The smut fungi (Ustilaginomycetes) of *Sporobolus* (*Poaceae*)

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New name: *Jamesdicksonia tremuli* Vánky (substituting *Melanotaenium sporoboli* Thirum. & M.C. Sriniv., type on *Sporobolus tremulus*, India). New combinations are: *Jamesdicksonia major* (Har. & Pat.) Vánky (based on *Entyloma majus*, type on *Sporobolus spicatus*, Chad); *J. sporoboli* (H.S. Jackson) Vánky (based on *Tolyposporella sporoboli*, type on *Sporobolus indicus*, Puerto Rico); *Macalpinomyces spermophorus* (Berk. & M.A. Curtis ex de Toni) Vánky (based on *Ustilago spermophora*, type on *Eragrostis poaeoides* USA); *M. spinulosus* (L. Ling) Vánky (based on *Ustilago spinulosa*, type on *Sporobolus paniculatus*, Sierra Leone); *M. sporoboli* (Tracy & Earle) Vánky (based on *Ustilago sporoboli*, type on *Sporobolus junceus*, USA); *Ustilago peruviana* (Zundel) Vánky (based on *Sphacelotheca peruviana*, type on *Sporobolus virginicus*, Peru); and *Ustilago utahensis* (Zundel) Vánky (based on *Sphacelotheca utahensis*, type on *Sporobolus patens*, USA). The host plant of *Ustilago schlechteri* Henn. is not a *Sporobolus* but an *Enneapogon* species. A neotype is designated for *Ustilago schlechteri*.

Key words: neotype, new combinations, new name, synonyms, taxonomy

Introduction

Sporobolus R. Br., in the subfamily *Chloridoideae*, tribe *Eragrostideae*, subtribe *Sporobolinae*, has about 160 species in the tropics and subtropics (Clayton and Renvoize, 1986: 224). At least 20 smut fungi have been recorded on *Sporobolus*. Some of them are synonyms, others belong to genera other than they were originally placed in, or the host plant is not a *Sporobolus*. For example, the host plant of the type of *Tilletia asperifolia* Ellis & Everh., *Sporobolus asperifolius* Nees & Mey., is now regarded as a synonym of *Muhlenbergia asperifolia* (Nees & Mey.) Parodi, and that of *T. montana* Ellis & Everh., *Sporobolus gracillimus* Vasey, is *Muhlenbergia filiformis* (Thurb.) Rydb. *Ustilago striiformis* (Westend.) Niessl has been collected in the USA on *Sporobolus auriculatus* Vasey, which is a synonym of *Muhlenbergia arenacea*

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(Buckl.) Hitchc. However, the specimens in BPI (167936, 167937) under this name, represent *Ustilago buchloës* Ellis & Tracy, on *Bouteloua* sp. *Ustilago schlechteri* Henn. was described on "*Sporobolus* sp.", which is *Enneapogon*, probably *E. scoparius* Stapf.

There is confusion regarding species delimitation and generic placement of many of the dark-spored "*Entyloma*" and "*Melanotaenium*" species of *Poaceae* and *Cyperaceae*, including those of *Sporobolus*. Since the work of Bauer *et al*. (1997), it is known that *Entyloma* and *Melanotaenium* species are restricted to dicotyledonous host plants (comp. also Vánky, 2002). Bauer *et al*. (2001) demonstrated that "*Entyloma*" and "*Melanotaenium*" species of *Poaceae* and *Cyperaceae* belong either to *Jamesdicksonia* Thirum., Pavgi & Payak (*Georgefischeriaceae*), to *Eballistra* R. Bauer, Begerow, A. Nagler & Oberw. (*Eballistraceae*), or to *Phragmotaenium* R. Bauer, Begerow, A. Nagler & Oberw. (*Tilletiariaceae*), all within the order *Georgefischeriales*. Knowledge of soral and spore morphology alone is insufficient to classify these fungi. For generic placement of these grass-infecting smuts, accurate knowledge of spore germination and/or molecular data is necessary. Unfortunately, these data are lacking for most of the "*Entyloma*" and "*Melanotaenium*" species of *Poaceae*. For now, it is best to place, by analogy, these fungi of *Sporobolus* into the genus *Jamesdicksonia.* However, caution! Similar, dark, blackish leaf spots on grasses may be produced also by ascomycetes. This is the case of "*Entyloma crastophilum* Sacc." on *Sporobolus asperifolius* Nees & Mey. (= *Muhlenbergia asperifolia*), USA, Utah, Salt Lake City, 18 August 1904, A.O. Garrett (BPI 175173!).

Several South African *Sporobolus* species in the complex comprising *S. africanus* (Poir.) Robyns & Tournay, *S. fimbriatus* (Trin.) Nees, *S. natalensis* (Steud.) Dur. & Schinz, and *S. pyramidalis* P. Beauv. are introduced, invasive weeds in Australia (Walton, 2001, Palmer, 2002). For their biological control, *Ustilago sporoboli-indici* L. Ling seems to be an excellent candidate.

Taxonomy

The sixteen recognised smut fungi on *Sporobolus* are:

Jamesdicksonia major (Har. & Pat.) Vánky, **comb. nov.** (Figs 1A, 2-3)

Basionym: ≡ *Entyloma majus* Hariot & Pat., Bulletin du Muséum d'Histoire Naturelle (Paris) 15: 197 (1909).

≡ *Melanotaenium majus* (Har. & Pat.) Ciferri, Atti dell' Istituto Botanico dell' Università de Pavia, Ser. 3, 1: 95 (1924). **- Type** on *Sporobolus spicatus* (Vahl) Kunth, Chad, between Modou and Bérirem, *ca*. 110 km N of Fort Lamy, at southern fringe of Lake Chad, October 1903, A. Chevalier. (**Holotype** PC, **isotypes** BPI 175837, HUV 13671!).

Sori (Fig. 1A) forming lead-coloured, swollen, usually fusiform spots on the leaves, rarely also on the leaf sheaths, 0.5-1.5 × 1-4 mm, or larger by confluence, covered by the epidermis which later ruptures longitudinally, revealing the black, agglutinated spore mass embedded in the host tissue. The spore mass separates into single spores in water, under pressure. *Spores* (Figs 2, 3) variable in shape and size, globose, ellipsoidal, elongated or irregular, 8-14 × 10-16(-19) µm, medium to dark reddish-brown; wall two-layered, endospore even, *ca*. 0.5 µm thick, brown, exospore even or slightly uneven, from nearly non-existent up to 2.5(-3) µm thick, subhyaline to pale

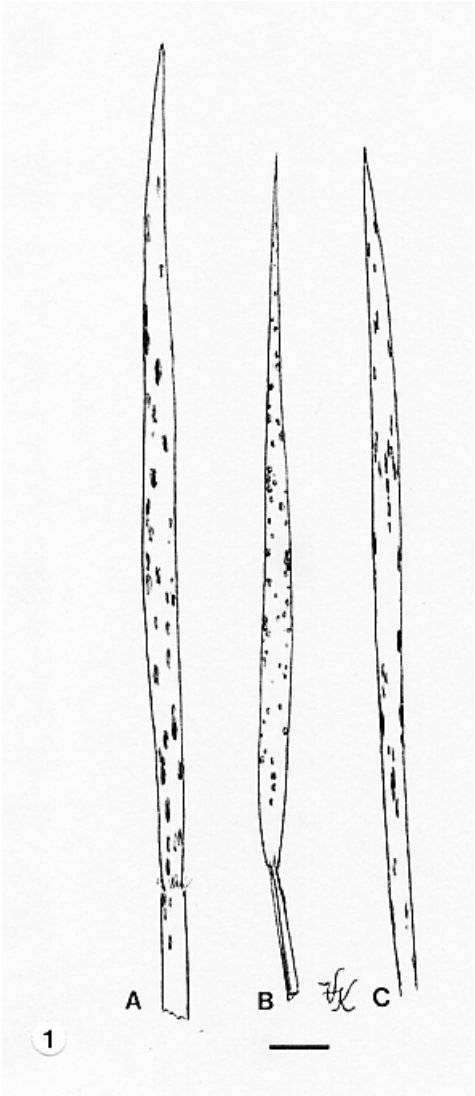
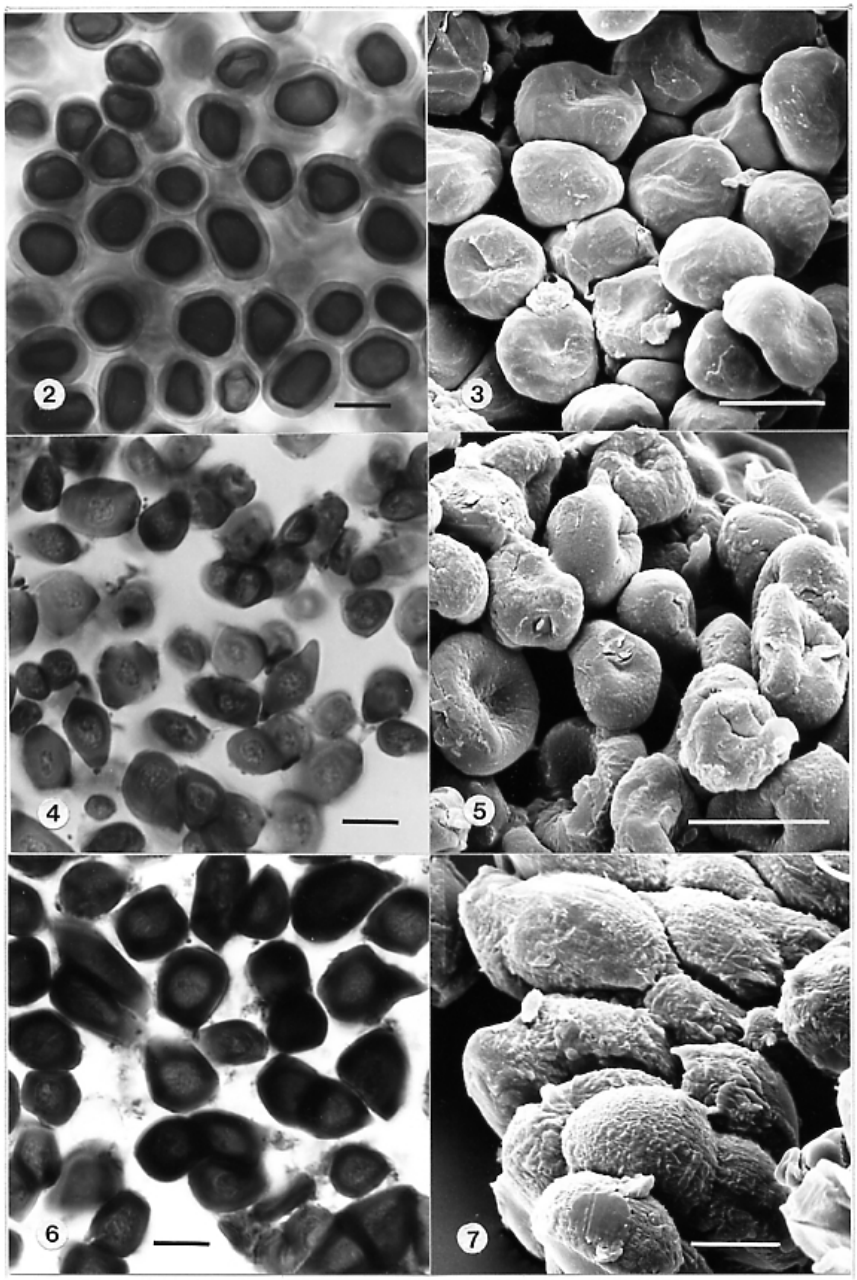


Fig. 1A. Sori of *Jamesdicksonia major* on a leaf of *Sporobolus spicatus* (from isotype), **B.** Sori of *Jamesdicksonia tremuli* on a leaf of *Sporobolus wallichii* (from HCIO 20563), **C.** *Jamesdicksonia sporoboli* on a leaf of *Sporobolus junceus* (from isotype). Bar = 1 cm.



Figs 2, 3. Spores of *Jamesdicksonia major* on *Sporobolus pyramidatus*, in LM and SEM (from Ciferri, Mycofl. doming. exs. no. 96, as *Tolyposporella sporoboli*). **Figs 4, 5.** Spores of *Jamesdicksonia sporoboli* on *Sporobolus indicus*, in LM and SEM (from holotype). **Figs 6, 7.** Spores of *Jamesdicksonia tremuli* on *Sporobolus wallichii*, in LM and SEM (from HCIO 20563). Bars = 10 μm.

yellowish-brown, smooth, but may be finely wavy due to very low tubercles or ridges, evident especially in SEM.

Hosts: *Sporobolus cordofanus* (Steud.) Coss., *S. ioclados* (Trin.) Nees, *S. marginatus* Hochst. ex A. Rich. (*S. arabicus* Boiss.), *S. pyramidatus* (Lam.) Hitchc. (*S. argutus* (Nees) Kunth), *S. spicatus* (Vahl) Kunth.

