

## A reappraisal of the genus *Bauhinus* (Microbotryaceae)

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**Abstract.** The current status of former *Ustilago* species on dicotyledonous plants, recently treated as members of the Microbotryaceae, is discussed. Almaraz *et al.* (2002) pointed out that the genus *Microbotryum* is restricted to the anthericolous smuts on Caryophyllaceae, based on the sequence analysis of ITS rDNA. They concluded that *Sphacelotheca* and ovariicolous *Microbotryum* species on Caryophyllaceae, or at least, *Microbotryum duriaeanum*, are generically distinct from *Microbotryum s. str.* These results, on the one hand, alter the taxonomic scheme of the Microbotryaceae and, on the other, reestablish the genus name *Bauhinus*, reduced by some recent authors to a synonym of *Microbotryum*, as a correct name. Twenty-six new combinations in *Bauhinus* are proposed: *B. ahmadianus*, *B. anomalus*, *B. calandriniicola*, *B. calyptratae*, *B. cilinodis*, *B. coronatus*, *B. dehiscens*, *B. dumosus*, *B. filamenticola*, *B. lewisiae*, *B. longisetus*, *B. ocrearum*, *B. paucireticulatus*, *B. perfoliatae*, *B. picaceus*, *B. polygoni-alati*, *B. prostratus*, *B. radians*, *B. scabiosae*, *B. shastensis*, *B. silybi*, *B. stewartii*, *B. tenuisporus*, *B. tovarae*, *B. tuberculiformis*, and *B. tumeformis*. A new genus, *Haradaea*, is described to accommodate the seed-destroying species of *Ustilago* on Caryophyllaceae. It unites seven species: *H. alsineae*, *H. arenariae-bryophyllae*, *H. duriaeanana*, *H. holostei*, *H. jehudana*, *H. moenchiae-manticae*, and *H. nivalis*.

**Key words:** *Bauhinus*, Caryophyllaceae, *Haradaea*, Microbotryales, *Microbotryum*, smut fungi, taxonomy, *Ustilago*

In 1992 Moore proposed a new genus, *Bauhinus*, for all dicot smuts of *Ustilago*. Vánky (1993) reduced *Bauhinus* to a synonym of *Microbotryum* because the species of *Microbotryum* Léveillé, 1847, including the type, are also parasites on dicotyledonous plants. According to Article 63.1. of the Berlin ICBN the name *Bauhinus* was nomenclaturally superfluous when published. Later, Moore (1996a, b) presented a new taxonomic scheme of the smut fungi. The parasitic species of the Ustilaginales were divided between the Ustilaginaceae, for species on monocots, and the Microbotryaceae, for species on dicots. Microbotryaceae was treated as “currently comprising two genera”: *Bauhinus* (type species *B. tragopogonis-pratensis*) on Polygonaceae, Dipsacaceae, and Compositae, and

*Microbotryum* on Caryophyllaceae. When published the basionym of the type species of *Bauhinus* was legitimate and in the taxonomical treatment of *Ustilago* in the diagnosis, i.e. “for all dicot smuts of *Ustilago*”, the genus *Ustilago* was treated in the sense of the then current taxonomic concept at the end of the 1980s and the beginning of 1990s (cfr Vánky 1987; Mordue 1991). Thus the criticism of Bauer & Oberwinkler (1997), Bauer *et al.* (1997), and Almaraz *et al.* (2002) that the name *Bauhinus*, when published, was nomenclaturally superfluous for *Sphacelotheca* and *Liroa* was not correct. After the publications of Langdon & Fullerton (1978) and Vánky (1987), the genus of *Sphacelotheca* was clearly delimited from *Ustilago* on dicotyledonous plants. A similar problem

