Therapeutic potential of Nankhawah/Ajwain (Trachyspermum ammi Linn): A comprehensive review article

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Article Info:

Background: Trachyspermum ammi Linn., commonly known as ajwain, is a widely recognized spice and medicinal plant originating from Egypt but cultivated across regions such as Iraq, Iran, Afghanistan, Pakistan, and India. Belonging to the Apiaceae family, this species offers diverse pharmacological benefits due to its rich chemical constituents.

Objectives: This review aims to summarize the traditional and contemporary applications of Trachyspermum ammi, focusing on its ethnomedical description, chemical composition, and pharmacological aspects.

Methodology: The literature search encompassed scientific databases and publications covering the historical usage, chemical profiling, and biological activities of Trachyspermum ammi.

Results: Trachyspermum ammi exhibits a variety of pharmacological activities, including antifungal, antioxidative, antimicrobial, antiinflammatory, antispasmodic, carminative, diuretic, aphrodisiac, and anthelmintic properties. Traditionally, it has been employed to treat conditions such as flatulence, atomic dyspepsia, diarrhea, abdominal tumors, abdominal pain, piles, bronchial issues, lack of appetite, galactagogue, asthma, and amenorrhea as it possesses properties of Muhallil, Mudirr-i-Bawl-o-Hayd, Dafl o Tafun, Jali, Habis etc. Modern research supports these claims while also revealing its potential in treating kidney stones, abortion, and aflatoxin detoxification.

Conclusion: Trachyspermum ammi holds great promise as a natural resource for novel therapies, owing to its extensive array of bioactive components and established pharmacological effects. Further investigation into its mechanisms of action and optimization of extraction techniques could lead to more efficient utilization of this valuable medicinal plant.

Keywords: Ajwain, Nankhawah, Trachyspermum Ammi Linn, Mudirr-i-Bawl-o-Hayd, Hazim, Thymol, Appetizer.

INTRODUCTION:

Unani System of drugs is one of the oldest conventional devices of drugs which has strived via a while in the prevention and remedy of diverse scientific conditions. Traditional medicinal drug, as described through the World Health Organization, is the sum entire of the thoughts, skills, and system primarily based totally on the theories, faiths, and incidents indigenous to unrelated civilizations, whether or not explicable or not. Used within side to upkeep the fitness along with prevention, diagnosis and/or remedy of bodily or intellectual disorder.1 According to the World Health Organization presently, 80% of the world population depends on herbal medicine for some aspect of primary health care. However, plants still provide some of our most valuable medicines.2

Trachyspermum ammi Linn. (ajwain) is an erect, aromatic annual herbaceous plant belonging to the Apiaceae family, which is used worldwide as a spice and has medicinal properties, therefore it is being used since centuries as a traditional system of medicine.3 Many members of Apiaceae belong to vegetation or aroma. This family comprises of about 250 genera and more than 3300 species.4 5 Trachyspermum ammi is a Latin word 5 India and eastern Persia is the origin of this plant.4 In the Indian Vedic literature, charaka samhita and sushruta samhita, the Ajwain is known as bhoottika and in the charaka samhita commentaries, it is termed yavanka. The medicinal role of Ajwain fruit claimed to be very important in the treatment of many ailments in humans.7 In Unani it is termed as ‘Naanakhawah’ Naan means chapati and khawah means desirous of seeking as it act as appetizer.8,9 In pharmaceuticals this plant is known as Fructus Ajwaini.

Ajwain seeds are used in certain domestic preparations like pickles, certain types of biscuits, confectionery, beverages and pan mixtures.4 In Indian medicine, ajwain is employed as a home remedy for stomach ailments, crushed fruit paste is applied externally to cut back colic pain, and hot and dry...
fermentation of chestnut fruit is employed as a typical remedy for asthma. Its seeds have stimulant, antioxidant, antitussive, antihypertensive, antimicrobial, antibacterial, carminative, diuretic, nematidal and hypolipidemic effects. High content of antioxidants, mainly polyphenols and flavonoids, make it a possible source for developing nutraceuticals. Traditional medical practices frequently employ *ajwain* for a number of pharmacological and therapeutic purposes. *Ajwain* has a long history in Traditional Persian Medicine (TPM) and is well-known. Its extract is called Jawahar Kamun Mulki in Arabic, Jawahar Nankhawah in Persian, Azwain in Urdu and Thymol in English.