Known distribution: Africa (Chad, Congo, Kenya, Sudan), Asia (Pakistan), West Indies (Dominican Rep.).

Jamesdicksonia sporoboli (H.S. Jackson) Vánky, **comb. nov.** (Figs 1C, 4-5)

Basionym: ≡ *Tolyposporella sporoboli* H.S. Jackson, in Whetzel & Kern, Mycologia 18: 122 (1926).

≡ *Melanotaenium sporoboli* (H.S. Jackson) Thirumalachar, Whitehead & O'Brien, Mycologia 59: 394 (1967), (later homonym, not Thirum. & M.C. Sriniv., 1963/1964). **- Type** on *Sporobolus indicus* (L.) R. Br. (det. A. Chase), Puerto Rico, El Yunque, 14 April 1916, H.H. Whetzel & E.W. Olive 450. (**Holotype** BPI 178145!, **isotypes** BPI 178143 & 178144).

Sori (Fig. 1C) forming lead-coloured, slightly swollen, elongated spots or striae on the leaves, 0.3-1.5 × 1-7 mm, or longer by confluence, first covered by the epidermis which later ruptures longitudinally, revealing the black, agglutinated spore mass embedded in the host tissue. *Spores* (Figs 4, 5) variable in shape and size, mostly rounded subpolyhedrally irregular, but also lacrymiform, lemon-shaped or elongated, more rarely globose or ovoid, 7–12 x 7-19 µm, pale olivaceous-brown; wall two-layered, endospore even, thin, *ca*. 0.5 µm, indistinct, exospore uneven, 1-6.5(-8) µm thick, with indistinct, concentric layers, smooth.

Hosts: *Sporobolus brockmanii* Stapf, *S. indicus* (L.) R. Br., *S. marginatus* Hochst. (comp. also Dennis, 1988).

Known distribution: Africa (Eritrea), Asia (Pakistan), West Indies (Puerto Rico).

Jamesdicksonia tremuli Vánky, **nom. nov.** (Figs 1B, 6-7)

Substituting ≡ *Melanotaenium sporoboli* Thirum. & M.C. Sriniv., in Srinivasan & Thirumalachar, Sydowia 17: 22 (1963/1964), [not *Jamesdicksonia sporoboli* (H.S. Jackson) Vánky, opus praesens]. **Type** on *Sporobolus tremulus* Kunth, India, Bombay State, Vadgaon, 11 July 1957.

Sori (Fig. 1B) forming lead-coloured, rounded, or ellipsoidal pustules on the leaves, 0.5-2 mm long, or longer by confluence, covered by the epidermis which later ruptures longitudinally, revealing the black, agglutinated spore mass embedded in the leaf tissue. *Spores* (Figs 6, 7) agglutinated into irregular groups, single spores extremely variable in shape and size, usually irregular, with one or several flattened sides, often elongated, broadly subfusiform or also triangular, with one or several acute or subacute tips, 9-15 × 11-20(-28) µm, dark olivaceous-brown; wall two-layered, endospore even,

thin, *ca*. 0.5 µm, exospore uneven, 1.5-7(-8) µm thick, smooth. *Spore germination* (Srinivasan & Thirumalachar, 1963/1964: 22) results in a holobasidium with 6-8 apical basidiospores.

Hosts: *Sporobolus diander* (Retz.) P. Beauv., *S. tremulus* Kunth, *S. wallichii* Munro.

Known distribution: Asia (India).

I did not see the type of *J. tremuli*, but I have seen the collection on *Sporobolus wallichii* from India (HCIO 20563) which, according to Srinivasan & Thirumalachar (1963/1964: 22) "is identical with the species under study".

Macalpinomyces spermophorus (Berk. & M.A. Curtis ex de Toni) Vánky, **comb. nov.** (Figs 8, 11-12)

Basionym: ≡ *Ustilago spermophora* Berkeley & M.A. Curtis ex de Toni, in Saccardo, Sylloge fungorum, etc. 7: 466 (1888).

≡ *Sphacelotheca spermophora* (Berk. & M.A. Curtis ex de Toni) Moesz, Botanikai Közlemények 19: 63 (1921).

≡ *Ustilago spermophora* Berk. & M.A. Curtis, in Curtis, Geological and Natural History Survey of North Carolina, Part 3, Botany: 123 (1867), (as '*spermophorus*'; nomen nudum). **- Type** on *Eragrostis poaeoides* P. Beauv. var. *megastachya* Koehler [= *Eragrostis cilianenis* (All.) Janchen], USA, Iowa, Charles City, September 1882, J.C. Arthur. (**Isotypes** in Ellis, N. Amer. fgi. no. 1098, as *Ustilago spermophorus*, HUV 10545!).

Further taxonomic synonyms are: = *Ustilago kusanoana* Henn.; = *U. orientalis* Yen; = *Sphacelotheca cheoana* Zundel (comp. Vánky, 1994: 376-377).

Sori (Fig. 8) in some ovaries of an inflorescence as 1-2 mm long, green, spherical or pyriform bodies between the glumes, covered by a peridium of fungal and host origin which ruptures irregularly to expose the dark brown, powdery spore mass intermixed with sterile cells, or they are apparently lacking. Sori usually fall off the plant. Often the distal part of the sorus bears a remnant of the caryopsis as a hard, yellowish-brown, acute body. Heavily infected panicles may be congested. *Spores* (Figs 11, 12) globose, subglobose to ovoid, occasionally elongate or irregular, 6.5-9(-10) × 8-11(-13) µm, light brown, finely, moderately densely verrucose-echinulate; spore profile finely serrulate. *Sterile cells* (Fig. 11) globose, subglobose, ellipsoidal, rarely elongate, 5.5-8 × 6-11 µm, hyaline, collapsed in old specimens; wall thin, *ca*. 0.5 µm, smooth. *Spore germination* of *Ustilago*-type (Ito, 1936: 17).

Hosts: *Bouteloua filiformis* (Fourn.) Griff., *Eragrostis* spp. (principal hosts), and *Sporobolus australasicus* Domin.

Known distribution: cosmopolitan. On *Sporobolus australasicus* Domin. only in Australia.

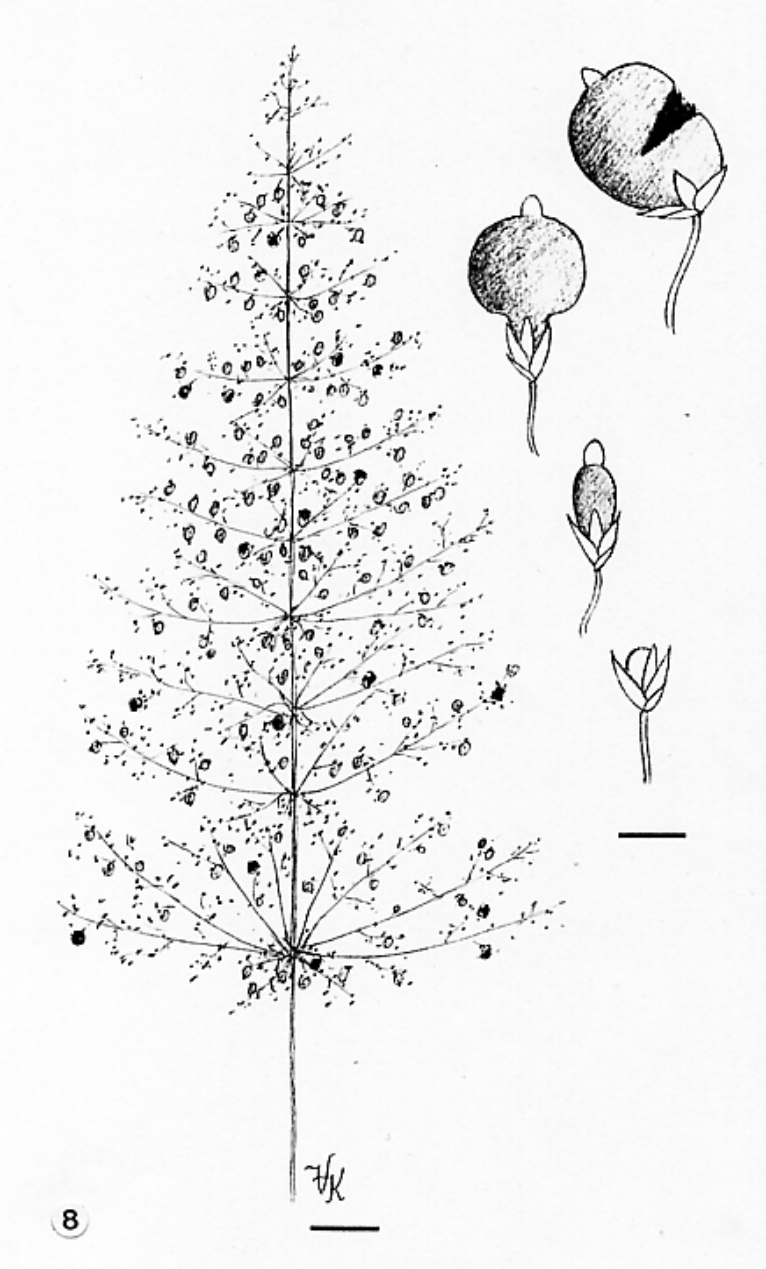


Fig. 8. Sori of *Macalpinomyces spermophorus* in swollen ovaries of *Sporobolus australasicus* (Vánky, Ust. exs. no. 1111). Habit and enlarged a healthy spikelet (below) and three spikelets with sori of different maturity. Bars = 1 cm, and 1 mm for enlargement.

There are variations in the density and coarseness of spore ornamentation between collections and on various host plants. An extreme of this is represented by *Macalpinomyces spinulosus*, which I am recognising as a separate species.

The generic place of *Macalpinomyces spermophorus* was obscure for a long time. It was described as *Ustilago*. Moesz (1921:63), based on the presence of sterile cells between the spores, a short, central columella in, and a peridium around the sori, transferred it into the genus *Sphacelotheca*. Now, it is known that *Sphacelotheca*, within the order Microbotryales, occurs only on members of the dicotyledonous Polygonaceae. The characters of our fungus fit very well with those of *Macalpinomyces*, hence its transfer into this genus.

Macalpinomyces spinulosus (L. Ling) Vánky, **comb. nov.** (Figs 9, 13-14)

Basionym: ≡ *Ustilago spinulosa* L. Ling, Sydowia 7: 154 (1953). - **Type** on *Sporobolus patulus* Hack. [= *S. paniculatus* (Trin.) Th. Dur. & Schinz], Sierra Leone, summit of Picket Hill, 18 November 1951, T.S. Jones. (**Holotype** IMI 48887, **isotypes** BPI 166739!, HUV 17398!).

Sori (Fig. 9) in some ovaries of an inflorescence, broadly ellipsoidal, 1-1.5 mm in length, covered by a thin peridium of host and fungal origin which later ruptures disclosing the dark brown, powdery mass of spores. *Spores* (Figs 13, 14) globose, ovoid, ellipsoidal, 7-10 × 7.5-11.5 µm, yellowish-brown; wall even, provided with sparsely situated, coarse, conical spines, 0.5-1 µm high; spore profile sparsely serrate; in SEM, between the spines, finely, sparsely verrucose. *Sterile cells* in groups, single cells subpolyhedrally irregular, rarely globose or ellipsoidal, 8-12 µm long, hyaline; wall thin, *ca*. 0.5 µm, smooth.

Host: *Sporobolus paniculatus* (Trin.) Th. Dur. & Schinz (*S. patulus* Hack.).

Known distribution: Africa (Sierra Leone).

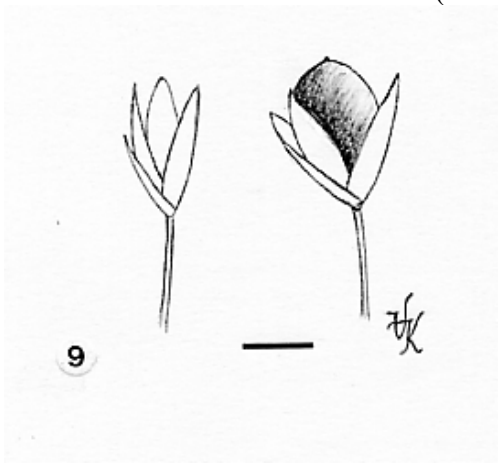


Fig. 9. A sorus of *Macalpinomyces spinulosus* in a swollen seed of *Sporobolus paniculatus* (from type). To the left a healthy spikelet with a seed. Bar = 1 mm.

