CUMIN

June 9, 2020

Pharmacognosy

SCIENTIFIC NAME

Cuminum cyminum, synonym Cuminum odorum.

Family: Apiaceae/Umbelliferae.

BACKGROUND

Cumin (*Cuminum cyminum*) is native to the area from the eastern Mediterranean to eastern India. It has been found in excavation sites in Syria from around 2000 BC, and in Egyptian archeological sites from the 16th to the 11th Centuries BC. It continues to be used as a medicinal herb and in cooking throughout the Middle East, North Africa, South Asia, and parts of southern Europe. Cumin is also found in "Tex-Mex," Brazilian, and Cuban cuisine, and may be found in Dutch cheeses, such as Leyden cheese, and in some traditional French breads.

Also known as: Anis Âcre, Comino, Cumin de Malte, Cummin, Jeeraka, Svetajiraka, Zira.

CLASSIFICATIONS

Antiplatelet Agents, Hypoglycemic Agents, Genistein-Containing Natural Ingredients

HISTORY

Cumin (Cuminum cyminum) is native to the area from the eastern Mediterranean all the way to eastern India. It has been found in excavation sites in Syria from around 2000 BC, and in Egyptian sites dating from the 16th to 11th Centuries BC. Traditional cultures have used it both for cooking and healing.

Nutritional value per 100 g	
Energy	1,567 kJ (375 kca
Carbohydrates	44.24 g
Sugars	2.25 g

Egyptians also used it for mummification.

Persians are thought to be the first people to have cultivated cumin, although other early users are mentioned in the Bible, and by Hippocrates, Dioscorides, and Pliny the Younger.

USES:

People Use This For

- Orally, cumin is used as an antiflatulent, stimulant, antispasmodic, diuretic, aphrodisiac, for stimulating menstrual flow, treating diarrhea, colic, and flatulence.
- In spices, foods, and beverages, cumin is used as a flavoring component.
- In other manufacturing processes, cumin oil is used as a fragrance component in cosmetics (maximum use level 0.4% in perfumes).

SAFETY

- LIKELY SAFE ...when used orally in amounts commonly found in foods. Cumin and cumin oil have Generally Recognized as Safe (GRAS) status in the US.
- POSSIBLY SAFE ...when used orally and appropriately in medicinal amounts.
- PREGNANCY AND LACTATION: Insufficient reliable information available; avoid using in excess of food amounts.

EFFECTIVENESS

There is insufficient reliable information available about the effectiveness of cumin.

DOSING & ADMINISTRATION

- Adult: Insufficient evidence available.
- Children: Insufficient evidence available.

STANDARDIZATION & FORMULATION

There is no well-known standardization for cumin.

Dietary fibre	10.5 g
Fat	22.27 g
Saturated	1.535 g
Monounsaturated	14.04 g
Polyunsaturated	3.279 g
Protein	17.81 g
Vitamins	Quantity
Vitamin A equiv.	64 mg
beta-Carotene	762 mg
Vitamin A	1270 IU
Thiamine (B1)	0.628 mg
Riboflavin (B2)	0.327 mg
Niacin (B3)	4.579 mg
Vitamin B6	0.435 mg
Folate (B9)	10 mg
Vitamin B12	0 mg
Choline	24.7 mg
Vitamin C	7.7 mg
Vitamin D	0 mg
Vitamin D	0 IU
Vitamin E	3.33 mg
Vitamin K	5.4 mg
Minerals	Quantity
Calcium	931 mg
Iron	66.36 mg
Magnesium	931 mg

