IJP (2025), Vol. 12, Issue 9 **(Review Article)**

Received on 04 September 2025; received in revised form, 28 September 2025; accepted, 29 September 2025; published 30 September 2025

A SCHEMATIC REVIEW ON AJWAIN AND ITS BIOLOGICAL IMPORTANCE

Dinesh Bachina *, Sridevi Kolli, Mansur Ali Shaik, Eswar Tony Darsi and Ramarao Nadendla

Department of Pharmacology, Chalapathi Institute of Pharmaceutical Sciences, Lam, Guntur - 522034, Andhra Pradesh, India.

Keywords:

Trachyspermum ammi (L), Pharmacological actions, Thymol

Correspondence to Author:
Dinesh Bachina

M. Pharmacy,
Department of Pharmacology,
Chalapathi Institute of Pharmaceutical Sciences, Lam, Guntur - 522034,
Andhra Pradesh, India.

E-mail: bachinadinesh1861@gmail.com

ABSTRACT: *Trachyspermum ammi (L)*, often known as "Ajwain," is a herbal remedy that has been used in the Unani school of medicine for millennia to treat a variety of diseases. It belongs to the *Apiaceae* family. The plant is around 90 cm tall. Its fruit is utilized as a spice around the world. Its fruit is utilized as a spice around the world. The fruit's morphological traits include two mericarps with bifid stylopods and five light-colored ridges. It is ovoid, has a sharp flavor, an aromatic odor, and is greyish-brown in appearance. It measures 2 meters in length and 1 millimeter in width. The temperature of the Unani text states that the fruit is hot and dry thirty. The majority of Ajwain's components each have unique pharmacological effects. One highly helpful ingredient found in Ajwain seed oil is called turbulence. Ajwain demonstrates a variety of properties, including hepatoprotective, antihypertensive, antispasmodic, antiflatulent, antihelminthic, antiplatelet, bronchodilation, antiulcer, antitussive, analgesic, and others. Additional research indicates the existence of a variety of phytochemical constituents, including but not limited to carbohydrates, glycosides, saponins, phenolic compounds, protein, fat, fiber, volatile oil (thymol, γ-terpinene, para-cymene, and α- and β-pinene), and mineral matter that includes calcium, phosphorous, iron, and nicotinic acid. These investigations demonstrate the diverse pharmacological effects and medicinally active chemical content of *T. ammi*.

INTRODUCTION: Ajwain, *Trachyspermum ammi (L.)* It is native to Egypt and is cultivated in India, Pakistan, Iran, Afghanistan, and Egypt. In India, mostly cultivated in Gujarat, Rajasthan, Maharashtra, Bihar, Madhya Pradesh, and West Bengal. In India, the most useful element of ajwain is the little fruit like caraway, which always especially admired in Indian delectable recipes, flavorful baked goods, and snacks [1]. The roots are diuretic Ajwain, also known as *Trachyspermum ammi (L)*, this plant has diuretic properties, while the seeds contain an essential oil that has excellent aphrodisiac properties.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.IJP.12(9).725-30

Article can be accessed online on: www.ijpjournal.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.IJP.12(9).725-30

The seeds contain 2-4.4% brown-colored oil known as ajwain oil, which is rich in thymol - a major oil component. Thymol is known for its therapeutic properties and is used in the treatment of gastrointestinal ailments, bronchial problems, and lack of appetite. The oil also exhibits fungicidal, antimicrobial, and anti-aggregatory effects on humans. Ajwain is a traditional herb that is widely used for curing various diseases in humans and animals. The fruit possesses stimulant, antispasmodic, and carminative properties [2].

Thymol, the major component of ajwain oil, is also used in perfumes and toothpaste. The seeds possess excellent aphrodisiac properties. The seeds contain 2–4.4% brown-colored oil known as ajwain oil. Seeds contain an essential oil containing about 35% -60% of thymol. The main component of this oil is thymol, which is used in the treatment of gastrointestinal ailments, lack of appetite, and bronchial problems.

The oil exhibits fungicidal, antimicrobial, and anti-aggregatory effects on humans. Ajwain is a traditional potential herb and is widely used for curing various diseases in humans and animals. The fruit possesses stimulant, antispasmodic, and carminative properties. Its major component, thymol, is used in perfumes and toothpaste [3, 4].

TABLE 1: CLASSIFICATION OF *TRACHYSPERMUM AMMI (L)*.

