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Overview of nutritional perspectives of chia seed (*Saliva hispanica*. L.): A review

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Abstract
This article emphasizes about the nutritive value of chia seeds and presents a quality framework for estimating the scientific impact of these studies. Increasing the demand of people and increasing health awareness in the present scenario led the researchers to study about the nature and nutritive behavior of chia seed. Chia is a quality source of polyunsaturated fatty acids like omega –3 and omega –6, soluble dietary fiber. Other than this, it also contains proteins, vitamins, minerals and phytochemicals. Besides this, the seeds are an excellent source of polyphenols and antioxidants, such as caffeic acid, rosmarinic acid, myricetin, quercetin, and others. Due to its nutritive value, it also used in prevention of many non- infectious diseases like hypertension, cancer and diabetes. Today, Chia oil is one of the most valuable oils in the market. There are different extraction methods have been used to produce the oil. In this study we have covered the chemical composition and nutritive benefits of chia seed. Among the nutritive concept, we had also discussed about impact of chia seeds on the human health.

Keywords: nutritional composition, physio-compound properties, anticoagulant

Introduction
Chia seeds or *Salvia hispanica* L. belongs to family Lamiaceae (Mint). Chia is a yearly spice, local to Mexico and Northern Guatemala which sprouts in summer season [5]. *Salvia hispanica* was utilized as food as ahead of schedule as in 3500 BC and acquired significance as a yield between 1500 BC and 900 BC in focal Mexico. It was utilized as a staple yield by Aztecs and was likewise offered to Gods in strict functions. This tribal seed has been known for its restorative and wholesome properties from old time because of its high substance of omega-3 unsaturated fats. While chia seeds were utilized as food, chia oil was utilized in beautifying agents and canvases by Aztecs. These days chia seeds are industrially filled in Mexico, Bolivia, Argentina, Ecuador and Guatemala. chia seeds showed undeniable degrees of lipids, proteins and filaments contrasted and different seeds.

It is proposed that fibre, one of the segments of chia, due to its high-water maintenance limit, are significant for the creation of different items like emulsifiers. In expansion, chia seeds introduced high substance of phenolic compounds with cell reinforcement movement adequately proposing that chia can bring medical advantages when utilized in food items. The variety alongside the measure of supplement creation in chia seed can assist with having a sound eating regimen and add esteem in the arrangement of items.

Structure and Composition
Chia seeds are by and large little, level and oval formed. The seeds of chia are 2.0 - 2.5 mm long, 1.2 - 1.4 mm wide and 0.8 – 1.0 mm in thickness in structure. The chia plant is delicate to sunshine and produces highly contrasting seeds. Dark shaded chia seeds are more normal. The high contrast shading seeds are marginally not quite the same as one another. White seeds are bigger, thicker and more extensive than the dark seeds. The normal dampness substance of high contrast seeds is 7.2 percent and 6.6 percent separately. The oil yield of white seeds and dark seeds is about 33.8 percent and 32.7 percent individually. Protein and unsaturated fat structure of both the seeds differs significantly [15, 17]. Chia seeds are a decent wellspring of unsaturated fats, dietary fiber, protein, minerals and cancer prevention agents. Chia seeds can be utilized as entire, processed or grounded. Oil separated from chia seeds can likewise be utilized in food.

Chemical Composition
The compound organization of chia seeds has been investigated in numerous examinations. Point by point information on essential chia seeds piece is introduced in Figure 1. Chia seeds are credited high nutritive worth especially on account of their high substance of dietary fiber and fat (Table 1). Chia seeds contain roughly 30–34 g dietary fiber, of which the insoluble part (IDF) represents roughly 85–93%, while dissolvable dietary fiber (SDF) is around 7–15%. As far as dietary fiber content, chia seeds surpass dried organic products, cereals or nuts (Figure 2). The unsaturated fat profile is specifically noteworthy. It is described by high substance of poly unsaturated unsaturated fats, chiefly -linolenic corrosive (ALA), which represents around 60% every unsaturated fat. Linoleic, oleic and palmitic acids are found in lower sums (Table 2). Chia seeds have more prominent substance of omega-3 acids than flaxseed. We additionally need to pressure the profitable proportion of omega-6 to omega-3 acids, which is roughly 0.3:0.35.

