

The smut fungi (Ustilaginomycetes) of Eriocaulaceae. II. *Eriocaulago* and *Eriosporium* new genera

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Abstract. Two new genera, *Eriocaulago* and *Eriosporium* are described. The following new combinations are proposed: *Eriocaulago eriocauli*, *Eriocaulago jagdishwari*, *Eriosporium hessii*, and *Eriosporium mesanthemi*. Lectotype is designated for *Eriosporium mesanthemi*.

Key words: *Eriocaulago*, *Eriocaulon*, *Eriosporium*, new genera, new combinations, smut fungi, Ustilaginomycetes

Introduction

The smut fungi of Eriocaulaceae are poorly known. On the ca 1200 species belonging to the Eriocaulaceae only six smut fungi have been reported, four on species of *Eriocaulon*, one on both *Eriocaulon* and *Syngonanthus*, and one on *Mesanthemum*. These are: *Cintractia eriocauli* Masee, *Sorosporium mesanthemi* E. Müll., *Tolyposporella eriocauli* Vienn.-Bourg., *Tolyposporium eriocauli* G.P. Clinton, *T. hessii* E. Müll., and *Ustilago jagdishwari* Mishra.

According to our present knowledge, species of *Ustilago* and *Tolyposporella* are restricted to host plants in the Poaceae, species of *Cintractia* s. str. to the Cyperaceae. *Tolyposporium* parasitises members of the two sister groups, Juncaceae and Cyperaceae, whereas *Sorosporium* (= *Thecaphora*) infects only dicotyledonous host plants. Therefore, the generic position of the known smut fungi on Eriocaulaceae represents an exciting challenge, especially in the absence of useful molecular data. Molecular data for most of these smut fungi is unlikely to be available in the near future because of the scarcity of material compounded by the fact that several type specimens are in poor condition, nearly non-existent or apparently lost. Rediscovery and collection of these species in the type localities, or elsewhere, is a difficult task.

For *Tolyposporium eriocauli* a new genus, *Eriomoeszia*, was proposed with a type *E. eriocauli* (G.P. Clinton) Vánky (Vánky 2005). For synonyms (*Tolyposporium eriocauli* G.P. Clinton,

Dermatosorus eriocauli (G.P. Clinton) M.D. Whitehead & Thirum., *Tolypoderma eriocauli* (G.P. Clinton) Thirum., and *Moesziomyces eriocauli* (G.P. Clinton) Vánky), detailed description, illustrations, host plant range, and geographic distribution see Vánky (op.c.).

Results

For *Cintractia eriocauli* a new genus is proposed:

***Eriocaulago* Vánky, gen. nov.**

Sori in ovariiis plantae nutrientis familiae Eriocaulaceae, capsulas massa sporarum fusca implentes, sine peridio, sine columella. *Sporae* singulae, pigmentiferae (brunneae), non colore violaceo neque flavide-rubro tinctae. *Cellulae steriles* absentes. *Germinatio sporarum* cum phragmobasidiis, basidiosporas producentibus.

Typus generis: *E. eriocauli*.

Sori in ovaries of host plants belonging to the Eriocaulaceae, filling the capsules with dark coloured spore masses, no peridium, no columella. **Spores** single, pigmented (brown), without violet or yellowish red tint. **Sterile cells** lacking. **Spore germination** results in phragmobasidia producing basidiospores.

Type of the genus:

Eriocaulago eriocauli (Masse) Vánky, **comb. nov.**

Basionym: *Cintractia eriocauli* Masee, *Grevillea* 22: 67, 1894. — *Ustilago eriocauli* (Masse) G.P. Clinton 1902: 137. — *U. eriocauli* (Masse) Ciferri 1928: 31 (comb. superfl.). — Type on *Eriocaulon fenestratum* Boj. ex Körn., Madagascar Central, coll. Baron, comm. J. Hooker (K; isotype BPI 160 374!).

