



## A Review on Iranian *Carum copticum* (L.): Composition and Biological Activities

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### Authors' contributions

This work was carried out in collaboration between both authors. Authors BFN and ZF designed the study, wrote the first draft of the manuscript. Both authors read and approved the final manuscript.

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Review Article

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### ABSTRACT

**Aims:** This paper examined thoroughly chemical composition and biological properties of *Carum copticum*.

**Study Design:** Introduction on curtain characteristic of medicinal Ajowan (*Carum copticum* (L.)).

**Place and Duration of Study:** Center of Agricultural Biotechnology, University of Zabol, 2015.

**Introduction:** *Carum copticum* medicinal plant with the scientific name of *Carum copticum* Heirn is belong to *Umbelliferae* family and *Trachyspermum copticum* genus and the Latin name of the species Ajowan is also similar to the local pronunciation Sistani ajqu. Herbaceous plants, annuals and native Sistan region that has existed since ancient times in the area of medication and had been used to therapy; *Carum copticum* is wild in eastern India, Iran and Egypt, and in the same area as many points with the same weather were cultured. The plant's most important ecological regions in Iran, Sistan and Baluchistan, Azerbaijan, Isfahan, Khuzestan, Fars, Kerman and Khorasan.

**Conclusion:** The fruits of this plant essences 4%, and that's the most important ingredient thymol, 45 per cent. The main object of this essential oil contains as much as 5.22 percent  $\gamma$ -terpinen,

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p-cymene rate of 22 percent, and other compounds such as  $\alpha$ -pinene, Cymene, limonene, Pinene, Dipentene, Terpinene and Carvacrol with smaller amounts of oil. *Ajowan* or plant seeds are antispasmodic, tonic, stimulant, carminative and is commonly used in making linoleum that enters for pain relief. Crushed and taken internally as a remedy to relieve stomach disorders, liver and throat problems, cough, rheumatism administered. *Ajowan* is rich source of thymol, known antiseptics, carminative, and tonic, strengthen the stomach, as well as to interrupt acute abdominal pain or diarrhea, relieve indigestion, colic and prescribed medication abuse. The root decoction is also used as a diuretic and carminative and also *Ajowan* can be against some microbes such as *Salmonella Typhosa*, *Micros-Porum Progenies* and *Escherichia* effect. In addition, *Carum copticum* products in powder form, Deodorant, ointments, lotions and solutions offered in the market.

**Keywords:** *Ajowan*; *Carum copticum* (L.) link; *Trachyspermum copticum*; therapy properties; disinfectant.

## 1. INTRODUCTION

*Ajowan* (*Carum copticum* L.) with 2n=18 chromosomes is a medicinal plant belonging to Apiaceae family [1] (Table 1). *Ajowan* (pronounced aj'o-wen) is a member of the *Umbelliferae* family, which has some 2,700 members including dill, caraway and cumin [2]. It is an annual and cross-pollinated plant that grows in the east of India, Iran, Pakistan and Egypt with white flowers and small brownish fruits [3]. *Ajowan* is one of the aromatic seed spices, which is generally used as a digestive stimulant or to treat liver disorders. The phytochemical studies on *Ajowan* seeds have revealed the presence of multiple constituents such as steroptin, cumene, thymene, amino acids like lysine and threonine, calcium, iron, starch, tannins and dietary fiber [1]. Seeds also contain essential oil (2–3%), which has thymol (40–50%),  $\gamma$ -terpinene, p-cymene,  $\alpha$ -pinene,  $\beta$ -pinene and carvacrol [4].

*Ajwain*, *ajowan* or *ajwan*, also *carom* (*Trachyspermum ammi*) is an annual herb in the *Apiaceae* family. It is originated in the eastern Mediterranean, possibly Egypt, and spread up to India from the Near East. Both the leaves and the fruit pods (often mistakenly called seeds) of the plant are used for human consumption. The plant is also called bishop's weed, but this is a common name it shares with some other different plants. The 'seed' (i.e., the fruit pod) is often confused with lavage seed [5] (Fig. 1). It is mostly found in Indian cooking, where it is also known as bishop's weed or carom. It is particularly suited to the delicate vegetarian fare found in the state of Gujarat [2].