ADVERSE EFFECTS

- General: Cumin has been used as a food spice over thousands of years in many different parts of the world. It is generally safe, although certain groups of people, especially those allergic to cumin or other spices in the same family (Apiaceae) should not use it. People with liver conditions may also experience adverse effects from cumin, as it may contain aflatoxin B1, due to fungal contamination, which has been associated with hepatocellular carcinoma. Side effects of medicinal herbs by diabetic Jordanian patients included headache, nausea, dizziness, itchiness, palpitation, and sweating. It was not indicated how many, if any, of these side effects were associated with cumin.
- Cardiovascular: In vitro study reported that cumin inhibited arachidonic acid-induced platelet aggregation by inhibiting thromboxane B2 production. Side effects of medicinal herbs by diabetic Jordanian patients included palpitation. It was not indicated if this side effect was associated with cumin.
- Dermatologic: There are several reports of contact dermatitis resulting from topical exposure to or ingestion of cumin. Skin prick and patch tests have demonstrated an IgE-mediated contact allergy resulting from exposure to cumin. Side effects of medicinal herbs by diabetic Jordanian patients included itching and sweating. It was not indicated if these side effects were associated with cumin.
- Gastrointestinal: An aqueous extract of cumin infused into the stomach of rats increased acid secretion in injured stomachs. Side effects of medicinal herbs by diabetic Jordanian patients included nausea. It was not indicated if this side effect was associated with cumin.
- Hepatic: Cumin has been shown to contain aflatoxin B1, which has been associated with hepatocellular carcinoma.
- Neurologic / CNS: Side effects of medicinal herbs by diabetic Jordanian patients included headache and dizziness. It was not indicated if these side effects were associated with cumin.
- Pulmonary/Respiratory: There are several reports of respiratory reactions following the ingestion of cumin; however, details are lacking.

Manganese	3.333 mg
Phosphorus	499 mg
Potassium	1788 mg
Sodium	168 mg
Zinc	4.8 mg
Other constituents	Quantity
Water	8.06 gm

TOXICOLOGY:

- Based on animal study, a diet containing 2% Cuminum cyminum fruits was not toxic to rats. Impairment of growth and enterohepatonephropathy were observed in rats fed a diet containing 10% Cuminum cyminum fruits. These changes were accompanied by leukopenia, anemia, increased serum AST activity and urea, and decreased total protein and albumin levels. In animal study, cumin was found to have moderate genotoxic effects (tests included chromosomal aberrations, sperm head abnormalities, and micronuclei production) but not mutagenic effects.
- The lethal dose of cumin fixed or volatile oil was determined in animal study. Further details are lacking.
- An in vitro study reported that cumin had very weak oxidative mutagenicity, but exhibited no base-pair substitution or frame-shifting mutagenic properties.
- Cumin contained arsenic when grown in an environment containing significant levels of arsenic. Adsorption of toxic metals on cumin has been determined using copper and zinc in a nonideal competitive adsorption model.
- Cumin often contained aflatoxin B1, due to fungal contamination, which has been associated with hepatocellular carcinoma. In spices marketed in Brazil, cumin exhibited low microbiological quality compared with other spices; coliforms and Salmonella were found in excess. In Mexico, cumin seed contained high levels of mesophilic aerobic microorganisms, as well as coliform bacteria and fungal contamination. Clostridium perfringens was also detected in cumin in Mexico. In Cuba, cumin was one of the most contaminated spices, with respect to aerobic
- Anticonvulsant effects: Based on in vitro study, extracellular application of the fruit essential oil of cumin decreased the frequency of spontaneous activity induced by pentylenetetrazol (PTZ). The duration of the action potential was increased, the amplitude and peak were decreased, and the firing rate was inhibited.
- Antidiabetic effects: Based on animal study using a diabetic model, a methanolic extract of cumin resulted in a reduction in blood glucose, glycosylated hemoglobin, creatinine, and blood urea nitrogen, and improved serum insulin and glycogen (liver and skeletal muscle) content when compared to diabetic control rats. There was also a significant reduction in renal and pancreas oxidative stress and formation of advanced glycated end products (AGE) as well as an improvement in rat tail tendon collagen, glycated collagen, collagen-linked fluorescence, and pepsin digestion, altered in the diabetic rats. In healthy rabbits, cumin decreased the area under the glucose tolerance curve and the hyperglycemic peak during an oral glucose tolerance test.

