caused by it (Scapin et al., 2016).

**1.4 Omega-3 fatty acid:** These are the key substances in the digestion process of animal fats and also play a essential role in human food and physical functioning (Cholewski et al., 2018). One of the peculiar attribute of chia seeds are their high levels of omega-3 fatty acids which are beneficial for the cardiac health. Omega-3 alpha-linolenic acids (ALA) are about 75% and 20% omega-6 fatty acids presented in chia seeds. It is an uncomplicated way to enhance the mental health through consuming chia seeds. Previous researches resulted that eating more Omega-3 than Omega-6 will reduce the infections and inflammations of the body. A small proportion of Omega-3 acid is linked with a reduced chance of plenty of long-lasting diseases like cardiac problem, cancer, inflammation and pre-mature deaths (Saini & Keum, 2018).

**1.5 Peptides:** These are formed by linking 20-50 amino acids together with peptide bonds. Chia seeds have consisted of around 19% protein. It's recognized to be a great source of proteins. Chia seeds have hoisted levels of proteins and vital amino acids, therefore these are a commendatory source of functional peptides. The structure and beneficial outcomes of protein and peptides in chia seeds have feasible influences on human health. Out of total proteins, 20 are categorized in chia seeds. These are a compatible part of plant's basal metabolism (Gomez-Favela et al., 2017). The advantageous chia seed effects are linked to humans by consisting the antioxidant ability, antihypertensive,

antihyperglycemic and antihypercholesterolemic response. This relatedness could be linked with chia protein along with peptide structures (Grancieri et al., 2019).

**1.6 Vitamins:** Vitamin is a natural and essential component that is a required micronutrient that an organism needs in low amounts for the pertinent activity of its cellular functions. Kulczyński et al. (2019) resulted that chia seeds consist of vitamin-E as tocopherols:  $\alpha$ -tocopherol (8 mg/kg of lipids),  $\gamma$ -tocopherol (422 mg/kg of lipids), and  $\delta$ -tocopherol (15 mg/kg of lipids). Chia seeds are the greater source for boosting the metabolism. Aside from this, their increased levels of omega-6 acids in absorbing fat-soluble vitamins A, D,E and K.

**1.7 Minerals:** Minerals are the components presented as a natural resources which are necessary for natural body functioning and development. Human body is in requirement of certain minerals. These minerals are categorized as essential minerals (Miller, 2017). Chia seeds are an astonishing origin of countless foundational minerals. These are bountiful in manganese, phosphorus, copper, selenium, iron, magnesium and calcium. The body makes use of minerals to carry out several activities, from the construction of strong bones to the itinerant of nerve impulses. However, divergent minerals are used to form hormones or for the normalization of a heart beat (Bailey et al., 2011).

## 2. A functional stance of chia seeds in various diseases:

### 2.1 Reduce the risk of cardiovascular disease:

Cardiovascular disease is a common locution for the state damaging the heart or blood vessels. It's the condition also known as myocardial infarction, the state which influences the heart and the blood flow. It's this occasion, it's related to the aggregation of fat on the inside of blood vessels and a considerable chance of blood clumps (Nangia et al., 2016).

Diet is the major component for in the management of cardiac disease. Dietary based favors involve overweight, hypertension, increased blood glucose level. It's the happening mainly linked with the consumption of increase amount of animal foods in a routine. Dietary consumption based on plant fats, soluble fibers and organic food can reduce the risk of cardiac diseases. Furthermore low quality food components such as over processed grains, salt, sugars, and saturated fats presented in low quantity in fresh fruits, veggies, nuts, legumes and are low in unprocessed cereal grains (Bechthold et al., 2019).

Generally chia seed is a small embryonic component which consists of increased biologically active minerals, vitamins, phytochemical substances which could prevent the DNA presented in the plant species from oxidative stress and leads the constancy of the species.

### **2.2 Reduced Triglyceride Fat:**

Increased amount of fat substances can lead to atherosclerosis which expands to the condition of stroke, cardiac failure and coronary illness. Increased fat substances can cause acute intensification of the pancreas (Pancreatitis) (Zhang, Y et al., 2019).

Chia seed consist of vital substances including increased fiber, protein and omega 3 fatty acids, which could reduce the risk and development of Triglycerides (Enes, B. N et al., 2020).

Chia seed oil supplementation could modify the lipid profile in the liver and adipose tissue, decreased amount of leptin, triglycerides, and liver cholesterol level (Citelli et al., 2016).

### **2.3 Improve High-Density Lipoprotein (HDL)**

Cholesterol is the substance which has a high viscosity content found in all cells and consist of numerous and valuable capabilities, which includes making difference in form of the human cell. Where these components bound with the protein substances called Lipoproteins Cook, R. P. (Ed.). (2015).

Chia seeds are considerable source of omega-3 fatty acids. It is a packed form of essential fatty acids such as alpha linoleic acid (ALA) and oleic acids. The essential fatty acids being converted into eicosapentaenoic acid (EHA) and docosahexaenoic acid (DHA) in the human body after the consumption (Jin et al., 2012). The level of High Density Lipoprotein can be increased via the Omega-3 unsaturated fatty acids. High Density Lipoprotein (HDL) is the “healthy” cholesterol which seals against coronary failures and strokes (Nieman et al., 2012).

### **2.4 Reduced Blood Pressure:**

Increased blood pressure could vandalize the arteries, blocks them and hinders the flow of the blood to the heart muscle. Elevated blood pressure could cause the expansion of heart and lack of blood supply to the body (Jordan et al., 2018). Chia seed consist of quercetin, which is an antioxidant that reduces the difficulty of various health issues, including coronary risks and risk factors of cardiac diseases (da Silva Marineli et al., 2014). Previous researches shown that chia seeds could lower the pulse rate in the

patients with hypertension, which is the far-fetched hazardous element for the coronary illness (Toscano et al., 2014).

