

## DOASSANSIOPSIS TOMASII, AN AQUATIC SMUT NEW TO UGANDA

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**Abstract.** *Doassansiopsis tomasii* Vánky, recently described as a new species from infected leaves of *Nymphaea nouchali* Burm.f. in Ethiopia, is reported from the second world locality in Uganda. In this country it was found in Lake Victoria on *Nymphaea* sp. 52 years earlier than the type specimen in Ethiopia. The sori and spore balls of *D. tomasii* are described and illustrated by line drawings, LM and SEM micrographs, and the global distribution of the smut fungus is presented on the map. In addition, an interesting case of accidental infection of *Nymphaea nouchali* by *Doassansiopsis nymphoides* Vánky in Zambia is briefly discussed.

**Key words:** *Doassansiopsis*, Doassansiopsidaceae, Urocystales, Uganda, Africa

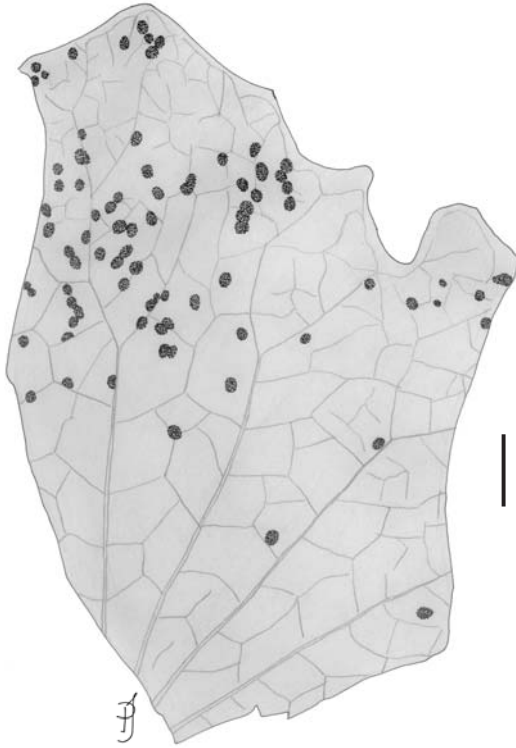
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Smut fungi (Ustilaginomycetes) of the so-called ‘*Doassansia*’ group contain an interesting assemblage of taxa that produce similar structures, evolved as an adaptation to parasitize aquatic or paludal plants. Most of them form spore balls composed of spores, sterile cells and/or hyphae in various configurations. The structure of the spore balls is the basis for generic delimitation. The exception is the genus *Doassinga* Vánky, R. Bauer & Begerow, which produces single spores scattered in the leaf mesophyll of *Callitriche* species. Phylogenetically, most genera of the ‘*Doassansia*’ group are closely related and included in the family Doassansiaceae, order Doassansiales, subclass Exobasidiomycetidae. However, the genus *Doassansiopsis* (Setch.) Dietel is only distantly related and is classified in the family Doassansiopsidaceae, order Urocystales, subclass Ustilaginomycetidae. The problems associated with this remarkable group have been discussed by Vánky (1981, 1999, 2001), Piepenbring (1995), Vánky *et al.* (1998), Vánky and Shivas (2006) and others. Nevertheless, many questions are still unanswered and the ‘*Doassansia*’ group surely needs much more work. Molecular studies are required to confirm the evolutionary relationships in this group, and to verify whether the currently accepted species

concept is in agreement with genetic data. No less needed are intensified field and herbarium studies to recognize and document the taxonomy, ecology and geography of this group of smut fungi.

Amongst the unidentified smut fungi obtained on loan from Kew Herbarium (K) was a spore-ball-forming smut from the ‘*Doassansia*’ group, infecting a leaf of an unidentified water plant in Lake Victoria in Uganda. Analysis of the leaf, especially in respect to its nervure, and comparison with various water plants preserved in the phanerogamic collection of the W. Szafer Institute of Botany in Kraków (KRAM), led me to the conclusion that the host plant is a member of the genus *Nymphaea*. In recent studies, Vánky (2006) enumerated the smut fungi infecting Nymphaeaceae and recognized five species: *Rhamphospora nymphaeae* D. D. Cunn., type on *Nymphaea nouchali* Burm.f. (= *N. stellata* Willd.), *Doassansiopsis euryalis* Verma & Jha, type on *Euryale ferox* Salisb., *D. nymphaeae* (Syd. & P. Syd.) Thirum., type on *N. nouchali* Burm.f. (= *N. stellata* Willd.), *D. ticonis* M. Piepenbr., type on *N. blanda* G. Mey., and *D. tomasii* Vánky, type on *N. nouchali* Burm.f.