  In separate study, using alloxan diabetic rats, the abstract indicated that oral administration of 0.25g/kg of body weight of cumin for six weeks resulted in a significant reduction in blood glucose and an increase in total hemoglobin and glycosylated hemoglobin. However, information within the document (data presented in result section and in table form) indicated that oral cumin reduced blood glucose and glycosylated hemoglobin in the diabetic rats, while preventing increased body weight, fatty changes, and infiltration of inflammatory cells in the pancreas.

  Based on in vitro research, a methanolic extract of cumin seeds reduced free radical levels and formation

mesophilic microorganisms, filamentous fungi, yeasts, coliforms, thermophilic and thermoresistant microorganisms, and Salmonella spp.

INTERACTIONS WITH DRUGS

ANTICOAGULANT / ANTIPLATELET DRUGS

Interaction Rating = Moderate Be cautious with this combination.

Severity = Moderate • Occurrence = Possible • Level of Evidence = D

In vitro evidence suggests that cumin can inhibit platelet aggregation. Theoretically, cumin might increase the risk of bleeding when used with antiplatelet or anticoagulant drugs. Some anticoagulant or antiplatelet drugs include aspirin, clopidogrel (Plavix), dalteparin (Fragmin), enoxaparin (Lovenox), heparin, ticlopidine (Ticlid), warfarin (Coumadin), and others.

ANTIDIABETES DRUGS

Interaction Rating = Moderate Be cautious with this combination.

Severity = Moderate • Occurrence = Probable • Level of Evidence = D

Evidence from animal research suggests that cumin can reduce blood sugar in diabetic animals. Theoretically, taking a combination of cumin and antidiabetes drugs may have an additive effect and may increase the risk of hypoglycemia. Monitor blood glucose levels closely. Some medications used for diabetes include glimepiride (Amaryl), glyburide (DiaBeta, Glynase PresTab, Micronase), insulin, pioglitazone (Actos), rosiglitazone (Avandia), chlorpropamide (Diabinese), glipizide (Glucotrol), tolbutamide (Orinase), and others.

of AGE. Decreased AGE formation has also been shown in other in vitro studies. Based on in vitro study, the aqueous extract of cumin inhibited rat lens and human recombinant aldose reductase, an enzyme implicated in the development of various secondary complications of diabetes. The IC50 was 0.2mg/mL. In animals, dietary cumin extract reduced the accumulation of intracellular sorbitol. Cuminaldehyde may be the active ingredient in cumin with regard to inhibition of aldose reductase, based on in vitro study. Cuminaldehyde also inhibited alpha-glucosidase.

In a review, a limited number of studies reported cumin seeds as having hypoglycemic effects. The researchers attributed the antihyperglycemic and hypoglycemic effects to flavonoids present in cumin, most likely through potentiation of insulin secretion.

- Antifungal effects: In vitro, cumin has antifungal activities against several soilborne phytopathogenic fungi, including Verticillium dahliae, Botrytis cinerea, Fusarium oxysporum, and Alternaria mali. The exact mechanism of action is not well understood. Antifungal effects of essential oil of cumin has also been shown against Aspergillus niger, Candida albicans, Candida blanki, Candida cylindracea, Candida glabrata, Candida krusei, Candida tropicalis, and Saccharomyces cerevisiaein vitro. The minimum inhibitory concentration range for essential oil of cumin was 0.15-1.25mcL/mL. Cumin hydrosols inhibited mycelial growth of Aspergillus parasiticus NRRL 2999 strain. In vitro, cumin oil inhibited formation of sterigmatocystin and aflatoxin and reduced mycelial growth of Aspergillus parasiticus var. globosus IMI 120920 and Aspergillus fumigatus. Inhibition of aflatoxin formation and mycelial growth by cumin has been shown in other

RIFAMPIN

Interaction Rating = Moderate Be cautious with this combination.

Severity = High • Occurrence = Possible • Level of Evidence = D

Evidence from animal research suggests that an aqueous extract of cumin containing a specific flavonoid glycoside can increase the bioavailability and plasma levels of rifampin. Theoretically, concomitant use of cumin and rifampin may increase the effects and adverse effects of rifampin.

