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An Overview of *Trachyspermum ammi* (L.): A Comprehensive Review

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ABSTRACT: *Trachyspermum ammi* (L.), commonly known as Ajwain, is a herbaceous plant in the Apiaceae family. It is prevalent across regions such as Egypt, Iran, Pakistan, Afghanistan, India, and parts of Europe. Ajwain seeds, which are rich in several chemical constituents, are reported to have a wide range of biological and pharmacological properties. These seeds exhibit antiseptic, anaesthetic, antiviral, antimicrobial, carminative, diuretic, stimulant, nematocidal, antiulcer, antihypertensive and antitussive properties. Additionally, these seeds also exhibit bronchodilator, antiplatelet, hepatoprotective, and antihyperlipidemic effects. A number of these properties were noted by early Persian physicians. Considering the aforementioned pharmacological attributes, Ajwain seeds hold promise for potential application in clinical practice. The current study aims to comprehensively compile information regarding the chemical composition and biological activities of Ajwain.
Keywords: Ajwain, Chemical composition, *Trachyspermum ammi*, traditional medicine, Pharmacological properties, herbal medicine

I. INTRODUCTION:

Nature has long served as a bountiful reservoir of medicinal plants with healing potential to address various infectious ailments, devoid of undesirable side effects (Gurib-Fakim, 2006**).** Traditionally, medicinal plants have been widely employed worldwide for therapeutic purposes in managing illnesses (Shakya, 2016). In recent times, there is a renewed focus on herbal compounds as potential sources of medicinal agents due to the observed adverse effects associated with synthetic drugs. Consequently, researchers are increasingly focusing on exploring herbal remedies and formulations derived from herbal sources have assumed a crucial role in advancing the pharmaceutical sector (Dar et al., 2017**;** Popoola et al., 2021). In other words, active components from plants are being utilized by scientists to create a range of diverse herbal medications.

Trachyspermum ammi Linn. (ajwain) is a member of the Apiaceae family. (Gersbach & Reddy, 2002) Across numerous Indian households, it is widely used as a culinary spice and is also utilized for the treatment of various health conditions (Jeet et al., 2012). Ajwain is also a vital commercial ingredient within the food and flavouring industry.

The Ajwain seed, distinguished by its aromatic nature, is associated with annual herbaceous plant (Naquvi et al., 2022). This plant has an upright growth pattern, with a delicate covering of fine hairs and branching consistently throughout its yearly life cycle. The fruits of T. ammi have been associated with numerous folk medicinal properties, including cytotoxicity (Bhardwaj et al., 2013), antimicrobial effects (Ishwar & Singh, 2000; Singh et al., 2008; Paul et al., 2011; Rao et al., 2023; Patil et al., 2016), anti-inflammatory characteristics (Dubey et al., 2015; Umar et al., 2012), antioxidant qualities (Rao et al., 2023; Umar et al., 2012), antipyretic attributes (Dubey et al., 2015), analgesic properties (Dubey et al., 2015), diuretic benefits, anti-termitic functions (Seo et al., 2009), antiviral actions (Roy et al., 2015; Naqvi et al., 2022), anticipatory traits, anticandidal activity (Pozzatti et al., 2008), anthelmintic (Lateef et al., 2006) and carminative effects.

Ahsan et al in 1990 investigated Ajwain's potential against kidney stones in his noteworthy study. The active compounds found in ajwain seeds are utilized as food preservatives (Banerjee & Sarkar 2004). In India, these seeds are employed to provide relief from digestive discomfort such as abdominal pain and indigestion (Hill, 2004). It imparts a thyme-like aroma due to presence of Thymol as a primary constituent, thereby allowing even a small quantity to dominate the dish's fragrance (Green, 2006). Approximately 2-5% of

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the seed's content consists of a brown-hued essential oil. The fruit of this plant holds remarkable medicinal potential and can help address various conditions including diarrhoea, flatulence, and atonic dyspepsia (Zaki & Ahmad 202). It has also found application in addressing issues like piles and abdominal tumours (Krishnamoorthy & Madalageri1999). Thymol, its major component, finds utility in perfumes and toothpaste formulations (Joshi, 2000).

