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PUCCINIA LOJKAIANA: A RUST FUNGUS NEW FOR POLAND

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Abstract. *Puccinia lojkaiana* Thüm., collected in Poland for the first time, is described, illustrated and compared with other rust fungi occurring on *Ornithogalum* spp.

Key words: Uredinales, rust fungi, distribution, *Puccinia, Ornithogalum*

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INTRODUCTION

In the years since monographs of Polish Uredinales were published (Majewski 1977, 1979), seven rust species new for Poland have been found: *Melampsoridium hiratsukanum* S. Ito, *Phragmidium mexicanum* (Mains) H. Y. Yun, Minnis & Aime (= *Frommeëlla mexicana* var. *indicae* McCain & Hennen), *Puccinia bornmuelleri* Magnus, *P. lagenophorae* Cooke, *P. laserpitii* Lindroth., *P. scillae* Linhart and *Uromyces baeumlerianus* Bubák (Wołczańska 1999; Adamska & Błaszkowski 2000; Piątek 2003; Ruszkiewicz-Michalska & Michalski 2005; Wołczańska & Lamorski 2006; Wołczańska & Piątek 2010; Wołczańska & Wójciak 2010). Another species to be included in this group is *Puccinia lojkaiana* Thüm., which we collected on *Ornithogalum boucheanum* Asch., an anthropophyte established in the Polish flora (Mirek *et al.* 2002). This plant is known from several stands at ruderal sites, mostly in southwestern and western Poland. It was introduced as an ornamental plant in 1880, and its first reported locality was in Głogówek in the Nizina Śląska lowland (Zając & Zając 2001; Tokarska-Guzik 2005). No rust fungus has been reported previously on *Ornithogalum boucheanum* in Poland. *Puccinia liliacearum* Duby (on *Ornithogalum umbellatum* L. and *O. collinum* Guss.) and *Uromyces gageae* Beck (on *O. umbellatum*) (Majewski 1979) are known from other representatives of this genus. Here we describe, illustrate and discuss *Puccinia lojkaiana*, found for the first time in Poland.

MATERIALS AND METHODS

Infected specimens of *Ornithogalum boucheanum* were collected in spring 2009 in a park close to the Turew Research Station of the Institute for Agricultural and Forest Environment (IAFE) of the Polish Academy of Sciences in Turew village near Poznań. Microscope slides were prepared from air-dried specimens. Teliospores were stained with cotton blue in lactic acid, warmed and observed under a light microscope. The spore surface ornamentation was studied by scanning electron microscopy (SEM). Dry spores were sputter-coated with gold and observed with a VEGA-3 LMU microscope. Monographs by Majewski (1977, 1979) and Gäumann (1959) were used for rust identification. Vascular plant names follow Mirek *et al*. (2002). The collected specimens are deposited in the herbarium of the Department of Botany and Mycology, Maria Curie-Skłodowska University in Lublin (LBL M) and in the private herbarium of Marek Wołkowycki.

RESULTS AND DISCUSSION

Puccinia lojkaiana Thüm. Fig. 1a–d

Öst. Bot. Z. 1876: 183. 1876.

Spermogonia usually on upper, rarely on lower side of leaves, usually surrounded by several telia.