INTERACTIONS WITH HERBS & SUPPLEMENTS

ANTICOAGULANT / ANTIPLATELET HERBS AND SUPPLEMENTS:

In vitro evidence suggests that cumin can inhibit platelet aggregation. Theoretically, concomitant use with other herbs that affect platelet aggregation could increase the risk of bleeding in some people. These herbs include angelica, danshen, garlic, ginger, ginkgo, red clover, turmeric, willow, Panax ginseng, and others.

HERBS AND SUPPLEMENTS WITH HYPOGLYCEMIC POTENTIAL:

Evidence from animal research suggests that cumin can reduce blood sugar in diabetic animals. Theoretically, cumin may have additive effects when used with other herbs and supplements with hypoglycemic potential and may increase the risk of hypoglycemia. Monitor blood glucose levels closely. Some herbs and supplements with hypoglycemic potential include devil's claw, fenugreek, guar gum, Panax ginseng, Siberian ginseng, and others.

studies.

Also, cumin had antifungal effects in apple-carrot juice. Antifungal effects of cumin essential oils have been examined in other studies . Further details are lacking.

- Antigenotoxic effects: Based on animal study, cumin had antigenotoxic effects following oral treatment with urethane; cumin may have attenuated the inhibitory effect of urethane on glutathione S-transferase activity.
- Anti-inflammatory effects: Based on in vitro study, the crude extract of cumin had anti-inflammatory activity determined by inhibition of trypsin, [beta]-glucuronidase, and conjugated diene formation.
- Antilipemic effects: Animal data have suggested that cumin may decrease lipid levels in alcohol- and thermally oxidized oil-induced hepatotoxicity and in animals with induced colon cancer. The exact mechanism of action is not well understood. Decreased serum cholesterol has been observed in ovariectomized rats given a methanolic extract of cumin, and in diabetic rats given cumin. In diabetic rats, cumin was also found to decrease free fatty acids, phospholipids, and triglycerides. However, cumin had a lack of an effect on lowering cholesterol in all animal studies.
- Antioxidant effects: In vitro, cumin had antioxidant activities like chelating (sequestering metals), scavenging free radicals, and inhibiting hydroxyl radicals and lipid peroxide. In animal study, cumin reversed metabolic trends associated with alcohol; these trends included lipid peroxidation, increased levels of thiobarbituric acid reactive substances (TBARS), hydroperoxides, and free fatty acids (FFA) in the liver, decreased levels of glutathione, vitamin C, and vitamin E in the liver and kidney, and decreased activities of superoxide dismutase (SOD), catalase, and

INTERACTIONS WITH FOODS

None known.

INTERACTIONS WITH LAB TESTS

BLOOD GLUCOSE:

Theoretically, cumin might decrease blood sugar and test results.

PLATELET FUNCTIONS:

Theoretically, cumin might inhibit platelet function and test results.

INTERACTIONS WITH DISEASES

BLEEDING CONDITIONS:

Cumin appears to have antiplatelet effects. Theoretically, taking cumin might increase the risk of bleeding in individuals with bleeding disorders.

DIABETES:

Theoretically, cumin might reduce blood sugar in patients with diabetes. Monitor blood glucose levels closely.

SURGERY:

Cumin might affect blood glucose levels and platelet aggregation. Theoretically, cumin might interfere with blood glucose control and cause excessive bleeding during and after surgical procedures. Tell patients to discontinue cumin at least 2 weeks before elective surgical procedures.

