Urocystis phalaridis sp. nov. on *Phalaris* sp. from Iran

توصیف گونه جدید *Urocystis phalaridis*، روی *Phalaris* sp. از ایران

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Abstract

A new smut fungus, *Urocystis phalaridis*, is described on *Phalaris* sp. (*Poaceae*) from Iran.

Keywords: Gorgan, new species, *Poaceae*, smut fungi, *Urocystidaceae*

Introduction

During the preparation of a monograph of the Iranian smut fungi, the authors of the monograph (Vánky & Abbasi 2012) checked numerous smut fungus collections, mainly preserved in the fungus colection of the Ministry of Jihad-e-Agriculture ("IRAN"). Several of them were not named or have been wrongly identified. Such a specimen is "*Urocystis agropyri*" on *Phalaris* sp., collected by Shobeir Daemi in Golestan Prov., Campus of the Natural Resources, University of Gorgan, 1.I.1993.

Urocystis Rabenh. ex Fuckel is the type genus of the *Urocystidaceae*, within the order *Urocystidales*, class *Ustilaginomycetes*. It is a large, natural, morphologically well-characterised genus, despite the fact that the ca 170 known species parasitise a wide range of host plants in 16 monocotyledonous and 15 dicotyledonous families (Vánky 2012).

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چکیده

بازنگری نمونه‌های هرباریومی سیاهک‌ها در مجموعه مرجع قارچ‌های وزارت جهاد کشاورزی مشخص نمود که نمونه سیاهک روی گونه‌ای از *Phalaris* جمع‌آوری شده از گرگان، به گونه جدیدی از جنس *Urocystis* تعلق دارد. لذا، نمونه مذکور در مقاله حاضر تحت گونه جدید *Urocystis phalaridis* شرح داده می‌شود. ضمن ارایه تصاویر میکروسکوپ الکترونی و نوری از این گونه جدید، کلیدی نیز برای شناسایی گونه‌های *Urocystis* روی زیرقبیله *Phalaridineae* در دنیا ارایه می‌شود.

واژه‌های کلیدی: گرگان، سیاهک‌ها، *Poaceae*، *Urocystidaceae*

Species delimitation is often difficult because of the scanty, often overlapping morphological characters of the spore balls, spores and sterile cells (Vánky 2002: 4 & 168). The type of the genus is *U. occulta* (Wallr.) Rabenh. ex Fuckel on rye (*Secale cereale*).

Urocystis agropyri (Preuss) A.A. Fisch. Waldh. (1867: 258), based on *Uredo agropyri* Preuss, in Sturm (1848: 367), has numerous nomenclatural and taxonomic synonyms and a great number of host plants (see Vánky, 2012: 1028–1029). Its type is on "Queckengrass" (= *Elymus repens* (L.) Gould; *Triticum repens* L.; *Agropyron repens* (L.) P. Beauv.; *Elytrigia repens* (L.) Nevski), Germany, Sachsen, Hoyerswerda, C.G.T. Preuss. *Ur. agropyri*, similar to many grass-infecting *Urocystis* species, has sori in the leaves, sheaths and culms, forming streaks parallel to the veins, initially lead-coloured, covered by the epidermis which ruptures to expose the dark-brown, dusty mass of spore balls. Spore balls globose to elongate, 16–32 µm long, composed of 1–3(–4) spores and a completely or almost completely investing layer of sterile cells. Spores globose, subglobose or ovoid, sometimes with flattened sides, 9.5–15 × 12–17.5 µm, reddish-brown, smooth. Sterile cells hyaline to yellowish, 4–12 µm long; wall thin (ca 1 µm), collapsing with age, giving a ridged appearance to the spore ball surface. In SEM sterile cells very finely punctate-verruculose. Spore germination (Thirumalachar & Dickson 1949) results in aseptate basidia, usually with four, apical, cylindrical basidiospores that fuse in pairs to form dikaryotic hyphae.

In the literature, there are about 50 host plant species given for *Ur. agropyri* in the genera *Agropyron* Gaertn., *Elymus* L. (incl. *Roegneria* Koch), *Leymus* Hochst., and *Psathyrostachys* Nevski. All these genera belong to the subfam. *Pooideae*, tribe *Triticeae* (Claiton & Renvoize 1986).

Urocystis on *Phalaris* L. (subfam. *Pooideae*, tribe *Aveneae*, subtribe *Phalaridinae*) differs from *Ur. agropyri* and other related species. It is described below as a new species.

Materials and Methods

The specimens studied in this paper are *Urocystis* "*agropyri*" on *Phalaris* sp., Iran, Golestan Prov., Gorgan, Campus of the Natural Resources University of Gorgan, 1.I.1993, coll. S. Daemi, IRAN-F 10352 & HUV 21977, and *Ur. agropyri* on *Elymus repens*, Hungary, comit. Veszprém, Tihany, 30.V.1977, coll. J. Gönczöl, S. Tóth, L. Zeller & K. Vánky, distributed in Vánky, Ust. exs. No. 236, HUV 6836.

