

OBSERVATIONS ON THE SPECTRUM OF POWDERY MILDEW ON CUCURBITS IN FAIZABAD MANDAL, U.P., INDIA

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ABSTRACT

The aim of this study was to establish the identity of causal organism of powdery mildew on cucurbits in the districts of Faizabad Mandal in Eastern Uttar Pradesh (India). All the cucurbits were found infected with powdery mildew disease in one or the other locality. Perithecia were found *Lagenaria siceraria* and *Cucurbita moschata* in two localities of Faizabad district and one locality of Sultanpur district. Other samples of cultivated cucurbits and a wild cucurbit, *Coccinia cordifolia* contained only conidial stage. The powdery mildew fungi infecting the cucurbits in the Faizabad Mandal (in the studied area) were identified as *Sphaerotheca fuliginea* and *Erysiphe cichoracearum*. *S. fuliginea* was wide spread.

KEYWORDS : Powdery mildew, Causal organism, Cucurbits

Powdery mildew is a disease of global significance and causes considerable damage to number of cucurbitaceous crops grown in India. Three powdery mildew species *Sphaerotheca fuliginea* (Schlecht.) Poll., *Erysiphe cichoracearum* DC. and *Leveillula taurica* (Lev.) Arnaud are recognised as causal organisms of the disease on cucurbits on world-wide basis (Sitterly, 1973; Khan, 1989, Sharma and Khan, 1991). Great similarities between conidial characters of *S. fuliginea* and *E. cichoracearum* and rare occurrence of perithecia (Perfect stage) compounded difficulty in establishment of their identity. For this reason, *E. cichoracearum* was recognized as the causal organism for long time. Clare, 1958 first time identified *S. fuliginea* in Australia as the causal species of powdery mildew disease on cucurbits. Since then many reports show that *S. fuliginea* is dominant species on cucurbits followed by *E. cichoracearum*. Reports of *L. taurica* infecting cucurbits are only from a limited number of countries (Gupta & Sharma, 2012; Lebeda et al., 2010). Available reports from some states in India like Bihar (Khan, 1976), Haryana (Gupta & Sharma, 2012), Madhya Pradesh (Dave et al., 1971), Rajasthan (Sirdhana & Chaudhary, 1972) and Uttar Pradesh (Khan et al., 1971) show similar dominance of *S. fuliginea*. Thus *S. fuliginea* was recognised as the only species causing the disease on cucurbits in different parts of world including India. Most of these are new record reports and lack objectively in efforts to establish the identity of species on cucurbits. Few reports of availability of powdery mildew species are available from some districts of Western U.P. From several

other districts of U.P, particularly Eastern districts, studies on powdery mildew in order to establish their identity, have not been undertaken. There is no such information available from Eastern districts of U.P. This situation prompted us to study the occurrence of powdery mildew on cucurbits and establish the identity of species causing the disease in the districts of Faizabad Mandal, an Eastern part of Uttar Pradesh.

MATERIALS AND METHODS

A survey was conducted in the first week of April, 2011 in different localities of Barabanki, Faizabad, Sultanpur and Ambedkarnagar in Faizabad Mandal of Eastern Uttar Pradesh to assess the incidence and intensity of powdery mildew on cucurbits and to establish the identity of causal species. Five to ten field, plots and other cultivation units like kitchen garden etc. were surveyed in each locality. Samples of leaves and stems collected from the infected cucurbits, packed in polythene bags, properly marked were brought to the laboratory for further studies. Incidence of disease (percent occurrence) on each cucurbit crop in a district was calculated.

Severity (intensity) of the disease on different cucurbits in different localities of the districts was rated on 0-3 scale (lebeda, 2010). Average of the rating from different fields of a locality was assigned as severity grade on each cucurbit in the locality. Symptoms on each cucurbit sample were characterized. Characteristics of perithecia and conidial characters of the fungi were used to establish the identity.

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For the presence or absence of fibrosin bodies in conidia, conidia from each sample dusted on three replicate clean glass slide, treated with few drops of 3% KOH (Potassium hydroxide) aqueous solution and 100 conidia selected at random from each slide were examined under microscope. Conidia from each sample were subjected to germination test in order to study morphology of germ tubes and development of appressoria. Conidia were gently dusted on three clean glass slides from each sample and slides were placed on glass rod triangle, kept in petriplates containing sterilized distilled water in the bottom lid and upper lid lined with moistened cotton wool. The petriplates were incubated at 20°C (± 2) for 24 hr and slides were examined for the morphology of germ tubes. Percent germination, percent forking by germ tubes were determined by examining 100 conidia from each replicate slide. A set of slides from each sample, incubated in the same way as described above, were examined after 48 hr for detecting the development of appressoria and percent appressorial development by germ tubes, was determined at the end of incubation period by accounting 100 conidia from each slide.

