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TRACHYSPERMUM AMMI(AJWAIN): A COMPREHENSIVE REVIEW

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ABSTRACT

Ajwain is the dripe ripe seeds of *Trachyspermum ammi* (L.) sprague, belonging to family Apiaceae is the distributed throughout of India and it is mostly cultivated in Gujarat and Rajasthan. The plant is used traditionally as a stimulant, carminative, flatulence, atonic dyspepsia, diarrhoea, abdominal tumors, abdominal pain, piles and bronchial problems, lack of appetite, galactogogue, asthma and ammenorrhoea. Medicinally, it has been proven to possess various pharmacological activities like antifungal, antioxidant, antimicrobial, antinociceptive, cytotoxic activity, Hypolipidaemic, Antihypertensive, antispasmodic, Broncho-dilating actions, antilithiasis, diuretic, Abortifacients, Antitussive, nematicidal, anthelmintic and antifilarial activity. over the past decades many reports have appeared in mainstream scientific journal describing its nutritional and medicinal properties.the available literature on this plant divulges that it contains many phytoconstituents including carbohydrates, glycosides, saponins, phenolic compound, volatile oil (thymol, Y-terpinene, paracymene, and alpha and Bita pinene), protein, fat, fibre, and mineral matter containing calcium, phosphorus, iron and nicotinic acid. the present review summarize the information concerning, the pharmacognostic, phytochemistry and pharmacological studies of *Trachyspermum ammi.*

KEYWORD: *Trachyspermum ammi*, Apiaceae, fruit, Antimicrobial, Ajowan, Ajwain.

INTRODUCTION

It is native of Egypt and is cultivated in Iraq, Iran, Afghanistan, Pakistan, and india. in India, it is cultivated in madhya Pradesh, uttar Pradesh, Gujarat, Rajasthan, Maharashtra, Bihar and west Bengal. *Trachyspermum ammi* L. belonging to family Apiaceae a highly valued medicinally important seed spice. the root are diuretic in nature and the seed possess

excellent aphrodisiac properties. the seed contains 2-4. 4% brown coloured oil known as ajwain oil. The main component of this oil is thymol, which is used as gastrointestinal ailments, lack of appetite, and bronchial problems. the oils exhibit fungicidal Antimicrobial and anti-aggregatory effects in human. Ajwain is traditional potential herbs, is widely used for curing various Diseases in humans and animals. it is important remedial agent for flatulence, atonic dyspepsia and diarrhoea. the seed of ajwain is bitter, pungent and it acts as anthelmintic, carminative, laxative and stomachic. it also cures abdominal tumors, abdominal pain and piles and bears anti-inflammatory and anti-oxidant activitiy seed contain an essential oil containing about 50% thymol which is strong germicide, anti-spasmodic and fungicide. thymol is also used in tooth paste and perfumery.

- **Synonyms**
- Sanskrit -yamini, yaminiki, yavaniki.
- Assamese-jain.
- Bengali -Yamani, yauvan, yavan, yavani, javan, yavani, yoyana.
- English-Bishop's weed, carom seed.
- Gujarati-Ajma, Ajmo, yavan, javain.
- Hindi- Ajwain, jevain.
- Kannada-oma, yom, omu.
- Malayalam-oman, Ayanodakan.
- Marathi- onva.
- Oriya-Juani.
- Tamil -omam.
- Telgu-Vamu.

- **Taxonomical Classification**

Kingdom-*Plantae*

Division- *magnoliophyta*

Class- *magnoliopsida*

Order-*Apiales*

Family-*Apiaceae*

Genus -*Trachyspermum*

Species-*ammi*

- **Macroscopic characters**

It is widely grown in arid and semi-arid regions, where soils contain the high levesl of salts. Ajwain is a profusely branched annual herb, 60-90 cm tall, stem is striated; inflorescence compound umbel with 16 umbellets, each containing up to 16 flowers; flowers actinomorphic, white male and bisexual; Corolla 5, petals bilobed; stamens 5, alternating with petals; ovary inferior; stigma knob-like; fruit aromatic, ovoid, cordate, cremocarp with a persistent stylopodium; leaves pinnate, with a terminal and 7 pairs of lateral leaflets, fruit consists of two mericarp, grayish brown, ovoid, compressed, about 2 mm long and 1. 7 mm wide, 5 ridges and 6 vittae in each mericarp usually separate 5 primary ridges.