*Ajowan* plant with Local pronounced Ajqu is known from the plant *Carum copticum* which has existed in ancient Sistan region and was being

used for medical treatment, as *Carum copticum* is wild plant in eastern India, Iran and Egypt and also grows in the same areas and many places with a similar climate to grow well. This plant grows in most regions, including the provinces of Sistan and Baluchistan, Azerbaijan, Isfahan, Khuzestan, Fars, Kerman and Khorasan. The dark plant parsley (*Umbelliferae*) and so it is interesting *Trachyspermum copticum* and *Ajwain* is also known as the Latin name based on linguistic considerations, it's pronounced Ajqu in Sistan [6-8].

**Table 1. Botanical profile, latin and scientific names of *Carum copticum***

<b>Flowers of <i>Trachyspermum ammi</i></b>	
<b>Scientific classification</b>	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Apiales
Family:	Apiaceae
Genus:	<i>Trachyspermum</i>
Species:	<i>T. ammi</i>
<b>Binomial name</b>	
<b><i>Trachyspermum ammi</i></b>	
<b>Sprague</b>	
<b>Synonyms</b>	
<b><i>Ammi copticum</i> L.</b>	
<b><i>Carum copticum</i> (L.)</b>	
<b><i>Trachyspermum copticum</i></b>	
Other names	Ajave Seeds, Ajowan, Ajvain, Ajwan, Bishop's Weed, Carom, Ethiopian Cumin, Omam, Omum
Iran:	Ajowan; French: Ajowan;
German:	Ajowan
Italian:	Ajowan; Spanish: Ajowan;
Indian:	ajvini, ajwain, javane



Fig. 1. Images of plant and seed of *Carum copticum*

## 2. MORPHOLOGY CHARACTERISTIC

An erect, glabrous or minutely pubescent, branched annual. The stems are striate; the leaves are rather distant, 2-3-pinnately divided, the segments are linear. The flowers occur in terminal or seemingly-lateral pedunculate, compound umbels, white and small; the fruits are ovoid, muricate, aromatic cremocarps, greyish brown; the mericarps, which are the components of the fruit, are compressed, with distinct ridges and tubercular surface, 1-seeded [9].

Ajowan is an annual herbaceous, 30 -70 cm (1 -2 ft.) in height, bearing feathery leaves and red flowers. When the seeds are ripe, they are dried and threshed. Ajowan is native to India, but it is also cultivated in Iran, Egypt, Pakistan and Afghanistan [2].

### 2.1 Cultivation

The plant is mainly cultivated in Iran and northern India [10]. Rajasthan produced about 55% of India's total output in 2006 [11].

A study to determine the effect of different planting times on adaptability, yield and essential oil content of Ajowan seeds in the four sowing dates (November, December, January and February) were cultivated fruit crop after harvest coincides with the essential oils were obtained by distillation with water. The results showed that planting dates had no significant effect on yield, growth and adaptation of plants in the climatic

conditions of the region, so that, planting late in March caused a sharp decline in the performance. Essential oil content also showed significant differences in different planting dates, such that sown in November and December, the highest essential oil content (08.04) and planted in February and March the lowest essential oil content (3.3), respectively. The results suggest that culture Ajowan November and December have the best compatibility with the weather conditions in Sistan region with the highest yield and essential oil content in the produced planting dates [12].

### 2.2 Preparation and Storage

*Carum copticum* often, they are wasting their hand or with a finger or the like breaks. Barasa for bread (a type of fried bread in Hindi) and other types of bread, *Carum copticum* grind slowly, it makes seeds after oil and bread to give more flavor. These medicines could be stored indefinitely. Away from light and in sealed containers.

