

Chia Seeds and Their Role in Controlling CVD

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ABSTRACT

The recognition of chia seed as a Novel Food by the European Parliament has led in widespread use of the chia seed in a range of cuisines. *Salvia hispanica* is the botanical name for Salba chia and Mexican chia seeds. It belongs to a flowering plant in the mint family Lamiaceae that is native to central and southern Mexico, the United States, and Guatemala. Chia seeds are referred to as either a superfood or a functional food. The phrase combines a Mayan word for strength with an Aztec word for oily. Chia is currently cultivated commercially in a number of countries, including Mexico, Guatemala, Peru, Argentina, Australia, and the United States. The seeds are well-known for being a nutrient-dense addition to healthy diets.

It is high in polyunsaturated fat (omega-3 fatty acids), fibre, proteins, calcium, phosphorus, zinc, caffeic acid, chlorogenic acid, kaempferol, and quercetin. Chia seeds and oil are resilient in tocopherols, phytosterols, carotenoids, polyphenolic compounds, myricetin, quercetin, and kaempferol. These compounds have the ability to scavenge free radicals, chelate ionic particles, and supply hydrogen.

The action of flavonoids, in particular, is required to explain the ad hoc movement of ROS and RNS, since hydrogen and electrons are moved to hydroxyl, peroxy acid, and peroxy nitrite to balance them out, resulting in a generally stable flavonoid. Cellular reinforcements limit the occurrence of infections, such as cancer and cardiovascular sickness, and give protection against many diseases and disorders.

Key words – *Salvia hispanica*, chia seeds, omega-3 fatty acids, cardiovascular disease (CVD).

I. INTRODUCTION

Salvia hispanica is the botanical name, Salba chia and Mexican chia are all names for chia seeds. It is a flowering plant in the mint family Lamiaceae native to central and southern Mexico, alternatively it is related to *Salvia columbariae* endemic to the southwestern United States and Guatemala. Chia seeds are classified as either a superfood or a functional food. Chia is now

commercially grown in a variety of nations, including Mexico, Guatemala, Peru, Argentina, Australia, and the United States. The seeds are well-known for being a nutrient-dense complement to healthy diets [1].



Fig. 1 – Chia seed plant

In ancient Aztec and Mesoamerican societies, they were an important crop. The seeds were used for therapeutic purposes and were an essential component of the people's meals. The term is composed of a Mayan word for "strength" and an Aztec term for "oily." Chia seeds have lately acquired popularity as a result of their numerous nutritional and physiological advantages. It's high in polyunsaturated fat (omega-3 fatty acids), fibre, proteins, calcium, phosphorus, and zinc. Chia seeds are also a good source of vitamins, minerals, and antioxidants. Caffeic acid, chlorogenic acid, kaempferol, and quercetin are some of these antioxidants [2].

Diverticulosis is defined as the existence of tube-like structures in the gut that are not accompanied by indications of inflammation. Chia seeds, which are vegetarian and high in omega-3 fatty acids and fiber, have been reported to aid in the prevention of diverticular illness.

Cardiovascular disease (CVD), commonly known as heart disease and cardiac arrest, refers to any condition that affects your heart or blood flow. It is usually associated with an increase in blood clumping and a build-up of fat on the interior of blood vessels. Chia seeds include omega-3 fatty acids and antioxidants that can be utilised as a functional component to help reduce the incidence of CVD. Chia seeds are a possible source of **cancer-fighting** compounds such as chlorogenic acid, caffeic acid, myricetin, quercetin, and kaempferol. It is thought to have anti-maturation and anti-disease characteristics in the **liver**. It has higher concentrations of beneficial unsaturated fatty acids, gluten-free proteins, nutrients, minerals, and phenolic compounds, all of which are beneficial to the **digestive system** and **diabetic management**. Type 2 diabetes is a common condition that produces excessive amounts of sugar (glucose) in the blood. It can induce symptoms like as thirst, frequent urination, and weariness. Chia seeds have 34 to 40g of dietary fibre per 100 grammes, whereas skimmed flour has 40% fibre, of which 5-10% is soluble and mucilage. As a result, chia seeds can be utilised to minimise the risk of diabetes. **Constipation** is a condition in which the bowel motions are reduced and the faeces are uncomfortable to pass. The fluid portion of the stool is incorporated once again into the body, causing the stool to become hard and dry. A portion of the fibre is fermented in the colon, which aids in the breakdown by human digestive enzymes. **Cancer** growth cells can move to other places of the body via the blood and lymphatic systems. Patients who take omega-3 supplements benefit from nutrition, particularly fat, without stimulating tumour growth. Antioxidants are particularly essential in cancer prevention because they assist to reduce free radical damage, which has been linked to the growth of cancer cells. Chia seeds are high in fibre, protein, magnesium, manganese, and calcium, making them a fantastic source of cell reinforcements [3,4].

