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DISCOVERY OF *PUCCINIA TILIAEFOLIA* (PUCCINIALES) IN NORTHWESTERN HIMALAYAS, INDIA

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Abstract. A rust infection was recently observed on *Grewia tiliifolia* Vahl during an exploration of rust fungi in Himachal Pradesh, India, in October 2015. An examination identified the rust fungus as *Puccinia tiliaefolia* T. S. Ramakr. & Sundaram. This finding represents a new record for the northwestern Himalayas and the first finding of *Puccinia tiliaefolia* in India in the last 46 years. A geographical distribution map of *P. tiliaefolia* is presented.

Key words: Asia, distribution, Himalayas, Indian Subcontinent, *Puccinia*, rust fungi

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Introduction

The genus *Puccinia* Pers. (Pucciniales, Pucciniaceae) contains *ca* 4000 obligatory plant-pathogenic species (Farr & Rossman 2016), which infect a wide range of host plants including agricultural crops as well as non-agricultural plants. The genus *Puccinia* is the most speciose of the estimated 168 rust genera and *ca* 7000 species known in the world. Herbarium Cryptogamae Indiae Orientalis (HCIO), a national herbarium of India, has prepared a checklist of *Puccinia* species preserved in the herbarium. It lists a vast collection containing 718 species from a range of host plant families (Kamil *et al.* 2013). Recently, Gautam and Avasthi (2016) published a checklist of rust fungi belonging to the genus *Puccinia* for Himachal Pradesh, and recorded 80 species infecting 91 host plant species and 33 host plant families. The family Poaceae was reported to be most commonly infected, with 26 species of *Puccinia*.

In the winter season (October 2015), a rust infection on leaves of *Grewia tiliifolia* Vahl was observed during an exploration of rust fungi in Himachal Pradesh. The examination of disease symptoms and morphological and microscopic characters of the pathogen identified this fungus as *Puccinia tiliaefolia* T. S. Ramakr. & Sundaram.

Puccinia tiliaefolia was established by Ramakrishnan and Sundaram (1955) based on a collection of a rust infecting *Grewia tiliifolia* in southern India. This rust fungus is characterized by 1-celled dikaryotic urediniospores (in uredinia), diploid 2-celled teliospores (in telia), and globose basidiospores borne on sterigmata. The current finding of *Puccinia tiliaefolia* in Himachal Pradesh constitutes a new record for the northwestern Himalayas and a rediscovery of the species after 46 years without such a record in India. Species descriptions along with distributional notes are provided here.

Material and methods

The infected plant leaves showing rust symptoms were collected during a mycological survey of Mandi District of Himanchal Pradesh, India, during October 2015. Field observations, infection symptoms and the colony morphology of the rust fungus on the host plant were noted during the collection event. Air-dried specimens were preserved in herbarium packets and on a herbarium sheet, and deposited in the Abhilashi University Mycological Herbarium (AUMH).

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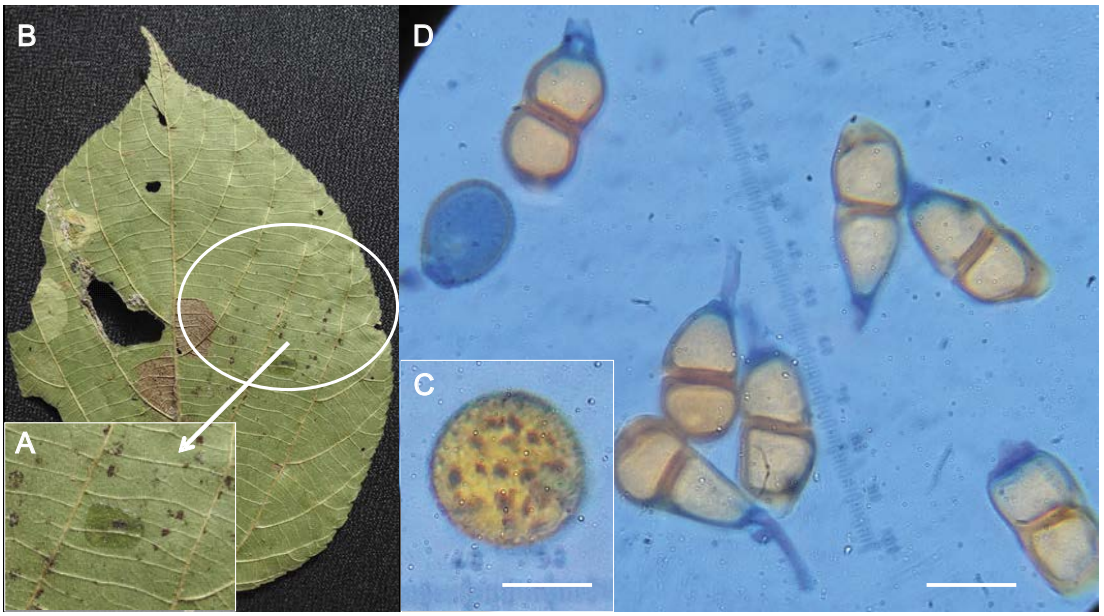

Fig. 1. *Puccinia tiliaefolia* T. S. Ramakr. & Sundaram on *Grewia tiliifolia* Vahl. A & B – telia (encircled and enlarged view), C – urediospore, D – teliospores. Scale bars: C = 10 µm, D = 20 µm.