- **Microscopic description**

Transverse secotion of fruit shown two hexagonal structures attached with each other by carpophores, epicarps consists of a single layer of tangetially elongated tabular cell, mesocarp consist of moderately thick-walled, rectangular to polygonal tangetially elongated cells having some vittae, carpophores and vascular bundles present as groups of thick walled radically elongated cells, integument, barrel shaped of tangetially elongated cells, endosperm consists of thin walled cells filled with embryo, oil globules, small and circular, composed of polygonal thin walled cells. the powder microscopy shows the presence of oil globules and groups of endosperm cells.

- **Phytochemical studies**

Ajwain seed analysis revealed it to contain fiber (11. 9%), carb(38. 6%), tannins, glycosides, moisture(8. 9%), protein (15. 4%), fat (18. 1%) saponins, flavone and mineral matter (7. 1%) containing calcium, phosphorus, iron and nicotinic acid, Ajwain fruits yield 2%to 4% brownish essential oil, with thymolas as the major constitute (35%to 60%) the non-thymol fraction (thymene) contains para-cymene, Y-terpinene, alpha and beta pinenes, dipentene, alpha terpinene and carvacrol. minute amounts of camphene, myrcene and alpha-3- carene also have been found in the plant. Alcoholic extracts contain a highly hygroscopic saponin from this fruits, an Yellow crystalline flavone and steroid like substance has been isolated and it also contains 6-O-Beta-glucopyranosyloxythymol, glucoside and yields 25% oleoresin containing 12% volatile oil and alpha and Beta pinene the principal oil constituents of *Trachyspermum ammi* are carvone (46%), limonene (38%) and dillapiole (9%).

- **Ethonopharmacological relevance**

In the Indian Vedic literature, charaka samhita and sushruta samhita, the Ajwain is konown as bhootika and in the charaka samhita commentaries, it is termed yavanika the medicinal role of Ajwain fruit claimed to be very important in the treatment of many ailments in humans. the plant *Trachyspermum ammi* Linn is a grassy, aromatic annual plant, which falls in the family umbelliferae. the plant is grown in India, Iran, Pakistan, Egypt etc. for it's medicinal benefits tribal of India use it for the teatment of diarrhoea, arthritis, colic and gastrointestinal problem. in the traditional preparation indan vaidya guru (Ayurveda guru 's) the Ajwain extract used as admoka arka. the Ayurveda doctors, hakim and vaidya guru recommended ajwain for treating headaches, cold flu, and even during painful menstrual periods.

- **Pharmacological activities**

Ajwain with its characteristics aromatic smell and pungent taste is widely used as spice in curries. its seeds are used in small quantities for flavoring numerous foods as preservatives, in medicine and for the manufacturer of essential oil in perfumery. in Indian system of medicine, Ajwain is administrated for curing stomach disorder, a paste of crushed fruits is applied externally for relieving colic pains and a hot dry foementation of the fruits is applied on chest for asthma.

T. ammi has been shown to possess Antimicrobial, Hypolipidemic, digestive stimulant, Antihypertensive, hepatoprotective, antispasmodic, broncho-dilating, antilithiasis, diuretic, abortifacients, galactogogic, antiplatelet-, aggregatory, antiinflammation, gastroprotective nematicidal, anthelmintic, detoxification of aflatoxins and ameliorative effects.

Therapeutics uses of *T. ammi* fruits include stomachic, carminative and expectorant, antiseptic and amoebiasis antimicrobial seeds soaked in lemon juice with *prunus amygdalus* are given curing amenhorroea and it is also used as antipyretic, febrifugal and in the treatment of typhoid fever.

- **Antihypertensive, antispasmodic and broncho-dilating activity**

The antihypertensive effect of *T. ammi* administered intravenously in vivo, and the antispasmodic and broncho-dilating action in vitro showed that calcium channel blockade that has been found to mediate spasmolytic effect of plant materials and it is being considered that this mechanism contributed to their observed result supported the traditional use of *T.*

ammi in hyperactive disease states of the gut such as colic and diarrhoea as well as in hypertension.

- **Hepatoprotective activity**

The Hepatoprotective actions in vivo showed that *Trachyspermum ammi* was 80% protective in mice against a normally -lethal dose of paracetamol (1g/kg), it prevented the CCL4-induced prolongation of pentobarbital sleeping time in mice, and it tended to normalize the high serum levels of liver enzymes caused by CCL4 -induced liver damage in rats.

