

## Scanning Electron Microscopy to Reveal True Identity of Anamorphic Powdery Mildew Pathogens on Cucurbits in Northeast India

PANKAJ BAISWAR\*, SATISH CHANDRA AND S. V. NGACHAN

ICAR Research Complex for NEH Region, Umiam 793103, Meghalaya, India

E-mail : pbaiswar@yahoo.com

\*Correspondence

### Abstract

Identity of many powdery mildew pathogens in northeast India has been based on the reports from other parts of the country. Light, scanning electron microscopy and germination pattern studies revealed the presence of anamorph of *Podosphaera xanthii* on *Cucurbita moschata*, *Luffa acutangula* and *Lagenaria cicereria*. This information will be of great use in screening against resistance and fungicidal trials for management of powdery mildew of these crops.

**Key words :** *Podosphaera xanthii*, Powdery mildew, Cucurbits.

Northeast India is considered to be a biodiversity hot spot. Biodiversity of cucurbitaceous crops is also high in this region comprising of many genera like *Cucurbita*, *Luffa*, *Cucumis*, *Momordica*, *Trichosanthes*, and *Benincasa* (1). Many of these crops are resilient and adaptive hence can be grown on the land, which is not suitable for other vegetables. But majority of the cucurbitaceous crops are severely affected by powdery mildew pathogens. Identity of most of the powdery mildew pathogens has been presumptive in this region (Baiswar et al. unpublished). We conducted surveys and examined the specimens using light and scanning electron microscopy for confirmation of the identity of the powdery mildew pathogens on few cucurbitaceous crops like *C. moschata*, *L. acutangula* and *L. cicereria*. Earlier for identification of powdery mildews, characters like type of appendages on chasmothecium were used but now new criteria have been discovered using light, electron microscopy and spore germination patterns (2—5). These criteria have made possible the identification of powdery mildew taxa based on anamorphic characters. Many new reports have been made from this region using these criteria (6—9).

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### Methods

For light microscopy a strip of clear tape was used to dislodge mycelia and conidia from the infected tissue (10). Characters like presence or absence of ectophytic mycelium, conidia in chain, fibrosin bodies and type of appressoria were examined. Three percent potassium hydroxide was used as mounting medium. Germination pattern was also examined (4). Latest literature was consulted for identification (2—5).

Pathogenicity tests were also conducted for fulfilling Koch's postulates. Small portions of diseased specimens were selected with the help of dissecting microscope and gold coated (JFC—1100, JEOL Ltd., Japan) under vacuum, then observed under scanning electron microscope (SEM JEOL JSM 6360, JEOL Ltd., Japan). Voucher specimens have been deposited in herbarium collection of ICAR (Indian Council of Agricultural Research) Research Complex for Northeastern Hill Region and MACS Agharkar Research Institute, Pune, India.

### Results and Discussion

#### *Cucurbita moschata*

Powdery mildew symptoms were more promi-

ment on upper surface of leaves as circular to irregular whitish growth. Conidia were ellipsoidal to ovoid ( $18\text{--}30 \times 16.5\text{--}18\mu\text{m}$ , specimen from Barapani and  $21\text{--}30 \times 15\text{--}18\mu\text{m}$ , Shillong) and produced in chains. Fibrosin bodies were present and appressoria on the hyphae were indistinct. The basal septum of the conidiophore was just adjacent to mycelium. Germ tubes developed laterally without any distinct appressoria. Smooth wrinkles were also evident on the surface of the conidia when observed under SEM. No perfect stage was found to be associated with this fungus. These morphological characters confirmed presence of the anamorphic *Podosphaera xanthii* (3, 5). Voucher specimens have been deposited in herbarium collection of ICAR Research Complex for NEH Region, Barapani, Meghalaya (ICARHNEH-109, Barapani and 117 from Shillong) and also in MACS Agharkar Research Institute, Pune, India (AMH 9325 from Shillong).

#### *Luffa acutangula*

Powdery mildew symptoms were present on both surfaces but were prominent on upper surface. Appressoria on the hyphae were indistinct. Fibrosin bodies were present. Conidia were ellipsoid ( $24\text{--}32 \times 13.5\text{--}19\mu\text{m}$ ) and produced in chains. The basal septum of the conidiophore was just adjacent to mycelium. Germ tubes developed laterally without any distinct appressoria. SEM observations revealed the presence of smooth wrinkles on conidial surface. Characters indicated the presence of *P. xanthii* (3, 5). Voucher specimens have been deposited in herbarium collection of ICAR Research Complex for NEH Region (ICARHNEH-114) and also in MACS Agharkar Research Institute, Pune, India (AMH 9322).

#### *Lagenaria cicereria*

Powdery mildew symptoms were more prominent on lower surface. Conidia were ellipsoid ( $24\text{--}30 \times 15\text{--}18\mu\text{m}$ ) and produced in chains. Fibrosin bodies were present and appressoria on hyphae were indistinct. The basal septum of the conidiophore was just adjacent to mycelium. Germ tubes developed laterally without any distinct appressoria. Smooth wrinkles were evident on the surface of the conidia in SEM observations. These characters suggested the

presence of *P. xanthii* (3,5). Voucher specimens have been deposited in ICAR Research Complex for NEH Region (ICARHNEH-118 from Deragoan, Assam) and also in MACS Agharkar Research Institute, Pune, India (AMH 9326). Pathogenicity tests yielded positive result in all the cases.

Earlier, *Erysiphe cichoracearum* has been reported as pathogen of *C. moschata* and *L. cicereria* (11).

Our results indicate that those observations were probably presumptive and were based on the reports from other parts of the country (11, 12). Our observations, which are based on the current literature, have also revealed the true identity of the powdery mildew pathogens in this region like presence of *P. xanthii* on *M. cochinchinensis* and *Sechium edule* (6, 8).

These results will help in screening for resistance and fungicide efficacy trials since in these experiments true identity is of utmost importance.

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