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Powdery Mildew Fungi from Phaltan Area of Satara District, Maharashtra

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A B S T R A C T

Powdery mildew disease is becomes a serious and widespread problem in many parts of India and abroad. Powdery mildew fungi can grow superficially on leaves of host plants and at severity of infection causes morphological, anatomical and physiological damages of plants. In this connection present attempt has been made to study the diversity of powdery mildew from Phaltan area of Satara District of Maharashtra. Survey was carried during June, 2018 to April, 2019. During the study total 54 host plant species and 07 fungal genera of powdery mildew were reported.

Introduction

Powdery mildew fungi belong to order Erysiphales are most common obligate parasites (Takamatsu *et al.,* 1998). These fungi produces enormous conidia on the host surface resulting in white powder coating and dusty appearance on the host surface hence they named as powdery mildew (Hasagoudar and Agrawal, 2009). The Erysiphaceae have dark and spherical perithecia, colourless, septate and uninucleate hyphae with upright conidiophores and conidia in chain. They are wide spread on about 7000 plant species including agricultural crops, vegetables, trees, herbs, shrubs, ornamentals and weeds (Thite and Kore, 2013; Gautam and Avasthi, 2018). They grow superficially on leaves and at severity of infection cause early leaf drop, chlorosis and stunted growth of host plant (Ajay Kumar, 2015). These fungi grow in abundantly in dry and cool seasons (Gautam and Avasthi, 2018). Depending upon the environmental conditions, this disease causes significant destructions and losses in crop plants and ultimately to the production (Pawar and Chavan, 2010).

Some powdery mildew diseases are externally destructive like *Uncinula necator* on grapes, *Sphaerotheca pannosa* on rose, *S. fuligineara* on cucurbits, *Erysiphae graminis* on cereals and grasses, *E. polygoni* on peas, *Leveillula taurica* on *Medicago sativa*, *Phyllactinia dalbergiae* on *Dalbergia sissoo* etc. In this connection, the present attempt was

undertaken to investigate incidence of powdery mildew fungi and their host diversity from Phaltan area of Satara district, Maharashtra, India.

Materials and Methods

Survey was carried from different localities of Phaltan area during the period of June, 2018 to April, 2019. The collected samples were packed separately in sterilized polythene bags and noted with their locality, host name, date of collection, time and brought to laboratory for further analysis.

Powdery mildew fungi were identified by macroscopic and microscopic analysis of infected plant material. The leaf scraping was taken and slides were prepared by using cotton blue stain and lactophenol as mounting medium.

Slides were observed under light microscope and micro-photography was done. Powdery mildew fungal genera were identified on the basis of morphological characters of conidia and conidiophores and by using standard literature (Hasagoudar and Agrawal, 2009, Paul and Thakur, 2006).

Results and Discussion

The interesting results were noticed from present investigation. Total 54 plant species were noticed as the hosts of powdery mildew fungi. Present study reported tremendous diversity of host plants containing 09 vegetables (*Abelmoschus esculentus*, *Anthus graveolens*, *Capsicum annuum*, *Coccinia grandis*, *Cucurbita maxima*, *Cyamopsis tetragonoloba*, *Daucus carota*, *Lagenaria vulgaris* and *Trigonella foenum-graecum*), 03 fruit yielding plants (*Mangifera indica*, *Punica granatum* and *Vitis vinifera*), 03 floricultural plants (*Rosa indica*, *Tagetes erecta* and *Zinnia elegans*), 03 pulses (*Phaseolous vulgaris*, *Vigna radiata* and *Vigna unguiculata*), 01 cereal (*Triticum aestivum*), 04 climbers (*Clitoria ternatea*, *Cocculus hirsutus*, *Convolvulus arvensis* and *Tinospora cordifolia*), 17 weeds (*Acalypha indica*, *Achyranthes aspera*, *Balsam* sp., *Bellis perennis*, *Euphorbia geniculata*, *E. hirta*, *E. microphylla*, *E. tithymaloides*, *Indigofera trita*, *Lagascea mollis*, *Martynia annua*, *Mirabilis jalapa*, *Oxalis corniculata*, *Parthenium hysterophorus*, *Physalis minima*, *Sonchus oleraceus* and *Xanthium strumarium*) and 14 wild plants (*Abutilon indicum*, *Acacia arabica*, *Azadirachta indica*, *Brassica nigra*, *Cassia tora*, *Cordia dichotoma*, *Dalbergia sisso*, *Nyctanthes arbor-tristis*, *Ocimum sanctum*, *Phyllanthus niruri*, *Santalum album*, *Tamarindus indica*, *Tectona grandis* and *Ziziphus jujuba*) (Table 1).