Materials and Methods:

Thorough literature search was carried out to gather applicable data on *ajwain* through publicly available electronic databases including pubmed, google scholar, scihub, science direct and other internet sources. A large number of published research and review articles upto 2023 were reviewed. Keywords used are *ajwain*, trachyspermum ammi linn, unani medicine, enmmenoguge activity, Mudirr-i-bowl-o-Hayd.

The name of species has been validated by using world flora online. Standard unani medical terminology published by CCRUM has been used to describe the proper unani terminologies. Additionally, the material was compiled using books that were published in both urdu and English as typical literature in unani medicine. This review examines the pharmacological action, morphology, ethnomedical applications and therapeutic uses of this medicinal plant from the viewpoint of unani medicine.

Description of *Ajwain* in Unani:

Its leaves are like small earrings or leaves of coriander. Flowers are like white umbrella of soya or *badiyan*. Later grains are grown in similar way. Seeds are small like *anisoon*. They are usually harvested in February/march. All of its parts have strong smell and are brownish in colour. If its seeds are stored properly then it can be preserved for 3-4 years.

The most beneficial component of *Ajwain*, according to Persian practitioners, are its seeds. *Ajwain*’s temperament can be characterised as hot and dry in the third degree, as well as having some bitterness and acidity.

Ethnobotanical Description:

It is said that the herb is extensively grown in dry and semi-arid sectors where the soil occupy high quantity 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 the petals; ovary inferior; stigma knob-like; fruit aromatic, ovoid, cordate, cremocarp with a persistent stylodium; leaves pinnate, with a terminal and 7 pairs of lateral leaflets.

**Figure**: Leaves, Flower and fruit of *Ajwain*.

Taxonomical Classification:

Kingdom: Plantae.

Subkingdom: Tracheobionta.

Division: Magnoliophyta.

Superdivision: Spermatophyta.

Order: Apiales.

Class: Magnoliopsida.

Family: Umbelliferae, Apiaceae.

Genus: Trachyspermum.

Species: ammi

Vernacular Names:

Assamese: Jain

Hindi: Ajwain, Jevain

English: Bishop’s weed, Ammi, Lovage, Carum, Ajwain, Ethiopian cumin

Tamil: Omam

Kannada: Oma, Omu

Telugu: Vamu

Bengali: Yamani, Yauvan, Yavan, Javan, Yavani, Yovana, ajudan

Sanskrit: Yamini, Yaminiki, Yaviniki, Dipyaka

Malayalam: Oman

Gujrati: Ajma, Ajmo, Yavanik, Dipyaka

Kashmiri: Ajma, Ajmo, Yavan, Javain

Kashmiri: Abzial, Ajawain

Unani:*Nankhawah*, Desi *ajawaayin*

Arabic: laamoon maluki, am

Sindhi: jaan

Synonyms:

*T.copticum* Link, *Carum copticum* Benth. & Hook

**Figure**: Leaves, Flower and fruit of *Ajwain*.
Temperament/Mizaj:
According to Sheikh bu ali sina (Avicenna) and Jalinoos (Galen) garm o khushk is degree 3/4. Few states that its mizaj is garm o khushk in second degree and few states that garm o khushk in last stage of 2-4 degree.22

Dosage / Miqdar Khurak:
Fruit: 3-6g
Powder: 18,21
3-5 masha/gram 13,20
1-3 gram 8
4-7, up to 10.5 masha/gram 5,14,22