Macalpinomyces sporoboli (Tracy & Earle) Vánky, **comb. nov.**

(Figs 10, 15-16)

Basionym: ≡ *Ustilago sporoboli* Tracy & Earle, Bulletin of the Torrey Botanical Club 23: 211 (1896), (not *U. sporoboli* Ellis & Everhart, 1897a: 282). **- Type** on *Sporobolus junceus* (Michaux) Kunth, USA, Mississippi, Columbus, 12 October 1895, M.S. Tracy & S.F. Earle. (**Holotype** BPI 166743!, **isotypes** BPI 166740!, 166741 & 194454; **Topotype** collected on 16 October1895, BPI 166742!, badly damaged by insects).

Sori (Fig. 10) in a few, hypertrophied ovaries of an inflorescence, ovoid, with a short, acute tip, laterally slightly compressed, *ca*. 1(-2) × 1.5-2.5(-3) mm, covered by a first green, later brown peridium, composed of an outer layer of the pericarp and an inner layer of sporogenous hyphae, enclosing the dark brown, first agglutinated, later semi-powdery mass of spores. *Spores* (Figs 15, 16) globose to ellipsoidal, yellowish- to dark reddish-brown, 10.5-13(-13.5) × 11-14.5(-16) µm, including the densely situated, 1-2(-2.5) µm high, broadly conical, coarse spines; spore profile coarsely serrate. *Sterile cells* between the spores few, smaller than the spores, hyaline, smooth.

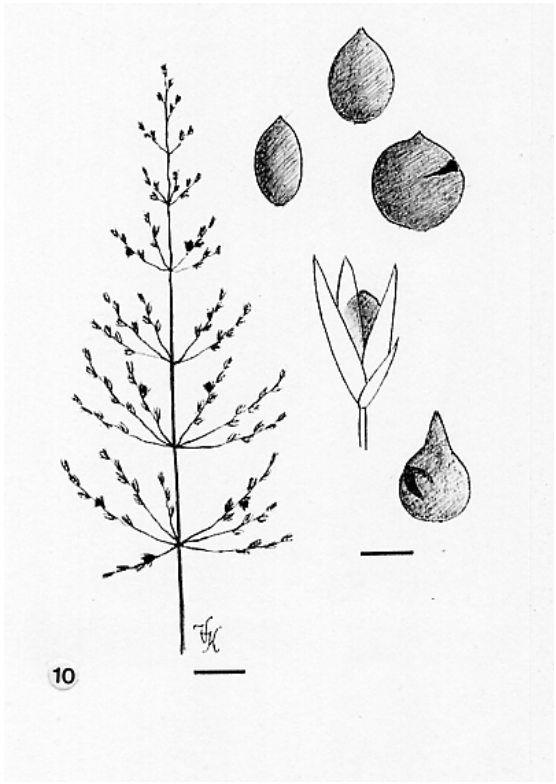
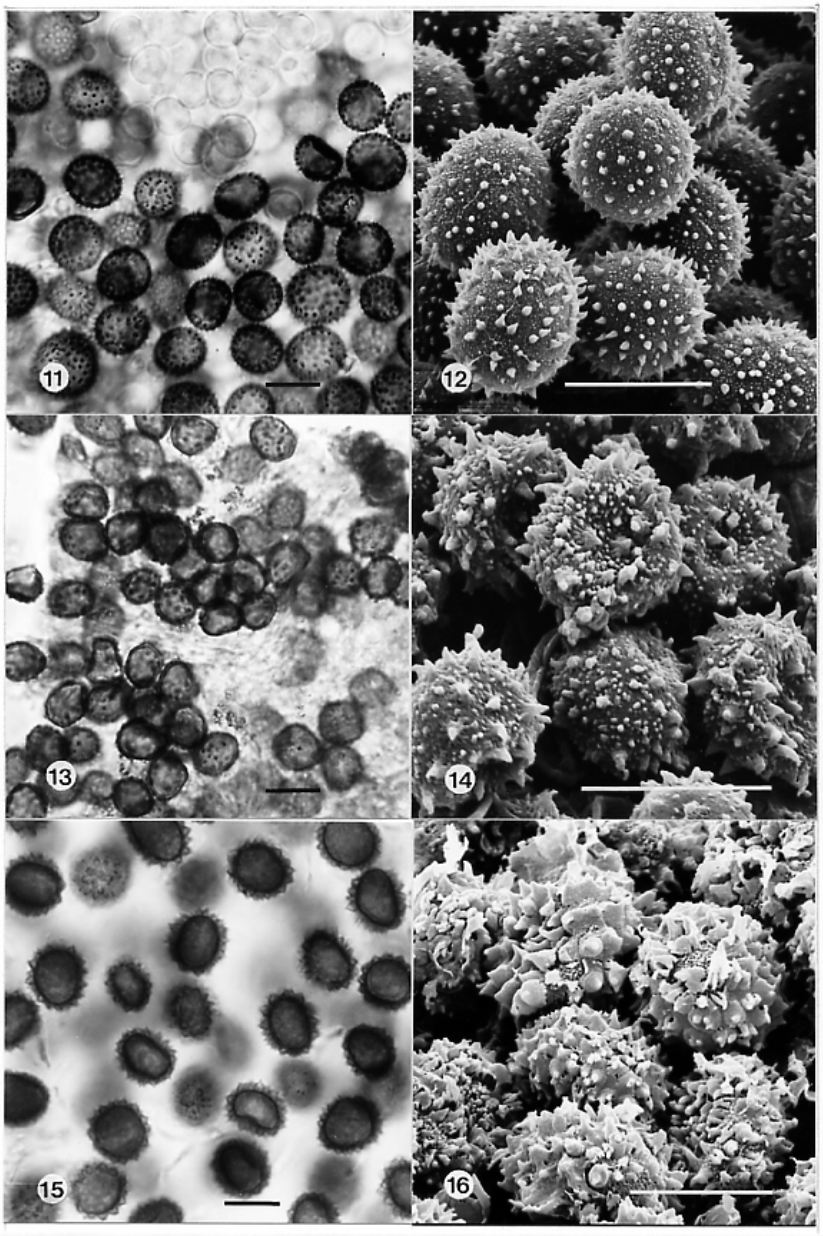


Fig. 10. Sori of *Macalpinomyces sporoboli* in some swollen ovaries of an inflorescence of *Sporobolus junceus* (from holotype). Enlarged a healthy spikelet, a healthy seed and three mature sori. Bars = 1 cm, and 1 mm for enlargement.



Figs 11, 12. Spores and sterile cells of *Macalpinomyces spermophorus* on *Sporobolus australasicus*, in LM and SEM (from Vánky, Ust. exs. no. 1111). **Figs 13, 14.** Spores of *Macalpinomyces spinulosus* on *Sporobolus paniculatus*, in LM and SEM (from holotype). **Figs 15, 16.** Spores of *Macalpinomyces sporoboli* on *Sporobolus junceus*, in LM and SEM (from holotype). Bars = 10 µm.

Host: *Sporobolus junceus* (Michaux) Kunth.

Known distribution: N. America (USA). Known only from the type locality.

The spores differentiate within the hyaline mass of sporogenous hyphae, in which the first elongated cell contents become shorter and thicker, finally spherical, each enclosed by a thick, hyaline, amorphous mass of the gelatinised hyphal wall. During maturation, the hyaline spore initials increase in size, become ornamented and coloured whereas the surrounding hyaline mass decreases and finally disappears. The peculiar spore ornamentation of *M. sporoboli* is very similar to that of *M. elionuri-tripsacoidis* Vánky (on *Elionurus*), and of *M. ewartii* (McAlpine) Vánky & R.G. Shivas (on *Sorghum* spp.).

Sporisorium hwangense Vánky & C. Vánky, in Vánky, Mycotaxon 74: 194 (2000). (Figs 17, 20-21)

Type on *Sporobolus panicoides* A. Rich., Zimbabwe, Matabeleland North Prov., Hwange (Wankie) National Park, Main Camp, Sedina Water Hole, alt. *ca*. 930 m., 6 March 1999, C. & K. Vánky. (**Holotype** HUV 18888!, **isotypes** BPI 746887 and in Vánky, Ust. exs. no. 1059).

Sori (Fig. 17) in all ovaries of an inflorescence, comprising also the inner floral organs, cylindrical, 0.5-1 × 3-8 mm, first covered by a whitish to pale yellowish-brown peridium composed of fungal cells which are arranged in tightly packed rows, and partially also of an external layer of host cells. The peridium ruptures longitudinally from its apex disclosing the dark brown, granular-powdery mass of spore balls intermixed with sterile cells surrounding a slender, simple, central columella of the length of the sorus. *Spore balls* (Figs 20, 21) variable in shape and size, subglobose, ellipsoidal, pyriform, elongate or irregular, 30-70 × 30-100 µm, dark reddish-brown to opaque, rather permanent, composed of numerous spores. *Spores* (Figs 20, 21) ellipsoidal to subpolyhedrally irregular, 7-11 × 8-12(-13) µm; outer spores dark reddish-brown with a *ca*. 1 µm thick wall, densely verruculose-echinulate on the free surface which appears finely serrulate in median view; inner spores lighter coloured, thin-walled (*ca*. 0.5 µm), apparently smooth. *Sterile cells* (Fig. 20) usually single, globose to ellipsoidal, 6-13 × 7-15 µm, hyaline; wall 1-3 µm thick, smooth.

Host: *Sporobolus panicoides* A. Rich.

Known distribution: Africa (Zimbabwe). Known only from the type locality.

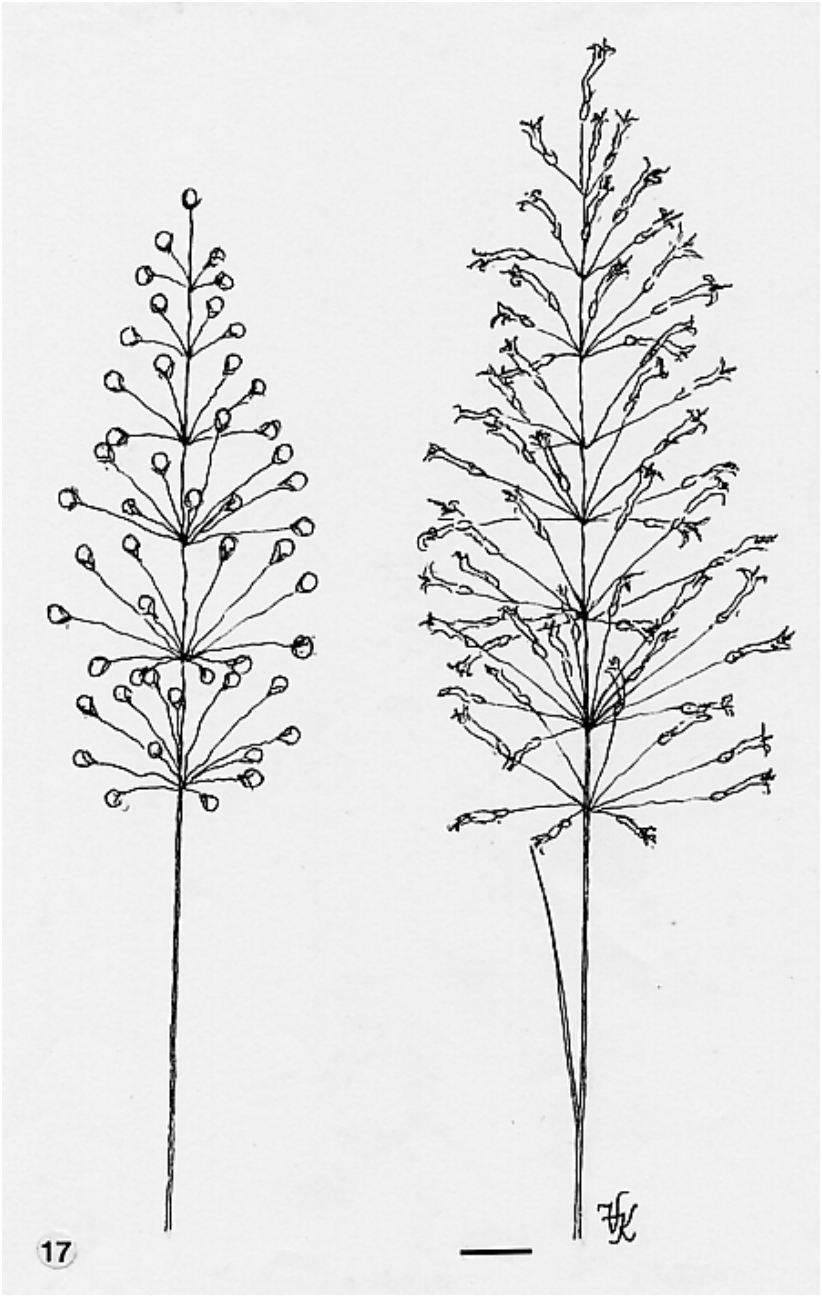


Fig. 17. Sori of *Sporisorium hwangense* in all flowers of *Sporobolus panicoides* (from holotype). To the left a healthy inflorescence with seeds. Bar = 1 cm.

