

# Chia Seed (*Salvia hispanica* L.) biology: A superfood cereal for healthy life - An overview

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## Abstract

The Chia seed plant (*Salvia hispanica* L.) is an annual cereal crop, gaining attention in recent years, all over the world as super food for its power in human health. Chia is an annual, small-seeded herbaceous plant and an important source of minerals, vitamins, and fiber. In tropical and subtropical climates, the cultivation and usage of chia seeds have grown tremendously due to their higher nutritional and medicinal value, containing healthy polyunsaturated fatty acids, omega-3 fatty acids, minerals, dietary fiber, proteins, and some important vitamins. Besides, the seeds are an excellent source of antioxidants and polyphenols such as myricetin, quercetin, caffeic and rosmarinic acid, and others. In recent years, researchers both in developed and developing countries have been researching the agronomic aspects and investigating the benefits of the mentioned seeds in the pharmaceutical, medicinal and food industries. In this study, an extensive overview of the nutritional properties to produce chia seed is discussed. This review article highlights the benefits of chia seeds, their antioxidants and nutritional values in human health and to use for maximum benefits along with the agronomic aspect of these potential seeds. High nutritional profile with tremendous health benefits, part of an overall healthy diet that improves blood lipid profile in humans.

**Keywords:** Chia seed, superfood, unsaturated fatty acids, nutritional properties, active compounds, antioxidant activity

## Introduction

Chia, a seed-bearing grain crop, scientific name *Salvia hispanica*, and a member of the Lamiaceae family [1-5]. The seeds of the plant are filled with large amounts of dietary fiber, essential fatty acids -omega 3, and plenty of high-quality protein, essential vitamins, and minerals including antioxidants. These important materials having a variety of benefits to boost the metabolism of human health, supporting teeth and bones health, improves digestive and cardiac health, reducing blood sugar and cholesterol levels, improves the immune system and boosting weight loss including reduction of inflammation of human body [6].

Besides having medicinal values/ properties, the seeds are used to prepare bread, cake, chips, Frankfurter, ice cream, and pudding including adding in drinks providing lot of energy to keep our body fit [7-10]. The oil after extraction of seed could also be used as a nutritious addition in smoothies and other meals, and support brain health as the fatty acids have neuroprotective effects that lead to reduced risk of stroke, depression and Alzheimer's disease including care of skin, hair and anticancer medicinal drug-related activities [11].

## Agronomy

The chia seeds, oval-shaped about 2 millimeters wide, tiny with a combination of black, grey, brown and white (Fig 1) considered as superfood as packed up with nutritional value and gaining attention in now a day all over the world [12].



Fig 1: Dried Chia seeds structure ready for sowing.

Photo credit: Nahar 2023

Chia seeds can germinate in different types of soil including different media as soilless cultures (Fig 2) and can be cultivated commercially from both seeds and seedlings [13].



Fig 2: Chia seeds germinating in different media (Tissue paper, sand etc)

Photo credit: Nahar 2023

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However, growing plantlets from seeds can be the best part of propagating as they can germinate and grow in any substratum/ media (Fig 3 & 4). Just sprinkle the seeds over the media, watering and after 3 days it will be germinated [13-18].



Fig 3: Chia seeds growing in soil: A. 1-week old seedlings B. 2- weeks old seedlings C. 3- weeks old seedling.



Fig 4. 3 weeks old seedling (A) and plants grown in different media with the aboveground and belowground part(B & C).

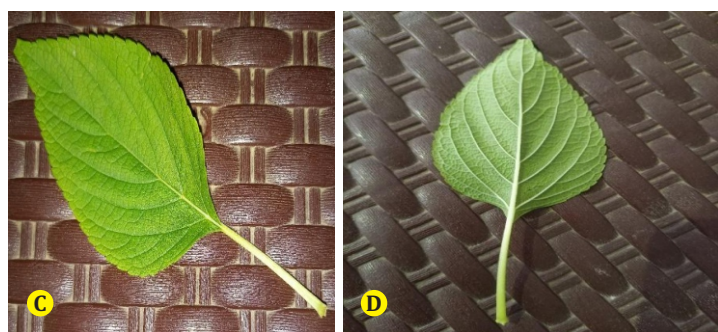


Fig 5: Leaf structure of Chia with net venation: C. Adaxial surface D. Abaxial surface

Leaves of the plant are oppositely arranged, green, and thick, and have serrated (toothed) margins containing long petioles with net venation (Fig 5) [19-23]. It grows well in temperatures between 20-36 degrees Celsius, however, at higher temperatures germination and also the growth and development rates are higher compared to lower (Fig 6)[24].