Chia seeds and oil are high in tocopherols, phytosterols, carotenoids, polyphenolic chemicals (mostly made up of fundamental units of caffeic acid and flavonoids), myricetin, quercetin, and kaempferol. These chemicals have the capacity to scavenge free radicals, chelate ionic particles, and provide hydrogen. The activity of flavonoids, in particular, is necessary to explain the unsystematically movement of ROS and RNS, since hydrogen and electrons are transported to hydroxyl, peroxy acid, and peroxy nitrite to balance

them out, resulting in typically stable flavonoid. Cell reinforcements reduce the incidence of infections, including cancer and coronary illness, and provide assurance against certain illnesses.

II. PLANT DESCRIPTION

Salvia hispanica is also known as chia. It is classified as a pseudocereal, cultivated for its edible seed, hydrophilic chia seed, and is planted and widely consumed in various nations. *S. hispanica* is one of two plants known as Chia. The other being *Salvia columbariae*, also known as Golden chia. Chia is hardy in USDA Zones 9-12.

Chia is an annual plant that may grow up to 6 feet (182.22 cm) tall. The leaves are oppositely arranged and are 4-8 cm long and 3-5 cm broad. It has purple or white blooms that grow in bunches. The delicate violet-blue bell-shaped blooms that bloom from late spring to early summer are artistically attractive. The seeds are tiny ovals around 1 mm (0.08 in) in diameter. They come in shades of brown, grey, black, and white. When the seeds are soaked, they absorb up to 12 times their weight in liquid [5].

Table 1. Scientific and Taxonomical Classification

Botanical Name	<i>Salvia hispanica</i>
Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Eudicots
Clade	Asterids
Order	Lamiales
Family	Lamiaceae
Genus	Salvia
Species	<i>S. hispanica</i>
Vernacular Name	Chia, Mexican chia and Spanish sage

Chia is farmed commercially for its seed, which is a food high in omega-3 fatty acids since the seeds contain 25-30% extractable oil, including α -linolenic acid. The typical fat composition of the oil is 55% ω -3, 18% ω -6, 6% ω -9, and 10% saturated fat.

Seed production varies by cultivar, manner of culture, and growth circumstances in each geographic location. Genotype has a greater influence on yield than protein content, oil content, fatty acid composition, or phenolic compounds, although high temperature lowers oil content and degree of unsaturation while increasing protein content.

S. hispanica may be grown with a modest fertiliser input of 100 kg/h nitrogen or, in certain situations, no fertiliser at all. Irrigation frequency in chia producing fields can range from none to eight irrigations every year during growth, according to weather conditions and rainfall. The several wild and cultivated varieties of *S. hispanica* are distinguished by seed size, seed breaking, and seed colour. Seed weight and colour are highly heritable, with white colour being controlled by a single recessive gene.

Chia leaves' essential oils contain insect repelling characteristics, making them appropriate for organic farming. Virus infections, however, may occur, possibly carried by white flies. Weeds may be an issue during the early stages of the chia crop's development until the canopy closes, however because chia is sensitive to the majority of regularly used pesticides, mechanical weed control is preferable.

III. NUTRITIONAL VALUE

They include antioxidants like quercetin. These compounds are thought to reduce the risk of cancer and other diseases, such as cardiovascular disease. Antioxidants also help to improve the shelf life of chia seeds by preventing rancidity, which can occur when other oil-producing seeds are stored.



Fig. 2 – Chia seeds

Chia seeds include a lot of fibre, protein, and omega-3 fatty acids. These seeds have the potential to increase bone strength. Because of their heart-healthy characteristics, these seeds are commonly found in cereal, granola bars, yoghurt, and baked goods [6,7].

They are frequently used to boost the nutritional content of smoothies.

