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Field survey for plant pathogenic fungi associated with *Parthenium hysterophorus* L. in Madhya Pradesh, India

L. P. KAURAW and ARCHANA CHILE
National Research Centre for Weed Science
Maharajpur, Jabalpur 482 004, Madhya Pradesh, India

ABSTRACT: The survey conducted at eight sites, namely, Jabalpur, Katni, Mandla, Seoni, Gadarwara, Narsinghpur, Bhopal and Chargawan road in Madhya Pradesh, revealed the association of *Fusarium pallidoroseum*, *Colletotrichum gleosporoides*, *Alternaria alternata*, *Curvularia lunata*, *Sclerotium rolfsii* and *Sclerotinia sclerotiorum* fungi with *Parthenium hysterophorus*.

KEY WORDS: *Parthenium hysterophorus*, plant pathogenic fungi, survey

Parthenium is a pernicious exotic weed that has assumed the status of a weed due to profuse growth, fast multiplication and rapid spread through seeds. It competes fast with natural useful vegetation and suppresses it. It has the ability of prolific seed bearing and rapid dissemination. Parthenium is a dominant type, once this weed gets established, it does not allow other plants to grow, due to secretion of toxic material from roots. Parthenium plant is toxic to human beings and animals, and causes dermatitis, sneezing, reddening and swelling of eyes. Evans (1987) has listed the pathogens of *Parthenium hysterophorus* L. reported from various parts of the world. Herbicides like 2,4-D and glyphosate are used for its control but these chemicals cause health hazards by contamination of air, water and soil. There is a need to find out the suitable alternative method for the management of Parthenium in India. Only a few reports are available on the occurrence of fungi to be used as mycoherbicide for the management of Parthenium. The present work was undertaken to search the suitable host specific indigenous fungi that can be used for management of Parthenium in India.

The survey was conducted in the state of Madhya Pradesh. Maximum sites were selected from Jabalpur, Katni, Mandla, Seoni, Gadarwara, Narsinghpur, Bhopal and Chargawan road. Samples were collected at 10 km distance in all the sites. The sites were visited up to 3 times from July, 94 to March, 97 (Kauraw *et al.*, 1997).

The samples of *Parthenium hysterophorus* exhibiting disease symptoms were collected and brought to the laboratory in polythene bags. The disease symptoms were recorded and associated pathogens, isolated. Isolations from diseased plants were made on potato dextrose agar (PDA) medium.

Isolation of the pathogens and maintenance of the cultures

The diseased parts of *P. hysterophorus* were cut into small bits and washed thoroughly in running tap water. The bits were surface sterilized with 1:1000 aqueous mercuric chloride ($HgCl_2$) for 30 seconds and washed in sterile distilled water thrice to remove the traces of mercuric chloride if any, then transferred to sterile PDA slants. The incubation was done at 25±1°C for seven days. The fungal cultures were purified by single spore or hyphal tip methods. The fungi were incubated at 25±1°C. The cultures so obtained were stored in refrigerator at 4 °C and were sub-cultured each month for further studies.

Pathogenicity

The seeds of *P. hysterophorus* were inoculated with spores of isolated fungi/ macerated fungal hyphae. The infected seeds were plated by blotter method and sown in pots which were incubated at 25± 1°C. The young plants sown, were inoculated with spores and covered in polythene bags. Humidity was maintained at 90-100 per cent. Suitable control plants were maintained by spraying sterilized distilled water and incubated at temperature of 25± 1°C for 15 days. After the appearance of symptoms, the organisms were re-isolated from artificially infected seeds/seedlings and the cultures obtained were compared with the original culture for confirmation. The pathogens isolated from different localities were sent for identification to Commonwealth Mycological Institute, England.

