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Full Length Research Paper

Species of the genus *Uromyces* (Basidiomycota: Pucciniales) from Leepa Valley, Azad Jammu and Kashmir (AJ and K), Pakistan

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During a survey of rust fungi from Leepa Valley, Azad Jammu and Kashmir (AJ and K), Pakistan, four species of *Uromyces* were found parasitizing four plant species. These include *Uromyces appendiculatus* on *Vigna mungo, Uromyces capitatus* on *Desmodium elegans*, *Uromyces penniseti* on *Pennisetum lanatum* and *Uromyces vossiae* on *Phaselurus speciosus*. Among these, *U. appendiculatus* is a new record for Pakistan, while *U. capitatus*, *U. penniseti* and *U. vossiae* represent new records for Leepa Valley, AJ and K, Pakistan. In addition, *U. appendiculatus* on *Vigna mungo* is reported as new host from Pakistan.

Keywords: Bean rust, Poaceae, *Uromyces.*

INTRODUCTION

Uromyces (Link) Unger is the second largest genus in the order Pucciniales, Basidiomycota with more than 600 species (Cummins and Hiratsuka, 2003), after *Puccinia*. This genus differs from *Puccinia* in having 1-celled teliospores. Species of *Uromyces* occur on a wide range of plant hosts throughout the world. Fifty eight (58) species of *Uromyces* have been reported from Pakistan (Ahmad et al., 1997; Afshan et al., 2008a), although, none are known from Leepa Valley, Azad Jammu and Kashmir, Pakistan. During this study of rust fungi of Leepa valley (AJ and K), *Uromyces appendiculatus* and *Uromyces capitatus* were found on members of Fabaceae, while *Uromyces penniseti* and *Uromyces vossiae* were found on members of Poaceae.

MATERIALS AND METHODS

Diseased plants were collected from Leepa valley (AJ and K), Pakistan, which lies between 33°N to 36°N latitude and 73°E to 75°E longitude. Healthy plants were collected along with inflorescence or fruits for accurate identification. Host plants were identified by comparing them with specimens in the herbarium, Department of Botany, University of the Punjab, Lahore (LAH).

Free hand 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 and Gunnell, 1969). Preparations were observed under a NIKON YS 100 microscope. Drawings of spores were made by using a Camera Lucida (Ernst Leitz Wetzlar Germany). Spore dimensions were taken using an ocular micrometer (Zeiss Eye Piece Screw Micrometer). Twenty five (25) spores were measured for each spore stage. Measurements include the typical range and the arithmetic means; extremes are given in parenthesis.

Enumeration of taxa

Rusts on Fabaceae

Uromyces appendiculatus F. Strauss, *Exantheme der Pflanzen. Up.*: 277 (1833) (Figure 1): Spermogonia and aecia not seen. Uredinia amphigenous, pulverulent, black, aggregated, 0.10 - 0.11 × 0.13 - 0.57 mm. Urediniospores cinnamon brown, obovoid or oblong, 16 - 22 × 20 – 27 µm (mean 20 × 23 µm); wall cinnamon brown, echinulate, 1 to 1.6 µm; germ pores two, equatorial or slightly above, sometimes with caps; pedicel hyaline, deciduous. Telia amphigenous, similar to uredinia, black, pulverulent, in groups, 0.10 - 0.11 × 0.13 - 0.57 mm. Teliospores chestnut brown, obovoid, ellipsoid or oblong, rounded at both ends, 18 - 27 × 25 - 38 µm (mean 23 × 28 µm); wall chestnut brown, smooth, 1.6 to 3 µm;

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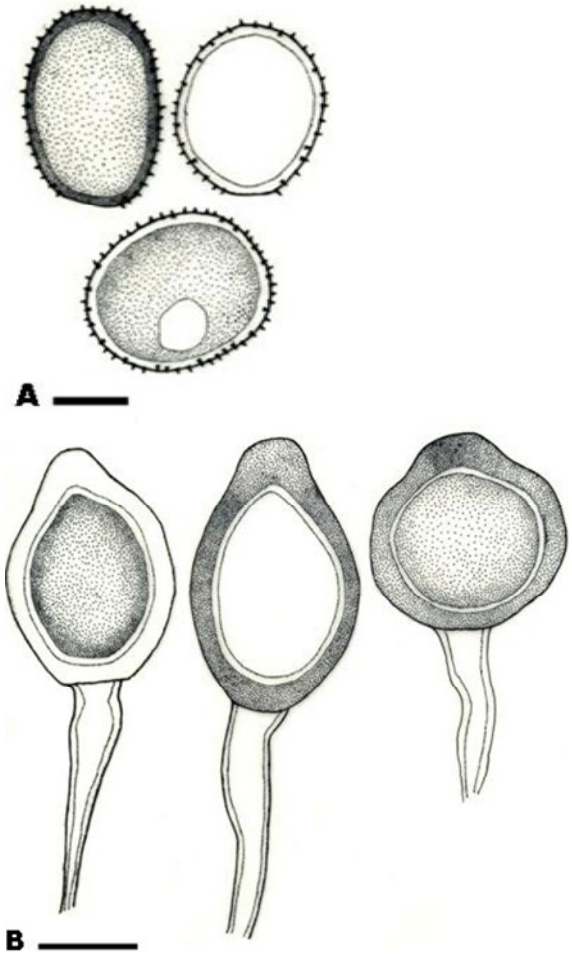