The specimen from Uganda showed characters of the genus *Doassansiopsis*, expressed by the structure of the spore balls, composed of a central



**Fig. 1.** Sori of *Doassansiopsis tomasii* Vánky on leaf of *Nymphaea* sp. [partly reconstructed, K(M) 134345]. Scale bar = 1 cm.

mass of pseudoparenchymatous cells surrounded by a layer of spores and an outer, cortical layer of small, sterile cells. On the basis of biometric characters it was identified as *Doassansiopsis tomasii*. This species was described recently by Vánky (2006) from infected leaves of *Nymphaea nouchali* collected in late 2004 near the Blue Nile Falls in Ethiopia. The Ugandan specimen exhibits all the typical features of the species (Figs 1–7). The sori are formed on both sides of the leaf as rounded, thickened, wart-like or cup-shaped, yellowish or brownish spots 1.5–3.0 mm in diameter. The spots are filled with numerous pale brown spore balls that are visible even with the naked eye. They are globose, subglobose, ellipsoidal or irregular, yellowish-brown, and 170–300  $\mu\text{m}$  in diameter. The spores are highly variable in size and shape, mostly radially elongated, irregular or subcuneiform, smooth, pale yellowish brown,

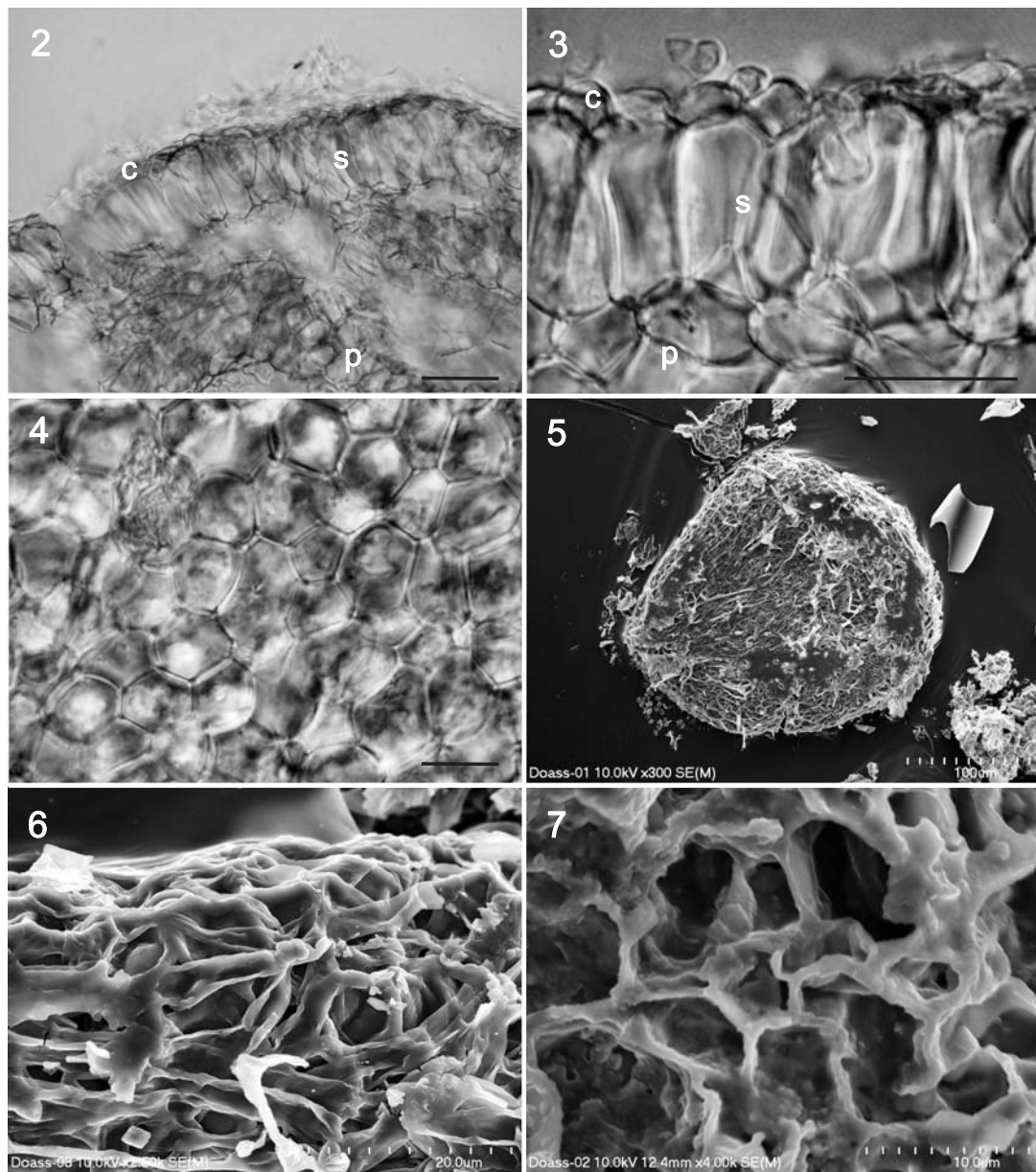
12–23  $\times$  6–12  $\mu\text{m}$ , and usually arranged in one layer. The central pseudoparenchymatous cells are extremely variable in size and shape, subglobose, ellipsoidal, irregularly polyhedral with compressed sides, empty, 5–30  $\times$  4–22  $\mu\text{m}$ . Cortical sterile cells are highly variable in shape and size, irregular, subcuneiform, and usually tangentially flattened, smooth, 6–11  $\times$  4–7  $\mu\text{m}$ . Sterile cells are covered by hyphal fragments, most probably the remnants of sporogenous hyphae.

