IJBPAS, November, 2023, 12(11): 5191-5210

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

MEDICINAL ASPECTS OF *CORIANDER SATIVUM* LINN

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Received 19th Oct. 2022; Revised 16th Nov. 2022; Accepted 20th March 2023; Available online 1st Nov. 2023

https://doi.org/10.31032/IJBPAS/2023/12.11.7569

ABSTRACT

Coriander sativum is commonly known as dhaniya. It is an annual herb and used as a spice from ancient time that belongs to Apiaceae family. All parts of this herb are in use as flavoring agent and/or as traditional remedies for the treatment of different disorders in the folk medicine systems of different civilizations. Methanolic extract of *Coriander sativum* (coriander) seeds was analyzed for the presence of various antioxidants; ascorbate, riboflavin, tocopherol, polyphenols and in vitro antioxidant potential. Coriander is also well known for its antioxidant, anti-diabetic, anti-mutagenic, antianxiety and antimicrobial activity.

Keywords: Coriander, chemical constituent, geographical source, seed flower, leaves, methenolic extract

INTRODUCTION

Coriander (*Coriander sativum* L.) belongs to carrot ancestors (Umbelliferae) and genus *Coriandrum embrace* cultivated plant (*Coriandrum sativum*) and wild species (*Coriandrum tordylium*). Coriander has poles apart names in different languages, i.e.

English (coriander), Urdu (dhaniya), Arabic (Kuzbara), Hindi (Dhania), Chinese (Yuan sui), Greek (korion). The "coriander", is consequential from Greek word for "bed-bug", as smell of spanking new foliage is said to resemble that of bugplague-ridden bed line. It is mentioned in Sanskrit prose as far flipside as 5000 BC and in Greek Eber Papyrus as early as 1550 BC **[1]**. Coriander is referred to as "kusthumbari" or "dhanayaka" in the Sanscrit literature **[2]**. All parts of this herb are in use as flavoring agent and/or as traditional remedies for the treatment of different dis orders in the folk medicine systems of different civilizations **[3]**. It is highly reputed ayurvedic medicinal plant commonly known as "Dhanya" in India. This plant is highly aromatic and has multiple uses in food and in other industries. Plants have played a critical role in maintaining human health and civilizing the quality of human life for thousands of years **[4]**. It is also used to flavor sausages. All parts of plant are edible, fresh leaves can be used for garnishing and are common ingredient in many foods like chutneys and salads. The green herb is also employed for the preparation of either steam-distilled essential oil or the solvent extracted oleoresin **[5]**. Dried coriander fruit is an important ingredient in pickle making. It is sometimes used to mask odd flavors **[6]**. Fresh leaves can be eaten as such because of various health benefits however, if it is not harvested freshly seeds mature and ripen in late summer developing delicate aroma which are then used as dried spice. Moreover, this plant is used to cure diseases like digestive tract disorders, respiratory tract disorders, urinary tract infections. Coriander has been reported to posses many pharmacological activities like antioxidant **[7]** anti-diabetic **[8]**. anti-mutagenic **[9]**.

CHEMICAL CONSTITUENT AND GEOGRAPHICAL SOURCE:-

It grows best in dry climates however it can grow in any type of soil like light, well drained, moist, loamy soil, and light to heavy black soil **[10]**. India is the biggest producer, consumer and exporter of coriander in the world with an annual production of around three lakh tonnes. It is an annual, herbaceous plant which originated from the Mediterranean and Middle Eastern regions and known as medicinal plants. It contains an essential oil (0.03 to 2.6%) **[11]**.

SEED:

Linalool (58.0–80.3%), γ-terpinene (0.3%–11.2%), α-pinene (0.2%–10.9%), p-cymene (0.1%–8.1%), camphor (3.0%–5.1%) and geranyl acetate (0.2%–5.4%) found in Europe **[12]**

FLOWERS:

Benzofuran,2,3-dihydro (15.4%), hexadecanoic acidmethyl ester (10.32%) 2,4a-epioxy-3,4,5,6,7,8,-hexahydro-2,5,5,8a-tetramethyl-2h-1-benzofuran (9.35 %), 2-methyoxy-4-vinylphenol (8.8%)2,3,5,6-tetrafluroanisole (8.62%) 2,6-dimethyl-3-aminobenzoquinone (6.81%) dodecanoic acid (5%) found in india **[13]**

LEAVES:

Decanal (19.09%), trans-2-decenal (17.54%), 2-decen-1-ol (12.33%) and cyclodecane (12.15%), cis 2-dodecena (10.72%), Dodecanal (4.1%), dodecan-1-ol (3.13%) which find in brazil [14]
Coriander fruit contains about 0.2%–1.5% of volatile and and 13%–20% of fat oil [15]