Chia seeds are made up of 6% water, 42% carbs, 16% protein, and 31% fat. Calcium, iron, magnesium, manganese, phosphorus, and zinc are among the minerals found in the seeds. The lipids in chia seed oil are mostly unsaturated, with linoleic acid (17%-26% of total fat) and α -linolenic acid (50%-57%) being the predominant fatty acids.

Table 2. Nutrient Value in Chia Seeds

S. No.	Nutrients/Proteins	Nutritional Value
1.	Energy	486 kcal
2.	Carbohydrates	42.12 g
3.	Dietary fiber	34.4 g
4.	Fat	30.74 g
5.	Saturated	3.330
6.	Trans	0.140 g
7.	Monounsaturated	2.309
8.	Polyunsaturated	23.665
9.	Omega-3	17.830 g
10.	Omega-6	5.835 g

11.	Protein	16.54 g
12.	Vitamin A	54 µg
13.	Thiamine (B1)	0.62 mg
14.	Riboflavin (B2)	0.17 mg
15.	Niacin (B3)	8.83 mg
16.	Folate (B9)	49 µg
17.	Vitamin C	1.6 mg
18.	Vitamin E	0.5 mg
19.	Calcium	631 mg
20.	Iron	7.72 mg
21.	Magnesium	335 mg
22.	Manganese	2.723 mg
23.	Phosphorous	860 mg
24.	Potassium	407 mg
25.	Sodium	16 mg
26.	Zinc	4.58 mg
27.	Water	5.80 g
28.	Cholesterol	0 mg

HEALTH BENEFITS - Chia seeds may help with weight loss since they include fibre and protein.

- Chia seeds are abundant in fibre and omega-3 fatty acids, thus eating them may lessen your risk of heart disease.
- Reduces blood sugar levels, eating chia seeds may aid with blood sugar management, probably due to its fibre content and other beneficial chemicals and bone minerals such as calcium, phosphorus, and magnesium.
- It is rich in selenium that may be found in soil and certain foods such as salmon. The body just needs a minimal amount of it. Regardless, having enough selenium in your diet is critical.
- It contains astaxanthin, a substance related to a variety of potent health benefits. It belongs to a member of the antioxidant carotenoid family and found to reduce the risk of heart disease by lowering LDL (bad) cholesterol oxidation and boosting HDL (good) cholesterol levels.
- With the aid of omega-3 fatty acids, it promotes appropriate blood lipid levels. It helps to decrease blood cholesterol while also preventing coronary heart disease. Chia seeds include monounsaturated lipids that aid in cholesterol reduction.
- It promotes better sleep. Serotonin and melatonin are two key chemicals for sleep. Tryptophan, an amino acid found in the body, is responsible for the production of these two hormones. Chia seeds, which are high in

tryptophan, promote restful sleep and relaxation.

IV. CHIA SEEDS IN CONTROLLING CARDIC ARREST

The European Parliament's designation of chia seed as a Novel Food has resulted in widespread use of the seed in a variety of cuisines. It is already widely documented that chia has no anti-allergic, anti-nutritional, or harmful effects on human health. Chia seed is commonly found in biscuits, pasta, cereal bars, snacks, yoghurt, and cake. Chia is one of the few medical plants that produces a high concentration of essential oil, which is employed in the manufacturing of omega-3 capsules. The nutritional value of butter oil was increased from 6.5% to 25% by mixing with chia oil, while the content of omega-3 fatty acids in chia fortified butter oil ranged from 4.17% to 16.74%. These findings demonstrated the effective use of chia oil to butter oil; however, more research should be conducted to determine the applicability of chia oil in other dairy products. The oil derived from chia leaves is used as a fragrance and condiment. According to the studies, chia seed contains a greater quantity of phytosterols, which have antibacterial and cancer-fighting properties. It has recently been demonstrated that chia seed mucilage may be used as a functional coating with better functional qualities [8].

Cardiovascular disease (CVD) is an umbrella term for any condition that affects the heart or blood vessels. CVD, commonly known as heart disease and cardiac arrest, refers to any condition that affects your heart or blood flow. It is usually associated with an increase in blood clumping and a build-up of fat on the interior of blood vessels. It might also be linked to the damage of other sections of the body, including as the heart, brain, eyes, and kidney. This includes hypertension, metabolic syndrome, muscular inactivity, diabetes mellitus, and other conditions. Coronary artery disease refers to conditions that cause the arteries leading to the heart muscle to contract or get clogged (coronary infarction). The primary physiological threat components of myocardial infarction and failure include increased consumption of imbalanced dietary patterns, lack of exercise, smoking, and adverse spirits usage. High blood pressure, high blood glucose levels, a high lipid profile, fleshiness, and chubbiness are the outcomes of physiological risks [9].