### **2.5 Helpful in gastro-intestinal tract related diseases:**

The prime dimensions of the gastrointestinal tract are to process and comprehend implemented supplements and discharge the wastes of digestion (Kim & Pritts, 2017). Most of the nutrients which is being consumed is complicated, being indigestible and leads the digestion process into the impossible one. Numerous diet modifiers such as prebiotics, probiotics and polyphenols are the most related essentially vigorous mixtures in the consuming regimen and have been exemplified to be beneficial (Forootan et al., 2018). Via the wholesomeness of chia seeds, it seems to be consisting of cancer preventive agents within the platform of chlorogenic harsh, caffeic harsh, myricetin, quercetin and kaempferol. It's acquired to have cardiac and hepatic shielding against thriving and truculent to disease components. Chia seeds are the great source to control diabetes mellitus via consisting the unsaturated fatty acids, proteins in the absence of gluten, nutrients, minerals and phenolic compounds which are completely beneficial (Ullah et al., 2016).

### **2.6 Constipation:**

Constipation is the condition, where the bowel movements reduced and stools become hardened and painful during the outcome. The portion of fluid in the stool is comprehended again into the body, which turns the stool into hard and dry one (Camilleri et al., 2017).

Chia seeds contain insoluble dietary fiber, which continues extended completion, enlarges excretion and anticipates impediment. They furthermore provide solid fats, proteins and cancer preventive agents that seal cells (Knez Hrnčič et al., 2020). Stools and poohing are easy to excrete, declining the moment of occlusion. During the stool is free and liquid, the dietary fiber could help to glue the stool by preoccupying wetness and enlarging the stool mass (Korczak et al., 2017). A healthy eating pattern full of fiber can lower the difficulty of hemorrhoids, diverticulosis and colorectal diseases. The portion of fiber is getting fermented in colon because of the human digestive enzymes are not able to breakdown it (Tang et al., 2020).

### **2.7 Cancer:**

It's the term for a disease where the cell division is abnormal and occupies nearby tissues. These cells can outspread to various parts of the body via the blood and lymphatic framework. Few primary types of cancers are there. Malignancy is the most common group which begins in the skin or in the tissues or tissues that covers the interior organs. Another type of cancer is Sarcoma which begins in ligaments, bones, veins and further connective or endorsement tissues. (Shaikh et al., 2021; Steele, 2021).

Previous researches commends that the increased calcium level may decrease the risk of cancer particularly colorectal disease (Grancieri et al., 2019).

Chia seeds are also affluent in polyphenols gained from caffeic acid and these phenols are cell augmentation that protects the body from free radicals, evolving and malignity (De Falco et al., 2017).

### Methodology:

The study entitled “Proximate analysis & Contrivance of *Salvia Hiapanica* in various recipes” handled through the following methodology.

The study is carried out with chia seed collected from the local supermarket placed in Madurai. Throughout the study the same chia seeds were utilized to maintain the quality of chia seed throughout the study. As an initial step the selected chia seeds (*Salvia Hispanica*) powdered by mechanical grinding machine and exploited for complete research process. In order to evaluate the micro and macro nutrients such as carbohydrate, protein, fat, Omega-3 fatty acids, Omega-6 fatty acids, Ash, Moisture, Calcium, Iron, Phosphorus, Magnesium, Potassium, Sodium, Zinc and copper of chia seed powder via AOAC (Association of Official Analytical Collaboration) procedure were followed. Preparation of ash solution was used for evaluating the mineral content.



**Figure-1: Powdered Chia Seed (Sample)**



**Proximate analysis:**

Anthrone method is used for the estimation of carbohydrate content in the chia seed powder. Where this method involves the following steps initially 100mg sample weighed into the boiling tube followed this method, sample were hydrolyzed by keeping it in a boiling water bath for 3 hours with 5ml of 2.5 N HCl & cooled in room temperature. Continuing the cooling process sample (chia seed powder) counteracted with  $\text{Na}_2\text{CO}_3$  (Sodium Carbonate) till the vivacity terminated. After that, prepared the volume of 1ml in all the test tubes including the sample tubes by adding distilled water. Then the sample reheated for about 8 minutes with the addition of 4ml of anthrone reagent (anthronal). Rapidly the sample cooled to observe the color change from green to dark green. Through the standard graph the amount of carbohydrates presented in the sample were calculated. In the powdered chia a seed (*Salvia Hispanica*) for the estimation of protein content Lowry method is handled. Which is the method is purely sensitive. Hydrolyzing the protein and estimating the content of amino acid will provide the accurate qualification. The enzyme extracts is generally estimated through this method. Via the decrement of Phosphomolybdic, phosphotungstic components the blue color developed.

For the estimation of fat content in the powdered chia seeds 500mg of dried powder of the sample was taken with the addition of 5ml chloroform, methanol. Then the sample was covered with aluminium foil and stand for overnight. Finally the % of fat content was calculated.

In the determination of ash content, as an initial step the ash solution was prepared, where the ash is moistened with the addition of small amount of distilled water nearly 0.5-1.0ml along with the 5ml of HCl in it. The mixture got evaporated to the dried condition on a boiling water bath. Same like the previous process, HCl was added frequently with some intervals to achieve the exact texture. While the 4ml of HCl acid and few drops of water added with the solution warmed via the boiling water bath then filtered into a 100ml volumetric flask utilizing whatman No 40 filter paper. After cooling, the volume is made up to 100 ml and suitable aliquots were utilized for the evaluation of phosphorus, iron and calcium.

The fiber content was estimated through the following procedures, 5g of the sample (chia seed powder) was weighed into the 500ml of beaker and 200ml of boiling 0.255N sulphuric acid added. The above mixture was boiled for 30 minutes. Maintaining the volume persistent by adding water at frequent intervals. Via the muslin cloth the mixture got filtered at the end the residue was washed along with the hot water till free from acids.