Sporisorium saharianum (Trotter) Karatygin, in Karatygin & Azbukina, Opredelitel' gribov SSSR, etc.: 78 (1989). (Figs 18, 22-23)

≡ *Sorosporium saharianum* Trotter, in Saccardo & Trotter, Annales Mycologici 11: 413 (1913). **- Type** on *Aristida pungens* Schreber [= *Sporobolus pungens* (Schreber) Kunth], Libya, Tripoli, dunes near Sdun (Sliten), 25 April 1913, A. Trotter. (**Holotype** PAD!, **isotype** BPI 195123).

Sori (Fig. 18) comprise the whole inflorescence, branches of the inflorescence or single spikelets, several cm or only a few mm long, covered by a thin, yellowish-brown peridium enclosing the agglutinated or granular-powdery mass of spore balls surrounding one or several columellae. *Spore balls* (Figs 22, 23) variable, mostly irregular, often elongated, 25-100 × 30-180 µm, dark reddish-brown to subopaque, composed of tens to hundreds of spores which separate by pressure. *Spores* (Figs 22, 23) variable in shape and size, rounded subpolyhedrally irregular, elongated, more rarely globoid or ellipsoidal, 8-13.5 × 9-16(-17.5) µm, yellowish-brown; wall even to slightly uneven, 0.5-1 µm thick, densely, finely punctate-verruculose; spore profile smooth to very finely serrulate. *Sterile cells* not seen.

Host: *Sporobolus pungens* (Schreber) Kunth (*Aristida pungens* Schreber).

Known distribution: Africa (Libya).

Fig. 18. Sori of *Sporisorium saharianum* on *Sporobolus pungens* (from holotype). To the left sori in branches of an inflorescence, to the right in single spikelets. Bar = 1 cm.

Tilletia sporoboli Vánky, Mycotaxon 74: 194 (2000). (Figs 19, 24-25)

Type on *Sporobolus festivus* A. Rich. (det. K.E. Bennett, SRGH), Zimbabwe, Midlands Prov., 15 km NW of Zvishavane, alt. *ca*. 1020 m., 1 March 1999, C. & K. Vánky. (**Holotype** HUV 18880!, **isotypes** BPI 746883, IMI 380468 and S).

Sori (Fig. 19) in some ovaries of the inflorescence, globose to broadly ellipsoidal, *ca*. 1 mm in diam., covered by the first green, later brown pericarp which ruptures irregularly disclosing the reddish-brown, granular mass of spores intermixed with sterile cells. *Spores* (Figs 24, 25) subglobose, ovoid, ellipsoidal to slightly irregular, 13-18 × 16-21 µm, pale yellow to pale reddish-brown, provided with blunt, 1.5-2.5 µm high, coarse, somewhat irregular, conical or frustra-of-pyramid-like warts. *Sterile cells* (Figs 24, 25) globose to ellipsoidal, variable in size, 10-22 × 12-24 µm, hyaline; wall 1.5-3 µm thick, smooth.

Host: *Sporobolus festivus* A. Rich.

Known distribution: Africa (Zimbabwe). Known only from the type locality.

Tranzscheliella hypodytes (Schltdl.) Vánky & McKenzie, Smut fungi of New Zealand: 156 (2002). (Figs 26, 29-30)

≡ *Caeoma hypodytes* Schlechtendal, Flora Berolinensis, Pars 2. Cryptogamia: 129 (1824).

≡ *Ustilago hypodytes* (Schltdl.) Fries, Systema Mycologicum. Vol. 3, sect. 2: 518 (1832).

≡ *Erysibe hypodytes* (Schltdl.) Wallroth, Flora Cryptogamica Germaniae, Pars II, 4: 216 (1833).

≡ *Uredo hypodytes* (Schltdl.) Desmazières, Annales des Sciences Naturelles; Botanique, Sér. 2, 13: 182 (1840).

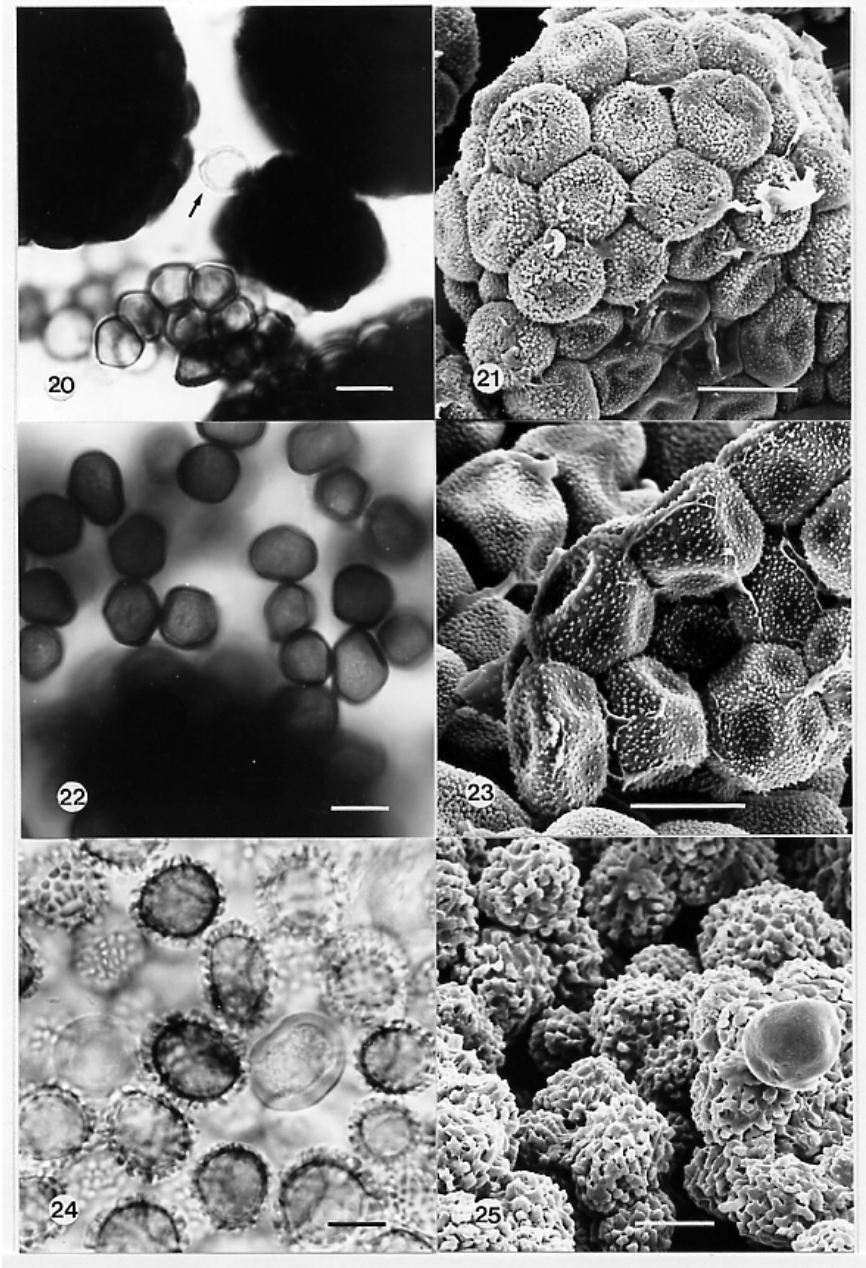
≡ *Cintractia hypodytes* (Schltdl.) Maire, Bulletin de la Societé Botanique de France 53: CXCVIII (1906). **- Lectotype** (design. by Hirschhorn, 1947: 74) on *Elymus arenarius* L. [= *Leymus arenarius* (L.) Hochst.], Germany, near Berlin, October 1884, P. Sydow; **isolectotypes** in Rbh., Fgi. eur. no. 3201, HUV 3784!

= *Ustilago sporoboli* Ellis & Everhart, Bulletin of the Torrey Botanical Club 24: 282 (1897a), (later homonym; not *U. sporoboli* Tracy & Earle, 1896: 211, *q.e. Macalpinomyces sporoboli*).

≡ *Ustilago funalis* Ellis & Everhart, Bulletin of the Torrey Botanical Club 24: 457 (1897b), (nom. nov. pro *U. sporoboli* Ellis & Everhart). **- Type** on *Sporobolus cryptandrus* Gray, USA, Colorado, foothills of the Rocky Mountains, July 1895, J.C. Cowen, (*n.v.*; syn. in Zundel, 1953: 168).

Further taxonomic synonyms are: = *Ustilago agrestis* Syd.; = *U. athenae* Maire; = *U. bromi-erecti* Cif.; = *U. hypodytes* var. *lolii* Thümen; = *U. lygei* Rabenh.; = *U. nummularia* Speg.; = *U. spegazzinii* Hirschh.; = *U. stipicola* Speg.; = *U. sumnevicziana* Lavrov (comp. Vánky, 1994: 361).

Fig. 19. Sori of *Tilletia sporoboli* in some considerably swollen ovaries of *Sporobolus festivus* (from holotype). Enlarged a spikelet with a sorus. Bars = 1 cm, and 1 mm for enlargement.



Figs 20, 21. Spore balls, spores and a sterile cell (arrow) of *Sporisorium hwangense* on *Sporobolus panicoides*, in LM and SEM (from holotype). **Figs 22, 23.** Spores and spore balls of *Sporisorium saharianum* on *Sporobolus pungens*, in LM and SEM (from holotype). **Figs 24, 25.** Spores and sterile cells of *Tilletia sporoboli* on *Sporobolus festivus*, in LM and SEM (from holotype). Bars = 10 µm.

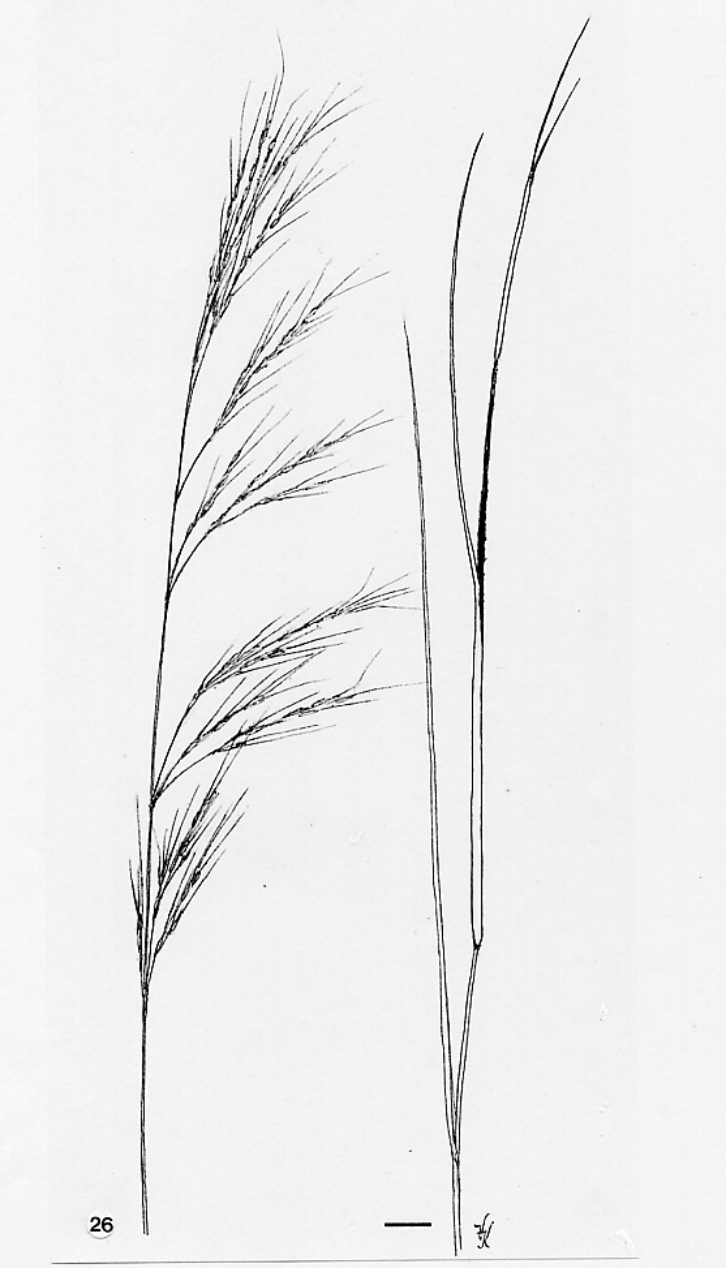


Fig. 26. Sori of *Tranzscheliella hypodytes* on *Nassella mucronata* (Kunth) L. Pohl (Ecuador; Vánky, Ust. exs. no. 937).