Fig 6: Growth and development of Chia plant in earthen pot at roof top garden (36 degree Celsius).

### Nutritional values

Chia seeds have tremendous nutritional value.100 grams of Chia seeds contain about 485 calories,6% water, 31 grams of heart-healthy fats ( omega 3 fatty acids), 34 gm dietary fiber, 42 grams of carbohydrates, 0 g sugar, 16 g protein including including important amino acids as lysine, leucine, isoleucine, methionine, threonine, tryptophan, phenylalanine, valine, and histidine[25].

### Sources and Important uses

**Sources of Fiber, vitamins and minerals:** Chia seeds contain insoluble fiber like cellulose a potential part of humans' daily diet, which helps to regulate the digestive system and remove harmful chemicals and waste materials from the body [26-30]. Vitamins are crucial micronutrients that keep the body's cells functioning. Seeds of chia are also an important source of protein, soluble fats with vitamins like A, D, E, K including vitamins B complex like thiamine (B1), and riboflavin (B2) [31]. niacin(B3), biotin (B7), folic acid(B9) and cyanocobalamin (B12)[32-35]. Like vitamins, minerals are also essential inorganic components for healthy body functions growth of biological systems and building of strong bones. Besides, chia seeds are rich in iron, calcium, magnesium, phosphorus, copper, manganese, copper, selenium, etc as essential minerals [36].

### Sources of antioxidant and Omega 3

Antioxidants (polyphenols and carotenoids) and Omega 3 are very important components for the proper functioning of the human body. Antioxidants generally protect the body cells from damage by slowing down the process of oxidation [37]. Thus, seeds of chia are considered as important source of antioxidants, benefit the heart and liver and protect from early aging and certain types of cancer Besides, seeds containing high omega 3 fatty acids, these fats play an active and vital role in digestion, helping to reduce blood pressure, risk of obesity including overall body functioning (Fig 7) [38].

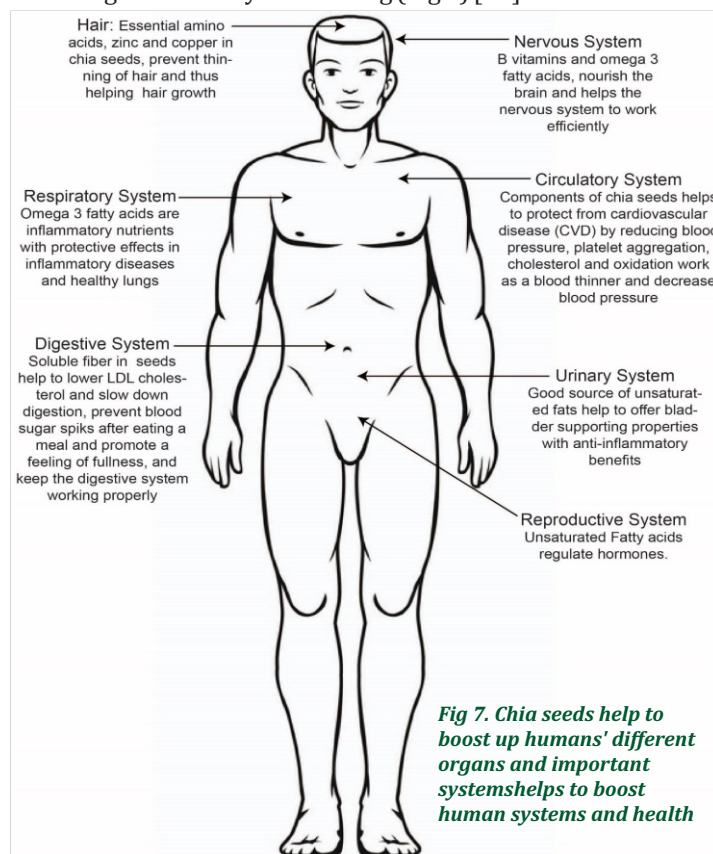


Fig 7. Chia seeds help to boost up humans' different organs and important systems helps to boost human systems and health

**Hair:** Chia seeds contain essential amino acids, zinc and copper, prevent thinning of hair and thus helping hair growth [39].

