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Research Article

Pharmacognostic Evaluation of *Trachyspermum ammi* (Ajwain)

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Abstract

Trachyspermum Ammi leaves are commonly called Ajowan belong to the family 'Apiaceae'. Its fruits yielded 2% to 4% essential oil, with thymol as the major constituent (35% to 60%). It also contains monoterpenoids and reports some new constituents. The plant is used traditionally as a stimulant, carminative, flatulence, atonic dyspepsia, diarrhoea, abdominal tumours, abdominal pains, piles, and bronchial problems, lack of appetite, galactogogue, asthma and amenorrhoea. It possesses various pharmacological activities like antifungal, antioxidant, antimicrobial, antinociceptive, cytotoxic activity, hypolipidaemic, antihypertensive, antispasmodic, broncho-dilating actions, antilithiasis, diuretic, abortifacient, antitussive, nematicidal, anthelmintic and antifilarial activity. This review deals with the evidence-based information regarding the pharmacological activity of *Trachyspermum ammi.*

Keywords: *Trachyspermum ammi,* Apiaceae, Ajowan leaves, constituents, pharmacological activities.

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1. Introduction

Medicinal plants have long served as a significant source of various pharmacological activities. Among these, species with anthelmintic properties have attracted particular attention due to their effectiveness in combating diseases that lead to considerable economic losses and diminished livestock productivity. Such pathogenic infections often result in high mortality rates and additional challenges, especially when resistance to anthelmintic agents develops within host organisms [1]. Although numerous synthetic drugs have been produced, they frequently cause adverse side effects that can outweigh the benefits of treatment [2].

Herbal medicines encompass the knowledge and application of natural remedies for the prevention, diagnosis, and management of physical, mental, or social health disturbances. Healthcare costs are escalating rapidly across the globe, increasing the demand for herbal alternatives. Simultaneously, the global market for phytopharmaceuticals continues to expand markedly [3]. According to World Bank estimates, the international trade in medicinal plants, botanical drug products, and raw materials is increasing at an annual rate of 5% to 15% [4].

Trachyspermum ammi sprague is an annual herbaceous plant bearing the greyish brown fruits or seeds. An erect, glabrous or minutely pubescent, branched annual, up to 90 cm tall, cultivated almost throughout India [5]. Stems striate; leaves rather distant, 2-3 pinnately divided segments linear, ultimate segments 1.0-2.5 cm long; flowers in terminal or seemingly-lateral pedunculate, white, small, fruits ovoid, muricate, aromatic cremocarps 2-3 mm long, compounds umbels, grayish brown; mericarp compressed, with distinct ridges and tubercular surface, one-seeded. Flowers and fruits bearing from January – April [6].

It belongs to the family 'Apiaceae' comprising 270 genera and species, mostly grown in the temperate regions of the world but species which are cultivated in tropical regions.

Ajwain is grown in Iran, Egypt, Afghanistan and India (largely in Uttar Pradesh, Bihar, Madhya Pradesh, Punjab, Rajasthan, Bengal, Tamil Nadu and Andhra Pradesh). It is generally grown in the month of October November and harvested in May -June. Though the plant is widely cultivated, it is indigenous to Egypt where it grows as a common weed in the fields [7].

1.1 Medicinal uses:

In the Indian system of medicine, ajwain is administered for stomach disorders, a paste of crushed fruits is applied externally for relieving colic pains; and a hot and dry fomentation of the fruits is applied on the chest to cure asthma. Ajwan-ka-arak (aqueous extract) is popular preparation for diarrhoea [8]. Therapeutic uses of *T. ammi* fruits include stomachic, carminative, expectorant, antiseptic, amoebiasis and antimicrobial activity. It also cures abdominal tumor, abdominal pains and piles [9]. It's also prescribed to comfort dipsomania, hysteria, sore throat; many ajowan ayurvedic formulations are available which is given to overcome infections with worms. It is also used for relieving flatulence, dyspepsia, spasmodic disorders, flatulence, common cold, acute pharyngitis, sore and congested throat [10].

1.2 Adulteration

Ajowan seed is available both as whole and in ground form. It is adulterated by the addition of exhausted or spent seed (from which oil or oleoresin has been extracted) excess stems, chaff and earth or dust [11]. The oil is also adulterated with ajowan chaff oil. The range of essential oil is 2–4% and it should contain thymol ranging from 35 to 60%. If chaff oil is added, the thymol content will reduce to below 35% [12]. The oleoresin may be adulterated by adding synthetic saturated acid. Detection of these adulterants can be done by gas chromatography or by thin layer chromatography coupled with high-performance liquid chromatography [13].