The two remaining *Doassansiopsis* species on *Nymphaea* differ from *D. tomasii* collected in Uganda by another set of diagnostic characters. *Doassansiopsis nymphaeae* forms large hypertrophied sori, 0.5–1.5 cm in diameter, on the petioles of *Nymphaea nouchali*, and has larger spores, 17–25  $\mu\text{m}$  long. *Doassansiopsis ticonis* produces flat spots without thickening, on the leaves of *Nymphaea blanda*, and has smaller spores, 12–16  $\mu\text{m}$  long (Piepenbring 1995; Vánky 2006).

In Uganda, *Doassansiopsis tomasii* was found 52 years earlier than in its type locality in Ethiopia, and has remained unidentified until now. The site is located at the northern shore of Lake Victoria, the largest natural freshwater lake in Africa. This first Ugandan report of *D. tomasii* and the second known in the world constitutes a significant extension of the species range, as it was found ca 1400 km SW of the type locality in Ethiopia (Fig. 8). However, because *Nymphaea nouchali* is a rather common water plant in numerous lakes and swamps in Africa, *D. tomasii* probably is more widely distributed on that continent.

**SPECIMEN EXAMINED.** UGANDA. BUGANDA PROVINCE: Lake Victoria, Napoleon Gulf, Jinja (opposite), on leaf of *Nymphaea* sp. (det. M. Piątek), 13 Nov. 1952, leg. R. Ross 1218, K(M) 134345.

In addition to five smut fungi recognized on Nymphaeaceae (Vánky 2006), one more species has been recorded on this host plant family, namely *Doassansiopsis nymphoides* Vánky on *Nymphaea nouchali*. This collection, duplicates of which are stored in BPI (871642 n.v.) and HUV (20953, see below), has not been published so far, and as Dr. Kálmán Vánky informed me, represents an interesting case of accidental infection.



**Figs 2–7.** *Doassansiopsis tomasii* Vánky on leaf of *Nymphaea* sp. [K(M) 134345]. 2 & 3 – parts of squashed spore balls with central mass of pseudoparenchymatous cells (p), surrounded by a layer of spores (s), and outer cortical layer of sterile cells (c), as seen by LM. Scale bars = 20 µm; 4 – pseudoparenchymatous cells, as seen by LM. Scale bar = 10 µm; 5 – spore ball, as seen by SEM. Scale bar = 100 µm; 6 – hyphal remnants on surface of spore ball, as seen by SEM. Scale bar = 20 µm; 7 – empty pseudoparenchymatous cells of broken spore ball, as seen by SEM. Scale bar = 10 µm.

*Doassansiopsis nymphoides* was described by Vánky (2002) from abundantly infected leaves of *Nymphoides rautanenii* (N. E. Br.) A. Raynal,

collected by him from a small lake in Zambia. *Nymphoides rautanenii* belongs to the family Menyanthaceae, but Dr. Vánky informed me that in



Fig. 8. Global distribution of *Doassansiopsis tomasii* Vánky in Africa: ● – type locality, ▲ – new locality.

the same lake he found a few sori on some leaves of the abundantly present *Nymphaea nouchali*, which is a member of Nymphaeaceae. The smut on *N. nouchali* was identical with *D. nymphoides* on *N. rautaneni*, and Dr. Vánky (pers. comm.) interprets this case as an accidental infection. Similar cases of accidental infections were earlier observed in the genus *Anthracoidea* Bref. Examples of such infection are *Anthracoidea irregularis* (Liro) Boidol & Poelt on *Carex tomentosa* L. (sect. *Acrocystis*) growing between heavily infected *Carex digitata* L. (sect. *Digitatae*) in Romania (Nannfeldt 1979; Vánky 1994), or *Anthracoidea bigelowii* Nannf. on *Carex paupercula* Michx. (sect. *Limosae*) amongst heavily infected *Carex bigelowii* Torr. ex Schwein. (sect. *Phacocystis*) in Sweden (Hendrichs *et al.* 2005).

SPECIMEN EXAMINED. ZAMBIA. SOUTHERN PROVINCE: 130 km SE urbe Kafue, 2 km N of sandy beach on Kariba Lake, alt. 520 m., 16°27'54"S/28°40'29"E,

on leaves of *Nymphaea nouchali*, 28 Apr. 2001, leg. C. Vánky & K. Vánky, HUV 20953.

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