**Nervous system:** Chia seeds contain omega 3 fatty acids including B vitamins which support, and nourish the brain and help the nervous system to work efficiently. [40]

**Circulatory system:** Components of chia seeds helps to reduce blood pressure, cholesterol levels, and platelet aggregation including improving the efficiency of oxidation work as a blood thinner and ultimately protecting from cardiovascular disease (CVD)

**Respiratory system:** Chia seeds are a good source of omega 3. Fatty acids of omega 3, act as active inflammatory nutrients with protective effects in inflammatory diseases. Therefore, to maintain healthy lungs we should take chia [41].

**Digestive system:** The soluble fiber of chia seeds helps to reduce the levels of LDL cholesterol, slow down the digestive process, including the prevention of blood sugar spikes after having a meal and provide a feeling of fullness. Besides, the fiber helps the stomach to produce good bacteria, keeping the digestive system to work properly.

**Urinary System:** Good source of unsaturated fats help to offer bladder-supporting properties with anti-inflammatory benefits [42].

**Reproductive system:** Unsaturated Fatty acids of chia seeds, regulate hormones, promote ovulation and improve uterine and reproductive health In recent years, it has been used as a popular and nutritious ingredient in many food items all over the world to achieve potential health benefits.

#### Add in meals

**To add in salad:** Sprinkle chia seeds over the favorite and delicious salad every day to incorporate the nutritional benefits including reducing the urge to overeat, which helps reduce the weight.

#### As oatmeal

As a cereal, chia seeds could be used as a nutritious and preferred oatmeal at breakfast, which help to keep the stomach full and reduce hunger for a longer time which ultimately slow down the digestion of carbohydrates.

**To prepare smoothies:** Mixing chia seeds in drinks, especially in smoothies or other beverage recipes will help to boost fibers and nutrients in our body.

**To prepare chia peanut butter:** To prepare a smooth paste to spread on toast or bread, could be prepared by chia seeds with peanut or any nut butter mixed in a blender until smooth to add in morning diet [43].

**To prepare baking goods:** By adding chia seeds in dough of flour before baking to prepare tasty bread, cakes, muffins etc will provide extra fiber, and healthy fats including protein to the baked items.

**To add in soup:** Before serving one teaspoonful of chia seed could be stirred to add into hot soup to enjoy the added thickness and keep feeling full [44].

**Chia seed pudding:** A pudding of chia seed is a nutritious and delicious dessert that helps to support healthy heart. To prepare a creamy nutritious pudding of the chia seeds needs to mixing the mentioned seeds with evaporated milk including desired flavorings and keep the mixture to sit overnight [45].

#### Conclusion

In the context of a developing country like Bangladesh with a huge population we need to grow more, make it popular, and provide the farmers the necessary support regarding chia seed cultivation, production and commercialization for the international market as the chia seeds are a high nutritional valued cereal crop with demand in the international market so that more farmers will be interested in the cultivation of chia seed as a profitable crop and the expanding cultivation by farmers will reduce our dependency on import of this important cereal crop.

The commercial cultivation of superfood chia seeds (*salvia hispanica*), in some areas of Bangladesh, has been giving new hope to farmers in Bangladesh with good yield as a result of favorable weather conditions instead of growing tobacco for three times with less profit, especially in hilly areas of Bangladesh and attracting more farmers for cultivation of this superfood seeds. Cultivation is mostly expanded in the hill tracts of the Chittagong district bringing a new revolution in the area as it is easy to cultivate and highly profitable compared to regular crops cultivation in hilly areas due to the possibility of mitigating risk factors related to pest and diseases. Therefore, chia seed cultivation shows promise in hilly areas and opens a new window for earning foreign currency for local farmers as well as exporters.

Nowadays, chia becoming a more popular cereal and annual crop because of its potential benefits for the betterment of human health, as lower blood pressure, and blood sugar with improved blood lipid profile, which help to boost up the immune system. Thus, adding chia seeds to our daily diet has tremendous health benefits to maintain and achieve a healthy life.