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was presented by the genus *Liroa* parasitizing Polygonaceae. Vánky (1987) treated it as a separate genus, despite the fact of some uncertainty. In the new, second edition of his *Illustrated Genera of Smut Fungi* he wrote about *Liroa emodensis* (Berk.) Cif.: “The generic position of this fungus was for a long time uncertain. However, morphological, ultrastructural, and molecular studies confirmed its place in a separate genus, *Liroa*, within the Microbotryaceae” (Vánky 2002: 88). *Zundeliomyces* on Polygonaceae, another monotypic member of the Microbotryaceae R.T. Moore, emend. R. Bauer & Oberw. (Bauer *et al.* 1997), as that family is defined in the recent classificatory system (Vánky 1999, 2002), has never been transferred into *Ustilago*. When Moore (1992) described *Bauhinus* for all dicot smuts of *Ustilago*, he had definitely understood the genus of *Ustilago* in the light of the then current generic taxonomic scheme, excluding *Sphacelotheca*, *Liroa*, and *Zundeliomyces*. Consequently, the name *Bauhinus* was nomenclaturally superfluous when published only regarding *Microbotryum*.

After the proposal by Moore (1996a, b) dividing *Ustilago* species on dicots between *Microbotryum* for species on Caryophyllaceae and *Bauhinus* for species on other dicot families, the taxonomic scheme was altered. In that case the genus *Bauhinus* became correct and when Denchev (1997a, b) proposed new combinations into *Bauhinus*, it was in accordance with Article 52.3. of the Tokyo ICBN. Additionally, Denchev (1997a) treated the species of *Microbotryum* more strictly than Moore (1996a), i.e. as limited to anthericolous smuts on Caryophyllaceae.

Bauer & Oberwinkler (1997) and Bauer *et al.* (1997) pointed out that up till then no morphological characters, including the spore germination, had been cited supporting the delimitation of *Bauhinus* from *Microbotryum*. Based on this statement, Vánky (1998, 1999, 2002) continued to consider *Bauhinus* as a synonym of *Microbotryum*. However, the taxonomic scheme of the Microbotryaceae again needs to be altered. Recently, in analysing the phylogenetic relationships of several smut fungi parasitic on dicotyledons, Almaraz *et al.* (2002) pointed out that the genus *Microbotryum* should be restricted to the anthericolous smuts on Caryophyllaceae, based on the sequence analysis of ITS rDNA. They concluded that *Sphacelotheca* and ovariicolous *Microbotryum* species on Caryophyllaceae, or at least, *Microbotryum duriaeanum*, are generically distinct from *Microbotryum s. str.* (type species *M. violaceum*).

We treat the species of *Microbotryum* as limited to the anthericolous smuts on Caryophyllaceae (incl. *M. majus*). If we treat at a genus level the other two distinct clades, recognized by Almaraz *et al.* (2002), i.e., these of the seed-destroying species of “*Ustilago*” (*Microbotryum* – sensu Vánky 1998) on Caryophyllaceae and the rest of species of *Microbotryum s. lat.* (sensu Vánky 1998, 1999, 2002), a new genus is necessary to be described for the seed-destroying species of *Microbotryum* on Caryophyllaceae. Because the type species of *Bauhinus*, *B. tragopogonis-pratensis* (Pers.) R.T. Moore, occurs on Asteraceae and is based on a legitimate basionym, *Bauhinus* becomes again a correct name according to Article 52.3. of the ICBN.

For accommodation of *Ustilago duriaeaana* in the Microbotryaceae, a new genus is proposed:

***Haradaea* Denchev, *gen. nov.***

*Fungi Microbotryacearum sensu Vánky (2002, ‘Illustrated genera of smut fungi’). Sori in seminibus plantarum Caryophyllacearum. Peridium et columella nullae, cellulae steriles inter sporas nullae, catenae sporarum nullae. Massa sporarum purpurascens. Sporae unicus generis, singulae, acatenatae.*

Members of the Microbotryaceae sensu Vánky (2002). **Sori** in seeds of plants belonging to Caryophyllaceae, filling the capsules with purplish **spore mass**; not as locular galls with central cavities. Peridium, collumella, sterile cells among the spores, and catenation of the spores lacking. **Spores** of one type, single, not catenate, not produced in cavities, not mixed with sterile filaments, not embedded in a gelatinous mass. Spore surface reticulate, rarely incompletely reticulate.