Diet is a major contributor to heart disease. Overweight, hypertension, unmanaged high blood glucose, and eating more animal fats are all dietary risk factors. A diet high in plant lipids, soluble fibres, and organic foods has been shown to reduce the occurrence of cardiac disorders. Furthermore, low standard dietary goods are high in processed grains, salt, sweets, and animal saturated fats; poor in fresh fruits, vegetables, nuts, and legumes; and high in unprocessed grains. They largely consist of processed food items that are generally prepared and fresh, with just a few whole foods and newly created products. Given the high energy and supplement density of seeds, the overall role of seeds in the prerural feeding regimen is reasonable. Seeds are also very important in human nutrition due of their fascinating blend of organically active combinations. It is important because, more recently, a great deal of logical proof is based on the positive effects of increased utilisation of plant seeds and inferred goods on various health outcomes (primarily CVD, diabetes mellitus type 2 (DM2), and intermediate indicators).

The seed is a miniature embryonic plant encased in a covering known as the seed coat, which is produced by mature ovules of flowering plants following pollination and reproduction. The seed is made up of a complex exterior matrix and a germ rich in physiologically active minerals, vitamins, and phytochemicals, which can protect the plant's DNA from oxidative stress and promote

species survival. Reduced use of salt and alcohol, as well as increased consumption of fruits and vegetables and physical activity, have all been linked to a decreased risk of CVD.

Omega-3 fatty acids have the capacity to inhibit calcium and sodium channel dysfunctions, which can lead to hypertension. Omega-3 fatty acids boost parasympathetic tone, reduce heart rate variability, and protect against ventricular arrhythmia. An increase in alpha-linolenic acid consumption reduced the chance of heart failure. A scientific study conducted at St. Michael Hospital in Toronto, Canada, revealed that 37 g seed on a daily basis stabilised blood glucose levels in diabetic patients, prevented myocardial infarction and strokes by inhibiting platelet aggregation, and reduced systolic blood pressure by up to 6 mmHg. Possible medical characteristics of chia include cholesterol reduction, blood clotting inhibition, stress and epilepsy prevention, immune system enhancement, and eating chia during pregnancy aids in the development of the foetus' retina and brain. A study conducted on male Wistar rats revealed that eating chia seed had a significant lowering effect on triglycerides while increasing the healthy HDL cholesterol. Another advantage of feeding chia seed was a decrease in omega-6 in plasma, which results in a lower omega-6: omega-3 ratio, which is cardio-protective.

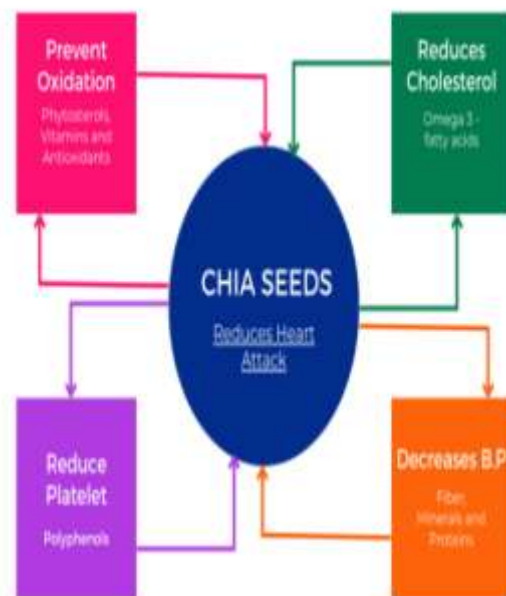


Fig. 3 – Chia seeds role in controlling Heart attack

Chia seeds are high in omega-3 fatty acids and antioxidants, which can be utilised as a functional component to help reduce the incidence of CVD. The use of medications to address hyperglycemia, high blood pressure, and cholesterol levels is also important in decreasing and managing the occurrence of this illness. Health programmes that create favourable conditions for developing healthy alternatives that are economical and easy are required to motivate individuals to retain and promote healthy behaviours. Furthermore, medical therapy for hyperglycemia, high blood pressure, and cholesterol content are critical in reducing and regulating the occurrence of this illness.