#### Declarations

**Conflicts of interest:** The author declares that there are no conflicts of interest exist

**Funding statement:** No funding was received for conducting this study

**Data availability:** No data were used for the review manuscript described in the article

#### References

1. Grancieri, M., Martino, H.S.D. and Gonzalez de Mejia, E. (2019). Chia Seed (*Salvia hispanica*L.) as a Source of Proteins and Bioactive Peptides with Health Benefits: A Review. *Comprehensive Reviews in Food Science and Food Safety*, 18(2):480–499.
2. Reyes-Caudillo, E., Tecante, A. and Valdivia-López, M.A. (2008). Dietary fibre content and antioxidant activity of phenolic compounds present in Mexican chia (*Salvia hispanica* L.) seeds. *Food Chemistry*, 107(2): 656–663.



3. Pellegrini, M., Lucas-Gonzalez, R., Sayas-Barberá, E., Fernández-López, J., Pérez-Álvarez, J.A. and Viuda-Martos, M. (2017). Bioaccessibility of Phenolic Compounds and Antioxidant Capacity of Chia (*Salvia hispanica* L.) Seeds. *Plant Foods for Human Nutrition*, [online] 73(1): 47–53
4. Ullah, R., Nadeem, M., Khalique, A., Imran, M., Mehmood, S., Javid, A. and Hussain, J. (2015). Nutritional and therapeutic perspectives of Chia (*Salvia hispanica* L.): a review. *Journal of Food Science and Technology*, 53(4):1750–1758.
5. Olivos-Lugo, B.L., Valdivia-López, M.Á. and Tecante, A. (2010). Thermal and Physicochemical Properties and Nutritional Value of the Protein Fraction of Mexican Chia Seed (*Salvia hispanica* L.). *Food Science and Technology International*, 16(1): 89–96.
6. da Silva, B.P., Anunciação, P.C., Matyelka, J.C. da S., Della Lucia, C.M., Martino, H.S.D. and Pinheiro-Sant'Ana, H.M. (2017). Chemical composition of Brazilian chia seeds grown in different places. *Food Chemistry*, 221:1709–1716.
7. Madaan, R., Bala, R., Zandu, S. K., & Singh, I. (2020). Formulation and characterization of fast dissolving tablets using *Salvia hispanica* (Chia Seed) mucilage as super disintegrant. *ACTA Pharmaceutica Scientia*, 58(1), 69.
8. Khalid, W, Arshad, S.M., Aziz, A., Rahim, A.M., Qaisrani, B.T., Afzal F, Ali, A., Ali, M.M., Ranjha N., Khalid, Z.M., and Anjum M.F (2023). Chia seeds (*Salvia hispanica* L.): a therapeutic weapon in metabolic disorders. *Food Sci Nutr*. 11(1): 3–16.
9. Aja, S.; Haros, C.M. (2022). Nutrient composition of fresh pasta enriched with chia (*Salvia hispanica* L.). *Biol. Life Sci. Forum*, 17, 3
10. Ferreira, D.M.; Nunes, M.A.; Santo, L.E.; Machado, S.; Costa, A.S.G.; Álvarez-Ortí, M.; Pardo, J.E.; Oliveira, M.B.P.P.; Alves, R.C. (2023). Characterization of chia seeds, cold-pressed oil, and defatted cake: An ancient grain for modern food production. *Molecules* 28, 723
11. Motyka, S.; Koc, K.; Ekiert, H.; Blicharska, E.; Czarnek, K.; Szopa, A (2022). The current state of knowledge on *Salvia hispanica* and *Salviae hispanicae semen* (Chia Seeds). *Molecules*. 27, 1207.
12. Grave, G.; Mouloungui, Z.; Cerny, M.; Lacroux, E.; Valentin, R.; Fabre, J.-F.; Merah, O. (2022). Oil content, fatty acid and phytosterol compositions of chia seeds cultivated under organic conditions in France. *OCL*. 29, 32.
