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Fungal pathogens of terrestrial weeds of Haryana-1

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Between 1992 and 1993 surveys for pathogenic fungi associated with terrestrial weeds of Kurukshetra and its adjoining areas (Haryana), twelve fungal pathogens were identified from the infected materials. Pathogenicity of a few, i.e. non obligate pathogens, to their respective hosts was proved and Koch's postulates were confirmed. Disease symptoms and fungal characteristics of all the 12 fungal pathogens had been described. Literature search indicates that *Cercospora calotropidis* on *Calotropis procera*, *Cercospora* sp. on *Amaranthus viridis*, *Oidium* state of *Leveillula taurica* on *Medicago lupulina*, *Ramularia rubella* on *Rumex dentatus*, *Bremia* sp. on *Sonchus oleraceous*, *Pseudocercospora atromarginalis* (=*Cercospara atromarginals*) on *Solanum nigrum*, *Pseudocercospora withaniae* on *Withania somniferum*, *Oidium* sp. on *Coccinea indica*, *Oidium* state of *Sphaerotheca fusca* on *Xanthium strumarium*, *Oidium* state of *Sphaerotheca crotonis* on *Croton bonplandianum* are the first report of occurrence of these pathogens from Haryana. *Curvularia lunata* on *Parthenium hysterophorus* is being reported for the first time from India.

Key words : Terrestrial weeds, fungal pathogens, symptoms, biological control, Kurukshetra

INTRODUCTION

Terrestrial weeds interfere with the cultivation of crops and cattle grazing, besides causing inconvenience in many other ways. In India, many of the noxious weeds are of alien origin. They were either introduced negligently or accidentally into our country and have become serious problem in the absence of host-specific natural enemies (plant pathogens and insects) in the new environment. In USA alone weeds continue to cause annual losses of about 12% of agriculture production creating a total loss of $14 billion (McWhorter and Chandler, 1982). Most of these weeds have occupied such proportions where mechanical and chemical control methods are neither feasible nor economical (Anonymous, 1989). In the recent years fungal plant pathogens have become a good biological control agent for problem weeds e.g. *Alternaria macrospora* and *Puccinia heterspora* created epiphytotics on spurred anoda (*Anoda cristata*) in the Yazoo-Mississippi Delta region of the USA (Ohr *et al.*, 1975). Some other successful examples of biocontrol of weeds are control of skeleton weed (*Chondrilla juncea*) in Australia and USA by *Puccinia chondrillina*; blackberries in Chile and Australia by *Phragmidium violaceum*, hamakua pamakani in Hawaii by *Entyloma compositarum* and musk thistle by *Puccinia carduorum* in Northeastern USA (Charudattan, 1990a,b). Keeping in view the significance of fungal pathogens to control weeds, search for naturally occurring plant pathogens on various terrestrial weeds of this region was initiated.

MATERIALS AND METHODS

Between 1992 and 1993 samples of fungal diseases of terrestrial weeds of Kurukshetra and its adjoining areas were collected. Infected plant parts were collected in sterlized polyethylene bags and brought to the laboratory for study of symptoms, isolation, identification and pathogenicity test of the pathogens involved. Some specimens were pressed, dried and kept as herbarium. The herbaria were deposited at the International Mycological Institute, England and the IMI number have been referred in the text.

To stimulate fungal sporulation, infected host's portions were washed thoroughly in running tap water for removing dust particles adherent to the leaves. These were later cut and incubated in moist chambers (sterile Petriplate lined with moist filter paper) at 25 ± 1°C for 3-5 days.

For isolation of the pathogen infected portions were cut into small pieces, surface sterillized with 70% alcohol/10% chlorax/0.1% $HgCl_2$ for different durations, i.e., 30-120 seconds, rinsed thoroughly in sterlie distilled water and blot dried in folds of sterile filter paper. These pieces were transferred onto potato dextrose agar and potato dextrose yeast agar plates supplemented with streptopencillin and incubated at 25±1°C for 3-7 days. The fungi growing from the leaf fragments, if contaminated, were purified by streaking and/or by serial dilution methods. Pure culture of the pathogen so obtained was maintained on PDA slants for further investigations.