- **Antilithiasis and diuretic activity**

Antilithiasis and diuretic actions in vivo of *Trachyspermum ammi* on inhibiting oxalate urolithiasis induced in rats. in a further study of a possible diuretic effect the result found that *Trachyspermum ammi* was not effective in increasing the 24-h urine production. the results concluded that the traditional use of *Trachyspermum ammi* in the treatment of kidney stones was not supported by their experimental evidence.

- **Abortifacients and galactogogic actions**

Trachyspermum ammi is listed in 14 indigenous medicinal plants that were reported to have been used for abortion in some districts of uttar Pradesh (India) in their survey conducted in 1987. Specifically, in the village of kallipuschium, Lucknow district, 50 of the 75 pregnant women who were surveyed (of a total of 155 women in the fertile period) claimed to have used *T. ammi seed for abortion. The herb was not 100% effective* and so the possibility of causing congenital defects was of concern. There was a high risk of potential human fetotoxicity of ten plants including *T. ammi*, based on teratogenicity observed in rat foetuses.
The National Diary Research Institute in India investigated the estrogenic content of some herbs (including *T. ammi*) that are traditionally busrd to increase milk yield in diary cattle *T. ammi* has also been traditionally used as galactogouguein humans. The total phytoestrogen content of dry *T. ammi* seed was 473 ppm, which was the second highest in the list of eight herbs tested (total phytoestrogen contents 131-593 ppm.)

- **Antiplatelet-aggregatory**

Antiplatelet-aggregatory experiments in vitro with blood from human volunteers, it showed that a dried the real extract of *Trachyspermum ammi* seeds, inhibited aggregation of platelets induced by arachidonic acid, collagen and epinephrine, Research study was intended to support the traditional use of *Trachyspermum ammi* in women post partiturition.

- **Anti-inflammatory potential**

Anti-inflammatory potentialof the total alcoholic extract (TAE) and Total aqueous extract (TAQ) of the Ajwain seeds was determined. TAE and TAQ exhibited significant P(<0. 001) anti-inflammatory activity in both the animals models. the weights of the adrenal glands we're found to be significantly increased in TAE and TAQ treated animals. TAE and TAQ extract from the Ajwain seeds exhibit significant anti-inflammatory potential.

- **Antitussive effects**

The Antitussive effects of aerosol of two different concentration of aqueous and macerated extracts and carvacrol, codeine and saline were tested by counting the number of coughs produced. the results showed significant reduction of cough number obtained in the presence of the both concentration of aqueous and macerated extracts and codeine (p<0. 001 for extracts and p<0. 01 for codeine).

- **Antifilarial activity**

In vitro activity of a methanolic extract of the fruits of *Trachyspermum ammi* (Apiaceae) against Setaria digitata worms has been investigated. The crude extract and the active fraction showed significant activity against the adults S. digitata by both a worm motility and MTT [3-(4, 5-dimethylthiazol-2yl)-2, 5-diphenyltetrazolium bromide] reduction assay. The isolated active principles phenolic monoterpene screened for in vivo antifilarial activity against the humans filarial worm *B. malayi. Trachyspermum ammi* crude extract exhibited macrofilaricidal activity.

- **Gastro protective Activity**

Trachyspermum ammi fruit showed antiulcer activity by using different ulcer model. Animals pre-treated with ethanolic extract showed significant decrease in ulcer index and percentage ulcer protection in all models. The reults suggest that the extract showed significant protection (p<0. 001) by reducing ulcerative lesions when compared with control group of animals.

- **Detoxification of aflatoxins**

Aqueous extract of ajowan seeds was found to contain an aflatoxin inactivation factor (IF). Thin layer chromatography analysis of the toxins after treatment with IF showed relative reduction of aflatoxin G1 > G2 > B1 > B2. Quantification of toxin using a fluorotoxin meter as well as the Enzyme Linked Immunosorbent Assay (ELISA) confirmed these findings. An

approximate 80% reduction in total aflatoxin content over the controls was observed. This observed phenomenon of reduction in total toxin was referred to as toxin inactivation. Temperature was found to influence the rate of toxin inactivation. At 45 8C, it was found to be rapid during the initial 5 h and slowed later. The IF was found to retain considerable activity even after boiling and autoclaving, indicating partial heat stability. The activity was lost below pH 4. 0. Above pH 4. 0, it increased gradually, reaching the maximum at pH 10. 0. IF was found to be stable to gamma irradiation. Toxin decontamination in spiked corn samples could be achieved using IF. This study emphasizes the potential of ajowan IF in aflatoxin removal from contaminated food commodities.