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ANTIOXIDANT ACTIVITY

Coriander is a good source of polyphenols and phytochemicals due to its high antioxidant activity. Reactive species of oxygen can cause oxidative stress and consequently, the damage of tissues and biomolecules **[21]**. Both leaves and seeds of coriander contain antioxidants but leaves contain more amounts of antioxidants than seeds **[22]**. In recent years, essential oils have been qualified as natural antioxidants. Coriander essential oils serve as potential antioxidants. Main components of its essential oil are: camphor (44.99%), cyclohexanol acetate (cis-2- tert.butyl-) (14.45%), limonene (7.17%), α-pinene (6.37%). This essential oil at percentage of 0.05, 0.10 and 0.15 is very much effective in inhabiting primary and secondary oxidation products. It was found that at the proportion of 0.02%, its effects were almost equal to BHA (butylated hydroxyanisole) **[23]**.

ANTIOXIDANT PROFILE OF *CORIANDER SATIVUM* METHANOLIC EXTRACT [24]

Compound	Amount (microgram/gm dry wt)
Oxidized ascorbate	150.5+9.14
Reducded ascorbate	136.6+9.36
Total ascorbate	287.1+1.82
Riboflavin	4.67+0.37
Tocopherol	181.33+9.02
Total poly phenol	18.696+0.12
Gallic acid	173.656
Ellagic acid	80.185
Quercetin	162.861
Kaempherol	608.903
	233.700

ANTI-HYPERGLYCEMIC ACTIVITY

Its seed extract is used as a traditional medicine for diabetic patients. Incorporation of ground coriander seed extract in diet led to marked decline in blood glucose and rise in levels of insulin in diabetic rats. Besides peroxidative damage inhibition, addition of its seed extract reactivated antioxidant enzymes and antioxidant levels in diabetic rats **[25]**. Gray and Flatt (1999) studied insulin releasing and insulin like activity of coriander. It was observed that its aqueous consumption evoked 1.3-5.7 fold stimulation of insulin secretion from colon B- cell line. An aqueous extract of coriander (1 mg/ml) increased the 2-deoxyglucose transport by 1.6 folds, glucose oxidation by 1.4 folds and incorporation of glucose into glycogen of isolated murine abdominal muscle by 1.7 folds **[26]**. The mechanism of action of the antihyperglycemic action of the aqueous extract of the coriander fruits is connected with stimulation of insulin secretion, enhancement of glucose uptake and metabolism by muscle. In general, the effect is generated by one or more components existed in the extract. Therefore, *C. sativum* is acceptable as a possible antihyperglycemic dietary supplement and can be accounted for a potential source of a new orally active agent for diabetes **[27]**.

HYPOLIPIDEMIC EFFECT

fed to obese-hyperglycemic-hyperlipidemic rats at a single dose in a sub-chronic study for 30 days. The results showed that the coriander extract suppressed hyperglycemia, with a normal blood glucose level reached after 4 h of dosing, An aqueous extract of coriander seeds (20 mg/kg) was fed to obese-hyperglycemic-hyperlipidemic rats at a single dose in a sub-chronic study for 30 days. The results showed that the coriander extract suppressed hyperglycemia, with a normal blood glucose. An aqueous extract of coriander seeds (20 mg/kg) was fed to obese-hyperglycemic-hyperlipidemic rats at a single dose in a sub-chronic study for 30 days.

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Hypolipidemia effect:-

Hyperlipidemia increases the risk for generation of lipid oxidation products, which accumulate in the subendothelial

spaces of vasculature and bone. Atherogenic high-fat diets increase serum levels of oxidized lipids, which are known to attenuate osteogenesis in culture and to promote bone loss **[38]**. studied the hypolipidemic effect of coriander (*Coriander sativum* L.). Coriander was given at a dose of 1g/kg to triton induced hyperlipidemic rats. It was found that coriander decreases the uptake and enhances the breakdown of lipids. Results were compared with commercially available herbal drug for hypolipidemia. From these findings it was assumed that coriander can be used as preventive and curative herbal against hyperlipidemia. Pure coriander seed oil seems to be more effective in its anti hypercholesterolemic effect as opposed to a blend of oils containing coriander oil **[29]**.

DIURETIC ACTIVITY

studied the diuretic activity of the plant extracts on wistar rats of either sex (200 to 250 g). Negative and positive control group comprising of five animals, each received saline and standard diuretic drug: furosemide (10 mg/kg), while rest of the groups with similar number of animals, were given different doses of the plant extracts dissolved in saline (50 ml/kg). The results concluded that the diuretic effect of coriander was confirmed due to significant increase in urine output (diuresis) in rats, similar to furosemide, a standard diuretic. Therefore, diuretic is considered as one of the best choices for the treatment and management of uncomplicated hypertension **[30]**.

