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# "The Incredible Health Advantages Of Chia Seeds":A Review

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## Abstract:

Chia, or Salvia hispanica L., is becoming a significant functional food ingredient due to its high protein and essential amino acid content, dietary fiber content, and omega-3 fatty acid content. It is also a good indicator of bioactive peptides.

Chia has existed for more than 5,500 years. One of the most significant parts of the Maya and Aztec diets was chia seeds. Chia has a strong nutritional potential due to its chemical makeup and technological characteristics. Chia is a good source of soluble dietary fiber and omega-3 and omega-6 polyunsaturated fatty acids. It also has a significant amount of phytochemicals and proteins. Because of its nutritional value, chia is used to prevent a number of non-infectious ailments, including diabetes, cancer, obesity, high blood pressure, and cardiovascular diseases (CVDs). Many scientific centers are now researching the nutritional a nd medicinal benefits of chia. This article's goal is to outline the nutritional and medicinal

## Key words:

Fatty acids, health, chia seeds, and Salvia Hispanica

## 1. INTRODUCTION:

The Lamiaceae family includes the summer annual herbaceous flowering plant known as chia (Salvia hispanica L.), which is native to southern Mexico and whose seeds have been eaten by the locals since ancient times [1]. It is known to bloom with purple and/or white petals. It is indigenous to Guatemala and central and southern Mexico, where it has long been considered a necessary culinary item and is still used in food and drinks [2, 3]. According to the USP, chia seed oil is the oil that is extracted from the seeds by cold pressing; solvents or external heat are not used in this process. Tocopherols can be added as antioxidants to help preserve the oil [2].


FIG NO:-1 CHIA SEEDS

The USP recently created a public quality standard for chia seed oil in response to the growing use of chia seed oil in dietary supplements. This standard gives manufacturers of dietary supplements a way to guarantee that, should they choose to comply, they can provide the public with high-quality products [2].

## 2. CHIA SEED OIL'S NUTRITIONAL COMPOSITION

Chia seeds have a very high percentage (44–69%) of α-linolenic acid and up to 39% fat [4]. is high in crude fiber (up to 30%) and protein (up to 25%), making them a good source of dietary fiber and omega-

linoleic acid, which is estimated to be between 55% and 66% and omega-6 linoleic acid, which is between 13% and 23% [5], [6] [7] Saturated fats make up 2.91% of the seed's total mass, monounsaturated fats make up 1.88%, and polyunsaturated fats make up about 26.85%. Studies have indicated that a diet rich in omega-3 fatty acids is associated with a decreased risk of rheumatoid arthritis, cancer, coronary artery disease, autoimmune disorders, and type 2 diabetes [8]. The fatty acid composition of chia seeds has been examined and contrasted by numerous researchers with that of other comparable seeds, like flax seeds.

Chia seed oil's sufficient concentration of linoleic fatty acids (55–60%) and linoleic acids (18–20%), as well as its lower quantity of saturated fatty acids (palmitic and stearic acids), make it an enticing and favored option for healthy food and cosmetic applications [4]. Chia seeds and oil have both been safely added to animal feed to raise polyunsaturated fatty acids and lower cholesterol and in meat, eggs, and goods [9]. Because of the ongoing mercury contamination of fish supplies and the depletion of ocean fisheries, which has resulted in a decreased intake of the long-chain n-3 fatty acids found in fish, which have been linked to lower risks of coronary heart disease [10]–[11], more research is currently being done on sources of alpha linoleic acids.

The exceptional, noteworthy chemical makeup of the seeds is another factor contributing to the high level of market interest in chia. Because chia seeds and oil are rich in antioxidants, they offer a long list of health advantages. Among other things, chia has been helpful in lowering blood pressure, cholesterol, diabetes, obesity, and cardiovascular disorders

The nutritional qualities of chia seeds, including their high content of polyunsaturated fatty acids, vegetable protein, dietary fiber, vitamins, minerals, and bioactive substances, have led to a number of studies demonstrating their therapeutic potential. Chia seeds are said to have hypotensive [,12]antineoplastic, laxative, and analgesic qualities. They are claimed to have anti-oxidative qualities, regulate lipid metabolism [13,14,15], protect the cardiovascular system [2], have anti-inflammatory qualities, and improve athletes' performance [16]