Sori (Fig. 26) in culms as a blackish-brown, semi-agglutinated to powdery spore mass surrounding the upper internodes (extending from the basal part of the internode sometimes to the next node) and occasionally in the axis of an abortive inflorescence. Sori at first protected by the leaf-sheath,

finally more or less naked. Upper internodes and leaves of host usually stunted. Infection systemic, inflorescences usually abortive. *Spores* (Figs 29, 30) globose, subglobose to ovoid, occasionally elongated, irregular or slightly compressed, 3.5-5.5 × 4-6(-7) µm, medium to dark olivaceous-brown; wall smooth, *ca*. 0.5 µm thick, usually with an inconspicuous, hyaline, smooth or finely punctate-verruculose cap at the poles; in SEM densely and minutely verruculose on the whole surface. *Spore germination* results in slender, septate (three- or four-celled, four-nucleate) basidia developing lateral, ramifying, septate, uninucleate branches. On nutrient media, these branches produce clumps of aerial "sporidia" (Bornhövd, 1936: 84, figs 5-6; Dietz, 1956; Ingold, 1983: 583, Fig. 9; 1987: 471, Fig. 1).

Hosts: many grass species belonging to at least 35 genera, including *Sporobolus cryptandrus* (Torr.) A. Gray, and *S. agrostoides* Chiov. (*S. filipes* Napper).

Known distribution: cosmopolitan. On *Sporobolus* in North America (USA) and Africa (Kenya).

All material of *Tranzscheliella hypodytes* on "*Sporobolus*" I have seen was fragmentary, not allowing the identification of the host plants. If *T. hypodytes* occurs on *Sporobolus* at all, it must be very rare. It is also possible that the host plants of the few existing collections are not *Sporobolus*. Recollection is desired.

Ustilago deformis L. Ling, Sydowia 7: 152 (1953). (Figs 27, 31-32)

Type on *Sporobolus patulus* Hack. (= *S. paniculatus* (Trin.) Th. Dur. & Schinz),, Sierra Leone, summit of Picket Hill, 18 November 1951, T.S. Jones. (**Holotype** IMI 48887, **isotype** HUV 17416!).

Sori (Fig. 27) forming pustules on the basal part of congested leaves on the top of sterile shoots, and on the distal part of the stem, 1-2 mm in diameter or larger by confluence, first covered by the epidermis which ruptures, disclosing the blackish-brown, powdery mass of spores. *Spores* (Figs 31, 32) usually ovoid or ellipsoidal, slightly flattened, rarely globoid, 7-10.5 × 8-13 µm, dark yellowish-brown; wall uneven, thinner on the flattened sides, 0.5-1 µm thick, moderately densely echinulate; spore profile finely serrulate.

Hosts: *Sporobolus paniculatus* (Trin.) Th. Dur. & Schinz (*S. patulus* Hack.), *S. piliferus* (Trin.) Kunth.

Known distribution: Africa (Sierra Leone), Asia (Nepal).

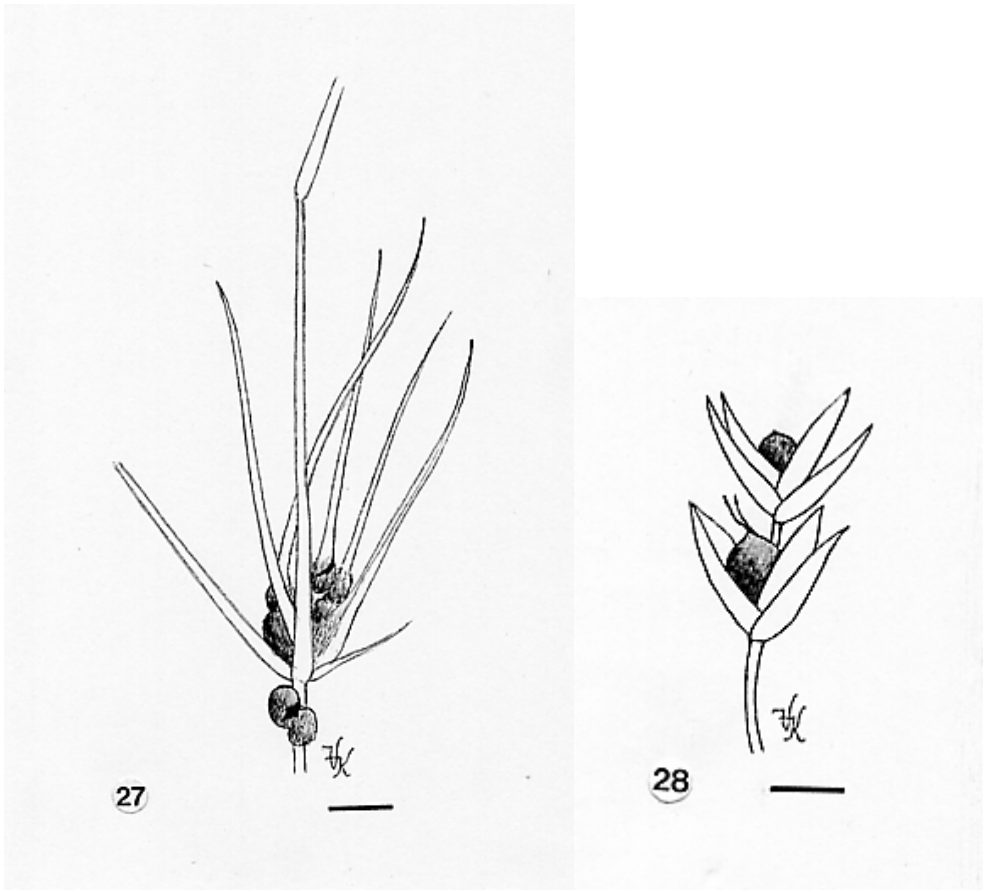
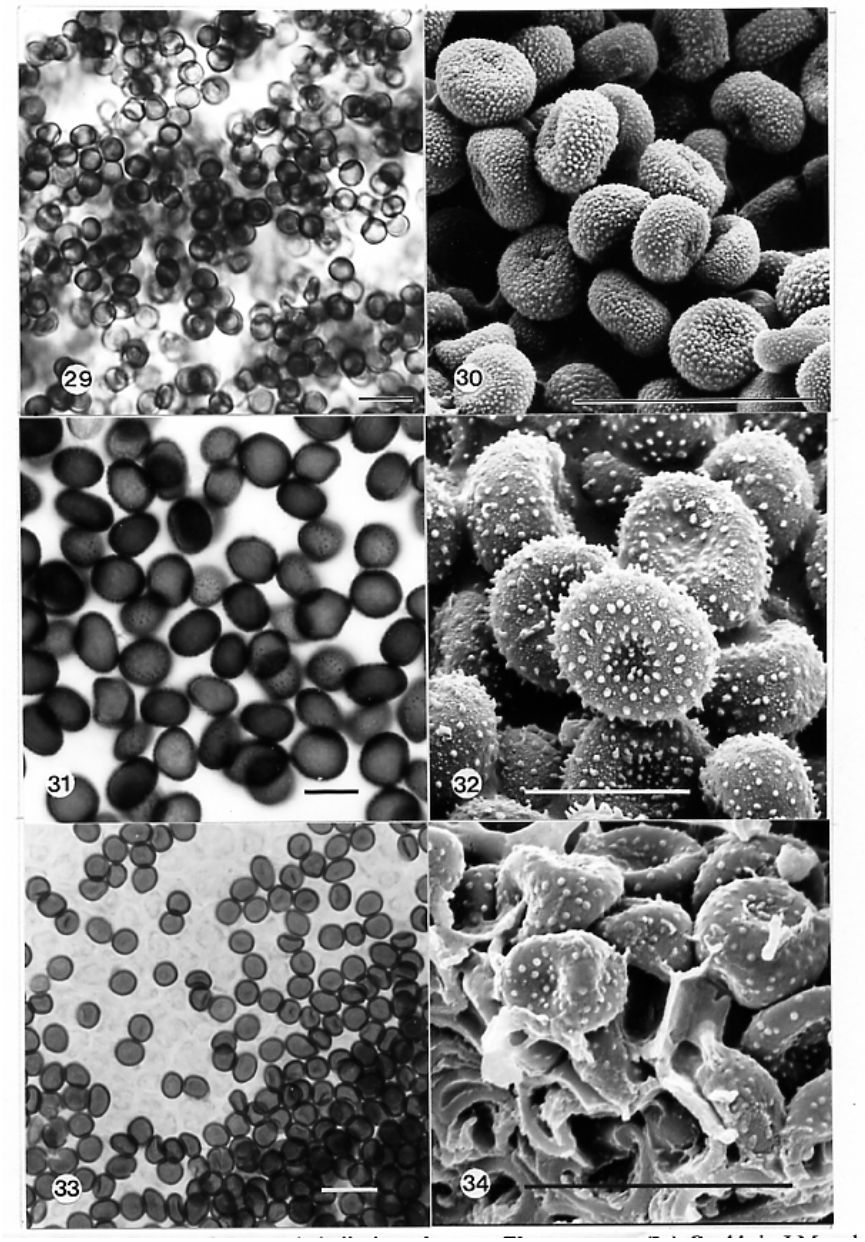


Fig. 27. Sori of *Ustilago deformis* on the stem and basal part of leaves of *Sporobolus paniculatus* (from isotype). Bar = 3 mm. **Fig. 28.** Sori of *Ustilago peruviana* in two seeds of *Sporobolus virginicus* (from type). Bar = 1 mm.

Ustilago peruviana (Zundel) Vánky, **comb. nov.** (Figs 28, 33-34)

Basionym: ≡ *Sphacelotheca peruviana* Zundel, Mycologia 34: 124 (1942). - **Type** on *Sporobolus virginicus* (L.) Kunth, Peru, Paracas Bay near Pisco, 1912, coll. H.O. Forbes, comm. A. Chase. (**Holotype** BPI 195082!, **isotype** BPI 194900!).

Sori (Fig. 28) destroying some ovaries of an inflorescence, globoid, slightly flattened, less than 1 mm in diameter, often with a short acute tip bearing remnants of the stigmata, more or less hidden by the floral envelopes and covered by a greenish-brown peridium composed of an outer layer of the pericarp and an inner layer of sporogenous hyphae, enclosing the agglutinated, later probably powdery, dark brown mass of spores. *Spores* (Figs 33, 34) globose, subglobose, ovoid to long ellipsoidal, 4-5.5 × 5-7(-8) µm, yellowish-



Figs 29, 30. Spores of *Tranzscheliella hypodytes* on *Elymus repens* (L.) Gould, in LM and SEM (New Zealand, Vánky, Ust. exs. no. 785). **Figs 31, 32.** Spores of *Ustilago deformis* on *Sporobolus paniculatus*, in LM and SEM (from isotype). **Figs 33, 34.** Spores of *Ustilago peruviana* on *Sporobolus virginicus*, in LM and SEM (from holotype). In LM picture hyaline, sporogenous cells of the peridium can be seen behind the spores. Bars = 10 μm.

brown; wall even, *ca*. 0.5 µm thick, apparently smooth, in SEM sparsely low verruculose. *Sterile cells* absent.

Host: *Sporobolus virginicus* (L.) Kunth.

Known distribution: S. America (Peru). Known only from the type locality.

As in the case of *Ustilago utahensis* (see below), Zundel (1942: 124) considered this smut to be a *Sphacelotheca* species. We now know that species of *Sphacelotheca* are restricted to host plants in the Polygonaceae. In his description, Zundel wrote: "Sori . . . hard, . . . covered by a delicate whitish membrane that disintegrates into delicate sterile cells that soon collapse, spore mass agglutinated; sterile cells tinted olivaceous-yellow with a thick almost hyaline epispore, globose to subglobose, often irregular, chiefly 7–8 µ diameter, delicate and soon collapsing;". Judged from the study of the scanty, obviously immature type material, and from the original description, I conclude that what Zundel considered to be sterile cells are actually immature spores. Consequently, *Sphacelotheca peruviana* belongs to the genus *Ustilago*, rather than to *Sporisorium*; there are no spore balls or spore ball initials, columella/ae. Sterile cells are also lacking.

Ustilago sporoboli-indici L. Ling, Mycological Papers No. 11: 7 (1945).

(Figs 35A, B, 36, 39-40)

Type on *Sporobolus indicus* (L.) R. Br., China, Szechwan Prov., Chengtu, 12 September 1940, L. Ling. (**Holotype** IMI 501, **isotypes** BPI 166745, 196295, HUV 14063!; **Topotype** collected on 1 October 1940, L. Ling, BPI 196293!).

= *Entyloma sporoboli* Castellani & Graniti, in Graniti, Nuovo Giornale Botanico Italiano, N.S., 57: 252 (1950). — **Type** on *Sporobolus indicus* R. Br. var. *laxus* Nees, Eritrea, Seraé, Mai Felasi, 24 October 1938, F. Di Martino. (**Holotype** FL, **isotype** BPI 176675!; syn. by Ling, 1953: 154, confirmed).

