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Ashwagandha: Importance, Uses, Cultivation, Diseases and their Management; A Review

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Abstract:
Ashwagandha (*Withania somnifera)* is an important herb in Ayurveda. It is a small shrub ofthe *Solanaceae* family. The roots of the plant are reputed to promote health and longevity. However, ashwagandha is invaded by many plant pathogens. Among them, leaf spots and fusarium wilt are major diseases found under cultivated conditions. Alternaria leaf spot cause heavy yield loss of around 50-60%. Also, fusarium wilt affects on root yield and mainly causes infection at theseedling stage. Different management practices are used to manage such diseases. Among them, chlorothalonil@ 0.20% was found effective against leaf spot and seed treatment of carbendazim 12% + mancozeb 63% WP was found effective against wilt disease.

Keywords: Ashwagandha,alternaria,fusarium wilt, leaf spot, management, medicinal plant, *Withania somnifera*

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Introduction:

The use of medicinal plants in the healthcare is known to mankind for several thousand years (Petrovska, 2012). However, in recent years, due to the growing realization of the adverse effects of synthetic drugs, there has been a resurgence of interest in the cultivation of medicinal plants and their scientific use (Singh, 2017). According to some sources, up to 80 per cent of people in India use some form of traditional medicine: a category that includes Ayurveda.(Aneesh *et al.*, 2009). Ashwagandha (*Withania somnifera)* is a profusely used medicinal plant belonging to the family *Solanaceae* (Sharma *et al.*, 2011b).

It is extensively exploited in traditional systems of medicine, Ayurveda, Siddha and Unani for over 3000 years (Sharma *et al*., 2011b) and is proudly called as Queen of Ayurveda (Widodo *et al.*, 2010).Ashwagandha plant is an erect, herbaceous, evergreen,tomentose woody plant and 13-150 cm high. All its parts are clothed with whitish, symmetrical hairs. Branching is extensive, the leaf is ovate, thin, its base is cuneate and densely hairy beneath. The flowers are bisexual, greenish or lurid yellow, axillary, in clusters of about 25 forming umbellate cymes, sessile or subsessile. The fruit type is a berry, 7 mm across, red, globose, smooth, enclosed in an inflated, membranous, somewhat 5-

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angled, pubescent with persistent calyx. The fruits turn orange-red in color when they mature. The seeds are yellow in color and reniform in shape (Farooqi and Sreeramu, 2004).

Ashwagandhais generally referredto as “Indian Winter cherry” or “Indian Ginseng”. It is one of the most important herbs of Ayurveda used as a Rasayana for its wide-ranging health benefits (Changhadi, 1938). The estimated production of its roots in India is more than 1500 tonnes, while the annual requirement is about 7000 tonnes, challenging an increase in its cultivation and higher production (Anonymous, 1976., Sharma, 2004 and Baghel*et al.* 2010). The demand of ashwagandha in herbal market was estimated to be 9127.5 tonnes per annum in the year 2004-05, grounded on the trend, the current demand of ashwagandha per annum would be around 12500 tonnes (Ashashri*et al*., 2015).

Twenty-three species of ashwagandha are so far known which are widely scattered throughout the drier parts of tropical and subtropical zones, ranging from the Canary Islands, the Mediterranean region and Northern Africa to Southwest Asia (Hunziker, 2001). Aswagandha is found wild in grazing grounds in the Mandsaur district of Madhya Pradesh and the forest lands in the Bastar district of Chhattisgarh, all over the foothills of Punjab, Himachal Pradesh and Western Uttar Pradesh. The crop is cultivated in an area of about 4000 ha in India, substantially in the drier parts of Manasa, Neemach and Jawad tehsils of the Mandsaur district of Madhya Pradesh, Mysore district in Karnataka, in Punjab, Sindh and Rajasthan (Rajamani*et al*., 2019).

The species name somnifera means ‘sleep-inducing’ in Latin, indicating that to it are attributed sedating parcels, but it has been also used for sexual vitality and as an adaptogen.The root smells like horse (“ashwa”), that is why it is called Ashwagandha (on consumption it gives the power of a horse). The activity of the Withania extract was roughly equal to the activity of the *Panax ginseng* extract. *Withania somnifera*,still, has an advantage over *Panax ginseng* in that it does not appear to result in ginseng-abuse syndrome, a condition characterized by high blood pressure, water retention, muscle tension(Andallu and Radhika, 2000).

