

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 fimbristylidis* Vánky & R. G. Shivas, *M. mauritiana* (Syd.) Vánky and *Pilocintractia fimbristylidicola* (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, Holotypus 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; sporae solitariae, applanatae, lateraliter ellipticae, 7.0–9.5 µm latae, visu plano subcirculares, ellipticae, ovoideae, paulo irregulares, 9.5–13.5 × 10.5–15.0(–16.0) µm, luteofuscae; paries sporae paulo inaequalis, tenuior in applanatis 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 verruculosis muris; hyalinae appendices absentes.

Sori (Fig. 1) in all flowers of the spikelet, inconspicuous, hidden by the glumes, globose 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 verruculose 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

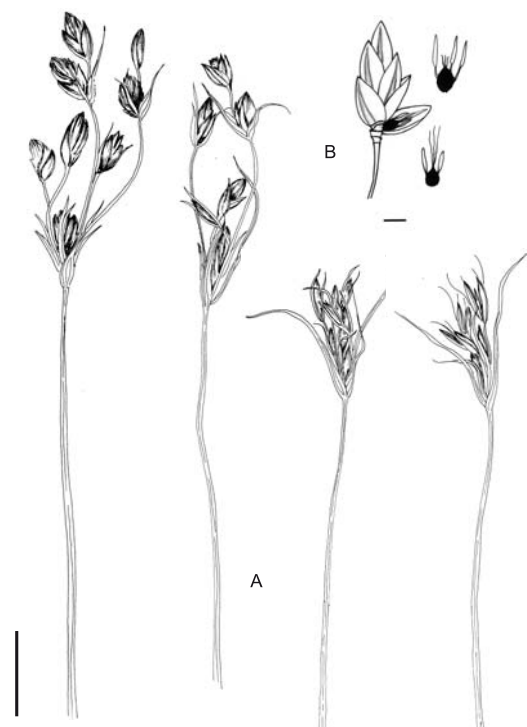
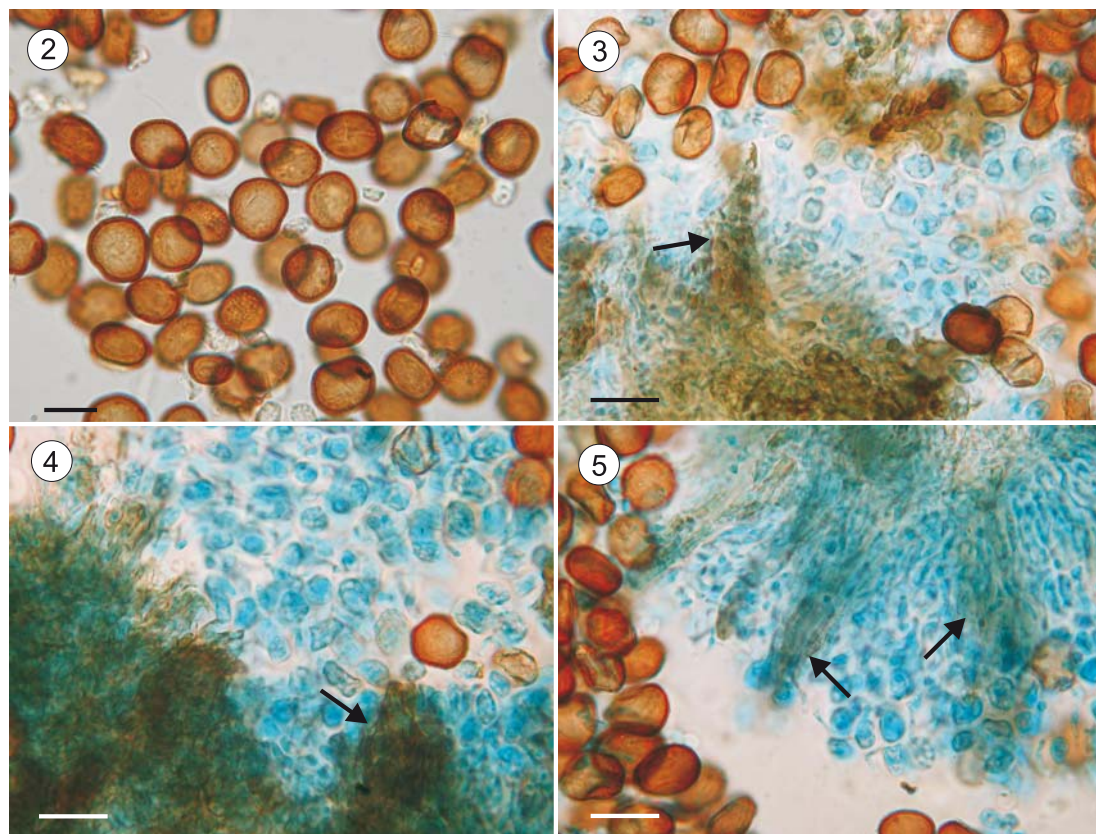


