Phytotaxa 192 (1): 044–049
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.192.1.5

The identity of *Entyloma anadelphiae*: reclassification and redescription of leaf and stem smut infecting *Anadelphia pumila* in Guinea

MARCIN PIĄTEK
Department of Mycology, W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL-31-512 Kraków, Poland
email: m.piatek@botany.pl

Abstract

The identity of a very rare smut fungus, *Entyloma anadelphiae*, described from infected leaves and stems of *Anadelphia pumila* (Poaceae, subfam. Panicoideae, tribe Andropogoneae) in Guinea is re-evaluated. Morphology indicates that this species is not identical with *Jamesdicksonia dactylidis*, with which it has been considered synonymous in recent smut monographs. It differs in having mostly dark brown spores with thicker, distinctly two-layered walls. *Entyloma anadelphiae* also differs from other smut species of the order Georgefischeriales described on hosts of the Andropogoneae. The species is redescribed, illustrated and reallocated to the genus *Jamesdicksonia* as a distinct species, *Jamesdicksonia anadelphiae comb. nov*.

Key words: Africa, *Anadelphia*, *Jamesdicksonia,* Georgefisheriales, historical collections, plant pathogens, smut fungi

Introduction

The smut order Georgefischeriales is represented in Africa by ten species, of which *Jamesdicksonia dactylidis* (Pass.) R. Bauer, Begerow, A. Nagler & Oberw. is most common, being reported on ten host plants in six countries (Vánky *et al.* 2011). However, *Jamesdicksonia dactylidis* is probably a species complex, as could be assumed of the many host species reported for this smut and its morphological variability on different hosts (Vánky 1994). The level of host specialization within this complex is still unresolved, and it is unclear whether every host genus or host species harbours its own *Jamesdicksonia* species. The cross-infection experiments of McKenzie & Latch (1981) with isolates taken from six grasses revealed that smut from an original host usually caused different levels of infection on non-host plants, indicating some potential for wider host range for certain species of the *J. dactylidis* complex. This observation should be tested using larger sampling on diverse hosts and applying molecular methods. While most host plants reported for *J. dactylidis* complex (Vánky 2012) are grasses from the subfamily Pooideae, a few grasses from the subfamily Panicoideae [*Anadelphia pumila* Jacq.-Fél., *Sehima nervosum* (Rottler) Stapf, *Setaria flavida* (Retz.) Veldkamp] were also reported as hosts of this smut. Of the 23 synonymous names of *Jamesdicksonia dactylidis* reported by Vánky (2012), 22 were described for species infecting pooid grasses and only one (*Entyloma anadelphiae* Vienn.-Bourg.) for species infecting a panicoid grass, *Anadelphia pumila* (tribe Andropogoneae).

Entyloma anadelphiae was described by Viennot-Bourgin (1957) who found this smut during his expedition to Guinea in January 1957 on the leaves and stems of *Anadelphia pumila* growing on wet sandstone in Foulaya near Kindia. Later, the species was neglected and only Ciferri (1963) included it in his revision of then-defined Tilletiaceae as an invalidly proposed combination, *Entyloma speciosum* [no rank] *anadelphiae* (Vienn.-Bourg.) Cif. [ICN, Art. 37.1 (Melbourne)]. Zambettakis (1970, 1971) included *E. anadelphiae* in the monograph of African smut fungi. It is probable that neither author examined the type material since both of them reported the same spore measurements as given in the protologue. Vánky & Shivas (2008) were the first to place *E. anadelphiae* in synonymy with *Jamesdicksonia dactylidis*, but probably without careful examination of type material. Even assuming that one species of *Jamesdicksonia* Thirum., Pavgi & Payak could infect several different host plants from the subfamily Pooideae, it is less likely that the same species may infect distantly related host plants from the subfamily Panicoideae. Thus, in the course of current studies on African smut fungi (Piątek 2006a, b, 2009a, b, 2010, Piątek & Vánky 2005, 2007, Piątek *et al.* 2008,

 Accepted by Eric McKenzie: 4 Dec. 2014; published: 7 Jan. 2015

of spore wall of *E. anadelphiae* that reach 3.5 µm or exceptionally even 4.0 µm thick. Additionally, the spore wall in *E. anadelphiae* is distinctly two-layered with a lighter, even and thinner inner layer and a darker, uneven and thicker outer layer. No information on the layers is included in most available descriptions of *J. dactylidis*, except those given by Piepenbring (2003) who reported that spore walls consist of two layers that are not easily distinguishable in light microscope. This contrasts with the distinctly visible layers in *E. anadelphiae*. The colour of spores in *E. anadelphiae* tends to be dark brown.