Kingdom	Plantae
Sub kingdom	Tracheobionta
Super division	Spermatophyta
Division	Magnoliophyte
Class	Magnoliopsida
Order	Apiales
Family	Apiaceae
Genus	Trachysperum

FIG. 1: FLOWERING PARTS OF THE PLANT *TRACHYSPERMUM AMMI (L)*

Morphology:

Taste: Bitter

Odour: Characteristic spicy

Colour: Grey Green (seeds)

Surface: Ajwain is small, erect, annual shrub with soft fine hairs

Parts used: Mostly Seeds and Fruits

Classification:

Sanskrit: Yamini, Yaminiki, Yaviniki

Assamese: Jain

Bengali: Yamani, Yauvan, Yavan, Javan, Yavani, Yoyana

English: Bishop's weed

Gujrati: Ajma, Ajmo, Yavan, Javain

Hindi: Ajwain, Jevain

Kannada: Oma, Yom, Omu

Malayalam: Oman, Ayanodakan

Marathi: Onva

Oriya: Juani

Tamil: Omam

Telugu: Vamu

Synonyms: *Ammi copticum* L., *Carum copticum* L.

TABLE 2: CHEMICAL CONSTITUENTS

Constituents	Percentage
Carbohydrates	38.6%
Fats	18.1%
Proteins	15.4%
Fiber	11.9 %
Tannins, Glycosides, Moisture	8.9%
Saponins, Flavones and Mineral matter	7.1%
Essential oils	2.5%-5.0%

Phytochemistry: Thymol is the main component (35%-60%) of this compound, along with other non-thymol constituents such as thymine which contains p-cymene (50%-55%), β-pinene (4%-5%), limonene with γ-pinenes and β-pinene (30%-35%). *T. ammi* is composed mainly of carvone (48%), limonene (38%), and dillapiole (9%).

It also contains several vitamins, minerals, and nutrients that we consume in our daily lives, such as cobalt, chromium, manganese, nicotinic acid, calcium, iodine, thymine, riboflavin, phosphorous, and zinc. Thymol is the main component (35%-60%) of this compound, along with other non-thymol constituents such as thymine which contains p-cymene (50%-55%), β-pinene (4%-5%), limonene with γ-pinenes and β-pinene (30%-35%). *T. ammi* is composed mainly of carvone (48%), limonene (38%), and dillapiole (9%).

It also contains several vitamins, minerals, and nutrients that we consume in our daily lives, such as cobalt, chromium, manganese, nicotinic acid, calcium, iodine, thymine, riboflavin, phosphorous, and zinc, which are commonly found in our daily diet [3, 4, 5].

