Review Article

PHARMACOLOGICAL EFFECTS OF CORIANDER (CORIANDRUM SATIVUM)

Hina Pasha and Hamid Javaid Qureshi

Abstract : Coriander (coriandrum sativum) is widely cultivated in Pakistan and other countries. The whole plant is used in preparation of sauces while its leaves give taste to soups, curries and bakery products. Its fruits are widely used as condiments. Coriander possesses extensive pharmacological actions. Coriander has hypoglycemic and antihyperlipidemic effects. It decreases levels of total cholesterol, triglycerides, low density lipoproteins while it increases high density lipoproteins. Hepatoprotective effect of coriander has also been reported. It possesses antioxidant and sedative effects. Coriander also protects gastric mucosal damage. Because of its multiple effects coriander should be included in the diet and its medicinal use is recommended.

Keywords: Coriander, corianderum sativum, hypoglycemic antihyperlipidemic.

Introduction

Use of herbs and plants in medicine is increasing because these are cheap and have relatively few side effects. Coriander is one of these plants. The word coriander was derived from old French "coriandre" which came from Latin coriandrum , in turn from greek κορίαννον (koriannon).[1] Coriandrum sativum is widely cultivated in India, Pakistan, Russia, Central Europe, Asia and Middle East.[2]It is very important spice and has a prime position to flavor the substances. Whole of the plant (stem, leaves and fruits) has a very pleasant aromatic odour. The whole plant is used in preparation of chutneys and sauces when it is young while leaves give taste to soups and curries. The fruits are widely used as condiments in seasoning curry powder, pickling spice and sausages. It is also used to add flavor to bakery products.[3]

Common Name of Plant:

Coriander has different names in different languages. In Hindi, it is called dhania, dhanya; in English: coriander, Chinese parsley; in Spanish: coriandro; in German: koriander; in Japanese: koendoro and in Greek: koriannon, korion.[4]

History of Plant:

It is one of the oldest herbs described in the history because of its use for more than 5000 years ago. Coriander seems to have been cultivated in Greece since second mellinium B.C.[5] In Egypt, people used to call it Herb of Happiness. The Chinese used coriander in their medical practice 207 B.C and had faith that coriander could entrust immortality.[6]

Plant morphology:

Coriander consists of dried ripe fruits of coriandrum sativum, a thin long soft hairless and branched annual and a perennial herb, growing upto 50cm, giving a characteristic aroma when rubbed. Its crop matures in 2-3 months after sowing then, herb is pulled out with roots after drying and fuits are threshed out and dried in sun. These seeds have a lemony citrus flavor when crushed.[7] **(Fig 1, 2)**

Whole of the plant is edible, but the fresh leaves and the dried seeds are the most commonly used parts of plant in cooking.[8]

Fig-1: Fresh coriander

Fig-2: Coriandrum sativum seeds (fruits)

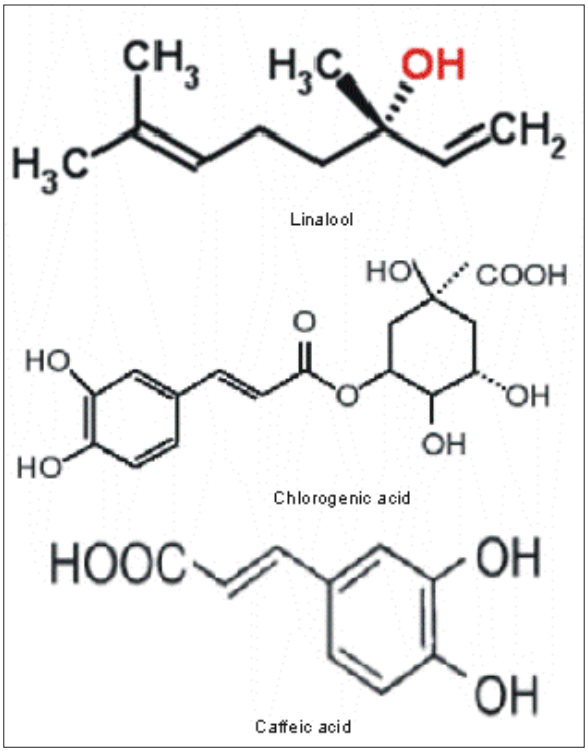

Fig-3: Active components of coriandrum sativum.