Ustilago eriocauli G.P. Clinton 1901: 82. — Type on *Eriocaulon septangulare* With. (= *E. aquaticum* (Hill) Druce), USA, Massachusetts, South Billerica, 17 Nov 1900, G.P. Clinton (BPI 160 378; isotypes BPI 160 375, Seymour & Earle, Econ. fgi., Suppl. C., no. 68, H.U.V. 9660!). (syn. by Clinton 1902: 137).

Sori (Fig. 1) in the capsules appearing as ovoid or usually laterally flattened, distinctly two lobed, blackish, rather hard bodies, *ca* 0.7–1 mm long and 0.8–1.2 mm wide, hidden by the perianths, filled with a dark reddish brown, agglutinated mass of spores, no sterile cells. **Spores** (Figs 2–3) subpolyhedrally or polyhedrally irregular, more rarely rounded, ovoid or elongated, 8–10.5 × 9.5–16 µm, pale olivaceous brown; wall even, *ca* 0.5 µm thick, in LM appearing as densely verruculose, spore profile finely wavy to finely, densely serrulate, in SEM densely verruculose, warts confluent, forming small, incomplete or complete meshes, then appearing as foveolate. **Spore germination** (Clinton 1901: 82) results in 4-celled basidia producing terminal and lateral basidiospores measuring 1.5–3 × 6–12 µm.

On *Eriocaulon aquaticum* (Hill) Druce (*E. septangulare* With., *E. articulatum* (Hudson) Morong.), *E. fenestratum* Boj. ex Körn.

Distribution: Africa (Madagascar), N. America (USA). Certainly more common but overlooked.

Etymology: *Eriocaul-* from the host plant family Eriocaulaceae, *-ago* from the smut fungus genus *Ustilago*.

Eriocaulago jagdishwari (Mishra) Vánky, **comb. nov.**

Basionym: *Ustilago jagdishwari* Mishra, *Mycologia* 48: 408, 1956. — Type on *Eriocaulon* sp., India, Bihar, Dumka, 20 Oct 1954, J.N. Mishra (RBG; isotypes IARI, IMI 60 497, H.U.V. 17 960!).

Sori in the capsules as obovoid, lobed, black bodies, *ca* 0.2–0.3 × 0.3–0.5 mm, hidden by the perianths, filled with a black, agglutinated to powdery mass of spores. **Infection** systemic. **Spores** (Figs 4–5) globose, subglobose, ovoid, ellipsoidal, elongate to slightly irregular, 10–13 × 11–16 µm, dark reddish brown; wall even or uneven, 0.5–1 (–2) µm thick, irregularly low verrucose, spore profile finely wavy.

On *Eriocaulon cinereum* R. Br., *Eriocaulon* sp., *Syngonanthus welwitschii* (Rendle) Ruhl.

Distribution: Africa (Angola), S. Asia (India).

The smut on *Syngonanthus welwitschii*, collected in Angola by H. Hess, preserved in Z+ZT! as *Ustilago eriocauli*, does not belong to that species but fits very well with the type of *E. jagdishwari*. The sole difference is the somewhat thicker spore wall (0.8–2 µm) in the *Syngonanthus* smut.

There are two smut fungi, *Sorosporium mesanthemi* and *Tolyposporium hessii*, on Eriocaulaceae in which the spores form spore balls without sterile cells. However, their sorus, spore ball, and spore morphology does not allow them to be included in *Sorosporium*, *Tolyposporium* or any other known genus (comp. Vánky 2002). A separate genus is proposed for them:

Eriosporium Vánky, **gen. nov.**

Sori in ovarii plantae nutrientis familiae Eriocaulaceae, capsulas glomerulis sporarum implentes, sine peridio fungali, item columella cellulisque sterilibus. **Glomeruli sporarum e sporis tantum compositi, cellulae steriles et stratum corticale absentes. Sporae pigmentiferae (brunneae), non colore violaceo neque flavide-rubro tinctae.**

Typus generis: E. mesanthemi.