### 2.3 Cooking with Ajwain

*Ajowan* combination with cookies and bread Darmsl starchy food (especially bread Barasa) has a unique taste. This spice is also to provide a variety of snacks, such as "snack Bombay mix" is potatoes and meatballs taste green beans and root vegetables such as carrots and the press and the turnips. *Carum copticum* spices curry powder is sometimes used in combination.

## 2.4 Principal Constituents

*Carum copticum*, is one of the most important medicinal plants that have cholesterol-lowering properties, affecting the activity of digestive enzymes in the pancreas and small intestine, fungal infections, clean the blood flow, calming and pain is all. Thymol, is a component of the active ingredient of the medicinal properties of this plant and have effect on blood pressure. Gamatrypynn other components of this essential oil that is used in perfumery. Parasympyn the other components of this essential oil is the most important biological characteristic is that the pores are able to deliver different drugs. Genetic factors and environmental factors is leading to secondary metabolites made. Environmental factors have a significant impact on the quantity and quality of products derived from herbs. The difference between the rates of fertilizers, is one of the influential factors to achieve good conditions during the period of growth and development to achieve maximum performance and quality of the medicinal plants. Application rates can impact vegetative and reproductive growth stages of different plant nutrients and through the growth and crop yield is affected. Manure management is an important factor in the success of the cultivation of medicinal plants and accordingly identify environmentally appropriate fertilizers for plants can have favorable effects on crop quantity and quality indicators [13]. Compound present in Ajowan has been reported to be a germicide, antispasmodic and antifungal agent [14]. Thymol is also used in toothpaste and perfume industries [15-17].

## 2.5 Ajowan Seeds Components

Seed *Carum copticum* seeds are very rich in essential oils such as thyme species, especially the "thymol" in this essential component of semen, alpha and Btapyynn there are also identified in the chemical composition of the Ajowan essential oil thymol, Kamatrypyn and original composition Parasympyn Ajowan essential oil form. The smell is caused by the seeds of its thymol.

- ✓ **Moisture:** 8.9 per cent
- ✓ **Protein:** 15.4 per cent
- ✓ **Fat** [ether extract]:18.1 per cent
- ✓ **Crude fiber:** 11.9 per cent
- ✓ **Carbohydrates:** 38.6 per cent
- ✓ **Mineral matter** [total ash: 7.1 per cent
- ✓ **Calcium:** 1.42 per cent
- ✓ **Phosphorus:** 0.30 per cent

- ✓ **Iron L:** 14.6 mg/100 g
- ✓ **Calorific value...**379/100 g.

Steam distillation of crushed seeds yields 2.5 to 4.0 per cent essential oil which is valued considerably in medicine on account of the presence of thymol therein. Ajowan seeds are distilled in India, partly in primitive native stills and partly in more modern and large-scale distilleries. Prior to and during World War I, considerable quantities of Ajowan seed were exported from India for distillation in Europe and the United States. The oil was the principal source of thymol for a long time. However, when the introduction of synthetic thymol, the distillation of Ajowan oil outside India has partially ceased, and the oil has lost its former importance. However, the demand situation is fast changing now with more demand for natural goods than synthetic goods. This changing scenario may put India to advantageous position only if India is in a position to meet the demand. We have necessary resource, since India produces sufficient Ajowan. We are only to gear up production of Ajowan oil with right quantity of thymol so that, we shall be in a position to meet expected global demand. The standard technology with various schemes. Is available. We shall only to plan and implement [18].

In a study at the Faculty of Pharmacy, Tehran University of Pharmacy doctoral thesis in 1996 had been on the market for the first time *Carum copticum* and retail oil explorations were studied. In this study it was found that the fruits of this plant essences 4%, and that's the most important ingredient thymol, 45 per cent. The main object of this essential oil contains as much as 5.22 percent  $\gamma$ -terpinen, p-cymene rate of 22 percent, and other compounds such as  $\alpha$ -pinene, Cymene, limonene, Pinene, Dipentene, Terpinene and Carvacrol with smaller amounts of oil there [19] and its main active ingredient is 50% thymol.