Figure **1.** Lucida drawings of *U. appendiculatus.* (A) Urediniospores showing echinulate ornamentation; (B) Teliospores. Scale bar: A = 5 µm, B = 10 µm.

germ pore one, apical; apex chestnut brown with a yellowish brown papilla, 3 to 7 µm; pedicel hyaline, persistent, 4 - 8 × 14 - 38 µm.

Material examined

On *Vigna mungo* (L.) Hepper, with II + III stages, Pakistan, Azad Jammu and Kashmir, Leepa Valley, at 1,981 m a.s.l., 1st October, 2010, coll. Malka Saba # 08 (LAH).

Comments: LAH Herbarium # 14776 collected from Kulali-Kalam revealed *Uromyces capitatus* on *Lablab purpureus* (L.) Sweet (=*Dolichos lablab* L.) instead of *U. appendiculatus*. *U. appendiculatus* has previously been reported on *V. mungo* from India and Tanzania (Farr and Rossman, 2011). This is a new record for Pakistan and *V. mungo* is a new host for *U. appendiculatus* in Pakistan.

Uromyces *capitatus* Syd. and P. Syd., *Öst. bot. Z.* 52: 182 (1902) (Figure 2).

Spermogonia and aecia not seen. Uredinia amphigenous, black, pulverulent, 0.04 - 0.10 × 0.09 - 0.28 mm. Urediniospores ellipsoid, pale brown, 22 × 24 µm; wall pale brown, echinulate; germ pores obscure. Telia amphigenous, similar to uredinia, black, compact,

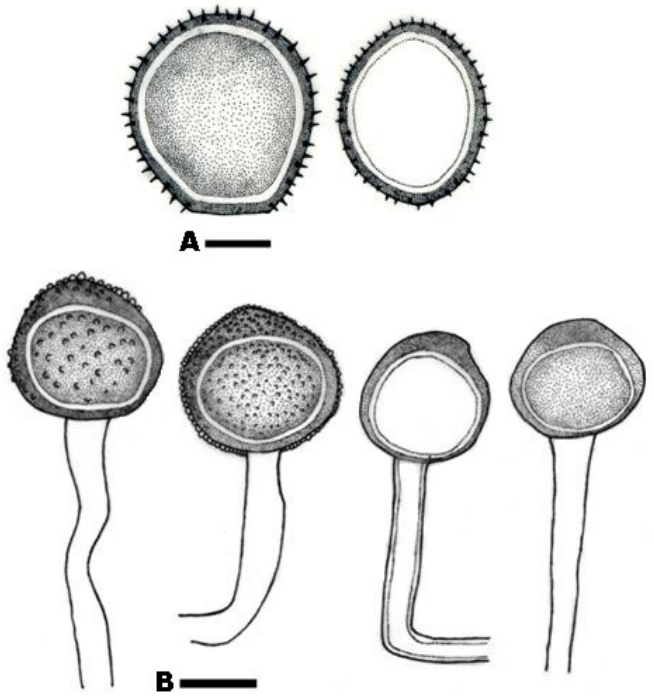

Figure 2. Lucida drawings of *U. capitatus.* (A) Urediniospores showing echinulate ornamentation; (B) Teliospores showing verrucose ornamentation. Scale bar: A = 5 µm, B = 10 µm.

0.04 - 0.10 × 0.09 - 0.28 mm. Teliospores globose to ovoid, dark brown to blackish brown, 20 - 25 × 18 - 23 µm (mean 21.6 × 20.8 µm); wall blackish brown, densely verrucose, 1.4 - 2.4 µm; apex chestnut brown, rounded, with pale papilla, 3 - 5 µm thick; pedicel hyaline, broken to short, persistent, 5 - 8 × 24 - 61 µm.

