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Phytochemistry, Pharmacological studies and Traditional benefits of *Trachyspermum ammi* (Linn.) Sprague

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Abstract

Trachyspermum ammi, commonly known as Bishop's weed, Carom seed (English names) and ajowan or ajwain or omum in Indian languages, is an erect annual herb with striate stem. According to Ayurveda, the seeds are hot, pungent, stomachic, appetizer, aphrodisiac, carminative, laxative and diuretic. The present paper highlights the phytochemistry, pharmacological activities and traditional benefits of the plant.

Key-Words: *Trachyspermum ammi,* Phytochemistry, Pharmacological activities, Traditional uses

Introduction

Trachyspermum ammi (L.) Sprague is a Greek work Trachy= rough & spermum= seeded, whereas ammi is name of plant in Latin. Syn. *Carum copticum*, commonly known as Ajwain belonging to family Apiaceae or Umbelliferae. The plant has a similarity to parsley. Because of their seed-like appearance, the fruit pods are sometimes called seeds; they are egg-shaped and grayish in colour.[1]

Morphological description

Type: glabrous annual. Aroma: fruit aromatic. Stems: hollow, striate, much branched. Umbels: compound. 5-10 (20) smooth or sparsely puberulent rays .lcm.peduncle > than rays. hermaphrodite. Leaves: lower 2-3 pinnatisect, withered by flrng time, long petiolate. lobes 1-2 cm, linear or filiform. upper leaves smaller, similar, or simply pinnatisect. shortly petiolate, short sheathing base. Bracts: 4-5, linear, sometimes lobed. bracteoles 3-6, linear-lanceolate. sparseley puberulent. Flowers: white, sepals small, acute. petals hairy beneath. styles form a stylopodium. fl 9.Fruit: 15-20mm, ovoid, laterally compressed. Covered in grey papillae. Commisure narrow. Mericarps with prominent ridges. Carpophore present. Vittae solitary. Pedicels 1-4mm, hairy. Styles x2 > as stylopodium, recurved. Stigma capitate. 2n=18. [2-3]

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Phytochemistry

The alcoholic extract was found to contain a highly hygroscopic saponin, with a hemolytic index of 500. A yellow, crystalline flavone (m.p. 291-94°) and a steroidal substance (m.p.140-50°) have also been isolated from the fruits[1]. The principal constituents of the essential oil from the fruits are the phenols, mainly thymol and some carvacrol. The Indian Pharmacopoeia requires ajowan oil to contain not less than 40 per cent thymol. The remainder of the oil is called 'thymene'. Thymene, which constitutes c.45 per cent of the oil, has the following composition: p-cymene, 50-55; g-terpinene, 30-35; a- and ß-pinenes, 4-5; and dipentene, 4-6%. Presence of minute 'amounts of camphene, myrcene and D3-carene is also reported[2]. Fixed oil extracted from the seeds contains resin acids, palmitic acid, petroselenic acid, oleic acid and linoleic acid. Vitamins and trace elements include riboflavin, thiamin, nicotinic acid, carotene, calcium, chromium, cobalt, copper, iodine, iron, manganese, phosphorus and zinc, and also consist of moisture 7.4%, protein 17.1%, percent, fat 21.8%, minerals 7.9%, fiber 21.2% and carbohydrates 24.6% per 100 grams.

Ajwain seed analysis has revealed it to contain fibre (11.9%), carbohydrates (38.6%), tannins, glycosides, moisture (8.9%), protein (15.4%), fat (18.1%), saponins, flavone and mineral matter (7.1%) containing calcium, phosphorous, iron and nicotinic acid.]The Ajwain fruits yields 2% to 4% brownish essential oil, with thymol as the major constituent (35% to 60%). The nonthymol fraction (thymene) contains para-

cymene, γ-terpenine, α- and β-pinenes, dipentene, α-terpinene, and carvacrol. Minute amounts of caphene, myrcene, and α-3-carene also have been found in the plant. Alcoholic extracts contain a highly hygroscopic saponin. From the fruits, a yellow, crystalline flavone and a steroid-like substance have been isolated and also contain 6-O-β-glucopyranosyloxythymol, a glucoside and a yield of 25% oleoresin containing 12% volatile oil (thymol, γ-terpinene, para-cymene, and α- and β-pinene). The principal oil constituents of *T. ammi* are carvone (46%), limonene (38%), and dillapiole (9%).

GC and GC-MS analysis of ajwain essential oil showed the presence of 26 identified components which account for 96.3% of the total amount. Thymol (39.1%) was found as a major component along with *p*-cymene (30.8%), γ-terpinene (23.2%), β-pinene (1.7%), terpinene-4-ol (0.8%) whereas acetone extract of ajwain showed the presence of 18 identified components which account for 68.8% of the total amount. The major component was thymol (39.1%) followed by oleic acid (10.4%), linoleic acid (9.6%), γ-terpinene (2.6%), *p*-cymene (1.6%), palmitic acid (1.6%), and xylene (0.1%).