Even after consuming 37g of chia seeds added to bread daily for 12 weeks, a randomized, single-blind study involving 20 adults with type 2 diabetes revealed a significant decrease in systolic blood pressure and C-reactive protein concentration in blood plasma. Additionally, a double increase in α-linolenic acid and eicosapentaenoic acid in plasma was observed in comparison to the control group. Chia seeds' anticoagulant and anti-inflammatory properties may assist type II diabetic individuals avoid heart attacksand strokes [12]

An increase in unsaturated fatty acids in plasma blood was also noted in a study of healthy postmenopausal women who took 25 g of milled chia seeds daily for seven weeks [17]. The effects of giving 76 adults 50 g of chia seeds for 12 weeks were investigated. Blood pressure, lipid profile, body weight, blood sugar, and inflammatory indicators did not significantly decrease in this study [18]. The study, which involved 62 obese women who were supplemented with 25g of whole or 25g of milled chiaseeds, produced similar outcomes [18].

However, another study found that healthy subjects had lower postprandial glycaemia [19,20,21]. Through a randomized double-blind trial, the impact of food intervention in assessing metabolic disorders was assessed. Triacylglycerols, C-reactive protein levels, and insulin resistance were significantly lower in the chia-based diet group in this 67-adult study [22].

Consuming 35 g of chia seeds for 12 weeks was found to raise LDL cholesterol and lower total cholesterol [23]. Although chia seeds' active ingredients contribute to the health benefits, safety, and effectiveness of this natural product or medicinal food, they still need to be validated by scientific protocols because there are currently few clinical studies on the safety and effectiveness of chia seeds, and those that have been published have not produced

conclusive results [24].

## 3. CHIA'S BENEFITS FOR HEALTH:

### A. Cardiovascular Diseases and Chia Seeds

The body uses alpha-linoleic acid and eicosapentaenoic acid to generate critical biological substances such prostaglandins, leukotrienes, and thromboxane for a variety of physiological processes [25], [26]. Hypertension can result from sodium and calcium channel dysfunctions, which omega-3 fatty acids help prevent [16], [17]. Furthermore, Watanabe & Tatsuno [16] hypothesize that omega-3 fatty acids improve parasympathetic tone, guard against ventricular arrhythmia, and heart rate variability. Chia seeds are an excellent product to use in preventing cardiovascular disease because they are a strong source of omega

3. Ullah and colleagues' review research [8]

discovered that chia is a fantastic source of antioxidants from both a nutritional and medicinal standpoint. containing substances such myricetin, acid, kaempferol, and quercetin that are thought to have anti-aging, anti-carcinogenic, and hepatic and heart protective properties. Salazar-Vega et al. [18] employed chia from Mexico in a study to assess the antihypertensive and antioxidative effects of functional meals containing chia. The study's findings showed that the angiotensin converting enzyme was inhibited by the protein hydrolysates from chia seeds. The findings imply that chia provides antioxidant protection that may explain its antihypertensive impact by acting as an electron donor and a free radical scavenger.


FIG NO:-2 CHIA SEEDS FOR HEALTH BENEFITS.

### B. Obesity and Chia Seed Oils:

Numerous investigations have been conducted to determine the connection between chia seed oil and obesity. A study by da Silva Marineli et al. [2] sought to determine how chia seeds and chia seed oil affected the heat shock proteins and related limitations in obese mice. The animals in this study were split up into six groups by the researchers. For six weeks and twelve weeks, respectively, these groups were on a high-fat, high-fructose diet, the control group, and a high-fat, high-fructose diet supplemented with chia seeds or chia oil.