1.1. TAXONOMIC CLASSIFICATION: (Jan et al., 2015)

Taxonomic Level	Classification
Kingdom	Plantae
Subkingdom	Tracheobionta
Division	Magnoliophyta
Super division	Spermatophyta
Order	Apiales
Class	Magnoliopsida
Family	Apiaceae
Genus	*Trachyspermum*
Species	*ammi*

1.2. VERNACULAR NAMES: (Bashyal et al., 2018)

Language	Vernacular Names
Hindi	Ajwain, Jevain
Sanskrit	Yamini, Yaminiki, Yaviniki
Bengali	Yamani, Yauvan, Yavan, Javan, Yavani, Yoyana
English	Bishop's weed
Kannada	Oma, Yom, Omu
Assamese	Jain
Gujrati	Ajma, Ajmo, Yavan, Javain
Tamil	Omam
Marathi	Onva
Telugu	Vamu
Malayalam	Oman, Ayanodakan
Oriya	Juani

1.3. DESCRIPTION:

Ajwain plant has an erect and ribbed stem. Plant can reach a height up to 90 cm. The stem may appear sleek and hairless (glabrous) or adorned with extremely delicate hairs (minutely pubescent) (Chatterjee & Parkashi1995; Zarshenas et al., 2014; Goyal et al., 2022; Munns, 2002; Bairwa et al., 2012). When subjected to rubbing, plant offers a distinctly sharp aroma, suggestive of the scent of thyme. The leaves of the Ajwain plant are comprised of numerous petite leaflets. These leaflets are symmetrically arranged along the stems in a feather-like manner. Plant forms clusters of small, white, or pale pink flowers resembling umbrellas and known as umbels. These flowers possess the typical traits of the Apiaceae family, characterized by the configuration of individual blossoms called florets within the structure of the umbel (Bairwa et al., 2012; Joy et al., 2001).

The most utilized component of the herb is its diminutive fruit. It resembles caraway seeds. This element is considerably popular in Indian savoury dishes (Kumar, 2006). It has a greyish-brown colour. The seeds or fruits are commonly utilized for their medicinal and nutritional benefits (Chauhan et al., 2012; Anwar et al., 2016). Typical planting season for this herb is around October to November, while the optimal time for harvesting falls between May and June (Anwar et al., 2016; Ranjan et al., 2011).

1.4. LOCATION:

T. ammi is predominantly grown in dry and semi-dry areas where soil has elevated salt levels (Joshi, 2000; Ranjan et al., 2011; Daliu et al., 2018; Sarhan et al., 2023). Its origin can be traced back to Egypt. However, it is cultivated and distributed widely across different regions including Iran, Pakistan, Afghanistan, India, and even parts of Europe (Shojaaddini et al., 2008). In India, the ajwain plant flourishes in states such as Uttar Pradesh, Rajasthan, Punjab, Bihar, Madhya Pradesh, Gujarat, Tamil Nadu, and Andhra Pradesh (Chahal et al., 2017). Loamy soil with a pH range of 6.5 to 8.2 is considered to be highly productive for Ajwain. Ideal growth of plant is observed between temperatures of 10 to 25 ºC and relative humidity (RH) levels ranging from 65% to 70%.

II. PHYTOCHEMICAL CONSTITUENTS:

The composition of phytochemical constituents in ajwain is shaped by a spectrum of factors, encompassing soil attributes, climatic circumstances such as temperature, pressure, humidity, and the duration of the extraction process. This collective interplay influences both the overall yield percentage and the specific chemical makeup of ajwain oil (Dwivedi et al., 2012). Ajwain has been the subject of scrutiny for various phytochemicals, encompassing alkaloids, chalcones, coumarins, flavonoids, glycosides, saponins, steroids, and tannins, as documented in previous investigations (Qureshi & Kumar 2010; Duke,1992; Soltani et al., 2018; Kumar & Khurana 2018). Evaluation of ajwain seeds has unveiled a compositional profile comprising components like fibre (11.9%), carbohydrates (38.6%), moisture (8.9%), protein (15.4%), fats (18.1%) and mineral content (7.1%) including essential elements like calcium, phosphorus, iron, and nicotinic acid (Pruthi, 1976)

During spring planting, it was observed that thymol constituted the primary constituent in both seeds (44.5%) and foliage (20%), followed by γ-terpinene (26.6% and 21%), ρ-cymene (21.6% and 10.8%), limonene (1.1% and 0.3%), and carvacrol (0.3% and 3.6%). In contrast, summer planting yielded thymol as the predominant component in seed and foliage oils (55.5% and 56.2%), trailed by γ-terpinene (22.5% and 26.9%), ρ-cymene (14.2% and 11.2%), limonene (1.9% and 0.5%), and carvacrol (0.3% and 1.4%) (Kambouche & El-Abed 2003).