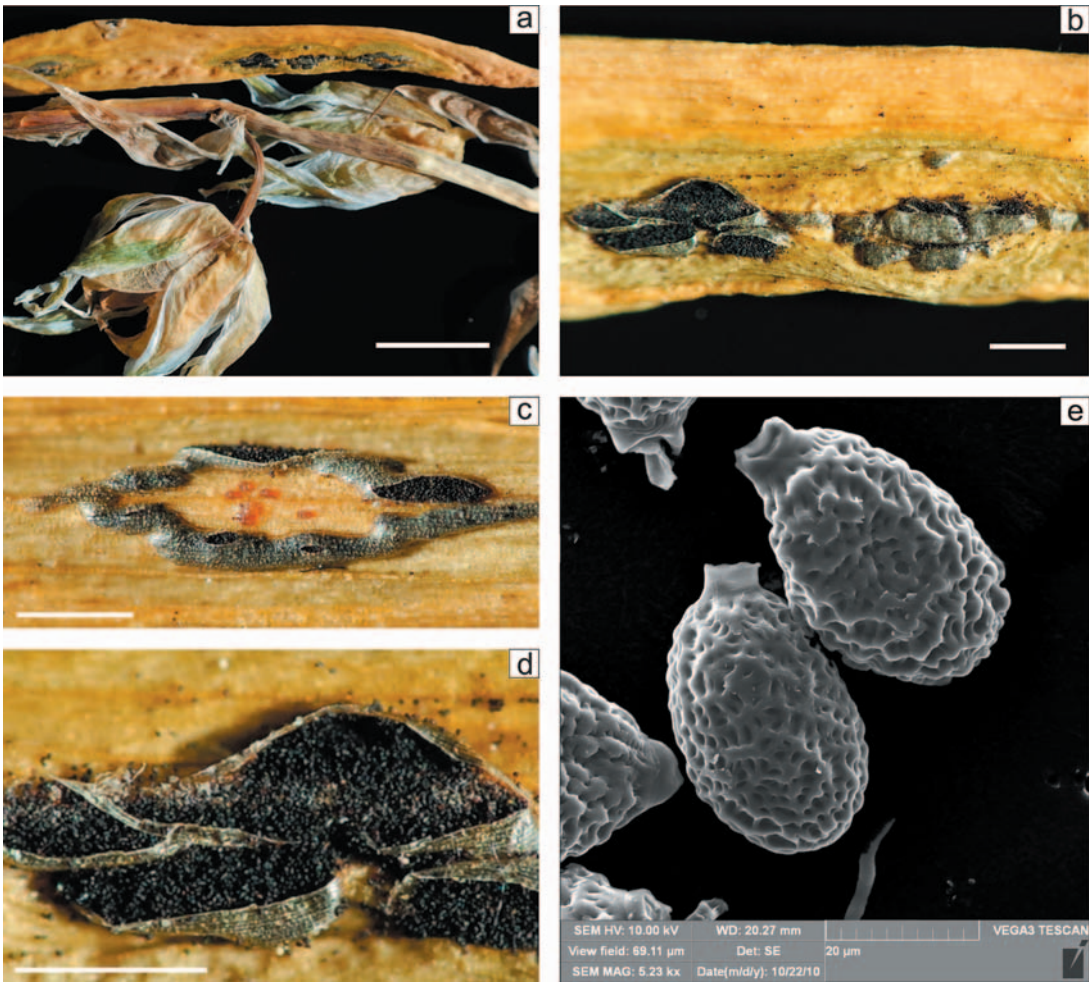

Fig. 1. *Puccinia lojkaiana* Thüm. on *Ornithogalum boucheanum* Asch.: a, b & d – telia on leaves; c – spermogonia and telia; e – teliospores (details on photo). Scale bars: a = 10 mm; b, c & d = 1 mm.

Telia usually on upper, rarely on lower side of leaves, initially covered by epidermis; after rupturing pulveraceous, brownish black, ellipsoidal, fusiform, 1–2 mm long; often they gather and surround spermogonia or create long strips up to 2 cm long (Fig. 1a–c). Teliospores 42–52 × 24–32 µm, ellipsoidal, usually rounded at both ends, the wall (2–)3–4 µm thick, dark brown, tuberculate, reticulate; pedicel hyaline, breaking off (Fig. 1d).

SPECIMEN EXAMINED: on *Ornithogalum boucheanum* Asch.: Nizina Wielkopolsko-Kujawska lowland, Turew near Poznań, park, 10 May 2009, *leg. M. Wołkowycki* (LBL M-11285, herb. M. Wołkowycki F-3847).

Three species of the genus *Puccinia* which infect plants of the genus *Ornithogalum* are known from Europe: *Puccinia lojkaiana, P. liliacearum* and *P. hordei* Otth (Gäumann 1959).

Puccinia hordei is a heteroecious species. It produces only spermatia and aeciospores on representatives of the genus *Ornithogalum*. Previously it was not found in Poland on this host (Majewski 1979; Majewski & Ruszkiewicz-Michalska 2008).

