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# *Puccinia himachalensis* – a new rust fungus from Himachal Pradesh, India

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**Abstract**

A new species of rust, *Puccinia himachalensis*, was recorded on *Clematis grata* from Himachal Pradesh, India. The species is compared morphologically with other *Puccinia* species described on the same plant host. A close resemblance was observed with *P. wattiana* but it differed in morphological characteristics including spore size and septal colouration in teliospores. Therefore, it is justified to introduce a new species of *Puccinia*. The taxonomic details of the new taxon, including field photographs and microphotographs, are presented and its distinctive characters are discussed.

**Key words** – India – new species – *Puccinia* – rust fungi.

## Introduction

*Puccinia* is the largest group of rust fungi that parasitize a wide range of host plants. This genus is characterized by macrocyclic life cycle including uredinia, telia, basidia, spermogonia and aecia. However, many of the native rusts complete their life cycles on one host species, and some do not produce all of the spore stages (Cummins 1971, Peterson et al. 1974). *Puccinia* spp. produce 1-celled, dikaryotic urediniospores (in uredinia), and diploid 2-celled teliospores (in telia), and haploid basidiospores (from basidia). The genus belongs to order Pucciniales, family Pucciniaceae, and is estimated to contain about 4000 species. There are 5413 epithets recorded on a large variety of plant hosts (www.indexfungorum.org; accessed 17 April 2016). More than 2800 rust specimens are available at Herbarium Cryptogamae Indiae Orientalis (HCIO), Indian Agricultural Research Institute, New Delhi, India. About 716 species of *Puccinia* have been reported from India (Kamil et al. 2013). Recently, Gautam & Avasthi (2016) published a checklist of *Puccinia* spp. for Himachal Pradesh and recorded 80 species on 91 host plant species belonging to 33 families.

A rust disease was found on *Clematis grata* during mycological visits in December 2013 from Balh Valley, Mandi, Himachal Pradesh, India; a region of the state known for its fertile land and plain and hilly regions. The species is compared morphologically with other *Puccinia* species described on the same plant host. A close resemblance was observed with *Puccinia wattiana* but it was found to be distinct in morphological characteristics, spore size and septal colouration in teliospores. It is, therefore, proposed as a new species and is described and illustrated in the present paper.

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## Materials & Methods

Plant leaves showing rust infection were collected and carried to laboratory for further mycological examination. These infected leaves along with host twigs and reproductive parts were dried between sheets of blotting paper and preserved for further studies. Host plants were identified and confirmed by matching the collections with herbarium and by consulting botanists. The type specimen is deposited at Faculty of Science, School of Agriculture, Abhilashi University (AUMH), Mandi, Himachal Pradesh, India.

The dried herbarium specimens were examined using a dissecting microscope for the presence of rust symptoms. Surface scrapings and free-hand cut sections were taken through infection spots and mounted in lactophenol cotton blue for microscopic examination. The microscope slides were examined immediately and photographed. Uredinospores and teliospores were measured and compared with descriptions in the literature. All measurements are given in the form min–max (mean ± standard deviation). The morphotaxonomic determination is based on comparison with closely related taxa using available literature.

## Results

The early symptoms of the rust on *Clematis grata* were the formation of small, orange uredinia on lower leaf surface with a yellow-brown spot on the corresponding upper surface. The sori were 0.5–3 mm diam., irregular in shape due to being restricted by the veins, scattered or in groups, covering large portions of the leaf. At later stages, dark brown to black telia appeared, which were confined mainly to the lower leaf surface. They were 1–4 mm diam., scattered or in groups, covering large areas of the leaf.

## Taxonomy

***Puccinia himachalensis*** A.K. Gautam & S. Avasthi, **sp. nov.** Fig. 1

MycoBank: MB 818695; FacesofFungi number: FoF 02708

Etymology – The species epithet *himachalensis* is named for the state from where sample collected (Himachal Pradesh, India).

Uredinia mainly hypophyllous, with lightly chlorotic tissue on corresponding upper surface, solitary or in groups, subepidermal, erumpent, orange. Urediniospores ovoid or more or less globose, yellowish orange, 20–47 × 16.5–47 [av. 27.2 (±7.0) × 21.4 (± 8.0), n = 30] µm, wall 1–3.3 µm thick. Telia amphigenous, erumpent, brown to black. Teliospores 2-celled, light to dark brown with light violet to chestnut brown coloured septum, oblong to oblong-clavate, rounded at both ends, not or slightly constricted at septum, 39.5–53 × 21–27.5 [av. 44.2 (± 3.19) × 23.0 (± 1.75), n = 25] µm; wall 2–3.5 µm thick at sides, 2.5–4.5 µm thick at apex, brown; germ pore of upper cell apical or usually depressed, pore of lower cell near septum; pedicels colourless, 23–67 (24.25 ±1.35) µm long.

Known distribution – Mandi, Himachal Pradesh, India.

Material examined – India, Himachal Pradesh, Mandi, 760 m, on leaves of *Clematis grata*, 14 November 2013, Ajay Kumar Gautam (AUMH 1032, holotype).