Agroecology:
In India, it is found in arid open disturbed lands, lowland plains and mount in the waterless areas. The plant of ajwain is deficiency tolerant.3 It is native to Egypt and cultivated in Mediterranean region and in south-west Asian countries such as Iraq, Iran, Afghanistan, tropical Africa and Pakistan, China.5,16 Ajwain is chiefly produced in India as it is extensively cultivated in Madhya Pradesh, Uttar Pradesh, Gujarat, Rajasthan, Maharashtra, Bihar and West Bengal.4,5,16

Chemical Constituents:
The chemical composition of ajwain seed essential oil is influenced by various factors. Different parameters such as pressure, temperature, and modifier volume and extraction time have significant effect on the percentage yield and composition of ajwain oil.16,22 Phytochemical studies revealed that ajwain seed oil contained fiber (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, cobalt, copper, iodine, manganese, thiamine, sodium, potassium, riboflavin.4,5,10,15,16,17,24,25

Thymol and essential oil (2-4%) present in the fruits are considered as the major constituents (35%-60%) of the plant.17,21 The nonthymol constituents which are present in Ajwain are paracymene, y- terpine, α- and β-pinenes, dipentene, aterpinene, and carvacrol. Camphene, myrcene, and α-3- carene are present in small quantity in the plant.4,5,16

Phytoconstituents in Different Plant Parts:24

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Source</th>
<th>Phytoconstituents</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Fruits</td>
<td>3,5-Dihyroxytoluene 3-O-β-D Galactopyranoside (glycosal compound), 1-(3- isopropyliden-2,2-dimethyl cyclopropy) –isopropanon (Non terpenoids), Alpha-pine, Alpha-terpine, Beta pinene, Beta phellandrene, Carvacrol, Delta-3-carene, Gamma-terpine, Paracymene, Styrone, Terpine-4-ol (Non thymol), 2-Methyl-3-Buten-2-ol-β-DGlucopyranoside, 7Dimethyloc11(10)-ene-1, 2, 6,7-Tetrol 1-O-β-D Glucopyranoside and 6-Hydroxythymol 3-O-β-D-Glucopyranoside.</td>
<td>Antibacterial, Analgesic, Antiinflammatory, Antifertility.</td>
</tr>
</tbody>
</table>

Organoleptic and Physicochemical Characteristics of Ajwain Powder:16,24

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Light brown</td>
</tr>
<tr>
<td>Taste</td>
<td>Pleasant</td>
</tr>
<tr>
<td>Odour</td>
<td>Characteristic</td>
</tr>
<tr>
<td>Foreign matter (% w/w)</td>
<td>2.4</td>
</tr>
<tr>
<td>Loss on drying (LOD) (%w/w)</td>
<td>4.7</td>
</tr>
<tr>
<td>pH of 1% w/v solution</td>
<td>3.23</td>
</tr>
<tr>
<td>pH of 10% w/v solution</td>
<td>3.35</td>
</tr>
<tr>
<td>Total ash (%)</td>
<td>8.6</td>
</tr>
<tr>
<td>Acid-insoluble ash (%)</td>
<td>0.49</td>
</tr>
<tr>
<td>Water-soluble extractive</td>
<td>42</td>
</tr>
<tr>
<td>Alcohol-soluble extractive</td>
<td>17.9</td>
</tr>
</tbody>
</table>

Functions / Af'al:
Mudirr-i-bowl-o-Hayd9,13,20,22
Musaqin9,20,22
Mujaffir9,13,20,22
Musakkin riyah9

Uses /Istemal:
- when used in the form of safoof and matboos useful in suye hazam, zofe hazam, zofe ishteha, nafakh and moqhz reeh9,14,20 shikam, uphaara, qararar shikam, dard shikam, wala wa fawaad.13
- It is also used in goulam9, shaheeq8, eqtaenaur rehem8, ishaal wabaiy,9,10 salabat jigar o tihhaal.8,13,14,20
- It is also used for taseqen of jigar o meda of sard mizaj persons and wabaiy diseases.8,13,20
- Because of its musaqin, muhallil and mujaffeh sudda properties used in chronic fevers.13,20 Accordingly ‘8 pehri
ajwain’ namely nuqoo is prepared in ‘8 peher’ and used so.13,20