Sori in ovaries of host plants belonging to the Eriocaulaceae, filling the capsules with spore balls. Fungal peridium, columella and sterile cells are lacking. **Spore balls** composed of spores only, sterile cells and cortical layer are lacking. **Spores** pigmented (brown), without violet or yellowish red tint.

Type of the genus:

Eriosporium mesanthemi (E. Müll.) Vánky, **comb. nov.**

Basionym: *Sorosporium mesanthemi* E. Müller, *Phytopathol. Z.* 23: 109, 1955. — Lectotype on *Mesanthemum radicans* Körn., Angola, Prov. Bié (designated here), Baixo Cubango, 176 km NW of Cuangar, alt. 1070 m, 29 Jan 1952, H. Hess 52/514 (Z+ZT!). Syntype on *M. radicans*, Angola, Prov. Bié, 61 km S of Caiundo, alt. 1160 m, 4 Feb 1952, H. Hess 52/614 (Z+ZT!), both types extremely scanty).

Sori (Fig. 6) in the capsules appearing as broadly ellipsoidal, obovoid or lemon shaped bodies, *ca* 0.5–1 × 0.8–1.2 mm, often with a short, acute tip, hidden by the perianths, first covered by a thin, greyish membrane of host origin (the remnants of the capsule), which ruptures irregularly disclosing the black, semiagglutinated to granular-powdery mass of spore balls. No columella, no fungal peridium. **Spore balls** (Figs 7–8) much varying in shape and size, mostly subpolyhedrally or even polyhedrally irregular, often elongated, more rarely globose, triangular or curved, 30–80 × 40–100 (–120) µm, medium dark yellowish brown, apparently loose but rather permanent, composed of tens to hundred(s)? of spores which separate by pressure. No cortex around the balls, no sterile cells between the spores. **Spores** (Figs 7–8) subglobose, ovoid, ellipsoidal to rounded subpolyhedrally slightly irregular, 5.5–8 (–9) × 6.5–9.5 (–10) µm, pale yellowish brown; wall even, *ca* 0.5 µm thick, apparently smooth, in SEM with low, inconspicuous warts.

On *Mesanthemum radicans* Körn.

Distribution: Africa (Angola).

In the original description of *Sorosporium mesanthemi*, two collections were enumerated but no type indicated. “Type” was noticed only on the hand-written label by E. Müller in