FIG NO:-3CHIA SEEDS OBESITY ANDCHIA SEEDS OIL

The following were identified with a significant level of $P < 0.05$: proteins controlling oxidative energy metabolism, skeletal muscle for antioxidant enzymes, and plasma markers for liver damage and glucose tolerance. The study's findings showed that a diet heavy in fat and fructose caused oxidative damage, insulin resistance, and glucose intolerance and the altered obesity-related factors. Eating either chia seeds or chia oil did not decrease weight gain or the buildup of belly fat. However, chia seed and chia oil improved insulin and glucose tolerance in both groups. Chia oil stimulates the expression of HSP70 and HSP25 in skeletal muscle. Additionally, chia oil restores system expression that has been impacted by a diet heavy in fat and fructose. Proliferator-stimulated Chia oil and chia seeds also restore receptor-Y coactivator-1α expression, which is inhibited by a diet heavy in fat and fructose. Chia seeds and oil also increase the expression of tissue protection proteins. When compared to chia, chia oil has a stronger antioxidant system reestablishment and an induced expression of more proteins.[2,17]

## 4. Diabetes and Chia Seed Oils :

Numerous research have been carried out to assess the impact of utilizing chia seeds and chia oil in the treatment of diabetes. Animals are used in the majority of these research. A study by [20], [21] sought to determine how chia seed oil affected the body's composition, insulin signaling, and the muscles of obese rats. For 135 days, the mice were given a high-fat diet by the researchers. After that, the mice were split up into groups, and one group was fed chia oil from day 90 to day 135

After that, the mice were split up into groups, and one group was fed chia oil from day 90 to day 135 of the experiment. The results showed that eating chia oil increased lean mass and reduced the buildup of fat mass. Additionally, obese mice given chia oil showed increased protein kinase B activation, increased translocation of glucose transporter type 4, and increased tyrosine phosphorylation of insulin receptor substrate 1. Chia oil supplementation lowers serum insulin and triacylglycerol, improves blood lipoprotein cholesterol levels, and increases insulin tolerance and glucose levels. Chicco et al.'s findings [22]

According to a study on the effects of eating chia seeds high in α-linoleic acid on insulin resistance and dyslipidemia, dietary chia seeds prevented the development of these conditions in rats given a high- sucrose diet. Additionally, chia seeds decreased the rats' visceral obesity.

## 5. Renal Disease and Chia Seed Oils :

Numerous investigations have been conducted to ascertain the effectiveness of eating omega-3 fatty acids in relation to renal abnormalities. Although xerosis and pruritus are the most common complaints from individuals with end-stage renal disease, it has been shown that omega-3 fatty acids can counteract these symptoms. Jeong [23] carried out research to assess those assertions. For eight weeks, the researchers used chia seed oil on five healthy volunteers who had xerotic pruritus symptoms and five additional patients who had pruritus.

We measured itching symptoms as well as other skin problems like skin capacitance and water loss. According to the study's findings, all patients' lichen simplex, skin moisture, and prurigo nodularis improved. Additionally, the skin's moisture and epidermal penetrability hurdle function improved. Chia seed oil can be used as a moisturizing agent for patients with prutic skin, according to the study [24].

Using primary cell lines such as chronic myelogenous leukemia and others, the 3-(4, 5-dimethylthiazol-2- yl)-2, 5-diphenyltetrazolium bromide) (MTT) and trypan blue assays were used to evaluate the in vitro cancer cytotoxic characteristics capability of chia seed oil and its composites. Chia seed oil and its derivatives' anti-inflammatory properties were investigated by assessing their anti-lipoxygenase activity in vitro. The study's findings show that both when combined with other vegetable oils and when incubated with chia seed oil, the anti-lipoxygenase activity was significantly suppressed. The authors concluded that chia seed oil, either by alone or in combination with other vegetable oils, has demonstrated itself to be a beneficial dietary supplement that also delays or prevents the onset of degenerative diseases.

## 6. Oils from Chia Seeds and Cancer :

It has been suggested that bioactive chemicals derived from plants include chemopreventive and anti- cancer properties [25]. A study by Vara-Messler et al. [26] sought to ascertain whether a diet high in α- linoleic acid affected growth limitations in a syngeneic model of breast cancer. Mice who had a tumor cell injection subcutaneously were fed a diet of maize oil and chia oil, which is high in α-linoleic acid. Mice given α-linoleic acid showed reduced tumor incidence, number of metastases, weight, and volume.

