FURTHER ADDITIONS TO THE RUST FLORA OF PAKISTAN

N. S. AFSHAN, A. N. KHALID AND HUMERA JAVED

Department of Botany
University of the Punjab, Quaid-e-Azam Campus,
Lahore, 54590, Pakistan

Abstract

Two species of rust fungi viz., Puccinia brachypodii var. arrhenatheri (Kleb.) Cummins & H.C. Greene and P. levis var. panici-sanguinalis (Rangel) Ramachar & Cummins are newly recorded together with three new host plants for Uredinales of Pakistan.

Introduction

Approximately 400 species in 21 genera and 5 form genera of rust fungi on approximately 350 host species have been reported from Pakistan (Ahmad et al., 1997). However this number is far less than the total number of host plants. In the present investigation, Puccinia brachypodii var. arrhenatheri and P. levis var. panici-sanguinalis are described and illustrated. These rust fungi are an addition to our rust flora. Helictotrichon virescens (Nees ex Steud.) Henr., for P. brachypodii var. arrhenatheri, Setaria glauca (L.) P. Beauv., for Puccinia levis var. panici-sanguinalis, Artemisia maritima L. for Puccinia chrysanthemi Roze, Polygonum plebejum R. Br. for Puccinia polygoni-amphibii Pers. var. polygoni-amphibii and Brachiaria ramosa (L.) Stapf., for Uromyces setariae-italicae Yoshino are new hosts from Pakistan.

Materials and Methods

During the survey of rust fungi of Pakistan, the areas including Lahore, North Western Frontier province (NWFP); Ayubia, Khanspur and Northern Area; Gilgit were visited. Rusted plants were collected. It was tried to collect healthy plants along with inflorescence or fruits for accurate identification. The collected specimens were pressed individually among blotting papers, properly labelled and the blotting papers were periodically changed to dry the collected rusted specimens. The samples were brought back carefully to the laboratory for their examination and they were photographed by a digital camera.

Host plants were identified by comparing with the plants already present in the herbarium of Botany Department, University of the Punjab, Lahore.

Free hand transverse sections of infected portions of material and spores were mounted in lactophenol. Semi-permanent slides were prepared by cementing cover slips with nail lacquer (Dade & Gunnell, 1969).

The sections showing rust stages were observed under a microscope (NIKON YS 100) and microphotographed with the help of digipro-Labomed camera. Drawings of spores and paraphyses were also made by using Camera Lucida (Ernst Leitz Wetzlar Germany). Spore dimensions were taken by an ocular micrometer (Zeiss eye piece screw micrometer).

pakrust@gmail.com; drankhalid@yahoo.com
Description of species

1. *Puccinia brachypodii var. arrhenatheri* (Kleb.) Cummins & H.C. Greene, *Mycologia*, 58: 709 (1966) (Fig. 1 A-C; Fig. 2 A-B0)

   Spermogonia, aecia and telia absent. Uredinia abaxial, golden brown, solitary, sometimes in rows, minute. Urediniospores mostly pale brown, hyaline, ellipsoid or ovoid, 20-24(-26) x (21-) 24-28 (-33) μm, wall thickness 1.6-2.3 μm, densely echinulate; germ pores up to 8, scattered, obscure; paraphyses intermixed with urediniospores, hyaline, capitate, 13-19 μm in diameter, up to 90 μm long.


   The rust fungi already reported on *Helictotrichon* spp., include *P. coronata* Corda, *P. brachypodii* Otth. var. *arrhenatheri* (Kleb.) Cumm. & Greene and *P. helictotrichi* Joerst. (Cummins, 1971).

   *P. brachypodii* var. *arrhenatheri* on *Helictotrichon virescens* is a new record from Pakistan and *H. virescens* is also a new host for rust fungi from Pakistan. No rust fungus has previously been reported on *H. virescens* from Pakistan.

2. *Puccinia levis var. panici-sanguinalis* (Rangel) Ramachar & Cummins, *Mycopath. Mycol. Appl.*, 25(1-2): 44 (1965) (Fig. 1 D-F; Fig. 2 C)

   Spermogonia, aecia and telia absent. Uredinia amphigenous, golden brown, arranged in rows, 0.3-0.7 x 0.2-0.4 mm. Urediniospores yellowish brown; broadly ellipsoid or globose to obovoid, 19-26 x 24-31 μm, wall thickness 1.8-2.5 μm, echinulate, germ pores 2, supraequatorial.


   Cummins (1971) reported *P. levis* var. *panici-sanguinalis* on *Setaria* sp., *P. levis* var. *panici-sanguinalis* is a new record from Pakistan.

   Ahmad (1956a) reported *Uromyces setariae italicae* (Diet.) Yoshino on *Setaria glauca* from Lahore and Sheikhupura. In Pakistan, *Setaria glauca* is being described for the first time as a host for *P. levis* var. *panici-sanguinalis*.