Spore balls, spores and sterile cells were studied using dried herbarium specimens. For microscopic study the spore balls were suspended in a small droplet of lactophenol, covered with a cover glass, gently heated to boiling point to rehydrate the spores and sterile cells, and expel air bubbles from the preparation, and studied in a light microscope (LM) at 1000× magnification. For scanning electron microscopy (SEM), spore balls were placed on double-sided adhesive tape, mounted on a specimen stub, sputter-coated with gold-palladium, ca 35 nm, and examined in a SEM at 10 kV.

The nomenclatural novelty was registered in: MycoBank (www.MycoBank.org, Crous *et al.* 2004).

Results

A study of the morphology of the spore balls, spores and sterile cells of *Urocystis* on *Phalaris* sp. revealed that it differs markedly from *Ur. agropyri*. It differs also from the three known *Urocystis* species on host plants in the subtribe *Phalaridineae*, namely from *Ur. roivainenii* (Liro) Zundel (1953: 332), on *Anthoxanthum*, from *Ur. hierochloae* (Murashk.) Vánky (1985: 165), on *Hierochloë*, and from *Ur. beijingensis* L. Guo (2001: 91), also on *Hierochloë*. The main characters of these species are:

Ur. agropyri: Spore balls 16–32 µm long, composed of 1–3(–4) spores; spores 12–17.5 µm long; sterile cells 4–12 µm long; wall ca 1 µm thick. On *Agropyrum* and related genera.

Ur. roivainenii: Spore balls 20–40 µm long, composed of 1–3(–8) spores; spores 12–20 µm long; sterile cells 7–16 µm long; wall 1–2(–2.5) µm thick. On *Anthoxanthum*.

Ur. hierochloae: Spore balls 20–35 µm long, composed of 1–4(–5) spores; spores 12–20 µm long; sterile cells 6–13 µm long, wall 1.5–2.5 µm thick. On *Hierochloë*.

Ur. beijingensis: Spore balls 20–50 µm long, composed of 1–5(–6) spores; spores 13.5–21 µm long; sterile cells 6.5–12 µm long; wall 1–1.5 µm thick. On *Hierochloë*.

Urocystis phalaridis Vánky, **sp. nov.**

MycoBank # MB 564271

Type on *Phalaris* sp., Iran, Golestan Prov., Gorgan, Campus of the Natural Resources, University of Gorgan, 36°50' N, 54°23' E, alt. 70 m, 1.I.1993, coll. S. Daemi, holotype HUV 21977, isotype IRAN 10325-F.

Urocystis phalaridis (typus in matrice *Phalaridis* sp.) differt a specie *U. roivainenii* (Liro) Zundel (1953: 332; basionym *Tuburcinia roivainenii* Liro, Mycotheca fennica. Die Etiketten. No. 301–600, p. 110, 1939; typus in matrice *Anthoxanthi odorati*), glomerulis sporarum majoribus (25–50 µm longis) e 1–7(–9) sporis compositis. Glomeruli sporarum speciei *Urocystidis roivainenii* 20–40 µm longi, e 1–3(–8) sporis compositi.

Sori (Fig. 1) on the leaves as long striae between the veins, at first lead coloured, covered by the epidermis which ruptures longitudinally disclosing the dark reddish -brown, powdery mass of spore balls. Spore balls (Fig. 2, 3) subglobose, irregular to elongated, 20–40 × 25–50 µm, composed of 1–7(–9) spores [I=7.8%, II=20.8%, III=30.4%, II=23.4%, V=11.8%, VI=3.4%, VII=1.6%, VIII=0.6%, IX=0.2%] and a completely investing layer of sterile cells. Spores (Fig. 2) subglobose, ovoid, ellipsoidal, elongated or subpolyhedrally irregular, with one or several flattened sides, 9–15 × 11–19 µm, reddish-brown. Sterile cells (Figs 2, 3) subglobose, ellipsoidal, elongated or irregular, 6.5–14 µm long, yellow; wall uneven, 0.5–2.5 µm thick, thinner on the free surface, thick on the contact sides, in SEM finely verruculose.