In a study, the aqueous extract of coriander fruits was implemented by continuous intravenous infusion (120 min) at two doses (40 and 100 mg/kg) under anesthetize conditions. A diuretic-Furosemide (10 mg/kg) has been used as the standard drug. In the assay, water and electrolyte excretion (sodium, potassium, and chloride) were measured in urine, and glomerular filtration ratio (equal to creatinine clearance) was determined. The crude aqueous extract of coriander fruits increased diuresis, excretion of electrolytes, and glomerular filtration rate in a dose-dependent way; but furosemide was found more potent as a diuretic and saluretic. By the way, the mechanism of action of the plant extract appears to be similar to that of furosemide. In Moroccan pharmacopeia, the coriander is listed and indicated that the aqueous extract of coriander fruits has diuretic and saluretic activity verifying the use of coriander as a diuretic plant **[31]**.

ANTI-ANTHELMINTIC ACTIVITY

In vitro anthelmintic activities of crude aqueous and hydro-alcoholic extracts of the seeds of Coriander were investigated on the egg and adult nematode parasite Haemonchus contortus. Its aqueous extract was also investigated for in vivo anthelmintic activity in sheep infected with

H. contortus. Both extract types of coriander inhibited hatching of eggs completely at a concentration less than 0.5 mg/ml **[32]**. The anthelmintic activities (*in vitro*) of crude aqueous and hydroalcoholic extracts of the fruits of *Coriander sativum* were investigated on the egg and adult nematode parasite called as *Haemonchus contortus* and the aqueous extract of coriander for *in vivo* anthelmintic activity in sheep infected with *Haemonchus contortus*. Both extract types inhibited completely leaving eggs at a concentration less than 0.5 mg/mL. ED_{50} of aqueous extract was found 0.12 mg/mL while that of the hydroalcoholic extract was 0.18 mg/mL **[33]**. Moreover, all essential oil dosages showed a significant level of toxicity to the *Sitophilus granarius* (an insect) after 5 days in chickpea grains **[34]**.

METAL DETOXIFICATION

Coriander can be used as a natural cleansing agent as it has potential to remove toxic metals from body. Chemical compounds present in coriander attach to toxic metals and remove them from cells **[35]**. observed that this plant is very effective to remove inorganic (Hg2+) and methyl mercury (CH3Hg+) from aqueous solutions. This effect was due to the binding effect of carboxylic group to mercury. These results clearly showed that sorbent can be used to remove inorganic and methyl mercury from contaminated water **[38]**. Coriander led to marked decline in oxidative stress caused by lead nitrate **[36]**.

In a Chinese study, mice were exposed to lead over a 40-day period. Five of six of the groups of mice were given vari-ous coriander preparations concurrently with the lead after a 7-day introductory period. Lead exposure in these mice in-creased their lipid peroxidation and reduced activity of their antioxidant enzymes and glutathione. Coriander leaf extracts improved these values. Coriander reduced the negative effect of lead on liver enzymes, testosterone levels, sperm density, and concentration of lead in the mice's testis, aqueous and alcoholic extract of coriander leaf protected the mice from exposure to lead, albeit to varying degrees **[37]**. Coriander is a potential herb to protect the body against absorption of heavy metals and other dietary toxins. Moreover, the herb can be able to prevent the formation of gastric ulcers and *Helicobacter pylori* **[38]**.

ANTI-ANXIETY EFFECT

An internal turmoil often accompanied by various diseases like stomach ache, nervous behavior. Anxiety may be sometimes uncontrollable and irritating. Coriander has been used as folk medicine in Iran for treatment of insomnia. Mahendra studied anti-anxiety activity of hydro alcoholic extract of coriander in mice using diazepam as standard. It was observed that the extract of 100 and 200 mg/kg produced anti-anxiety

effects similar to diazepam **[39]**. Its aqueous extract causes anxiolytic effect and was studied by using extract (10, 25, 50, 100 mg/kg) in male albino mice using elevated plus-maze as an animal model of anxiety. It was found that aqueous extract at 50, 100 and 500 mg/kg significantly reduced spontaneous activity and neuromuscular coordination, compared to control group. All these results led to conclusion that coriander extract can be used as potential sedative and muscle relaxant **[40]**.