Sori (Figs 35A, B) in the leaves, leaf sheaths and stems of sterile shoots, forming short or long, bullate, lead-coloured striae, at first covered by the epidermis which early ruptures exposing the blackish-brown, semiagglutinated to powdery mass of spores which are scattered. The leaves become perforated or rupture longitudinally into fascicles. More rarely sori occur also on the floral axis or spikelets of weakly developed and deformed inflorescences. *Spores* (Figs 39, 40) rather variable in shape and size, globose, subglobose, ovoid to long ellipsoidal, (5.5-)6.5-9.5 × (6.5-)7-11.5 µm, yellowish-brown; wall even, 0.5-0.8 µm thick, from apparently smooth to finely punctate or finely, moderately densely verrucose-echinulate which does not affect the spore profile. *Spore germination* (Fig. 36; on water-agar, at room temperature, in 1 day) results in 4-celled basidia measuring 1.5-2.5 × 35-45 µm. On the basidia, on short sterigmata, ovoid to long ellipsoidal basidiospores are produced

Fig. 35A-B. Sori of *Ustilago sporoboli-indici* on the leaves of **A.** *Sporobolus pyramidalis* (Uganda; HUV 20019), and on **B.** *Sporobolus africanus* (South Africa; Vánky, Ust. exs. no. 1192). Each with a healthy inflorescence. Bars = 1cm.

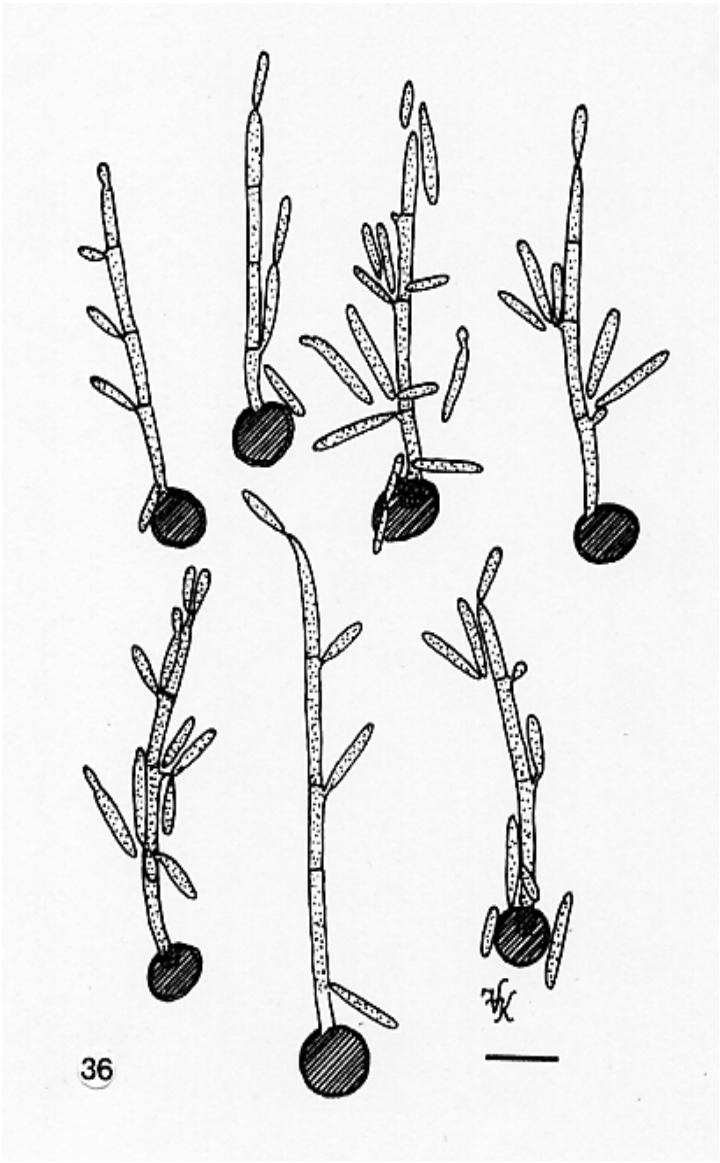


Fig. 36. Germinating spores of *Ustilago sporoboli-indici* from *sporobolus pyramidalis* (Vánky, Ust. Exs. No. 1191). Bar = 10 µm.

measuring 1.5-2.5 × 5-14 µm. In 2 days, after conjugation of basidiospores or apparently without conjugation, long, *ca*. 1.5 µm wide, infection(?) hyphae develop.

Hosts: *Sporobolus africanus* (Poir.) Robyns & Tournay [*S. capensis* (Willd.) Kunth], *S. elongatus* R. Br., *S. indicus* (L.) R. Br., and its var. *laxus* Nees, *S. pyramidalis* P. Beauv.

Known distribution: Africa (Eritrea, Rep. of South Africa, Uganda, Zambia), Asia (China), Philippines.

Ustilago sporoboli-tremuli T.S. Ramakrishnan & K. Ramakrishnan, Proceedings of the Indian Academy of Science, Part B, 28: 58 (1948).

(Figs 37, 41-42)

Type on *Sporobolus tremulus* Kunth, India, Tamil Nadu, Coimbatore, Chettipalayam, 17 July 1934, N.K. Naidu. (**Holotype** HCIO 12113, **isotypes** BPI 166746, HUV 17347!).

Sori (Fig. 37) in the basal, swollen part of distal leaf sheaths of short, congested shoots, 1-3 mm long, covered by the epidermis. *Spore mass* blackish-brown, semiagglutinated to powdery. *Spores* (Figs 41, 42) subglobose, ovoid, ellipsoidal or slightly irregular, 13-17 × 14.5-19(-20) µm, yellowish-brown; wall even, *ca*. 1 µm thick, finely, densely verrucose which just affects the spore profile.

Host: *Sporobolus tremulus* Kunth.

Known distribution: Asia (India). Known only from the type collection.

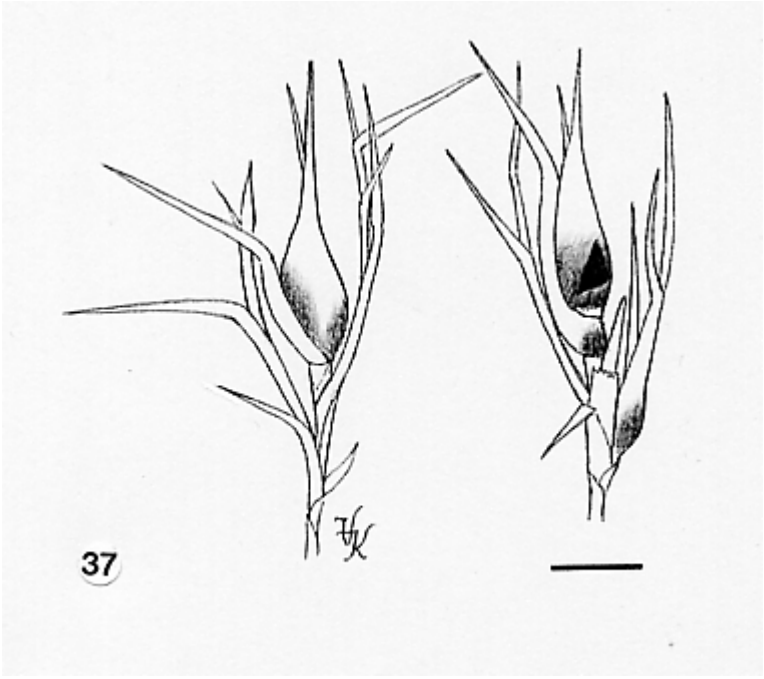


Fig. 37. Sori of *Ustilago sporoboli-tremuli* in the basal, swollen part of distal leaf sheaths of *Sporobolus tremulus* (from type). Bar = 2 mm.

Ustilago utahensis (Zundel) Vánky, **comb. nov.** (Figs 38, 43-44)

Basionym: ≡ *Sphacelotheca utahensis* Zundel, Mycologia 34: 125 (1942). **— Type** on *Sporobolus airoides* (Torr.) Torr. (= misnamed *S. patens* Swallen, teste K. Vánky), USA, Utah, Garfield Co., Escalante Mountains, 20 June 1932, coll. M. Stanton 770, comm. J.A. Stevenson. (**Holotype** BPI 195057!, **isotype** BPI 192090!).

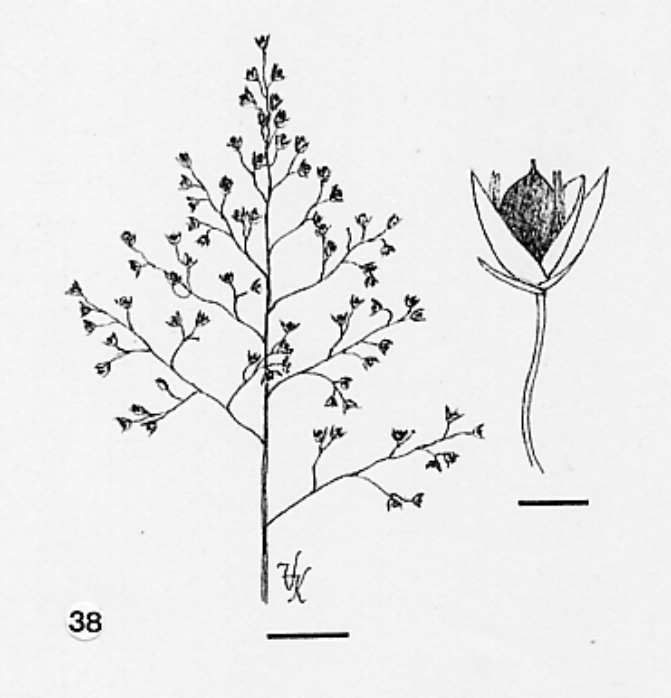


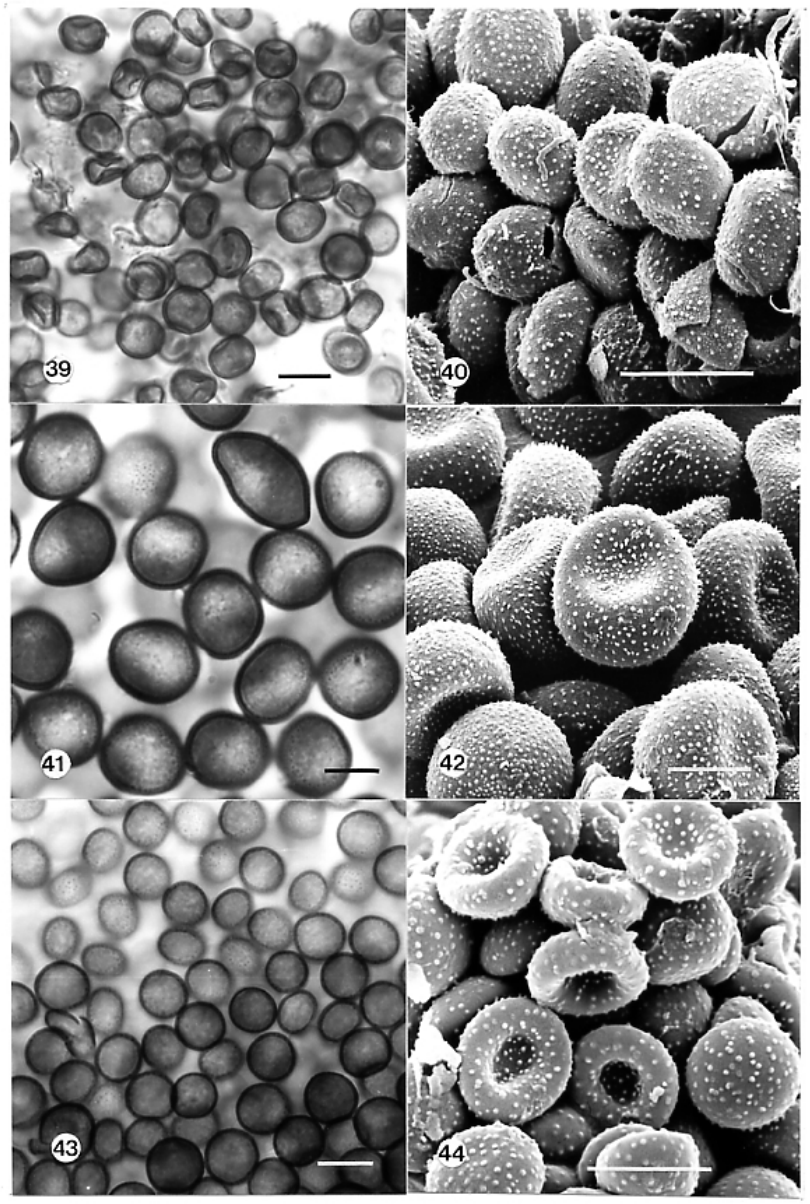
Fig. 38. Sori of *Ustilago utahensis* in all ovaries of inflorescence of *Sporobolus patens* (from type). Habitat and enlarged spikelet with a sorus. Bars = 1 cm, and 2 mm for enlargement.