The distillation of volatile oil from *T. ammi* showcased a composition of nine monoterpenes, encompassing seven hydrocarbons (97.1%) and two alcohols (2.9%). Prominent among these were γ-terpinene (35%), α-phellandrene (31.4%), o-carene (19.3%), p-mentha-1,3,8-triene (8.8%), p-cumin-7-ol (2.7%), β-pinene (1.9%), β-myrcene (0.4%), cis-myrtenol (0.2%), and Ot-pinene (0.3%) (Gaba et al., 2018). Particularly noteworthy was thymol (72.03% and 71.80%), the principal compound in seeds, succeeded by γ-terpinene and ρ-cymene. Additional nutritional elements such as protein, ash, moisture, fats, fibre, and carbohydrates were also approximated (Davazdahemami et al., 2011).

The identification of a methanol extract showcased robust antioxidant activity across multiple assays, including 2,2-diphenyl-1-picrylhydrazyl, hydroxyl radical, and nitric oxide scavenging, coupled with a notable ferric reducing antioxidant power (FRAP) value, surpassing hexane and dichloromethane extracts (Akhlaghi et al., 2018). Correspondingly, significant constituents in Algerian T. ammi oil were recognized, including isothymol (51.1%), ρ-cymene (14.1%), thymol (13.0%), limonene (11.8%), and γ-terpinene (6.8%) (Dhaiwal et al., 2017).

Furthermore, an identification of 44 compounds through GC and GC/MS analysis in North East Iran unveiled prominent components such as hexadecanoic acid (27.5%), ethyl linoleate (8.5%), 6-methyl-α-ionone (8.0%), isobutyl phthalate (5.8%), α-cadinol (4.7%), and germacrene D (4.3%) (Khan et al., 2020).

III. PHARMACOLOGICAL PROPERTIES:

3.1. Anti-inflammatory activity:

Allergic rhinitis is a condition characterized by the body's hypersensitive response to allergens. The inflammatory process plays a pivotal role in exacerbating the symptoms of this ailment. Notably, the use of ajwain oil has demonstrated a significant reduction (with a statistical significance of $p < .001$) in sneezing, nasal discharge, and nasal rubbing. Additionally, ajwain oil has shown the ability to increase the weight of the spleen, lungs, and the overall body.

Furthermore, ajwain oil has exhibited a substantial decrease (with a statistical significance of $p < .001$) in the levels of IgE, histamine, and MDA, while concurrently enhancing the levels of SOD, Nrf2, and HO-1. Additionally, ajwain oil has been observed to effectively decrease the counts of eosinophils, neutrophils, macrophages, and epithelial cells in the nasal passages.

One of the most significant findings is that ajwain oil exerts a notable inhibition (with a statistical significance of $p < .001$) on the activation of the NF-κBp65 and STAT3 signalling pathways. This inhibition has been linked to an amplification of the synthesis of anti-inflammatory cytokines, consequently leading to a reduction in the production of inflammatory molecules and allergen-specific type 2T helper cells (Th2) and Th17 cytokines.

Based on the amassed data, it is strongly implied that ajwain oil holds significant promise as an effective anti-allergic agent in mitigating the symptoms of allergic rhinitis in mice, largely due to its profound anti-inflammatory properties (Li et al., 2021).

3.2. Antitussive effects:

The study evaluated the antitussive effects of different concentrations of macerated and aqueous extracts, with codeine and carvacrol as reference drugs. The assessment was based on the count of induced coughing episodes. The findings clearly demonstrated a significant reduction in the frequency of coughing in the presence of ajwain extract at varying concentrations (Boskabady et al., 2005)

3.3. Antimicrobial effect:

In 2023, Nag & Gupta conducted a research study aimed at investigating the antimicrobial properties of *T. ammi* leaf extracts against various plant pathogens. Their findings revealed that the ethyl acetate leaf extract, prepared using a Soxhlet apparatus, exhibited a broad spectrum of antimicrobial activity across bacterial groups. The most significant inhibition zones were observed against Escherichia coli (NCIM 5346) and Pseudomonas aeruginosa, with diameters of 35mm and 30mm, respectively.

