

***Puccinia ardahanensis* sp. nov., a new rust fungus from Turkey**

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Puccinia ardahanensis sp. nov. found on *Veronica armena* in Turkey, is described, illustrated and discussed.

Keywords: Uredinales, *Puccinia*, new species, Turkey, *Veronica*.

The genus *Veronica* L. comprises about 300 species which are distributed worldwide in a diverse variety of habitats (Martinez-Ortega & Rico 2001, Albach *et al.* 2004). Davis (1965–85) listed 79 *Veronica* species for the flora of Turkey, among them 26 endemics.

The known rusts infecting *Veronica* belong to the genus *Puccinia* or to the anamorph genus *Aecidium*. While most *Puccinia* species occurring on *Veronica* are microcyclic, *P. cynodontis* Lacroix and *P. isiacae* Winter are heteroecious and produce spermogonia and aecia on *Veronica* among other plant genera. *P. cynodontis* has been reported from Turkey on *Cynodon dactylon* (L.) Pers. (Bahcecioglu & Yildiz 2005, Bahcecioglu *et al.* 2006) while *P. isiacae* is unknown in the country to our knowledge (Farr & Rossman without date, Henderson 1964).

In the present paper, we describe a new *Puccinia* on *Veronica armena* Boiss. & Huet from northeastern Turkey.

Materials and Methods

Spores were scraped from dried host specimens and mounted in lactophenol. The preparations were examined with an Olympus BX51 light microscope and micrographs taken with a ColorView IIIu camera. The “Cell*B” software package (Software Imaging System GmbH) was used to capture and edit micrographs. Measurements were made by the use of an ocular micrometer scale and are given to 0.5 µm. At least 30 spores were measured for each spore state. The host name fol-

lows the 'Flora of Turkey and Aegean Islands' by Davis (1965–85). Specimens are deposited in the Inonu University Herbarium (INU), Turkey and Herbarium Turicense (ZT), Switzerland.

Taxonomy

Puccinia ardahanensis R. Berndt, Z. Bahcecioglu & Ş. Kabaktepe, **sp. nov.** – Figs. 1–3.

MycoBank no.: MB 514144.

Spermogonia et aecia absentia. Uredinia praecipue caulibus petiolisque insidentia, subepidermalia, ferruginea, pulverulenta, elongata; urediniosporae subglobose, globosae vel obovoideae, $20.5\text{--}26 \times 18\text{--}21.5 \mu\text{m}$ ($22.3 \times 20.0 \mu\text{m}$), *pariete* dilute brunneo vel pallide aurantio-brunneo ca. $1\text{--}1.5 \mu\text{m}$ crasso crebre delicate et sate aequaliter verruculoso verrucis minus quam $1 \mu\text{m}$ inter se distantibus, poris germinationis $5\text{--}9$ dispersis papillis carentibus. Teli praecipue caulibus petiolisque insidentia, subepidermalia, picea, subcompacta ad subpulverulenta, elongata, confluentia et deinde striiformia; teliosporae ellipsoideae, late ellipsoideae, subpyriformes, rariter obovoideae vel subglobose, $33.5\text{--}47 \times 19\text{--}28 \mu\text{m}$ ($39.7 \times 24.2 \mu\text{m}$), in septo non vel vix constrictae, apicaliter rotundatae vel late conicae, *pariete* castaneo levi vel sublevi et lenissime verruculoso-ruguloso lateraliter ca. $(1.5) 2\text{--}3.5 \mu\text{m}$ crasso in apice vix vel leniter ($5\text{--}8 \mu\text{m}$) incrassato, poris germinationis apicalibus et juxta septum; *pedicello* basaliter inserto subhyalino vel dilute brunneo plusminusve persistenti usque ad $120 \mu\text{m}$ longo; teliosporae unicellulares nonnunquam adsunt.

Holotypus. – (INU 8533): Turkey, Ardahan, 4–5 km from Göle to Şenkaya, alt. 1950 m a.s.l., on *Veronica armena* Boiss. & Huet, leg. Ş. Kabaktepe (no. 4189), 14 Jul 2006. Isotype in ZT.

Spermogonia and aecia absent. Uredinia mainly on stems and petioles, subepidermal, ferruginous, pulverulent, elongated; urediniospores subglobose, globose or obovoid, $20.5\text{--}26 \times 18\text{--}21.5 \mu\text{m}$ (mean $22.3 \times 20.0 \mu\text{m}$), spore wall pale brown and with pallid orange tinge (apricot), ca. $1\text{--}1.5 \mu\text{m}$ thick, densely and rather evenly verruculose with warts less than $1 \mu\text{m}$ apart, germ pores $5\text{--}9$, scattered, without caps. Teli mainly on stems and petioles, subepidermal, blackish, subcompact to subpulverulent, elongated and becoming confluent forming longer striae; teliospores ellipsoid, broadly ellipsoid or subpyriform, rarely obovoid or subglobose, $33.5\text{--}47 \times 19\text{--}28 \mu\text{m}$ (mean $39.7 \times 24.2 \mu\text{m}$), not or hardly constricted at septum, apically rounded or very broadly conical, spore wall chestnut brown, more or less smooth, some spores with most inconspicuously and finely verruculose-rugulose surface, ca. $(1.5) 2\text{--}3.5 \mu\text{m}$ thick at sides, apex slightly thickened to ca. $5\text{--}8 \mu\text{m}$, germ pores apical and adjacent to septum, pit-like, pedicel inserted at spore base, subhyaline to pale brownish, more or less persistent, up to $120 \mu\text{m}$ long but generally breaking shorter; one-celled teliospores occasionally present.