Uses of Ashwagandha

National Medicinal Plant Board includes Ashwagandha in 32 prioritized medicinal plants (Ashashri*et al*., 2015). It is a widely used, Ayurvedic herb it appears in World Health Organisation (WHO) monographs on selected medicinal plants and an American herbal Pharmacopoeia is also forthcoming (Mirjalili,*et al*., 2009).

Medicinal uses in Ayurveda:Useful part of Ashwagandha is substantially the root. Seeds,leaves and fruits are also used as drugs.

External Uses: Ashwagandha leaves and root pasteisapplied on enlarged cervical glands or swelling of otherglands as it reduces edema and pain, oil massage isdone in Vata diseases and weakness. For the healing of blisters, black ashes of the roots are applied.The dried leaves are ground to a powder from which apaste is made and used in treating burns and wounds and for sunscreen upon women's faces.

Internal uses:

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i) Nervous system: Ashwagandha root is a sedative,tranquilizing and nervine tonic, hence helps in tonicnerves and is useful in fainting, giddiness and insomniaIt is also used as an "adaptogen" to assist thebody cope with daily stress, as a general tonic and for improving thinking ability.

ii) Digestive system:The bark powder of ashwagandha isan appetizer, carminative and anthelmintic and hence isused in abdominal pain, constipation and worms.

iii) Circulatory system: Ashwagandha has an effect on theheart, purifies the blood and reduces edema.So, it isused in weakness of the heart, blood disorders and edema.

iv) Respiratory system: Ashwagandha is an expectorant and hasanti-asthmaticproperties, due to which it is useful in cough.

v)Satmilkaran: It increases weight, improves immunityand is an aphrodisiac. Used in debilitation diseases andmarasmus in children (Meher*et al.*, 2016).

Cultivation

In India, Ashwagandha is cultivated in around 10,780 ha with a production of 8429 tons while the annual demand for this herb increased from 7028 tons during 2001- 2002 to 9127 tons during 2004-2005 (Srivastava and Sahu, 2013). This 29.8% increase in the demand for ashwagandha has led to an increase in the area under its cultivation for higher production (Shanmugaratnam *et al.*, 2013). The crop is cultivated in 10760 ha in India, out of this area more than 5000 ha area is comes in Neemuch and Mandsaurof Madhya Pradesh (Ashashri*et al.*, 2015). Two species of ashwagandha that are economically and medicinally important and are commercially cultivated in several regions of India are *W. somnifera*and *W. coagulans* (Panwar and Tarafdar, 2006).The Central Institute of Medicinal Aromatic Plants, Lucknow, India has developed complete agro-technology for the cultivation of ashwagandha. It has also carried out organic cultivation and processing of ashwagandha root with certification from the international organic certification agency ESCOCERT South Africa (Sharma, 2004).

Soil and climate

In natural conditions,*W.somnifera*occursondisturbed soil, along roadsides,incultivated land, on termite mounds in forestland, in open woodland and riverine vegetation, from sea level up to 2300 m altitude (Patra *et al.*, 2004). In India, it is allocated from 230 N-330 N, from 180-1700 m above mean sea level. The crop grows well in well-drained sandy, sandy loam or light textured red/black soils having a pH of 7.5-8.0 (Rajeshwari Rao *et al.*, 2012).

Yield

Patel *et al.* (2003) showed that harvesting 210 days after sowing resulted in maximum root yield (277 kg/ha). The crop produces 400-1200 kg/ha. Dried roots and 200-500 kg seeds/hectare. Good selling roots are selling at a price of 250-300/ kg and seeds at Rs. 40-100/kg. The cost of cultivation works out to Rs. 15000-25000/ha. The net profit ranges from Rs. 25000-155000/ha. Additional returns can be earned by selling seeds and leaves (RajeshwariRao*et al.*, 2012).

Diseases of ashwagandha

Thecropencountersmanypestsanddiseasesinthefieldconditionsespecially coleopteran and lepidopteran pest infestation and fungal disease infection were observed frequently (Verma *et al.*, 2007; Kumar *et*

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al., 2009; Sharma *et al*., 2011a).Among them the two most destructive fungal pathogens of the crop are *Alternaria alternata* causing alternaria leaf spot and *Fusarium solani*, causing fusarium wilt.