Material examined

On *Desmodium elegans* DC., with II + III stages, Pakistan, Azad Jammu & Kashmir, Leepa Valley, at 1,981 m a.s.l., 1st October, 2010, coll. Malka Saba 09 (LAH).

Comments: *Uromyces capitatus* has been reported on *Desmodium tiliaefolium* (D. Don) G. Don. from Sharan (Kaghan valley), Madian (Swat), Salt range and Saiden shah by Ahmad (1956a, b) and Khalid et al. (1993). It is a new record for Leepa valley (AJ and K), Pakistan.

Rusts on Poaceae

Uromyces *penniseti* S. Ahmad, *Biologia*, Lahore 6(2): 125 (1961) [1960] (Figure 3).

Spermogonia and aecia not seen. Uredinia amphigenous, scattered, covered by ruptured epidermis, golden brown, naked, 0.08 - 0.1 × 0.095 - 0.15 mm. Urediniospores globose to subglobose or ovoid, pale brown, 18 - 24 × 20 - 29 µm; wall echinulate, 1.5 - 3 µm thick; germ pores 2 to 5, equatorial. Telia amphigenous, scattered, blackish, naked, compact, 0.095 - 0.14 × 0.15 - 0.3 mm. Teliospores cinnamon brown to chestnut brown thick; apex rounded, sometimes conical, chestnut brown, 5 to 7 µm thick; pedicel persistent, light brown to dark brown, 4 to 9 × 64.3 µm.

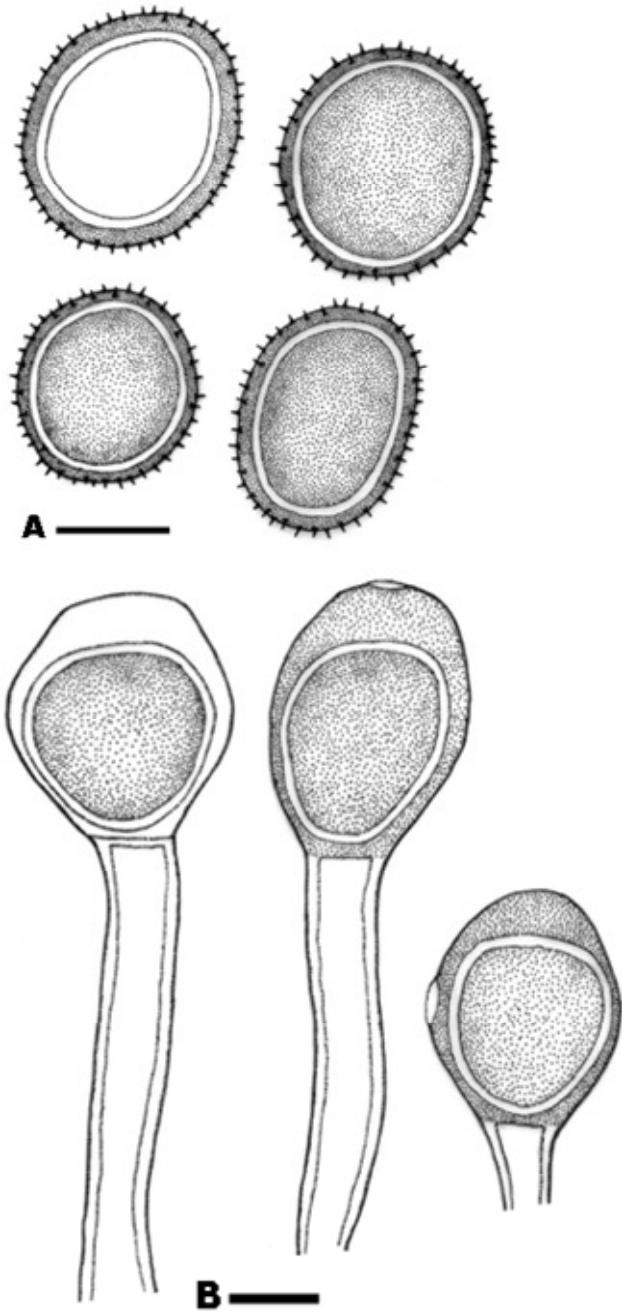

Figure 3. Lucida drawings of U. penniseti. (A) Urediniospores showing echinulate ornamentation; (B) Teliospores. Scale bar: A and B = 10 µm.