Concerning fungal pathogens, both ethanol and ethyl acetate extracts displayed notable inhibitory effects. Specifically, they demonstrated considerable inhibition percentages of 0.77% and 0.77% against Fusarium oxysporum (NCIM 1008), as well as 0.40% and 0.42% against Penicillium citrinum (NCIM 1435), respectively.

3.4. Antioxidant activity:

Through an in vivo study, the antioxidant and ameliorative effects of Ajwain extract were assessed concerning oxidative stress and toxicity induced by hexachlorocyclohexane (Rao et al., 2023). The outcomes of the investigation demonstrated that the consumption of dietary Ajwain extract led to a reduction in the toxicity arising from hepatic free radical stress caused by hexachlorocyclohexane (Anilakumar et al., 2009)

In a separate study conducted by Rao et al. in 2023, the focus was on investigating the stability of key compounds, sorption characteristics, as well as the antioxidant and antimicrobial capabilities of ajwain (*Trachyspermum copticum* L.) leaves that underwent solar drying. The process involved the transformation of fresh ajwain leaves (FAL) into solar-dried ajwain leaves (SDAL), which were then carefully enclosed in polyethylene pouches for subsequent analyses.

The nutritional analysis revealed that SDAL exhibited higher levels of protein, fiber, and mineral content compared to FAL. Notably, the active constituents like β-carotene (present in quantities of 17 and 89 mg/100 g) and total chlorophyll (with concentrations of 112 and 82 mg/100 g) were identified in FAL and SDAL respectively. Impressively, SDAL exhibited elevated levels of ascorbic acid and polyphenols.

The investigation into moisture sorption isotherms unveiled that SDAL exhibited non-hygroscopic behaviour and remained stable at room temperature. Assessed through methanolic extraction, the antioxidant activity of SDAL surpassed that of FAL. This phenomenon could be attributed to the augmented levels of ascorbic acid and total phenolics resulting from solar drying. Despite a reduction in ascorbic acid post-drying, the overall antioxidant activity actually increased. Notably, the ABTS antioxidant activity observed in the ajwain leaf extract was significantly influenced by the concentrations of polyphenols and ascorbic acid.

3.5. Antinociceptive activity:

Al-Khazraji in 2019 conducted a research study aimed at investigating the pain-reducing properties of an alcoholic extract derived from *T. ammi* in experimental animals. The study employed three different algesiometric methods and various doses of the extract. The findings revealed that the extract exhibited statistically significant results ($P < 0.05$), indicating its potential as an effective pain-relieving agent.

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The extract demonstrated a rapid onset of antinociceptive action, accompanied by a prolonged duration of effectiveness. Notably, the pain-relieving impact of the extract was counteracted by Metclopramide and Atropine. Importantly, the extract did not exhibit sedative effects.

Chemical analysis of the extract identified several active components, including alkaloids, flavonoids, steroids, and polyphenols, all of which contribute to its pain-reducing effects. This efficacy is attributed to the extract's interaction with dopaminergic and cholinergic muscarinic pathways. The collective outcome of this research underscores the extract's effectiveness in mitigating neural and inflamed pain, expanding its potential applications. These findings introduce a novel dimension to the study and affirm *T. ammi* as a promising botanical solution for alleviating various types of pain, validating its traditional uses as a pain-relieving plant.

3.6. Anthelmintic activity:

In research conducted by Tambe and Mahadik in 2020, they confirmed the significant anthelmintic attributes of leaf extracts from *T. ammi.* This investigation encompassed the evaluation of in-vitro anthelmintic capabilities using leaf extracts derived from ethyl acetate, chloroform, and petroleum ether on Indian earthworms (*Phertima prosthuma*). The earthworms were subjected to varying concentrations of these extracts, spanning from 20 to 100 mg/ml, alongside the standard drug Albendazole. Subsequent to exposure, the resulting paralysis and fatality durations were meticulously noted.

The findings unveiled a consistent decline in paralysis and mortality durations in tandem with the concentration of the extracts, mirroring the trend observed with Albendazole treatment. Noteworthy results emerged from the highest concentration of each extract, namely 100 mg/ml: for ethyl acetate, the mean paralysis time was 2.07 minutes, for chloroform, it was 4.65 minutes, and for petroleum ether, it was 9.47 minutes. Likewise, the mean mortality durations at this peak concentration were 6.17 minutes for ethyl acetate, and 9.8 minutes for both chloroform and petroleum ether extracts.