## 2.6 Ajowan Oil

Ajowan seeds consist of moisture, protein, fat, minerals, fiber, carbohydrates, calcium, phosphorus, iron, carotene, thiamin, riboflavin and niacin. This is precious and well known in medicinal drug on account of the component known as thymic acid. The ajowa oil is an almost colorless to brownish liquid with odour and a sharp hot taste characteristic. Ajwain water is the water distilled from the seeds in an excellent carminative that cures flatulence, indigestion & low appetite.

Oil of Ajowan is an almost colorless to brownish liquid, which has a characteristic odor and a sharp burning taste. On standing, a part of the thymol may separate from the oil in the form of crystals, which is sold in Indian market under the name of `Ajowan ka phul` or `Sat Ajowan` and is much valued in medicine, as it has nearly all the properties ascribed of Ajowan seeds. This was used in surgery as an antiseptic and was also found to be of great value in the treatment of hookworm disease. The aqueous solution of thymol is an excellent mouthwash and thymol is a constituent of many toothpastes. Extracts of seeds in 70 per cent and 40 per cent alcohol are toxic to Staphylococci and Escherichia coli. There are a number of medicinal virtues for this spice has and is considered as an important herb in case of Indian systems of medicine. Therefore there is possibility of using this source for planning projects for manufacture of various medicinal preparations [18].

Ajowan oil is used as a tranquilizer or for whooping cough and toothaches in India. Ajowan seed oil is enormous assistance to those who are suffering from a painful throat as well. Ajowan Oil is used in Medicines & Pharmaceutical and seasoning of soups and Salad etc. Ajowan oil is: Anti-infectious, Antibacterial, Antiviral, Anti-fungal, Anti-parasitic, Antiseptic, Anti-nausea and Tonic.

## 2.7 Ajwain Fruit Pods

The small fruit pods are pale brown and have an oval shape, resembling caraway and cumin. It has a bitter and pungent taste, with a flavor similar to anise and oregano. They smell almost exactly like thyme because it also contains thymol, but is more aromatic and less subtle in taste, as well as slightly bitter and pungent. Even a small amount of fruit pods tend to dominate the flavor of a dish [20,10].

## 2.8 Culinary Uses

The fruit pods are rarely eaten raw, they are commonly dry-roasted or fried in ghee, clarified butter. This allows the spice to develop a more subtle and complex aroma. It is considered to be an anti-flatulent, a spice which reduces the gaseous effects of beans and other legumes [5 the fruit pods are sprinkled over bread and biscuits]. In Afghanistan [21].

## 2.9 Medicinal Properties of *Carum copticum*

*Carum copticum* medicinal plant with the scientific name *Carum copticum* Heirn and annual herbaceous plant belonging to the Apiaceae family and its fruit, which contains 5-2% of oil is used medicinally. Ajowan or plant seeds such as caraway warm and dry in nature, and their properties are antispasmodic, tonic, stimulant and carminative [13] and is commonly used in making linoleum that enters for pain relief. Crushed and taken internally as a remedy to relieve stomach disorders, liver and throat problems, cough, rheumatism administered [22, 23]. Ajowan is rich source of thymol, known antiseptics [17,24]. India Ajowan as antiseptic and carminative and tonic, strengthen the stomach, as well as to interrupt acute abdominal pain or diarrhea and relieve indigestion and colic and prescribed medication abuse. The root decoction is also used as a diuretic and carminative. The amount of food in domestic consumption such as caraway is slightly less than it. It should be noted that the hot-tempered person use it or not, when required to eat small amounts and combined with medicinal plants of cold. In addition, *Carum copticum* products in powder form, Deodrant, ointments, lotions and solutions offered in the market. Ajowan can be against some microbes such as Salmonella Typhosa, Microsporum pyogenes and Escherichia effect [12,25,26].