**Phytochemical Screening:**

The following components such as Alkaloids, terpenoids, saponins, flavonoids, tannins, glycosides, phenols and phytosterol was assessed in the powder of chia seed.

In assessing the presence of **Alkaloids** 1ml of HCl has been added to 3ml of extract in a test tube along with the addition of few drops of Meyer's reagent. After this process, the precipitation of creamy white substance indicated the presence of Alkaloids.

In the evaluation of **terpenoids** 5ml of extract was mixed with 2ml of  $\text{CHCl}_3$  in a test tube. 3ml of concentrated  $\text{H}_2\text{SO}_4$  was added to form the layer. In the end the presence of terpenoids indicated via the formation of interface with a reddish brown coloration.

For analyzing the presence of **saponins**, 5ml of sample extract was shaken forcefully to attain a stable tenacious forth. The forth then mixed with the 3 drops of olive oil finally observed for the formation of emulsion, which concluded the existence of **saponins**.

A few drops of 1%  $\text{NH}_3$  solution has been added along with the research sample (Chia seeds powder) in a test tube. The formation of yellow colour has been observed for the residence of **flavonoids**.

For the 5ml of extract solution, 1ml of distilled water and 1-2 drops of ferric chloride solution were added and observed with the occupancy of brownish green or a blue black coloration. It represents the presence of **Tannins**.

For testing the presence of **Glycosides** 10ml of 50%  $\text{H}_2\text{SO}_4$  has been added to 1ml of extract in a boiling tube. The mixture was heated in boiling water for about 5 minutes. 10ml of Fehling's solution (5ml of each solution A and B) has been added and boiled. The occurrence of brick red precipitate stipulated the presence of **glycosides**.

Occurrence of bluish black colour represented the presence of phenol, where this process was undertaken where the extracts were treated with 3-4 drops of ferric chloride solution.

In assessing the occupancy of **Phytosterol Salkowski** test was done for the observation of phytosterols. In this assessment 1ml of concentrated Sulphuric acid was added to the plant extract and allowed to position for 5 minutes. After mixing, the occurrence of golden yellow colour in the lower layer represents the residence of phytosterols.

#### **METHOD USED FOR CONSUMER ACCEPTABILITY OF CHIA SEED INCORPORATED PRODUCTS:**

Chia seed assimilated food products such as fruit jelly, chia cookies, chia fruit salad was given to the 25 individuals of both groups faculties and students of **Thassim Beevi Abdul Kader**

**College for Women** for the sensory evaluation (Appearance, colour, taste, texture, flavor and general acceptability) of the prepared 3 products.

The standard product cookies, fruit salad and jelly were done for the reference. The chia seed comprised product was developed in 3 standards (1g & 2g of chia seeds). A written set of description have been followed for each recipes, each ingredient was weighed via utilizing a weighing scale before and after the preparation process. And also the portion sizes, duration of preparation process were noted in each batch. All the recipes were standardized for one serving and repeated about thrice to yield the standard results and put through to sensory evaluation and for consumer overall acceptability.

Sensory evaluation consists of judging the quality of food via the panel of judges. The estimation deals with the process such as measuring, analyzing and interpreting the qualities of food as they are discerned via the sense of sight, taste, touch and hearing.

## RESULTS & DISCUSSION

The result of the present study “**PROXIMATE ANALYSIS AND CONTRIVANCE OF *Salvia Hispanica* IN VARIOUS RECIPES**” is presented under the following headings;

- ✓ Quantitative analysis of macro nutrients of the sample (Chia seeds)
- ✓ Qualitative analysis of micro nutrients of the sample (Chia seeds)
- ✓ Quantitative analysis of phytochemical components in the sample (Chia seeds)
- ✓ Consumer acceptability of chia seed incorporated products.

### I Quantitative analysis of macro nutrients of the sample (Chia seeds)

The powdered chia seed was evaluated to find out the macro nutrient content such as carbohydrates, protein, fat, fibre, moisture, ash, pectin, Omega-3 and Omega-6 fatty acids following the methods named Anthrone & Lowry method (Carbohydrate & Protein analysis).

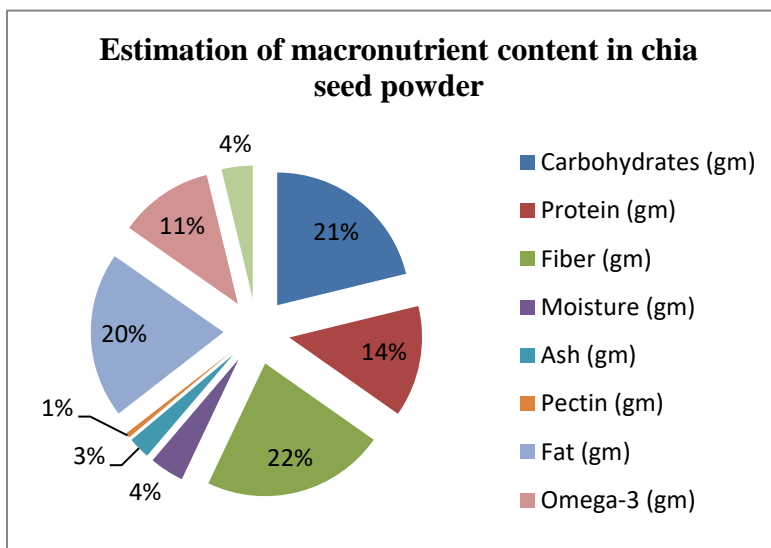
**Table-I**

**Estimation of Macro Nutrient content in chia seed powder:**

Sample (100gm)	Carbohydrate (g)	Protein (g)	Fiber (g)	Moisture (g)	Ash (g)	Pectin (g)	Fat (g)	Omega-3	Omega-6 (g)
Chia seed	34.55	22.12	36.35	6.831	4.350	0.98	32.9 44	18.77	6.18