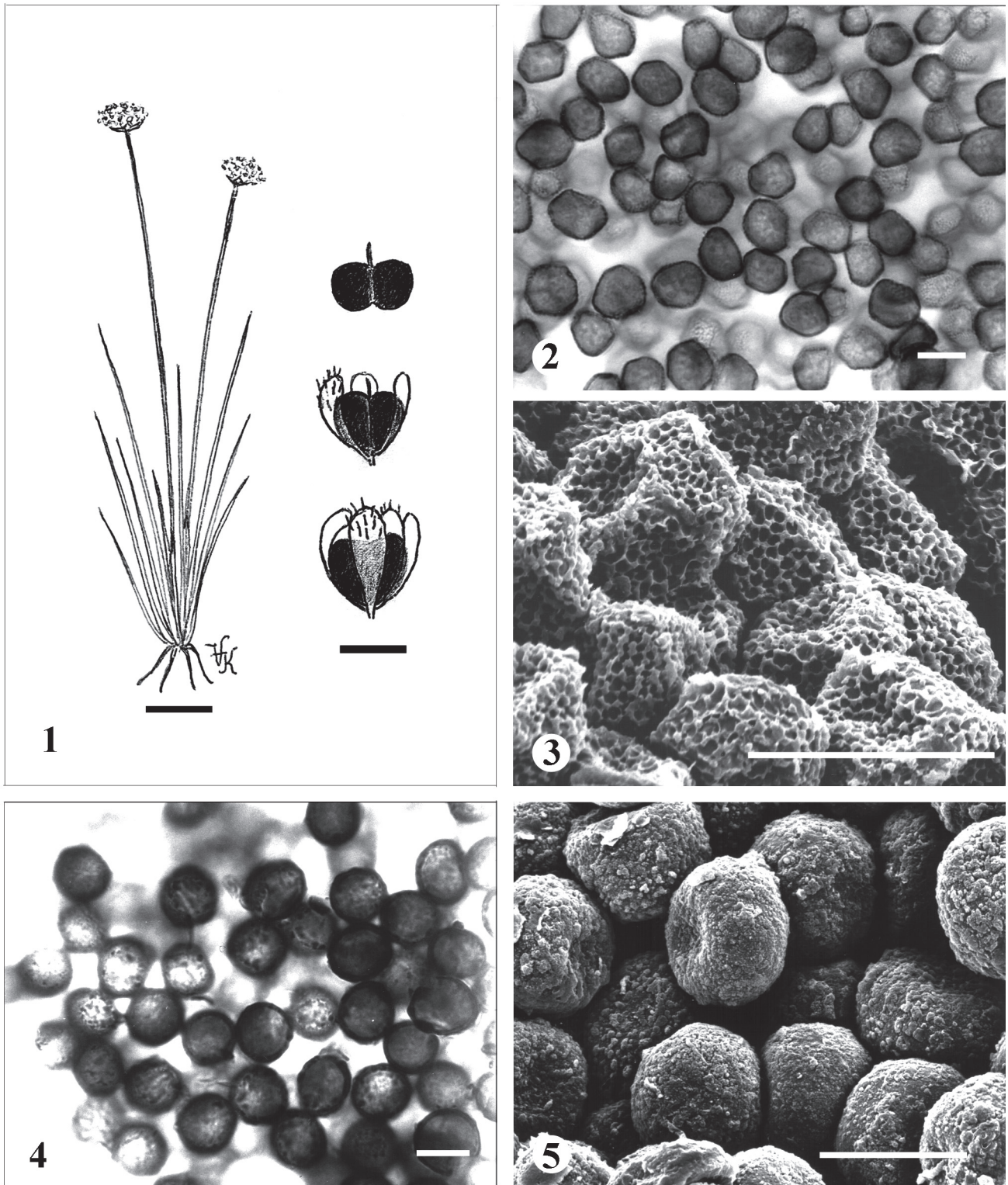


Fig. 1. Sori of *Eriocaulago eriocauli* in the capsules of *Eriocaulon aquaticum* (type). Habit. Enlarged three sori. Bars = 1 cm for habit, and 1 mm for detail drawings. Figs 2-3. Spores of *Eriocaulago eriocauli* on *Eriocaulon aquaticum* in LM and in SEM (type). Bars = 10 μ m. Figs 4-5. Spores of *Eriocaulago jagdishwari* on *Eriocaulon* sp. in LM and in SEM (type). Bars = 10 μ m