3.7. Antiepileptic activity:

Epilepsy is a collection of persistent neurological disorders characterized by recurring and unprovoked seizures. Latha et al. in 2018 conducted a study to assess the antiepileptic effects of Ajwain oil both independently and in conjunction with diazepam in Swiss albino mice. They employed two seizure-inducing models: Maximum Electro Shock (MES) and Pentylenetetrazole (PTZ).

A total of forty-eight Swiss albino mice of various genders were employed in the study. The animals were divided into two sets of twenty-four each, and within each set, they were further divided into four groups of six animals. In each set, the groups were administered different treatments: control group received 2% Tween 80 (10mg/kg), the standard group received Diazepam (2mg/kg), the test drug group received Ajwain oil (75mg/kg), and the adjuvant group received a combination of Ajwain oil (75mg/kg) and Diazepam (2mg/kg). All drugs were administered intraperitoneally, 30 minutes before inducing seizures.

The data was analysed using one-way ANOVA to compare the group means, followed by the post hoc Tukey's test for statistical assessment. In the MES model, the test drug exhibited statistically significant antiepileptic activity when compared to the control group, although the results were on par with the standard group. In the PTZ model, the adjuvant therapy demonstrated significant activity compared to the standard group, with a p-value of less than 0.001.

These findings clearly indicate that Ajwain oil possesses notable antiepileptic properties. Its effectiveness was evident in both seizure models, and its combined use with diazepam showed particularly promising results in the PTZ-induced seizure model.

3.8. Hepato-protective and Anti-hyperlipidaemic effect:

In a study conducted by Gilani et al. in 2005, it was observed that methanolic extract of Ajwain demonstrated significant in vivo hepatoprotective activity. The extract provided an impressive 80% protection against a normally lethal dose of paracetamol in mice. Furthermore, the extract exhibited preventive effects against the prolongation of pentobarbital sleeping time induced by CCl_4, and it helped restore the balance of hepatic enzymes, including Alkaline Phosphatase (ALP) and Aminotransferases (AST and ALT) during liver damage. Given the global increase in cardiovascular issues leading to higher mortality rates, often linked to dyslipidaemia, this research holds significance.

Another study explored the potential of methanol and aqueous extracts from *T. ammi* at varying doses (1 g/kg, 3 g/kg, and 5 g/kg) on rats. This investigation involved 45 male albino rats, divided randomly into nine groups (n = 5). After a single intraperitoneal injection of Triton X-100 (100 mg/kg), there was a noticeable increase in lipid levels within 24 hours. Interestingly, extracts at doses of 3 g/kg and 5 g/kg demonstrated the ability to reduce low-density lipoprotein levels while increasing high-density lipoprotein levels. Additionally, these extracts led to decreased levels of triglycerides and total cholesterol. Notably, the methanolic extract at the 5 g/kg dose exhibited antihyperlipidemic effects similar to those of a standard drug.

In another context, Javed et al. in 2009 investigated the potential of *T. ammi* Sprague, commonly known as Ajowan, seed powder in addressing hyperlipidaemia in albino rabbits. They induced hyperlipidaemia through unrestricted butter consumption and oral administration of cholesterol (400 mg/kg body weight). As a reference point, Simvastatin (marketed as Tablet Survive®), a synthetic cholesterol-lowering medication, was included.

Their findings revealed that a specific dosage of *T. ammi* seed powder (2 g/kg) exhibited noteworthy hypolipidemic effects, leading to substantial reductions of 49%, 53%, 71%, and 63% in total lipids, triglycerides, total cholesterol, and LDL-cholesterol, respectively. Strikingly, this dosage of *T. ammi* seed powder also resulted in a 62% increase in HDL-cholesterol levels. However, doses of 0.5 g/kg and 1 g/kg did not manifest antihyperlipidemic effects.

Both the 2 g/kg dosage of *T. ammi* seed powder and simvastatin (at 0.6 mg/kg body weight) exhibited comparable efficacy in treating hyperlipidaemia in albino rabbits. Furthermore, this specific dosage notably decreased cholesterol levels in the liver tissue. The mechanisms underlying these lipid-lowering effects are believed to involve enhanced elimination or breakdown of lipoproteins, inhibition of HMG COA reductase, and potential suppression of liver-secreted lysosomal lipid hydrolytic enzymes.