13. Hassanin, H.A.; Taha, A. (2022). Sonochemical-assisted biogenic synthesis of theophrasite  $\beta$ -Ni (OH)<sub>2</sub> nanocluster using chia seeds extract: Characterization and anticancer activity. *Nanomaterials*. 12, 1919.
14. Fernandez I., Vidueiros S.M., Ayerza R., Coates W., Pallaro A. (2008). Impact of chia (*Salvia hispanica* L.) on the immune system: preliminary study. *Proceedings of the Nutrition Society*. 67(OCE):12.
15. Tak, Y.; Kaur, M.; Kumar, R.; Gautam, C.; Singh, P.; Kaur, H.; Kaur, A.; Bhatia, S.; Jha, N.K.; Gupta, P.K. (2022) Repurposing chia seed oil: A versatile novel functional food. *J. Food Sci*. 87:2798–2819.
16. Kulczynski, B.; Cisowska, J.K.; Taczanowski, M.; Kmiecik, D.; Michalowska, A.G. (2019) The chemical composition and nutritional value of chia seeds- current state of knowledge. *Nutrients*. 11, 1242.
17. Oteri, M.; Bartolomeo, G.; Rigano, F.; Aspromonte, J.; Trovato, E.; Purcaro, G.; Dugo, P.; Mondello, L.; Beccaria, M. (2023). Comprehensive chemical characterization of chia (*Salvia hispanica* L.) seed oil with a focus on minor lipid components. *Foods*. 12 (1), 23
18. Abdel Ghani, A.E.; Al-Saleem, M.S.M.; Abdel-Mageed, W.M.; AbouZeid, E.M.; Mahmoud, M.Y.; Abdallah, R.H. (2023). UPLC-ESI-MS/MS profiling and cytotoxic, antioxidant, anti-inflammatory, antidiabetic, and antiobesity activities of the non-polar fractions of *Salvia hispanica* L. aerial parts. *Plants*. 12, 1062
19. Dąbrowski, G.; Konopka, I.; Czaplicki, S. (2018). Variation in oil quality and content of low molecular lipophilic compounds in chia seed oils. *Int. J. Food Prop.* 21, 2016–2029
20. Prathyusha, P.; Kumari, B.A.; Suneetha, W.J.; Srujana, M.N.S. (2019). Chia seeds for nutritional security. *J. Pharmacog. Phytochem.* 8, 2702–2707.
21. Katunzi-Kilewela, A.; Kaale, L.D.; Kibazohi, O.; Rweyemamu, L.M. 2021. Nutritional, health benefits and usage of chia seeds (*Salvia hispanica*): A review. *Afr. J. Food Sci.* 15, 48–59.
22. Rabail, R.; Sultan, M.T.; Khalid, A.R.; Sahar, A.T.; Zia, S.; Kowalczewski, P.Ł.; Jezowski, P.; Shabbir, M.A.; Aadil, R.M. (2022). Clinical, nutritional, and functional evaluation of chia seed-fortified muffins. *Molecules*. 27, 5907.
23. Olmos, E.; Roman-Garcia, I.; Reguera, M.; Mestanza, C.; Fernandez-Garcia, N. (2022) An update on the nutritional profiles of quinoa (*Chenopodium quinoa* Willd.), amaranth (*Amaranthus* spp.), and chia (*Salvia hispanica* L.), three key species with the potential to contribute to food security worldwide. *JSFA Rep.* 2, 591–602.
24. Suri S., Passi S.J., Goyat J. (2016). Chia seed (*Salvia hispanica* L.)—A new age functional food. *Int. J. Adv. Technol. Eng. Sci.* 4:286–299.
25. Munoz L.A., Cobos A., Diaz O., Aguilera J.M. (2013). Chia seed (*Salvia hispanica*): An ancient grain and new functional food. *Food Res. Int.* 29:394-408.
26. Iglesias-Puig E., Haros M. (2013). Evaluation of performance of dough and bread incorporating chia (*Salvia hispanica* L.) *Eur. Food Res. Technol.* 237:865–874.