Sori (Fig. 38) in all ovaries of an inflorescence, globoid to ovoid, with a short acute tip, *ca*. 1 × 1-2 mm, first covered by a peridium composed of an outer layer of the pericarp and an inner layer of irregular chains of septate, sporogenous hyphae in different stages of maturation. At maturity, the peridium ruptures irregularly, disclosing the dark brown, first agglutinated, later powdery mass of spores. No columella. *Spores* (Figs 43, 44) globose, subglobose, ellipsoidal, 8-10.5 × 9-11(-12) µm, yellowish-brown; wall even, *ca*. 0.5 µm thick, sparsely, finely verrucose; spore profile almost smooth. *Sterile cells* absent.

Host: *Sporobolus patens* Swallen.

Known distribution: N. America (USA). Known only from the type locality.

Zundel (1942: 125) considered this smut to be a *Sphacelotheca* species because of the presence of supposed sterile cells, resulting from the peridium, "sterile cells", which are "globose to elongated, often irregular, hyaline, 7-14 µm long, smooth;" What Zundel considered to be sterile cells are actually immature spores (see also *Ustilago peruviana* above).



Figs 39, 40. Spores of *Ustilago sporoboli-indici* on *Sporobolus pyramidalis*, in LM and SEM (from isotype). **Figs 41, 42.** Spores of *Ustilago sporoboli-tremuli* on *Sporobolus tremulus*, in LM and SEM (from isotype). **Figs 43, 44.** Spores of *Ustilago utahensis* on *Sporobolus patens*, in LM and SEM (from holotype).

The host plant of *Ustilago utahensis* is definitely not *Sporobolus airoides* (Torr.) Torr., as given originally. Judged from the two smutted inflorescences in BPI, it is most probably *S. patens* Swallen.

Ustilago vilfae G. Winter, Hedwigia 22: 2 (1883a); Bulletin of the Torrey Botanical Club 10: 7 (1883b). (Figs 45, 48-49)

Type on *Vilfa vaginiflora* Torr. [= *Sporobolus vaginiflorus* (Torr.) Wood], USA, Pennsylvania, Chester Co., autumn 1881, coll. Martin Geo (Ellis no. 3729). (**Holotype** NY, **isotype** BPI 169423, devoid of sori).

= *Ustilago hilariae* Ellis & Tracy, Journal of Mycology 6: 77 (1890). **- Type** on *Hilaria jamesii* (Torr.) Benth., USA, New Mexico, Albuquerque, 17 June 1887, S.M. Tracy, BPI 160870, BPI 160871! (syn. by Fischer, 1953: 316).

= *Tilletia subfusca* Hume, Proceedings of the Iowa Academy of Science 9: 235 (1902). **- Type** on *Sporobolus neglectus* Nash, USA, Iowa, Spirit Lake, 15 November 1892, coll. J.C. Arthur (**Holotype** BPI 173883!; syn. by Clinton, 1904: 338, confirmed).

Sori (Fig. 45) in the inflorescence, transforming it into a dark brown, semiagglutinated to powdery spore mass, 1-3 × 4-10 mm, more or less hidden by the distal leaf sheaths, but sori may also comprise the basal part of the uppermost, congested leaf sheaths and are then larger, or they may appear on the distal part of the stems as vesicles, covered by the epidermis. *Spores* (Figs 48, 49) subglobose, ovoid or ellipsoidal, 12-14.5 × 13.5-16 µm, yellowish-brown; wall even, *ca*. 1 µm thick, evidently echinulate; spore profile serrulate.

Fig. 45. Sori of *Ustilago vilfae* in two inflorescences of *Sporobolus negletus* (Ellis and Everhart, Fgi. Colomb. No. 2197). Bar = 1 cm.

Hosts: *Hilaria cenchroides* H. B. K., *H. jamesii* (Torr.) Benth., *H. mutica* (Buckl.) Benth., *Sporobolus neglectus* Nash, *S. vaginiflorus* (Torr.) Wood (*Vilfa vaginiflora* Torr.).

Known distribution: N. America (USA).

Zundel (1953: 165 & 217) treated *Ustilago vilfae* and *U. hilariae* as two separate species, whereas Fischer (1953: 316) considered them to be synonyms. Indeed, no differences in sorus or spore morphology could be seen between specimens on *Sporobolus* and *Hilaria*.

Ustilago vilfae on *Lasiurus sindicus* Henrard [= *L. hirsutus* (Forssk.) Boiss.], reported by Agarwal *et al*. (1977: 206) from India, Western Rajastan (HCIO 32094!) represents *Sporisorium desertorum* (Thümen) Vánky.

Ustilago schlechteri* is not on *Sporobolus

There are several confusions regarding *Ustilago schlechteri* Henn. The type specimen, described on "*Sporobolus* sp." from South Africa, was destroyed by fire in Berlin, 1943. The original description is incomplete. This led Zundel (1953: 198) to give a more detailed description of this species, based on a specimen, identified by him as *U. schlechteri*, collected in South Africa, Natal Prov., by A.O.D. Mogg, on *Sporobolus indicus* (L.) R. Br. (PREM 11644, = BPI 166238! & 195260!). However, this collection represents another species, *U. sporoboli-indici* L. Ling. (det. K. Vánky). A topotype was found in BPI (166237), containing the tip of a single infected plant of "*Sporobolus* sp.", but with very typical sori. The host identity cannot be verified in lack of a healthy plant. Recently, during a survey of *Sporobolus* diseases in South Africa, a few hundred kms from the type locality of *U. schlechteri*, R.G. Shivas and the author collected a smut fungus on *Enneapogon scoparius* Stapf., with the same type of characteristic sori. A comparison of the spores confirmed that they represent the same fungus. This means that the host plant of *U. schlechteri* is not a *Sporobolus* sp. but *Enneapogon* cf. *scoparius*, which is common in that part of South Africa. The description below is based on the neotype, and on the specimens collected recently, edited in Vánky, Ust. exs. no. 1189.

Ustilago schlechteri Hennings, Hedwigia 34: 325 (1895). (Figs 46-47, 50-53)

Type on "*Sporobolus* sp." (= misnamed *Enneapogon* cf. *scoparius* Stapf, teste K. Vánky), South Africa, Transvaal (= North-Western Prov.), Naboomfontein, 4300 ft., 23 May 1895, R. Schlechter (type destroyed in B). **Neotype** (designated here), collected in 1894 by Schlechter (= topotype; BPI 166237!).

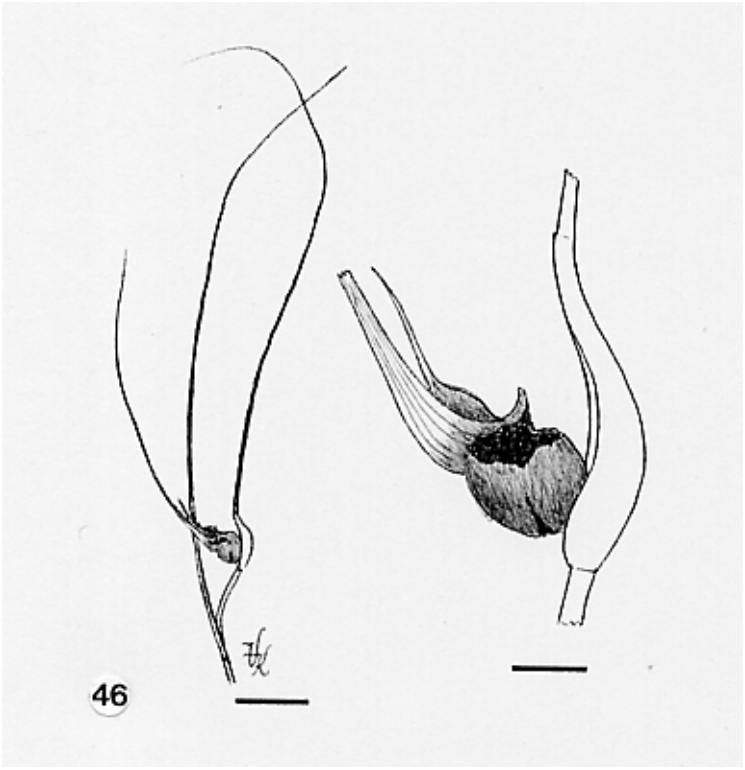


Fig. 46. Sori of *Ustilago schlechteri* in the basal part of uppermost leaf sheaths of "*Sporobolus* sp." (from topotype). Bars = 1 cm, and 2 mm for enlargement.

Sori (Figs 46, 47) in the basal part of the uppermost two (rarely one), congested leaf sheaths, swollen, ovoid, globoid or cylindrical with tapered distal part, 1.5–3.5 mm wide, together 3–7(–12) mm long, continued in filiform leaf blades. There often is an appendage with minute, scale-like floral remnants on the top of the distal sorus. Sori covered by the first green, later greyish-brown epidermis, which ruptures irregularly at maturity, disclosing the blackish-brown, powdery mass of spores. No columella, no sterile cells. Infection systemic, all shoots of an infected plant affected. Rarely, a few shoots escape infection, producing inflorescences. *Spores* (Figs 50–53) globose, ovoid, ellipsoidal, elongated to slightly irregular, variable in size, 9.5–13 x 10–14.5(–15) µm, yellowish-brown; wall even, *ca*. 0.5 µm thick, sparsely, evidently, low echinulate; spore profile wavy to finely, sparsely serrulate.

Host: *Enneapogon scoparius* Stapf.

Known distribution: Africa (Rep. of South Africa).

