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Therapeutic Properties of Chia Seeds - A Review

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ABSTRACT

Currently, chia is consumed not only as seeds but also as oil, which has similar outcomes. Chia seeds and chia seed oil are primarily utilized as food ingredients, with the oil also being widely employed as a nutritional component in a variety of dietary supplements. The Maya and Aztecs consumed chia seed (Salvia hispanica), an ancient oilseed. This seed is a natural source of proteins, soluble and insoluble fibre, and omega-3 fatty acids (-linolenic acid), as well as other significant nutritional elements like vitamins, minerals, and natural antioxidants. Furthermore, since the European Parliament has approved chia seeds as a Novel Food, they are now readily available and can be consumed or included in a variety of dishes. In terms of other bioactive substances, chia seeds are a good source of antioxidants such kaempferol, chlorogenic, and caffeic acids. Chia seeds have been linked to a variety of health benefits because of their composition, including anti-inflammatory and antidiabetic properties, as well as favorable effects on cardiovascular disease and hypertension, as well as laxative, antidepressant, antianxiety, analgesic, vision, and immune system-improving properties. This essay discusses current commercial possibilities, medicinal advantages for human health, and recently discovered active components.

Keywords - Novel Food, Chia Seeds

I. INTRODUCTION

(Arctos Specimen Database, 2018) Salvia hispanica L., sometimes known as chia, is a herbaceous plant that is a member of the genus Salvia and the families Lamiaceae and Nepetoideae. **(Biesalski et al., 2009; Micha et al, 2017; Mozaffarian, 2016; Tilman and Clark, 2014; Trovato, 2012; Zarrinpar et al, 2016)** The concept of "functional food" is important for both modern nutrition and human health. **(Baginsky et al., 2016; Orona-Tamayo et al., 2017)** Currently, Mexico and Bolivia are home to the majority of the world's chia seed production, with the majority of the seeds going to the United States, Japan, and Europe.

According to **(J. L. Bresson, A. Flynn, M. Heinonen, et al. 2009; P. G. Peiretti and G. Meineri, 2008; E. Reyes-Caudillo, A. Tecante, and M. A. Valdivia-López et al. 2008)**, Between 25% and 40% of the seed is oil, of which 60% is omega-3 alpha-linolenic acid and 20% is omega-6 linoleic acid. The human body needs both of these important fatty acids for proper health, and they cannot be produced in a lab. **(J. P. Cahill, and M. C. Provance 2002)** Chia flowers have tiny corollas and joined flower components, which together with their small size and high self-pollination rate result in small (3–4 mm) blooms. The oval-shaped seed ranges in size from 1 to 2 mm and can be black, grey, or white with black spots. **(W. Jamboonsri, T. D. Phillips et, al. 2012)** Salvia hispanica L., which has a reputation for being used medicinally, was given the common title "chia" by pre-Columbian and Aztec South American natives. **(Orona-Tamayo et al. 2017)** Scientists currently refer to chia seeds as the "golden seed" of the twenty-first century. (**Ayerza and Coates, 2000, Fonte-Faria et al., 2019, Marineli, Lenquiste, Moraes, & Maróstica, 2015**) Chia seeds have a variety of biological activities and health benefits, including anti-inflammatory, antioxidant, anticoagulant, hypotensive, hypoglycemic, hypolipemic, cardioprotective, hepatoprotective, and immunostimulatory properties, which are all described in recent scientific studies. **(R. Ullah, M. Nadeem, A. Khalique et, al. 2016, C. de Souza Ferreira, F. et, al. 2015, K. Marcinek and Z. Krejpcio 2017)** Another essential feature is their ability to produce a polysaccharide gel, which may work as a stabilizer and thickening agent with a variety of uses in the food sector. **(Cahill, 2004; Vuksan et al., 2007)** Today, the chia seed is ingested whole or in the form of flour alone, and it is added to other meals such as yoghurt, salads, and fruits, as well as breads, cakes, granola bars, drinks, and others. **(Beltrán-Orozco MC and Romero MR, 2003, Hentry HS, Mittleman M and Mc Crohan PR, 1990)** Whole and crushed Chia seeds were consumed as food, but their oil was also extracted and used to make face and body paints. Chia seeds were given to the Aztecs as yearly tributes from the people who lived under their authority, and they were utilized as a sacrifice to the gods in religious rites.

Phytochemical Properties of Chia Seed

(Ullah R, Nadeem M, et, al. 2016) Essential fatty acids are one of the main components of chia seed oil. Chia seed oil is high in polyunsaturated fatty acids (PUFAs), notably omega-3 linolenic acid (54 - 67%) and omega-6 linoleic acid (12 - 21%), as well as potential bioactive substances for human health. Chia seed has a low carbohydrate content (3.4%) but a high protein (18.9%) and fat (31.2%) content. **(Meyer & Groot, 2017)** This high n-3 level has been linked to a lower risk of coronary artery disease, hypertension, type 2 diabetes, rheumatoid arthritis, autoimmune illnesses, and cancer.