Microscope slides were prepared from fresh samples by mounting the rust powder in a drop of distilled water and Lactophenol Cotton Blue mount mixture. The spore characteristics were observed from such prepared slides. The fungal specimens were identified and their distributional records were checked in the standard literature (Bilgrami *et al.* 1991; Cummins & Hiratsuka 2003; Jamaluddin *et al.* 2004). Illustrations were prepared and photographed under an Olympus CH2 light microscope fitted with a Sony DSC 1500 digital camera.

Results and discussion

Puccinia tiliaefolia T. S. Ramakr. & Sundaram
Figs 1 & 2

Proc. Indian Acad. Sci., B **41**(5): 194. 1955.

Telia hypophyllous, minute, scattered, erumpent, pulvinate, brown, gregarious, several adjacent telia coalesce to form compact groups 0.2–0.5 mm in diameter. Teliospores oblong or obclavate, elliptical, brown, 2-celled, apex almost rounded, sometimes thickened (up to 4.5 µm), slightly constricted at septum, 20–42 × 10–17 (average 27 × 15) µm, wall 2.0–2.5 µm thick at sides, pedicels colourless, up to 65 µm long, fragile. Mesospores (3-celled spores) not found. Uredinia not observed, but in LM some urediospores seen to be borne singly on pedicel and mostly echinulate, with germ pores various. This indicates that

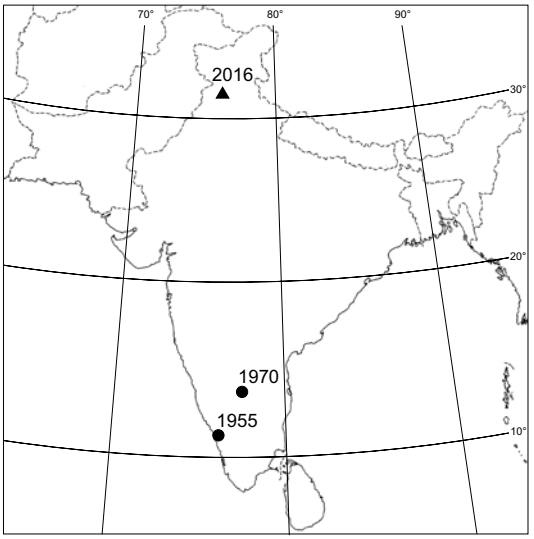

Fig. 2. Distribution map for *Puccinia tiliaefolia* T. S. Ramakr. & Sundaram in India (▲ – current report).

the telia and uredia are mixed during the growth and development of the rust fungus.

Material examined: INDIA, Himachal Pradesh, Mandi, 760 m, on leaves of *Grewia tiliifolia* (Malvaceae), 26 Oct. 2015, *A.K. Gautam* (AUMH 135).

Notes. According to the literature, *Puccinia tiliaefolia* was first described from Ambalovayal (Malabar), Madras, Tamil Nadu (now in Kerala) by Ramakrishnan and Sundaram (1955) and later found in the Nandi Hills (Karnataka) by Rangaswami *et al.* (1970) (Fig. 2). Previously *ca* 33 host plant families were reported to be infected by *Puccinia* species in Himachal Pradesh, but there was no rust reported on host plants in the family Malvaceae. Except for two records in southern India mentioned above, no other report of *P. tiliaefolia* was published from any part of the country. This is the first report of *P. tiliaefolia* from the northwestern Himalayas, and a new addition to the rust fungi of the region. This discovery extends the geographical range of *Puccinia tiliaefolia* in India.

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References

Bilgrami K. S., Jamaluddin M. A. & Rizwi M. A. 1991. *The Fungi of India*. Part III (List and References). Today and Tomorrow's Printer and Publishers, New Delhi.

Cummins G. B. & Hiratsuka Y. 2003. *Illustrated genera of rust fungi*, 3rd ed. APS Press, St. Paul.

Farr D. F. & Rossman A. Y. 2016. Fungal Databases, Systematic Mycology and Microbiology Laboratory, ARS, USDA [30 April 2016]. http://nt.ars-grin.gov/fungaldatabases/

Gautam A. K. & Avasthi S. 2016. First checklist of rust fungi in the genus *Puccinia* from Himachal Pradesh, India. *Plant Pathology & Quarantine* **6**(2): 114–128.

Jamaluddin, Goswami M. G. & Ojha B. M. 2004. *Fungi of India* (*1989–2001*). Scientific Publishers, Jodhapur.

Kamil D., Sharma R. K., Uma Masheswari C., Prameela Devi T. & Jain R. K. 2013. *HCIO – Herbarium Cryptogamae Indiae Orientalis, Check List of* Puccinia *species*. Indian Agricultural Research Institute, New Delhi, India.

Ramakrishanan T. S. & Sundaram N. V. 1955. Additions to fungi of Madras – XVII. *Proc. Indian Acad. Sci., B* **41**(5): 189–195.

Rangaswami G., Seshadri V. S. & Lucy Channamma K. A. 1970. *Fungi of South India*. University of Agriculture Sciences, Banglore.