The adulteration at any level can be detected by using the specifications as explained separately for whole seed, powdered seed, volatile oil and oleoresin. The seeds are sometimes adulterated with ban ajwain [Seseli diffusum (Roxb. ex. Sm.)] or randhuni [Apium graveolens (Linn.) Sprague] [14]. The adulteration can be detected by thin layer chromatography using benzene: petrol (1:7). Reported phytoconstituents: Ajwain seed possessed fibre (11.9%), carbohydrates (38.6%), tannins, glycosides, moisture (8.9%), protein (15.4%), fat (18.1%), saponins, flavone and mineral matter (7.1%) containing calcium, phosphorous, iron and nicotinic acid [15].

Fig. 1: *Trachyspermum ammi* leaves

2. Materials and Methods:

2.1 Collection of plant materials:

The leaves of *Trachyspermum ammi* were collected from the local area. The plant drugs were identified, collected, authenticated and stored for further use [17].

2.2 Preparation of Extracts:

The powder of the *Trachyspermum ammi* was extracted with ethyl acetate, methanol and water, respectively. A total 50gm of individual plant powder of the *Trachyspermum ammi* was taken and mixed with 250 ml distilled water (1:5) in a round-bottom flask and gently refluxed for ½ hour separately [18]. The residue was removed by filtration through Whatmann No.1 filter paper, and the aqueous extract was concentrated by evaporation using a rotary evaporator to get a solid yield extract [19].

2.3 Physicochemical Investigations:

Six samples of powder drug were subjected to the determination of physicochemical parameters such as loss on drying, ash values, pH value, and extractive values according to the methods recommended by the World Health Organization [20].

2.4 Determination of pH

The pH of different formulations in 1% w/v (1g: 100ml) of water-soluble portions of plant powder of *Trachyspermum ammi* were determined using pH meter [21].

2.5 Moisture content (LOD) (Gravimetric determination)

Placed separately about 1.0g of whole plant powder of the *Trachyspermum ammi* in an accurately weighed moisture disc for estimation of loss on drying, it was dried at 105°C for 5 hours in an oven, cooled in a desiccator for 30 minutes, and weighed without delay. The weight change was calculated as the content in mg/g of air-dried material [22].

2.6 Determination of water and methanol-extractable matter:

Separately placed about 5.0g of whole plant powder of the *Trachyspermum ammi* in an accurately weighed, glass stoppered conical flask. For estimation of hot water-extractable matter, 100ml of distilled water was added to the flask and weighed to obtain the total weight including the flask [23]. The contents were shaken well and allowed to stand for 1 hour. A reflux condenser was attached to the flask and boiled gently for 1 hour; cooled and weighed. The flask was readjusted to the original total weight with distilled water and it was shaken well and filtered rapidly through a dry filter [24]. Then 25 ml of the filtrate was transferred to an accurately weighed, tarred flat-bottomed dish (Petri dish) and evaporated to dryness on a water-bath. Finally, it was dried at 105°C for 6 hours in an oven, cooled in a desiccator for 30 minutes, and weighed without delay. Same procedure was followed using ethanol instead of distilled water to determine extractable matter in ethanol. The extractable matter was calculated as the content of active ingredient in mg per g of air-dried material [25].

2.7 Determination of total ash:

Accurately weight 2 g. of the whole plant powder of *Trachyspermum* ***ammi*** was placed in a previously ignited (350°C for 1 hour) and tared crucible [26]. Dried material was spread in an even layer in the crucible and the material ignited by gradually increasing the heat to 550°C for 5 hours in a muffle furnace until it was white, indicating the absence of carbon. Cooled in a desiccator and weighed. Total ash content was calculated in mg per g of air-dried material [27].

2.8 Determination of acid-insoluble ash:

25 ml of hydrochloric acid (~70g/l) TS was added to the crucible containing the total ash, covered with a watch-glass and boiled gently for 5 minutes. The watch-glass was rinsed with 5 ml of hot water and this liquid added to the crucible. The insoluble matter was collected on an ash less filter-paper (Whatmann 41) and washed with hot water until the filtrate was neutral. The filter-paper containing the insoluble matter was transferred to the original crucible, ignited by gradually increasing the heat to 550°C for 3 hours in a muffle furnace to constant weight. Allowed the residue to cool in a suitable desiccator for 30 minutes, and then weighed without delay. Acid-insoluble ash content was calculated as mg per g of air-dried material [28].