The nutrient content of the chia seed is absolutely high and that's represented in the Table-I. The macro nutrient content of the sample is carbohydrate **34.55/100gm**, protein **22.12/100gm**, Fibre **36.35/100gm**, Moisture **6.831/100gm**, ash **4.350/100gm**, Pectin **0.98/100gm**, Fat **32.944/100gm**,

Omega-3 fatty acids **18.77/100gm** and Omega-6 fatty acids **6.18/100gm**. One ounce of chia seeds (roundly 28gm) carries **138 calories**, **8gm** of fat, **12gm** of carbohydrate, **10gm** of fiber and **5gm** of Protein. The sample is also a rich source of polyunsaturated fatty acids, specifically omega-3 fatty acids. Chia seed’s lipid profile is consisting of 60% of Omega-3 fatty acids, which made the sample as one of the greatest plat source of the fatty acids.



**Figure-2: Estimation of Macro Nutrient content in chia seed powder**

**II Qualitative analysis of micro nutrients of the sample (Chia seeds)**

The prepared chia seed powder has undergone the process of qualitative analysis to assess the following nutrients such as Iron, Calcium, Phosphorus, Potassium, Sodium, Zinc, Copper and Magnesium.

**Table-II**

**Estimation of Micro Nutrient content in chia seed powder**

Sample (100gm)	Iron (mg)	Calcium (mg)	Phosphorus (mg)	Potassium (mg)	Sodium (mg)	Zinc (mg)	Copper (mg)	Magnesium (mg)
Chia seed	15.3	26.7	52.5	600	124.8	3.46	0.125	0.156

The Table-II shows the result of micro nutrient content of the chia seed. The result expresses that the sample (chia seeds) consist the micro nutrient content is Iron **15.3 mg/100gm**, Calcium **26.7 mg/100gm**, Phosphorus **600 mg/100gm**, Sodium **124.8 mg/100gm**, Zinc **3.46 mg/100gm**, Copper **0.125 mg/100gm** and Magnesium **0.156 mg/100gm**.

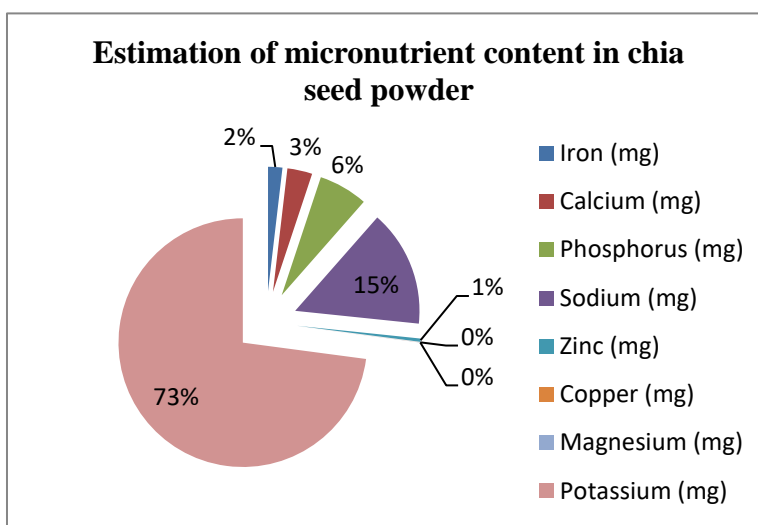


Figure-3: Estimation of Micro Nutrient content in chia seed powder

### III Qualitative analysis of micro nutrients of the sample (Chia seeds)

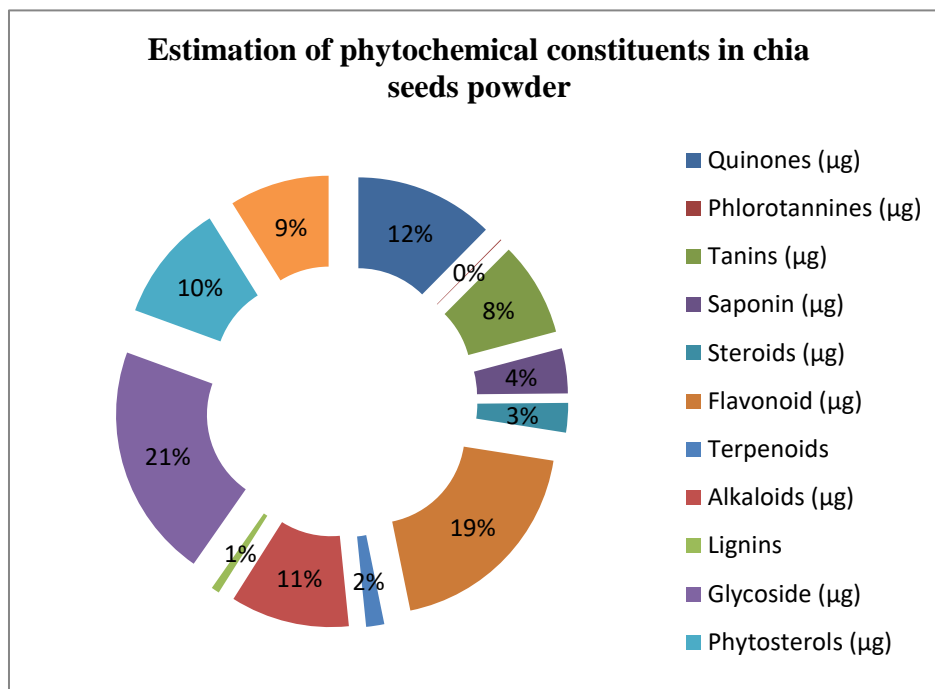
Chia seed is affluent source of phytochemical includes many kind of antioxidants. The screening of the phytochemical content shows that the sample consist of terpenoids, flavonoids, alkaloids, phytosterols, phenols, tannins and saponins. Some other phytochemical components presented in the sample are triterpenes, campesterol, stigmasterol, sitosterol and lignans.

