

SPECIES SPECTRUM OF CUCURBIT POWDERY MILDEW IN ANDHRA PRADESH, INDIA

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Objective of this study was to establish the identity of causal organisms of powdery mildew on cucurbits in Andhra Pradesh. All the cucurbits except *Citrullus lanatus*, *C. vulgaris* var. *fistulosus* and *Momordica charantia* were found infected with powdery mildew disease in one or the other locality. Teleomorph was found on *Lagenaria siceraria* in Krishna district. Other samples of cultivated cucurbits and a wild cucurbit, *Coccinia grandis* contained only anamorph. The powdery mildew fungi infecting the cucurbits in the state (in the studied area) were identified as *Sphaerotheca fuliginea* and *Erysiphe cichoracearum*. *S. fuliginea* was wide-spread.

Key words : Cucurbits, Anamorph, Teleomorph.

Cucurbits are infected by a number of powdery mildew fungi (Ballantyne, 1975). *Sphaerotheca fuliginea* (Schlecht) Poll., *Erysiphe cichoracearum* DC. and *Leveillula taurica* (Lev.) Arn. are well established causal organisms of the disease on cucurbits in many countries of the world (Khan, 1983, 1989). *S. fuliginea* and *E. cichoracearum* are more commonly encountered than *L. taurica* (Khan, 1989). Anamorphs of *S. fuliginea* and *E. cichoracearum* and symptoms induced by them show similarities and teleomorphs are not commonly produced on cucurbits. For this reason, a great deal of confusion surrounds the identity of the causal organisms of the disease in various parts of the world including India. *E. cichoracearum* was considered as the causal organisms of the disease in many countries of the world. But now in several of them, *S. fuliginea* has been found mainly responsible for the disease. Some attempts made in past established the identity of the powdery mildew fungi on cucurbits in some of the states of India (Sharma and Khan, 1990), but this is yet to be done for several other states. Characterisation of the species responsible for the disease in a given area or host is a basic component of the management strategy for the disease. In the paper, we present our observations on the species spectrum of the powdery mildew fungi that infect cucurbits in Andhra Pradesh (India).

MATERIALS AND METHODS

Four districts of Andhra Pradesh namely Karimnagar, Warangal, Krishna and Guntur were surveyed in the first week of May, 1989, to assess the incidence and intensity of powdery mildew disease and

to establish the identity of the causal organisms. In each locality of the districts, five to ten field plots or other cultivation units like kitchen garden, farm yards, orchards or cucurbits climbing on the roof tops or huts or other dwelling units were included in the survey. Samples consisting of leaves and stems were collected from the infected cucurbits for further studies.

Symptoms on each cucurbit sample were characterized. Teleomorph and anamorph characters of the species were studied. Mode of parasitism, shape and size of conidia, presence of well developed fibrosin bodies, morphology of germ tube, position of germ tube on conidia and development of appressoria were examined to determine the identity of the species. Characters of teleomorph, wherever present, supplemented the anamorph characters for determining the identity of the species. To determine the presence of fibrosin bodies in conidia, conidia from each sample were dusted on three replicate clean glass slides and treated with few drops of 3% KOH (potassium hydroxide) aqueous solution and 100 conidia selected at random from each slide were examined under the microscope. Conidia from each sample were germinated to study morphology of germ tubes and development of appressoria. Glass slides with conidia obtained from each sample were germinated to study morphology of germ tubes and development of appressoria. Glass slides with conidia obtained from each sample were incubated at 20(±2) for 14 h, separately in petriplates containing sterilized distilled water in the bottom lid and upper lid lined with moistened cotton wool. Per cent germination and per cent forking by

germ tubes were determined by examining 100 conidia from each replicate slide. Position of germ tubes on conidia were also examined. A set of slides from each sample incubated in the same way were examined after 48 h to study the appressorial development. After 48 h, slides were examined and per cent appressorial development by germ tubes were determined by accounting 100 conidia from each slide.

RESULTS AND DISCUSSION

Cucurbits i.e. *Lagenaria siceraria* (Molina) Stand., *Cucurbita moschata* Duch., *Cucurbita maxima* (Duch.), *Luffa cylindrica* (L.) Roem, *Coccinia grandis* (L.) Voigt, *Cucumis melo* L., *Cucumis melo* var. *utilissimus* L., *Cucumis melo* var. *momordica* Roxb., *Cucumis sativus* L., *Citrullus lanatus* (Thunb.) Manst. *Momordica charantia* and *Citrullus vulgaris* var. *fistulosus* Steward were encountered during the survey in 22 localities of the four districts of Andhra Pradesh. All the cucurbits except *C. lanatus*, *C. vulgaris* var. *fistulosus* and *M. charantia* were found infected with powdery mildew in one or the other locality and or district. *L. siceraria* was apparently more heavily infected than other cucurbits.

Teleomorph was observed on leaves and stems of *L. siceraria* collected from one locality in Krishna district.

Microscopic examination of the teleomorph found in *L. siceraria* showed that perithecia were scattered to densely gregarious, brown to dark, globose to subglobose, measuring 66-99.6 μm in diameter. Appendages were mycelioid, brown, variable in number and length. Each perithecium contained broadly elliptical to subglobose ascus measuring 56-85 x 29-59 μm (63 x 41 μm). Ascospores were 8 in number, ellipsoidal to spherical in shape 16-21 x 10-20 μm (18.5 x 15.4 μm). Materials have been deposited to H.C.I.O., New Delhi, under number 30412. Based on these characters of teleomorph the powdery mildew present on *L. siceraria* was identified as *Sphaerotheca fuliginea* (Schlecht.) Poll.

Regardless of locality/district or cucurbit, mycelium was ectophytic in all the samples collected from the state. Among the cultivated cucurbits the conidia from *L. siceraria* measuring 34.2 x 17.9 μm were biggest and from *C. melo* var. *utilissimus* were smallest in size. The conidia from *C. grandis* were 34.8 x 15.1 μm in size. Length/breadth (L/B) index of each cucur-

bit showed a degree of consistency. It was less than 2 for cultivated cucurbits and more than 2 for *C. grandis*. 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. grandis*. Some conidia in samples of cultivated cucurbits did not show fibrosin bodies. Per cent occurrence of fibrosin bodies in conidia in such samples ranged between 80-93. The number of fibrosin bodies per conidium showed a range of 7-9.

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 between 40-61. The conidia obtained from cultivated cucurbits did not develop appressoria.

Conidia obtained from *C. grandis* invariably formed simple germ tubes (non-forked) emerging from the apical part of the conidium which subsequently produced appressoria. On the basis of the anamorph and teleomorph characters, the powdery mildew species infecting all the cultivated cucurbits was identified as *S. fuliginea* (Schlecht.) Poll. and *C. grandis* as *E. cichoracearum* DC.

Sphaerotheca fuliginea and *Erysiphe cichoracearum* were found infecting the cucurbits in the state. *L. taurica* was, however, not encountered. The over all incidence of the disease on cucurbits in the area showed that the pathogens are fairly widely distributed in the area and are infecting a high percentage of field grown with cucurbits in the state. Bottlegourd, 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 was restricted to *C. grandis*, *S. fuliginea* is unquestionably most important powdery mildew species of cucurbits on world wide basis (Khan, 1989; Lethan and Priest, 1989; Sharma and Khan, 1990; Cvjetkovic *et al.*, 1988). *E. cichoracearum* has been relegated to second position though its occurrence is fairly wide in the world (Molot and Lecoq, 1986; Branzanti and Brunelli, 1987). The significance of *E. cichoracearum*, mostly found on *C. grandis*, is not well determined.

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