2.9 Determination of water-soluble ash

25 ml of water was added to the crucible containing the total ash, covered with a watch glass and boiled gently for 5 minutes. Insoluble matter was collected on an ash less filter paper. Washed with hot water and ignited in a crucible for 15 minutes at a temperature not exceeding 450°C in a muffle furnace. Allowed the residue to cool in a suitable desiccator for 30 minutes, and then weighed without delay. The weight of the residue was subtracted in mg from the weight of total ash. Water-soluble ash content was calculated as mg per g of air-dried material [29].

2.10 Determination of sulfated ash

Ignited a crucible (silica) at 550°C to 650°C for 30 minutes, cooled the crucible in a desiccator (silica gel) and weighed it accurately. One gram of the plant powder of the *Trachyspermum ammi* was placed in a previously ignited crucible, ignited gently at first, until the substance was thoroughly white. Cooled and moistened the sample with a small amount (usually 1 ml) of sulfuric acid (~1760 g/l) TS, heated gently at a temperature as low as practicable until the sample is thoroughly charred. After cooling, moistened the residue with a small amount (usually 1 ml) of sulfuric acid (~1760 g/l) TS, heated gently until white fumes were no longer evolved, and ignited at 800°C until the residue is completely incinerated. Ensure that flames were not produced at any time during the procedure. Cooled the crucible in a desiccator, weighed accurately. This was repeated until the sample reaches a constant weight and calculated the percentage of residue [30,31].

3. Results and Discussion

3.1 Physicochemical Investigation:

Physicochemical parameters were determined as per guidelines of WHO, air dried coarse powdered sample of *Trachyspermum ammi* was subjected for determination of physicochemical parameters such as pH, foreign organic matter, methanol soluble extractives, water soluble extractives, total ash content, acid insoluble ash, water soluble ash, loss on drying and % moisture content were determined. The average physicochemical parameters of the *Trachyspermum ammi* course powder ware mention in table 1&3.

Table 1: Physicochemical Parameters of *Trachyspermum ammi plant*

S.N.	Parameters	Values
1	pH range	3.25±0.01
2	Loss on drying	8.20±0.10
3	Methanol soluble extractive value	15.56±0.20
4	Water-soluble extractive value	13.20±0.50
5	Total ash value	4.25±1.10
6	Water-soluble ash	2.10±0.05
7	Acid insoluble ash	1.35±0.20
8	Sulphated ash	1.20±0.10

3.2 Extraction of Plant Drug:

The plant leaves powder of the *Trachyspermum ammi* were extracted using solvents ethyl acetate, methanol and water, respectively. The solvent was removed and the practical yield was found and recorded. The findings were mentioned in Table 2.

Table. 2: Extractive values of *Trachyspermum ammi*

Solvent	Yield (g)	% Yield
Ethyl acetate	2.5	5%
Methanol	2.0	4%
Water	3.5	7%

Table 3: Preliminary Phytochemical screening of plant *Trachyspermum ammi*

S.N.	Phytoconstituents	Ethyl acetate Extract	Methanol Extract	Water Extract
1.	Alkaloids	+	-	-
2.	Tannins	-	+	+
3.	Flavonoids	+	+	+
4.	Steroids	-	-	-
5.	Phenolic Compounds	-	-	+
6.	Coumarins	-	-	-
7.	Proteins	-	+	-
8.	Quinones	-	-	-
9.	Anthraquinones	-	-	-
10.	Saponins	+	+	-
11.	Reducing sugars	-	-	+
12.	Fixed oils and fats	-	-	-

5. Conclusion:

In the current work some plants of Apiaceae family were selected for the assessment of phytochemical and physicochemical parameters. These parameters studies are carried out to confirm the identity of plant and ascertain the quality and purity of the drug material. So these parameters may be useful for the better investigations in respect to plant drugs. The preliminary phytochemical screening of the ethanol and water (hot) extracts of plant powder of *Trachyspermum ammi* were carried out using standard laboratory procedures, to detect the presence of different secondary metabolites (phytochemical constituents) such as alkaloids, flavonoids, saponins, tannins, steroid glycosides, phenols, coumarins, reducing sugars, protein, anthraquinones, quinines, Fixed oils and fats. The generated results of the present study will provide data which is helpful in the correct identification and authentication of this medicinal plant and may help in preventing its adulteration.

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