Chia seeds are additionally a decent wellspring of plant protein, which represents around 18–24% their mass [3]. Investigations of the amino corrosive creation affirmed the presence of 10 exogenous amino acids, among which the best substance were for arginine, leucine, phenylalanine, valine and lysine. Proteins in chia seeds are additionally wealthy in endogenous amino acids, primarily glutamic and aspartic acids, alanine, serine and glycine. It should be

focused on that chia seeds are sans gluten and as such may be devoured by celiac patients [14]. In addition, chia seeds supply numerous minerals, with phosphorus (860–919 mg/100 g), calcium (456–631 mg/100 g), potassium (407–726 mg/100g) and magnesium (335–449 mg/100 g) found in most prominent sums. Studies likewise affirmed the presence of a few nutrients, essentially nutrient B1 (0.6 mg/100 g), nutrient B2 (0.2 mg/100 g) and niacin (8.8 mg/100 g). Chia seeds are additionally a rich wellspring of especially fascinating gatherings of phytocompounds described by high natural movement [4]. These are especially polyphenols: gallic, caeic, chlorogenic, cinnamic and ferulic acids, quercetin, kaempferol, epicatechin, rutin, apigenin and p-coumaric corrosive. Isoflavones, for example, daidzein, glycitein, genistein and genistin, are found in limited quantities. Ciftci *et al*. showed the presence of camp sterol (472 mg/kg of lipids), stigmasterol (1248 mg/kg of lipids), -sitosterol (2057 mg/kg of lipids) and D5-avenasterol [2]. Also, it was discovered that chia seeds additionally contain tocopherols: -tocopherol (8 mg/kg of lipids), - tocopherol (422 mg/kg of lipids) also, -tocopherol (15 mg/kg of lipids).

Nutritional Composition of Chia Seeds

Various biological systems have variable huge impacts on the supplement arrangement of *Salvia hispanica* particularly its protein and oil content and furthermore the unsaturated fat piece. The natural variables which have been found to impact creation of chia seeds incorporate temperature, light, soil synthesis and type/assortment [8]. Analysis of chia seeds filled industrially in three distinct biological systems to be specific Argentina (T1 - Semi Arid Chaco Ecosystem), Bolivia (T2 - Sub Humid Chaco Ecosystem) and Ecuador (T3 - Inter-Andean valley) has shown that the protein content abatements as height increases. Chia seeds filled in the sub damp Chaco ecosystem (T2) have been found to contain 61per penny more protein than other two environments for example the semi-bone-dry chaco and the between a dean valley biological system. Oil content doesn't show any critical distinction among the various environments yet its organization differs. Chia seeds developed in biological system T3 contain higher centralization of alpha linolenic corrosive (56.9per penny to 64.8per penny) which is the primary constituent of oil. Since chia seeds are the most extravagant wellspring of omega-3 unsaturated fats among plant food sources and are a decent wellspring of fibre and phytochemicals, they can be considered as practical food [8].

Protein

The normal protein content changes from 15per penny to 23per penny as indicated by the area where the seeds have been developed [24]. Chia seeds (per 100g) contain higher measure of protein (16.54 g) when contrasted with different grains like wheat (11.8 g), oats (13.6 g), grain (11.5 g), rice (6.8 g) and corn (11.1 g). The protein substance of defatted chia flour as surveyed by dry fractionations is about 446.2g/kg of proteins. TABLE 2 gives the nitty gritty amino corrosive arrangement of chia seeds.

Average amino-acid composition of chia seeds

Table 1

Amino acid	Value (g per 100g)	Amino acid	Value (g per 100g)
Arginine	2.143	Phenylalanine	1.016
Glutamic acid	3.500	Tyrosine	0.536
Threonine	0.709	Histidine	0.531
Tryptophan	0.436	Valine	0.950
Isoleucine	0.801	Alanine	1.044
Leucine	1.371	Glycine	0.943
Methionine	0.588	Aspartic acid	1.689
Lysine	0.970	Proline	0.776
Cystine	0.407	Serine	1.049

Source: USDA National Nutrient Database for Standard Reference Release 28, 2011. A comparison of the amino acid profile of chia seeds with other seeds is given in fig. 1.