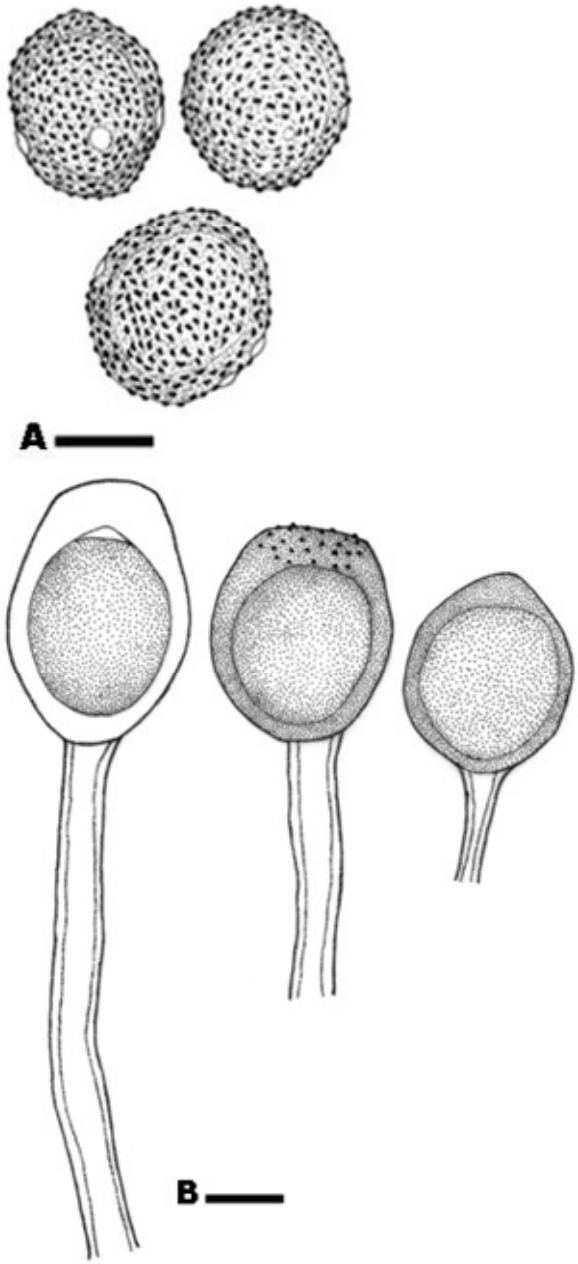

Figure 4. Lucida drawings of U. vossiae. (A) Urediniospores showing striolate verrucose ornamentation; (B) Teliospores. Scale bar: A and B = 10 µm.

Material examined

On *Pennisetum lanatum* Klotz., with II + III stages, Pakistan, Azad Jammu andKashmir, Leepa Valley, at 1,981 m a.s.l., 1st October, 2010, coll. Malka Saba 10 (LAH).

Comments: *U. penniseti* has been reported on *Pennisetum lanatum* from Naran (Kaghan valley) by Ahmad (1969) and Cummins (1971). It is a new record for Leepa valley (AJ and K), Pakistan ***Uromyces vossiae*** Barcl. *J. Asiat. Soc. Bengal* 59: 76 (1890) (Figure 4).

Spermogonia and aecia not seen. Uredinia on abaxial side of leaf, sub-epidermal, yellowish brown to dark brown, scattered, 0.06 - 0.1 × 0.12 - 0.2 mm. Urediniospores globose to subglobose or ellipsoid, golden brown to dark brown, 18 - 24 × 21 - 25 µm; wall 1 - 2 (-3) µm thick, striolate verrucose; germ pores 2 - 4, obscure, equatorial. Telia amphigenous but mostly on abaxial surface, black, compact, sub-epidermal, 0.04 - 0.07 × 0.06 - 0.14 mm. Teliospores ovoid to ellipsoid, cinnamon brown to chestnut brown, 20 - 26 × 23 - 31 µm; wall 1 to 3 µm thick, minutely verrucose specially at the apex; germ pore 1 per cell; apex 4 to 6 µm thick. Pedicel hyaline, persistent, collapsing, 6 - 7 × 16 - 80 µm.

Material examined

On *Phacelurus speciosus* (Steud.) C.E. Hubbard, with II + III stages, Pakistan, Azad Jammu & Kashmir, Leepa Valley, at 1,981 m a.s.l., 1st October, 2010, coll. Malka Saba 11 (LAH). ellipsoid, cinnamon brown to chestnut brown, 20 - 26 × 23 – 31 µm; Comments: *U. vossiae* has been reported on *Phacelurus speciosus* from Kaghan and Khanspur by Ahmad (1962, 1969) and Afshan et al. (2008b). It is a new record for Leepa valley (AJ and K), Pakistan.

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