Pathogenicity tests of various isolates was determined on detached leaves. Artificial inoculations of a fungal pathogen was made on healthy leaves of its host. Inoculations were made on surface sterilized leaves by placing mycelial discs from 7-day old fungal cultures on wounded and non-wounded portions. Inoculated leaves were kept in moist chambers and incubated at 25±1°C. Regular observations for symptoms were made after 3 days of incubation.

RESULTS

A total of 12 fungal pathogens were recorded on twelve weeds belonging to 9 families of angiosperms (Table 1). Leaf spots, smut, powdery and downy mildews were the symptoms observed. The symptoms produced by fungal pathogens on their respective hosts and cultural characteristics of these pathogens are described below.

Cercospora calotropidis Ell. & Ev.

Leaf spots are circular to oval, black with diameter 0.4 - 1 mm. Conidiophores, caespitose, straight, unbranched, brown, paler towards apex. Conidia solitary, acropleurogenous (borne at tip and along sides), simple, obclavate, colourless, smooth, 7.6 - 8.1 × 16 -29 µm.

On living leaves of *Calotropis procera*, Kurukshetra, (IMI : 352985).

Cercospora sp.

Leaf spots are dark brown to black. Conidiophores caespitose, straight, unbranched, brown. Conidia hyaline, liliform, several celled, smooth 6.5 - 7.0 × 16 - 19 µm.

On living leaves of *Amaranthus viridis*, Kurukshetra (IMI : 352981)

Pseudocercospora atromarginalis (Atk.) Deighton

Leaf spots dark greenish, circular, 2-7 × 1-6 mm. Conidiophores simple, arising in clusters, Conidia dark, filiform, 7.5 - 8.2 × 15-30 µm.

On living leaves of *Solanum nigrum*, Kurukshetra (IMI : 335903).

Table 1. Fungal diseases observed on various terrestrial weeds of Haryana

Pathogen	Disease	Host	Family
Cercospora calotropidis	Leaf spot	*Calotropis procera*	Asclepiadaceae
Cercospora sp.	Leaf spot	*Amaranthus viridis*	Amaranthaceae
Psudocerocospora atromarginalis	Leaf spot	*Solanum nigrum*	Solanaceae
P. withaniae	Leaf spot	*Withania somnifera*	Solanaceae
Ramularia rubella	Leaf spot	*Rumex dentatus*	Polygonaceae
Curvularia lunata	Leaf spot	*Parthenium hysterophorus*	Asteracea
Ustilago cynodontis	Smut	*Cynodon dactylon*	Poaceae
Oidium state of *Leveillula taurica*	Powdery	*Medicago lupulina*	Fabaceae
Oidium state of *Sphaerotheca crotonis*	Powdery mildew	*Xanthium strumarium*	Asteraceae
Oidium state of *Sphaerotheca crotonis*	Powdery mildew	*Cropton bonplandianum*	Euphorbiaceae
Oidium sp.	Powdery mildew	*Coccinea indica*	Curcurbitaceae
Bremia sp.	Downy mildew	*Sonchus oleraceous*	Asteraceae

Pseudocercospora withaniae (H. Sydow and Sydow) Deighton

Leaf spots circular, brownish in colour, 0.3 - 0.9 × 0.5 - 0.6 mm. Conidiophores fasciculate, branched, golden brown, 15 - 30 × 3 - 4 µm. Conidia straw coloured, 2-5 septate, 35-65 × 3-4 µm.

On living leaves of *Withania somnifera,* Kurukshetra (IMI : 335902).

Ramularia rubella (Bonorden) Nannf.

Leaf spots circular, dark greenish, 0.4 - 0.8 mm. Conidiophores tuft, hyaline, 37.5 - 45.0 × 3.75 - 7.5 µm. Conidia hyaline, 2-celled, 15 - 45 × 6 - 8 µm.