1)Alternaria Leaf Spot

The disease is caused by *Alternaria alternata.* Alternaria leaf spot is a major concern and adversely affects commercial cultivation as well as the production of the crop. (Meena *et al.*, 2019a). It was first reported by Pandey and Nigam in 1985.The yield loss due to the alternaria leaf spot of ashwagandha has been estimated by 50-60% (Pati *et al*., 2008).The pathogen may affect the quantitative characteristics *viz*., root biomass as well as secondary metabolites production in many crops (Meena, 2012; Pati *et al*., 2008) and also the photosynthesis activities (Sharma *et al*., 2014). Diseased leaves exhibited a decrease in sugars (20%) and chlorophyll (26.5%) (Kathal*et al.*, 2018).

Symptomatology

This disease is characterized by brownish to black spots on the leaves. During severe infection, 80–90% of the leaves of a single plant may get infested with *A. alternata*, causing significant biodeterioration of pharmaceutical important secondary metabolites (Pati *et al*., 2008).The leaf spot of ashwagandha symptoms initially appear as minute brown to dark brown necrotic spots and noticed around 45–50 DAS. The disease symptoms were characterized by concentric brown spots surrounded with water-soaked yellow halo prominent on the upper surface of the older leaves (Meena *et al*., 2019a).Rahman *et al*. (2019) observed the symptoms of leaf blight of *W. somnifera* caused by *A. alternata*. At the initial stage of infection, symptoms appeared as small, light brown spots, gradually getting irregular, dark brown, concentrically zonate with a diffuse margin, frequently surrounded by light yellow haloes, conspicuous brownish concentric rings in the advanced stage of infection.

Morphological characters

The fungal mycelia of *A. alternata*were of dark brown to greyish color and the conidia were muriform type, pale to black olivaceous color with 20-38 × 11-16 µm size. The pathogen also produced conidia in long-branched chains. (Meena *et al*., 2019a). Rahman *et al*. (2019) studied the cultural and morphological characteristics of *A. alternata.* Mycelium was hyaline that turned to grey brownish. The conidiophores measured 42.26 µm (27.30-112 µm) in length and 4.29 µm (3.12-8.43 µm) in width.

Management

Biological management

Chauhan and Ravi (2020)evaluated four bioagents (*T. harzianum, T. viride, P. fluorescens* and *B. cereus*) for their antagonistic effect against *A. alternata*causing leaf spot in ashwagandha by using the dual culture technique. The bioassay showed that *T. viride*was most effective with 55.66% inhibition of mycelial growth while *P. fluorescens* (34.91%) was the least effective.*T. viride*has been found to cause a significant reduction in the mycelial growth, spore germination, spore production and germ tube formation of *A. solani* and *A. alternata* (Latha*et al*., 2009).Tekade*et al*. (2009) studied the effect of different bioagents, viz., *T. viride, T. harzianum*and *P. fluorescence* against *A. alternata* of

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ashwagandhaand observed that *T. viride* recorded maximum inhibition (57.8%) followed by *T. harzianum* (42.6%).

Organic Management

Sharma *et al*. (2010) used cow urine and cow dung in non-composted and composted form (vermicompost), respectively in varying concentrations (0.5, 2, 3.5 and 5%) for observing the spore germination behaviour of four fungal species ofphytopathogenic behaviour. The conidia of *Alternaria alternata*, *Fusarium oxysporum*, *Colletotrichum capsici*and *Curvularialunata*were used for their germination attributes. Both the cow products posed an inhibitory impact towards germination, however, the degree of inhibition increased with the improvement of concentrationdose.Pandia*et al*. (2019) evaluated organic inputs under *in vitro* conditions against *A. alternata*causing a leaf spot of mungbean. Results showed that *jeevamrut*was found most effective in inhibiting *A. alternata*with mycelial growth inhibition of 93.34 percent. Cow urine has also a significant inhibitory effect against the test pathogen with mycelial growth inhibition of 92.23 percent at a concentration of 7.5 percent.

Botanical management

Borekar*et al*. (2011) tested *in-vitro* efficiency of eight different botanicals (*Azadirachta indica, Pongamia pinnata, Lantana camera, Eucalyptus* sp., *Nerium oleander, Prosopis juliflora, Jatropha gossypifolia*and *Ipomea carnea*) against *Alternaria* sp. Maximum growth inhibition (73.21%) was showed by *Eucalyptus* sp. followed by *J. gossypifolia*(69.91%) at both levels of concentration *i.e*.5 and 10%.Vibha and Upadhayay (2016) evaluated neem formulations such as Achook (0.15%), Bioneem (0.03%), Azadirachtin (0.3%), Azadirachtin (0.15%), Neem Seed Kernel Extract (4.0%) against *A. alternata* and reported that mycelial growth inhibitory effect of Azadirachtin (0.30%) was the highest but statistically at par with Azadirachtin (0.15%).

