



A Comprehensive Review On *Coriandrum Sativum Linn*

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Abstract

Coriander (*Coriandrum sativum L.*) being an annual herb is most commonly used for seasoning purposes. Its plant seeds, leaves, and roots are edible, although they have very distinct flavors and uses. The herb has a light and fresh flavor. Coriander can be used as a whole plant and can be processed because of its perishable nature of leaves and to increase the palatability of ripe fruits (seeds) before using it as a flavoring agent in different food preparations. Whole plants of coriander mainly fresh leaves and ripe fruits are used for culinary purposes. Coriander leaves have a different taste than their seeds, with citrus overtones. The coriander plant is a rich reservoir of micronutrients and nutritional elements which leads us to focus our study on this herb. Coriander is very low in saturated fat, however, contains a good amount of linoleic acid which is a good source of α -tocopherol and vitamin K. Leaves of the plant are a rich source of vitamins while seeds are rich in polyphenols and essential oils. Coriander taste is devoted to its essential oil comprising a significant content of linoleic and furanocoumarins (coriandrine and dihydrocoriandrine). Coriander is also well known for its antioxidant, anti-diabetic, anti-mutagenic, anti-anxiety, and antimicrobial activity along with analgesic and hormone balancing effect that promotes its use in foods due to numerous health benefits and its protective effect to preserve the food for a longer period. The aim of the present study was to highlight the processing, nutritional and functional aspects of coriander.

Key words: Coriander, processing, fatty acids, antioxidant content, Anthelmintic Activity, Sedative Hypnotic Activity, anti-anxiety, diuretic activity, Hepatoprotective Activity, anti-hyperglycemic activity.

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148

INTRODUCTION

Nature can be described as the oldest and most comprehensive pharmacy of all times, and phytomedicine has been practiced for health benefits in different systems of traditional medicine, including Chinese, Greco-Arab (Unani-Tibb), and Ayurveda.^{1,2} Currently, there is a revival of interest in the use of phytomedicines particularly for preventive measures. According to the latest report, around 80% of the world population relies on some forms of traditional medicines mainly herbs (WHO, 2002). The use of complementary and alternative medicine has been widespread all over the world.³

One of the oldest herbs that have been used for over 3,000 years (Ebers papyrus of 1550 BC), for both culinary and medicinal purposes is,

Coriander (*Coriandrum sativum L.*), from the Umbelliferae (Apiaceae) family.⁴ Coriander is indigenous to the Mediterranean region and is widely cultivated in Russia, Central Europe, North Africa, and Asia.⁵ The fruits of coriander, also known as the seeds, are globular and aromatic with a slightly bittersweet, spicy taste.⁶ Coriander seed is an integral part of curry powder and is used in minced meat dishes and stews. Young leaves of the plant are used to make sauces and chutneys. The green leaves are consumed as fresh herbs, in salads, and as garnishes due to their attractive green color and aroma.⁷ Coriander oil is also used in cosmetics, body care products, and perfumes.⁸ Different parts of the coriander plant have been reported for multiple health functions and biological activities. Traditionally, coriander has been used to treat

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gastrointestinal disorders such as anorexia, dyspepsia, flatulence, diarrhea, pain, and vomiting.⁹

Dhaniya consists of dried ripe fruit of *Coriandrum sativum* Linn Umbelliferae; a slender, glabrous, branched, cultivated all over India, giving a characteristic aroma when rubbed. It is an annual herb originating from the Mediterranean.^{10, 11} The whole plant, and especially the unripe fruit, is characterized by a strong disagreeable odor, wherever the name coriander (from the Greek k'opis, a bug)¹². All part of the plants is edible but the fresh leaves and the dried seeds are the most common parts used in cooking. In India, it is chiefly found in Madhya Pradesh, Tamil Nadu, Karnataka, Rajasthan, Andhra Pradesh, and Bihar.

In Indian traditional medicine, coriander is used for disorders of the digestive, respiratory and urinary systems, as it has diaphoretic, diuretic, carminative, and stimulant. In Iranian traditional medicine, coriander has been indicated for several medical problems such as dyspeptic complaints, loss of appetite, convulsion, and insomnia.