Table-III

#### Estimation of Phytochemical constituents in chia seed powder

Sample (100gm)	Quinones (µg)	Phlorotannines (µg)	Tannins (µg)	Saponin (µg)	Steroids (µg)	Flavonoids (µg)	Terpenoids (µg)	Alkaloids (µg)	Lignins (µg)	Glycoside (µg)	Phytosterols (µg)	Phenol (µg)
Chia seed	15.2	0.099	10.3	4.91	3.22	23.7	1.98	12.99	0.89	25.6	12.95	10.9

The sample was undergone for the examination of phytochemical components for qualitative method which discloses with the worthwhile output. **Table-III** shows that the sample contains Quinones **15.2 µg/100gm**, Phlorotannines **0.099 µg/100gm**, Tannins **µg/100gm**, Saponin **4.91 µg/100gm**, Steroids **3.22 µg/100gm**, Flavonoids **23.7 µg/100gm**, Terpenoids **1.98 µg/100gm**, Alkaloids **12.99 µg/100gm**, Lignins **0.89 µg/100gm**, Glycoside **25.6 µg/100gm**, Phytosterols **12.95 µg/100gm** and Phenol **10.9 µg/100gm**.



**Figure-4: Estimation of Phytochemical constituents in chia seed powder**

**IV Consumer acceptability of chia seed incorporated products:**

Sensory evaluation consists of concluding the quality of the chia seed imported products via the panel of judges. The assessment deals with measuring, analyzing and interpreting the qualities of food as they are discerned by the senses of vision, taste, touch and smell.

The standardized recipes are subjected to the consumer acceptability, the scores obtained for each recipe was explained in the following tables.

**Table-IV**

**Mean score of Standard and Chia seed incorporated recipes- Cookies**

Recipes	Level of Incorporation	Appearance	Colour	Texture	Flavor	Taste	Overall acceptability
Standard cookies	-	5	5	5	5	5	25
Chia seed Incorporated cookies	1gm	5	5	3	4	4	21
	2gm	5	4	4	4	5	22

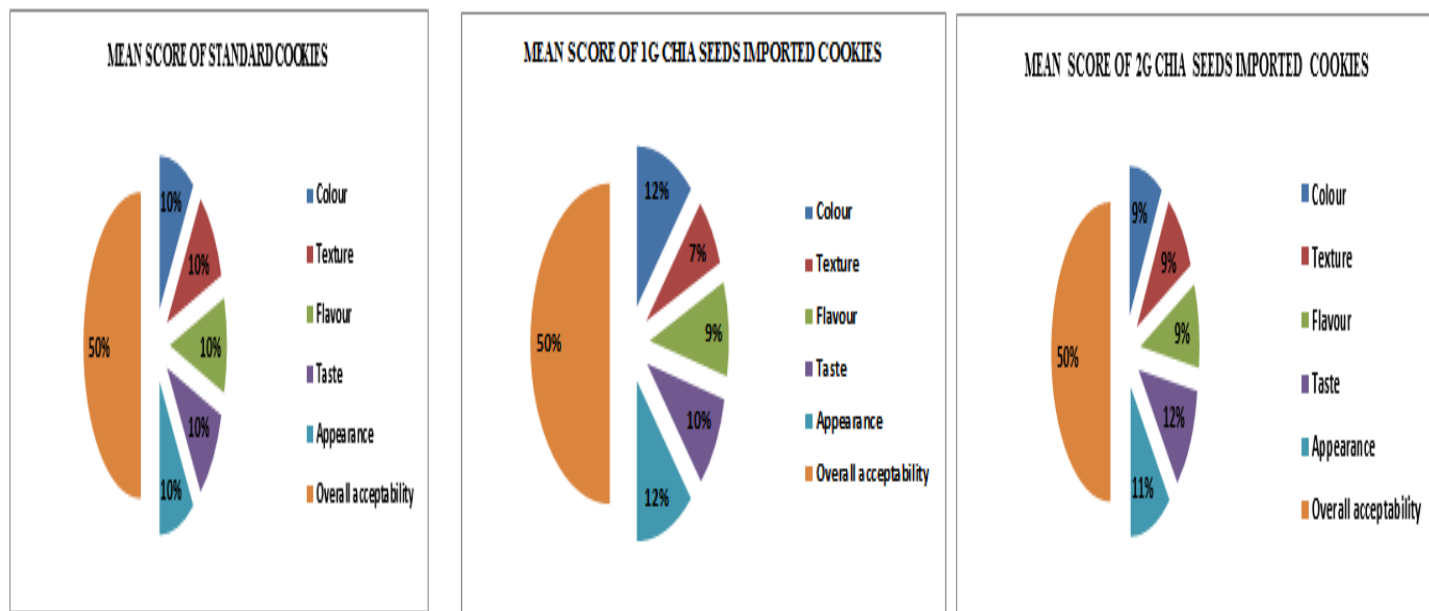


Figure-5: Mean score of Standard and Chia seed incorporated recipes- Cookies (Chart)



Figure-6: Mean score of Standard and Chia seed incorporated recipes- Cookies 1g & 2g

