Cilantro—Culinary Herb or Miracle Medicinal Plant?

Article *in* Alternative and Complementary Therapies · October 2012

DOI: 10.1089/act.2012.18507

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Cilantro—Culinary Herb or Miracle Medicinal Plant?

Kathy Abascal, BS, JD, RH (AHG), and Eric Yarnell, ND, RH (AHG)

Abstract

This article reviews the medicinal effects of *Coriandrum sativum* (coriander, cilantro, Chinese parsley). Despite its reputation among laypeople for removing heavy metals from the body, studies indicate that coriander is unlikely to do so. Research does show that coriander may help protect the body in general and, in particular, the liver from heavy metals and toxins; may have a beneficial effect in a variety of skin infections; has potential as a sunscreen; and may be beneficial in noninsulin-dependent diabetes mellitus and dyslipidemia. The herb also shows interesting anxiolytic, sedative, and pain-relieving effects.

Introduction

As an herb, *Coriandrum sativum* (coriander, cilantro, Chinese parsley) plays, at most, a minor role in the apothecary of most Western professional botanical practitioners and is viewed primarily as a cooking herb. It appears to play a greater medicinal role in other cultures, such as those of India, Iran, Pakistan, and Morocco. Although not widely used by professional practitioners in the West, the herb is often described as a miracle plant in other circles, as exemplified by internet articles, based on this herb's claimed ability to aid substantially in ridding the human body of heavy metals. This article explores the research on this plant in an attempt to determine its rightful place in the Western botanical medicine apothecary.

The Coriander Plant

When the plant is harvested green, and the leaves are used, it is called cilantro. When the dried fruits (usually called seeds*) are used, the herb is called coriander. In this article, when the plant is referred to in general terms, applicable to both the leaves and seeds, it is called coriander. When a specific part of the plant is being discussed the terms *coriander seed* or *coriander leaf* will be used.

Coriander has such a long history of use, and has so widely escaped from cultivation and naturalization in so many different cultures, that its ancestry as a wild plant is largely unknown. It is believed to have originated somewhere in the Mediterranean area. Coriander seed was found in the Neolithic level of the Nahal Hemel Cave in Israel. About one half L of coriander seeds were present in the tomb of Tutankhamun. Coriander seems to have been cultivated in Greece, since at least the second millennium BC, where the plant was used in perfumes, and both the seeds and leaves were used in cooking. The herb was also widely used in the Roman Empire. For instance, Apicius includes some 70 recipes using coriander in his cookbook. Coriander was in use in Germany in ~ 900 AD.[1]

Constituents

Coriander seed oil contains 60%–70% linalool and, in addition to the essential oil, the seeds contain sugars, alkaloids, flavones, resins, tannins, anthraquinones, sterols, and fixed oils. Coriander leaves contain good amounts of caffeic, ferulic, gallic, and chlorogenic acids.[2]

Traditional Medicinal Uses

Coriander seed has been used to treat indigestion, worm infestations, rheumatism, loss of appetite, convulsions, insomnia, anxiety, and joint pain.[3] In Iran, the seed was primarily used to treat anxiety and insomnia.[4] The seed was widely used internally as a carminative, digestive, spasmolytic, and galactagogue. Topically, it was used as a cosmetic and to relieve joint pain.[3]

Today, coriander is widely used to treat digestive disorders, respiratory and urinary disorders, anxiety and insomnia, allergies, amoebic dysentery, burns, coughs, cystitis, dizziness, edema, hayfever, headaches, hemorrhoids, rashes, urethritis,

*Although this is inaccurate, the fruits are typically called seeds in common parlance and in the literature; therefore, they are referred to as *seeds* in this article.