*Typus generis: Haradaea duriaeaana* (Tul. & C. Tul.) Denchev & H.D. Shin, **comb. nov.** — Basionym: *Ustilago duriaeaana* Tul. & C. Tul., Ann. Sci. Nat. Bot., Sér. 3, 7: 105, 1847. — Syn.: *Microbotryum duriaeanum* (Tul. & C. Tul.) Vánky, Mycotaxon 67: 43, 1998.

Etyymology: *Haradaea* is named in honour of the Japanese mycologist and phytopathologist, Prof. Yukio Harada (Hirosaki University, Hirosaki, Aomori).

Because six other *Ustilago* species in the seeds of Caryophyllaceae possess similar sorus structure and spore development and morphology, like those of *Haradaea duriaeaana*, the following additional new combinations are proposed:

***Haradaea alsineae*** (G.P. Clinton & Zundel) Denchev & H.D. Shin, **comb. nov.** — Basionym: *Ustilago alsineae* G. P. Clinton & Zundel in Zundel, North American Flora 7(14): 1029, 1939.

***Haradaea arenariae-bryophyllae*** (Vánky) Denchev & H.D. Shin, **comb. nov.** — Basionym: *Ustilago arenariae-bryophyllae* Vánky, Mycotaxon 18: 333, 1983.

***Haradaea holostei*** (de Bary) Denchev & H.D. Shin, **comb. nov.** — Basionym: *Ustilago holostei* de Bary, in Fischer von Waldheim, Jahrb. Wiss. Bot., 7: 105, 1870.

***Haradaea jehudana*** (Zundel emend. Denchev) Denchev & H.D. Shin, **comb. nov.** — Basionym: *Ustilago jehudana* Zundel, Mycologia 36: 401, 1944. For a description and the diagnosis emendation, see Denchev (1997b).

***Haradaea moenchiae-manticae*** (Lindtner) Denchev & H.D. Shin, **comb. nov.** — Basionym: *Ustilago moenchiae-manticae* Lindtner, Glasn. Prir. Muz. Srpske Zemlje, Ser. B, Biol. Nauke 3-4: 32, 1950.

***Haradaea nivalis*** (Liro) Denchev & H.D. Shin, **comb. nov.** — Basionym: *Ustilago nivalis* Liro, Ann. Acad. Sci. Fenn., Ser. A, 17(1): 42, 1924.

The status of *Ustilago moehringiae* Togashi & Y. Maki will be discussed in a separate article.

An emended description of *Bauhinus* and twenty-six new combinations in this genus are proposed herein.

***Bauhinus*** R.T. Moore, Mycotaxon 45: 98, 1992, emend. Denchev & R.T. Moore

Members of the Microbotryaceae *sensu* Vánky (2002), attacking plants of different dicotyledonous families, except Caryophyllaceae.

**Sori** in various organs of the host plants: (i) only in vegetative organs – usually in the leaves (and petioles), rarely in the stems, branches, and aerial bulbils, causing round spots, blister-like pustules or swellings of the infected parts, firstly, covering by the epidermis which at maturity of the sori ruptures exposing the spore mass; (ii) in both vegetative and generative organs – leaves, petioles, stems, and flowers, visibly destroying and swelling the infected parts; (iii) in the visibly swollen and deformed flowers filling them with spore mass (in the Asteraceae floral heads all florets destroying into purple spore mass), rarely in the inflorescence branches or floral pedicels; (iv) in the anthers, rarely in the filaments of the stamens; (v) in the ovules or seeds destroying the embryo and endosperm and filling the fruits with spore mass; never as locular galls with central cavities. Surrounding peridium absent, except the young sori of *B. bistortarum* covered by a greyish peridium of host tissue and fungal origin. Collumella, sterile cells among the spores, and catenation of the spores lacking. **Spore mass** powdery, very rarely semi-agglutinated; usually dark and mostly purplish, rarely light. **Spores** of one type, single, not catenate, not produced in cavities, not mixed with sterile filaments, not embedded in a gelatinous mass. Spore surface mainly reticulate, rarely verruculose, incompletely reticulate, striated or cerebriform. Spore germination results in phragmobasidia.