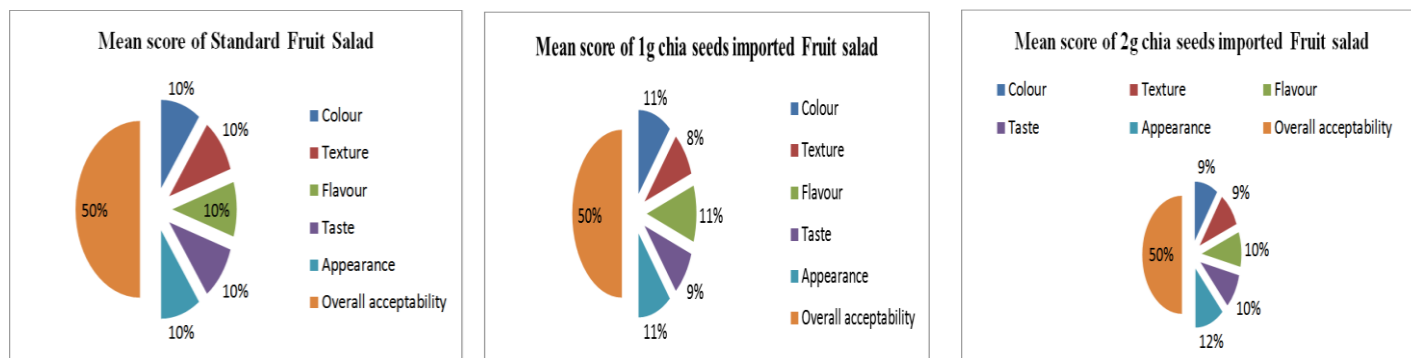
The above table indicates that the consumer acceptability of the standard and chia seed powder incorporated in cookies were subjected to sensory examination such as appearance, color, texture, flavor and taste to evaluate the overall acceptability. The recipe was prepared with the incorporation of 2gm level was increasingly acceptable than 1 gm.

**Table-V**

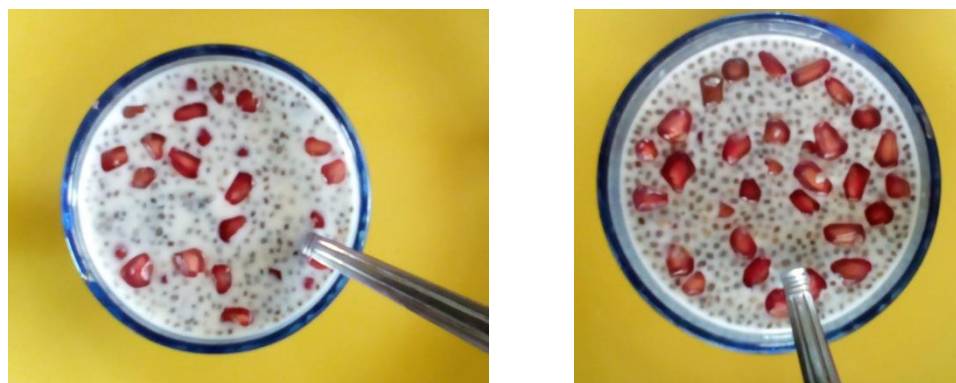
**Mean score of Standard and Chia seed incorporated recipes- Fruit Salad**

Recipes	Level of Incorporation	Appearance	Colour	Texture	Flavor	Taste	Overall acceptability
Standard fruit salad	-	5	5	5	5	5	25
Chia seed Incorporated fruit salad	1gm	5	5	4	5	4	23
	2gm	5	4	4	4	4	21

The above table indicates that the consumer acceptability of the standard and chia seed powder incorporated in fruit salad were subjected to sensory examination such as appearance, color, texture, flavor and taste to evaluate the overall acceptability. The recipe was prepared with the incorporation of 1gm level was increasingly acceptable than 2gm.



**Figure-7: Mean score of Standard and Chia seed incorporated recipes- Fruit Salad**



**Figure-8: Mean score of Standard and Chia seed incorporated recipes- Fruit Salad 1g & 2g**

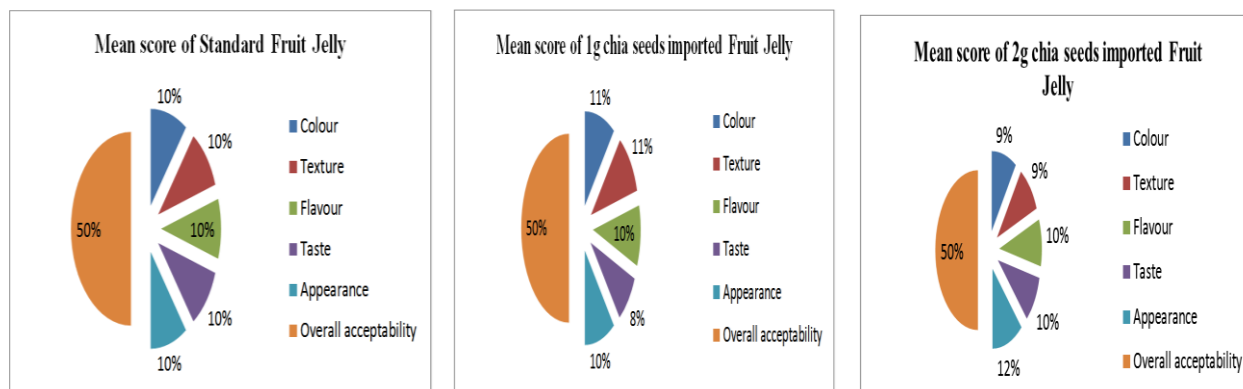


**Table-VI**

**Mean score of Standard and Chia seed incorporated recipes- Fruit Jelly**

Recipes	Level of Incorporation	Appearance	Colour	Texture	Flavor	Taste	Overall acceptability
Standard fruit jelly	-	5	5	5	5	5	25
Chia seed Incorporated fruit jelly	1gm	5	5	5	5	4	24
	2gm	5	4	4	4	4	21

The above table indicates that the consumer acceptability of the standard and chia seed powder incorporated in fruit jelly were subjected to sensory examination such as appearance, color, texture, flavor and taste to evaluate the overall acceptability. The recipe was prepared with the incorporation of 1gm level was increasingly acceptable than 2gm.