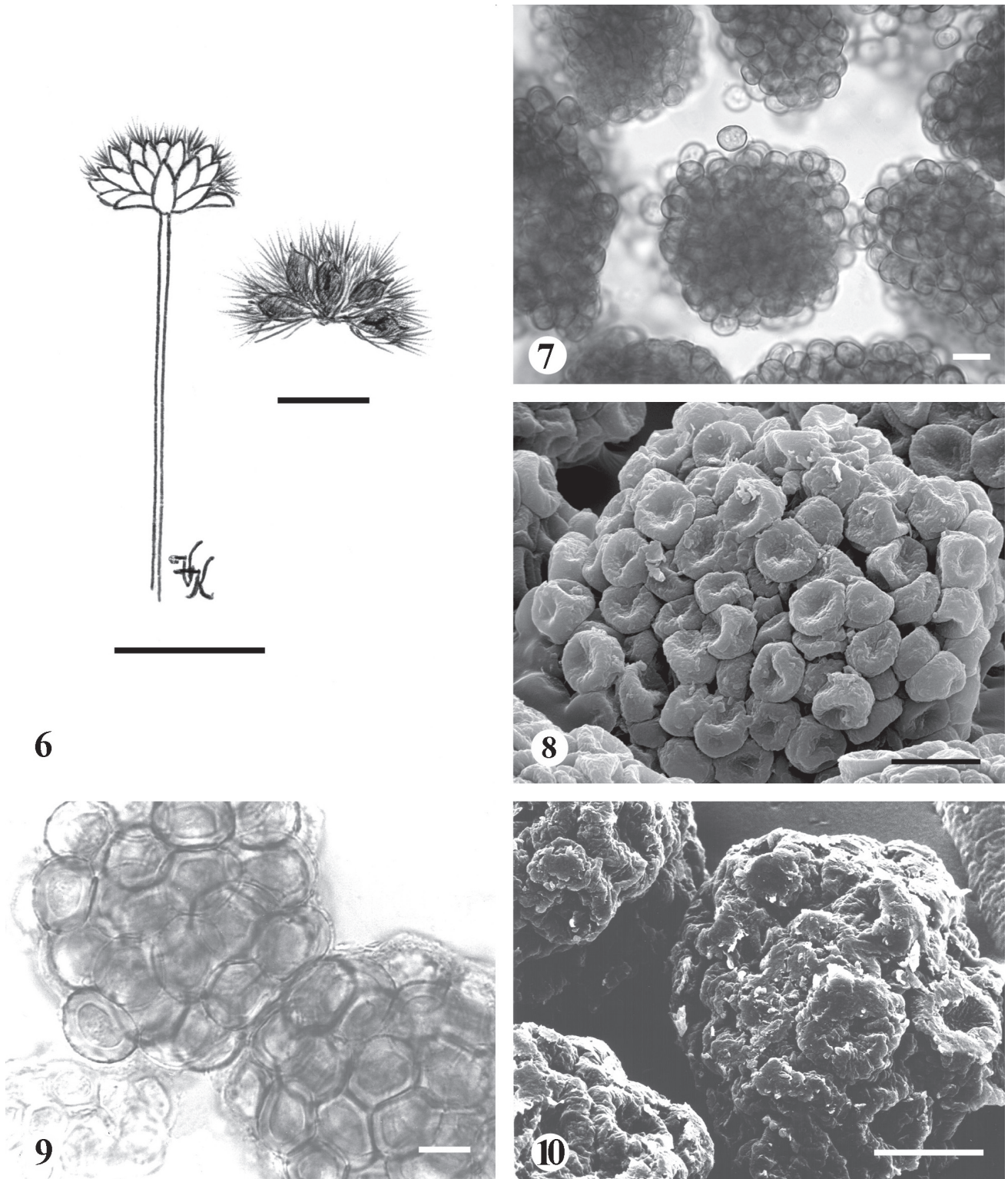


Fig. 6. Sori of *Eriosporium mesanthemi* in the capsules of *Mesanthemum radicans* (type). Habit and enlarged some sori hidden by the perianths. Bars = 1 cm for habit, and 4 mm for detail drawings. Figs 7-8. Spores of *Eriosporium mesanthemi* on *Mesanthemum radicans* in LM and in SEM (type). Bars = 10 μ m. Figs 9-10. Spores of *Eriosporium hessii* on *Eriocaulon lanatum* in LM and in SEM (type). Bars = 10 μ m

Z+ZT, which is designated here as the lectotype, the second collection being the syntype.

Eriosporium differs from *Eriomoeszia* in having spore balls composed of spores only, lacking sterile cells between the spores and a cortex of sterile cells. It differs from *Tolyposporium* (type *T. junci* (J. Schröt.) Woronin on *Juncus bufonius* L.), in having sori in the fruits, not on the surface of the host tissues, by having pale brown, not dark blackish brown to opaque spore balls, in which the spores are not glued together as in *T. junci*. They differ also in host plant families.

A study of the type material of *Tolyposporium bessii* showed similar soral characters and spore ball structure as *Eriosporium mesanthemi*. Hence they are considered congeneric.