Dietary fibre

Fibre is one of the significant parts of sound eating regimen. Admission of satisfactory measure of dietary fibre is related with the counteraction of cardiovascular illnesses like stroke, myocardial localized necrosis, vascular infections, corpulence, hypertension, hyperglycaemia, and hyperlipidaemia. Dietary strands can't be processed and consumed by the small digestive system yet get aged in the internal organ. Based on their physio-compound properties and capacities, dietary filaments are characterized in two structures insoluble strands which show building activity and dissolvable dietary filaments which get matured incompletely/totally in the colon.The all-out dietary fiber substance of chia seeds goes from a day and a half 40 g for each 100g which is a lot higher than that present in a few grains, vegetables and organic products like corns, carrot, spinach, banana, pear, apple, kiwi. Insoluble and solvent dietary fiber shifts from 23 to 46 percent and 2.5 to7.1 percent separately. Chia contains around 5% adhesive which can additionally go about as solvent fibre [11]. The insoluble dietary fibre of chia is equipped for holding water a few times of its weight during hydration and in this way gives mass and delays the gastro-intestinal travel time. Expanded gastro-intestinal time is straightforwardly identified with continuous expansion in post-prandial blood glucose levels and diminishing in insulin obstruction throughout some undefined time frame [11].

Antioxidants

Chia seeds are high in phenolic intensifies which have been logically demonstrated to exhibit antioxidant related capacities. Cell reinforcements and phenolic compounds have been found to have wellbeing promotive properties and furthermore give security from degenerative infections, for example, cardio vascular illnesses, malignancies, diabetes and diverticulosis [21].Chia seeds and oil likewise contain a

few bioactive mixtures to be specific quercetin, myricetin, kaempferol, chlorogenic corrosive and 3,4 dihydroxyphenylethanol-elenolic corrosive dialdehyde (DHPEA-EDA). A few in-vitro measures have affirmed that these polyphenols have high cancer prevention agent limit and their essence is related with lower levels of lipid autoxidation. Thusly, chia seeds can be utilized as a utilitarian fixing in the plan of items for business applications.

Total Fats

Salvia hispanica contain on a normal 30.74 percent of absolute lipids [20]. A few scientists have evaluated the unsaturated fat synthesis of chia seeds and variable outcomes have been acquired. For instance, in an investigation completed by Marineli *et al* (2014) alpha linolenic fatty corrosive was discovered to be in most wealth (62.80g/100g) trailed by linoleic corrosive (18.23g/100g), palmitic corrosive (7.07g/100g), oleic corrosive (7.04g/100g) and stearic corrosive (3.36g/100g). This unsaturated fat arrangement anyway shifts from that given by United States Department of Agriculture. Allude TABLE 4 for the unsaturated fat organization given by USDA (2011). Chia seeds contain on a normal, 40 percent of their all-out weight as oil. Their oil contains almost 60% omega-3 unsaturated fats [19]. Omega-3 unsaturated fats are useful in the anticipation and the board/treatment of hyperlipidaemia, hyperglycaemia and hypertension. Chia seeds contain higher grouping of omega-3 unsaturated fat (63.8per penny) when contrasted with flaxseeds (57.5per penny) and menhaden fish oil (1.5per penny).

Vitamins and Minerals

Chia has likewise been discovered to be a decent wellspring of a few nutrients and minerals especially niacin, zinc, calcium, phosphorus and magnesium. Niacin substance of chia is higher than different grains (corn, soybeans and rice), though the riboflavin and thiamin content is like that present in corn and rice. Chia contains multiple times more calcium, multiple times more phosphorus and multiple times more potassium than 100g of milk [11].

Antioxidant Activity of Phenolic Compounds from Chia (*Salvia hispanica L.*)

Capacity to sequestrate the DPPH free extremist. The cancer prevention agent movement of the phenolic extricates was controlled by the inactivation of DPPH (Figure 1). The chia phenolic separate (32.35 µgGAE.mLextract-1) appeared cancer prevention agent movement that was measurably equivalent during the period from 120 to 210 min. The concentrate was compelling in killing over 70% of the free revolutionaries. There was a huge contrast between the chia separate and the control, a manufactured cancer prevention agent (GAE). In view of these information, it is apparent that bioactive parts in the concentrates go about as extremist sequestrators and hydrogen givers. Contrasting our outcomes with the examination by Schmidt *et al*., the chia phenolic compounds showed high cell reinforcement action in the DPPH test. Phenolic compounds extricated from rice grain (0.1 mg. mL-1) repress around half of the DPPH in the response after 30 min. The bioactive, cell reinforcement parts in these food varieties bring down the occurrence of cardiovascular sickness and forestall the rancidity of unsaturated fats.