However, the release of pro-tumor chemicals derived from omega 6 fatty acids decreased in the tumor, and the tumor latency time increased. There was also less mitosis than in the control experiment, according to the observations. A diet high in α-linoleic acid has been shown to decrease the estrogen receptor, which is known to promote breast cancer. According to the study's data, meals enhanced with α-linoleic acid have anticancer properties and can help prevent breast cancer

## 7. Chia Seed Oil and the Health of the Skin :

Studies have been done to assess how well chia seed oil works to treat tumors and cancer. A study by Salih [24] used the color Doppler vascularity index to demonstrate the effectiveness of chia oil. He split the thirty male rats he employed into two groups of fifteen. Chia oil was administered to the first group, while the second group served as the experiment's control. Each and every animal had its dorsum surgically altered. This resulted in a 2 cm long, entire skin depth horizontal wound. Chia seed oil was thenapplied to the wound.


FIG NO:-4CHIA SEEDS FOR PERFECT SKIN

Following three, seven, and ten days, the rats were scarified. For histological evaluation, a standard segmenting approach was used. The study's findings showed that applying chia oil to the wounds accelerated the re-epithelialization and transformation of the skin's fibrous structures. In contrast to the controlled one, the study found that adding chia oil to wounds significantly improves the wound healing process.

## [4] Conclusion:

The modern world has recently seen a surge in the use of chia seeds because of its many health advantages. The effects of chia seeds and chia seed oil have been the subject of numerous investigations. These research' findings have demonstrated the potential benefits of chia seeds and oil in reducing the risk of cardiovascular disease, obesity and weight reduction, diabetes, poor cognitive function, elevated cholesterol, and gastrointestinal function. This indicates the huge potential of chia in the culinary, pharmaceutical, and nutraceutical industries. Rats in particular have been the subjects of the majority of these research. Human trials are required in order to produce more precise results.

## [5] Refrence:


1. Ali NM, Yeap SK, Ho WY, Beh BK, Tan SW, Tan SG. The promising future of chia, Salvia hispanica L. J Biomed Biotechnol 2012; 2012: 171956
2. United States Pharmacopeal Convention 2017. USP40–NF35 Supple-ment: No. 2 Page 8889. Available at http://www.uspnf.com/official-text.Accessed December 1, 2017
3. Kintzios SE. Sage: The Genus Salvia. Boca Raton, FL: CRC Press; 2000: 9
4. V. Y. Ixtaina et al., “Characterization of chia seed oils obtained by pressing and solvent extraction,” Journal of Food Composition and Analysis, vol. 24, no. 2, pp. 166–174, 2011.
5. J. L. Bresson et al., “Scientific Opinion of the Panel on Dietetic Products Nutrition and Allergies on a request from the European Commission on the safety of ‘Chia seed (Salvia hispanica) and ground whole Chia seed’ as a food ingredient,” The EFSA Journal, vol. 996, no. 1, pp. 1–26, 2009.
6. R. Ayerza (h), “Oil content and fatty acid composition of chia (Salvia hispanica L.) from five northwestern locations in Argentina,” Journal of the American Oil Chemists’ Society, vol. 72, no. 9, pp. 1079–1081, 1995.
7. R. Ullah et al., “Nutritional and therapeutic perspectives of Chia (Salvia hispanica L.): a review,” Journal of Food Science and Technology, vol. 53, no. 4, pp. 1750–1758, 2016.
8. C. de Souza Ferreira, L. de F. de Sousa Fomes, G. E. S. da Silva, and G. Rosa, “Effect of chia seed (Salvia hispanica l.) consumption on cardiovascular risk factors in humans: A systematic review,” Nutricion Hospitalaria, vol. 32, no. 5, pp. 1909–1918, 2015.
9. A. Antruejo et al., “Omega-3 enriched egg production: the effect of α-linolenic ω-3 fatty acid sources on laying hen performance and yolk lipid content and fatty acid composition,” British Poultry Science, vol. 52, no. 6, pp. 750–760, 2011.
10. P. M. Kris-Etherton, W. S. Harris, and L. J. Appel, “Fish consumption, fish oil, omega-3 fatty acids, and cardiovascular disease,” Circulation. Journal of the American Heart Association, vol. 106, no. 21, pp. 2747–2757, 2002.
11. C. M. ALBERT et al., “Blood levels of long chain omega 3 fatty acids and the Risk of Sudden Death,” New England Journal of medicinecine, vol. 346, no. 15, pp. 1113–1118, 2002.
12. Brenna J.T., Salem N. Jr., Sinclair A.J., Cunnane S.C.: Alpha-Linolenic acid supplementation and conversion to n-3 long-chain polyunsaturated fatty acids in humans. Prostaglandins Leukot. Essent. Fatty Acids ISSFAL 2009; 80(2-3):85-91.
13. Chicco A.G., D'Alessandro M.E., Hein G.J., Oliva M.E., Lombardo Y.B.: Dietary chia seed (Salvia hispanica L.) rich in alpha-linolenic acid improves adiposity and normalises hypertriacylglycerolaemia and insulin resistance in dyslipaemic rats. Br J Nutr 2009;101(1):41-50
14. Rodea-Gonzáleza D.A., Cruz-Olivaresa J., Román- Guerrerob A., Rodriguez-Huezoc M.E., Vernon- Carterd E.J., Pérez-Alonso C.: Spray-dried encapsulation of chia essential oil (Salvia hispanica L.) in whey protein concentrate-polysaccharide matrices. J Food Eng2012;111(1):102-109.
15. Ayerza R. & Coates W.: Chia: Rediscovering an Ancient Crop of the Aztecs. 2005. University of Arizona Press, Tuscon