Eriosporium bessii (E. Müll.) Vánky, **comb. nov.**

Basionym: *Tolyposporium bessii* E. Müller, *Phytopathol. Z.* 23: 108, 1955. — *Sorosporium bessii* (E. Müll.) Thirumalachar & Neergaard 1978: 184. — Type on *Eriocaulon lanatus* H. Hess, Angola, Prov. Bié, Baixo Cubango, 30 km N of Caiundo, at Rio Cuevi, alt. 1230 m, 6 Feb 1952, leg. H. Hess 52/640 (Z+ZT!; extremely poor material).

Sori in the capsules appearing as lemon-shaped, dark brown bodies, 0.7-1.2 × 1-1.5 mm, hidden by the perianths, first covered by a delicate membrane of host origin (the remnants of the capsule) which ruptures irregularly, disclosing the dark brown, granular-powdery mass of spore balls. Columella, fungal peridium and sterile cells are lacking. **Spore balls** (Figs 9-10) globose, ovoid, ellipsoidal to slightly irregular, varying in size, 30-70 × 30-80 µm, pale yellowish brown, compact, composed of 10 to several tens of rather firmly united spores which separate by pressure. **Sterile cells** between the spores

and a cortex around the balls are lacking. **Spores** (Figs 9-10) subglobose, ovoid, ellipsoidal, more rarely subpolyhedrally slightly irregular, 9-13.5 × 10.5-16 µm, pale yellowish brown (beige) coloured; wall thick, 2-3 (-4) µm, slightly uneven, thickest at the angles, with remnants of the sporogenous hyphae, in SEM provided with irregular, often confluent warts. Young spore balls are embedded in and surrounded by a hyaline, amorphous fungal mass which disappears at maturity.

On *Eriocaulon lanatus* H. Hess.

Distribution: Africa (Angola). Known only from the type collection.

Tolyposporella eriocaulonis Viennot-Bourgin 1957: 275 (as "*Tolytosporella*").

Type on *Eriocaulon afzelianum* Witskr., Guinea (French), near Kindia, Jan 1957, G. Viennot-Bourgin. (type ubi?).

Sori on the leaves and peduncles of the inflorescence, forming lead coloured, compact striae, 1-4 mm long, first covered by the epidermis which ruptures disclosing the black, agglutinated to semi-powdery mass of spores. Diseased peduncles distorted or spirally coiled. **Spores** subglobose, ellipsoidal, 7-12 × 8-17 µm, brown, opaque; wall uneven, 3-6 µm thick, of several, concentric layers, smooth. **Spore germination** not known.

On *Eriocaulon afzelianum* Witskr.

Distribution: Africa (Guinea). Known from the type locality only.

No specimen was found in Herb. Viennot-Bourgin in PC. Description taken from the original. Generic position is uncertain.

Key to smut fungi of Eriocaulaceae

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|----|--|---------------------------------|
| 1 | Sori as striae on the leaves and peduncles. | <i>Tolyposporella eriocauli</i> |
| 1* | Sori in the ovaries (capsules) | 2 |
| 2 | Spores single | 3 |
| 2* | Spores in spore balls. | 4 |
| 3 | Spores irregular, pale olivaceous brown; wall ca 0.5 µm thick. | <i>Eriocaulago eriocauli</i> |
| 3* | Spores regular, dark reddish brown; wall 0.5-1 (-2) µm thick | <i>Eriocaulago jagdishwari</i> |
| 4 | Spore balls mixed with sterile cells, and covered by a cortex. | <i>Eriomoeszia eriocauli</i> |
| 4* | Spore balls without sterile cells and cortex | 5 |
| 5 | Spores 6.5-9.5 (-10) µm long; wall ca 0.5 µm thick. | <i>Eriosporium mesanthemi</i> |
| 5* | Spores 10.5-16 µm long; wall 2-3 (-4) µm thick | <i>Eriosporium bessii</i> |
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