

Health Benefits of Chia Seeds' Dietary Consumption

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Abstract

Chia seeds have recently attained great popularity due to its nutritional composition, functional properties and particularly the possible therapeutic effects of its ingestion. The studies which included chia seeds' supplementation in diets reported several benefits, such as, anti-carcinogenic, anti-inflammatory, anti-obesity (reduction of visceral fat), antioxidant and antiradical activities, control of dyslipidemia thanks to low-density lipoprotein (LDL) and triglycerides contents reduction and also high-density lipoprotein (HDL) and α -linolenic acid (ALA) levels increase. Furthermore its consumption reduced postprandial glucose levels and improved insulin tolerance. They also can protect the cardiovascular system due to changes in blood lipids and hepatic enzymes activities. Moreover they may help improve hepatic and skeletal muscle function, they may be used for treating skin problems, can be ingested by celiac patients and help control diabetes and hypertension.

Keywords: Health Benefits; Chia Seeds; α -Linolenic Acid (ALA)

Introduction

Currently consumers shift their dietary habits towards healthier food options, especially those which convey an adequate intake of nutrients and present therapeutic effects. This leads to the consumption of products which were abundant and consumed in the past and nowadays are becoming more popular and appreciated. That is the case of seeds, particularly, *Salvia hispanica* L. seeds (commonly known as chia) which have been incorporated in diets and attained great popularity due to its health benefits and functional properties. Moreover its approval as a Novel Food by the European Parliament allowed its incorporation in several food products, making them available everywhere [1].

Regarding its nutritional aspects, chia seeds are a great source of fat, particularly polyunsaturated fatty acids such as α -linolenic (ALA, n-3, more than 60%, which can be converted into eicosapentaenoic and docosahexaenoic acids, both essential fatty acids to the organism) and linoleic (LA, n-6, almost 20%) acids, presenting a very low n-6/n-3 ratio (around 0.30). They also present high levels of protein (between 16 to 26%, mainly prolamins, glutelins, globulins, albumins) with nine essential amino acids in appreciable amounts (glutamic acid is the most abundant). The carbohydrate content ranges from 23 to 41%. The dietary fibre includes cellulose, hemicellulose, lignin, pectin, gums, mucilage and other polysaccharides and oligosaccharides, with a content of 85% of insoluble fibre. Furthermore they are rich in vitamins (predominantly from complex B [thiamine, riboflavin, niacin and folic acid] and also C and E) and minerals (such as calcium, phosphorus, potassium, magnesium, iron, zinc and selenium). Additionally, the absence of gluten makes them appropriate for celiac patients, being also a source of bioactive compounds with antioxidant activity: chlorogenic and caffeic acids, quercetin, kaempferol, phytosterols, carotenoids, tocopherols and phenolic compounds. They are also free of mycotoxins and have metal levels within safe limits. Nevertheless their composition is dependent on the climate and cultivation region of the plant. The emulsifying properties are another relevant characteristic of chia seeds since they allow the formation of a polysaccharide gel, functioning as a stabilizer and thickening agent useful in the food processing industry. Besides their by-products, such is the case of the oil and the flour, are both industrially added to numerous products [1-3].

Based on the described composition, chia seeds have been related to different therapeutic effects, namely anti-inflammatory and anti-diabetic activities as well as positive effects on cardiovascular diseases and hypertension (consult table 1). In this work, a review is made on the human health benefits proportionated by chia seeds' ingestion in order to provide an overall, yet comprehensive view, about this grain consumption effects.

Health benefits of chia seeds ingestion

Some of the beneficial effects in health of chia seeds reported in literature are summarized in table 1.

Effects on health and therapeutic value	Reference
Anti-carcinogenic due to anti-proliferative and apoptotic activities	[4-6]
Immunostimulant and anti-inflammatory	[7,8]
Antioxidant activity and antiradical activity	[9-13]
After chia hydrolysis, low molecular weight peptides with antioxidant activity are produced, enabling damaged tissue repairment	[11,12]
Anti-obesity activity	[14,15]
Control of dyslipidemia	[16,17]
Potential to reduce LDL and increase HDL cholesterol	[5,18,19]
Reduction in triglycerides content	[7,19,20]
Increased plasma ALA and decreased n-6/n-3 fatty acid ratio	[16,20-23]
Reduction of visceral fat or improvements in its deposition	[14,15,19,24,25]
Reduction of postprandial glucose levels	[26-28]
Improvements in hepatic function	[14,19,24]
<i>In vivo</i> improvement of skeletal muscle stamina and function	[17,29]
Skin disorders treatment in integumentary system	[5,30,31]
Celiac disease appropriate	[32]
Control of diabetes	[1,25]
Improvement in glucose and insulin tolerance	[24,33]
Protection of the cardiovascular system	[5,34]
Hypotensive effect and control of hypertension	[5,7,32,35]
Changes in blood lipids and hepatic enzymes activities improve cardiovascular health	[15,24,25]
Reduction in thiobarbituric acid reactive substances and carbonyl groups levels	[25,33]

Table 1: Possible benefits of chia seed consumption categorized by the caused effects on health and its therapeutic value on various conditions.

