Mycobiology 37(4) : 308-309 (2009)

Lasiodiplodia theobromae is a Mycoparasite of a Powdery Mildew Pathogen

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(Received August 18, 2009. Accepted December 2, 2009)

Powdery mildews on over 40 plants in Bangalore were screened during July-December of 2003~2008. Isolates from mycoparasitised *Oidium caesalpiniacearum* of *Bauhinia purpurea* comprised *Lasiodiplodia theobromae*, in addition to *Ampelomyces quisqualis*. Koch's postulates were satisfied to establish the mycoparasitism of *L. theobromae*. This is the first report that *L. theobromae* acts as a mycoparasite of a powdery mildew.

KEYWORDS : Biocontrol, Mycoparasitism, Powdery mildew

More than 500 species of fungi belonging to Erysiphaceae cause powdery mildews on over 1500 genera of plants (Braun, 1987). As an alternative to using potentially dangerous chemical fungicides, biocontrol agents can be used alone or in combination with reduced amounts of chemicals to control powdery mildews (Kiss, 2003). The mycoparasite, *Ampelomyces quisqualis* Ces., is the only fungus that has been successfully used as a biocontrol agent for several powdery mildews worldwide (Kiss *et al.*, 2004). Although *A. quisqualis* is widespread in India, there could be a possibility of its misidentification in certain situations because of the presence of other morphologically similar fungi.

Therefore, to find out if any other pycnidial fungi occur in association with powdery mildews alongside *A. quisqualis*, different powdery mildews on over 40 plant species were screened in Bangalore (12°58'13"N; 77°33'37"E), India during July-December of 2003~2008. Mycoparasitic fungal isolates from the powdery mildew (*Oidium caesalpiniacearum* Hosagoudar & U. Braun) of the camel's foot tree or butterfly tree (*Bauhinia purpurea* L.) (Fig. 1) frequently comprised a characteristic mycoparasite in addition to the commonly associated *A. quisqualis*.

Microscopic examination of the leaves revealed the presence of numerous dark brown to black pycnidia emerging through the powdery mildew pathogen on the leaf surface. Leaf bits possessing abundant pycnidia of the associated mycoparasite were cut into 5 mm × 5 mm leaf sections, plated directly on tap water agar in such a manner that the pycnidia were in touch with the agar surface, and then incubated on the laboratory bench (daytime room temperature: 24 ± 2°C). The fungus started developing rapidly into sparse colonies within one day and produced new pycnidia by the fifth day (Fig. 2).

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Fig. 1. Mycoparasitised powdery mildew of *Bauhinia purpurea.*

In micromorphological studies on the fungus, it was found that the paraphyses were hyaline, cylindrical, septate, occasionally branched, 50~55 μm long, 3~4 μm wide, and had rounded ends. The conidiogenous cells were hyaline, thin-walled, smooth, cylindrical, and holoblastic. The discharged conidia were subovoid to ellipsoid-ovoid, broadly rounded at apex, tapering to truncate base, widest in middle to upper third, thick-walled, and one-septate with dimensions of 20~27.5 × 12.5~15 μm ($\bar{x}$ ± S.D. = 23.8 ± 2.25 × 12.8 ± 0.76 μm, l/w ratio = 1.9 ± 0.16). A selected isolate of the fungus [isolate MP(Oc)3] was identified at the Indian Type Culture Collection, Indian Agricultural Research Institute, New Delhi, as *Lasiodiplodia theobromae* (Pat.) Griff. & Maubl. (= *Botryodiplodia theobromae* Pat.), the asexual state of *Botryosphaeria rhodina* (Berk. & M.A. Curtis) Arx.

Koch's postulates were satisfied to establish that *L. theobromae* is pathogenic to the host powdery mildew. A

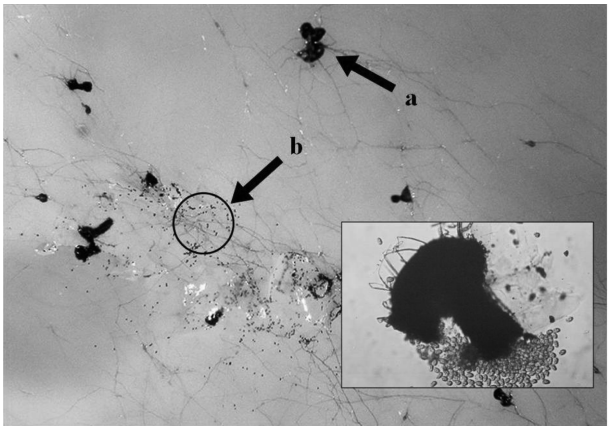

Fig. 2. Culture of *Lasiodiplodia theobromae* (a, Pycnidia; b, Conidia) (Inset: Sporulating pycnidium in a squash mount, × 400).

conidial suspension of the mycoparasite was made in sterile deionised water (5×10^7 conidia/*ml*) from cultures grown on potato dextrose agar. The suspension was used to inoculate the epiphyllous mycelia of the powdery mildew on intact leaves of *B. purpurea* by moistening an approximately 15-mm^2 region on the upper surface of 10 leaves. Control leaves were only treated with sterile deionised water. The leaves were monitored for 30 days by which time control leaves developed normal powdery mildew fruiting structures whereas treated leaves developed abundant pycnidia of the mycoparasite in and around the treated areas. The newly developed pycnidia were cultured and the resultant cultures were found to be identical to the mother culture.

Although *L. theobromae* has a worldwide distribution in tropical and subtropical regions and occurs on a wide range of plants (Punithalingam, 1976), it has never been reported as a mycoparasite of a powdery mildew anywhere in the world. To our knowledge, this is the first report of *L. theobromae* acting as a mycoparasite of a powdery mildew disease of any plant.

Acknowledgements

We thank the Project Director, Project Directorate of Biological Control, Bangalore, for providing research facilities. We are also grateful to Dr. Levente Kiss, Head, Department of Plant Pathology, Plant Protection Institute of the Hungarian Academy of Sciences, Budapest, Hungary, for useful comments on the manuscript.

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