First report of *Uromyces carthagenensis* on *Manihot grahamii* (Euphorbiaceae) in Uruguay

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Abstract A rust disease was observed on leaves of the native tree *Manihot grahamii* in Uruguay. Samples were collected in ornamental and spontaneous trees in the city of Florida, Uruguay and the causal agent determined as *Uromyces carthagenensis*. This is the first record of *Uromyces carthagenensis* in Uruguay.

Keywords Cassava · Pucciniomycota · Rust

The genus *Manihot* (Euphorbiaceae) contains around 100 species which are native to the Neotropical region (Rogers and Appan 1973) with Central Brazil having the richest diversity (Nassar 2000). *Manihot* species are found mostly in dry regions and vary in habitat from small trees to shrubs (Rogers and Appan 1973). *Manihot esculenta* (cassava) is the best known species of the genus and is cropped for the tuberous roots that are used as human and animal feed. Wild *Manihot* species have gained importance as these species may act as sources of alleles which were lost during domestication of cassava, and that could yield valuable information for crop improvement (Tanksley and McCouch 1997). *Manihot grahamii*, is a small tree distributed in SE South America and the only species of the genus known from Uruguay where it is known as “falsa mandioca” (“false cassava”) (Brussa and Grela 2007). This is a

deciduous tree reaching about 7–8 m tall and distributed in Uruguay in N and NE regions, but naturally regenerated trees are found in native forest in the south of the country (Carrere 2007). This tree is used as an ornamental in parks, streets and gardens and in crafts and musical instruments (Carrere 2007). During March 2007, a young ornamental tree of *M. grahamii* was found with symptoms of rust infection in a private garden at Florida City, South Uruguay. Subsequent examinations did not reveal new infections until 2010. Samples were collected, photographed for macroscopic characteristics and dried in a plant press. Dried material was labeled and deposited in the herbaria MVHC and RB. Specimens were mounted in 85% lactic acid or aqueous phloxine for light microscopy and examined with a compound microscope. Following morphological analysis, the rust species was identified as *Uromyces carthagenensis*, which represents a new record for Uruguay. The description of the Uruguayan specimens is given below.

Taxonomic description

Uromyces carthagenensis Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 6: 216. 1899.

Figures 1–6.

Pycnia and aecia not seen. Uredinia on petioles and lower surface of leaves (Fig. 1), near circular, reddish brown. Urediniospores ovoid to ellipsoid, 30–40×15–18 µm, wall hyaline to yellowish, verrucose and 1–2 µm thick, with 4 pores, two on each side above the equatorial region and two below (Figures 2–4). Telia on the lower surface of leaves (Fig. 1), scattered, erumpent, 2–6 mm in diameter, reddish black to blackish, darker than uredinia. Teliospores ellipsoid to nearly globose, 30–38×20–26 µm, with an asymmetrical umbo, lighter in color and up to

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Figs. 1–6 *Uromyces carthagenensis*: 1. Detail of disease symptom on abaxial leaf surfaces. 2–4. Urediniospores. 2. Median focus. 3. Surface focus. 4. Showing the germ pores (arrows). 5–6. Teliospores. 5. Median focus. 6. Surface focus

10 µm long, external wall hyaline, internal wall reddish brown and with small verrucae, pedicels hyaline, persistent and up to 38 µm (Figures 5–6).

Material examined: URUGUAY, FLORIDA, Arroyo Calleros y Camino a la Macana (S 34° 06' 26,5" W 56° 12' 50,5"), on leaves and petioles of naturally regenerated trees of *Manihot grahamii* Hook found in a riparian forest, 17 May 2010, leg. S. Martínez-Kopp (MVHC 5537); Covidef 1 #8, leaves of *M. grahamii*, 9 May 2010, S. Martínez-Kopp s. n. (MVHC 5538, RB), Covidef 1, leaves of *M. grahamii*, Apr. 2010, leg. S. Martínez-Kopp (MVHC 5539, RB).

This is the first record of *Uromyces carthagenensis* for Uruguay. Previously it was only known from Brazil and Argentina on *Manihot* sp., *M. carthagenensis*, *M. grahamii*, (recorded under the name *M. flabellifolia*) and *M. tweediana* (Lindquist 1982; Monoson and Prose 1983; Hennen et al. 2005). This is the third rust species recorded on

Euphorbiaceae in Uruguay. *Uromyces euphorbiae* (= *U. tordillensis*) on *Euphorbia ovalifolia* and *Aecidium detritum* on *Phyllanthus sellowianus* have been previously recorded (Herter 1933; Koch et al. 1981). Monoson and Prose (1983) monographed twenty autoecious *Uromyces* species on the new world Euphorbiaceae. They stated that *Uromyces carthagenensis* is most similar to *U. tolerandus*, being differentiated mostly by the origin of the sculptures and the appearance in median view of the teliospore. The verrucae in the teliospores of *U. carthagenensis* originate internally in the spore wall giving a sculptured appearance in median view. The urediniospores can be differentiated by the number of pores, four in *U. carthagenensis* with two on each side (Fig. 4), as described by Lindquist (1982), and two for *U. tolerandus* with one above and one below the equator (Monoson and Prose 1983). *Uromyces carthagenensis* can become an important foliar pathogen for

Manihot grahamii, since this species is increasingly cultivated as an attractive native ornamental tree.

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