CINTRACTIA MAJEWSKII, A NEW SMUT FUNGUS (USTILAGINOMYCETES) ON FIMBRISTYLIS (CYPERACEAE) FROM AFRICA

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Abstract. A new species of smut fungi, Cintractia majewskii M. Piątek & Vánky sp. nov. on Fimbristylis sp., collected in the Democratic Republic of the Congo in Africa, is described, illustrated and compared with similar taxa. A key for the identification of the eight smut fungi on Fimbristylis spp. is provided.

Key words: Cintractia, new species, smut fungi, Ustilaginomycetes, Fimbristylis, taxonomy, Democratic Republic of the Congo, Africa

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INTRODUCTION

Fimbristylis Vahl is a genus of Cyperaceae with about 200 species worldwide, occurring mostly in subtropical and tropical regions. On Fimbristylis spp. seven species of smut fungi have been hitherto recognized as good taxa: Cintractia axicola (Berk.) Cornu, C. fimbristylis-miliaceae (Henn.) S. Ito, C. mitchellii Vánky, Dermatosorus fimbristylidis (Thirum. & Naras.) Langdon, Moreaua fimbristylicidis Vánky & R. G. Shivas, M. mauritiana (Syd.) Vánky and Pilocintractia fimbristylicidica (Pavgi & Mundk.) Vánky. On the closely related host genus Bulbostylis Kunth, five smut fungi have been described: Cintractia bulbostylidis R. G. Shivas & Vánky, Cintractia eleocharidis (Thirum. & Pavgi) Vánky, Dermatosorus bulbostylidis (Thirum. & Pavgi) Vánky, Moreaua bulbostylidis M. Piepenbr. and Ustanciosporium kuwanoanum (Togashi & Y. Maki) Vánky. Descriptions and illustrations of these species can be found in recent monographs and papers (Piepenbring 2000a–b; Vánky 1987, 1997a–b, 2002, 2004, 2005; Vánky & Shivas 2001).

When studying several unidentified smut fungi obtained on loan from BR, the first author found a remarkable specimen of Cintractia Cornu s.l. on Fimbristylis sp. It was not Cintractia axicola, the most common member of this genus, which forms sori mostly around the pedunculi, and the author thought that it is Cintractia eleocharidis. This assumption was due mostly to the morphology of the spores, which are similar in size to this latter species, and whose surface is covered by confluent warts which form an irregular reticulum with irregularly verruculose muri. This latter character is visible under SEM while under LM the confluent warts appear as a barely visible reticulum. The examination of this collection by the second author revealed that it is not Cintractia eleocharidis, but represents a still unknown species described and illustrated below.

DESCRIPTION

Cintractia majewskii M. Piątek & Vánky, sp. nov.
Typus (hic designatus) in matrice Fimbristylis sp., Democratic Republic of the Congo, Gungu, Mukulu, 06°00’S, 19°20’E, Jan. 1914, leg. H. Vanderyst, Holo-typus in BR 121117-61!
Sori in omnibus floribus inconspicui, glumis obtecti, globose vel ovoidei, 0.5–1.0 mm in diam., nigri, compositi e massa agglutinata sporarum cum pulveracea superficie; infectio systemica; spora solitaria, aplana; lateritellae ellipticae, 7.0–9.5 μm latae, visu plano subcircularis, ellipticae, ovoideae, paulo irregulares, 9.5–13.5 × 10.5–15.0(–16.0) μm, luteofuscae; paries sporae paulo inaequalis, tenuior in planis partibus, 0.5–1.0 μm, crassus, superficies in LM dense et tenuiter verruculosa, in faciei latere altero sporae laevigatae tenuiter sinuosae, in SEM tenuiter et irregulariter reticulatiformis cum irregulariter verruculo-muris; hyalinae appendices absent.

Sori (Fig. 1) in all flowers of the spikelet, inconspicuous, hidden by the glumes, globoid or subacutely ovoid, 0.5–1.0 mm in diameter, black, composed of an agglutinated spore mass with powdery surface surrounding the basal part of the innermost floral organs often with the anthers or stigmata protruding. Infection systemic, all spikelets of an inflorescence affected. Spores (Figs 2, 6–11) single, flattened, in side view elliptic, 7.0–9.5 μm wide, in plane view subcircular, elliptic, ovoid to slightly irregular, 9.5–13.5 × 10.5–15.0(–16.0) μm, yellowish-brown; wall slightly uneven, thinner on the flattened sides, 0.5–1.0 μm thick, surface in LM densely, finely verrucose, spore profile smooth to finely wavy, in SEM finely, irregularly reticulate with irregularly verrucose muri. Hyaline appendages absent. The spores are produced successively (Figs 3–5), on the top of sporogenous hyphae arranged radially on the surface of the host tissues. Between the mass of sporogenous hyphae, distally narrowing fascicles are present (10–15 μm wide, 60–100 μm long), composed of sterile, elongated fungal cells (Figs 3–5, arrows).

ETYMOLOGY. This species is dedicated to Professor Tomasz Majewski, an outstanding Polish mycologist. In the 1970s he elaborated, together with Józef Kochman, a monograph of the smut fungi of Poland, and later became a specialist on rust fungi and especially Laboulbeniales.