Chemical management

Mishra (2021) tested different fungicides in the field affected with alternaria leaf spot of ashwagandha. The minimum leaf spot intensity was recorded in ridomil MZ (4.80%) followed by chlorothalonil (4.93%), propineb (5.30%), streptocycline sulphate (6.93), triodimefon (7.47%) and metalaxyl (8.07%) at 10 days after 1st spray. 10 days after second spray, the lowest disease intensity was recorded in chlorothalonil (8.40%) followed by metalaxyl(8.53%), Propineb (10.80%) and streptocycline sulphate (11.47%). Percent disease control was recorded maximum in metalaxyl(65.78) followed by chlorothalonil (64.12) and Propineb (60.15).Seven fungicides *viz.*, carbendazim (0.05%), mancozeb (0.2%) copper oxychloride (1%), chlorothalonil (0.2%), fosetyl (0.1%), Metalaxyl(0.05%) and Dithane M-45(0.05%) were tested against *A. alternata*. Among the different fungicides, the minimum diameter of mycelial growth of *A. alternata* (0.75cm) and maximum percentage of inhibition (91.34%) was recorded in mancozeb (0.2%) (Kalieswari*et al.*, 2016).

Other leaf spot diseases

I)Curvularia leaf spot

The disease is caused by *Curvularialunata.*

Symptomatology

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Small, circular to oval dark brown necrotic sunken patches formed on the leaves. The center of the lesion turned reddish brown to brown in hue as these patches became larger. Spots formed on both surfaces of the leaf in the advanced stages of infection; the afflicted area lost its mucilaginous gel, resulting in the death of diseased leaves (Parida*et al.*, 2022).

Morphological characters

The colony of *C. lunata* was dark olive-gray in color and on the reverse side was greyish black. Conidiophores were erect, long and unbranched. Conidia were four transverse septa and 18-29 × 10-8 µm in size. (Rahman *et al.*, 2019)

II) Phycomyces leaf spot

Phycomyces leaf spot is caused by *Pithomyceschartarum.*

Symptomatology

Symptoms of the disease were small circular to irregular necrotic spots of light brown colour which were dispelled over the abaxial surface of the leaf, their size varied from 5–12 mm in diameter. In some cases, spots combined together, forming large necrotic patches. Individual spots had bright yellow halos. On the adaxial surface, spots were circular, grey to blackish in appearance and scattered over a healthy portion of the leaf lamina. Severely infected plants defoliated prematurely. (Verma *et al.*, 2008).

Morphological characters

A single spore culture was dropped on potato dextrose agar. Colonies were fast growing, dark grey to black. Conidiophores formed laterally on hyphae, 2·4–10 × 1·5–3 µm in size. Conidia were multicellular, darkly painted, formed on small peg-like branches of the hyphae. They were broadly elliptical, pyriform, oblong and echinulate, 16–22 × 10–14 µm in size. (Verma *et al.*, 2008).

III) Myrothecium leaf spot

The disease is caused by *Myrothecium roridum.* It was first time reported by Dr. R. P. Maharishi in the year 1986 at Rajasthan, India.

Symptomatology

Small, yellow to brown water-soaked patches on the leaves with a brown to violet edge and a chlorotic halo developed as the first symptom. Although infection is rare, It can hinder plant development during the wet season (Parida*et al.*, 2022).

Morphological characters

The fungus colony reached 40 mm in diameter on PDA after 7 days. Initial colonies of isolates were white, floccose mycelium and developed dark green-to-black concentric rings that were sporodochia bearing viscid spore masse after 5 days. Conidiophores branched repeatedly. Conidiogenous cells in whorls of three to seven on ultimate branches were hyaline, cylindrical and 10

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to 14 × 1.5 to 2 µm. Conidia were hyaline and cylindrical with both rounded ends, occasionally one blunt end, and 6.0 to 7.6 × 2.2 to2.8 µm (Ben *et al.,* 2014).

Management

The leaf spots of ashwagandha caused by *Curvularialunata, Pithomyceschartarum*and *Myrothecium roridum*can be managed by the use of pathogen-free high-quality seed in sowing.Sow pathogen-free, high-quality seed. Seed contamination can bereduced by using hot water treatment. Pick leaf spot-resistant or disease-tolerant cultivars. Crop rotation with non-host should be three years or further. Deeply bury agricultural trash after harvest to eliminate possible disease sources. By avoiding dense planting, orienting rows parallel to the prevailing wind direction, and scheduling irrigations to cease before nightfall, minimize lengthy periods of leaf wetness. If at all feasible, avoid using overhead watering. Apply a copper fungicide at a rate of 2.5 kg per hectare. (Parida*et al.*, 2022).