- Used in kaali khansi and amraaz tashannuji because of its musaffin, mujaffif and mujatteh properties.13,20
- Beneficial in falij and isterqa.14
- Qunwaat bah: when used dried after soaking 7 times in arq leemu.14
- Chark chashm and saqal samiya: when used in the form of joshanda and dropped in eye and ear.14,16,23,24
- Beneficial in dysuria and bladder stones.9,14,17
- Works as diuretic, emmenouge and galactogogue.13,14
- Beneficial in tap rafa.14
- Warm and pain: when used all over body mixing with honey or filfil.9,14
- Amraaz jild: used in beheq, bars, muhaase,9,14,17,22,24,29 contusion in the form of tila.13
- Increases blood pressure.13
- Used in side effects of afjin5 and alcohol.13,24
- Rehem ka tanqiyaa: when used as dhuni along with zaft and ratneef.9
- Seed powder in mixture with ghee and raw sugar is used to clear out the uterus.17
- If its joshanda is poured on the part of scorpion bite it gives instant relief from pain.9,24
- Strengthens gurda and masana.9,14
- Hookworm: when used along with shehed.9,14
- The aqueous extract of the fruit is a popular remedy for diarrhoea in Indian medicine.21
- Pechish: when used along with burnt agrot.9
- Boil one tablespoon of ajwain seeds in a glass of water, let it cool, then filter it known as Ajwan ka araq and drink it twice a day.23,24
- The ayurvedic pharmacopoeia of India recommends the dried fruits in tympanitis, constipation, colic and hemilmenthasis.
- Oil – used as expectorant in empysema, bronchial and other respiratory ailments.
- Used externally in cases of rheumatism.21
- Heat one and half masha/gram ajwain and by placing it in a cloth and inhaling bring sneezes thereby reduces nazla o zukham.8,22,23,24
- Nafigh: when 3-6 masha/gram of ajwain is mixed with one and half masha/gram kaala namak and is drank along with water.22,24
- Zof hazima: soak ajwain and sonth for 12 hours, grind, sieve, boil add salt and drink.
- Kasir riyah, dard nafigh, zof hazima: grind ajwain, kali mirch, salt and drink with hot water.
- Tashaanuji: when flowers of ajwain and its oil are mixed and massaged.22
- Different researchers studied the oestrogenic content of T.ammi that are traditionally used to increase milk quantity in dairy cattle.
- Ajwain has also been traditionally used as a galactogogue when seeds of Ajwain is fried in oil and used as a thin soup.4
- Ajwain is mixed with jaggery and warm ghee and taken orally to provide strength right after pregnancy.17,23

**Pharmacological Studies:**

**Antihyperlipidemic effect:**16,4

Javed et al., subjected the chloroform, methanol, petroleum ether extract of Trachyspermum ammi against butter fed ad libitum and orally intubating cholesterol induced hyperlipidaemia rabbit models. The methanol and petroleum ether extracts at the dosage of 2 g/kg body weight powder were found to very effective against hyperlipidaemia in the models. It was found that petroleum ether extract produced more potent results in increasing HDL-cholesterol level and decreasing LDL-cholesterol level than that of methanolic extract. Also, petroleum ether extract helped in effective reduction of atherogenic index. Saleem et al., reported the potent anti-hyperlipidemic activities of aqueous extract and methanol extract of the plant in triton induced hypelipidemia rat models. The study revealed that both the extracts at the dosage of 3 g/kg and 5 g/kg significantly reduced the levels of total cholesterol, triglyceride, and low-density lipoprotein along with the remarkable increase in the high-density lipoprotein concentration in serum.17