Type: *Bauhinus tragopogonis-pratensis* (Pers. : Pers.) R.T. Moore

Currently, this genus comprises 62 species.

## A list of accepted species of *Bauhinus*

On Asteraceae

*Bauhinus cardui* (A.A. Fisch. Waldh.) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago cardui* A.A. Fisch. Waldh.).

*Bauhinus cichorii* (Syd.) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago cichorii* Syd.).

*Bauhinus onopordi* (Vánky) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago onopordi* Vánky).

*Bauhinus scolymi* (Roum. & Trab. ex Juel) Denchev, Mycotaxon 65: 424, 1997 (Syn.: *Ustilago scolymi* Roum. & Trab. ex Juel).

*Bauhinus scorzonerae* (Alb. & Schwein.) R.T. Moore, Mycotaxon 45: 99, 1992 (Syn.: *Ustilago scorzonerae* (Alb. & Schwein.) J. Schröt.).

***Bauhinus silybi*** (Vánky & Berner) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Microbotryum silybum* Vánky & Berner, Mycotaxon 85: 308, 2003.

*Bauhinus tragopogonis-pratensis* (Pers. : Pers.) R.T. Moore, Mycotaxon 45: 99, 1992 (Syn.: *Ustilago tragopogonis-pratensis* (Pers. : Pers.) Roussel).

On Dipsacaceae

*Bauhinus cephalariae* (Vánky) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago cephalariae* Vánky).

*Bauhinus flosculorum* (DC.) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago flosculorum* (DC.) Fr.).

*Bauhinus intermedius* (J. Schröt.) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago intermedia* J. Schröt.).

***Bauhinus scabiosae*** (Vánky) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Microbotryum scabiosae* Vánky, Mycotaxon 67: 52, 1998. — Syn.: *Farinaria scabiosae* Sowerby (nom. inval.), *Bauhinus scabiosae* (Sowerby) R.T. Moore (comb. inval.).

*Bauhinus succisae* (Magnus) Denchev, Mycotaxon 65: 424, 1997 (Syn.: *Ustilago succisae* Magnus).

On Gentianaceae

*Bauhinus nannfeldtii* (Liro) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago nannfeldtii* Liro).

On Lamiaceae

*Bauhinus betonicae* (Beck) Denchev, Mycotaxon 65: 421, 1997 (Syn.: *Ustilago betonicae* Beck).

On Lentibulariaceae

*Bauhinus pinguiculae* (Rostr.) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago pinguiculae* Rostr.).

On Morinaceae

*Bauhinus morinae* (Padwick & A. Khan) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago morinae* Padwick & A. Khan).

On Onagraceae

*Bauhinus gayophyti* (Harkn.) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago gayophyti* Harkn.).

On Polygonaceae

***Bauhinus abmadianus*** (Syd.) Denchev & R. T. Moore, **comb. nov.** — Basionym: *Ustilago ahmadiana* Syd., Ann. Mycol. 36: 437, 1938.

***Bauhinus anomalus*** (J. Kunze ex G. Winter) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago anomala* J. Kunze ex G. Winter, in Rabenh., Krypt.-Fl. Deutschl., 2 Aufl. 1(1): 100, 1881. — Syn.: *U. anomala* J. Kunze in Kunze, Fungi sel. exs., no. 23, 1875 (nom. nud.); *Bauhinus anomalus* (J. Kunze) R. T. Moore, Mycotaxon 45: 99, 1992 (comb. inval.).

*Bauhinus avicularis* (Liro) Denchev, Mycotaxon 65: 421, 1997 (Syn.: *Ustilago avicularis* Liro).

*Bauhinus bistortarum* (DC.) Denchev, Mycotaxon 65: 421, 1997 (Syn.: *Ustilago bistortarum* (DC.) Körn.).

*Bauhinus bosniacus* (Beck) Denchev, Mycotaxon 65: 421, 1997 (Syn.: *Ustilago bosniaca* Beck).