DOI: 10.1089/act.2012.18507 • MARY ANN LIEBERT, INC. • VOL. 18 NO. 5 OCTOBER 2012

urinary-tract infections, urticaria, and vomiting.[5] In Morocco, coriander is used to treat a variety of disorders, including diabetes and dyslipidemia.[6] This plant is also used as a diuretic.[7] In India, the seed is reportedly used to treat spermatorrhea, leucorrhea, and rheumatic fever. The seeds are also said to have both diuretic and aphrodisiac properties.[6]

In traditional medicine, the usual dose of seed powder is from 1 g to 5 g, three times per day. This translates to a 43–71-mg/kg dose for a 70-kg individual.[5]

Heavy Metals

Today, coriander leaf is widely promoted on the internet for a purported ability to remove heavy metals, particularly mercury, from the human body. Unfortunately, there is little-to-no evidence to support these claims. Yoshiaki Omura, MD, developed BDORT, a bidigital *O*-ring test that is claimed to measure heavy metals. In an article published in the journal *Acupuncture & Electro-Therapeutics Research* in 1996, Dr. Omura wrote that mercury levels rose in a patient after dental amalgam removal.[8]

Dr. Omura had previously noted that a Vietnamese soup made with cilantro increased urinary excretion of mercury, lead, and aluminum and, therefore, was able to remove the mercury from the dental patient using a 100-mg coriander leaf tablet, 4 times per day, along with some type of enhancement method using his BDORT.

After using his BDORT to examine other patients, Dr. Omura wrote that *Chlamydia trachomatis*, herpes viral infections, and other infections tended to concentrate in areas of the body where mercury was concentrated and that this allowed infections to evade antibiotics and other drugs. He stated that a combination of coriander leaf tablets and antibiotics cleared these infections.[9] No additional research has been forthcoming since these early articles.

Dr. Omura's claims are viewed with great skepticism among professionals, because of the lack of follow-up studies using accepted techniques to measure the effect of coriander leaf tablets on excretion of heavy metals.[10] Nonetheless, coriander leaf's reputation as a mercury detoxifier remains extraordinarily popular among the general public and some alternative practitioners.

While the suggestion that coriander leaf can be used to remove heavy metals from the body is highly questionable, there are indications that coriander leaf may reduce the uptake of heavy metals if taken during exposure. In addition, if the leaf is used in advance, it may protect the liver from some toxins.

In a Chinese study, mice were exposed to lead over a 40-day period. Five of six of the groups of mice were given various coriander preparations concurrently with the lead after a 7-day introductory period. Lead exposure in these mice increased 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. These changes were not always of statistical significance. However, overall, aqueous and alcoholic extract of coriander leaf protected the mice from exposure to lead, albeit to varying degrees.[11]

The highest concentration of absorbed lead is usually found in the bones. In one study, mice were exposed to lead in their drinking water for 32 days. Seven days after the onset of lead exposure, the mice were given a coriander leaf preparation or dimercaptosuccinic acid (DMSA; a chelating agent) as a control. The DMSA suppressed lead deposits in the mice's femurs and kidneys. The coriander at 12 "mg per body"[†] also had the same effect. In contrast to DMSA, the herb did not affect calcium deposits, a distinct advantage for bone health. This raises the possibility that coriander contains some type of chelating agent that reduces lead absorption but, unlike phytic acid (a common chelating agent found in other plants), lacks an undesired affinity for calcium.[12]

One study showed that fish feed containing coriander did not affect the growth or health of farmed rainbow trout negatively but did reduce their uptake of cadmium by 12%–17%. In a follow-up study, fish were divided into groups, with 1 group fed a diet equal to 20% fresh coriander leaf in freeze-dried form along with cadmium. The coriander increased the amount of cadmium bound to metallothionein, thereby reducing cadmium toxicity in the fish significantly.[13]

Pretreatment with a coriander leaf extract which was 100 or 200 mg/kg b.w. 2 weeks before exposure to carbon tetrachloride provided significant liver protection in rats. The leaf's effect was equivalent to that of a standard 25 mg/kg dose of silymarin administered intraperitoneally.[2,‡]