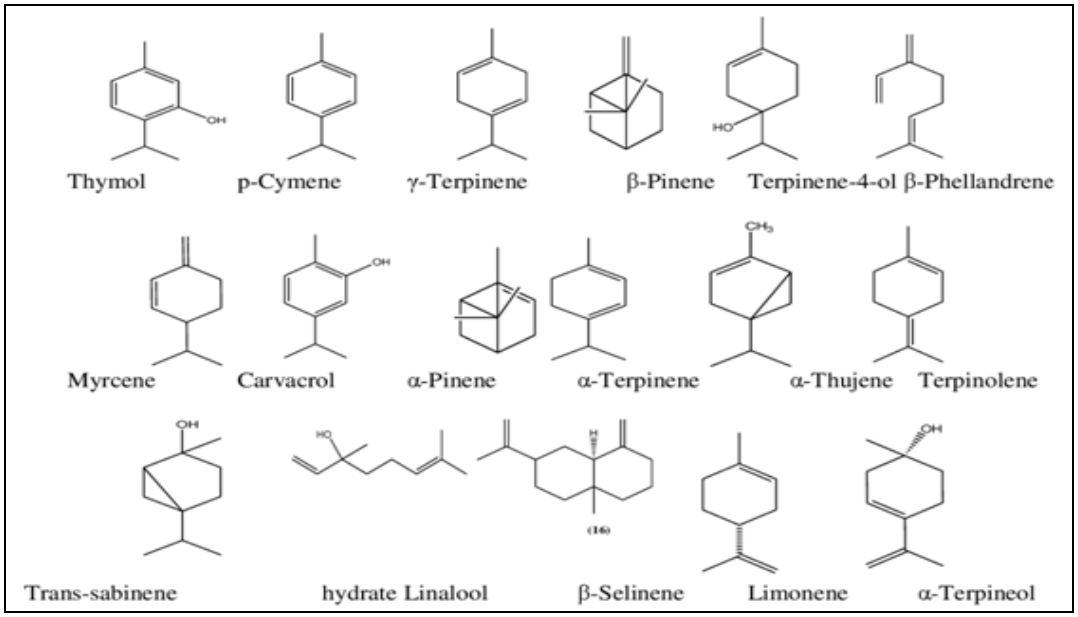

FIG. 2: STRUCTURES OF *TRACHYSPERMUM AMMI* CONSTITUENTS

TABLE 3: PLANT PARTS AND THEIR BIOLOGICAL FUNCTIONS

Plant part	Biological functions
Roots	Diuretic
Seeds	Stomache, Laxative, Carmative, Anthelmintic, Aphrodisiac, Abdomial tumors.
Seed oil	Gasro-intestinal ailments, Bronchial problems, Fungicidal, Lack of appetite, and also in toothpaste and perfumery.
Fruit	Stimulant, Antisapmodic, Carmative, Atonic dyspepsia and Diarrheoa

Microscopic Description: The transverse section of fruit has two hexagonal structures attached by carpophores, epicarps, and a layer of tangentially elongated tabular cells, mesocarp consists of moderately thick-walled, rectangular to polygonal tangentially elongated cells carpophores and vascular bundles present in radically elongated cells integument, barrel-shaped of tangentially elongated cells, endosperm consists of thin-walled cells filled with the 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 [2, 6].

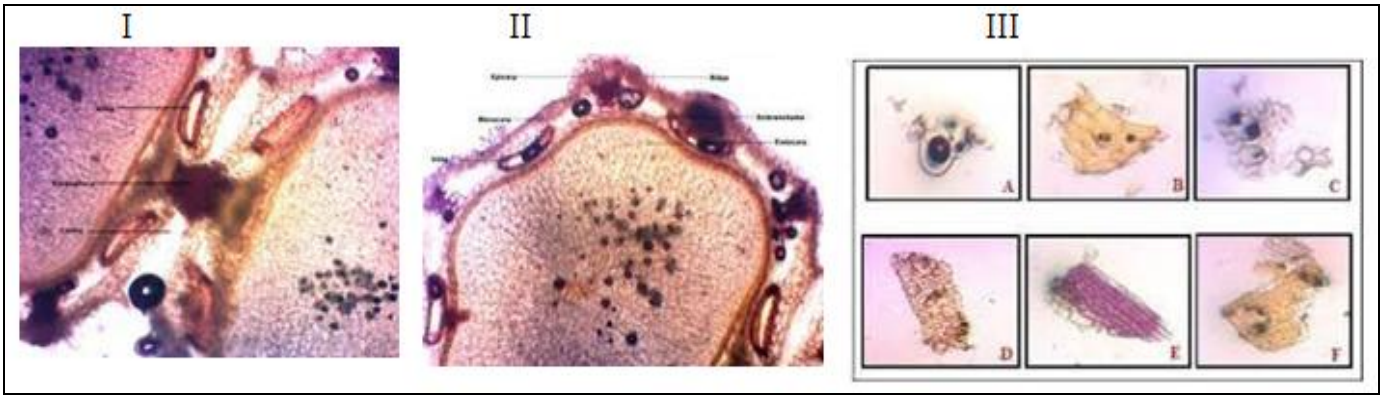

FIG. 3: (I, II) MICROSCOPY AND (III) POWDER MICROSCOPY IMAGES: IN III PICTURES (A): ENDOCARP IN SURFACE VIEW; (B): DETACHED PROTUBERANCE; (C): MICROROSETTE CRYSTALS; (D): STRAITED CUTICLE IN SURFACE VIEW; (E): PITTED FIBRES; (F): ENDOSPERUM CONTAINING MICROROSETTE CRYSTALS OF CALCIUM OXALATES

Adulteration: Ajwain seeds are often subject to adulteration by adding exhausted or spent seeds, stems, earthy materials, chaff, or dust. The oil content of ajwain seeds can range from 35% to 60%, but if chaff oil is added, the thymol content may fall below 35%. Detection of these adulterants

can be done by using gas chromatography or by combining thin-layer chromatography with high-performance liquid chromatography. Adulteration at any level can be determined by using the specifications explained separately for whole seed, powdered seed, volatile oil, and oleoresin. Sometimes, ajwain seeds are adulterated with ban ajwain (*seseliduffusum {Roxb.ex.sm.}*) or Gandhi (*Apium graveolens{Linn.}sprague*). Thin-layer chromatography can be used to detect adulteration using benzene: petrol (1:7) [1].