Total 07 fungal genera belonging to family Erysiphaceae and order Erysiphales were noticed as powdery mildew fungal genera. The reported fungal genera were *Blumeria*, *Euoidium*, *Leveillula*, *Oidium*, *Ovulariopsis*, *Phyllactinia* and *Uncinula*. The *Oidium* species was found as dominant species which was occurred on 46 host plant species followed by *Ovulariopsis* and *Uncinula* on 02 hosts, *Blumeria*, *Euoidium*, *Leveillula* and *Phyllactinia* on 01 host plant (Table 1). Gupta (1989) observed that atmospheric temperature was the most important factor for powdery mildew disease on set and epidemic development under field conditions and these fungi could cause disease from 15 to 32^0C temperature and 15.5 to 100% relative humidity. In identification of powdery mildew fungi characters of fruiting body and their appendages plays very important role (Braun *et al.*, 2006).

Powdery mildew of mango becomes a serious and widespread problem in many parts of India caused by *Oidium mangiferae* reported by Khandelwal *et al.*, (2012).

Table.1 List of the host plants of powdery mildew fungi from Phaltan area of Satara district of Maharashtra

Sr. No.	Name of host plant	Host plant family	Powdery mildew fungus
1.	*Abelmoschus esculentus*	Malvaceae	***Oidium* sp.**
2.	*Abutilon indicum*	Malvaceae	***Oidium* sp.**
3.	*Acacia arabica*	Fabaceae	***Oidium* sp.**
4.	*Acalypha indica*	Euphorbiaceae	***Oidium acalyphae***
5.	*Achyranthes aspera*	Amaranthaceae	***Oidium* sp.**
6.	*Anthus graveolens*	Apiaceae	***Oidium* sp.**
7.	*Azadirachta indica*	Meliaceae	***Oidium azadirchtae***
8.	*Balsam* sp.	Balsaminaceae	***Oidiopsis taurica***
9.	*Bellis perennis*	Asteraceae	***Oidium* sp.**
10.	*Brassica nigra*	Brassicaceae	***Oidium* sp.**
11.	*Capsicum annuum*	Solanaceae	***Oidium* sp.**
12.	*Cassia tora*	Fabaceae	***Oidium cassiae***
13.	*Clitoria ternatea*	Fabaceae	***Oidium clitoriae***
14.	*Coccinia grandis*	Cucurbitaceae	***Oidium* sp.**
15.	*Cocculus hirsutus*	Menispermaceae	***Oidium* sp.**
16.	*Convolvulus arvensis*	Convolvulaceae	***Oidium* sp.**
17.	*Cordia dichotoma*	Boraginaceae	***Ovulariopsis* sp.**
18.	*Cucurbita maxima*	Cucurbitaceae	***Oidium* sp.**
19.	*Cyamopsis tetragonoloba*	Fabaceae	***Leveillula taurica***
20.	*Dalbergia sisso*	Fabaceae	***Phyllactinia dalbergiae***
21.	*Daucus carota*	Apiaceae	***Oidium* sp.**
22.	*Euphorbia geniculata*	Euphorbiaceae	***Oidium* sp.**
23.	*Euphorbia hirta*	Euphorbiaceae	***Oidium* sp.**
24.	*Euphorbia microphylla*	Euphorbiaceae	***Oidium* sp.**
25.	*Euphorbia tithymaloides*	Euphorbiaceae	***Oidium* sp.**
26.	*Indigofera trita*	Fabaceae	***Oidium* sp.**
27.	*Lagascea mollis*	Asteraceae	***Oidium lagascae***
28.	*Lagenaria vulgaris*	Cucurbitaceae	***Oidium* sp.**
29.	*Mangifera indica*	Anacardiaceae	***Oidium mangiferae***
30.	*Martynia annua*	Martyniaceae	***Oidium* sp.**
31.	*Mirabilis jalapa*	Nyctaginaceae	***Oidium mirabilifolli***
32.	*Nyctanthes arbor-tristis*	Oleaceae	***Oidium braunii***
33.	*Ocimum sanctum*	Lamiaceae	***Euoidium labiatarum***
34.	*Oxalis corniculata*	Oxalidaceae	***Oidium* sp.**
35.	*Parthenium hysterophorus*	Asteraceae	***Oidium parthenii***
36.	*Phaseolous vulgaris*	Fabaceae	***Oidium* sp.**
37.	*Phyllanthus niruri*	Phyllanthaceae	***Oidium* sp.**
38.	*Physalis minima*	Solanaceae	***Oidium* sp.**
39.	*Punica granatum*	Lythraceae	***Oidium* sp.**
40.	*Rosa indica*	Rosaceae	***Oidium rosacearum***
41.	*Santalum album*	Santalaceae	***Oidium santalacearum***
42.	*Sonchus oleraceus*	Asteraceae	***Oidium parthani***
43.	*Tagetes erecta*	Asteraceae	***Oidium* sp.**
44.	*Tamarindus indica*	Fabaceae	***Oidium tamarindi***
45.	*Tectona grandis*	Lamiaceae	***Uncinula tectonae***
46.	*Tinospora cordifolia*	Menispermaceae	***Oidium* sp.**
47.	*Trigonella foenum-graecum*	Fabaceae	***Oidium* sp.**
48.	*Triticum aestivum*	Poaceae	***Blumeria graminis***
49.	*Vigna radiata*	Fabaceae	***Oidium* sp.**
50.	*Vigna unguiculata*	Fabaceae	***Oidium* sp.**
51.	*Vitis vinifera*	Vitaceae	***Uncinula necator***
52.	*Xanthium strumarium*	Asteraceae	***Oidium xanthami***
53.	*Zinnia elegans*	Asteraceae	***Oidium* sp.**
54.	***Ziziphus jujuba***	**Rhamnaceae**	***Oidium zizyphi***