Fig. 1. *Cintractia majewskii* M. Piątek & Vánky, *sp. nov.*: A – sori in spikelets of *Fimbristylis* sp., to the left two infected plants, to the right two healthy inflorescences (HOLOTYPE: BR 121117-61). Scale bar = 1 cm; B – detail of an infected spikelet of *Fimbristylis* sp. and two sori with remnants of the anthers and stigmata (HOLOTYPE: BR 121117-61). Scale bar = 1 mm.



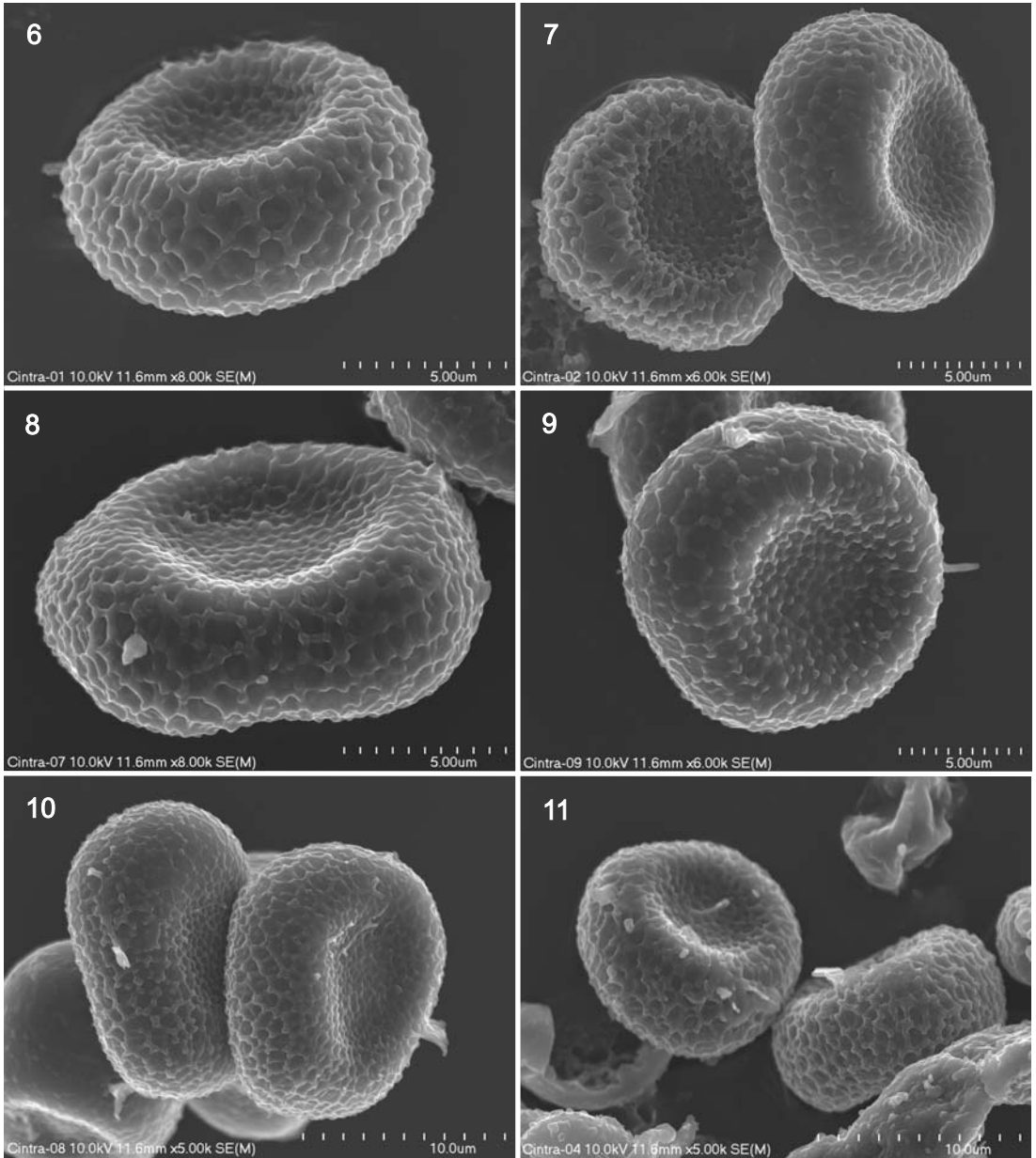
Figs 2–5. *Cintractia majewskii* M. Piątek & Vánky, sp. nov. 2 – Spores in LM. 3–5 – Basal part of the sori with mass of sporogenous hyphae (in blue) and young spores in different developmental stages (in blue). Between developing spores fascicles of sterile fungal cells can be seen (arrows) which are not coloured in blue, similarly to the mature spores (HOLOTYPE: BR 121117-61). Scale bars = 20 μ m.