Pharmacological studies

Preliminary pharmacological studies of the oil indicated that it had a parasympathomimetic effect and produced contraction of the isolated ileum, tracheal chain and bronchial musculature in guinea pigs. It depressed the cardiac musculature in frogs and caused a marked fall in blood pressure in cats. On account of its low toxicity, further trials of the oil as an hypotensive agent are recommended. The drug also seems to possess some anti-diuretic effect[3]. Ajwain with its characteristic aromatic smell and pungent taste is widely used as a spice in curries. Its seeds are used in small quantities for flavouring numerous foods, as preservatives, in medicine and for the manufacture of essential oil in perfumery. In Indian system of medicine, *ajwain* is administered as a stomach disorders, a paste of crushed fruits is applied externally for relieving colic pains; and a hot and dry fomentation of the fruits applied on chest for asthma. *T. ammi* has been shown to possess Antimicrobial, Hypolipidaemic, Digestive stimulant, Antihypertensive, Hepatoprotective, Antispasmodic, Broncho-dilating, Antilithiasis, diuretic, Abortifacient, galactogogic, Antiplatelet-Aggregatory, Antiinflammatory, Antitussive Effects, Antifilarial, Gastroprotective, Nematicidal, Anthelmintic, Detoxification of aflatoxins, Ameliorative effect.[4] Ajowan is much valued for its antispasmodic, stimulant, tonic and carminative properties. It is administered in flatulence, atonic dyspepsia and diarrhea, and often recommended for cholera. In the Unani system, ajowan is used as a crude drug to enhance the body's resistance, and is prescribed in amebiasis. It is a potent antimicrobial agent.

Medicinal uses[5-6]

Effect: tonic, diuretic, expectorant, relaxes spasms, improves digestion, increases persipiration, antiseptic.

Application: internally for colds, coughs, influenza, asthma, diarrhoea, cholera, colic, indegestion,wind,oedema, arthritis, rheumatism. Externally for vaginal discharge, rheumatism.

Traditional uses & benefits

- Ajwain is very similar to its western relatives in the plant family *Apiaceae* Cumin, Dill and Parsley, both in the way it is used in food and medicine. The high concentration of essential oils in ajwain seeds, primarily thymol, give them an aroma and flavor resembling thyme, with a stronger bite. Ajwain seeds are used to flavor vegetables and fish in Indian cuisine and are fried in oil or ghee(clarified butter) to mellow the acrid taste.
- Digestion: Ajwain seeds are also known as a digestive aid, and combines well with fennel to relieve gas and bloating. A side dish of ajwain seeds often accompanies food in the Middle East.
- Colds and Flu: Ajwain seeds contain about 50% thymol, a well known and antibacterial essential oil, and along with thyme can be used to enhance the immune system to ward off colds and flu and other viral infections.
- It is also traditionally known as a digestive aid, a relief for abdominal discomfort due to indigestion and an antiseptic. In southern parts of India, dry ajwain seeds are powdered and soaked in milk, which is then filtered and fed to babies. Many assume it relieves colic in babies, and for children it also improves digestion and appetite. Ajwain can be used as digestive mixture in large animals. In India, it is often added to heavy fried dishes to aid digestion.
- A study conducted using the essential oil suggests that it has some use in the treatment of intestinal dysbiosis. Its benefit comes from being able to inhibit the growth of undesired pathogens while not adversely affecting the beneficial flora.
- Seeds possesses aromatic, bitter, digestive, diuretic, diaphoretic, expectorant, tonic, antiseptic, antispasmodic properties
- They are used in treatment of influenza, asthma, coughs, colds, colic, diarrhea, cholera, indigestion, edema, rheumatism. They are also

soaked in the lemon juice during night and eaten in the morning to remove eosinophilia from the blood, and extracted essential oils are used as diuretic, carminative and anti-septic.

- For relieving flatulence, dyspepsia and spasmodic disorders; a teaspoonful of Ajwain seeds with a little amount of rock-salt, mixed with water taken internally.
- For colic; Ajwain seeds, dry ginger and black salt ground together, the three grams of this powder is taken along with warm water.
- For flatulence, Ajwain seeds and dried ginger in an equal quantity are soaked into two-and-half times the quantity of lime juice. After draining the water, they are dried and powdered with a little amount of black salt and about 2 grams such powder mixed with warm water and taken internally, 2-3 times a day.
- For Cholera, flatulent colic, diarrhea, atomic dyspepsia and indigestion; the volatile oil of Ajwain seeds is given internally in a dose of 1- 3 drops.
- For removing phlegm; Ajwain seed poowder and buttermilk given internally.
- For pharyngitis in influenza; Ajwain seeds, clove and a pinch of common salt are chewed for such complaint.
- For common cold; a tablespoonful of Ajwain seeds crushed and tied in a cloth as a bundle whioch is then inhaled by the patient. And such bundle can be used in nasal congestion; it is covered in the same blanket with the patient during sleeping hours.
- For the acute pharyngitis, sore and congested throat and hoarseness of the voice due to colds or making noise; Infusions of the seeds with common salt are beneficial.
- Ajwain seeds with the kernel of tamarind seeds act as an effective aphrodisiac; they are prepared by frying an equal quantity of both in pure ghee, dried and then powdered and preserved in airtight container. This is taken at bedtime as a promoter for virility.
- For an earache; a half a teaspoon of the Ajwain seeds heated in 30ml of milk till the aroma of the seeds permeate the milk, which is then filtered and used as an ear drop.
- For boils in the ear; 3 grams each of ajwain seeds, with garlic are boiled together in 40 grams of sesame oil until it turns red. The oil is then strained while cooling to body temperature, and used as ear drops.
- A habit of chewing Ajwain seeds prevents bad breath.
- For bronchial asthma; Ajwain seeds are tied in the cotton cloth, heated in a frying pan and applied on the chest and neck when still warm.

