



# First report of *Puccinia horiana* causing white rust of chrysanthemum in India

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In 2013 and 2014, white rust disease of chrysanthemum caused by *Puccinia horiana* Henn. was noticed in chrysanthemum crops grown in fields in and around Bengaluru, Karnataka state, India. Conversations with chrysanthemum growers revealed that such occurrences had also been noticed in Udagamandalam district of Tamil Nadu state since 2012, with a renewed occurrence there in 2014. The severity of occurrence of this disease coincides with the post-monsoon season followed by the winter spell (October to December). In Bengaluru the total rainfall during September and October in 2013 was 291.3mm and 85.7mm respectively. The mean minimum and maximum temperatures recorded during November 2013, December 2013 and January 2014 were 27.8/17.8°C, 26.7/15.7°C and 27.7/15.5°C respectively. The disease incidence was 100% in certain germplasm accessions while in others it ranged from 20-60%. However, in a few germplasm accessions the disease was not noticed under field conditions during the same period. The first symptom was the appearance of yellow spots on the upper surface of the leaves (generally 2-5 mm diameter) with white to yellow pustules (telia) on the corresponding places on the lower side of the leaves (Fig. 1). The teliospores were typically two celled (Fig. 2). Telia are mostly erupted on the leaf surface, sometimes sunken, compact, yellowish, white or yellowish white, rarely pinkish, 0.5-4 mm in diameter. Teliospores are typically two celled, oblong, with a pedicel of 20-40 µm in length with dimensions of teliospores ranging from 27-41 x 11-18 µm. Teliospores germinate in water in five hours when incubated at 17°C and 90% RH. Basidiospores are hyaline and elliptical in shape.

Generally brown rust caused by *Puccinia chrysanthemi*, and characterised by uredospores, used to occur to a minor degree in southern India specifically in Coimbatore, Tamil Nadu and Bengaluru, Karnataka. But the new rust exhibited telia and two celled teliospores. The chrysanthemum cultivars in which the white rust was observed were progenies or cultivars of *Chrysanthemum morifolium*. The confirmation of the species of the rust pathogen was made by amplification of *P. horiana* species specific primers: forward Ph F2 (5'- CCCCTTTTATTATATAACACAAG - 3') and reverse Ph R1 (5'- CAAAATTATTTTGTGAGAGGG - 3') as described by Pedley (2009). The amplified product of 240 bp size (Fig. 3) was sequenced and the sequence has been deposited in GenBank (Accession No. KP267823). The phylogenetic analysis of the sequence data revealed that the Indian isolate is closer to European isolates than other Asian isolates for which sequences have been deposited in GenBank (Fig. 4). A specimen of the disease has been deposited at *Herbarium Cyptogamme*

*Indae Orientalis* (HCIO) located at Division of Plant Pathology, Indian Agricultural Research Institute, New Delhi, India (HCIO 51831).

*Puccinia horiana* is a microcyclic rust. More than 10 different chrysanthemum species are susceptible to this pathogen. Commercially cultivated *Chrysanthemum x morifolium* is highly susceptible to this pathogen. This is the first report of the occurrence of *Puccinia horiana* causing chrysanthemum rust in India. The disease was first reported in Japan in 1985 (Hennings, 1901) and moved to England in the 1960s (Baker, 1967). This pathogen is native to East Asia and now widespread in Australia (Priest, 1995), Africa, Europe and South and Central America (EPPO 2004). *P. horiana* is a quarantine pathogen in many countries. It is listed as a regulated pest according to the International Plant Protection Convention. The European Union is also following strict quarantine measures in preventing the pathogen entry into new locations (EFSA, 2013).

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Figure 1



Figure 2

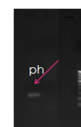


Figure 3

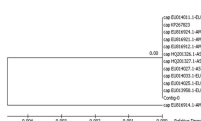


Figure 4

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