Phytochemistry of Coriandrum Sativum:

Because of medicinal use of *coriandrum sativum*, a lot of studies have been done to identify its active chemical constituents. Mostly studies have been done on its seeds. Phytochemical studies have been conducted on its volatile oil[9], ethanolic extract, aqueous extract[10] and methanolic extract.[11]

The major constituents of coriander are essential oils and lipids (rich in petroselinic acid).[12] Among essential oils, linalool is the major component (65-79%)[13] (Fig. 3). Others important constituents are camphor, alpha pinene and gamma terpinene. The main components of fatty acids are petroselinic acid (68.8%), linoleic acid, oleic acid and palmitic acid. Coriander also contains other phytochemicals which include flavinoids, polyphenolic compounds and sterols.[14] Rajeshwari et al (2011) carried reversed-phase high performance liquid chromatography (RP-HPLC) method to separate and identify the flavinoids in ethanolic and methanolic extract of coriander seeds. They separated rutin, quercetin, chlorogenic acid and caffeic acid and reported that chlorigenic acid is predominantly found in methanolic extract followed by others while ethanolic extract contains more rutin than other constituents.[11]

Pharmacological effects of coriandrum satiuvm:

Coriandrum sativum has extensive pharmacological actions and many studies have been conducted so far to reveal its effects.

Hypoglycemic effect:

The hypoglycemic effect of Coriandrum sativum was investigated in streptozotocin induced diabetic rats. Significant decrease in blood glucose level with increased activity of pancreatic beta Cells and insulin were observed After treatment with ethanolic extract of seeds of Coriandrum sativum Given in Traperitoneally.[16] Aissoui et al, in 2011 conducted a study on diabetic and normal rats and reported that blood glucose of diabetic rats decreased after treatment even with a single dose of aqueous extract of coriandrum sativum.[17] In another study, the antidiabetic activity of aqueous extract of coriandrum sativum was investigated in streptozotocin induced diabetic rats. The dose of 250mg/kg and 500mg/kg of extract showed decrease in blood glucose level.[18] Antihyperglycemic effect of coriander seeds was studied by using its powder, alcoholic extract and aqueous extract in type 2 diabetic humans. These seeds in high dose (4.5g t.i.d) showed hypoglycemic effects more markedly in those subjects who were taking oral hypoglycemic agents already but with a history of poor control.[19] Coriandrum sativum essential oil was analysed by using gas chromatography and was administered to a group of streptozotocin induced diabetic rats. The essential oil showed decreased blood glucose level besides improving kidney and pancreas pathological changes occurred as a result of induction of diabetes.[20,21] Antihyperglycemic action of coriander is associated with stimulation of insulin secretion and enhancement of glucose uptake and metabolism by muscle. In a study conducted by Gray (2012), actions of aqueous extracts of coriander on glucose metabolism in isolated murine abdominal muscle and on insulin secretion by a clonal β-cell line were investigated. The effect of coriander, not only as hypoglycemic agent was studied but also the presence of natural constituents and products in coriander was investigated which exhibited insulin releasing and insulin like actions.[22]

Antihyperlipidemic effect:

The antihyperlipidemic activity of coriandrum sativum was observed in diabetic as well as in normal animals. The oral administration of aqueous extract of coriander and ginger showed synergetic effects with glibenclamide in lowering the lipid profile of diabetic animals.[23] In a study conducted on the patients having metabolic syndrome with disturbed levels of lipids and

