

Status of Diseases of Ajwain (*Trachyspermum ammi* L.)

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Abstract

Ajwain (*Trachyspermum ammi* L.), a medicinal spice crop, is grown throughout the country, but Rajasthan and Gujarat are major producers in India. Even though ajwain has numerous medicinal and biological qualities, it is afflicted by a variety of plant pathogenic microorganisms such as fungi (root rot, wilt, seed rot, leaf spot and powdery mildew), phytoplasma (*Trachyspermum* little leaf) and nematodes (*Tylenchorhynchus* sp., *Helicotylenchus* sp.), which cause damage to plants, resulting in a loss of productivity. In the current context, a brief status of severe diseases of ajwain and their symptoms and management are discussed.

Keywords: Ajwain, *Trachyspermum ammi* L., Crop, Diseases.

Introduction

Ajwain (*Trachyspermum ammi* L.) is an annual herbaceous medicinal plant of the Apiaceae family and named carum ajowan and bishop's weed². In India, it is mostly farmed in Rajasthan and Gujrat in the dry and semi-arid regions³. In Rajasthan, Ajwain is mostly grown in Chittorgarh, Udaipur, Rajsamand, Bhilwara, Kota, Tonk, Pratapgarh, Nagaur, Ajmer, Jalore, Jhalawar, Jaipur and Pali districts⁴. The cultivated area of ajwain is 27.83 thousand ha, and their production in the country is 16.83 thousand tonnes. The yield of ajwain is 605.33 kg/ha. The total area and output shared by ajwain among seed spices in India are 0.83 percent and 0.26 percent, respectively⁵. Ajwain ranks first in India in cultivation and production, followed by fennel, cumin, and fenugreek⁶⁻⁷. Ajwain seeds are used to impart aroma and flavour in addition to food preservative and medicinal property.

Review of Literature

Ajwain is affected by some fungal diseases which cause disease like leaf spot (*Alternaria alternata*), wilt (*Fusarium oxysporum*), root rot (*Rhizoctonia solani*), powdery mildew (*Erysiphe polygoni*), seed rot (*Aspergillus* sp., *Penicillium capsulatum*) and stem rot (*Sclerotinia sclerotiorum*)⁸⁻¹¹, Phytoplasma and nematodes. The infection of these microbes results in yield loss as well as quality of seed. In this study, a brief overview of these diseases has been provided.

Status of Diseases

Ajwain is an important medicinal plant and it is utilised to cure many stomach disorder. The objective of my study is to make a list of important disease of ajwain, their effect on yield and quality of ajwain seeds and their management.

Fungal Infections

Ajwain is susceptible to many fungal infections, which result in low yields and poor quality. Leaf spot (*Alternaria alternata*), wilt (*Fusarium oxysporum*), root rot (*Rhizoctonia solani*), powdery mildew (*Erysiphe polygoni*), seed rot (*Aspergillus* sp., *Penicillium capsulatum*), and stem rot (*Sclerotinia sclerotiorum*) are some of the most common fungal diseases of ajwain⁸⁻¹¹.

Manjari *et al.*¹² investigated the mycoflora of ajwain gathered from Varanasi (UP) and recovered 39 fungal species from unsterilized and 24 from sterilised seeds, with *Alternaria alternata*, *Aspergillus* sp., *Chaetomium bostrychoeds* and *Curvularia lunata* being the most common. *Chaetomium funicola* was isolated from Ajwain seeds collected in Hyderabad¹³.



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Shrivastav and Jain¹⁴ reported 24 fungal species belonging to 16 genera on the seeds of ajwain collected from the district Sagar (M.P.). The fungi reported were *Acrophialophora fussipora*, *Aspergillus fumigatus*, *A. flavus*, *A. ochraceus*, *A. nidulans*, *A. niger*, *A. terreus*, *Aspergillus* sp., *Chaetomium globosum*, *Chaetomium* sp., *Cladosporium herbarum*, *C. sphaerspermum*, *Curvularia lunata*, *C. pallescens*, *Fusarium* sp., *Penicillium* sp., *Rhizopus arrhizus*, *Helminthosporium* sp., *Emericella rugulosa*, *Theilarvia* sp., *Thielaviopsis* sp. and *Trichothecium roseum*.

The major fungal species of *Aspergillus* reported in Ajwain are *A.flavus*, *A. niger*, *A. fumigans*, *A. ocharaceous*, *A. awamori*, *A. nidulans*, *A. oryzae*, *A. ruber*, *A. sydowi*, *A. terreus* and *A. unguis*^{12, 15-16}.