- Baubinus cardui* (A.A. Fisch. Waldh.) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago cardui* A.A. Fisch. Waldh.).
- Baubinus cilinodis*** (Savile) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago cilinodis* Savile, Canad. J. Bot. 31: 670, 1953.
- Baubinus cordae* (Liro) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago cordae* Liro).
- Baubinus coronatus*** (Liro) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago coronata* Liro, Ann. Acad. Sci. Fenn., Ser. A, 17(1): 244, 1924.
- Baubinus debiscens*** (L. Ling) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago debiscens* L. Ling, Sydowia 3: 124, 1949.
- Baubinus dumosus*** (Vánky & Oberw.) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago dumosa* Vánky & Oberw., in Vánky, Mycotaxon 36: 477, 1990.
- Baubinus filamenticola*** (L. Ling) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago filamenticola* L. Ling, Mycol. Papers 11: 5, 1945.
- Baubinus goeppertianus* (J. Schröt.) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago goeppertiana* J. Schröt.).
- Baubinus koenigiae* (Rostr.) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago koenigiae* Rostr.).
- Baubinus kuehneanus* (R. Wolff) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago kuehneana* R. Wolff).
- Baubinus longisetus*** (Vánky & Oberw.) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago longiseta* Vánky & Oberw., Nova Hedwigia, Beiheft 107: 54, 1994.
- Baubinus marginalis* (DC.) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago marginalis* (DC.) Lév.).
- Baubinus nepalensis* (Liro) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago nepalensis* Liro).
- Baubinus ocrearum*** (Berk.) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago ocrearum* Berk., in Hooker's J. Bot. Kew Gard. Misc. 6: 207, 1854.
- Baubinus parlatorei* (A.A. Fisch. Waldh.) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago parlatorei* A.A. Fisch. Waldh.).
- Baubinus paucireticulatus*** (Vánky) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Microbotryum paucireticulatum* Vánky, Mycotaxon 89: 78, 2004.
- Baubinus picaceus*** (Lagerh. & Liro) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago picacea* Lagerh. & Liro, in Liro, Ann. Acad. Sci. Fenn., Ser. A, 17(1): 8, 1924.
- Baubinus piperii* (G.P. Clinton) Denchev, Mycotaxon 65: 424, 1997 (Syn.: *Ustilago piperii* G.P. Clinton).
- Baubinus polygوني-alati*** (Thurum. & Pavgi) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago polygوني-alati* Thurum. & Pavgi, Sydowia 20: 24, 1968.
- Baubinus prostratus*** (Vánky & Oberw.) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago prostrata* Vánky & Oberw., in Vánky, Mycotaxon 40: 164, 1991.
- Baubinus pustulatus* (DC.) Denchev, Mycotaxon 65: 424, 1997 (Syn.: *Ustilago pustulata* (DC.) G. Winter).
- Baubinus radians*** (Vánky & Oberw.) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago radians* Vánky & Oberw., Nova Hedwigia, Beiheft 107: 68, 1994.
- Baubinus reticulatus* (Liro) Denchev, Mycotaxon 65: 424, 1997 (Syn.: *Ustilago reticulata* Liro, *Baubinus utriculosus* (Nees) R.T. Moore).
- Baubinus rhei* (Zundel) Denchev, Mycotaxon 65: 424, 1997 (Syn.: *Ustilago rhei* (Zundel) Vánky & Oberw.).
- Baubinus shastensis*** (Zundel) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago shastensis* Zundel (as 'shastense'), in W.B. Cooke, Mycobiota of North America, Mycobiota of Mount Shasta, no. 63 [issued 30 Mar 1940].
- Baubinus stewartii*** (Zundel) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago stewartii* Zundel, Mycologia 36: 403, 1944.
- Baubinus stygius* (Liro) Denchev, Mycotaxon 65: 424, 1997 (Syn.: *Ustilago stygia* Liro).
- Baubinus tenuisporus*** (Cif.) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago tenuispora* Cif., Ann. Mycol. 29: 58, 1931.
- Baubinus tovarae*** (Savile) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago anomala* J. Kunze ex G. Winter var. *tovarae* Savile, Canad. J. Bot. 31: 670, 1953.
- Baubinus tuberculiformis*** (Syd. & P. Syd.) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago tuberculiformis* Syd. & P. Syd., Ann. Mycol. 1: 22, 1903.
- Baubinus tumeformis*** (L. Ling) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago tumeformis* L. Ling, Sydowia 4: 77, 1950.
- Baubinus vinosus* (Tul. & C. Tul.) R.T. Moore, Mycotaxon 45: 99, 1992 (Syn.: *Ustilago vinosus* Tul. & C. Tul.).
- Baubinus warmingii* (Rostr.) Denchev, Mycotaxon 65: 425, 1997 (Syn.: *Ustilago warmingii* Rostr.).
- On Portulacaceae
- Baubinus calandriniae* (G.P. Clinton) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago calandriniae* G.P. Clinton).
- Baubinus calandrinicola*** (Speg.) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Ustilago calandrinicola* Speg., Anales Mus. Nac. Buenos Aires, Ser. 3, 19: 287, 1909.
- Baubinus calyptratae*** (Vánky) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Microbotryum calyptratae* Vánky, Mycotaxon 69: 96, 1998.
- Baubinus claytoniae* (Shear) Denchev, Mycotaxon 65: 422, 1997 (Syn.: *Ustilago claytoniae* Shear).
- Baubinus lewisiae*** (Vánky) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Microbotryum lewisiae* Vánky, Mycotaxon 69: 96, 1998.
- Baubinus nelsonianus* (Savile) Denchev, Mycotaxon 65: 423, 1997 (Syn.: *Ustilago nelsoniana* Savile).
- Baubinus perfoliatae*** (Vánky) Denchev & R.T. Moore, **comb. nov.** — Basionym: *Microbotryum perfoliatae* Vánky, Mycotaxon 69: 96, 1998.
- On Primulaceae
- Ustilago primulae* Wettst., Oesterr. Bot. Z. 36: 73, 1886. This species is known only from the type description and there is no type specimen saved in any herbarium (Vánky 1998;