16. Ulbricht C., Chao W., Nummy K., Rusie E., Tanguay- Colucci S., Iannuzzi C.M., Plammoottil J.B.: Varghese M., Weissner W.: Chia (Salvia Hispanica): a systematic review by the natural standard research collaboration.Rev Recent Clin Trials 2009; 4(3):168-174
17. 24. Jin F, Nieman D.C. Shea W. Xie G. Om Y. Jia W Supplementation of milled chia seeds increases plasma ALA and EPA in postmenopausal women. Plam FoodsNieman D.C., Cayea E.J., Austin M.D., Henson D.A., McAnulty S.R., Jin E: Chia seed does not promoteweight loss or alter disease risk factors in overweight adults. Nutr Res 2009,29(6):414-418.
18. Nieman D.C., Gillitt N., Jin F., Henson D.A., Kennerly K., Shanely R.A., OreB., Su M., Schwartz S.: Chia seed supplementation and disease risk factors in overweight women: a metabolomics investigation. J Altern Complement Med 2012;18(7):700-708
19. Ho H. Lee A.S. Jovanovski E Jenkins AL., Desouza R. Fuksan : Effect of whole and ground Salba seeda (Salvia Hispanica L.) postprandial glycemia in healthy volunteers: a randomized controlled, dose- response trial. Eur J Clin Nutr 2013:67(2):105-110
20. 51. Vuksan V., Jenkins A.L., Dias A.G., Lee A.S., Jovanovski E., Rogovik A.L., Hanna A.: Reduction in postprandial glucose excursion and prolongation of satiety: possible explanation of the long-term effects of whole grain Salba (Salvia Hispanica L.). Eur J Clin Nutr 2010; 64(4):436-438.
21. 53. Vuksan V., Choleva L., Jovanovski E., Jenkins A.L., Au- Yeung F, Dias A.G., Ho H.V.T., Zurbau A., Duvnjak L.: Comparison of flax (Linum usitatissimum) and Salba-chia (Salvia Hispanica L.) seeds on postprandial glycaemia and satiety in healthy individuals: A randomized, controlled, crossover study European journal of clinical nutrition 2016; 71(2):234-238.
22. Guevara-Cruz M., Tovar A.R.. Aguilar-Salinax CA.. Medina-Vera L. Gil-Zenteno L, Hernández- Viveros L., López-Romero P, Ordaz-Nava G., Canizales-Quintero S.. Guillen Pineda LE, Torres N.: A dietary pattern including nopal, chia seed, soy protein, and oat reduces serum triglycerides and glucose intolerance in patients with metabolic syndrome. J Nutr 2012, 142(1):64-69.
23. Tavares Toscano L., Leite Tavares R., Oliveira Silva C.S., Silva A.S.: Chia induces clinically discrete weight loss and improves lipid profile only in altered previous values. Nutr Hosp 2015; 31(3):1176-1182.
24. Valdivia-López M.A. & Tecante A.: Chapter Two-Chia (Salvia Hispanica): A Review of Native Mexican Seed and its Nutritional and Functional Properties. Adv Food Nutr Res 2015; 75:53-75.
25. A. H. Metherel, A. F. Domenichiello, A. P. Kitson, K. E. Hopperton, and R. P. Bazinet, "Whole-body DHA synthesis-secretion kinetics from plasma eicosapentaenoic acid and alpha-linolenic acid in the free- living rat," Biochimica et Biophysica Acta Molecular and Cell Biology of Lipids, vol. 1861,no. 9, pp. 997-1004, 2016.
26. Y. Watanabe and I. Tatsuno, "Omega-3 polyunsaturated fatty acids for cardiovascular diseases: present, past and future," Expert Review of Clinical Pharmacology, vol. 10, no. 8, pp. 865-873, 2017.
27. O. N. Ciftci, R. Przybylski, and M. Rudzińska, "Lipid components of flax, perilla, and chia seeds," European Journal of Lipid Science andTechnology, vol. 114, no. 7, pp. 794-800, 2012.
28. R. Ullah et al., "Nutritional and therapeutic perspectives of Chia (Salvia hispanica L.): a review," Journal of Food Science and Technology, vol. 53, no. 4, pp. 1750-1758, 2016.
29. M. R. Segura-Campos, I. M. Salazar-Vega, L. A. Chel-Guerrero, andD. A. Betancur-Ancona, "Biological potential of chia (Salvia hispanica L.) protein hydrolysates and their incorporation into functional foods," LWT-Food Science and Technology, vol. 50, no. 2, pp. 723-731, 2013.
30. R. da S. Marineli, É. A. Moraes, S. A. Lenquiste, A. T. Godoy, M. N. Eberlin, and M. R. Maróstica, "Chemical characterization and antioxidant potential of Chilean chia seeds and oil (Salvia hispanica L.)," LWT-Food Science and Technology, vol. 59, no. 2P2, pp. 1304- 1310, 2014.
31. T. Fonte-Faria et al., "Chia oil supplementation changes body composition and activates insulin signaling cascade in skeletal muscle tissue of obese animals," Nutrition, vol. 58, pp. 167-174, 2019.
32. R. Ayerza and W. Coates, "Effect of dietary a-linolenic fatty acid derived from chia when fed as ground seed, whole seed and oil on lipid content and fatty acid composition of rat plasma," Annals of Nutrition and Metabolism, vol. 51, no. 1, pp. 27-34, 2007.