2)Wilt

Wilt disease of ashwagandha is caused by *Fusarium solani.* The yield loss due to fusarium wilt has been estimated by 55-65% (Bharti *et al*., 2013). *F. solani* causes infection at a seedling stage which sometimes results in incomplete yield loss, however when the infection is caused at a later stage, no seed formation takes place or if formed, it is thin, tiny and shriveled. The disease cause considerable damage to the plant during warm and humid climatic conditions. In India, the incidence of wilting occurs during April-May and may cause 30-50% plant mortality (Alam*et al*., 2007).

Symptomatology

At 30, 60, 90 and 120 DAS, the incidence of *Fusarium solani*producing root rot disease of ashwagandha was reported in the field. The first signs of the disease are withering and drooping of the plants, followed by severe wilting, death, and rotting of subsurface portions. The afflicted plant's root was pulpy and brownish in color. The fungus grew as a white cottony growth at the base of afflicted plants around ground level. At the seedling stage, the plants in the nurseries also displayed yellowing, drooping, and decay indications, resulting in 30-40% mortality (Gupta *et al*., 2004).

Morphological characters

The colony of *F. solani* grown on PDA became whitish to brown. Macroconidia were hyaline, two-to several-celled,fusiformorsickle inshape. Microconidia were 1- to 2-celled, hyaline, pyriform, fusiform to ovoid, straight or curved (Rahman *et al.*, 2019).

Management

Jetawat and Mathur (2016) denoted that seed treatments with the integration of fungicides, neem cake manure, neem oil and *Trichoderma viride* agentindividually as well as in the different combination of seed treatment and application of neem cake to soil was found effective.Integrated treatment [ST SAAF(carbendazim 12% + mancozeb 63% WP) + neem cake manure + *T. viride*] and soil application of neem cake manure@500g/plot showed minimum percentdisease and maximum percent germination and maximum yield of ashwagandha as compared to their individual applications over the untreated control.Here, the inoculated control, mortality was 88.9% while in the uninoculated control, it was 70.4% the seed treatment with SAAF and *Trichoderma* formulation and neem cake

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manure resulted in 32.2%, 49.3% and 30.3% mortality, respectively, while plots having seed treatments with neem oil showed 64.7% mortality. Combined treatment resulted in considerably reduced mortality and SAAF and neem oil resulted in 36.0% mortality, seed treatment with neem oil + *T. viride*also was at per showing 35.7% mortality.

3)Damping off

Damping offof ashwagandha is caused by *Pythium aphanidermatum.* The disease was first time observed in Uttar Pradesh in the year of 2016.It is one of the most common diseases under a moist and cool atmosphere in ashwagandha crop. In *W. somnifera*, damping off disease incidence was recorded at about 15-20% at the seedling stage during the rabi season of 2016 and 2017 in experimental fields, which is of great concern. (Meena *et al.*, 2019b).

Symptomatology

The earliest symptoms of damping off disease was observed as typical toppling over and watery maceration of arising seedlings. Root rotting was also noticed while uprooted the seedlings Pre-emergence infection caused mortality of the germinating seedling before reaching to the soil surface and in post-emergenceinfection, seedlings, were collapsed. (Meena *et al.*, 2019b).Mainly appear at nursery stage. Initially water-soaked, necrotic lesions on the basal stem.Stems became soft and mushy. Young leaves wilt and become grey to brown colour and ultimately plant die.(Parida*et al.*, 2022).

Morphological characters

The microscopic observation revealed characteristic cylindrical, hyaline and coenocyte hyphae and encysted zoospores with a diameter of 10-12 µm large, globose to cylindrical sporangia (Meena *et al.*, 2019b).