glucose, thirty drops of plant mixture (3 times daily for 6 weeks) containing the ethanolic extracts of olive leaves, bilberry leaves, elder flowers, coriander fruits and the aerial parts of centaury were given, the levels of serum triglycerides and cholesterol were decreased. [24] Sreelatha et al (2012). Determined that coriander contained some bioactive compounds like phenolics, flavonoids, steroids, and tannins. The extract treated diabetic (allaxon induced) rats showed decreased level of total cholesterol, triglycerides and serum low density lipoprotein (LDL) while high level of high density lipoprotein (HDL).[25] The coriander seeds incorporated into the diet of rats fed with high fat diet and added cholesterol. The effect on the metabolism of lipids was determined by Dhanapakiam et al. They concluded that it had a significant hypolipidemic action. In the tissues of experimental rats, the level of total cholesterol and triglycerides increased significantly. A significant increase in β-hydroxy, β-methyl glutaryl CoA reductase and plasma lecithin cholesterol acyl. Transferase activity (LCAT) was noted. The increased activity of plasma LCAT, enhanced degradation of cholesterol to fecal bile acids and neutral sterols appeared to account for its hypocholesterolemic effect.[26]

Hepatoprotective effect:

KUmar et al (2011), Showed the hepatoprotective effects of coriander seeds In organophosphate induced Intoxicated lIver Of albino mice. An elevated level of liver enzymes was observed in intoxicated mice in comparison to the control. COriander exract was given to those mice and DecreasEd levelS of liver enzymes wEre observed.[27]

Diuretric effect:

The aqueous extract of coriander seed possesses diuretic and saluretic activity. The crude aqueous extract of coriander seeds increased diuresis, excretion of electrolytes, and glomerular filtration rate. The mechanism of action of the plant extract appears to be similar to that of furosemide.[28]

Antioxidant action:

Antioxidants are of interest to biologists and clinicians because these protect the body from hazards induced by free radicals generated in atherosclerosis, ischemic heart disease, Alzheimer's disease and even in aging process.[29] This activity was attributed due to the presence of total phenolic contents of extract.[30]

Anxiolytic and sedative effects:

The aqueous extract of coriandrum sativum seed has anxiolytic effect and may have potential sedative and muscle relaxant effects. The aqueous and hydroalcoholic extracts and essential oil of coriander seeds possess sedative-hypnotic effect. They increased the phenobarbitol induced sleeping time. [31]

Anti-microbial action:

Coriandrum. sativum essential oil has been reported to inhibit a broad spectrum of micro-organisms. The primary mechanism of action of coriander oil is membrane damage, which leads to cell death.[32]

Anthelmentic action:

The aqueous and hydro-alcoholic extracts of coriandrum sativum have anthelmintic activity.[33]

Gastrointestinal effects:

The gastric mucosal injuries caused by NaCl, NAOH, ethanol, indomethacin and pylorus ligation accumulated gastric acid secretions and effect of coriander pretreatment on these injuries was investigated in rats by Al-Mofleh et al. The protective effect against ethanol-induced damage of the gastric tissue might be related to the free-radical scavenging property of different antioxidant constituents (linanool, flavonoids, coumarins, catechins, terpenes and polyphenolic compounds) present in coriander. The inhibition of ulcers might be due to the formation of a protective layer of either one or more than one of these compounds by hydrophobic interactions.[34]

Coriander possesses gut stimulatory and inhibitory effects mediating through cholinergic and Ca2+ antagonist mechanisms respectively.[35]

Antimutagenic action:

Cortes-Eslava et al, investigated the antimutagenic activity of coriander juice. They showed that the aqueous crude coriander juice significantly decreased the mutagenicity of metabolised aromatic amines and the chlorophyll content in vegetable juice.[36]

Metal detoxification:

Chemical compounds present in the coriander get attached to the toxic metals and remove them from the body. Arunasagar et al, observed that coriander is very effective to remove inorganic (Hg+2) and methyl mercury from aqueous solution. This effect was due to the binding effect of carboxylic group to mercury.[37,38]

Conclusion

Because of its hypoglycemic, antihyperlipidemic, antioxidant and other pharmacological effects, coriander should be a part and parcel in our daily diet. Its medicinal use is also recommended.