HOST AND DISTRIBUTION. On Cyperaceae: Fimbristylis sp., Democratic Republic of the Congo, Africa. Known only from the type collection.

DISCUSSION

The generic position of several smut fungi on Cyperaceae can be difficult to determine since the genus Cintractia Cornu s.l. was split (Piepenbring et al. 1999). This is also the case with Cintractia majewskii, which shares the characters of both Cintractia and Ustanciosporium Vánky emend. M. Piepenbr. For instance, the structure of the sori and spore formation, including the presence of fascicles of sterile fungal cells support an affinity to the genus Cintractia. On the other hand, there is no peridium around the sori, which is a characteristic feature of the genus Ustanciosporium. In many situations, molecular data can help in establishing the generic placement, but molecular study of the present species is impossible because the material...
is too old. To give an example, *Cintractia amazonica* Syd. & P. Syd. has a soral structure (no peridium and sterile stroma) similar to that of several species accommodated in *Ustanciosporium*, but molecular data have shown that it is closely related to *Cintractia axicola* (Piepenbring & Oberwinkler 2003). Therefore, it seems that the presence of a peridium is not an obligatory character for the genus *Cintractia*, and we decided to accommodate the new species in the genus *Cintractia* rather than *Ustanciosporium*.

*Cintractia axicola*, the type species of the genus *Cintractia*, forms sori usually at the bases of the peduncles, rarely also in the spikelets, and its spores are finely punctate-verruculose. In contrast, *Cintractia majewskii* has sori in all flowers of the spikelet. The sori are inconspicuous, hidden by the glumes of the host plant. Attempts to identify the host plant at the species level failed because the two healthy inflorescence of *Fimbristylis* sp., present in the type collection, are immature and sterile, and do not contain nuts.

More or less reticulate spore ornamentation is present also in *Cintractia bulbostylidis*, *C. eleocharidis*, *Ustanciosporium kuwanoanum* and *Pilocintractia fimbristylidicola*. However, all of these species have sets of characters which differentiate them from *C. majewskii*. *Cintractia bulbostylidis* occurs on *Bulboestylis barbata* (Rottb.) C. B. Clarke in Australia and has much smaller spores, 8–10 × 8–11 μm, with a finely, irregularly reticulate spore surface (SEM...
in Vánky & Shivas 2001). *Cintractia eleocharidis* infects *Bulbostylis* sp. in India (not *Eleocharis* sp. as originally stated in the protologue, see Vánky 2005). Its spores (Figs 12–13) are often lacrimiform with an acute or subacute tip and distinctly verrucose-echinulate with warts or spines often connected by thin, low muri forming a complete or incomplete, irregular reticulum as seen by SEM. *Ustanciosporium kuwanoanum* is known from various host genera, including

Figs 6–11. Spores of *Cintractia majewskii* M. Piątek & Vánky, sp. nov. in SEM (HOLOTYPE: BR 121117-61). Scale bars = 5 μm (Figs 6–9) and 10 μm (Figs 10–11).
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Bulbostylis, Cyperus and Rikliella, and occurs in East Asia and Africa. The ornamentation of the spores of this species is somewhat similar to that in *C. majewskii* (SEM in Vánky & Guo 1986) but the spores are longer and arranged in spore-balls. *Pilocintractia fimbriystelicola* parasitizes some species of *Fimbristylis* in India and Central America, and has superficially similar spore ornamentation (SEM in Piepenbring 2000b and Vánky 2004), but differs from *C. majewskii* by the presence of hard sori without a powdery surface, and by having gelatinized fungal filaments between the spores. These characters are unique amongst smut fungi and differentiate the unispecific genus *Pilocintractia* Vánky (Vánky 2004).

KEY TO THE SMUT FUNGI ON *FIMBRISTYLIS*

1. Spores in spore-balls .......................... 2
2. Spore balls composed of spores only .......... 4
2′ Spore balls composed of spores with reticulum appearing as parenchymatous fungal cells separating the spores; spore balls surrounded by a cortex of sterile cells .......... *Dermatosorus fimbriystelicis*
3. Spore balls 20–50(–60) μm long, composed usually of 2–16 spores; spores up to 16 μm long .......... *Moreaua mauritiana*
3′ Spore balls 40–100 μm long, composed usually of 20–100 spores; spores up to 20(–24) μm long .... *Moreaua fimbriystelicis*
4. Spores apparently smooth to finely punctate or verrucose-reticulate ........................... 5
4′ Spores evidently verrucose- or echinulate-reticulate .................................................. 6
5. Spores 10.0–14.5 μm long, in SEM finely, irregularly verrucose-reticulate; sori in the spikelets .......... *Cintractia mitchelli*
5′ Spores 12–17 μm long, in SEM finely punctate- verruculose; sori around the bases of pedunculi or sometimes in the spikelets .......... *Cintractia axicola*
6. Spores distinctly verrucose-reticulate .......... 7
6′ Spores distinctly echinulate-reticulate, 9.5–14.5 μm long .......... *Cintractia fimbriystelicis-miliacea*
7. Spores 10.5–15.0(–16.0) μm long; sori powdery .......... *Cintractia majewskii*
7′ Spores 8–12 μm long; sori hard without a powdery surface .......... *Pilocintractia fimbriystelicola*

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