(Munoz L. A., Cobos, A. et al., 2012) Furthermore, chia seed has more vitamins than other seeds, including riboflavin (0.17 mg/100 g), niacin (8.83 mg/100 g), and thiamine (0.62 mg/100 g). **(da Silva, B. P., Anunciac¸ao et al., 2017)** Calcium (455 mg/100 g), phosphorus (585 mg/100 g), potassium (585 mg/100 g), magnesium (340 mg/100 g), iron (8.54 mg/100 g), and zinc (3.70 mg/100 g) are also abundant in Chia. **(Hrnčič et al., 2019, Ullah et al., 2016)** Chia seeds include a high concentration of polyphenolic chemicals, which account for approximately 8.8% of the total seed components.

(Amato et al., 2015, Fuxia et al., 2012, Martínez Cruz and Paredes López, 2014, Muñoz et al., 2013, Pellegrini et al., 2018, Reyes-Caudillo et al., 2008) The main group of polyphenolic compounds found in the seeds is phenolic acids, which include rosmarinic acid as the dominant compound (from 65.4 to 92.7 mg/100 g d.m), caffeic acid (from traces to 12.5 mg/100 g d.m), chlorogenic acid (from 0.5 to 10.2 mg/100 g d.m), and gallic acid (from 0.3 to 12.5 mg/100 g d.m), as well asapigenin (from traces to 0.005 m/100 g d.m), kaempferol (from traces to 0.013

m/100 g d.m), quercetin (from traces to 0.17 m/100 g d.m), and rutoside (from traces to 0.22 m/100 g d.m).

(V. Dubois, S. Breton et, al. 2007; R. Ayerza and W. Coates, 2009) Differences in the environment, temperature changes, nutrient availability, crop year, and soil conditions all play important roles in the variances. **(R. Ayerza h and W. Coates, 2011)** Protein content, for example, tends to decrease as temperature rises.

Nutritional composition of chia seed

(Ixtaina VY, Martínez ML et, al 2011) The abundance of the major fatty acids was evaluated as follows: ALA> Linoleic acid> Oleic acid> Palmitic acid> Stearic acid. Chia seed oil has Ω-3 to Ω-6 PUFA ratio of 3.18-4.18, which is the greatest recorded range for vegetable oil.

(Olivos-Lugo et al., 2010, Orona-Tamayo et al., 2017, Sandoval-Oliveros and Paredes-López, 2013) The primary protein in chia seeds with a storage function is globulin, which constitutes about 7-54% of the total protein composition. Albumin (3.9-18.6%), glutelins (6.4-23%), and prolamins (7.2-53.8%) are also detected in lower levels.

(Nitrayová et al., 2014, Rabail et al., 2021) Chia seeds contain every one of the essential amino acids, including arginine (Arg), phenylalanine (Phe), histidine (His), isoleucine (Ileu), leucine (Leu), lysine (Lys), methionine (Met), threonine (Thr), tryptophan (Trp), and valine (Val).

(Mohd Ali et al., 2012, Motyka et al., 2021, Valdivia-López and Tecante, 2015), Valdivia-López and Tecante (2015) Chia seeds' primary carbohydrate portion (30-34%) is dietary fibre, the quantity of which ranges from 34 to 40 g/100 g d.m. - comparable to 100% of the daily recommendations for adults.

(Hrnčič et al., 2019, United States Department of Agriculture, 2022) Hispanica has a high concentration of B-group vitamins as well as vitamins A, E, and C. Individual vitamin contents of 100 g d.m. chia seeds are as follows: vitamin B3—8.83 mg, vitamin C—1.6 mg, vitamin B1—0.62 mg, vitamin E—0.50 mg, vitamin B2—0.17 mg, and vitamin A—54 g. **(Ciftci et al., 2012)** Individual tocopherols that make up vitamin E in chia seeds are as follows: -tocopherol is 0.8 mg/100 g d.m., and δ-tocopherol is 1.5 mg/100 g d.m.

(Hrnčič et al., 2019, Ullah et al., 2016) Phosphorus (P), iron (Fe), manganese (Mn), calcium (Ca), potassium (K), magnesium (Mg), sodium (Na), and sulphur (S) are minerals present in chia seeds, while microelements include zinc (Zn), copper (Cu), molybdenum (Mo), and selenium (Se). Chia seeds have a greater calcium, phosphorus, potassium, and magnesium content than wheat, rice, or maize.