Effect of Chia on Human health

Not very many investigations have been done on human volunteers to evaluate the effect of devouring chia seeds on wellbeing. A randomized, fake treatment controlled clinical preliminary on 76 grown-ups tracked down no huge decrease in body weight, lipid profile, incendiary markers and glucose levels even in the wake of ingesting 50g chia seeds each day for 12 weeks. Rise in plasma alpha linolenic corrosive (24.4 percent) was noted when contrasted with the benchmark group. Impact of ingesting 25g processed chia seeds for seven weeks was inspected on 10 postmenopausal solid ladies. The ingestion of chia seeds brought about critical expansion in the eicosapentaenoic corrosive (EPA) andalpha linolenic corrosive (ALA) levels in plasma by 30% and 138 percent separately. Be that as it may, no huge change was seen on body mass index [61]. Higher admission of omega-3 unsaturated fats in diet through both marine (EPA and DHA) and plant sources (ALA) are firmly connected with diminishing the danger of death because of cardiovascular sicknesses which is a significant reason for mortality on the planet these days. A randomized, fake treatment controlled clinical trial was conducted by Vuksan *et al* (2007) on twenty sort 2 controlled diabetics (with medication) who were given 37g chia seeds every day (included white bread). The outcomes indicated that high fiber substance of chia helped in controlling hyperglycaemia and diminishing systolic pulse. ALA and EPA levels were found to increment with utilization of chia. Anticoagulant and mitigating impact of chia seeds may help in forestalling strokes and heart attacks in type-II diabetic patients. Few examines demonstrate that chia seeds exhibit positive consequences for wellbeing, for example, decrease of post-prandial blood glucose levels and systolic pulse [32]. In a twofold visually impaired fake treatment controlled preliminary 67 grown-ups (isolated into two gatherings) with overabundance body weight and metabolic condition were given 4g chia seeds blended in with oats, palm and soy powder weakened in 250 ml of water two times each day for a very long time alongside some caloric adjustments in the day by day diet. The investigation results demonstrated a huge decrease in the body weight, abdomen boundary and basal metabolic pace of test bunch in contrast with fake treatment bunch. Critical decrease in insulin obstruction, fatty oils levels and C-responsive protein were noted. Notwithstanding, no critical change was found in the complete cholesterol, glucose and all out-plasma insulin levels.

Conclusion

Seeds are not new to humanity. They have been utilized even in the pre-Colombian time by Aztecs as food item and in strict services. Chia seeds are a magnificent wellspring of dietary fibre (insoluble and dissolvable), omega-3 unsaturated fats, proteins and bioactive mixtures or phytochemicals. Chia has numerous significant physiochemical and utilitarian properties which makes it more reasonable in the food business. Chia goes about as a decent thickener, gel previous, chelator, froth enhancer, emulsifier, suspension formers, explaining specialist and as a rehydrating specialist. Hence it tends to be utilized industrially for the improvement of new items advanced with omega-3, protein, dissolvable/insoluble fiber and phenolic compounds. Chia seeds may help in the anticipation, treatment, and the board of a few non-

transferable illnesses, improving insusceptibility and maybe altering the blood coagulating instrument. Chia additionally helps in improving the post-prandial blood glucose levels in blood by hindering the processing of starches. It tends to be joined in frozen items, bread shop, drinks, desserts, child food varieties, pasta, hotdogs and so on Explores done *in vivo* and *in vitro* have upheld the way that that it is ok for human utilization and furthermore displays wide scope of medical advantages. There is degree for research on chia seeds as for the food business and nutraceuticals. Chia would thus be able to be considered as a utilitarian food which could help in improving the wellbeing of the majority.