Entyloma anadelphiae is also clearly different from other georgefischerialean species described on hosts of the Andropogoneae (Table 1). *Tolyposporella chrysopogonis* G.F. Atk., *T. irregularis* (Pazschke) Zundel, *T. puccinioides* R. Durán and *T. rhytachnes* Vienn-Bourg. differ in having spores united in spore-balls, with larger size (except in *T. chrysopogonis*) and thicker walls. *Eballistra punensis* Denchev & T. Denchev has smaller spores, *Jamesdicksonia brunkii* (Ellis & Galloway) J. Walker & R.G. Shivas, *J. ischaemiana* (Thirum. & Pavgi) R. Bauer, Begerow, A. Nagler & Oberw. and *J. linearis* (Berk. & Broome) Vánky have larger spores with thicker walls, *Melanotaenium arthraxonis* (Thirum. & Pavgi) Vánky has larger spores, while *J. caribensis* M. Piepenbr. and *J. obesa* (Syd. & P. Syd.) Thirum., Pavgi & Payak have thicker spore walls. Additionally, spore walls in *J. brunkii*, *J. caribensis* and *J. obesa* are multi-layered, contrasting with two-layered spore walls in *Entyloma anadelphiae*.

On the contrary, *Melanotaenium apludae* Thirum. & M.C. Sriniv., *M. dimeriae* A.R. Patil, T.M. Patil & M.S. Patil and *Phragmotaenium indicum* (Vánky, M.S. Patil & N.D. Sharma) R. Bauer, Begerow, A. Nagler & Oberw. have rather similar spore sizes and wall thickness (Table 1), but the two former species are insufficiently characterized morphologically to draw any definite conclusions about their identity, while *P. indicum* could be distinguished from *E. anadelphiae* by having more regular spores. In the case that *Melanotaenium apludae* and *M. dimeriae* are indeed conspecific with *E. anadelphiae*, which is doubtful, they should be placed in synonymy of the latter species as they were described later, in 1964 and 2004, respectively.

The generic placement of *Entyloma anadelphiae* is a challenge. The dark-spored smuts sporulating within the vegetative tissues of different grasses, and not exposed by tissue rupture, were classified in three genera, namely *Eballistra* R. Bauer, Begerow, A. Nagler & Oberw., *Jamesdicksonia* and *Phragmotaenium* R. Bauer, Begerow, A. Nagler & Oberw. (Bauer *et al.* 2001). They have similar spore morphology and ultrastructure, and could be differentiated on the basis of type of spore germination and/or molecular phylogeny. These data cannot be obtained using old holotype material of *Entyloma anadelphiae*. Nevertheless, to retain this species in *Entyloma* de Bary, a group of dicot-infecting leaf smuts (Begerow *et al.* 2002, Vánky 2012), would be highly discordant and impractical. Therefore, following the approach of Piepenbring (2003), Vánky (2004) and Piątek & Prończuk (2006), *Entyloma anadelphiae* is reallocated to the georgefischerialean *Jamesdicksonia*, pending molecular confirmation of its generic placement when fresh material is collected in the future.

The separation of *Jamesdicksonia anadelphiae* and *J. dactylidis* implies that currently 11 species of the order Georgefischeriales are known from Africa, and that *J. dactylidis* is limited to the Mediterranean areas (Egypt, Madeira, Morocco, Tunisia, Vánky *et al.* 2011). The record of *J. dactylidis* in Eritrea and the host plant *Sporobolus indicus* var. *laxus* (Nees) Stapf in the African checklist of smut fungi (Vánky *et al.* 2011) are probably incorrect. This smut species has not been included in the monograph of Ethiopian and Eritrean smuts (Vánky 2005). It is likely that this record is based on a mistakenly made assignment of *Entyloma sporoboli* E. Castell. & Graniti on *Sporobolus indicus* var. *laxus* described from Eritrea (Graniti 1950) as a putative synonym of *Jamesdicksonia dactylidis*. The name *Entyloma sporoboli* is however a synonym of *Ustilago sporoboli-indici* L. Ling (Vánky 2012).

Acknowledgements

I thank Bart Buyck, the Curator of PC, for loan of the specimen. This work was supported by the National Science Centre (NCN) of Poland (project no. N N303 414037 for the years 2009–2014).

References

Bauer, R., Begerow, D., Nagler, A. & Oberwinkler, F. (2001) The Georgefischeriales: a phylogenetic hypothesis. *Mycological Research* 105: 416–424.
http://dx.doi.org/10.1017/S0953756201003690

Begerow, D., Lutz, M. & Oberwinkler, F. (2002) Implications of molecular characters for the phylogeny of the genus *Entyloma*. *Mycological Research* 106: 1392–1399.
http://dx.doi.org/10.1017/S0953756202006962

Ciferri, R. (1963) Revisio Ustilaginearum (Pars I. Tilletiaceae). *Quaderno* 27: 1–431.

Denchev, C.M. (2001) *Fungi Bulgariae 4. Classis Ustomycetes (ordines Tilletiales, Ustilaginales et Graphiolales)*. Editio Academica "Prof. Marin Drinov", Editio "Pensoft", Sofia, 286 pp.

Denchev, C.M. & Denchev, T.T. (2013) Erratomycetaceae, fam. nov., and validation of some names of smut fungi recently described from India. *Mycobiota* 1: 63–70.
http://dx.doi.org/10.12664/mycobiota.2013.01.07

Gandhe, R.V. (2011) *Ustilaginales of India*. Bishen Singh Mahendra Pal Singh, Dehra Dun, 414 pp.