On living leaves of *Rumex dentatus*, Kurukshetra (IMI : 352986). Koch's postulates were confirmed.

Curvularia lunata (Wakker) Boediyn (telomorph *Cochliobolus lunatus* Nelson and Haaris)

Leaf spots are dark black on margins of mature leaves which gradually spread towards the centre.

Colonies are grey in colour. Conidiophores monoematous straight. Poroconidia curved with 3-4 septa pale dark brown and end cells paler than others, 18 - 24 × 7 - 13 µm.

On living leaves of *Parthenium hysterophorus*, Kurukshetra (IMI : 333328).

Ustilago cynodontis P. Henn.

Inflorescence filled with black, dry, powdery mass of telio spores. Teliospores unicellular round, 3.75 - 7.5 µm.

On living inflorescence of *Cynondon dactylon*, Kurukshetra.

Oidium state of *Leveillula taurica* (Lev.) Arnaud.

Greyish white-powdery mass appears on upper leaf surface. Conidiophores branched and arise from a stoma. Conidia one-celled, hyaline, elongate, 13.75 - 30 × 7.5 - 11.25 µm.

On living leaves of *Medicago lupulina*, Kurukshetra, (IMI : 352984).

Oidium state of *Sphaerotheca fusca* (Fr.) Blumer

Powdery growth on the adaxial surface of the leaf. Mycelium is superficial on host, white; Conidiophores upright, simple; Conidia cylindrical; 1-celled, hyaline.

On living leaves of *Xanthium strumarium*, Kurukshetra (IMI : 335906).

Oidium state of *Sphaerotheca crotonis* (Ponnappa) Braun.

Powdery growth on abaxial surface of the leaf and stem. Mycelium grows superfically on the host, Condiophores upright, simple; Conidia cylindrical, 1-celled; hyaline.

On living leaves of *Croton bonplandianum*, Kurukshetra, (IMI : 335906).

Oidium sp.

Powdery growth on the adaxial and abaxial surfaces of the leaf. Mycelium superficial white, with upright conidiophores, simple. Conidia cylindrical, 1-celled, hyaline.

On living leaves of *Coccinea indica*, Kurukshetra, (IMI : 335904).

Bremia sp.

Whitish growth on underside of the leaves, full of sporangiophores and sporangia. Sporangiophores branched bearings at the tips round to oval sporangia varying in diameter from 7.5 - 15 µm.

On living leaves of *Sonchus oleraceous*, Kurukshetra.

DISCUSSION

During 1992-93 surveys for plant pathogenic fungi associated with weeds of Kurukshetra, a total of 12 fungal pathogens have been identified on the basis of their symptoms and morphological characteristics.

Typical disease symptoms were produced by some of the isolated pathogens on their respective hosts on both injured and un-injured leaves *in vitro* (excepting obligate pathogens). The inoculated pathogens were reisolated and were found similar to the original isolates in cultural characteristics, thus confirming the pathogenicity to their respective hosts.

Literature search (Bilgrami *et al.*, 1979, 1981; Mukerji and Bhasin, 1986) indicates that *Cercospora* species on *Amaranthus viridis, Cercospora calotropidis* on *Calotropis procera, Leveillula taurica* on *Medicago lupulina, Ramularia rubella* on *Rumex dentatus; Bremia* species on *Sonchus oleraceous*; *Pseudocercospora atromarginalis* (= *Cercospora atromarginalis*) on *Solanum nigrum; Pseudocerospora withaniae* on *Withania somnifera; Oidium* species on *Coccinea indica; Oidium* state of *Sphaerotheca crotonis* on *Croton bonplandianum* are the first report of occurrence of these pathogens on these hosts from this region. *Curvularia lunata* on *Parthenium hysterophorus* is a new host record for India. Keeping in view the significance of biocontrol over the other methods of control of weeds, viz., mechanical and chemical, experiments of some selected host pathogen systems would be conducted in the laboratory as well as in fields to see their efficacy in controlling the notorious weed of this region.

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