Department of Physiology,
Shalimar Medical Collage Lahore e

References

1 Coriandrum, Charlton T. Lewis, Charles Short, A Latin Dictionary, on Perseus. 1879.
2. Ravi R, Parkash M, Bhat KK. Coriander (coriandrum sativum l.) seed oil improves plasma lipid profile in rats fed a diet containing cholesterol 2007 Eur Food Res Technol;225:36774.
3. Shivanand P, coriandrum sativum: A biological description and its uses in the treatment of various diseases, Int J Pharm Life Sci 2010.119-26.
4. Sharma MM, Sharma RK: Coriander. Handbook of Herbs and Spices. In: Peter KV (editor). England: Woodhead Publishing Ltd 1999;1-6.
5. Gogate VM, Gogte VM. Ayurvedic Pharmacology& Therapeutic uses of medicinal plant, In: Ramakrishna (editor). 1st ed. Mumbai: Bhavan BV 2000; 405-6.
6. Zohary D, Hopf M. Domestication of plants in the old world. 3rd ed. Oxford University Press 2001.
7. Coriandrum sativum (More than 3000 years of Expressed usage) URL:www.doterra.squarespace.com/storage/conference_calls/coriander%20information%20sheet.pdf
8. Plant profile of Coriandrum sativum. Available from official website of United States Department of Agriculture at:http://plants.usda.gov/java/profile?symbol=COSA
9. Bhuiyan NI, Begum J, Sultana M. Chemical composition of leaf and seed essential oil of coriandrum sativum l. from Bangladesh. Bangladesh J Pharmacol 2009;4:150-3.
10. Kansai l, Sharma V, Sharma A, Lodi S, Sharma SH. Protective role of coriandrum sativum (coriander) extracts against lead nitrate induced oxidative stress and tissue damage in the liver and kidney in male mice. IJABPT 2011;2:65-83.
11. Rajeshwari CU, Andallu B. Isolation and simultaneous detection of flavonoids in the methanolic and ethanolic extracts of coriandrum sativum l. seeds by RP-HPLC. Pak J Food Sci 2011;21:13-21.
12. Bhat S, Kaushal P, Kaur M, Sharma HK. Coriander (coriandrum sativum l.): processing, nutritional and functional aspects. Afr J Plant Sci 2014;8:25-33.
13. Grosso C, Ferraro A, Figueiredo AC, Barroso JG, Coelho JA, Palavra AM. Supercritical carbon dioxide extraction of volatile oil from italian coriander seeds, Food Chem 2008;111:197- 203.
14. Momin AH, Acharya SS, Gajjar AV. Coriandrum sativum- review of advances in phytopharmacology. IJPSR 2012;3:1233-9.
15. Asgarpanah A, Kazemivash N. Phytochemistry, pharmacology and medicinal properties of coriandrum sativum l. Afr J Pharma Pharmacol 2012;6:2340-5.
16. Aissoui A, Zizi S, Israili ZH, Lyoussi B. Hypoglycemic and hypolipidemic effect of coriandrum sativum l. on meriones shawi rats. J Enthnopharmacol 2011;137:652-61.
17. Ozbek H, Him A, Turkozu D. The levels of lethal dose and anti-inflammatory effect of coriandrum sativum l. essential oil extract. Ege J. Med 2006;45:16.
18. Eidi M, Eidi A, Saeidi A, Molanaei S, Sadeghipour A, Bahar M, Bahar K. Effect of coriander seed (coriandrum sativum l.) Ethanol extract on insulin release from pancreatic beta cells in streptozotocin-induced diabetic rats. Phytother Res 2009;23:404-6.
19. Naquvi KM, Ali M, Ahmad J. Antidiabetic activity of aqueous extract of corian- drum sativum l. fruits in streptozotocin induced rats. Int J Pharm Pharm Sci 2011;4:239-40.
20. Waheed A, Miana GA, Ahmad SI, Khan MA. Clinical investigation of hypoglycemic effect of coriandrum sativum in type-2(NIDDM) diabetic patients. Pak J Pharmacol 2006;23:7-11.
