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***Puccinia cortusae* (Basidiomycota; Uredinales) on *Cortusa brotheri* (Primulaceae), new to southern Asia (Fairy Meadows, Pakistan)**

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ABSTRACT — *Puccinia cortusae* has been found parasitizing *Cortusa brotheri* from northern Pakistan. This first report from Pakistan and southern Asia also establishes *C. brotheri* as a new host for the rust fungus. We believe this is the first report of *P. cortusae* since it was first described in 1904. New observations of one-celled teliospores and variable germ pore position supplement the original description.

KEY WORDS — Bial Camp, *Cortusa matthioli*

Introduction

Worldwide, the *Primulaceae* comprises ca. 24 genera and 1000 species, (most of which represent herbs confined mainly to north temperate regions), among which only around 28 species have been recorded as alternate or (sometimes) primary hosts for 18 rust species and five genera (Arthur & Cummins 1962, Wilson and Henderson 1966, Hiratsuka et al. 1992, Farr & Rossman 2011). Although 60 species (eight genera) representatives of the *Primulaceae* have been reported from Pakistan, not a single species has been from the country as a host for rust fungi.

During the present study, *Cortusa brotheri* was found parasitized by *Puccinia cortusae*. With this addition, the number of rust fungi has been raised to 73 from Fairy Meadows, Pakistan (Afshan et al. 2009, 2011).

Materials & methods

During the survey of rust fungi from Pakistan, *Cortusa brotheri* was collected from Northern Pakistan, Fairy Meadows, 3036 m a.s.l., occupying rock crevices along a running stream. A healthy flowering plant was also collected for accurate host identification. Free hand sections of infected material and spores were mounted in lactophenol. Semi-permanent slides were prepared by cementing cover slips with nail lacquer (Dade & Gunnell 1969). Preparations were observed under a Nikon YS100 microscope and

photographed with a digipro-Labomed (USA). Spore drawings were made using a Leitz Camera Lucida (Wetzlar, Germany). Twenty-five spores were measured using a Zeiss ocular micrometer (St Albans, England). Measurements include range and arithmetic means with extremes shown in parenthesis.

Taxonomy

Puccinia cortusae Tranzschel, in Sydow & Sydow, Monogr. Uredin. (Lipsiae) 1(5): 886 (1904).