**Antihypertensive, antispasmodic and bronchodilatory properties:**15,16,20,24

Intravenous administration of extracts of TA showed antihypertensive, antispasmodic and bronchodilating activity. The antispasmodic activity was found to be mediated through calcium channel blockade that supported the traditional use of TA in hyperactive disease states of the gut such as colic and diarrhoea as well as in hypertension. Thymol and different concentrations of the essence also exhibit a significant antispasmodic action on acetylcholine-induced contractions in isolated rat’s ileum. The study suggested that relaxant effect of thymol is probably due to its anticholinergic property. In a study, boiled extract of Carum coticum exhibited bronchodilatory effect on asthmatic airways which was comparable with the effect of theophylline at concentrations used in asthmatic patients. The results of the study indicate an antitussive effect of Carum coticum which was even greater than that of codeine at concentrations used on guinea pig tracheal chains while it is also suggested that the antitussive effect of Carum coticum was not due to its main constituent, carvacrol.19

**Anthelmintic Activity:**16,24

Anthelmintic activity of T. ammi shows its effect against specific helminths e.g. Ascaris lumbricoides in humans and Haemonchus contortus in sheep. Anthelmintic activity of T. ammi exerts 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 cholinergetic 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.15

**Anti-diarrhoeal activity:**27

T. ammi extracts of seed have potential at 100 mg/kg to control the diarrhoea. Its 95% total alcoholic extract and aqueous extract in experimental rats resulted a promising control in castor oil induced diarrhoea in concentration dependent manner. The total aqueous and alcoholic extracts...
decreased the droppings of diarrhoea while comparing to castor oil group.28

**Anti-oxidant activity**27:

*Ajwain* is also rich in vitamins and minerals and have health-promoting phytonutrients such as carotenoids (β-carotene and lutein) and flavonoids for providing powerful antioxidant protection. At 1 mg/ml acetone extract showed highest FRAP value (2270.27 ± 0.05 μmol/l) as compared to aqueous and methanol extract of *ajwain* seeds and contribute a highly significant bio resource of antioxidants to be used in our day-to-day life and in food and pharmaceuticals. T. ammi methanol extract possesses strong antioxidant activity against DPPH, and could be used as natural antioxidant in food or pharmaceutical industry.27

**Insecticidal**:4,24,28

Some compounds extracted from plants have insecticidal action. Plant derived metabolites play a significant function in the plant-insect connections. Essential oil extracted from the seeds of *ajwain* reveals insecticidal activity in opposition to Callosobruchus chinesis in the ova-position step in addition to egg originate and developmental inhibitory actions6

**Antulcer activity**:16,17,28

Using different ulcer models, oregano *ajwain* ethanolic extract significantly reduced the ulcer index in pre-treated animals and also showed ulcer protection altogether models. Overall the extract reduced ulcerative lesions compared to the control group of the animal model.10

**Abortifacients and galactogogic**:7,16,24,28

Actions of *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. 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 used to increase milk yield in dairy cattle T. ammi has also been traditionally used as galactagogue in 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)15

**Antiplatelet Aggregatory Activity**:16,24

Antiplatelet-aggregatory attempts out in vitro in human volunteers, and the document hooked up that the dried ethanolic extract of *ajwain* seeds suppressed the accumulation of platelets decreased by using collagen, arachidonic acid, and epinephrine16

**Diuretic and anti-lithiasis activity**:14,16,21

*Ajwain* was attributed to have diuretic and anti-lithiasis activity in ethno-pharmacological reports. Accordingly, a human study was performed and in which, seeds of *Ajwain* were decocted in milk and given orally to volunteers suffering from urinary stone for a nine days period. The results were reported satisfactory against pure ca-oxalate stone.19 *C. coticum* has been used in traditional medicine for relieving rheumatic,6,19, joint pain6,19, Headache6,19 and neuralgic pain.6,19 a Dashṭ-Rahmatabadi et al. demonstrated that analgesic effect of ethanolic extract of *C. coticum* is comparable with morphine and this effect is suggested to be due to its parasympathomimetic through descending pain modulating pathways. Analgesic effect of *C. coticum* essential oil in formalin test was also assessed and pain scores were recorded during one hour (every 5 minutes).25,27,29