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References

1. Marineli R, Lenquiste SA, Moraes EA, Marostica MR. Jr. Antioxidant potential of dietary chia seed and oil (Salvia hispanica L.) in diet-induced obese rats. Food Res. Int,2015:76:666-674. [CrossRef] [PubMed]
2. Ciftci ON, Przybylski R, Rudzi´nska M. Lipid components of flax, perilla, and chia seeds. Eur. J. Lipid Sci.Technol,2012:114:794-800. [CrossRef]
3. Grancieri M, Duarte Martino HS, Gonzalez de Mejia E. Chia seed (Salvia hispanica L.) as a source of proteins and bioactive peptides with health benefits: A review. Compr. Rev. Food Sci. Food Saf,2019:18:480-499. [CrossRef]
4. Oliveira-Alves SC, Vendramini-Costa BD, Baú Betim Cazarin C, Maróstica MR, Jr Ferreira JPB Silva AB, Prado MA *et al*. Characterization of phenolic compounds in chia (Salvia hispanica L.) seeds, fiber flour and oil. Food Chem,2017:232:295-305. [CrossRef] [PubMed]
5. Ixtainaa VY, Nolasco SM, Tomas MC. Physical properties of chia (Salvia hispanica L.) seeds, Journal of Industrial crops and products,2008:28(3):286-293.
6. Capitani MI, Spotorno V, Nolasco SM, Tomás MC. Physicochemical and functional characterization of by-products from chia (Salvia hispanica L.) seeds of Argentina, LWT - Food Science and Technology,2012:45:94-102.
7. W. Coates. Whole and ground chia (Salvia hispanica L.) seeds, chia oil - effects on plasma lipids and fatty acids. Nuts and Seeds in Health and Disease Prevention, 2011. DOI: 10.1016/B978-0-12-375688-6.10037-4.
8. Ayerza R, Coates W. Composition of chia (salvia hispanica) grown in six tropical and subtropical ecosystems of South America, Journal of Tropical Science,2004:44(3):131-135.
9. Ayerza R, Coates W. Protein content, oil content and fatty acid profiles as potential criteria to determine the origin of commercially grown chia (Salvia hispanica L.), Journal of Industrial Crops and Products, 2011:34:1366-1371.
10. Ayerza R, Coates W. Chia seeds: New source of omega-3 fatty acids, natural antioxidants and dietary fiber, (South-East Center for Natural Products Research and Commercialization, Office of Arid lands studies, Tucson, Arizona, USA, 2001.
11. Coates W, Ayerza R. Chia (Salvia hispanica L.) seeds as an omega-3 fatty acid source for feeding pigs: effects on fatty acid composition and fat stability of the meat and internal fat, growth performance and meat sensory characteristics, Journal of Animal Science, 2009:87:3798-3804. doi: 10.2527/jas.2009-1987.
12. Munoz LA, Cobos A, Diaz O, Aguilera JM. Chia seeds: microstructure, mucilage extraction and hydration, Journal of Food Engineering,2012:108:216-224.
13. Ixtaina VY, Nolasco SM, tomas MC. Oxidative stability of chia (salvia hispanica L.) seed oil: effect of antioxidants and storage conditions, Journal of American Oil Chemists Society,2012:89:1077-1090.
14. Warrand J, Michand P, Picton P, Muller L, Curtosis G, Ralainirina B *et al*. Structural investigation of the neutral polysaccharide of LinumusitatissimumL.seeds mucilage, International Jouranl of Biological Macromolecules,2005:35(3-4):121-125.
15. W. Cui, N.A.M. Eskin, C.G. Biliaderies, Chemical and physical properties of yellow mustard (Sinapsis alba L.) mucilage, Journal of Food Chemistry,1993:46(2):169-176.
16. Ahmed M, Hamed R, Ali M, Hassan A, Babiker E. Proximate composition, antinutritional factors and protein fractions of guar gum seeds as influenced by processing treatments, Pakistan Journal of Nutrition,2006:5(5):340-345.
17. Suri S, Malhotra A. Food science, nutrition and safety (Dorling Kindersley, India, Pvt. Ltd, 2014.
18. Borneo R, Aguirre A, León AE. Chia (Salvia hispanica L) gel can be used as egg or oil replacer in cake formulations, Journal of the American Dietetic Association,2010:110:946-949.
19. Campos BE, Dias Ruivo T, MR da Silva Scapim, Madrona GS, R.de C. Bergamasco, Optimization of the mucilage extraction process from chia seeds and application in ice cream as a stabilizer and emulsifier, LWT - Food Science and Technology, 2015, doi: 10.1016/ j.lwt,2015.09.021.
20. Vázquez-Ovando A, Betancur-Ancona D, Chel-Guerrero L. Physicochemical and functional properties of a protein-rich fraction produced by dry fractionation of chia seeds (Salvia hispanica L.), CyTA - Journal of Food,2013:11:(1)75-80. http://dx.doi.org/10.1080/19476337.2012.692123.
21. Coorey R, Tjoe A, Jayasena V. Gelling properties of chia seed and flour, Journal of Food Science,2014,79(5).
22. Coorey R, Grant A, Jayasena V. Effects of chia flour incorporation on the nutritive quality and consumer acceptance of chips, Journal of Food Resaerch, 2012, 1(4). http://dx.doi.org/10.5539/jfr.v1n4p85.
23. Michele Silveira Coelho. Myriam de las Mercedes Salas-Mellado. Effects of substituting chia (Salvia hispanica L.) flour or seeds for wheat flour on the quality of the bread, LWT - Food Science and Technology,2015:60:729-736
24. Zettel V, Kramer A, Hecker F, Hitzmann B. Influence of gel from ground chia (Salvia hispanica L.) for wheat