Coriander has been reported to exhibit several pharmacological effects such as antioxidant activity, anti-diabetic activity, anti-mutagenic activity, anthelmintic activity, sedative-hypnotic activity, anticonvulsant activity, diuretic activity, cholesterol-lowering activity, protective role against lead toxicity, antifungal activity, anti-feeding activity, anticancer activity, anxiolytic activity, hepatoprotective activity, anti-protozoal activity, anti-ulcer activity, post-coital anti-fertility activity, heavy metal detoxification.

Botanical Description:^{14,16}

Leaves: A small herb having many branches and subbranches. New leaves are oval but aerial leaves are elongated.

Flowers: white, having slightly brinjal-like shades.

Fruit: round, divided into 2 parts.

Seed: The herb bears flowers and seeds at the end of winter.

Phytochemicals: The general chemical composition present in coriander fruits are described in Table 1. Green coriander contains 84% water.

Table 1: Describes The Chemical Composition Of Coriander Sativum

Component Content	Percentage (%)
Water	11.37
Crude protein	11.49
Fat	19.15
Crude fiber	28.43
Starch	10.53
Pentosans	10.29
Sugar	1.92
Mineral constituents	4.98
Essential oil	0.84

Seeds contain up to 1.8% volatile oil according to origin (BP standard not less than 0.3%). Major active constituents of *Coriandrum sativum* is essential oils and fatty oil. The essential oil content of the weight of ripe and dried fruits of coriander varies between 0.03 and 2.6%, and the content of fatty oil varies between 9.9 and 27.7% 1% the major component of which is S- (+)-linalool (60-70%) other minor active constituents in essential oil are monoterpenes hydrocarbons viz. α -pinene, limonene, γ -terpinene, p-cymene, borneol, citronellol, camphor, geraniol and geraniol acetate, heterocyclic components like pyrazine, pyridine, thiazole, furan and tetrahydrofuran derivatives, isocoumarins, coriandrin, dihydro-coriandrin, coriandrone A-E, flavonoids, phtalides, neochidilide, digustilide phenolic acids, and sterols. The composition of the essential oil & fatty oil are described in Tables 3 and 4 respectively.¹⁷

Table 2: Describe the composition of essential oil in ripe fruits of Coriander sativum¹⁸

Main components	% of Total Essential oil	Minor components (all with less than 2%)
Linalool	67.7	β -pinene
α -pinene	10.5	Camphene
γ -terpine	9.0	Myrcene
Geranylacetate	4.0	Limonene
Camphor	3.0	p-cymo
Graniol	1.9	Dipentene α -terpinene n-decylaldehyde Boreanol

Pharmacological Studies:

Antioxidant Activity: An aqueous coriander



extract obtained through a sequential extraction process identify the phenolic compounds responsible for its antioxidant activity. When considered the recognized antioxidant ability of phenolic acids, suggest that they are principal components responsible for the antioxidant activity of the aqueous coriander extract. This study is designed to examine the fruit essential oil composition, the total phenolic amounts, and the antioxidant activities in methanolic extracts of *CoriandrumSativum*.

Five fractions (b-carotene, b-cryptoxanthin epoxide, lutein-5, 6-epoxide, violaxanthin, and neoxanthin) were isolated from a coriander ether extract using column chromatography and identified according to their chromatographic and spectral characteristics. Extracts of different polarity from leaves and seeds of coriander and coriander oil were investigated for their antioxidant activity coriander to food will increase the antioxidant content and may have potential as a natural antioxidant and thus inhibit unwanted oxidation processes. Extracts from both leaves and seeds showed a concentration-dependent DPPH scavenging activity respectively.^{19,20}

Anti-diabetic Activity: After a single oral dose of the extract (20 mg/kg) in sub-chronic administration of an aqueous extract of coriander seeds in OHH-Merionesshawi rats normalized glycemia and decreased the elevated IR (insulin resistant), levels of insulin, total cholesterol, LDL-cholesterol and TG, without a significant effect on BW (body weight), and plasma urea and creatinine. Our results also imply that regular consumption of coriander seeds (which are relatively non-toxic) could decrease hyperglycemia as well as prevent or reduce cardiovascular complications caused by dyslipidemia/hyperlipidemia in pathologies such as pre-diabetes, T2DM, and the metabolic syndrome.²¹