## 3. PHARMACOLOGY

Preliminary pharmacological studies of the oil indicated that it had a para sympathomimetic effect and produced contraction of the isolated ileum, tracheal chain and bronchial musculature in guinea pigs. It depressed the cardiac musculature in frogs and caused a marked fall in blood pressure in cats. On account of its low toxicity, further trials of the oil as a hypotensive agent are recommended. The drug also seems to possess some anti-diuretic effect [9].

### 3.1 Health Benefits

Ajowan seeds contain an essential oil which is about 50% thymol which is a strong germicide, anti-spasmodic and fungicide. Thymol is also used in toothpaste and perfumery. It is used in a steeped liquid form against diarrhea and flatulence. In India the seeds are used as a household remedy for indigestion and colic, and

used in poultices to relieve asthma and arthritis. It also has aphrodisiac properties and the Ananga Ranga prescribes it for increasing a husband's enjoyment in his middle years [2].

### 3.2 Indications

Ajowan is much valued for its antispasmodic, stimulant, tonic and carminative properties. It is administered in flatulence, atonic dyspepsia and diarrhea, and often recommended for cholera. In the Unani system, Ajowan is used as a crude drug to enhance the body's resistance, and is prescribed in amebiasis. It is a potent antimicrobial agent [9].

### 3.3 General Discussion

Ajowan, medicinal plant, which is native in Sistan region since ancient times, it is used for medical purposes a lot of and has a large amount of oil, that the oil contains chemicals such  $\alpha$ -pinene, p-cymene, limonene,  $\gamma$ -terpinen, Pinene, Cymene, Dipentene, Terpinene, Carvacrol and its main active ingredient is 50% thymol. Over the years, the use of indiscriminate harvesting of medicinal plants and herbs from nature, and even increased in some cases, some of which are endangered [14] As a result, researchers are trying to use the techniques of tissue culture and rapid method for mass propagation of plants found to be both safe timely plant source for the pharmaceutical industries to provide And appropriate explants at low temperatures in the gene bank to avoid extinction. Because to date no research has been done Biotechnology on Ajowan As a result, the importance of the initiative in this regard will be *Carum copticum* to commercially harvest the oil from the plant tissue culture techniques can be used to quickly attempts to reproduce it and the oil extracted with a faster rate. It should therefore be noted that research has been conducted on different plants [27].

## 4. CONCLUSION

*Carum copticum* medicinal plant is contains 5-2% of oil and oil is contain about 50% thymol which is a strong germicide, anti-spasmodic and fungicide. Thymol is also used in toothpaste and perfumery. It is used in a steeped liquid form against diarrhea and flatulence. Preliminary pharmacological studies of the oil indicated that it had a para sympathomimetic effect and produced contraction of the isolated ileum, tracheal chain and bronchial musculature. On

account of its low toxicity, further trials of the oil as a hypotensive agent are recommended. The drug also seems to possess some anti-diuretic effect and also their properties are antispasmodic, tonic, stimulant, carminative, strengthen the stomach, as well as to interrupt acute abdominal pain or diarrhea and relieve indigestion and colic and prescribed medication abuse and is commonly used in making linoleum that enters for pain relief. Crushed and taken internally as a remedy to relieve stomach disorders, liver and throat problems, cough, rheumatism administered. Ajowan is rich source of thymol, known antiseptics. The root decoction is also used as a diuretic and carminative. It should be noted that the hot-tempered person use it or not, when required to eat small amounts and combined with medicinal plants of cold and can be against some microbes such as Salmonella Typhosa, Microsporum pyogenes and Escherichia effect.

Because of Origin of Ajowan is Iran and the author of this manuscript has decided and achieved to pursue his researchers on Ajowan such as Mass production of secondary metabolites Ajowan in the center of Agricultural Biotechnology, University of Zabol.

### NOTE

*Carum copticum* is medicinal plants that was used in traditional medicine in the region of sistan as antiemetic, carminative, tonic, reduce blood cholesterol and relieve spasms mentioned [10,6,22,23] but *carum copticum* medication to treat more than this level, is not the responsibility of the authors.

### CONSENT

It is not applicable.

### ETHICAL APPROVAL

It is not applicable.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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