**Figure-8: Mean score of Standard and Chia seed incorporated recipes- Fruit Jelly.**



**Figure-8: Mean score of Standard and Chia seed incorporated recipes- Fruit Jelly 1g & 2g**

Table-VII

Computing Nutritive value for standard and incorporated recipe- Chia seed Cookies

S.no	Nutrient content	Standard cookies	Incorporated cookies (Accepted level- 2gm)
1	Carbohydrate (gm)	60	60.3
2	Protein (gm)	4.3	4.8
3	Fat (gm)	26.08	26.8
4	Fiber (gm)	4.17	4.34
5	Iron (mg)	17.3	17.4
6	Calcium (mg)	1	1.3
7	Sodium (mg)	347	352
8	Potassium (mg)	0.5	0.6

The above table VII expresses the results of nutritive value of standard and incorporated with chia seed cookies shown marked increase in nutrient content such as carbohydrate **60.3g**, protein **4.8g**, fat **26.8g**, fiber **4.34g**, Iron **17.4 mg**, Calcium **1.3 mg**, Sodium **352 mg** and Potassium **0.6 mg**.

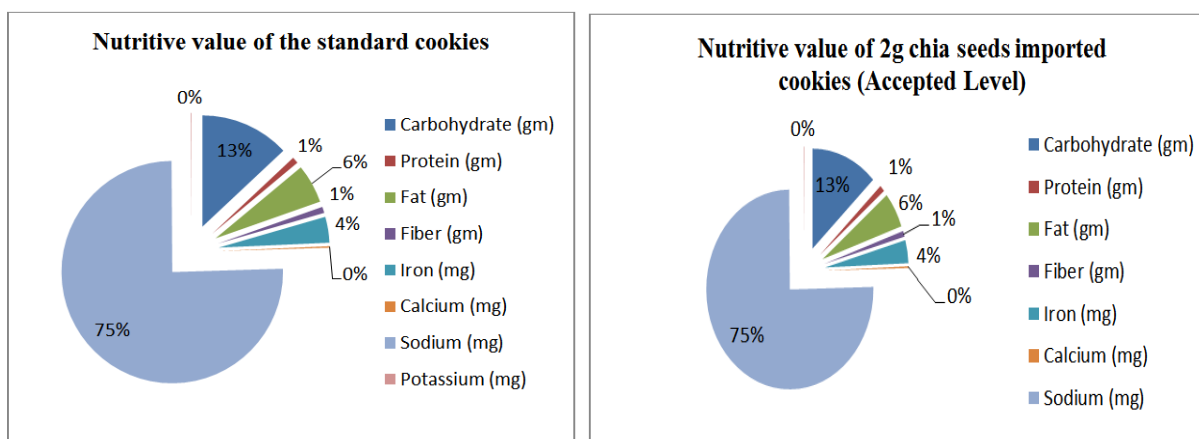


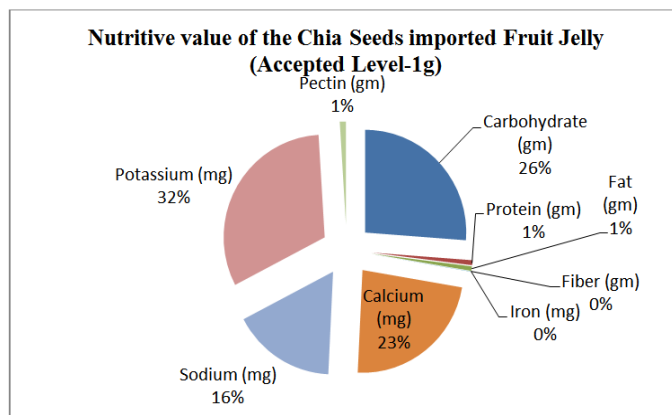
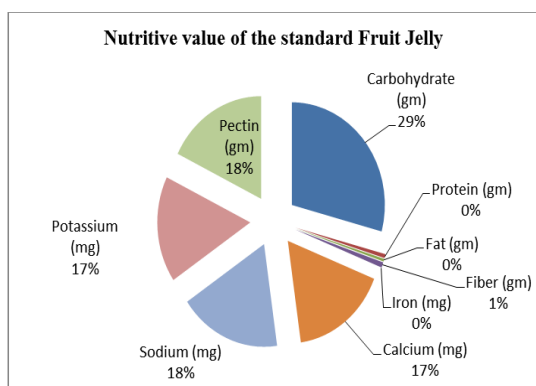
Figure-9: Nutritive value for standard and incorporated recipe- Chia seed Cookies

**Table-VIII**

**Computing Nutritive value for standard and incorporated recipe- Chia seed fruit jelly**

S.no	Nutrient content	Standard fruit jelly	Incorporated fruit jelly (Accepted level- 1gm)
1	Carbohydrate (gm)	27.9	27.28
2	Protein (gm)	0.6	0.8
3	Fat (gm)	0.4	0.73
4	Fiber (gm)	0.8	-
5	Iron (mg)	-	0.04
6	Calcium (mg)	16	24
7	Sodium (mg)	17	17.27
8	Potassium (mg)	16	33
9	Pectin (gm)	1	1.01

The above table VIII expresses the results of nutritive value of standard and incorporated with chia seed cookies shown marked increase in nutrient content such as carbohydrate **27.28g**, protein **0.8g**, fat **0.73g**, Iron **0.04 mg**, Calcium **24 mg**, Sodium **17.27 mg**, Potassium **33mg** and Pectin **1.01gm**.