Etymology. – After the city of Ardahan where the rust was collected.

Host plant. – *Veronica armena* Boiss. & Huet (Plantagina-ceae*).

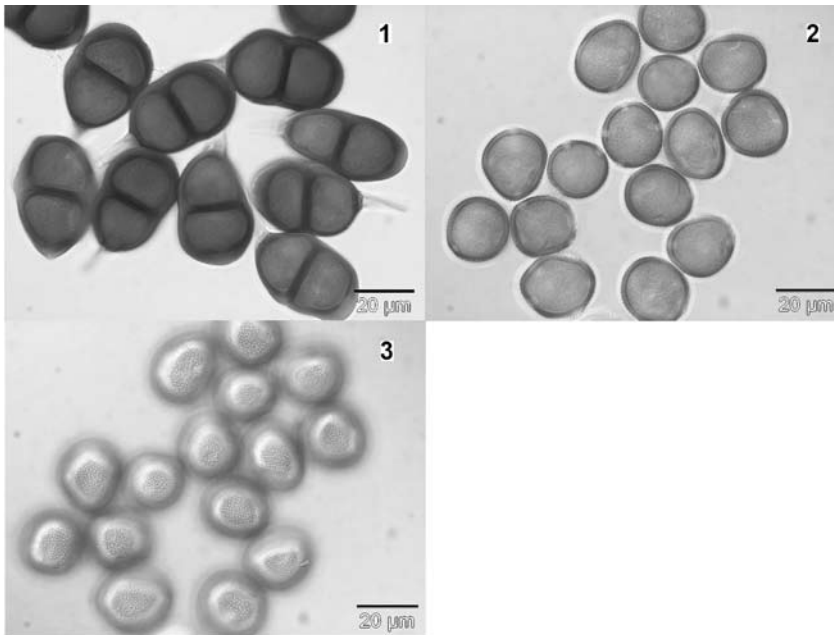
Distribution. – Turkey, Ardahan.

Material examined. – *Puccinia ardahanensis* R. Berndt, Z. Bahcecioglu & Ş. Kabaktepe: Turkey, Ardahan, 4–5 km from Göle to Şenkaya, alt. 1950 m a.s.l., on *Veronica armena* Boiss. & Huet, leg. Ş. Kabaktepe (no. 4189), 14 Jul 2006.

Holotypus. – (INU 8533): Turkey, Ardahan, 4–5 km from Göle to Şenkaya, alt. 1950m a.s.l., on *Veronica armena* Boiss. & Huet, leg. Ş. Kabaktepe (no. 4189), 14 Jul 2006. Isotype in ZT.

Discussion

We compared *P. ardahanensis* to the *Puccinia* spp. known on plant genera belonging to the tribe Veroniceae as understood by Albach *et al.* (2004) and found it to be different. Most of these *Puccinia* spp. are autoecious and microcyclic: *P. acrophila* Peck, *P. albulensis* Magnus (incl. subspecies), *P. gymnandrae* Tranz. (incl. subspecies), *P. rhaetica* Ed. Fischer, *P. kyangjinensis* Ono, Adhikari & Rajbhandari, *P. paederotae* Savile, *P. veronicae* Schröter, *P. veronicae-longifoliae* Savile, *P.*



Figs. 1–3. *Puccinia ardahanensis*: 1. Teliospores. 2. Urediniospores: optical section. 3. Urediniospores: focus on spore surface showing finely and densely verruculose spore wall.

* *Veronica*, formerly assigned to Scrophulariaceae, is currently placed within Plantaginaceae (Albach *et al.* 2005).

veronicarum DC. and *P. wulfeniae* Diet. & Holw. (incl. subspecies and *P. synthyridis* Ell. & Everh.) (e.g., Gäumann 1959, Savile 1968). These microcyclic species do not only differ from *P. ardahanensis* in lacking a uredinial anamorph but also in teliospore characters. *Puccinia acrophila*, *P. gymnandrae*, *P. kyangjinensis*, and *P. rhaetica* have a conspicuously verrucose spore wall. *Puccinia paederotae*, *P. veronicae-longifoliae*, and *P. veronicarum* have dimorphic teliospores with clearly distinct resting and leptosporic spores (Savile 1968). In *P. albulensis* and *P. veronicae*, the teliospores are not distinctly dimorphic. *P. albulensis* differs from *P. ardahanensis* in smaller, thinner-walled teliospores with apical papillae; *P. veronicae* has narrower and thinner-walled teliospores with persistent pedicels.

Puccinia cynodontis, *P. isiacae*, and *P. daisenensis* Hirats. f. are heteroecious and produce spermogonia and aecia on *Plantago*- and *Veronica* species or *Veronica* or *Veronicastrum*, respectively (Cummins 1971, Farr & Rossman without date, Ono & Azbukina 1997). It is interesting to note, with regard to the aecial hosts of *P. cynodontis*, that *Veronica*, formerly assigned to Scrophulariaceae, is currently placed within Plantaginaceae (Albach *et al.* 2005).

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