Zwetko & Blanz 2004). According to Vánky (1998), the type specimen probably no longer exists. Surely, this species is not a member of *Ustilago* and with big probability it is a *Baubinus* species.

*Microbotryum* should be reduced only to the group of the anthericolous species (incl. *M. majus*) on Caryophyllaceae.

***Microbotryum*** Léveillé, Ann. Sci. Nat. Bot., Sér. 3, 8: 372, 1847.

Members of the Microbotryaceae *sensu* Vánky (2002). Sori in the anthers, rarely also in ovaries, of plants belonging

to Caryophyllaceae, replacing the attacked organs with powdery spore mass, light to dark coloured, mainly of colours from the purple group, vinaceous or reddish-brown; not as locular galls with central cavities. Peridium, collumella, sterile cells among the spores, and catenation of the spores lacking. Spores of one type, single, not catenate, not produced in cavities, not mixed with sterile filaments, not embedded in a gelatinous mass. Spore surface mainly reticulate, rarely incompletely reticulate or verrucose. Spore germination results in phragmobasidia.

Type: *Microbotryum antherarum* (DC.) Lév. [= *M. violaceum* (Pers. : Pers.) G. Deml & Oberw.]

### Key to the genera of smut fungi of the family Microbotryaceae

- 1 Spores of two types: thin-walled and longitudinally ridged, and thick-walled and tuberculate . . . . . *Zundeliomyces*  
 1\* Spores of the same type . . . . . 2  
 2 Peridium and columella in the sori present. Spores at first catenate, joined by disjunctors . . . . . *Sphacelotheca*  
 2\* Peridium and columella absent. Spores not catenate . . . . . 3  
 3 Spores produced in cavities and mixed with filaments . . . . . *Liroa*  
 3\* Spores not produced in cavities and not mixed with filaments . . . . . 4  
 4 Sori in the seeds of species of Caryophyllaceae . . . . . *Haradadea*  
 4\* Sori in the anthers or anthers and other floral parts of species of Caryophyllaceae . . . . . *Microbotryum*  
 4\*\* Sori in various organs of host plants of different dicotyledonous families, except Caryophyllaceae . . . . . *Baubinus*

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