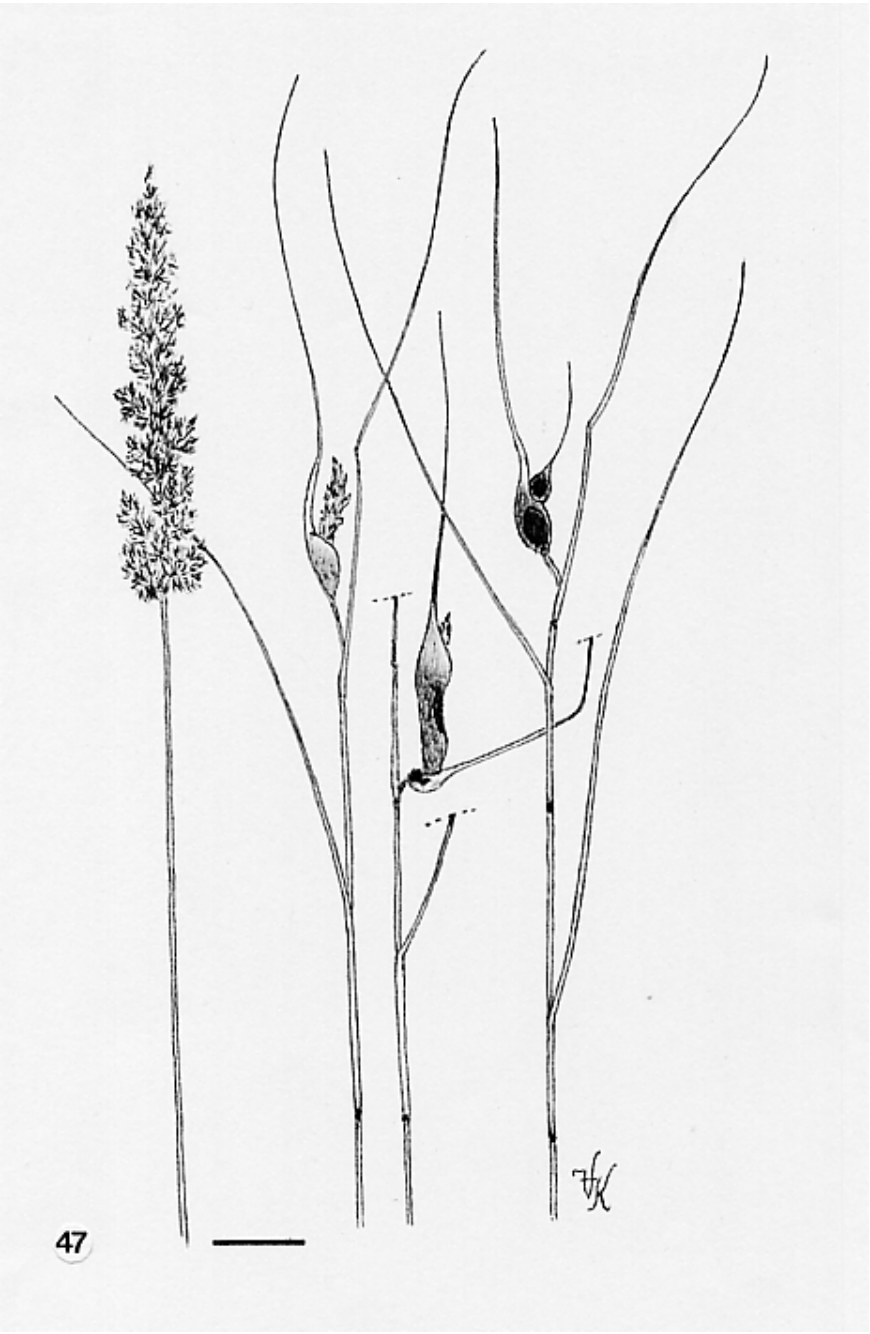
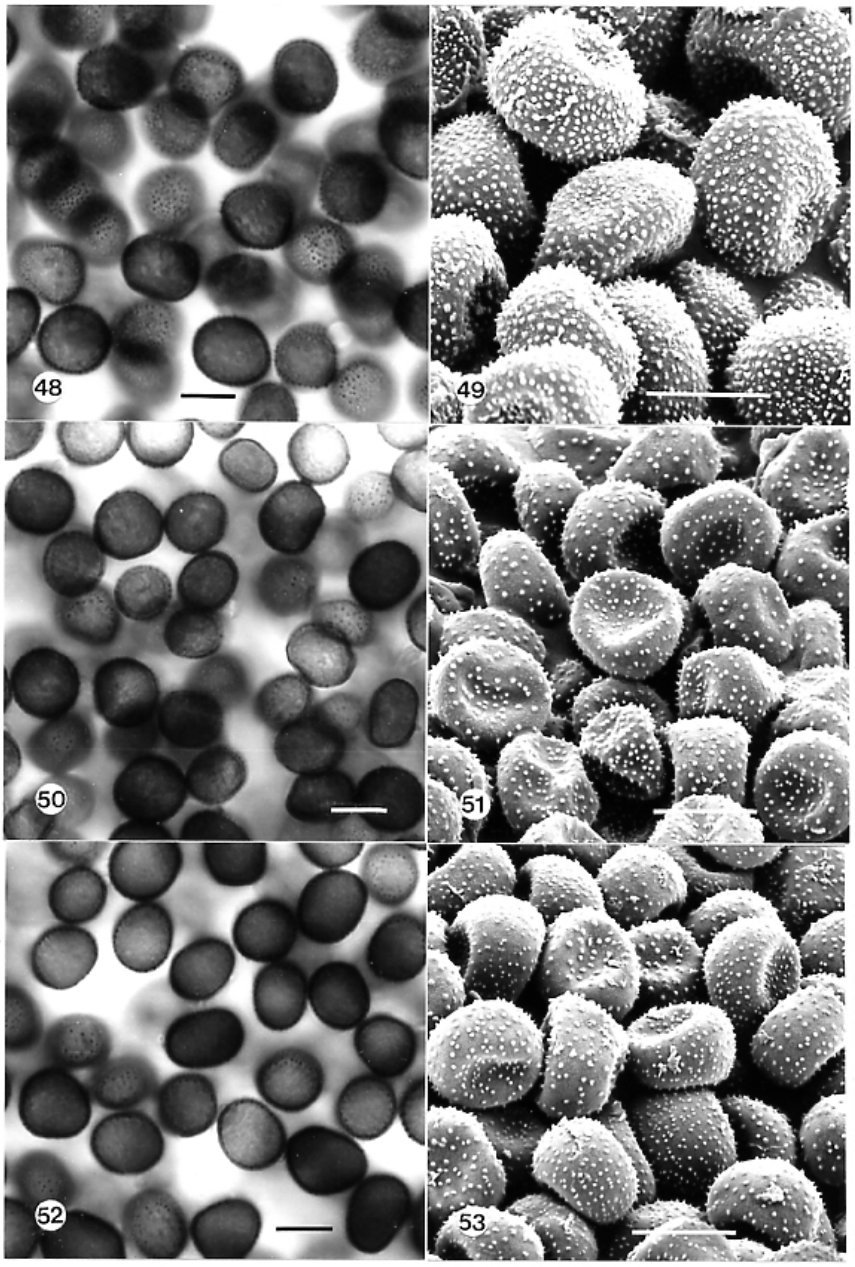


Fig. 47. Sori of *Ustilago schlechteri* in the basal part of uppermost leaf sheaths and often also in remnants of the inflorescence of *Enneapogon scoparius* Stapf. (from Vánky, Ust. exs. no. 1189). Three infected shoots and, to the left, a healthy inflorescence. Bar = 1 cm.



Figs 48, 49. Spores of *Ustilago vilfae* on *Sporobolus neglectus*, in LM and SEM (from Ellis & Everhart, Fgi. Colomb. no. 2197, HUV 4947). **Figs 50, 51.** Spores of *Ustilago schlechteri* on "*Sporobolus* sp.", in LM and SEM (from topotype). **Figs 52, 53.** Spores of *Ustilago schlechteri* on *Enneapogon scoparius* Stapf, in LM and SEM (from Vánky, Ust. exs. no. 1189). Bars = 10 µm.

Key to the smut fungi of *Sporobolus*

1. Sori surrounding upper internodes, naked..... ***Tranzscheliella hypodytes***
1. Sori elsewhere, not naked 2

2. Sori in the leaves, or also in the stems 3
2. Sori in the ovaries, flowers or inflorescence 8

3. Sori as lead coloured pustules or streaks. Spore mass black, agglutinated 4
3. Sori not so. Spore mass more or less pulverulent.....6

4. Spore wall 0.5-3(-3.5) µm thick, with very low tubercles. Exospore subhyaline to pale yellowish-brown .....***Jamesdicksonia major***
4. Spore wall 1.5-7(-8) µm thick, smooth. Exospore olivaceous-brown.....5

5. Sori as swollen, elongated spots or striae. Spores mostly rounded-irregular, 7–19 µm long, pale olivaceous-brown ..... ***Jamesdicksonia sporoboli***
5. Sori rounded or ellipsoidal. Spores mostly elongated-irregular, 11–20(–28) µm long, dark olivaceous-brown.....***Jamesdicksonia tremuli***

6(3). Sori as bullate striae. Spores 7-11.5 µm long ..... ***Ustilago sporoboli-indici***
6. Sori on the basal part of uppermost leaves, swollen or bullate 7

7. Spores 8-13 µm long .....***Ustilago deformis***
7. Spores 14.5-19(-20) µm long ..... ***Ustilago sporoboli-tremuli***

8(2). Sori in the whole inflorescence 9
8. Sori in the flowers or ovaries 10

9. Peridium, columella, spore balls present. Spores densely, finely punctate-verruculose .... ***Sporisorium saharianum***
9. Peridium, columella, spore balls absent. Spores evidently echinulate ..... ***Ustilago vilfae***

10. Sori in the flowers. Columella and spore balls present.....***Sporisorium hwangense***
10. Sori in the ovaries. Columella and spore balls absent 11

11. Spores 5-7(-8) µm long, in LM smooth..... ***Ustilago peruviana***
11. Spores larger, ornamented.....12

12. Sterile cells absent. Spores 9-11(-12) µm long, finely verruculose; spore profile almost smooth ..... ***Ustilago utahensis***
12. Sterile cells usually present. Spores of various sizes, evidently to coarsely ornamented; spore profile serrulate or serrate 13

13. Spores 16-21 µm long .....***Tilletia sporoboli***
13. Spores smaller 14

14. Spores 11-14.5(-16) µm long .....***Macalpinomyces sporoboli***
14. Spores 7.5-11(-13) µm long 15

15. Spores moderately densely verrucose-echinulate. Spore profile finely serrulate .... ***Macalpinomyces spermophorus***
15. Spores sparsely, coarsely echinulate. Spore profile sparsely serrate .... ***Macalpinomyces spinulosus***

HOST – PARASITE LIST
(*S. = Sporobolus*)

S. "*airoides*" = *S. patens – Ustilago utahensis*
S. africanus – Ustilago sporoboli-indici
S. agrostoides – Tranzscheliella hypodytes
S. arabicus = S. marginatus – Jamesdicksonia major, *J. sporoboli*
S. argutus = S. pyramidatus – Jamesdicksonia major
S. asperifolius = Muhlenbergia asperifolia – Tilletia asperifolia
S. auriculatus = Muhlenbergia arenacea – Ustilago striiformis
S. australasicus – Macalpinomyces spermophorus
S. brockmanii – Jamesdicksonia sporoboli
S. capensis = S. africanus – Ustilago sporoboli-indici
S. cordofanus – Jamesdicksonia major
S. cryptandrus – Tranzscheliella hypodytes
S. diander – Jamesdicksonia tremuli
S. elongatus – Ustilago sporoboli-indici
S. festivus – Tilletia sporoboli
S. filipes = S. agrostoides – Tranzscheliella hypodytes
S. gracillimus = Muhlenbergia filiformis – Tilletia montana
S. indicus – Jamesdicksonia sporoboli, *Ustilago sporoboli-indici*
S. indicus var. *laxus – Ustilago sporoboli-indici*
S. ioclados – Jamesdicksonia major
S. junceus – Macalpinomyces sporoboli
S. marginatus – Jamesdicksonia major, *J. sporoboli*
S. neglectus – Ustilago vilfae
S. panicoides – Sporisorium hwangense
S. paniculatus – Macalpinomyces spinulosus, *Ustilago deformis*
S. patens – Ustilago utahensis
S. patulus = S. paniculatus – Macalpinomyces spinulosus, *Ustilago deformis*
S. piliferus – Ustilago deformis
S. pungens – Sporisorium saharianum
S. pyramidalis – Ustilago sporoboli-indici
S. pyramidatus – Jamesdicksonia major
S. spicatus – Jamesdicksonia major
S. tremulus – Jamesdicksonia tremuli, *Ustilago sporoboli-tremuli*
S. vaginiflorus – Ustilago vilfae
S. virginicus – Ustilago peruviana
S. wallichii – Jamesdicksonia tremuli
S. "sp." = *Enneapogon* cf. *scoparius – Ustilago schlechteri*

FUNGUS NAMES
(valid names in bold face)

agrestis Ustilago = ***Tranzscheliella hypodytes***
asperifolia Tilletia
athenae Ustilago = ***Tranzscheliella hypodytes***
bromi-erecti Ustilago = ***Tranzscheliella hypodytes***
buchloës Ustilago
cheoana Sphacelotheca = ***Macalpinomyces spermophorus***
deformis Ustilago
desertorum Sporisorium
Eballistra
elionuri-tripsacoidis Macalpinomyces
Entyloma
ewartii Macalpinomyces
funalis Ustilago = ***Tranzscheliella hypodytes***
hilariae Ustilago = ***Ustilago vilfae***
hwangense Sporisorium
hypodytes Caeoma = ***Tranzscheliella hypodytes***
hypodytes Cintractia = ***Tranzscheliella hypodytes***
hypodytes Erysibe = ***Tranzscheliella hypodytes***
hypodytes Tranzscheliella
hypodytes Uredo = ***Tranzscheliella hypodytes***
hypodytes Ustilago = ***Tranzscheliella hypodytes***
hypodytes Ustilago var. *lolii* = ***Tranzscheliella hypodytes***
Jamesdicksonia
kusanoana Ustilago = ***Macalpinomyces spermophorus***
lygei Ustilago = ***Tranzscheliella hypodytes***
major Jamesdicksonia
majus Entyloma = ***Jamesdicksonia major***
majus Melanotaenium = ***Jamesdicksonia major***
Melanotaenium
montana Tilletia
nummularia Ustilago = ***Tranzscheliella hypodytes***
orientalis Ustilago = ***Macalpinomyces spermophorus***
peruviana Sphacelotheca = ***Ustilago peruviana***
peruviana Ustilago
Phragmotaenium
saharianum Sorosporium = ***Sporisorium saharianum***
saharianum Sporisorium
schlechteri Ustilago
spegazzinii Ustilago = ***Tranzscheliella hypodytes***
spermophora Sphacelotheca = ***Macalpinomyces spermophorus***
spermophora Ustilago = ***Macalpinomyces spermophorus***
spermophorus Macalpinomyces
spinulosa Ustilago = ***Macalpinomyces spinulosus***
spinulosus Macalpinomyces
sporoboli Entyloma = ***Ustilago sporoboli-indici***

sporoboli Jamesdicksonia
sporoboli Macalpinomyces
sporoboli Melanotaenium, (H.S. Jackson) Thirum., Whitehead & O'Brien = ***Jamesdicksonia sporoboli***
sporoboli Melanotaenium, Thirum. & M.C. Sriniv. = ***Jamesdicksonia tremuli***
sporoboli Tilletia
sporoboli Tolyposporella = ***Jamesdicksonia sporoboli***
sporoboli Ustilago, Ellis & Everhart = ***Tranzscheliella hypodytes***
sporoboli Ustilago, Tracy & Earle = ***Macalpinomyces sporoboli***
sporoboli-indici Ustilago
sporoboli-tremuli Ustilago
stipicola Ustilago = ***Tranzscheliella hypodytes***
striiformis Ustilago striiformis
subfusca Tilletia = ***Ustilago vilfae***
sumnevicziana Ustilago = ***Tranzscheliella hypodytes***
tremuli Jamesdicksonia
utahensis Sphacelotheca = ***Ustilago utahensis***
utahensis Ustilago
vilfae Ustilago

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