V. CONCLUSION

Chia (*Salvia hispanica* L.) is a member of the Labiatae family that originated in Mexico and northern Guatemala. Since 1500 BC, seeds have been a component of human sustenance. Seeds have traditionally been utilised as a meal, in a variety of folk remedies, fundamental cosmetics, and as part of religious rites in pre-Columbian communities. Because of its enormous nutritional and medicinal potential, the chia seed has been widely utilised in many nations for thousands of years. The European legislature has nominated Chia seed as a novel food. Chia seeds are the greatest plant source of omega-3 polyunsaturated fatty acids, which can help prevent aggravation, increase cognitive function, and decrease cholesterol levels. Chia seeds are also high in polyphenols derived from caffeic acid, which are cell reinforcements that protect the body against free radicals, maturation, and cancer.

Chia seeds, which are veggie and high in omega-3 fatty acids and fibre, have been shown to benefit in the prevention of diverticular disease. Cardiovascular disease (CVD), often known as heart disease and cardiac arrest, refers to any ailment that affects your heart or blood flow. It is frequently connected with an increase in blood clumping and an accumulation of fat on the inside of blood vessels. Chia seeds include omega-3 fatty acids and antioxidants that can be used as a functional component to help lower the risk of CVD. Chia seeds are abundant in omega-3 fatty acids and antioxidants and can be used as a functional component to help lower the risk of CVD. The use of drugs to treat diabetes, elevated blood pressure, and excessive cholesterol levels is also beneficial for preventing and treating the prevalence of this medical condition. The activity

of flavonoids in particular is explained by the ad hoc movement of ROS and RNS, since hydrogen and electrons are transported to hydroxyl, peroxy acid, and peroxy nitrite to balance them out, resulting in a typically stable flavonoid. Cellular reinforcements help to reduce the incidence of illnesses such as cancer and cardiovascular disease, as well as provide protection against a variety of diseases and disorders.

To drive individuals to preserve and promote healthy practises, health interventions that establish optimal conditions for generating healthy alternatives that are affordable and simple are necessary.

REFERENCES

- [1]. Chia seed, https://en.wikipedia.org/wiki/Chia_seed
- [2]. Chia seeds plant: Facts, benefits, uses and maintenance tips, <https://housing.com/news chia-seeds-plant-salvia-hispanica/20> Benefits of Chia Seeds, How to Use, Recipes, & Side Effects, [https://www.stylecraze.com/articles/health-benefits-of-chia-seeds/#:~:text=Chia%20seeds%2C%20simply%20because%20they,treat%20this%20condition%20\(31\)](https://www.stylecraze.com/articles/health-benefits-of-chia-seeds/#:~:text=Chia%20seeds%2C%20simply%20because%20they,treat%20this%20condition%20(31))
- [3]. Enticing Health Benefits of Chia Seeds, <https://www.healthline.com/nutrition/11-proven-health-benefits-of-chia-seeds>
- [4]. *Salvia hispanica*, https://en.wikipedia.org/wiki/Salvia_hispanica
- [5]. Health Benefits of Chia Seeds, <https://www.webmd.com/diet/health-benefits-chia-seeds>
- [6]. The Nutrition Source, <https://www.hsph.harvard.edu/nutritionsource/food-features/chia-seeds/>
- [7]. U. Rahman, M. Nadeem, A. Khalique, M. Imran, S. Mehmood, A. Javid, and J. Hussain. (2016). Nutritional and therapeutic perspectives of Chia (*Salvia hispanica* L.): a review. *Journal of Food Science and technology*. 53(4): 1750–1758. doi: 10.1007/s13197-015-1967-0, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4926888/>
- [8]. K. Waseem, A. Muhammad Sajid, A. Afifa, R. Muhammad Abdul, Q. Tahira Batool, A. Fareed, A. Anwar, R. Muhammad Modassar Ali Nawaz, K.



- Muhammad Zubair, and A. Faqir Muhammad. (2023). Chia seeds (*Salvia hispanica* L.): A therapeutic weapon in metabolic disorders. *Food Science and Nutrition*. 11(1): 3–16. doi: 10.1002/fsn3.3035, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9834868/>
- [9].