Health Benefits of Chia Seeds

1) Antioxidant capacity

(Aggarwal & Shishodia, 2006; Ellulu, 2017; Rahman, Biswas, & Kirkham, 2006) Chia seeds contain a variety of antioxidant components, including vitamins, polyphenols, and peptides. **(Kampa et al., 2002)** In vitro, these chemicals can block the activation of the NF-B transcription factor, lowering inflammatory and carcinogenic processes and protecting against reactive oxygen and nitrogen species (ROS).

(Marcinek & Krejpcio, 2017) These antioxidant effects can protect the body from illnesses such as neurological disorders, inflammation, immunodeficiency, ischemic heart disease, strokes, Alzheimer's and Parkinson's diseases, and cancer.

2) Immunostimulant effects

(Fernandez I, Vidueiros SM, et, al. 2008) On the basis of food consumption, body weight, thymus weight, thymocyte number, and immunoglobin E levels, chia was shown to be equivalent to fish oil.

3) Anti-obesity activities

(Poudyal H, Panchal SK, et, al. 2012) SCD activity, which converts elaidic acid to conjugated linolenic acid, is inhibited by chia seed. According to this study, C18:2n-6 is oxidized and transferred into the mitochondria, where it lowers n-6/n-3 levels. SCD

inhibition protects mice from obesity, cellular lipid buildup, and insulin resistance.

4) Anti-inflammatory activity

(Grancieri M, Martino HSD, Gonzalez de Mejia E. 2019) All chia-derived peptides had anti-inflammatory properties, but the peptide fraction between 1-3kDa had the greatest anti-inflammatory impact, lowering NO (65.1%), ROS (19.7%), prostaglandins (34.6%), TNF- (24.1%), MCP-1 (18.9%), IL-6 (39.6%), and IL-10 levels. As a result, chia peptides inhibited the production and release of inflammation-related markers.

5) Postprandial glucose levels

Furthermore, chia supplements may help to control the tendency to overeat. **(Lee AS, Jovanovski E, et, al. 2009)** discovered that S. hispanica lowered the amount of postprandial blood glucose incremental area under the curve and hunger on a subjective self-analysis by the individual in one trial. **(Vuksan V, Jenkins AL, et al. 2010)** suggested a comparable analysis and They proved that ground chia can lessen the effect of postprandial glycemia, although they cautioned that this occurrence may not occur with whole chia seed.

6) Diabetes

(Vuksan et al. 2017) expanded their research to type 2 diabetes and determined in 2016 that chia accelerated the process of weight reduction by 1.6 kg and waist circumference by 2.4 kg in type 2 diabetic patients compared to the control. The limitation is that the phenomena of chia reducing the degree of aberrant indices of body weight and fat buildup but not enhancing values already in normal limits has been observed in both human and animal research. Subjective health features, as well as blood C-reactive protein and cytokine levels, were unaltered.

7) Use of Chia Seed in food Industry

(Turck et al., 2019a, Turck et al., 2019b). Chia seeds are utilised in a variety of ways in the food business, including whole, ground, and roasted. Furthermore, oil produced from these seeds is utilized. On December 20, 2017, the European Food Safety Authority (EFSA) issued a rule establishing the allowed amount of chia seeds in various dietary items. The content of chia seeds should be within the following limitations, according to the regulation: Bread contains 5% whole seeds; breakfast cereals contain 10% whole seeds; baked goods contain 10% whole seeds; fruit and seed mixtures contain 10% whole seeds; fruit pastes contain 1% whole seeds; yoghurts contain 1.3 g whole seeds per 100 g yoghurt or 4.3 g per 330 g yoghurt; vegetable and fruit juices and drinks contain 15 g whole or ground seeds; and ready-to-eat foods contain 5% whole seeds. **(Orona-Tamayo et al., 2017**) There are some on the market for example, varied quantities of packed chia seeds for eating, with a daily usage recommendation of 15-25 g d.m./day.

II. CONCLUSION

Functional foods are becoming increasingly popular, particularly in developed nations, as people's lifestyles change and their willingness to learn more about the advantages of bioactive dietary elements grows. Chia seeds have been designated as FOSHU owing to their health-promoting effects, which may be linked to their high nutritional content, which includes proteins, essential amino acids, EFAs, dietary fibre, vitamins, and mineral salts. However, the majority of this study has been conducted on animals, and there are still gaps in knowing the effect of chia supplementation on human cardiovascular health. Furthermore, the mechanisms of chia seed's hypolipidemic effects must be explored and compared to those of isolated omega 3 and omega 6 fatty acids. can be considered as extremely valuable with health-promoting and dietary properties, and although they

are not immensely popular today, their use will undoubtedly increase in the near future across countries.

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