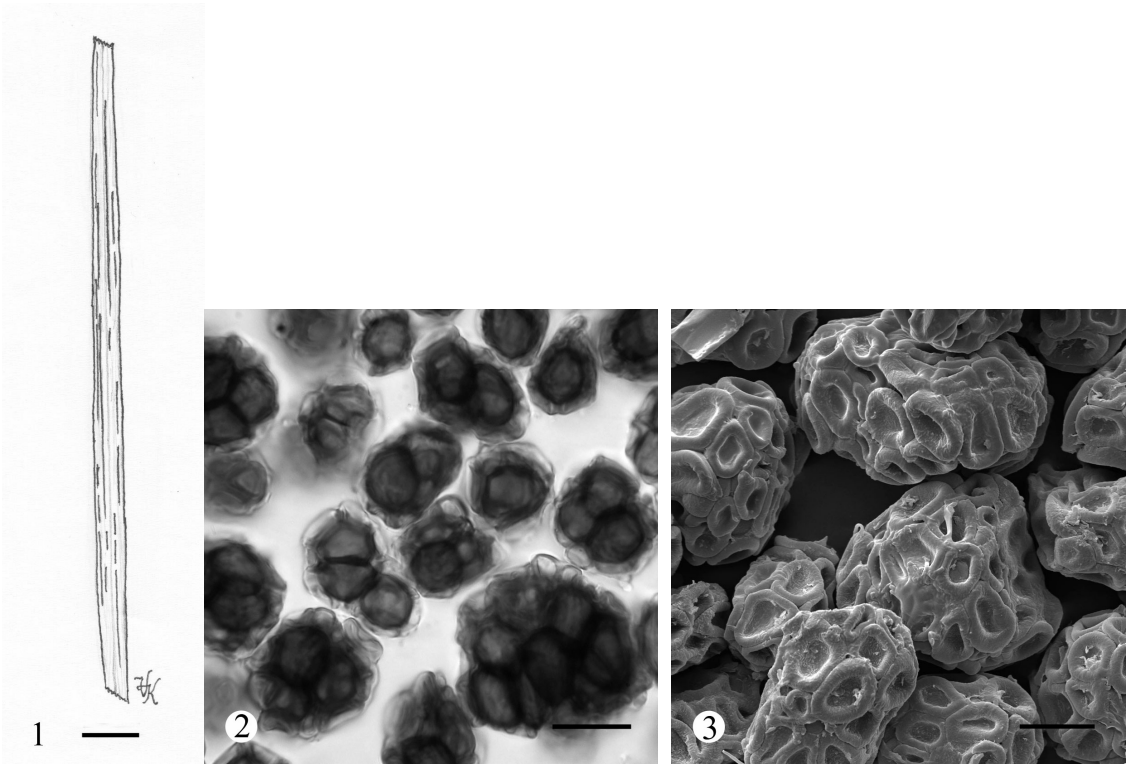
On *Poaceae*: *Phalaris* sp.

Distribution: Asia (Iran). Known only from the type locality.

Comments: No inflorescence of the host plant is preserved in the type specimen of *Urocystis phalaridis* in IRAN 10325-F. The host plant was identified by Dr. Abdolghayum Ebrahimi, Professor Emeritus of Islamic Azad University of Gorgan, as *Phalaris* sp. Based on a study of the ligule and epidermal cells of a smutted leaf, and a comparison with those of *Phalaris minor* Retz., and *P. paradoxa* L., the junior author confirmed that the host plant genus was correctly identified as *Phalaris* sp.

Key to the species of *Urocystis* on the subtribe *Phalaridineae*

1. On *Hierochloë* ……...……..…….……. 2
– Not on *Hierochloë* 3
2. Spore balls 20–35 µm long, composed of 1–4(–5) spores …….....*Ur. hierochloae*
– Spore balls 20–50 µm long, composed of 1–5(–6) spores .....*Ur. beijingensis*
3. On *Anthoxanthum*; spore balls 20–40 µm long, composed of 1–3(–8) spores ..... *Ur. roivainenii*
– On *Phalaris*; spore balls 25–50 µm long, composed of 1–7(–9) spores ……..……*Ur. phalaridis*



Figs 1–3. *Urocystis phalaridis* on *Phalaris* sp. (type): 1. Sori on a leaf forming long striae. Habit (Bar = 1 cm), 2–3. Spore balls, spores and sterile cells in LM and in SEM (Bars = 10 µm).

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References

Clayton, W.D. & Renvoize, S.A. 1986. Genera graminum. Grasses of the world. Kew Bulletin Additional Series XIII. London, UK, 389 pp.

Crous, P.W., Gams, W., Stalpers, J.A., Robert, V. & Stegehuis, G. 2004. MycoBank: an online initiative to launch mycology into the 21st. century. Studies in Mycology 50: 19–22.

Fischer von Waldheim, A.A. 1867. Sur la structure des spores des Ustilaginées. Bulletin de la Société Imperiale des Naturalistes, Moscou 40: 242–261.

Guo, L. 2001. *Urocystis beijingensis* sp. nov., and a smut species of *Urocystis* new to China. Mycotaxon 77: 91–92.

Sturm, J. 1848. Deutschlands Flora, etc. Abt. III, Heft 25 & 26. Preuss, C. G. Die Pilze Deutschlands. Nürnberg.

Thirumalachar, M.J. & Dickson, J.G. 1949. Chlamydospore germination, nuclear cycle, and artificial culture of *Urocystis agropyri* on red top. Phytopathology 39: 333–339.

Vánky, K. 1985. Carpathian Ustilaginales. Acta Univ. Upsal., Symb. Bot. Upsal. 24(2): 1–309.

Vánky, K. 2002. Illustrated Genera of smut fungi. 2nd. ed. APS Press, St. Paul, Minnesota, USA, 238 pp.

Vánky, K. 2012. Smut fungi of the world. APS Press, St. Paul, Minnesota, USA, XVIII + 1458 pp.

Vánky, K. & Abbasi, M. 2012. Smut fungi of Iran. Polish Botanical Studies (in prep.).

Zundel, G.L. 1953. The Ustilaginales of the world. Pennsylvania State College School of Agriculture Department of Botany Contribution 176: XI + 1–410.