Khan (1991) conducted his study to find out powdery mildew disease incidence and their severity from Uttar Pradesh and concluded that, Brassicaceae, Cucurbitaceae and Papilionaceae families were heavily suffer from infections. Surveys of powdery mildew fungi from Khandesh region of Maharashtra was carried out by Pawar and Patil (2011) during 2004 to 2005 and reported 35 wild plants species as hosts of powdery mildew fungi. Among this *Oidium* was major genus containing 19 species. Similar results were also recorded from present investigation.

Thite and Kore (2013) investigated the diversity of powdery mildew fungi from Satara district and reported 95 hosts belonging to 92 genera. Further they reported 92 anamorphic and 3 telomorphic stages of reported fungi and O*idium* species was found as dominant. Shahare (2016) reported four different fungal species from Amravati, Maharashtra out of which *Leveillula clavata* was on *Euphorbia geniculata* host was firstly recorded. The checklist of powdery mildew fungi of Himachal Pradesh was published by Gautam and Avasthi (2018) and reported 15 genera and 92 species of powdery mildew fungi and 168 host plant species belonging to 122 genera and 49 families.

Pawar and Chavan (2010) studied the powdery mildew incidence on different cucurbits in different seasons and noticed that, in kharif season *Sphaerotheca fuliginea* was dominantly present on *Cucurbita maxima*, *Lageneria siceraria* and *Cucurbita pepo* and in the rabbi season *Sphaerotheca fuliginea* was dominantly found on *Cucurbita maxima*, *Lageneria siceraria*, *Luffa acutangula* and *Luffa cylindrica.* On the contrary we found *Oidium* as a dominant fungus on Cucurbitaceae members in our study. Also Pawar and Chavan (2010) reported the incidence of powdery mildew is more at post flowering and fruiting stages of host plants.

Biju *et al.,* (2013) studied the diversity of powdery mildew fungi from Kerala and two newly recorded species were investigated i.e. *Pseudoidium clitoriae* on *Clitoria ternate* and *Fibroidium balsaminae* on *Impatiens balsaminia.* During the survey of powdery mildew fungi from Madhya Pradesh, Patel *et al.,* (2015) first time recorded *Pseudoidium santalacearum* fungus on sandalwood from Mandsaur and Indore districts. We also found same fungus on same host from our study area.

Rodriguez-Alvarado *et al.,* (2010) first time reported powdery mildew fungus *Erysiphe heraclei* on commercial carrot crop from Mexico. On the contrary they examined that, other Apiaceae members may not be infected, so it was concluding that *Erysiphe heraclei* is host specific.

According to Tuba *et al.,* (2010) powdery mildew fungus *Erysiphe polygoni* is the one of the important biological constraint to the black gram [*Vigna mungo* (L.) Hepper]. Linde and Shishkoff (2003) noticed that, powdery mildew of roses is to be one of the major scourges of roses in Germany. Mariana Nakova (2012) studied the powdery mildew fungi of spinach caused by *Uncinula* sp. and *Euoidium* type anamorph from Bulgaria. They investigated that, infected plants have reduced growth, young leaves becomes small, matured leaves becomes yellowish and wilted in a short period.

Mwale *et al.,* (2014) estimated damages of wheat infected by powdery mildew fungus *Blumeria graminis* (syn. *Erysiphe graminis* (DC) f.sp. *tritici*) and reported 13 to 30% damages in low to moderate infection and 50 to 100% damages when infection was severe. Gent *et al.,* (2014) reported the economic loss of hop (*Podosphaera macularis*) due to infection of powdery mildew fungi from Washington State.

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