Puccinia lojkaiana and *P. liliacearum* are autoecious species (Majewski 1979). They produce three types of spores in their life cycle: spermatia,

Table 1. A comparison of *Puccinia liliacearum* Duby and *Puccinia lojkaiana* Thüm. Characters of *Puccinia liliacearum* according to Majewski (1979).

Character	*Puccinia liliacearum*	*Puccinia lojkaiana*
Types of spores	spermatia, teliospores, basidiospores	spermatia, teliospores, basidiospores
Telia	roundish, up to 0.5 mm in diameter	ellipsoidal, fusiform, 1–2 mm in length, often fused then up to 2 cm in length
Dimensions of teliospores	45–65 × 22–32 µm	42–52 × 24–32 µm
Thickness of teliospore wall	2.0–2.5 µm	(2–)3–4 µm
Wall ornamentation	smooth	tuberculate, reticulate
Hosts (in Poland)	*Ornithogalum umbellatum, Ornithogalum collinum*	*Ornithogalum boucheanum*

teliospores and basidiospores. The main feature distinguishing the two species is teliospore wall ornamentation. The wall of *P. liliacearum* is smooth, and that of *P. lojkaiana* distinctly tuberculate or reticulate (Fig. 1d). The two species are compared in Table 1. In Poland, *P. liliacearum* is a rare species, recorded from only a few localities: Nakło, Bydgoszcz, Prusice near Złotoryja, Skorocice Reserve near Busko Zdrój, Skierniewice, and Szczecin and vicinity (Majewski 1979; Michalski 1986; Romaszewska-Sałata 1981; Saniewska & Jarecka 2005; Zioło *et al.* 2008) (Fig. 2).

It is difficult to determine whether in Poland *P. lojkaiana* is a native species unnoticed because of its hosts' phenology (early-spring geophytes, flowering for a short time and occurring rarely) or rather an alien species that may become invasive. The second suggestion seems more plausible, as it was collected on the alien host species *Ornithogalum boucheanum*, aggressively infected the plant's leaves, and attacked many specimens. The fungus currently is known from only one locality, so its invasive potential in Poland cannot be determined.

Puccinia lojkaiana infects different *Ornithogalum* species but has also been reported from representatives of the genera *Muscari* (including *Leopoldia*), *Bellevalia* and *Puschkinia* (Majewski 1979; Farr & Rossman 2012), though these records require confirmation (Cannon 2011). Records of *Puccinia lojkaiana* on *Ornithogalum* spp. are known from Asia (Iran, Iraq, Turkey), Africa (Canary Islands), and Southern and Central Europe (Austria, Bulgaria, Czech Republic, Germany, Greece, Hungary, Italy, Romania, Slovakia, Spain) (Cooke 1906; Poelt & Zwetko 1997; Urban & Marková 2009; Cannon 2011).

The fungal database (Farr & Rossman 2012) and Cannon's (2011) work, citing the monograph of Majewski (1979), include information that *Puccinia lojkaiana* occurs in Poland. However, Majewski (1979) only suggested the possibility of finding *P. lojkaiana* in this country; since that monograph was written in Polish this information apparently was inaccessible to non-Polish readers. The present work is the first report of this rust species in Poland.

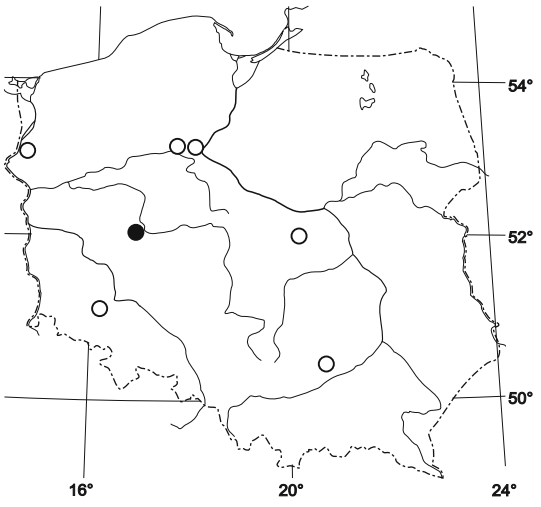

Fig. 2. Distribution map of *Puccinia lojkaiana* Thüm. (●) and *P. liliacearum* Duby (○) in Poland.

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