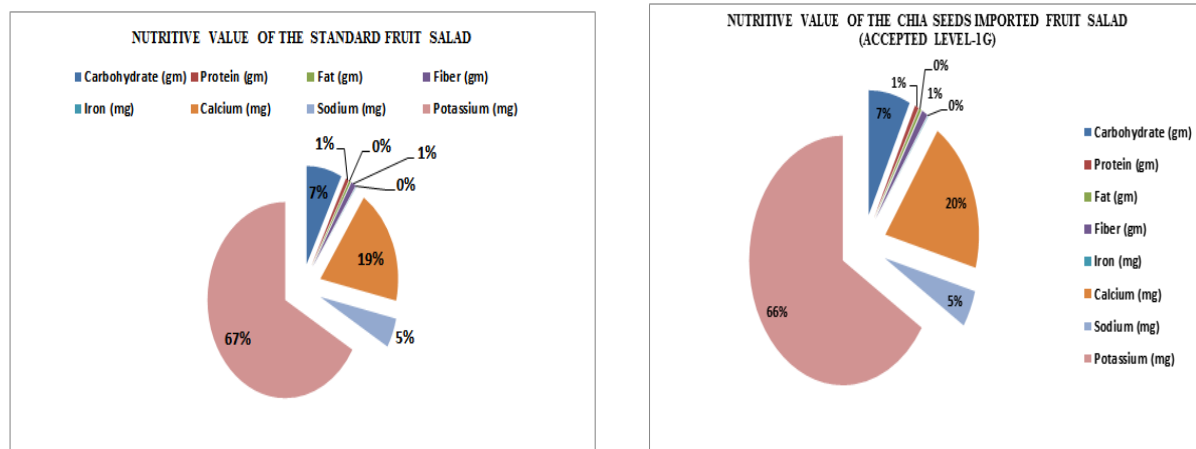
**Figure: Nutritive value for standard and incorporated recipe- Chia seed Fruit Jelly**

**Table-IX**

**Computing Nutritive value for standard and incorporated recipe- Chia seed fruit salad**

S.no	Nutrient content	Standard fruit jelly	Incorporated fruit jelly (Accepted level- 1gm)
1	Carbohydrate (gm)	45.7	46.08
2	Protein (gm)	4.1	4.3
3	Fat (gm)	2.25	2.58
4	Fiber (gm)	6.3	6.56
5	Iron (mg)	0.45	0.49
6	Calcium (mg)	118.9	126.9
7	Sodium (mg)	30.25	30.52
8	Potassium (mg)	414	421

The above table IX expresses the results of nutritive value of standard and incorporated with chia seed cookies shown marked increase in nutrient content such as carbohydrate **46.08 g**, protein **4.3 g**, fat **2.58 g**, Fiber **6.56 g**, Iron **0.49 mg**, Calcium **126.9 mg**, Sodium **30.52 mg**, Potassium **421mg**.



**Figure: Nutritive value for standard and incorporated recipe- Chia seed Fruit Salad**

**SUMMARY AND CONCLUSION:**

The present study entitled “**PROXIMATE ANALYSIS AND CONTRIVANCE OF *Salvia Hispanica* IN VARIOUS RECIPES**” is under taken to evaluate the proximate analysis of macro and micro nutrient components, qualitative and quantitative examination of phytochemical components in chia seed. The sample (*Salvia Hispanica*) was collected from the local supermarket Madurai. The same sample was used for the whole study. The sample was grinded through the mechanical grinding machine and exploited for biochemical evaluation and development of the products.

The proximate analysis showcased that the sample was affluent in macro nutrients such as Fiber (36.35 gm), Omega-3 fatty acid (18.77 gm), Omega-6 fatty acid (6.18 gm), carbohydrate (34.33 gm) continued by protein (22.12 gm), moisture (6.83 gm) and pectin (0.98 gm). Nonetheless the carbohydrate is low in the sample, the amalgamation of healthy fat and high fibre terminate it as a good source for the weight loss, reduced hypertension, constipation, diabetes mellitus, cardiac disease and cancer.

The micro nutrients such as sodium (124.8 mg), potassium (600 mg), phosphorus (52.5 mg) are affluent in the sample continued by calcium (26.7 mg), iron (15.5 mg), manganese (0.156 mg) and copper (0.125 mg). Enhanced level of sodium and magnesium brings usual water balance, initiate and maintain the heartbeat. The presence of calcium and phosphorus level in sample tends to helps in maintenance of strong skeletal system.

The sample is consists of phytochemicals which are the substances found in the plat sources that are advantageous to the body. Phytochemical screening of the chia seed showed the residence of phytosterols, lignins, steroids, phlorotannins and quinones.

The amount of glycosides, flavonoids, quinones were rich in chia seed powder compared to other phytochemicals. Glycosides in chia seed acts as anti-inflammatory components, flavonoids, quinones in the sample acts as an antioxidants and reduces the formation of free radicals.

The products such as chia seed incorporated cookies, chia seed implemented fruit jelly, chia seed incorporated fruit salad was developed with incorporation of 1gm and 2gm standards of chia seed. The analysis showcased that 1gm sample was accepted for the products fruit salad, 2gm was accepted for chia cookies.

**CONCLUSION:**

The present study “**PROXIMATE ANALYSIS AND CONTRIVANCE OF *Salvia Hispanica* IN VARIOUS RECIPES**” concluded that the sample (chia seed) consist of great quantity of macro, micro and phyto nutrients. The overall acceptability of the food products

incorporated with chia seed was higher than the commercial products which are all available in the market. Thus it was delineated that formulation of healthy supplements and nutraceuticals to prevent the body from the degenerative diseases as well as non-communicable diseases. Chia seed which is auspicious potential source of difference nutrients and phytochemical components could be applied in the various fields for the multiple purposes for the multiple solutions.

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