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.

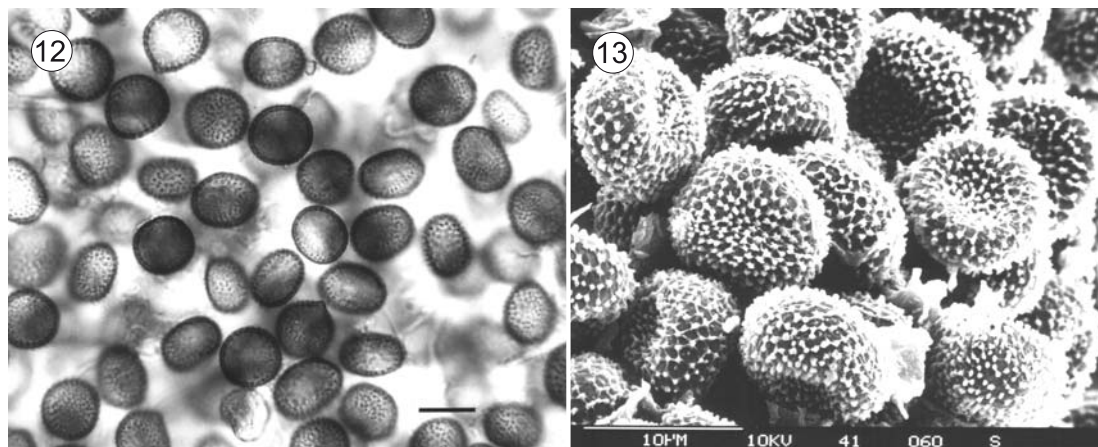
More or less reticulate spore ornamentation is present also in *Cintractia bulbostylidis*, *C. eleocharidis*, *Ustanciosporium kuwanoanum* and *Pilocintractia fimbristylidicola*. However, all of these species have sets of characters which differentiate them from *C. majewskii*. *Cintractia bulbostylidis* occurs on *Bulbostylis barbata* (Rottb.) C. B. Clarke in Australia and has much smaller spores, 8–10 \times 8–11 μ m, with a finely, irregularly reticulate spore surface (SEM



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).

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 12–13. Spores of *Cintractia eleocharidis* (Thirum. & Pavgi) Vánky on *Bulbostylis* sp., in LM and SEM (ISOTYPE: HUV 15510). Scale bars = 10 μ m.

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 fimbristylidicola* 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).

- 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 μ m long, in SEM finely, irregularly verrucose-reticulate; sori in the spikelets *Cintractia michellii*
- 5* Spores 12–17 μ m 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 μ m long *Cintractia fimbristylis-miliaceae*
- 7. Spores 10.5–15.0(–16.0) μ m long; sori powdery *Cintractia majewskii*
- 7* Spores 8–12 μ m long; sori hard without a powdery surface *Pilocintractia fimbristylidicola*

KEY TO THE SMUT FUNGI ON *FIMBRISTYLIS*

- 1. Spores in spore-balls 2
- 1* Spores single 4
- 2. Spore balls composed of spores only 3
- 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 fimbristylidis*
- 3. Spore balls 20–50(–60) μ m long, composed usually of 2–16 spores; spores up to 16 μ m long *Moreaua mauritiana*
- 3* Spore balls 40–100 μ m long, composed usually of 20–100 spores; spores up to 20(–24) μ m long *Moreaua fimbristylidis*

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