Conclusions

In general, the results reported in literature describe beneficial results regarding human health improvement, highlighting that the interest which arose behind this seed is valid and chia seeds are an interesting alternative to include in diets. Nevertheless there is still a need for further research in order to confirm results by scientific investigation and take more conclusive interpretations upon the consequences of its intake.

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Bibliography

1. Ullah R, *et al.* "Nutritional and therapeutic perspectives of Chia (*Salvia hispanica* L.): a review". *Journal of Food Science and Technology* 53.4 (2016): 1750-1758.
2. Marcinek K and Krejpcio Z. "Chia seeds (*Salvia hispanica*): health promoting properties and therapeutic applications - a review". *Roczniki Panstwowego Zakladu Higieny* 68.2 (2017): 123-129.
3. de Souza Ferreira C., *et al.* "Effect of chia seed (*Salvia Hispanica* L.) consumption on cardiovascular risk factors in humans: a systematic review". *Nutricion Hospitalaria* 32.5 (2015): 1909-1918.
4. Adams JD., *et al.* "Preclinical and clinical examinations of *Salvia miltiorrhiza* and its tanshinones in ischemic conditions". *Chinese Medicine* 1 (2006): 3.
5. Ayerza R and Coates W. "Chia: rediscovering a forgotten crop of the Aztecs". Tucson: University of Arizona Press xiv (2005): 197.
6. Espada CE., *et al.* "Effect of Chia oil (*Salvia Hispanica*) rich in omega-3 fatty acids on the eicosanoid release, apoptosis and T-lymphocyte tumor infiltration in a murine mammary gland adenocarcinoma". *Prostaglandins, Leukotrienes, and Essential Fatty Acids* 77.1 (2007): 21-28.
7. Rodea-González DA., *et al.* "Spray-dried encapsulation of chia essential oil (*Salvia hispanica* L.) in whey protein concentrate-polysaccharide matrices". *Journal of Food Engineering* 111.1 (2012): 102-109.
8. Fernandez I., *et al.* "Impact of chia (*Salvia hispanica* L.) on the immune system: Preliminary study". *Proceedings of The Nutrition Society* 67 (2008): E12.
9. Orona-Tamayo D., *et al.* "Inhibitory activity of chia (*Salvia hispanica* L.) protein fractions against angiotensin I-converting enzyme and antioxidant capacity". *LWT - Food Science and Technology* 64.1 (2015): 236-242.
10. Parker J., *et al.* "Therapeutic Perspectives on Chia Seed and Its Oil: A Review". *Planta Medica* 84.9-10 (2018): 606-612.
11. Ullah R., *et al.* "Omega-3 fatty acids and oxidative stability of ice cream supplemented with olein fraction of chia (*Salvia hispanica* L.) oil". *Lipids in Health and Disease* 16 (2017): 34.
12. Segura Campos MR., *et al.* "Angiotensin I-Converting Enzyme Inhibitory Peptides of Chia (*Salvia hispanica*) Produced by Enzymatic Hydrolysis". *International Journal of Food Science* (2013): 158482.
13. Rincon-Cervera MA., *et al.* "Vegetable oils rich in alpha linolenic acid increment hepatic n-3 LCPUFA, modulating the fatty acid metabolism and antioxidant response in rats". *Prostaglandins, Leukotrienes, and Essential Fatty Acids* 111 (2016): 25-35.
14. Poudyal H., *et al.* "Lipid redistribution by α -linolenic acid-rich chia seed inhibits stearyl-CoA desaturase-1 and induces cardiac and hepatic protection in diet-induced obese rats". *The Journal of Nutritional Biochemistry* 23.2 (2012): 153-162.
15. Ayerza R Jr and Coates W. "Effect of dietary alpha-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* 51.1 (2007): 27-34.
16. Valenzuela BR., *et al.* "Alpha linolenic acid (ALA) from *Rosa canina*, *sacha inchi* and chia oils may increase ALA accretion and its conversion into n-3 LCPUFA in diverse tissues of the rat". *Food and Function* 5.7 (2014): 1564-1572.
17. Chicco AG., *et al.* "Dietary chia seed (*Salvia hispanica* L.) rich in α -linolenic acid improves adiposity and normalises hypertriglycerolaemia and insulin resistance in dyslipaemic rats". *British Journal of Nutrition* 101.1 (2008): 41-50.
18. Brenna JT., *et al.* "Alpha-Linolenic acid supplementation and conversion to n-3 long-chain polyunsaturated fatty acids in humans". *Prostaglandins, Leukotrienes, and Essential Fatty Acids* 80.2-3 (2009): 85-91.