A dose of 5 mg/kg showed protective effect similar to that of phenobarbitural (20 mg/kg). These findings were confirmed by another report, whereby; aqueous-alcoholic extract and essential oil of coriander seeds provided a dose-dependent protection against PTZ-induced tonic convulsions and death. Aqueous extract appears to be more active than essential oil in increasing the onset of time for myoclonic and clonic convulsions **[41]**. The same extracts (100–600 mg/kg) were administered to mice to assess for their sedative activity. Aqueous extracts at concentration of 200, 400 and 600 mg/kg prolonged pentobarbital-induced sleeping time as compared to control group. The essential oil showed sedative effect only at 600 mg/kg, suggesting that the sedative component might be present in higher amount in the polar fractions **[42]**.

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ANTIBACTERIAL

protection against PTZ-induced tonic convulsions and death. Aqueous extract than essential oil in onset of time for anti-bacterial activity

Aliphatic (2E)-alkenals and alkanals characterized from the fresh leaves of the coriander were found to possess in the joints. Many of its healing properties can be attributed to its exceptional phytonutrients and hence, it is often referred to as store house for bioactive compounds **[43]**. It also has preventive action on gastric mucosal

membranes due to many reasons like free radical scavenging activity or due to formation of protective layer **[44]**. Its oil can also be used as anti microbial agent. This oil is effective against both gram positive as well as gram negative bacteria and also against pathogenic fungus. Coriander oil also exhibits bactericidal activity with the exception of Bacillus cereus and Enterococcus faecalis **[45]**.

ANTIMICROBIAL AND TOPICAL PROPERTIES

oriander seed oil produces very good activity against *Staphylococcus aureus, S. haemolyticus, Pseudomonas aeruginosa, Escherichia coli, and Listeria monocytogenes*. One study looked at the effect of coriander seed oil on Acinetobacter baumannii, a gram-negative bacteria developing increasing antibiotic resis-tance. In a microdilution broth susceptibility assay, coriander oil synergistically potentiated the action of the drugs chloram-phenicol, ciprofloxacin, gentamicin, and tetracycline against A. baumannii. The synergistic effect of coriander on chloram-phenicol, to which the bacteria were resistant, was pronounced while coriander only had an additive effect on cefoperazone and piperacillin **[46]**.

Essential oils are useful as topical treatments for impetigo, chronic wounds, and herpes simplex outbreaks. However, many essential oils in use, such as tea tree oil, are proving to be contact allergens, leading to the search for oils that combine good antimicrobial activity and low-sensitizing potential **[47]**.

CARDIOPROTECTIVE EFFECT:-

The hydro-methanolic extract of coriander fruits has been found cardioprotective potential. This effect should be attributable to its high polyphenol content in the fruits likewise. The preventive effect of coriander on cardiac damage has been investigated by isoproterenol induced cardiotoxicity model in male Wistar rats and found that the methanolic extract of the fruits prevent myocardial infarction by inhibiting myofibrillar damage on rats **[48]**.

The coriander fruits caused a significant decrease in all cholesterol-associated lipids, while the extract reduced high-density lipoprotein (HDL) cholesterol; the extract also improved the cardioprotective indices. Coriander fruits also reduced dyslipidemia in rabbits. All blood-fat values improved significantly with the coriander diet. It means that the extracts have beneficial profits on cardioprotective effect **[49]**.

ANTICANCER EFFECTS

The biochemical effect of coriander fruits on lipid parameters in 1,2-dimethylhydrazine induced colon cancer has been studied in rats. The concentrations of cholesterol and cholesterol to phospholipid ratio declined while the level of phospholipid increased significantly in 1,2-dimethylhydrazine control group compared to the coriander

administered group. Fecal dry weight, fecal neutral sterols, and bile acids showed a sharp increase in the coriander-fed group compared with the DMH-administered group. Thus, it seems that the coriander plays a protective role in the lipid metabolism of colon cancer **[50]**.

MENSTRUAL DISORDER [20]

It helps in the proper secretion of hormones from the endocrine glands, reducing pain during periods.

Silent feature	processing method
Increased protection of Active components of oil	Encapsulation
Higher values of phenolic components and antioxidants activities as compared to prolonged heat treatment.	Water-balancing
Significant effect on amount of vitamin C and shelf life. Moisture conatain reduction.	Vacuum cooling drying
Product formation like sauces,salsas etc.to increase shelf life	Thermal processing
Prevention of loss of cholorophyll in foliage	Micro drying
Immature fruit contain higher volatile oil than ripe fruit	Harvesting
Reported to cause inactivation of peroxide enzyme at 90 degree celcius for 2 min.	Blanching
Greatly reduces cholorophyll losses	Blanching

CONCLUSION:

Coriander sativum is a highly placed drug in the Ayurvedic medicine. It is one of the most versatile plants having a wide spectrum of medicinal activities. This medicinal plant have various chemical constituent specially methenolic extract that show most of medicinal activities. Different part of this plant like leave, flowers, fruits show different theraputic effect.

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