Management

Remove and destroy the disease-infested plant or plants from the garden to prevent its spread. Use viable, non-infested seeds or seedlings from planting. Follow crop rotation. Grow more fusarium resistance crop. Use slow-releaseorganic fertilizer rather than nitrogen fertilizer. Soil solarization of the nursery bedsshould be followed. Add a sufficient amount of organic matter such asfarmyard manure, oil cakes or microbial antagonists to the soil. Seedtreatment with Carbendazim @0.2% or covaxin37.5%+ thiram 37.5%@ 0.2% or with*Trichoderma viride* @ 6g/kg of seed will be effective. (Parida*et al.*, 2022).Meena *et al.* (2019b) evaluated the *in-vitro* efficacy of fungicides against *P. aphanidermatum*causing damping-off disease in *W. somnifera*. Among different fungicides metalaxyl-M was most efficient to inhibit 90.56% mycelium growth of *P. aphanidermatum* at 0.20% conc. with the 8.5 mm colony diameter, followed by carbendazim with 89.67% inhibition and 9.30 mm growth over 90 mm mycelium growth in control.

4)Root-knot nematode

Symptomatology

W. somnifera is highly susceptible to the root-knot nematode; *Meloidogyne incognita*and *M. javanica*. Roots are the primary center of infection. Infestations results in root galling, and stunted growth which ultimately leads to a decrease in the production of the ashwagandha crop (Pandey and

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Kalra 2003). The infected plant shows symptoms of yellowing, stunting growth, wilting, tubers, bulbs and galling of roots (Bakr et al. 2014).

Morphological characters

Meloidogyne incognita also known as southern root knot nematodes are obligate parasites, completely dependent on living plant cells for its nourishment and reproduction (Bakr *et al.* 2014).Males and females are morphologically different. Females are pear shaped having no posterior protuberance, round and offset knobs, wavy striae and Perry and Starr 2009 15-16 µm long stylet. Males are devoid of offset heads and lateral lips, labial disc is elevated stylet, 23-26 µm long and knobs are rounded to oval (Perry and Starr, 2009).

Management

Ebhad and Patel (2012) evaluated five bioagents (*Pochoniachlamydosporia, P. fluorescence, Paecilomyceslilacinus, T. viride*and and *T. harzianum*)with different doses for management of root-knot nematode of ashwagandha. Among them, root weight was significantly more in all the treatments over control.Maximum root weight was noticed in *P. fluorescence* followed by *P.lilacinus*. The lowest root-knot index was recorded in *P. fluorescence.* However, it was at par with *P. lilacinus.*Soil application of *P. fluorescence* (2.6×10^6cfu gm^{-1}) at 2.5 kg ha^{-1} recorded lowest nematode population with highest economic yield of ashwagandha.Sharma and Pandey (2009) studied the efficacy of fungal bioagents (*T. harzianum, P. lilacinus* and *Arthrobotrysoligospora*) against root-knot nematode of ashwagandha. Besides potential biocontrol agents, Carbofuran as a chemical treatment and Neem compound as a natural organic compound treatment were also included in the experiment. The efficiency of *T. harzianum* was found to be comparable to that of carbofuran (RKI=2), followed by *P.lilacinus, A. oligospora* and neem compound. Besides reducing nematode infestation, the biocontrol agents also improved the growth of the plant.

5)Witches broom

The disease was first observed in and around Lucknow, Uttar Pradesh province, India during January and February, 1992. The causal organism was identified as a phytoplasma. The disease is now spreading to other parts of the country like Gujrat, Haryana, Madhya Pradesh, Punjab and Rajasthan (Zaim and Samad, 1995).

Symptomatology

It is phloem inhabiting, wall-less prokaryote. It results in the abnormal brush like a cluster of dwarfed weak shoot arising at or near the same point. (Parida*et al.*, 2022).

Morphological characters

Phytoplasmas are single-celled organisms that are resemble to bacteria but lack a rigid cell wall. They are obligate parasites and cannot survive apart from a host. They grow and multiply in the cytoplasm of host cells, both in insect vectors and in plants. (Samad *et al.*, 2011).

Management

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It can be checked by chloramphenicol and chlortetracycline. It can be destroyed above 45-50^{0}C. Resistant variety should be used (Parida*et al.*, 2022).

Conclusion

Ashwagandha (*Withania somnifera)* is used in the families of India as a home remedy for minor health problems. There is a great demand for ashwagandha in the international market. Hence, the production is need to be increased. Priority should be given to resolving the production constraints. Prominent diseases of ashwagandha likealternaria leaf spot, fusarium wilt and root-knot diseases are the major constraints. Integrated disease management practices like field application of metalaxyl @ 0.25% or chlorothalonil @ 0.2%, seed treatment with carbendazim @ 0.2% and use of fungal bioagents are to be followed to overcome the impact of such diseases on the production and productivity of ashwagandha. It is very important medicinal crop, but still, there is a need to focus on the management of ashwagandha diseases.

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