27. Pizarro P.L., Almeida E.L., Samman N.C., Chang Y.K. (2013). Evaluation of whole chia (*Salvia hispanica* L.) flour and hydrogenated vegetable fat in pound cake. *LWT Food Sci. Technol.* 54:73–79.
28. Steffolani E., Martinez M.M., Leon A.E., Gomez M.(2015). Effect of pre-hydration of chia (*Salvia hispanica*L.), seeds and flour on the quality of wheat flour breads. *LWT Food Sci. Technol.* 61:401–406.
29. Peiretti P.G., Gai F.(2009). Fatty acid and nutritive quality of chia (*Salvia hispanica* L.) seeds and plant during growth. *Anim. Feed Sci. Technol.* 148:267–275.
30. Bushway A.A., Belyea P.R., Bushway R.J. (2006). Chia seed as a source of oil, polysaccharide, and protein. *J. Food Sci.* 46 (5):1349–1350.
31. Coelho M.S., Salas-Mellado M.M. (2014). Chemical characterization of Chia (*Salvia hispanica* L.) for use in food products. *J. Food Nutr. Res.* 2:263–269.
32. Teoh S.L., Lai N.M., Vanichkulpitak P., Vuksan V., Ho H., Chaiyakunapruk N.(2018). Clinical evidence on dietary supplementation with chia seed (*Salvia hispanica* L.): A systematic review and meta-analysis. *Nutr. Rev.* 76:219–242.
33. Ding Y., Lin H.W., Lin Y.L., Yang D.J., Yu Y.S., Chen J.W., Wang S.Y., Chen Y.C.(2018). Nutritional composition in the chia seed and its processing properties on restructured ham-like products. *J. Food Drug Anal.* 26:124–134.
34. Oliveira M.R., Novack M.E., Santos C.P., Kubota E., Rosa C.S. (2015). Evaluation of replacing wheat flour with chia flour (*Salvia hispanica* L.) in pasta. *Semin. Ciênc. Agrár.* 36:2545.
35. Coelho M.S., Salas-Mellado M.M.(2015). Effects of substituting chia (*Salvia hispanica* L.) flour or seeds for wheat flour on the quality of the bread. *LWT Food Sci. Technol.* 60:729–736.
36. Coorey R., Grant A., Jayasena V. (2012). Effects of chia flour incorporation on the nutritive quality and consumer acceptance of chips. *J. Food Res.* 1:85–95.
37. Campos B.E., Ruivo T.D., Scapin M., Madrona G.S., Bergamasco R.C.(2016). Optimization of the mucilage extraction process from chia seeds and application in ice cream as a stabilizer and emulsifier. *LWT Food Sci. Technol.* 65:874–883.
38. Pintado T., Herrero A.M., Jimenez-Colmenero J., Ruiz-Capillas C. (2016). Strategies for incorporation of chia (*Salvia hispanica* L.) in frankfurters as a health-promoting ingredient. *Meat Sci.* 114:75–84.
39. Valdivia-López M.Á., Tecante A. (2015). Chia (*Salvia hispanica*): A review of native Mexican seed and its nutritional and functional properties. *Adv. Food Nutr. Res.* 75:53–75.
40. Zettel V., Hitzmann B. (2018). Applications of chia (*Salvia hispanica* L.) in food products. *Trends Food Sci. Technol.* 80:43–50.
41. Zettel V, Krämer A, Hecker F, Hitzmann B. (2015). Influence of gel from ground chia (*Salvia hispanica* L.) for wheat bread production. *European Food Research and Technology* 240:655-662
42. Steffolani E, De la Hera E, Pérez G, Gómez M. (2014). Effect of Chia (*Salvia hispanica* L.) Addition on the Quality of Gluten-Free Bread. *Journal of Food Quality* 37:309-317
43. Marcinek K, Krejpcio Z ( 2017) Chia seeds (*Salvia hispanica*): health promoting properties and therapeutic applications – a review. *Rocz Panstw Zakl Hig.* 68(2):123-129. PMID: 28646829.
44. Nikpayam, Omid, et al (2023) "Effect of chia product supplement on anthropometric measures, blood pressure, glycemic-related parameters, lipid profile and inflammatory indicators: A systematic and meta-analysis." *Journal of Functional Foods* 110: 105867.
45. Toscano LT, da Silva CS, Toscano LT, de Almeida AE, Santos Ada C, Silva AS ( 2014). Chia flour supplementation reduces blood pressure in hypertensive subjects. *Plant Foods Hum Nutr.* 69(4):392-8.