Nine fungal species, including *Alternaria alternata*, *Aspergillus flavus*, *A. flavus*, *A. fumigatus*, *A. niger*, *Curvularia lunata*, *Fusarium moniliforme*, *Penicillium chrysogenum*, *Rhizopus nigricans*, and other fungi, have been found associated with ajwain seeds¹⁷. They found the highest percentage of incidence of *A. niger* (24.28) and the lowest percent of incidence of *Penicillium chrysogenum* in ajwain seeds (4.33).

The fungus *Fusarium oxysporum* causes ajwain wilt. Infected plants have drooping leaves and eventually die as a result of this infection. At any stage of crop development, wilt infection might appear in patches. It is difficult to reduce the damage caused by wilt in ajwain once it has occurred¹¹. Lowering essential oil content in ajwain seeds due to infection of *Aspergillus flavus*, *A. niger*, *Fusarium sporotrichiodes* and *Trichoderma viridae* have been reported¹⁸.

Root Rots

Rhizoctina solani causes ajwain root rot disease, which develops on young plants in the seedling stage favoured by soil moisture. The foliage becomes yellow and dries up in afflicted plants. Infected plants have stunted root development, and due to rotting, the roots turn black and die¹¹. Fagodiaet *al.*¹⁹ investigated several cultivars of ajwain gathered from Gujarat, Rajasthan, and Uttar Pradesh and reported seed-borne *Rhizoctonia solani*. Seeds can be treated with a plant extract (neem oil) or antagonistic fungus *Trichoderma viridae* and *T. harzianum* to treat the disease.

Powdery Mildew

Erysiphe polygoni causes the disease, which usually develops late in the season. In the early stages, symptoms appear on the leaves and twigs in the form of a white powdery mass. Later the entire flowers die, and no seeds are produced^{11, 20}. At temperature 15-20°C and relative humidity of 60%, the disease becomes severe. This disease hampered both the seed quality and the oil content of ajwain seeds. Spraying Karathane (0.1 percent) twice throughout the flowering stage at 15-day intervals or dusting with sulphur at a 25kg/ha rate were found to control the disease²¹.

Alternaria Blight

Alternaria blight is caused by *Alternaria alternata* is a seed-borne disease^{8, 19}. The infected plants develop dark brown spots and browning leaves and stems, causing the plants to wither. Also, affected stems and petioles become fragile. Small irregular reddish-brown dots with a tan to grey centre are also developed²⁰.

Stem Rot

Sclerotinia sclerotiorum causes ajwain stem rot, which is a devastating disease. Lesions arise when the stem nears the soil becomes infested. On the surface of the stem, thick white mycelia are formed, followed by the production of sclerotia both on and inside the stem. The leaves begin to yellow, and plants wither and die. The sickness manifests itself in patches. The act of turning the soil slows the spread of disease. Water-soaked, brown and straw-coloured areas of the stem are visible^{16, 20}.

Phytoplasma Infections

Phytoplasmas are plant pathogenic bacteria; infect a wide range of plants worldwide, including ornamental plants, fruit trees, and commercially important crops²²⁻²³. Insect vectors spread the disease from afflicted to healthy plants. Plants infected with phytoplasma display symptoms like witches broom, phyllody, yellowing, stunting, virescence, and phloem necrosis. Plants that have been infected with Phytoplasma die, and the disease has wreaked havoc on agricultural production.

A significant loss in yield occurs as a result of the insufficient flower head and fruit set. Pleomorphic structures were seen in the phloem cells of sick plants when they were examined using transmission electron microscopy²⁴. They also noticed that when farmers were growing the same crop in the same area, infection and symptoms were much higher. As a result, they argued that crop rotation and the use of new fresh seeds for sowing could help regulate or reduce phytoplasma infection.

Nematode Infections

In studies of some medicinal herbs, including Ajwain (*Trachyspermum ammi*), Alsi (*Linum usitatissimum*), Gul-e-babona (*Matricaria chamomilla*), Buck wheat (*Fagopyrum esculentum*), and Kalonji (*Nigella sativa*) *Tylenchorhynchus* sp. was the most common phytoparasitic nematode, followed by *Helicotylenchus* sp., which belongs to the ectoparasitic nematode group. The plants showed signs of stunting, yellowing, withering, and discoloration²⁵.

Nematode disease infection can be managed by employing organic amendments (neem cake or oil cake) and bioagents combined with cultural techniques such as deep ploughing in the summer, crop rotation, and clean farming²⁵.

Conclusion

Despite being attacked by fungal, bacterial, phytoplasma and nematode pathogens that cause diseases, it can be determined from the preceding research that ajwain has various therapeutic characteristics. Fungal infections were responsible for significant diseases such as ajwain wilt, root rot, powdery mildew, stem rot and alternaria blight. These diseases impact seed productivity and quality and can be managed with chemical treatments and bioagents, antagonists, and plant extracts.

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