Pharmacological Activities of the *Trachyospermum ammi*:

Anti-microbial Activity: For the checking of anti-bacterial and anti-fungal activity, the aqueous extract is tested against the *Enterococcus facecalis*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aerginosa*, *Salmonella typi*, *Salmonella typhimurium*, *Shigella flexneri*, and *Staphylococcus aureus*. Ethanol acetone extract of ajwain seeds possessed an antibacterial activity and has two negative food spoilage bacteria *Pseudomonas aeruginosa* and *Escherichia coli*. In *In-vitro*, it is performed by using the disc diffusion method. Also, the ethanolic extract of ajawain shows anti-bacterial activity against the strains of helicobacter pylori, methanolic activity is done by using agar well-diffusion method. On the other hand, no activity is observed against the pseudomonas in the study [1, 2, 5].

Antioxidant Activity: The antioxidant and ameliorative properties of ajwain extract have been evaluated on hexachloro cyclohexane tempt oxidative stress and toxicity in an *in-vivo* investigation [4]. Accordingly, results revealed that the dietary ajwain extract would result in toxicity resulting from hepatic free radical stress [3, 7].

Anthelmintic Activity: The anthelmintic activity of *Trachyspermum ammi* was investigated by some researchers and established that the plant ajwain shows anthelmintic activity against some particular helminths Like *Haermonchus contortus* and *Ascaris lumbricoides* in humans and sheep. *Trachyspermum ammi* (ajwain) exhibits anthelmintic activity maintained by disturbance with the parasite energy metabolism by synergism of ATPase action. The plant *Trachyspermum ammi* has also exhibited cholinergic action with peristaltic motions of the gut, hence assisting in the expulsion of enteral parasites, which may also be a contributing component to its anthelmintic property [2, 5].

Antiplatelet Activity: Antiplatelet activity has been done on the dried ether extract of ajwain. Therefore, in an *in-vitro* study with human blood samples. Ajwain seeds inhibited the platelet aggregation induced by arachidonic acid, collagen, and epinephrine. The research study was intended to support the traditional use of *T. ammi* in women post parturition [2].

Analgesic Activity: The alcoholic extract of *Trachyspermum ammi* can act as a natural safe, orally active, moderately strong antinociceptive. It also justifies the therapeutic claim in traditional medicine that the alcoholic extract of *Trachyspermum ammi* has painkilling activity [4, 8].

Anti-hypertension: The calcium channel-blocking effect, Ajwain has a role in heart rate and blood pressure. It caused a fall in blood pressure and heart rate. Various cardiovascular effects of ajwain and its constituents were noticed. When 1-10mg/kg thymol was administered in mice it resulted in decreased blood pressure. It was suggested that the effect of thymol could be due to calcium channel-blocking properties [8].

Anti-tussives: By measuring the number of coughs produced, the antitussive effects of aerosols containing two different concentrations of aqueous and macerated extracts together with carvacrol, codeine, and saline were evaluated. Both quantities of aqueous and macerated extract as well as codeine significantly reduced the number of cough episodes ($p<0.001$ for extracts and $p<0.01$ for codeine), according to the results [2, 5].

Hepatoprotective: Along with the potent antioxidant activity, the Ajwain methanolic extract was revealed to exhibit *in vivo* hepatoprotective activity with 80% defense against an in general deadly dose of paracetamol in pests. The extract also obsessed preventive effects against CCl4-induced prolongation of pentobarbital sleeping time as well as equilibrating the level of alkaline phosphate (ALP), Aminotransferase (AST and

ALT) hepatic enzymes, and during liver damage [2, 8].

Anti-flatulent: From the ancient times of Ajwain is used to relieve the retention of gas and flatulence when taken with warm water. It is an excellent natural home remedy to treat abdominal gas, anorexia, nausea, and vomiting [8].

Anti-inflammatory: It was established whether the ajwain seeds' total alcoholic extract (TAE) and total aqueous extract (TAQ) have anti-inflammatory properties. Significant ($p<0.001$) anti-inflammatory effect was demonstrated by TAE and TAQ in both animal models. The weights of the adrenal glands were found to be significantly increased in TAE and TAQ extracts from the ajwain seeds exhibit significant anti-inflammatory potential [3].