Graniti, A. (1950) Su alcuni fungilli graminicoli dell'Africa Orientale. *Nuovo Giornale Botanico Italiano*, *N.S.* 57: 247–256.

McKenzie, E.H.C. & Latch, G.C.M. (1981) New plant disease record in New Zealand: *Entyloma dactylidis* and *E. brizae* on grasses. *New Zealand Journal of Agricultural Research* 24: 397–400.
http://dx.doi.org/10.1080/00288233.1981.10423405

Piątek, M. (2006a) *Doassansiopsis tomasii*, an aquatic smut fungus new to Uganda. *Polish Botanical Journal* 51: 173–176.

Piątek, M. (2006b) *Sporisorium kenyanum*, a new smut fungus with long twisted sori on *Setaria pallide-fusca* in Kenya. *Polish Botanical Journal* 51: 159–164.

Piątek, M. (2009a) *Sporisorium themedae* new to Mauritius, and *Tilletia mauritiana* new to Madagascar. *Polish Botanical Journal* 54: 21–26.

Piątek, M. (2009b) Two smut fungi on *Ischaemum*: *Sporisorium austroafricanum* sp. nova and *Tolyposporium bogoriense* revisited. *Annales Botanici Fennici* 46: 425–430.
http://dx.doi.org/10.5735/085.046.0508

Piątek, M. (2010) *Sporisorium ignotum* – a remarkable smut fungus from Zimbabwe originally classified in the genus *Ustilago*. *Polish Botanical Journal* 55: 309–314.

Piątek, M., Piątek, J. & Mossebo, D.C. (2012) Recently discovered collections extend the geographical range of the smut fungus *Sphacelotheca polygoni-serrulati* to Cameroon and Zambia. *Polish Botanical Journal* 57: 285–293.

Piątek, M., Piątek, J. & Yorou, N.S. (2014) Emended description and geographical distribution of *Sporisorium elegantis* (Ustilaginaceae), a species shared between West Africa and India. *Phytotaxa* 175(3): 148–154.
http://dx.doi.org/10.11646/phytotaxa.175.3.4

Piątek, M. & Prończuk, M. (2006) *Jamesdicksonia irregularis*, newly recognized in Poland, with a note on the genus *Jamesdicksonia* (Ustilaginomycetes). *Polish Botanical Journal* 51: 79–86.

Piątek, M. & Vánky, K. (2005) *Cintractia majewskii*, a new smut fungus (Ustilaginomycetes) on *Fimbristylis* (Cyperaceae) from Africa. *Polish Botanical Journal* 50: 1–6.

Piątek, M. & Vánky, K. (2007) *Ustilago aldabrensis*, a new species from Seychelles, and two other smut fungi on *Dactyloctenium*. *Mycological Progress* 6: 213–219.
http://dx.doi.org/10.1007/s11557-007-0536-y

Piątek, M., Vánky, K., Mossebo, D.C. & Piątek, J. (2008) *Doassansiopsis caldesiae* sp. nov. and *Doassansiopsis tomasii*: two remarkable smut fungi from Cameroon. *Mycologia* 100: 662–672.
http://dx.doi.org/10.3852/07-189R

Piepenbring, M. (2003) Smut fungi (Ustilaginomycetes p.p. and Microbotryales, Basidiomycota). *Flora Neotropica Monograph* 86: iv + 1–291.

Vánky, K. (1994) *European smut fungi*. G. Fischer Verlag, Stuttgart-Jena-New York. 570 pp.

Vánky, K. (2004) New smut fungi (Ustilaginomycetes) from Mexico, and the genus *Lundquistia*. *Fungal Diversity* 17: 159–190.

Vánky, K. (2005) The smut fungi of Ethiopia and Eritrea. *Lidia* 6(4): 93–120.

Vánky, K. (2012) *Smut fungi of the world*. APS Press, St. Paul, Minnesota, 1480 pp.

Vánky, K. & Piątek, M. (2006) The genus *Testicularia* (Ustilaginomycetes). *Mycologia Balcanica* 3: 163–167.

Vánky, K. & Shivas, R.G. (2008) *Fungi of Australia: The smut fungi*. ABRS, Canberra; CSIRO Publishing, Melbourne. 267 pp.

Vánky, K., Vánky, C. & Denchev, C.M. (2011) Smut fungi in Africa – a checklist. *Mycologia Balcanica* 8: 1–77.

Viennot-Bourgin, G. (1957) Trois Ustilaginales nouvelles de Guinée française. *Bulletin de la Société Botanique de France* 104(5–6): 266–275.
http://dx.doi.org/10.1080/00378941.1957.10835108

Zambettakis, C. (1970) Recherches sur les Ustilaginales d'Afrique. *Bulletin de la Société Mycologique de France* 86: 305–692.

Zambettakis, C. (1971) *Les Ustilaginales des plantes d'Afrique*. Laboratoire de Cryptogamie du Muséum National d'Histoire Naturelle, Paris, 388 pp.