## Discussion

The rust fungus examined in present study has ovoid to globose, unicellular urediniospores and two celled teliospores which revealed that fungus taxonomically falls under genus *Puccinia.* Five species of *Puccinia* have been recorded on *Clematis* spp.: *P. wattiana* Barclay, *P. ustalis* Berk., *P. clematidicola* Tai, *P. atragenes* Hausmann, and *P. exhausta* Dietel (Table 1; Zhuang et al. 1991). After comparison with all, a close resemblance was seen with *P. wattiana*. In *P. wattiana* the telia form in more or less concentric circles whereas they are scattered and single in the new species. The teliospores of *P. himachalensis* are larger than in *P. wattiana* (39.5–53 × 21–27.5 µm versus 30–48 × 18–25 µm). A light violet to chestnut brown colouration was observed in septa of teliospores which also supports distinction of present taxa from *P. wattiana*. The size of pedicel is

also variable as compared to *P. wattiana*. Therefore, it is justified to introduce a new species of *Puccinia*.

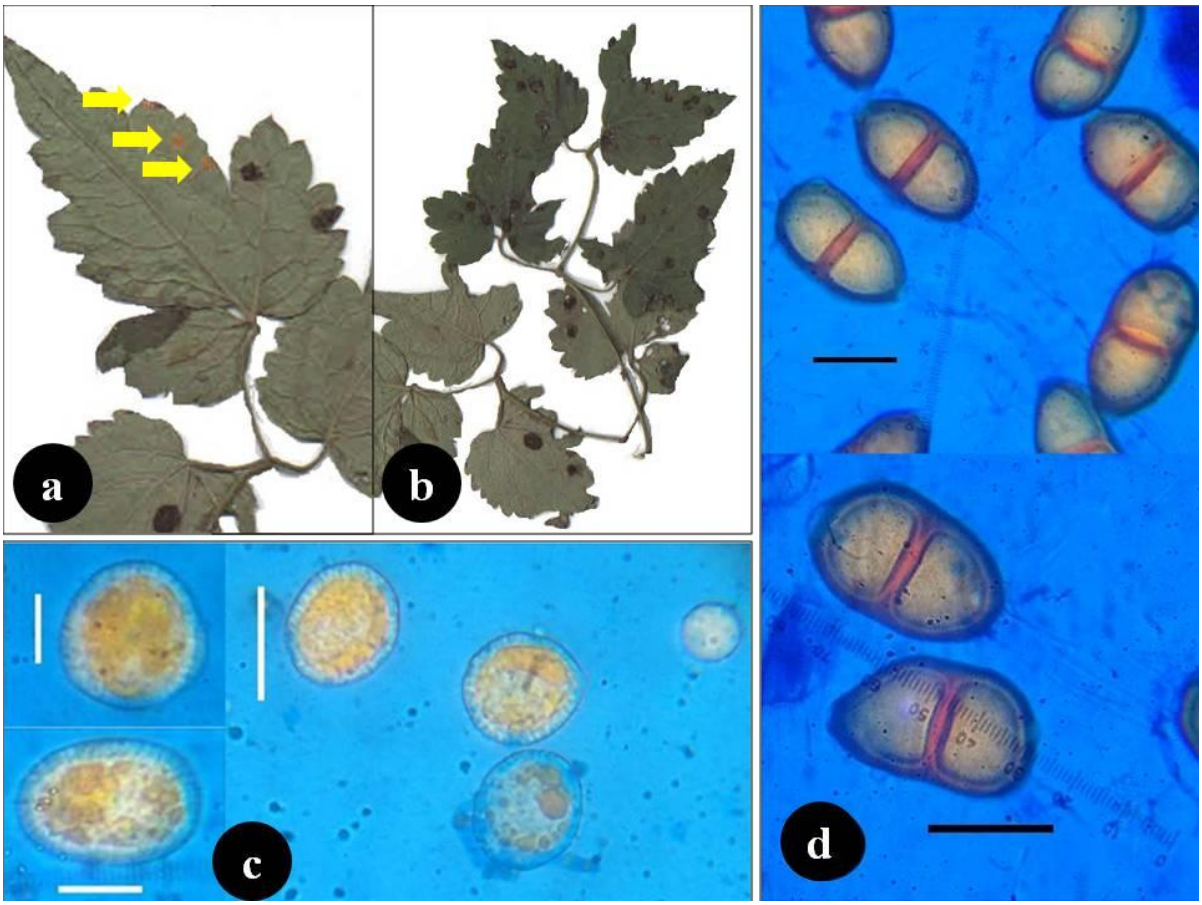


**Fig 1** – *Puccinia himachalensis* sp. nov. on *Clematis grata*. a, Uredinia (arrowed), b, Telia, c, Uredinospores, d,Teliospores. Scale bars c = 10 µm; d = 20 µm.

**Table 1** Morphological comparison of *Puccinia* species reported on *Clematis* spp.

| **Characters** | ***P. wattiana*** | ***P. ustalis*** | ***P. clematidicola*** | ***P. atragenes*** | ***P. exhausta*** | ***P. himachalensis* sp. nov.** |
|---|---|---|---|---|---|---|
| Telia (diam.) (mm) | 0.2–0.5 | 1–5 | 0.2–1 | 2–3 | 1–2 | 1–4.5 |
| Teliospores (µm) | 30–48 × 18–25(–27) | (30–)38–76 × 10–20 | 30–48 × 12–20 | 35–55 × 23–30 | 38–50 × 23–28 | 39.5–53 × 21–27.5 |
| Wall thickness (µm) | 2–2.5 (sides); 2.5–5 (apex) | 3–8(–10) | 1 | (2.5–)3–5 (sides); 2.5–7.5 (apex) | 2–2.5 | 2–3.5 (sides); 2.5–4.5 (apex) |
| Pedicels (µm) | up to 65 long | 5–10 long | up to 30 long | up to 150 long | (30–50)–150 | 23–67 |

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