MECHANISM OF ACTION

- Constituents: Cumin contains 2-ethoxy-3-isopropylpyrazine, 2-methoxy-3-methylpyrazine, 2-methoxy-3-sec-butylpyrazine, 2-methyl-3-phenyl-glutathione peroxidase (GPx) in the liver. Gamma-irradiation and microwave treatment of cumin essential oil had a lack of an effect on antioxidant effects in sunflower oil. Cuminaldehyde may be one constituent of cumin that has antioxidant effects, with a K(i) value for nitrobluetetrazolium (NBT) inhibition of 120mcM. Based on animal study in a cancer model, cumin reduced the number of stomach tumors and the incidence of cervical carcinoma; the levels of cytochrome P450 (cyt P450) and cytochrome b5 (cyt b(5)) were augmented by cumin seed, as were the phase II enzymes glutathione S-transferase and DT-diaphorase and the antioxidant enzymes superoxide dismutase and catalase.
- Bone effects: Based on animal study, the methanolic extract of cumin inhibited ovariectomy-induced bone loss. Urinary calcium excretion was reduced, and bone calcium and mechanical strength was increased. Scanning electron microscope results showed greater bone and ash densities and improved microarchitecture of bones vs. rats not given cumin. Body weight gain and weight of the atrophic uterus were not affected.
- Central nervous system effects: In animals, cumin has been shown to weaken morphine tolerance and dependence. Cumin has been used as an olfactory stimulus in study of human EEG response to food aromas.
- Coagulation effects: In vitro study reported that cumin inhibited arachidonate-induced platelet aggregation by inhibiting thromboxane B2 production.
- Enzymatic effects: Based on in vitro study in the rat jejunum, cumin extract inhibited the Na(+)-K(+)-ATPase.

propanal, 3',5-dihydroxyflavone 7-O-beta-D-galacturonide 4'-O-beta-D-glucopyranoside (a flavonoid glycoside), aflatoxin B1, alpha-pinene, beta-pinene, caffeic, chlorogenic and ferulic acids, cineol, cuminaldehyde (4-isopropylbenzaldehyde), elements (Mg, Al, Si, P, S, Cl, K, Ca, Ti, Mn, Fe, Cu, Na, and Zn), essential amino acids (including threonine and lysine), flavonoids, gamma-terpinene, genistein, limonene, myrcene, myrtenal, p-cymene, p-mentha-1,4-dien-7-al, pyrazines, selenium, and tannins. Other constituents include cuminosides A and B (sesquiterpenoid glucosides), alkyl glucosides, (1S,5S,6S,10S)-10-hydroxyguaia-3,7(11)-dien-12,6-olide beta-D-glucopyranoside, (1R,5R,6S,7S,9S,10R,11R)-1,9-dihydroxyeudesm-3-en-12,6-olide 9-O-beta-D-glucopyranoside, methyl beta-D-apiofuranosyl-(1-->6)-beta-D-glucopyranoside, and ethane-1,2-diol 1-O-beta-D-apiofuranosyl-(1-->6)-beta-D-glucopyranoside.

Glycosides of 2-C-methyl-D-erythritol from the fruit of cumin included 1-O-beta-D-glucopyranoside, 3-O-beta-D-glucopyranoside, and 4-O-beta-D-glucopyranoside. Safrole (3,432mg/kg) was also determined in the spice.

- Constituents of the volatile oil include cuminal (32.26%) and safranal (24.46%), as well as monoterpenes, sesquiterpenes, aromatic aldehydes, and aromatic oxides (all over 1%), and terpenes, terpenols, terpenals, terpenones, terpene esters, and aromatic compounds (less than 1%). Monoterpenoid glucosides were isolated from the water-soluble portion of the methanolic extract of cumin.
- Cumin is thought to contain 18.25% crude protein, with 18 amino acids. Free amino acids, protein, and amino acid compositions of cumin have been investigated by

This enzyme provides the driving force for many transport processes.

- Estrogenic effects: Based on in vitro study, cumin had estrogenic effects, based on MCF-7 cells transfected with estrogen receptor and lucerifase reporter constructs. The estrogenic activity of cumin has also been investigated in rats. Further details are lacking. Cumin frequently contains genistein, which is a phytoestrogen.
- Food preservative effects: Cumin had antifungal effects in apple-carrot juice. In sunflower oil, cumin delayed rancidity and preserved alpha-tocopherol.
- Gastrointestinal effects: In animal study, a spice mix containing cumin, as well as coriander, turmeric, red chili, and black pepper, enhanced the activities of pancreatic lipase, chymotrypsin, and amylase when consumed during the diet. There was also a stimulation of bile flow and bile acid secretion. An aqueous extract of cumin infused into the stomach of rats increased acid secretion in injured stomachs.
- Irritable bowel syndrome: Cumin extract can be effective in improving all IBS symptoms. Considering its low cost and easy availability Cumin administration in patients with IBS may have economic benefits.[efn_note] Cumin Extract for Symptom Control in Patients with Irritable Bowel Syndrome: A Case Series [/efn_note]
- Hepatic effects: Based on animal study in a cancer model, cumin reduced the number of stomach tumors and the incidence of cervical carcinoma. The levels of cytochrome P450 (cyt P450) and cytochrome b5 (cyt b(5)) were significantly augmented by cumin seed, as were the phase II enzymes glutathione S-transferase and DT-diaphorase and the antioxidant enzymes superoxide dismutase and catalase; however, in