- **Ameliorative effect**

Effect of ajwain extract on hexachlorocyclohexane (HCH)- induced oxidative stress and toxicity in rats were investigated. Pre-feeding of ajwain extract resulted in increased GSH, GSH-peroxidase, G-6-PDH, SOD, catalase, glutathione S-transferase (GST) activities and decreased hepatic levels of lipid peroxides. It was concluded that HCH administration resulted in hepatic free radical stress, causing toxicity, which could be reduced by the dietary ajwain extract.

- **Antimicrobial actions in vitro.**

The antimicrobial action of Trachyspermum ammi, in the protection of foodstuffs against microbial spoilage, conducting laboratory assays of antimicrobial efficacy in vitro was studied. The active principles thought to be responsible for the antimicrobial activity of ajwain were reported to be carvacol and thymol. Thymol 's kill the bacteria resistant to even prevalent third generation antibiotics and multi-drug resistant microbial pathogens and thus work as a plant based 4th generation herbal antibiotic formulation. Antifungal action of volatile constituents of *Trachyspermum ammi* seeds on ten fungi (*Acrophialophora fusispora, Curvularia lunata, Fusarium chlamydosporum, F. poae, Myrothecium roridum, Papulaspora sp., Alternaria grisea, A. tenuissima, Drechslera tetramera,* and *Rhizoctonia solani*). Trachyspermum ammi seeds were found to inhibit the growth of all test fungi by 72-90%. Phenolic compounds, such as thymol and carvacol, are known to be either bactericidal or bacteriostatic agents depending on the Concentration used.

- **Hypolipidaemic action in vivo.**

Antihyperlipidaemic effect of Trachyspermum ammi seed has been obtained in albino rabbits. It was assessed that Trachyspermum ammi powder at dose rate of 2 g/kg body weight and its equivalent methanol extract were extensively effective lipid lowering action by decreased total cholesterol, LDL-cholesterol, triglycerides, total lipids.

- **Digestive stimulant actions in vivo and vitro.**

Trachyspermum ammi would increase the secretion of gastric acid; the addition of Trachyspermum ammi to the infusion increased the amount of gastric acid. The gastric acid secretion was increased nearly fourfold. *Trachyspermum ammi* affect on the food transit time in experimental rats in vivo, the addition of *Trachyspermum ammi* to the diet reduced food transit time and also enhanced the activity of digestive enzymes and/or caused a higher secretion of bile acids.

- **Nematicidal Activity**

Pine wilt disease caused by the pinewood nematode (PWN) *Bursaphelenchus xylophilus*. Ajwain oil constituents (camphene, pinene, myrcene, limonene, terpinene, terpinen- 4-ol, thymol and carvacrol) showed nematicidal activity against PWN32. PWN bodies treated with the muscle activity blockers levamisole hydrochloride and morantal tatrate. Amino and hydroxyl groups have been hypothesized as target sites of methyl isothiocyanate in nematotatrate. Some essential oils have been reported to interfere with the neuromodulator octopamine or GABA-gated chloride channels of insect pests.

Thymol and carvacrol were very effective against PWN. These studies confirm that the nematicidal activity of Ajwain oil was mainly attributed to the activity of thymol and carvacrol. Nematicidal activity of Ajwain essential oils LC50 values was 0. 431 mg/ml.

- **Anthelmintic activity**

Anthelmintic activity of *Trachyspermum ammi*, shows its effect against specific helminths, e. g. Ascaris lumbricoides in humans and Haemonchus contortus in sheep. Anthelmintic Activity *Trachyspermum ammi* exert by interference with the energy metabolism of parasites through potentiation of ATPase activity and thus loss of energy reserves. The plant has also been reported to possess cholinergic activity with peristaltic movements of the gut, thus helping in expulsion of intestinal parasites which might also be a contributory factor to its anthelmintic activity.

- **DISCUSSION**

Trachyspermum ammi is an important medicinal plant, which has both nutritional as well as medicinal uses. This particular have a wide established and hidden therapeutic uses. This medicinal plant needs a scientific explore to the hidden curative and therapeutic potential. This review is an attempt to provide well assembled scientific data on the behalf of *Trachyspermum ammi*. It is expected that this review will attract attention towards medicinal potential, applications and commercialization of various Pharmacognostic, Phytochemical studies, Ethnopharmacology relevance, Pharmacological activities of *Trachyspermum ammi.*

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