RESULTS AND DISCUSSION

The study area which included 4 districts of Faizabad Mandal in Eastern Uttar Pradesh (India) showed cultivation of eleven cucurbits, i.e. *Cucurbita moschata*, *Lagenaria siceraria*, *Cucurbita maxima*, *Luffa cylindrica*, *Cucumis melo*, *Cucumis melo var. utilissimus*, *Cucumis melo var. momordica*, *Cucumis sativus*, *Citrullus vulgaris var. fistulosus*, *Coccinia cordifolia* and *Citrullus lanatus*. The powdery mildew disease was wide spread appearing on all the cultivated cucurbits. *C. cordifolia* (a wild cucurbit) was also infected. No variation in symptoms was noticed. Powdery mildew in all the samples were ectophytic. The disease intensity on the cucurbits showed a variation among the localities. The highest intensity was found on *L. siceraria*, being mild to severe.

Perithecia were observed on leaves and stems of *L. siceraria* and *C. moschata* collected from two localities of Faizabad district and one locality of Sultanpur district.

Microscopic examination of the perithecia found on *L. siceraria* showed that perithecia were scattered to densely gregarious, brown, globose to subglobose, measuring 72.2-101.3 μ m in diameter. Appendages were mycelioid, brown, variable in number and length. Each perithecium contained broadly elliptical to subglobose ascus measuring 60.5-90 \times 31-64 μ m (65 \times 44 μ m). Ascospore were 8 in number, ellipsoidal to spherical in shape, 18-24 \times 12-22 μ m (20.3 \times 17.2 μ m).

Perithecia found on *C. moschata* were more on leaves than on stem, scattered, 70.3-110 μ m in diameter. Appendages variable in number and mycelioid, single ascus, elliptical, 60-91 \times 30-60 μ m in size, 8 ascospores, ellipsoidal, 18-23 \times 14-20 μ m (20.6 \times 16.9 μ m). Based on these perithecial characters the powdery mildew species present on both cucurbits was identified as *Sphaerotheca fuliginea* (Schlecht.) Poll.

Conidial characters like shape and size of conidia, dimensions of conidia (length and breadth), L/B index, presence and absence of fibrosin bodies in conidia, morphology of germ tube and development of appressoria and point of origin of germ tube on conidia were studied to identify and to test the reliability of these characters in the identification of powdery mildew species involved in the development of disease on cucurbits. Among the cultivated cucurbits the conidia from *L. siceraria* measuring 35.4 \times 18.6 μ m were biggest and from *C. melo var. utilissimus* were smallest (32.7 \times 15.8 μ m) in size. The conidia from *C. cordifolia* were 36.5 \times 16.6 μ m in size. Length/Breadth (L/B) index of each cucurbit showed a degree of consistency. It was less than 2 for cultivated cucurbits and more than 2 for *C. cordifolia*. Fibrosin bodies were present in a high percentage of conidia obtained from all the cultivated cucurbits but were absent from the conidia obtained from *C. cordifolia*. Some conidia in samples of cultivated cucurbits did not show fibrosin bodies. Percent occurrence of fibrosin bodies in conidia in each sample ranged between 75-90. The number of fibrosin bodies per conidium showed a range of 8-9.

On germination; conidia from cultivated cucurbits developed laterally, simple and forked germ tubes. The percentage of forking of germinating conidia also varied from each cucurbit. It ranged 50-65.

The conidia obtained from cultivated cucurbits did not develop appressoria. Conidia obtained from *C. cordifolia* invariably formed simple germ tubes (non forked) emerging from the apical part of the conidium which subsequently produced appressoria. On the basis of the perithecial and conidial characters, the powdery mildew species infecting all the cultivated cucurbits were identified as *S. fuliginea* (Schlecht.)Poll. and *C. cordifolia* as *E. cichoracearum* DC.

Sphaerotheca fuliginea and *Erysiphe cichoracearum* were found infecting the cucurbits in all the districts of Faizabad Mandal. *L. taurica* was, however, not encountered. The overall incidence of the disease on cucurbits in Faizabad Mandal showed that the pathogens are fairly widely distributed in the area and one infecting a high percentage of field grown cucurbits in Faizabad Mandal. Bottle gourd, pumpkins and melons are highly infected cucurbits of the area but other cucurbits are relatively less affected. of the two species recorded *S. fuliginea* was found to be most frequent species in the area being dominant in all the districts. *E. cichoracearum* in general has restricted to *C. cordifolia*. *S. fuliginea* is unquestionably most important powdery mildew species of cucurbits on world-wide basis (Letham and Priest, 1989, Sharma and Khan, 1994, Lebeda et al., 2010,) *E. cichoracearum* has been relegated to second position though its occurrence in fairly wide in the world including India (Molot and Lecoq, 1986; Kristkova et al., 2009; Gupta and Sharma, 2012).

The significance of *E. cichoracearum*, mostly found on *C. cordifolia*, is not well determined. Thus this study, for the first time records the occurrence of two species on cucurbits in the districts of Faizabad Mandal in Eastern Uttar Pradesh and establish their identity as *Sphaerotheca fuliginea* on cultivated cucurbits and *Erysiphe cichoracearum* on *C. cordifolia*.

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