other authors, but further details are lacking.

Methods have been developed to quantify volatile oils in ground cumin and to extract constituents from essential oil of cumin.

- Antibacterial effects: In vitro, cumin possessed significant antibacterial properties, including killing Heliobacter pylori, elongating cells, repressing capsule expression, and decreasing urease activity of Klebsiella pneumoniae ATCC. Antibacterial effects against both Gram-positive and Gram-negative bacteria have been shown. Cumin essential oil was not effective against Bacillus in vitro. Growth and acid production of Lactobacillus plantarum were stimulated by cumin, but inhibited by cumin essential oil.
- In humans, brushing teeth with cumin essential oils provided protection from caries.
- Anticancer effects: Based on animal study, cumin decreased levels of beta-glucuronidase in animals with elevated levels due to treatment with the carcinogen 1,2-dimethyl hydrazine (DMH). Histopathological studies also showed lesser infiltration into the submucosa, fewer papillae, and lesser changes in the cytoplasm of the cells in the colon. In mice, cumin seeds decreased neoplasia and hepatomas induced by carcinogenic agents. Based on animal study in a cancer model, cumin reduced the number of stomach tumors and the incidence of cervical carcinoma. It was determined that levels of cytochrome P450 (cyt P450) and cytochrome b5 (cyt b(5)) were augmented by cumin seed, as were the phase II enzymes glutathione S-transferase and DT-diaphorase, and the antioxidant enzymes superoxide dismutase and catalase. The activities of glutathione peroxidase and glutathione reductase were not affected. Other potential mechanisms of action include separate animal study cumin essential oil had a lack of an effect on cytochrome P450 activity.
- Immune effects: Based on animal study cumin stimulated cyclosporine A and restraint stress-induced immune suppression. In normal and cyclosporine-induced animals, cumin stimulated the T cell count (CD4 and CD8) and expression of Th1 cytokines.
- Insecticidal effects: Cumin essential oil was effective against larvae of Lycoriella ingenua. Various constituents of cumin, including cuminaldehyde, were potentially effective. Essential of oil cumin also had insecticidal effects against the pulse beetle, Callosobruchus chinensis. Effects included reduced oviposition potential, egg hatching rate, pupal formation, and emergence of adults of F(1) progeny.
- Nutritional effects: Based on animal study, addition of spices, including cumin, had a lack of an effect on protein digestibility of sorghum or chickpea.
- Ocular effects: The aqueous extract of cumin prevented glycation of total soluble protein (TSP), alpha-crystallin, and bovine serum albumin in vitro, and delayed progression and maturation of streptozotocin-induced cataract in rats. Cumin was also effective in preventing glycation of TSP and alpha-crystallin in the diabetic lens.
- Olfactory effects: Based on animal study, cumin exposure as a fetus resulted in increased attraction of the odor as neonates. In young spiny mice, cumin was used to study stability and development of olfactory preferences.

Trichloroethylene degradation effects: Based on in vitro study, cumin oil, cuminaldehyde, and cumene induced trichloroethylene cometabolic degradation by Rhodococcus sp. L4, a toluene-degrading bacteria.

increased glutathione-S-transferase activity in tissues and decreased chromosome aberrations, as well as prevention of DNA adduct formation by aflatoxin B1 in vitro.

PHARMACOKINETICS

Distribution: Based on animal study, cumin seed consumption increased p-cymene in venous plasma, and four constituents were found in milk.