   = *Puccinia absinthii* DC., *Encycl. Méth. Bot.* 8: 245 (1806) (Fig. 1. G-I; Fig. D-E)

   Spermogonia and aecia absent. Uredinia abaxial, intermixed with telia, brownish black, 0.4-0.6 x 0.2-0.4 mm. Urediniospores ovoid or ellipsoid, sometimes globose, pale brown, 23-26 x 24-28 μm, wall thickness 1.6-2.5 (-3) μm, echinulate. Telia abaxial, intermixed with uredinia, brownish black, 0.4-0.6 x 0.2-0.4 mm. Teliospores ellipsoid or oblong, brown, 16-26 x 39-53 μm, slightly verrucose; apex rounded, 5-9 μm thick; pedicel hyaline, upto 81 μm long.

Fig. 2. A-H: Camera Lucida drawings of spores of rust fungi.
(A). Urediospores of *P. brachypodii* var. *arrhenatheri*, (B). Capitate paraphyses of *P. brachypodii* var. *arrhenatheri*, (C). Urediospores of *P. levis* var. *panici-sanguinalis* (D). Urediospores of *P. chrysanthemi*, (E). Teliospores of *P. chrysanthemi*, (F). Urediospores of *P. polygoni-amphibii* var. *polygoni-amphibii*, (G). Urediospores and paraphyses of *Uromyces setariae-italicae*, (H). Teliospores of *U. setariae-italicae*. Scale bar: For A & B = 8.5µm, 10µm; For C = 12 µm; For D & E = 7.5µm, 8.3µm; For G & H = 10µm.

*Artemisia maritima* is a new host for this rust fungus from Pakistan. This fungus has previously been reported on *A. persica* Boiss., and *A. parviflora* Roxb., from Quetta, Chitral and Changla Galli (NWFP); on *A. dubia* Wallich ex Besser from Swat valley and on *A. dracunculus* L., from Kaghan valley (Ahmad *et al*., 1997). No rust fungus has previously been reported on *A. maritima* from Pakistan.
4. *Puccinia polygoni-amphibii* Pers., Syn. meth. fung., (Göttingen) I: 227 (1801) var. *polygoni-amphibii* (Fig. 1 J-L; Fig. 2 F)

Spermogonia, aecia and telia absent. Uredinia abaxial, brown, scattered, pulverulent, 0.1-0.3 x 0.1-0.2 mm. Urediniospores ovoid or globose, pale brown, echinulate, 24-29 \( \mu m \) x 24-29 \( \mu m \), wall thickness 1.5-2 \( \mu m \); germ pores 2, equatorial or tending to be equatorial; pedicel minute.

**Material examined:** On *Polygonum plebejum* R. Br., Pakistan, Northwest Frontier Province, Nathia Galli, II, 20th Sep., 2003, SHI Mycological Herbarium, # NSA-4506. *Polygonum plebejum* is a new host for this fungus. Ahmad (1956a) reported *Puccinia polygoni-amphibii* var. *polygoni-amphibii* on *Polygonum pterocarpum* Wall., from Swat and Kalam. No rust fungus has previously been reported on *Polygonum plebejum* from Pakistan.

5. *Uromyces setariae-italicae* (Diet.) Yoshino, *Bot. Mag.*, Tokyo, 20: 247 (1906). (Fig. 1 M-O; Fig. 2 G-H)

Spermogonia and aecia unknown. Uredinia amphigenous, scattered or in rows, pulverulent, brown, 0.09-0.1 x 0.1-0.3mm. Urediniospores subglobose to ovoid or ellipsoid, brown to yellowish brown, echinulate, 23-27.5 x 23-29\( \mu m \); wall 1.5-2.5 \( \mu m \) thick; germ pores up to 4, equatorial pedicel hyaline and minute. Paraphyses numerous, clavate, hyaline, up to 40\( \mu m \) long. Telia amphigenous covered by the epidermis, blackish, small and inconspicuous, striated, 0.05-0.2 x 0.09-0.2mm. Teliospores one celled, variable, mostly angularly globose or obovoid, 16-24 x 16-28\( \mu m \), wall uniformly 1-2\( \mu m \) thick, smooth, yellowish brown to chestnut brown; apex not thickened, rounded or truncate; germ pores 1-2, scattered. Pedicel hyaline, minute, collapsing, 4x 15\( \mu m \).

**Material examined:** On *Brachiaria ramosa* (L.) Stapf., Pakistan, Punjab, Lahore. SHI Mycological Herbarium # NSA 15. 23rd October, 2006. Cummins (1971) reported *Puccinia orientalis* (H. Syd., P. Syd. & Butl.) Arth. & Cumm. and *P. negrensis* P. Henn. on *Brachiaria ramosa* (L.) Stapf. Ahmad (1956) reported *Uromyces setariae-italicae* on *Brachiaria reptans* (L.) Gard. & C.E. Hubb. from Tandojam. No rust species has previously been reported on *Brachiaria ramosa* from Pakistan. So *Brachiaria ramosa* is a new host for rust fungi from Pakistan.

**Acknowledgements**

We sincerely thank Prof. S. H. Iqbal for going through the manuscript critically.

**References**


(Received for publication 30 March 2007)