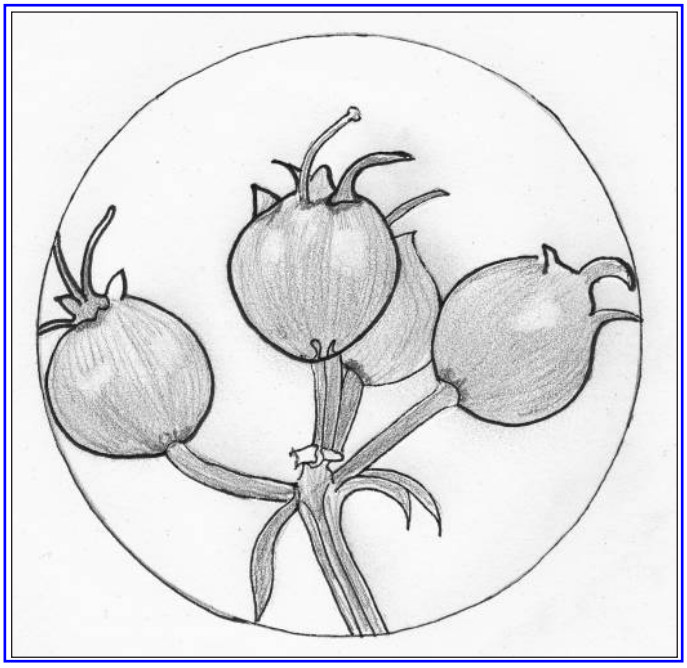
While there is no evidence that coriander leaf has the ability to remove heavy metals already in the human body, there is some preclinical evidence that, when used in advance or concurrently, coriander leaf can reduce toxin absorption and toxic effects. More research is needed to validate this research and elucidate appropriate dosing. However, given the ever-increasing concentration of heavy metals in the foods of the world, it would appear to be beneficial to encourage patients to incorporate coriander leaf in their diets.[14] For instance, the herb can be used in pesto or salsas when foods, such as fish, that are likely to be contaminated with mercury and other heavy metals, are consumed.

Type 2 Diabetes

Research on botanicals for treating type 2 diabetes mellitus is increasing because, worldwide, the incidence of diabetes is increasing. Inexpensive, readily available alternative treatments are needed, especially in poorer countries where people cannot afford pharmaceuticals to treat the ailment. The body's defenses against free-radical damage are altered in diabetes, hence, the motivation to explore antioxidant effects of foods and herbs.[15] Much of the research on using

[†]Dosing was expressed as mg per body in this article.

[‡]Although not entirely clear, it appears that the coriander leaf and stem extracts were administered per os.



Coriandrum sativum (coriander fruit; also known as seeds). Drawing © 2012 by Kathy Abascal, BS, JD, RH (AHG).

coriander in diabetes is based on the fact that coriander is a strong antioxidant traditionally used in some cultures to treat diabetes.

In a study of 40 volunteers, 20 subjects took 2.5 g of ground coriander seed twice daily for 60 days. Another 20 volunteers served as controls.[15,§] The treatment group had a significant reduction in fasting blood-sugar levels; a significant reduction in lipid peroxidation in red blood cells; and rises in serum β-carotene, vitamin A, vitamin C, vitamin E, and glutathione levels. The controls' blood-sugar levels rose and the controls' antioxidant status dropped, compared to baseline.[15]

Ideally any treatment of diabetes should have a positive effect on both blood-glucose and lipid levels, as both tend to be dysregulated in patients with diabetes. Unfortunately, most antidiabetes drugs do not have a favorable effect on lipid profiles. The effect of coriander seed, in this respect, was compared with glyburide in *Meriones shawi* rats, a breed that develops obesity, hyperglycemia, and hyperlipidemia if fed a high-calorie diet while prevented from engaging in physical activities. After testing coriander-seed extract doses ranging from 20 mg/kg to 400 mg/kg in rats, the 20 mg/kg dose produced the best results.[5]

For 90 days, the rats were either fed a high-calorie diet and physical activity was limited, or they were fed a normal diet and allowed unlimited physical activity. Thereafter, these groups were subdivided and given coriander seed, glyburide (2.5 mg/kg), or distilled water.[5]

A single dose of coriander seed reduced blood-glucose levels significantly, which is equivalent to the glyburide effect in the obese rats, and the herb and drug lowered blood sugar less in

Coriander leaves.

normal rats. Both reduced insulin resistance. In a 30-day test, neither treatment affected body weight. Both treatments normalized blood sugar levels with a rebound about a week after treatment cessation.[5]