In another investigation, Saleem et al. in 2017 examined the potential antihyperlipidemic effects of aqueous and methanol extracts from *T. ammi* at varying dosage levels (1 g/kg, 3 g/kg, and 5 g/kg) in rats. This study employed 45 male albino rats, which were randomly distributed into nine equal groups (n = 5). To induce elevated lipid levels, a single intraperitoneal injection of Triton X-100 (100 mg/kg) was administered, and the effects were assessed 24 hours later.

The rats were orally administered aqueous and methanol extracts equivalent to the specified doses (1 g/kg, 3 g/kg, and 5 g/kg) for a duration of 21 days. The outcomes revealed that extracts at doses of 3 g/kg and 5 g/kg led to significant reductions in levels of total cholesterol, triglycerides, and low-density lipoprotein, while concurrently increasing the concentration of high-density lipoprotein in the serum. Furthermore, *T. ammi* extracts demonstrated the ability to decrease parameters related to liver function tests (LFT) and renal function tests (RFT) at

This suggests that *T. ammi* seed powder holds promise as a natural intervention for addressing elevated lipid levels, possibly through a combination of lipid-regulating mechanisms.

3.9. Anticandidal activity:

Wahab et al. in 2021 conducted a study exploring the effectiveness of ethanolic extract from *T. ammi* sprague seeds, as well as a hexanes fraction containing thymol, against Candida albicans—an organism responsible for candidiasis in individuals with compromised immunity or underlying conditions. The research encompassed both in-vitro and in-vivo assessments of their anticandidal properties.

In the laboratory setting, the hexanes fraction exhibited a minimal inhibitory concentration of 225 μg/mL, slightly higher than the established amphotericin B standard (200 μg/mL). Moving into an in-vivo scenario utilizing a BALB/c mice model with cutaneous candidiasis, an ointment containing the extract and fraction was topically administered at varying concentrations on the flank of the mice. Impressively, this approach led to substantial recovery rates ranging from 90% to 100% in the mice, surpassing the outcomes achieved with the conventional drug clotrimazole.

3.10. Antiviral Effects:

To assess the antiviral potential of Ajwain, an in vitro assay was conducted using the herb's methanolic extract. This study revealed noteworthy inhibitory effects on the protease of Hepatitis C Virus (HCV) (Hussein et al 2000).

3.11. Gastro Protective Activity:

The potential antiulcer effects of *T. ammi* fruit were studied through various animal models with ulcers. Gastroprotective and antiulcer properties were constantly demonstrated in the findings. Prior to inducing ulcers in the animal models, they were administered ajwain extract. The results indicated a considerable decrease in ulcer occurrence percentage among the treated animal models compared to both the control group and the standard reference group (Komeili & Soluki, 2012).

3.12. Hypotensive activity:

Using a 70% methanol extract of Ajwain seeds, a dose-dependent decrease in mean arterial blood pressure (BP) was observed. The reduction ranged from approximately 6% at a 3.0 mg/kg dose to around 42% at a 100.0 mg/kg dose. Additionally, the hypotensive impact of acetylcholine at 1 µg/kg was comparable in strength to the effect produced by ajwain extract at 30.0 mg/kg, as reported by Gilani et al. in 2005.

IV. CONCLUSION:

Trachyspermum ammi, commonly known as Ajwain, has remarkable significance as a medicinal plant. It has an extensive history of medicinal and dietary applications. Ajwain seeds possess stimulant, antispasmodic, and carminative properties, and have been traditionally employed as a crucial remedy for conditions such as flatulence, atonic dyspepsia, diarrhoea, abdominal tumours, abdominal pains, piles, bronchial issues, lack of appetite, galactagogue, asthma, and amenorrhea. Its medicinal value is emphasized by its proven pharmacological activities encompassing antifungal, antibacterial, antioxidant, antimicrobial, antinociceptive, cytotoxic, hypolipidemic, antihypertensive, antispasmodic, broncho-dilating actions, along with roles in antilithiatic, diuretic effects, abortifacient properties, antitussive capabilities, nematocidal attributes, and efficacy as an anthelmintic and antifilarial agent. However, even with a number of experimental and animal inquiries, lack of thorough clinical trials concentrating on the mentioned effects remains an ongoing constraint in confirming the traditional knowledge.

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CONFLICT OF INTEREST:
No conflict of interest

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