

## *FUSICLADIUM LEVIERI*, A FUNGAL PARASITE OF PERSIMMON, FOUND IN INDIANA

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**ABSTRACT.** The parasitic microfungus *Fusicladium levieri* Magnus (anamorphic Ascomycota) was found for the first time in Indiana on *Diospyros virginiana* L. (American Persimmon). The species has been insufficiently described so far. Therefore, disease symptoms and morphological features are described in detail.

**Keywords:** Persimmon, *Fusicladium levieri*, fungus, Indiana

*Diospyros virginiana* L. (American Persimmon; Ebenaceae) is a small- to medium-sized North American tree native to eastern USA and distributed from Connecticut to Iowa and southward from Florida to Texas (e.g., Brockman 1986). In Indiana it grows wild over much of the southern half of the state, where it is a scattered species throughout the area (Deam 1940). Individual plants are occasionally found in northern Indiana (Hayden 2001). The fruits are edible; and, although native persimmons are not widely cultivated commercially, the fruit is prized as a real delicacy, both fresh, in preserves and in persimmon dishes such as persimmon pudding. Persimmon wood is similar in hardness, weight and durability to other members of the ebony family (Wampler & Wampler 2000). Its property of becoming and staying very smooth and polished under continued wear make it prized in use in shuttles for textile weaving (Hayden 2001). The smoothness, density and resistance to mechanical shock make its black heartwood desirable for golf club heads. Persimmon wood is also used in veneer for furniture (Hayden 2001).

Farr et al. (1989) list numerous parasitic fungi on *D. virginiana*, three of which have

been found in Indiana. There are two macrofungal parasites, *Fomitopsis sprague* (Berk. & M.A. Curtis) R.L. Gilbertson & Ryvarden and *Heterobasidium annosum* (Fr.: Fr.) Bref. (Hymenomycetes, Basidiomycota), and one parasitic microfungus, an unidentified species of the genus *Phyllosticta* (anamorphic Ascomycota). Here, we report on a leaf spot fungus, *Fusicladium levieri*, which is already known from three states in the USA (Connecticut, Florida, Mississippi), but new for Indiana. The fungus was identified on leaves collected from a naturally occurring tree.

*Fusicladium levieri* Magnus  
in Sommier & Levier, Trudy St. Petersb.  
Bot. Sada 16:543 (1900).

= *Ragnhildiana levieri* (Magnus) Vassiljevsky 1937.

= *Phaeoramularia levieri* (Magnus) U. Braun 1997.

= *Fusicladium kaki* Hori & Yoshino 1905.

= *Fusicladium diospyri* Hori & Yoshino, in herb.

USA, Indiana, Vigo County, Terre Haute, Persimmon Street, on *Diospyrus virginiana* L., leg. J. Lehman, 6/26/2002 (PUL 1680).

**Macroscopic features.**—Leaf spots (Fig. 1) amphigenous, subcircular to angular-irregular, 1–5 mm diam., at first dark brown to almost black, later center paler, medium brown, dingy brown to grayish-brown, margin indefinite or a pale center surrounded by a narrow

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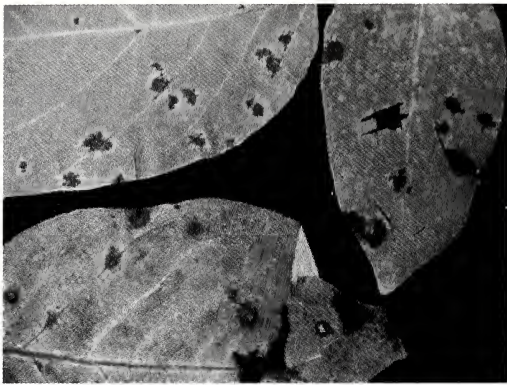


Figure 1.—Leaf spots on *Diospyros virginiana* leaves caused by *Fusicladium levieri* (herbarium specimen PUL 1680).

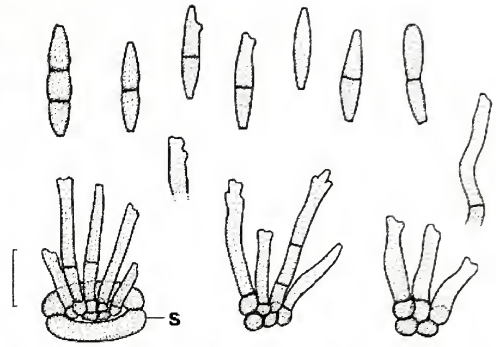


Figure 2.—*Fusicladium levieri*. Conidia and conidiophores in fascicles (PUL 1680). Scale bar = 10  $\mu\text{m}$ , s = stoma.

to wide dark border, occasionally with a narrow diffuse yellowish halo. Caespituli amphigenous, punctiform to subeffuse, dark brown, not very conspicuous.