Abortifacient and Galactogogic Actions: The seeds of *Trachyspermum ammi* were used within the reason for abortion in a few countries in India. Specifically in the metropolis of Lucknow. In that, fifty to 75% of the pregnant girls who were accompanied were exacted to have utilized ajwain seed for abortion. From the survey, it was clear that the herb was not good, and there was an opportunity for a higher hazard of human fetotoxicity. The NRDI (countrywide Dairy Research Institute in India) also looked into the estrogenic capability of the plant *Trachyspermumu ammi* based totally on traditional information that is used to boost milk production in cows. *Trachyspermum ammi* also has been used traditionally as boom milk manufacturing in humans [2, 3].

Hypolipidemic Activity: The antihyperlipidemic effect of *Trachyspermum ammi* has been obtained in albino rabbits. It was assessed that *Trachyspermum ammi* powder dose rate of 2g/kg body weight and its equivalent methanol extract were extensively effective in lipid-lowering action by decreasing total cholesterol, LDL-cholesterol, triglycerides, and total lipids and increasing HDL-cholesterols [2, 3, 9].

Anti-ulcer Activity: A series of experiments are done to reveal the ani-ulcer activity of the *T. ammi* by using animals such as Wister albino rats. These are divided into two groups such as placebo or control groups and drug-induced groups of animals and verify for the lesions and their ulcer index scores can be measured. Using different ulcer models, ajwain ethanolic extract resulted in a significant ulcer index decreased in animals pretreated with and also exhibited ulcer protection in all models. Overall, the extract reduced the ulcerative lesions compared to a control group of animal model [6, 8].

Ameliorative Action: We looked at how ajwain extract affected the oxidative stress and toxicity that hexachlorocyclohexane (HCH) caused in rays. Pre-feeding ajwain extract led to elevated activities of GSH, GSH-peroxidase, G-6-PDH, SOD, catalase, and glutathione S-transferase (GST), and it also resulted in lower hepatic free radical stress, which caused toxicity and could be mitigated by the dietary ajwain extract [2].

Diuretic and Anti-lithiasis Activity: Ajwain was attributed to have diuretic and anti-lithiasis activity in ethnopharmacological decocted in milk and given orally to volunteers suffering from urinary stones for nine days. The results were reported satisfactory against pure calcium oxalate stone [3].

Insecticidal Action: Some compounds extorted from plants have insecticidal action. Plant-derived metabolites play a significant function in plant-insect connections. The essential oil extracted from the seeds of ajwain reveals insecticidal activity in opposition to Collosobruchus chinensis in the ova-position step in addition to egg origination and developmental inhibitory actions [4, 7].

Digestive Stimulant: The herb was suggested as a digestive stimulating medication by traditional healers. Ajwain has been shown to enhance the activity of digestive enzymes as well as the release of bile acids and stomach acid. Also, it could shorten the period that food is temporary. Ajwain's enhancement of pancreatic lipase and amylase efficacy as an enzyme modulatory activity may bolster the action of digestive stimulants [2, 11].

Bronchodilatory: Investigations on the inhibitory impact of both Ajwain concentrate and basic oil on Histamine (H_1) receptors of isolated guinea pig tracheal chains. In an additional study, in the field of respiratory, bronchodilatory possessions of dissimilar portions of Ajwain were inspected. Consequences demonstrated that the relaxant and

bronchodilatory consequence of essential oil fractions may be because of the quantity of Carvacol. The bronchodilatory impact of the decocted concentrate of ajwain on the asthmatic patient's airways was inspected in an ensuring examination powder. According to the outcomes, the concentrate has a reasonable bronchodilatory impact on asthmatic airways assessed to the impact of theophylline at fixations utilized [2, 3, 4].

CONCLUSION: After a comprehensive review of *Trachyspermum ammi* (ajwain) has been well known as an ayurvedic spice since historical times. It has a wider range of medicinal uses and dietary use. It has traditionally been used as a medicinal plant for the treatment of indigestion dyspepsia and many other gastric disorders. Ajwain is also rich in moisture, protein, carbohydrates, fats, minerals, fibers, calcium, phosphorous, iron, carotene, thiamine, riboflavin, and niacin these are used to treat minor ailments. Also, it possesses significant pharmacological effects such as Carmative, anti-microbial, anti-oxidative, anthelmintic, anti-platelet, analgesic, anti-hypertensive, antitussive, hepatoprotective, anti-flatulent, anti-inflammatory, abortifacient and galactagogue, anti-hyperlipidemic, anti-ulcer, ameliorative, diuretic and anti-lithiasis, insecticidal, digestive stimulant, bronchodilatory, and also spasmolytic properties. The chemical composition of essential oil and the presence of a variety of diverse constituents in it are responsible for the wide range of biological properties. This assessment is a try to furnish the accumulated clinical information of the *Trachyspermum ammi*.