Anti-microbial Activity: Aqueous infusions and aqueous decoctions of coriander against 186 bacterial isolates belonging to 10 different genera of G +ve bacterial population and 2 isolates of *Candida albicans* isolated from urine specimens. The essential oil from leaves of *CoriandrumSativum* L. (Apiaceae), obtained by

hydro-distillation was analyzed.²²

The major constituents were 2E-decenal (15.9%), decanal (14.3%), 2E-decen-1-ol (14.2%), and n-decanol (13.6%). Other constituents present in fairly good amounts are 2E-tridecen-1-al (6.75%), 2E-dodecenal (6.23%), dodecanal (4.36%), undecanol (3.37%), and undecanal (3.23%). The oil was screened for antimicrobial activity against both Gram-positive (*Staphylococcus aureus*, *Bacillus* spp.) and Gram-negative (*Escherichia coli*, *Salmonellatyphi*, *Klebsiella pneumonia*, *Proteus mirabilis*, *Pseudomonas aeruginosae*) bacteria and a pathogenic fungus, *Candida albicans*.²³

Anti-Mutagenic Activity: The 4-nitro-o-phenylenediamine (NOP) is a well-known direct-acting mutagen whose mutagenic potential can be enhanced by plant metabolism; m-phenylenediamine (m-PDA) is converted to mutagenic products detected by the *Salmonella typhimurium* TA98 strain, and 2-aminofluorene (2-AF) is the plant-activated promutagen most extensively studied. Plant cells activate both 2-AF and m-PDA into potent mutagens producing DNA frame shift mutations. *CoriandrumSativum* is a common plant included in the Mexican diet, usually consumed uncooked.

The antimutagenic activity of coriander juice against the mutagenic activity of 4-nitro o-phenylenediamine, m-phenylenediamine, and 2-aminofluorene was investigated using the Ames reversion mutagenicity assay (his - to his+) with the *S. typhimurium* TA98 strain as an indicator organism. The plant cell/microbe coinubation assay was used as the activating system for aromatic transformation and plant extract interaction. Aqueous crude coriander juice significantly decreased the mutagenicity of metabolized aromatic amines (AA) in the following order: 2-AF (92.43%) > mPDA (87.14%) > NOP (83.21%).²⁴

Anthelmintic Activity: *In vitro* anthelmintic activities of crude aqueous and hydro-alcoholic extracts of the seeds of *CoriandrumSativum* (Apiaceae) were investigated on the egg and adult nematode parasite *Haemonchus contortus*. The aqueous extract of *CoriandrumSativum* was also investigated for



in vivo anthelmintic activity in sheep infected with *Haemonchus contortus*. Both extract types of *CoriandrumSativum* inhibited the hatching of eggs completely at a concentration of less than 0.5 mg/ml.

ED(50) of aqueous extract of *CoriandrumSativum* was 0.12 mg/ml while that of the hydro-alcoholic extract was 0.18 mg/ml. The hydro-alcoholic extract showed better in vitro activity against adult parasites than the aqueous one.²⁵

Sedative Hypnotic

Activity: *CoriandrumSativum* L. has been recommended for the relief of insomnia in Iranian traditional medicine. To determine sedative & hypnotic activity Aqueous and hydroalcoholic extracts & essential oil administer to rats. The result of the experiment shows that aqueous extract prolonged pentobarbital-induced sleeping time at 200, 400, and 600 mg/kg. Hydroalcoholic extract at doses of 400 and 600 mg/kg increased pentobarbital-induced sleeping time compared to the saline-treated group. The essential oil increased pentobarbital-induced sleeping time only at 600 mg/kg. The extracts and essential oil of coriander seeds possess sedative-hypnotic activity.²⁶

Anticonvulsant activity: The anti-convulsant effects of aqueous and ethanolic extracts of *coriander sativum* seeds were studied in two anti-convulsant evaluation tests, namely the pentylenetetrazole (PTZ) and the maximal electroshock tests. Aqueous and ethanolic extracts prolonged the onset of clonic convulsions and the anti-convulsant activity of a high dose (5mg/kg) was similar to that of phenobarbital at a dose of 20mg/kg in the PTZ test. Both extracts in high doses decreased the duration of tonic seizures and showed a statistically significant anticonvulsant activity in the maximal electroshock test.