**Microscopic features.**—Mycelium internal; hyphae sparingly branched, septate, pigmented, smooth, 1–3  $\mu\text{m}$  wide. Stromata lacking or with only small brown hyphal aggregations, substomatal to intraepidermal. Conidiophores (Fig. 2) in small, loose to dense fascicles, occasionally solitary, arising from internal hyphae or hyphal aggregations, erumpent through the cuticle or emerging through stomata, erect, subcylindrical to geniculate-sinuose, often denticulate, simple, rarely branched, 10–70  $\times$  3–8  $\mu\text{m}$ , continuous to 1–3-septate, pale olivaceous, olivaceous-brown to brown, wall thin to slightly thickened, smooth or almost so; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25  $\mu\text{m}$  long; conidiogenous loci conspicuous, often denticle-like, apex truncate, 1.5–3  $\mu\text{m}$  wide, non-pigmented to distinctly pigmented, but consistently unthickened. Conidia (Fig. 2) catenate, occasionally in branched chains, ellipsoid-ovoid, subcylindrical, fusiform, usually straight, (12–)15–25(–40)  $\times$  3–7  $\mu\text{m}$ , 0–1(–2)-septate, occasionally constricted at the septa, subhyaline to pale olivaceous, smooth or almost so, apex obtuse to truncate, base obconically truncate, hila 1.5–3  $\mu\text{m}$  wide, non-pigmented to pigmented, but unthickened.

There is no sexual state known from *F. levieri*, but if a teleomorph is formed it might

belong to *Venturia* or *Acantharia* as indicated for other *Fusicladium* species. The species is not likely to be confused with other parasitic species of mitosporic fungi on *Diospyros* in the USA. There is some similarity between *F. levieri* and cercosporoid species, four of which are known on *Diospyros* from the USA, viz., *Passalora fuliginosa* (Ellis & Kellerm.) Crous, Alfenas & R.W. Barreto (= *Cercospora fuliginosa* Ellis & Kellerm., as “*fuliginosa*”), *Pseudocercospora kaki* Goh & W.H. Hsieh (= *Cercospora kaki* Ellis & Everh.), *Pseudocercospora macclatchieana* (Sacc. & Syd.) U. Braun & Crous (= *Cercospora macclatchieana* Sacc. & Syd.) U. Braun & Crous (= *Cercospora diospyri* (Thüm.) U. Braun (= *Cercospora diospyri* Thüm., *Sirosporium diospyri* (Thüm.) Deighton) (see Crous & Braun 2003). Spores of the three native species of cercosporoid hyphomycetes on *Diospyros* (see Farr et al. 1989), however, have much longer, pluriseptate scolecosporous conidia (ca. 40–75  $\mu\text{m}$  on average; compare Chupp 1953). Furthermore, the conidiogenous loci in *Passalora fuliginosa* and *Stenella diospyri* are conspicuously thickened and pigmented, and the latter species is additionally distinguished by having verruculose superficial hyphae with solitary conidiophores. Besides being formed on *D. virginiana*, *Fusicladium levieri* is also known from outside the USA (China, India, Japan, Georgia, Romania) on *D. kaki* L. fil. (Date plum, Japanese persimmon) and on *D. lotus* L. (Schubert 2001). There is no record of this species on *D. texana* Scheele (Texas persimmon), the second native persimmon of the USA (South Texas). Alfieri et al. (1984) list

“*Ramularia* sp.” on *D. kaki* and on *D. virginiana* in Florida. These records might actually be *F. levieri* as well.

#### LITERATURE CITED

- Alfieri, S.A., Jr., K.R. Langdon, C. Wehlburg & J.W. Kimbrough. 1984. Index of Plant Diseases in Florida. Florida Dept. of Agriculture & Consumer Services, Div. of Plant Industry. Bull. No. II (Revised). 389 pp.
- Brockman, C.F. 1986. Trees of North America. Golden Press. New York. 280 pp.
- Chupp, C. 1953. A Monograph of the Fungus Genus *Cercospora*. Cornell University Press. Ithaca, New York.
- Crous, P.W. & U. Braun. 2003. *Mycosphaerella* and Its Anamorphs: 1. Names Published in *Cercospora* and *Passalora*. CBS Biodiversity Series 1. Utrecht. 571 pp.
- Deam, C.C. 1940. Flora of Indiana. W.M. Burford. Indianapolis. 1236 pp.
- Farr, D.F., G.F. Bills, G.P. Chamuris & A.Y. Rossman. 1989. Fungi On Plants and Plant Products in the United States. APS Press. St. Paul. 1252 pp.
- Hayden, R.A. 2001. Persimmons. Department of Horticulture, Purdue University Cooperative Extension Service. Bulletin HO-108-W.
- Schubert, K. 2001. Taxonomische Revision der Gattung *Fusicladium* (Hyphomycetes, *Venturia*-Anamorphen). Dipl.-Arbeit, Martin-Luther-Universität Halle. 136 pp.
- Wampler, M. & F. Wampler. 2000. Trees of Indiana. Indiana University Press. Bloomington, Indiana. 152 pp.

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