ACKNOWLEDGEMENT: Nil

CONFLICT OF INTEREST: Nil

REFERENCES:

1. Zainab Zaki, Gulzar Ahmad and Farha: A Review on *Trachyspermum ammi* (Ajwain); Journal of Integrated Community Health 2021; 10(1): 22-26.
2. Bairwa: *Trachyspermum ammi*: A review; Pharmacognosy Reviews 2012; 6(11).
3. Praveena Panda, Sirisha Valla, M. Uma Lakshmi, Ch Harika and Preetha Bhadra: An Overview of Ajwain (*Trachyspermum ammi*). IJNS 2020; 10(59).
4. Hanif MA: An Overview on Ajwain (*Trachyspermum ammi*) Pharmacological Effects: Current and Conventional. Pharma Science and Techn 2021; 5(1): 1-6.
5. Chahal KK, Dhaiwal K, Kumar A, Kataria D and Singla N: Chemical composition of *Trachyspermum ammi* L. and its biological properties: A review. Journal of Pharmacognosy and Phytochemistry 2017; 6(3): 131-140.
6. Monawara Begum, Sharma BP and Barbhuiya Aziz SM: Ethnobotanical, phytochemical and pharmacological science of *Trachyspermum ammi* (Ajwain) A Systematic Review. IJPSR 2021; 12(11): 5690-5697.
7. Himani Rawat: (*Trachyspermum ammi*) Ajwain, Health Benefits, Pharmacological Test, Its Uses in Modern Era, and Its Herbal Remedies - A Review. International J of Research Publication and Reviews 2021; 2(10): 663-667.
8. Shashank Mishra: A review of super food ajwain and its pharmacological actions. International Journal of Research in Pharma & Pharmaceutical Science 2020; 1(1): 30–33.
9. Gulshan Ara Jalbani, Shaheena Hakro, Shah Murad, Khalid Niaz, Abdul Qudoos, Hafiz Moeen-Ud-Din and Ajaz Fatima: flaxseeds and ajwain for primary hyperlipidemia. J of Drug Del & Therap 2016; 6(2): 37-39.
10. Meshal Nazeer, Humera Waheed, Maria Saeed, SamanYousuf Ali, M. Iqbal Choudhary, Zaheer Ul-Haq & Aftab Ahmed: Purifcation and characterization of a nonspecifc lipid transfer protein 1 (NSLTP1) from ajwain (*Trachyspermum ammi)* Seeds; Scientific Reports 2019; 9: 4148 | https://doi.org/10.1038/s41598-019-40574-x.
11. Darshankumar Bhingaradiya and Subhajit Ray: An extraction and utilization of essential oil from ajwain (*Trachyspermum ammi* L.) seed: a systematic review. Eur Chem Bull 2023; 12(10): 4763-4784.
12. Baby Chauhan, Gopal Kumar and Mohammed Ali: Pharmacognostical and Physiochemical Parameters of *Trachyspermum ammi* (L.) Sprague (Fruits); Current Research in Pharmaceutical Sciences 2013; 3(3): 87-91.
13. Singh G, Maurya S, Catalan C, de Lampasona MP, "Chemical constituents, antifungal and antioxidative effects of ajwain essentials oil and its acetone extract," J of Agricultural and Food Chemistry 2004; 52(11): 3292–96.
14. Nagalakshmi S, Shankaracharya NB, Naik JP, Rao LJM. Studies on chemical and technological aspects of ajowan (*T. ammi* syn. *Carum copticum*) JFST 2011; 37: 277–81.
15. Kamran Javed Naquvi, S. H. Ansari, Afrin Salma, Javed Ahamad and Shehla Najib: A review on phytochemical investigations and biological activities of *T. ammi* (L) Sprague. Research J of Pharmacy and Technology 2022.
16. Anilkumar KR, Saritha V, Khanum F and Bawa SA: Ameliorative effect of ajwain extract on hexachlorocyclohexane-induced lipid peroxidation in rat liver. Food and Chem Toxicol 2009; 47: 279-282.

How to cite this article:
Bachina D, Kolli S, Shaik MA, Darsi ET and Nadendla R: A schematic review on ajwain and its biological importance. Int J Pharmacognosy 2025; 12(9): 725-30. doi link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.12(9).725-30.