Infected samples of *Parthenium hysterophorus* revealed the association of *Fusarium pallidoroseum* (IM I359246, 47), *Colletotrichum gloeosporides* (IMI 3597775), *Alternaria alternata* (IMI 359776), *Curvularia lunata* (IMI 359782), *Sclerotium rolfsii*, *Sclerotinia sclerotiorum* from Kanti, Seoni, Chargawan road, Gadarwara, Mandla, NRCWS Farm and around Jabalpur city. In the NRCWS Farm, *A. alternata* was found infecting the leaves, branches and flowers of *P. hysterophorus* (Table 1). This fungus seems to be very effective in killing *P. hysterophorus* flowers. *Myrothecium roridum* Tode ex fr. and *S. rolfsii* have been reported by Pandey *et al.* (1990). Aneja *et al.* (1994) reported *Cochilobolus lunatus* causing leaf spot on *P. hysterophorus* in Punjab and Haryana.

SYMPTOMS ON HOST WEED

***Fusarium pallidoroseum* (Cooke) Saccardo**

The symptoms appeared as water soaked brown spots scattered on the leaf surface. These spots coalesced and formed larger brown spots. The seeds became shriveled and small in size, however, no clear symptoms could be seen on the seeds. Under artificial inoculation, the fungus infected seeds and seedlings, but no symptoms developed on leaves.

Table 1. Fungi associated with diseased samples of *Parthenium hysterophorus* during July to December

Plant part	Name of localities						Extent of damage (%)
	Katni	Mandla	Gadarwada	Charagawan	Around Jabalpur	NRCWS farm	
Leaf	*Fusarium pallidoroseum*	–	*Fusarium pallidoroseum*	– –	*Fusarium pallidoroseum*	–	50.75
	Alternaria alternata	*Alternaria alternata*	–	–	*Alternaria alternata*	*Alternaria alternata*	80-90
	Colletotrichum gleosporoides	–	–	–	–	–	40-80
Stem	*Curvularia lunata*	–	–	*Sclerotiorum rolfsii*	*Sclerotiorum rolfsii*	*Alternaria alternata*	20-30
	Sclerotina sclerotiorum	–	–	*Sclerotina sclerotiorum*	*Sclerotina sclerotiorum*	–	50-75
	Sclerotiorum rolfsii	–	–	–	–	–	75-80
Root	*Sclerotina sclerotiorum*	–	–	*Sclerotina sclerotiorum*	*Sclerotina sclerotiorum*	–	80-90
	Sclerotiorum rolfsii	–	–	*Sclerotiorum rolfsii*	*Sclerotiorum rolfsii*	–	75-80
Seed	*Alternaria alternata*	*Alternaria alternata*	–	*Alternaria alternata*	*Alternaria alternata*	*Alternaria alternata*	50-75
Flower	–	–	–	–	–	*Alternaria alternata*	90-100

Alternaria alternata

Small, oval discoloured lesions appeared on the leaves. The spots became irregular in shape. When their size increased they turned brown to gray in colour. Sometimes concentric rings were formed surrounded by a yellow halo. Several such lesions coalesced involving large areas resulting in leaf drying. The symptoms also appeared on terminal branches and flowers. The colour of the flowers turned dark black.

Sclerotium rolfsii

The infected plants first appeared pale green and stunted. The infection occurred at the base of the plants namely, the collar region. The tissues of the infected portion softened and turned brown and eventually, the plants drooped and dried. White, fan like mycelial growth was observed on the stem at the basal region. White to brown mustard like sclerotia were also present.

Sclerotinia sclerotiorum

The infected plant first appeared pale green, then dried. The infection occurred at the base of the plants namely, stem and roots. White cottony mycelial growth was seen on the basal portion of the stem, on splitting, the stem exhibited black sclerotia of the fungus.

Colletotrichum gloeosporioides

The symptoms appeared as irregular brown to deep brown spots of various sizes scattered all over the leaf surface. Under high humidity, the fungus grew rapidly forming elongated brown, necrotic areas. Infected leaves often exhibited shot hole symptoms. The disease was more on older leaves than the younger ones.

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