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Table 1: Database of *Trachyspermum ammi*[7-8]

Common Name:	Ajowan
Other Names:	Ajava, Ajowan caraway, Ajowan Seeds, Bishop's Weed, Bishop's Flower, Bullwort, Flowering Ammi, Yavani, *Ajwain*
Botanical Name:	*Trachyspermum ammi* syn. *T copticum, Ammi copticum, Carum copticum*, *Ammi majus*
Genus:	*Trachyspermum*
Family:	Apiaceae
Location:	Asia
Cultivation:	Moist soil in sun.
Propagation:	By seed sown in autumn or spring.
Harvest:	Whole plants are cut when flowering for extraction of oil. Seeds are collected when ripe and distilled for oil, or dried for use in infusions and powders.
Height:	30-90cm (1-3ft)
Width:	30-45cm (12-18in)
Hardiness:	Min. 10-15°C (50-59°F) depending on cultivar.
Parts Used:	Whole plant, fruits (seeds), oil.
Properties:	A bitter, aromatic, warming herb with a thyme-like aroma, and tonic, diuretic, and expectorant effects. It relaxes spasms, improves digestion, increases perspiration, and is strongly antiseptic.
Medicinal Uses:	Internally for colds, coughs, influenza, asthma, diarrhea, cholera, colic, indigestion, wind, edema, arthritis, and rheumatism (fruits). Externally for vaginal discharge and rheumatism (fruits). Used mainly in Ayurvedic medicine as a stimulating decongestant for the respiratory and digestive systems. Oil is given to expel hookworms. To treat kidney stones, and psoriasis.
Culinary Uses:	Seeds are used to flavor savory dishes, including curries, legumes, breads (*naan, pakora, paratha*), and pastry snacks, especially in India, Iran, Ethiopia, and Afghanistan. An ingredient of a spice mix known as *chat masala*. Not suitable as a substitute for thyme in Western cooking.
Economic Uses:	Seed extracts are added to cough medicines, soaps, and epoxy derivatives.
Warning:	Contraindicated in hyperacidity.
Possible Side Effect:	Ajava seeds side effects include nausea and headache
Drug Interactions:	**Taking Ajava seeds with these drugs may increase the risk of bleeding or bruising:**

Abciximab, (ReoPro)	Antithrombin III, (Thrombate III)	Argatroban, (Argatroban)	Aspirin, (Bufferin, Ecotrin)	Aspirin and Dipyridamole, (Aggrenox)
Bivalirudin, (Angiomax)	Clopidogrel, (Plavix)	Dalteparin, (Fragmin)	Danaparoid, (Orgaran)	Dipyridamole, (Novo-Dipiradol, Persantine)
Enoxaparin,	Eptifibatide,	Fondaparinux,	Heparin,	Indobufen,

	(Lovenox)	(Integrillin)	(Arixtra)	(Hepalean, Hep-Lock)	(Ibustrin)
	Lepirudin, (Refludan)	Ticlopidine, (Alti-Ticlopidine, Ticlid)	Tinzaparin, (Innohep)	Tirofiban, (Aggrastat)	Warfarin, (Coumadin, Jantoven)
Lab Test Alteration:	May increase HDL levels, May increase liver function tests				
Disease Triggering Effects:	May worsen liver function in people with liver disease.				
Supplement Interactions:	May increase the risk of liver damage when combined with herbs and supplements that can cause hepatotoxicity (destructive effects on the liver), such as Bishop's Weed, Borage, Chaparral, Uva-Ursi, and others.Increased risk of bleeding when used with herbs ans supplements that might effect platelet aggregation, such as Angelica, Danshen, Garlic, Ginger, Ginkgo Biloba, Red Clover, Turmeric, White Willow, and others.May have additive effects when used with herbs and substances that increase photosensitivity, such as St. John's Wort.				

(a)

(b)

(c)

Fig. 1 (a) Whole plant of *Trachyspermum ammi*, (b) Seed of *Trachyspermum ammi*, (c) Flowering tops of *Trachyspermum ammi*