21. Neveen H., Nabila A, Gamila SM, Wahby MS, Khalil MY, Kassem AE, Morsy F, Shaffie N. Efficacy of coriandrum sativum l. essential oil as antidiabetic. J App Sci Res 2012;7:3646-55.
22. Gray AM, Flatt PR. Insulin-releasing and insulin-like activity of the traditional antidiabetic plant coriandrum sativum (coriander). Bri J Nut 1999;81:2039.
23. Vijaya Durga P, Barla K, Dhanaraju M, Ramachandran S. Antihyperglycemic, hypolipidemic and antioxident effect of aqueous extract of coriander sativum (seed) and ginger officinale (rhizome) combination in streptozotocin induced diabetes mellitus rats. Int J Biol Pharm Res 2013;4:872-7.
24. Ivankovic MD, Savikin K, Zdunic G, Martcic JD, Tepsic J, Popovic T, Vucic V, Konic-Ristic A, Glibetic M. The effects of a new plant mixture on lipid levels in patients with metabolic syndrome. Arch Biol Sci 2010; 62; 403-7.
25. Sreelatha S, Inbavalli R. Antioxidant, antihyperglycemic, and antihyperlipidemic effects of coriandrum sativum leaf and stem in alloxan-induced diabetic rats. J Food Sci. 2012; 77:119-23.
26. Dhanapakiam P, Joseph JM, Rameaswamy VK, Moorthi M, Kumar AS. The cholesterol lowering property of coriander seeds (coriandrum sativum): mechanism of action. J Environ Biol 2008;29:53-6.
27. Kumar A, Kumar R, Kumar N, Nath A, Singh JK, Ali M. Protective effect of cuminum cyminum and coriandrum sativum on profenofos induced liver toxicity. IJPBA 2011;2:1405-9.
28. Aissoui A, Zizi S, Israili ZH, Lyoussi B. Acute diuretic effect of continuous intravenous infusion of an aqueous extract of coriandrum sativum l. in anesthetized rats. J Ethnopharmacol 2008;115:8995.
29. Aruoma OI. Methodological considerations for characterizing potential antioxidant actions of bioactive components in plant foods. Mutat Res 2003;9-20.
30. Helle W, Samuelsen AB, Malterud KE. Antioxidant activity in extracts from coriander. Food Chem 2004;88:2937.
31. Emamghoreishi M, Hamedani GH. Sedative-hypnotic activity of extracts and essential oil of coriander seeds. Iran J Med Sci 2006;31:22-7.
32. Silva F, Ferreira S, Queiroz JA, Domingues FC. Coriander (coriandrum sativum l.) essential oil: its antibacterial activity and mode of action evaluated by flow cytometry. J Med Microbiol 2011;60:1479-86.
33. Debella A, Feleke A, Makonnen E, Til ahun G, Eguale T. In vitro and in vivo anthelmintic activity of crude extracts of coriandrum sativum against haemonchus contortus. J Ethnopharmacol 2007; 110:428-33.
34. Al-Mofleh IA, Alhaider AA, Mossa JS, Al-Sohaibani MO, Rafatullah S, Qureshi S. Protection of gastric mucosal damage by coriandrum sativum l. Pretreatment in wistar albino rats. Environ Toxicol Pharmacol 2006;22:64-9.
35. Jabeen Q, Bashir S, Lyoussi B Gilani AH., Coriander fruit exhibits gut modulatory, blood pressure lowering and diuretic activities. J Ethnopharmacol 2009;122:123-30.
36. Josefina CE, Arroyo SG, Pietrini RV, Javier J, Aguirre E. Antimutagenicity of coriander (coriandrum sativum) juice on the mutagenesis produced by plant metabolites of aromatic amines. Toxicol Lett 2004;153:28392.
37. Abid HM, Sawapnil SA, Amit VG. Coriandrum sativum: review of advances in psychopharmacology. Int J Res Pharm Sci 2012;3:1233-9.
38. Arunasagar D, Balarama KMV, Rao SV, Arunachalam J. Removal and pre concentration of inorganic and methyl mercury from aqueous media using a sorbent prepared from plant coriander. sativum. J Hazard Mat 2005;118:133-9.