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
e-mail: 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*, Georgefischeriales, 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* Vien.-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,
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. rhytmachnes* 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 & Próźczuk (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**


http://dx.doi.org/10.1017/S0953756201003690