**Anti-inflammatory activity**:15,16

Aslam et al., examined this property of *Trachyspermum ammi* different seed extracts prepared from hexane, chloroform and methanol solvents.17 Thangam and ghananjay observed anti-inflammatory potentials against rat models.4

**Wound healing activity**:8

Gilani *et al.* found anti-bacterial potential of *ajwain* in healing of wound in rabbits by applying cream with 5% *ajwain* essential oil. They also compared it with iodine solution. Wound contraction at 15th day in *ajwain* group was 99.68% as comparable to healing by iodine solution and untreated group which was found to be 100 and 96.57% respectively indicating great healing power of *ajwain*.28

**Hepatoprotective**:15,17,23,24,28

The hepato-protective pastime of the methanolic extract of *ajwain* became said with the aid of the Gilani *et al.*, in that file it turned into showed that *Trachyspermum ammi* established in vivo hepato-protective pastime in mice approximately 80 per cent against a normally-LD of the paracetamol at a dose 1g/kg of body weight. The methanolic extract of *ajwain* additionally indicates preventive results towards CCI4-accelerated continuation of drug pentobarbital sound asleep time, which confirms the hepato-protective interest of the extract other than it also balancing the extent of Alkaline Phosphatase (hepatic enzymes) and Aminotransferases (hepatic enzymes) all through the severe damaging circumstance of the liver.16

**Estrogenist value**:24,25

The phytoestrogen value was studied in *ajwain* seeds that revealed it is 473ppm.27

**Adverse Effect**:

*Trachyspermum ammi* is an abortifacient therefore should not be used in pregnancy. In higher doses, it is toxic and may lead to fatal conditions.3

**Dose and Administration Route**:8

Three to six grams of the seed powder with food or by means of other ways can be consumed daily. Although the seeds are small, they should be powdered for more effectiveness. In addition, it may be extracted or boiled and used. Dried extract of *C. coticum* seeds can be consumed up to 125 mg daily. The liquid extract (tincture) can be also consumed up to 6 mL daily.29

**Adverse effect according to unani/Muzirat**:

musadda,8,13,14,20 Garm mizaj persons.22

**Corrective/Musleh**: Dhaniya8
turmis, Unnab, sard wa tar ajza14,22

**Substitute/Bodal**: kalonjii13,14,20,22Zeera siyah, 8,14,22

**Main Action /Nafa e khas**: mujaff jf rutubat, meda kasir riyah,13,22

**Compound Formulations /Murakkabath**: Arq Ajwain
Majoon nankhawah
Majoon zabeel8,13,18,20

**Relative Star/Nisbat sitara**: mansooob bamarj, azroye mizaj.14

**Conclusion**:

*Trachyspermum ammi*, commonly known as “Ajwain,” is a versatile plant with numerous medicinal applications and pharmacological effects. Studies indicate that it serves as a
rich source of biologically active compounds, exhibiting benefits in treating various health issues. This review discussed in detail about the nutritional value, phytochemistry, pharmacological actions, and therapeutic uses and also the pharmacological studies conducted so far on ajwain. In unani system of medicine ajwain has been commonly used as emmenagogue, appetizer, anti-inflammatory, antibacterial, digestor, cleanser, supports functioning of respiratory system etc. This species exhibits numerous pharmacologically active compounds and has demonstrated various beneficial effects, including antifungal, antioxidant, antimicrobial, antiinvasive, antisapmosodic, bronchodilating, anthelmintic, antitussive, hepato-protective, and anti-inflammatory properties.

Additionally, it has been employed for treating kidney stones, gastrointestinal issues, respiratory disorders, and gynecological concerns. However, caution must be exercised regarding its abortifacient action, as it can cause adverse effects if misused during pregnancy. Further clinical trials and meta-analysis are required to draw a definitive conclusion on the efficacy and therapeutic applications of ajwain.

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