The coriander seed caused a significant decrease in all cholesterol-associated lipids, a more-pronounced effect than what was achieved with glyburide. While the extract reduced high-density lipoprotein (HDL) cholesterol, the extract also improved the cardioprotective indices. The researchers stated: "Coriander seed normalized blood sugar, decreased the elevated insulin resistance, decreased levels of insulin, cholesterol, LDL-cholesterol, and triglycerides without a significant effect on body weight, blood urea or creatinine validating its traditional use in the treatment and management of diabetes."[5]

In another study, rats with streptozotocin-induced, insulin-dependent diabetes were administered 0.1 mg/kg of glimepiride, 250 mg/kg of coriander seed extract, or 500 mg/kg of the extract. The higher dose of coriander seed was more effective than the lower dose but the reference drug lowered blood sugar more effectively in this 3-week study.[6]

Coriander seed also reduced dyslipidemia in rabbits. Rabbits fed an atherogenic diet were given a dose of 500 mg/kg of coriander seed extract for 60 or 120 days. All blood-fat values improved significantly with the coriander regimen. It also in-

[§]The study appeared to be randomized but it was not blinded. The controls were given the same dietary advice as the active group but were not given a placebo.

Ancient Advice for Using Coriander

Dioscorides* wrote about *Coriandrum sativum*:

III.63. κορις The coriander: it has a cooling property, wherefore when plastered on with bread or barley groats, it cures erysipelas and shingles; with honey and raisins, it treats pustules that are most painful at night, testicular inflammations, and carbuncles; and with bruised corn, it dissolves scrofulous swellings of the glands and tumors. A small quantity of its seed drunk with grape-syrup expels intestinal worms and furthers the production of semen, but if too much is taken, it dangerously disturbs the thinking process; this is why one must guard against drinking it to excess and continuously. Anointed with white lead or with litharge, and with vinegar and unguent of roses, the juice benefits surface tumors that are inflamed.

*Source: Beck LY, transl. Pedianius Dioscorides of Anazarbus. In: The Materia Medica: Ancient Scientific Texts and Studies, vol. 38 [in German]. Hildesheim, Germany: Olms-Weismann.

creased the catalase and glutathione content of the rabbits' livers. The researchers posited that the extract's beneficial effect was the result of its effect on oxidative stress.[16]

Gastric Issues

Coriander seed has a long history of use in digestive disorders, for which it is used as a carminative and antispasmodic to prevent griping, flatulence, dyspepsia, and constipation.[17] Research also suggests it may be useful as part of the treatment for *Helicobacter pylori* infections. This is of great importance, because ~ 50% of the world's population is infected with *H. pylori*, with up to a 100% infection rate in some developing countries. A higher rate of infection is found in people of lower socioeconomic status. Emerging resistance to antibiotics used to treat *H. pylori* limits their use worldwide. The combination of economic inability to purchase drug treatments that are increasingly ineffective makes alternative treatments highly sought after.

Hallmarks of *H. pylori* pathogenesis include oxidative stress and a rise in the cytokine interleukin-8 (IL-8). A preliminary study looked at 50 plants used in traditional Pakistani medicine to treat gastrointestinal (GI) disorders such as dyspepsia, ulcers, and gastritis.[18] Although some of the studied plants produced only minor activity against *H. pylori*, they were chosen for further study, because they are extensively prescribed for GI disorders in traditional medicine. The goal of the study was to determine if these plants, instead, had a significant effect on *H. pylori*–induced sequelae.[18]

Coriander seed was one of the plants studied for its effect on IL-8 and reactive oxygen species (ROS) production.[18] At 50 µg/mL and 100 µg/mL, coriander seed produced mild activity against IL-8. However, the seed strongly inhibited ROS production in *H. pylori*–infected cells. Coriander seed was not the strongest of the herbs tested even in this second group. However, the researchers noted that, in traditional medicine, typically, formulas are used, suggesting that coriander seed may be a useful component in traditional treatments of *H. pylori*.[18]

An earlier animal study showed that coriander seed (250 mg/kg and 500 per os) dose-dependently protected the animals against the ulcerogenic effects of salt, sodium hydroxide, ethanol, indomethacin, and pylorus ligation. There were suggestions that coriander seed may inhibit ulcers by forming a protective layer of compounds.[17] Certainly, these results suggest that cilantro seed may be a beneficial addition to the diets of patients faced with stomach ulcers.