33. A. G. Chicco, M. E. D'Alessandro, G. J. Hein, M. E. Oliva, and Y. B. Lombardo, "Dietary chia seed (Salvia hispanica L.) rich in a-linolenic acid improves adiposity and normalises hypertriacylglycerolaemia and insulin resistance in dyslipaemic rats," British Journal of Nutrition,vol. 101, no. 1, pp. 41-50, 2009.
34. S. K. Jeong, H. J. Park, B. D. Park, and I. H. Kim, "Effectiveness of topical chia seed oil on pruritus of end-stage renal disease (ESRD) patients and healthy volunteers," Annals of Dermatology, vol. 22, no. 2, pp. 143-148, 2010.
35. R. F. Salih and E. Fadhil, "Radiological evaluation of the effect of chia seeds oil on skin wound healing, histological examination on male rats," Journal of Pharmaceutical Sciences and Research, vol. 10, no. 11, pp. 2929-2933, 2018.
36. K. Spyridopoulou et al., "Dietary mastic oil extracted from Pistacia lentiscus var. chia suppresses tumor growth in experimental colon cancer models," Scientific Reports, vol. 7, no. 1, pp. 1-14, 2017.
37. M. Vara-Messler et al., "Increased dietary levels of a-linoleic acid inhibit mammary tumor growth and metastasis," European Journal of Nutrition, vol. 56, no. 2, pp. 509-519, 2017.