FIGS. 1-2

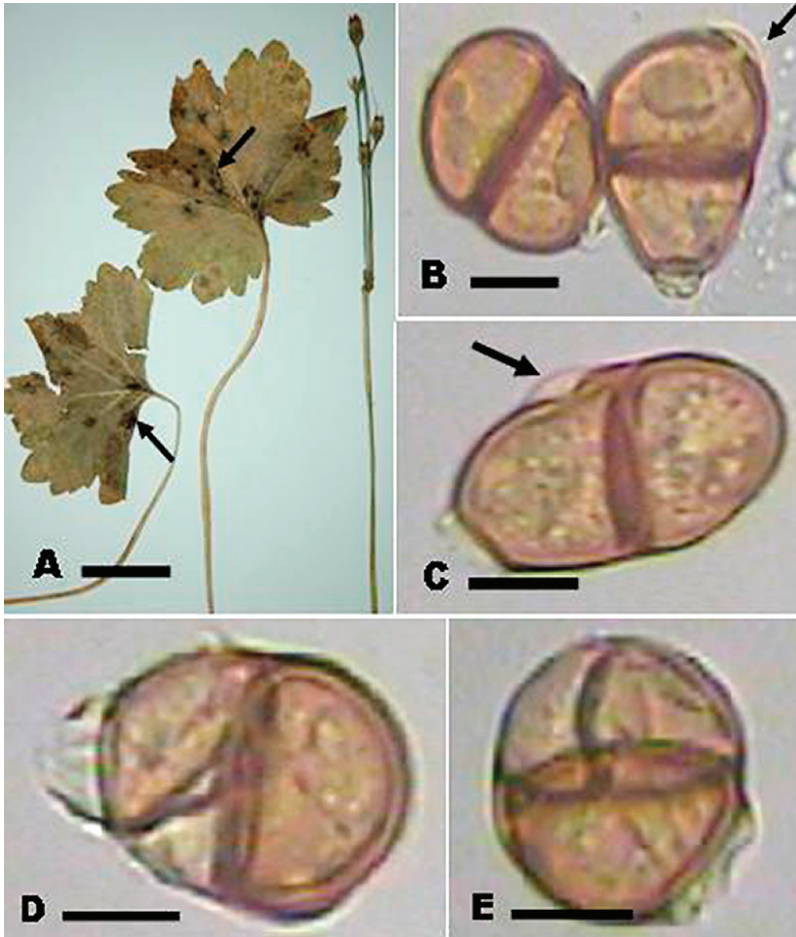


FIG. 1. *Puccinia cortusae*. A: Infected host plant, *Cortusa brotheri* (arrows showing telia along and between veins); B-C: Teliospores (arrows showing sub-apical position of germ pore in distal cell and next to septum in proximal cell with hyaline papillae); D-E: Aberrant teliospores with additional oblique and perpendicular septa. Scale bars: A = 2 cm, B-E = 10 µm.

SPERMOGONIA, AECIA and UREDINIA not seen. TELIA hypophyllous, rarely epiphyllous, circinate, pulverulent, covered by ruptured epidermis, naked, along or between veins, 70–140 × 280–400 µm. TELIOSPORES pale brown to chestnut brown, ellipsoid, broadly ellipsoid or obovoid, rounded or attenuated at base, slightly or not constricted at septum, chestnut brown at septum, 16–25(–31) × 24–37 µm (mean 22.2 × 29 µm); wall chestnut brown, smooth, 1–1.6 µm; germ pore one per cell, with variable position, mostly apical, sub apical or sometimes adjacent to septum in distal cell; in proximal cell mostly adjacent to septum, sometimes shifted ½ to ¾ towards hilum, germ pores with hyaline papillae; apex not thickened, rounded, sometimes conical; pedicel hyaline, deciduous, short, sometimes obliquely attached, 5–11 × 3–20 µm. One-celled teliospores and aberrant teliospores with additional oblique or perpendicular septa present but rare.

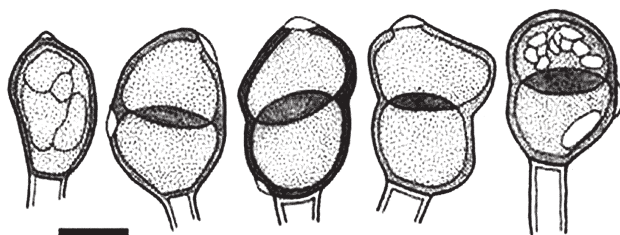


FIG. 2. Lucida drawings of *Puccinia cortusae* showing one- and two-celled teliospores. Scale bar = 10 µm.

MATERIAL EXAMINED: PAKISTAN, Fairy Meadows, Bial Camp, on *Cortusa brotheri* Pax ex Lipsky (*Primulaceae*), 24 July 2010, Malka Saba 07, with III stage (LAH 1147).

COMMENTS: Among new observations made for *P. cortusae* not mentioned in the original description are the presence of both two-celled and one-celled teliospores that are broader (15–21 µm in the original). Teliospore germ pores were observed in different positions, e.g., apical, subapical, or sometimes adjacent to the upper cell septum although they were mostly observed in the lower cell adjacent to the septum or sometimes shifted half or three-quarters of the distance toward the hilum.

Puccinia cortusae is the only rust fungus reported on *Cortusa* L., and has previously been known only from the type collection on *C. matthioli* L. from the Alai Range in southern Kyrgyzstan (Sydow & Sydow 1904: “in jugo Alaico Turkestanicae”; Farr & Rossman 2011). Our collection is a new record of *P. cortusae* for southern Asia and *C. brotheri* is a new host for this rust fungus. The two hosts are closely related, with *C. brotheri* sometimes treated as a form of *C. matthioli*, *C. matthioli* f. *brotheri* (Pax ex Lipsky) R. Knuth.

Gäumann (1959) described *Puccinia cortusae* as a microform (telial stage only) of *P. primulae* Grev. Teliospores resemble those of *P. primulae* in shape although they differ in size, those of *P. cortusae* being longer and broader ($16\text{--}25\text{--}31 \times 24\text{--}37 \mu\text{m}$ vs. $15\text{--}18 \times 22\text{--}30 \mu\text{m}$) with chestnut brown wall, variable position of germ pores and apically unthickened.

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