19. da Silva BP, *et al.* "Chia Seed Shows Good Protein Quality, Hypoglycemic Effect and Improves the Lipid Profile and Liver and Intestinal Morphology of Wistar Rats". *Plant Foods for Human Nutrition (Dordrecht, Netherlands)* 71.3 (2016): 225-230.
20. Flachs P, *et al.* "Cellular and molecular effects of n-3 polyunsaturated fatty acids on adipose tissue biology and metabolism". *Clinical Science (London, England: 1979)* 116.1 (2009): 1-16.
21. Nieman DC, *et al.* "Chia seed does not promote weight loss or alter disease risk factors in overweight adults". *Nutrition Research* 29.6 (2009): 414-418.
22. Valenzuela R, *et al.* "Modification of Docosahexaenoic Acid Composition of Milk from Nursing Women Who Received Alpha Linolenic Acid from Chia Oil during Gestation and Nursing". *Nutrients* 7.8 (2015): 6405-6424.
23. Valenzuela R, *et al.* "Vegetable oils rich in alpha linolenic acid allow a higher accretion of n-3 LCPUFA in the plasma, liver and adipose tissue of the rat". *Grasas Aceites* 65.2 (2014): e026.
24. Marineli RDS, *et al.* "Antioxidant potential of dietary chia seed and oil (*Salvia hispanica* L.) in diet-induced obese rats". *Food Research International* 76.3 (2015): 666-674.
25. Ferreira MR, *et al.* "Dietary Salba (*Salvia hispanica* L.) ameliorates the adipose tissue dysfunction of dyslipemic insulin-resistant rats through mechanisms involving oxidative stress, inflammatory cytokines and peroxisome proliferator-activated receptor gamma". *European Journal of Nutrition* 57.1 (2018): 83-94.
26. Vuksan V, *et al.* "Reduction in postprandial glucose excursion and prolongation of satiety: possible explanation of the long-term effects of whole grain Salba (*Salvia Hispanica* L.)". *European Journal of Clinical Nutrition* 64.4 (2010): 436-438.
27. Vuksan V, *et al.* "Comparison of flax (*Linum usitatissimum*) and Salba-chia (*Salvia hispanica* L.) seeds on postprandial glycemia and satiety in healthy individuals: a randomized, controlled, crossover study". *European Journal of Clinical Nutrition* 71.2 (2016): 234-238.
28. Ho H, *et al.* "Effect of whole and ground Salba seeds (*Salvia Hispanica* L.) on postprandial glycemia in healthy volunteers: a randomized controlled, dose-response trial". *European Journal of Clinical Nutrition* 67.7 (2013): 786-788.
29. Illian TG, *et al.* "Omega 3 Chia Seed Loading as a Means of Carbohydrate Loading". *The Journal of Strength and Conditioning Research* 25.1 (2011): 61-65.
30. Diwakar G, *et al.* "Inhibitory effect of a novel combination of *Salvia hispanica* (chia) seed and *Punica granatum* (pomegranate) fruit extracts on melanin production". *Fitoterapia* 97 (2014): 164-171.
31. Jeong SK, *et al.* "Effectiveness of Topical Chia Seed Oil on Pruritus of End-stage Renal Disease (ESRD) Patients and Healthy Volunteers". *Annals of Dermatology* 22.2 (2010): 143-148.
32. Adams JD, *et al.* "*Salvia columbariae* contains tanshinones". *Evidence-Based Complementary and Alternative Medicine* 2.1 (2005): 107-110.
33. Marineli Rda S, *et al.* "Chia (*Salvia hispanica* L.) enhances HSP, PGC-1alpha expressions and improves glucose tolerance in diet-induced obese rats". *Nutrition* 31.5 (2015): 740-748.
34. Muñoz LA, *et al.* "Chia seeds: Microstructure, mucilage extraction and hydration". *Journal of Food Engineering* 108.1 (2012): 216-224.
35. Vuksan V, *et al.* "Supplementation of conventional therapy with the novel grain Salba (*Salvia hispanica* L.) improves major and emerging cardiovascular risk factors in type 2 diabetes: results of a randomized controlled trial". *Diabetes Care* 30.11 (2007): 2804-2810.

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