Antimicrobial and Topical Properties

Coriander 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 resistance. In a microdilution broth susceptibility assay, coriander oil synergistically potentiated the action of the drugs chloramphenicol, ciprofloxacin, gentamicin, and tetracycline against *A. baumannii*. The synergistic effect of coriander on chloramphenicol, to which the bacteria were resistant, was pronounced while coriander only had an additive effect on cefoperazone and piperacillin.[19]

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.[20] Coriander seed oil meets these requirements. In a study of different essential oils, coriander seed oil was the most effective against *Campylobacter jejuni*. The oil's main constituent, linalool, was tested in two clinical studies. In the first study, none of the 1200 patients with contact eczema had a positive patch-test reaction. In the second study, only 3 of 1825 patients with contact eczema reacted, indicating that coriander seed oil has a very low sensitizing potential.[20,21]

Isolated aldehydes from coriander leaves were very effective against *Candida* spp., *S. aureus*, *Salmonella typhi*, *Salmonella choleraesuis*, and other bacteria. The isolated aldehydes were more effective against *L. monocytogenes* than the seed oil, but the aldehydes have an unpleasant scent, whereas coriander oil has a mild, pleasant scent and a long history of use in cosmetics. Using the standard agar dilution method, this study showed that coriander-seed oil caused a pronounced inhibition of growth in many bacterial strains involved in skin conditions such as *Streptococcus pyogenes* and *Streptococcus viridans*. The oil also had a good inhibitory effect on *S. aureus* and methicillin-resistant *S. aureus*.[20]

Patch testing was done on 40 volunteers using a lotion and cream, plain or with 0.5% or 1% coriander essential oil: The coriander oil caused no erythema. The oil's history of use in cosmetics, its low sensitizing potential, and its mild anti-inflammatory action combined with the oil's antibacterial effect at levels used comfortably (0.5%–1% in lotions) indicate that the oil would

be beneficial for treating superficial skin infections and oozing dermatitis, and skin infection involving *S. pyogenes*. A 0.5% coriander essential-oil lotion significantly reduced ultraviolet B erythema but less so than a 1% hydrocortisone solution did.[21]

In a study of herbal sunscreens, a coriander-seed preparation was most favored by study participants. The preparation provided good protection against ultraviolet radiation.[22]

Sedative and Anxiolytic Effects

In a mouse study, coriander seed (50, 100, and 200 mg/kg) was compared with diazepam (0.5 mg/kg) in animal models of anxiety (elevated plus maze, open-field test, social interaction, and light and dark test). At the two higher doses, coriander seed was nearly equivalent to diazepam as an anxiolytic.[23] An aqueous extract of coriander seed (50, 100, or 500 mg/kg) produced anxiolytic effects in mice and dose-dependently reduced locomotor activity in a manner suggesting a possible muscle-relaxant effect.[24]

Coriander-seed extract (100, 200, 300 mg/kg b.w.) administered daily prior to stress testing in rats reduced urinary excretion of vanillylmandelic acid and increased the excretion of ascorbic acid, indicating that the extract improved the animals' stress-coping abilities. Coriander seed extract dose-dependently reduced scopolamine-induced amnesic deficits and inhibited both liver and brain lipid peroxidation to a greater extent than the standard antioxidant ascorbic acid did. This suggests that coriander seed may be useful in a variety of ways for alleviating stress.[25] In another study, fresh leaves were fed to rats at 5%, 10%, and 15% w/w for 45 days and produced a dose-dependent improvement in the memory of both young and aging rats similar to that of piracetam at a dose of 400 mg/kg, intraperitoneally.[26]

In Iranian traditional medicine, coriander seed has a long history of use as an anxiolytic and a sedative in insomnia. One study showed that an aqueous extract of coriander seeds (200, 400, and 600 mg/kg per day), alcohol extracts (400 and 600 mg/kg per day), and essential oil (600 mg/kg per day) increased pentobarbital-induced sleeping time.[27] These, of course, are very high doses; and the human equivalent of this would be a 110-lb person taking a dose as high as 30 g per day if attempting to match the dose used in the study animals.