Diuretic: The aqueous extract of coriander seed possesses diuretic and saluretic activity, thus, validating the use of coriander as a diuretic plant in Moroccan pharmacopeia aqueous extract of coriander seed was administered by continuous intravenous infusion (120 min) at two doses (40 and 100 mg/kg) to

anesthetized Wistar rats. Furosemide (10 mg/kg), a standard diuretic was used as the reference drug. The crude aqueous extract of coriander seeds increased diuresis, excretion of electrolytes, and glomerular filtration rate in a dose-dependent way; furosemide was more potent as a diuretic and saluretic. The mechanism of action of the plant extract appears to be similar to that of furosemide.²⁷

Cholesterol-lowering Activity: Coriander seeds were incorporated into the diet and the effect of the administration of coriander seeds on the metabolism of lipids was studied in rats fed with a high-fat diet and added cholesterol. The seeds had a significant hypolipidemic action. In the experimental group of rats (tissue) the level of total cholesterol and triglycerides increased significantly. There was a significant increase in b-hydroxy, b-methyl glutaryl CoA reductase, and plasma lecithin cholesterol acyl transferase activity was noted in the experimental group. The level of low-density lipoprotein (LDL) and very low-density lipoprotein (VLDL) cholesterol decreased while that of high-density lipoprotein (HDL) cholesterol increased in the experimental group compared to the control group. The increased activity of plasma LCAT, enhanced degradation of cholesterol to fecal bile acids, and neutral sterols appeared to account for its hypocholesterolemic effect.²⁸

Anti-Anxiety Activity: *CoriandrumSativum* L. has been recommended for the relief of anxiety and insomnia in Iranian folk medicine. The anxiolytic effect of aqueous extract (10, 25, 50, 100 mg/kg, i.p.) was examined in male albino mice using elevated plus-maze as an animal model of anxiety. The effects of the extract on spontaneous activity and neuromuscular coordination were assessed using Animex Activity Meter and rotarod, respectively. In the elevated plus-maze, aqueous extract at 100 mg/kg showed an anxiolytic effect by increasing the time spent on open arms and the percentage of open-arm entries, compared to the control group. Aqueous extract at 50, 100 and 500 mg/kg significantly reduced spontaneous activity and neuromuscular coordination, compared to the control group. These results suggest that the aqueous extract of *CoriandrumSativum* seed has an anxiolytic



effect and may have potential sedative and muscle relaxant effects.²⁹

Hepatoprotective Activity: Ethanolic extract was found to be rich in alkaloids, phenolic compounds, and flavonoids, isoquercetin, and quercetin. *C. sativum* signifies hepatoprotection against carbon tetrachloride (CCl₄), by reducing the liver weight, activities of SGOT, SGPT, and ALP, and direct bilirubin of CCl₄ intoxicated animals. Administration of *C. sativum* extract at 300 mg/kg dose resulted in the disappearance of fatty deposits, ballooning degeneration, and necrosis, indicating antihepatotoxic activity.³⁰

Anti-Protozoal Activity: Leishmaniasis is a zoonosis caused by the protozoan species *Leishmania infantum* (syn.- *L. chagasi*) and is primarily transmitted through the bite of the female *Lutzomyia longipalpis*. The *in vitro* effect of methanol fraction from *Coriandrum sativum* (coriander) on promastigotes and amastigotes of *L. infantum* and to analyze the toxicity against the murine monocytic cells RAW 264.7. To determine the viability of these substances on 50% parasites (IC₅₀), we used a tetrazolium dye (MTT) colorimetric assay (bromide 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium), and on amastigotes, we performed an *in situ* ELISA. The flavonoid quercetin isolated from fruits of *C. sativum* interferes with the iron metabolism in *L. donovani*, reducing the splenic burden in golden hamsters by 75–95%³¹.

CONCLUSIONS

Herbs and spices are processed in foods from early times for sea only as well as to increase the shelf life of food and to restore health. Coriander is of miraculous herb that functions as both, spice as well as herbal medicine. Although the plant can be grown throughout the year, it is processed to increase its palatability, and profitability and facilitate international trade. The leaves and fruits are highly fragrant and contain nutrients like fat, proteins, vitamins, minerals, etc. Its health benefits activities ranging from antibacterial to anticancer activities. The most important and well-characterized property of coriander is its use as an antioxidant. Due to its multi-functional uses and protective and preventive

action against various chronic diseases, this herb is rightly called as “herb of happiness”. Moreover, the processing of fruits and leaves of coriander is the best way to preserve this herb.

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CONFLICTS OF INTEREST: Nil

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