bread production. Europe Food Research Technology, 2014. DOI: 10.1007/s00217-014-2368-8
25. Patricia Luna Pizarro, Eveline Lopes Almeida, Alessandra Silva Coelho, Norma Cristina Samman, Miriam Dupas Hubinger, Yoon Kil Chang Functional bread with n-3 alpha linolenic acid from whole chia (Salvia hispanica L.) flour. Journal of Food Science and Technolgy, 2014. DOI: 10.1007/s13197-014-1477-5.
26. George E Inglett, Diejun Chen, Sean Liu. Physical properties of sugar cookies containingchia–oat composites, J Sci Food Agric,2014:94:3226-3233.
27. T. Pintado, Herrero AM, Jiménez-Colmenero F, Ruiz-Capillas C. Strategies for incorporation of chia (Salvia hispanica L.) in frankfurters as a health-promoting ingredient, Meat Science,2016:114:75-84.
28. Ayerza R, Coates W, Lauria M. Chia seed (Salvia hispanica L.)as an omega-3 fatty acid source for broilers: influence on fatty acid composition, cholesterol and fat content of white and dark meats, growth performance and sensory characteristics, Journal of Poultry Science,2002:81:826-837.
29. Coorey R, Novinda A, Williams H, Jayasena V. Omega-3 fatty acid profile of eggs from laying hens fed diets supplemented with chia, fish oil and flaxseed, Journal of Food Science, 2014. doi:10.1111/1750-3841.12735.
30. Chicco AG, Alessandro MED, Hein GJ, Oliva ME, Lombardo YB. Dietary chia seed (Salvia hispanica L.) rich in alpha linolenic acid improves adiposity and normalizes hypertriacyl glycerolaemia and insulin resistance in dyslipaemic rats, British Journal of Nutrition, 101, 2009, 41-50.
31. Marinelli RDS, Lenquiste SA, Moraes EA, Marostica MR. Jr., Antioxidant potential of dietary chia seed (Salvia hispanica L.) and oil in diet induced obese rats, International Journal of Food Research, 2015, doi: 10.1016/j.foodres,2015:07:039.
32. Morato PN, Rodrigues JB, Moura CS, Drummond FG Silva e, Esmerino EA, Cruz AG *et al*. Lollo, Omega-3 enriched chocolate milk: A functional drink to improve health during exhaustive exercise, Journal of Functional Foods, 14, 2015, 676-683.
33. Vuksan V, Whitman D, Sievenpiper J, Jenkins A, Rogovik A, Bazinet R *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, Journal of Diabetes Care,2007:30(11):2804-2810.
34. Vuksan V, Jenkins AL, Dias AG, Lee AS, Jovanovski E, Rogovik AL *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,2010:64(4):436-438.
35. Ho H, Lee AS, Jovanovski E, Jenkins AL, Desouza R, Vuksan V. Effect of whole, ground salba seeds (Salvia hispanica L.) on post-prandial glycemia in healthy volunteers: a randomized controlled, dose –response trial, European Journal of Clinical Nutrition,2013:67(7):786-788.
36. Commission EU. Authorizing the placing on the market of chia seeds (Salvia hispanica) as novel food ingredient under Regulation (EC) No. 258/97 of European Parliament of the Council. Official Journal of the European Union, C, 2009, 7645.
37. EFSA "opinion of the scientific panel on dietetic products, nutrition and allergies on a request from the European commission related to the safety of chia (Salvia hispanica L.), Seeds and ground whole chia as a novel food ingredient intended for use in bread," EFSA Journal,2005:278:1-12.
38. EFSA, "scientific opinion of the panel on dietetic products, nutrition and allergies on a request from the European commission on the safety of „chia seeds (Salvia hispanica L.) and ground whole chia seeds‟ as a food ingredient", The EFSA Journal,2009:996:1-2.
39. Reyes-Caudillo E, Tecante A, Valdivia-López MA. "Dietary fibre content and antioxidant activity of phenolic compounds present in Mexican chia (Salvia hispanica L.) Seeds", Food Chem,2008:107:656-663.
40. Coelho MS, Salas-Mellado MD. Chemical characterization of chia (Salvia hispanica L.) for use in food products. Journal of Food and Nutrition Research,2014:2(5):263-9