Miscellaneous Actions

In vitro, aqueous, and alcoholic coriander-seed extracts prevented nematode eggs from hatching, but the alcoholic extract had a superior effect on adult parasites. In sheep, fecal egg count and total worm count reduction was seen at a dose 0.45–0.9 g/kg.[3]

It has been reported that coriander seed had been used as a diuretic and for patients with kidney diseases. One group of researchers attempted to confirm that coriander had a diuretic action by infusing an aqueous extract of the seed (40 or 100 mg/kg) or furosemide (10 mg/kg) intravenously.[7] The higher dose increased diuresis by 415%, compared to a 1140% increase with furosemide. The effect of the 100-mg/kg dose was equivalent to furosemide in terms of its effect on sodium excretion, but this dose had caused less potassium to be excreted (65% versus 221%.) The absolute increase in potassium excretion was 18 times less than that caused by furosemide. The researchers acknowledged that traditional use of coriander seed as a diuretic is done orally; here, it was given intravenously to avoid the impact of digestive and liver factors on its diuretic action. The dose used in this study was much higher than that typically dispensed but this dose caused no toxicity.[7]

An alcohol extract of cilantro produced good antioxidant action equivalent to other commercial antioxidants. The leaves appeared to be a better antioxidant than the seeds, probably because of their phenolic content.[3]

In rats with formaldehyde-induced arthritis and complete Freund's adjuvant–induced arthritis, coriander seed extract, at a dose of 32 mg/kg, reduced joint swelling consistently and was superior to 3 mg/kg of indomethacin. Indomethacin and a dose of 16 mg/kg coriander seed only reduced formaldehyde-induced joint swelling significantly on days 9 and 10 of the study. Coriander seed also reduced synovial expression of proinflammatory cytokines without producing any detectable adverse effects, suggesting that coriander might have the potential as a safer alternative to nonsteroidal anti-inflammatory drugs for treating rheumatoid arthritis.[28]

Conclusion

Coriander is an herb that we seldom use in our practices. This review, however, has opened our eyes to the potential that coriander holds both as a food and as a medicine.

Coriander's potential ability to protect the body against absorption of heavy metals and other dietary toxins suggests that coriander use as a food should be emphasized, given the increasing contamination of our food.

This herb's ability to help prevent formation of gastric ulcers and *H. pylori* sequelae also suggests that it would be beneficial to increase coriander use in the Western diet. In addition, studies on the use of coriander-seed oil as a topical treatment for a variety of skin conditions and as a component of herbal sunscreens are very impressive.

Adding a dose of coriander seed to the regimen of patients who have noninsulin-dependent diabetes mellitus also is worth exploring to ascertain if the herb actually works to regulate blood sugar and dyslipidemia at typical traditional doses. The other uses of coriander are intriguing but, unfortunately, knowledge of their possible benefits remains clouded by the fact that most of the studies involve mice and rats given very high doses.

Finally, most of the studies reviewed strongly urge that coriander is an incredibly safe herb. At a dose of 750 mg/kg, coriander seed caused no mortality in rats and its LD_{50} (lethal dose that kills 50% of test subjects) for the oil was 4.13 g/kg.[3] However, high doses of coriander seed (500 mg/kg) inhibited

implantation in female rats significantly and had a small abortifacient (but no teratogenic) effect on the rats. In the Ames test, a dried leaf extract produced a mutagenic effect.[29,30]

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Kathy Abascal, BS, JD, RH (AHG), is executive director of the Botanical Medicine Academy in Vashon, Washington. **Eric Yarnell, ND, RH (AHG),** is chief medical officer of Northwest Naturopathic Urology, in Seattle, Washington, and is a faculty member at Bastyr University in Kenmore, Washington.

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