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MORPHOLOGY OF THE MICROCYCLIC RUST FUNGUS, *Puccinia boroniae*, IN WESTERN AUSTRALIA

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INTRODUCTION

Boronia is an aromatic Australian native wildflower. Several species endemic to Western Australia are commercially cultivated for the cut flower market.

Puccinia boroniae is an important rust pathogen of the two most common *Boronia* species grown commercially, *B. heterophylla* and *B. megastigma*, and was first described by Hennings in 1903 (1). Only the telial stage has been observed in the field and recorded. *P. boroniae* has been described as a microcyclic rust fungus with teliospores able to germinate without a period of dormancy, however no reference to germination structures or host inoculations confirming this have been published.

The objectives of this study were to provide a current and detailed morphological description of the various spore stages observed in the field, to describe the teliospore germination structures and basidiospores, and to confirm the lifecycle of *P. boroniae*.

MATERIALS AND METHODS

The morphology of the telial and pycnial spore stages, and teliospore germination characteristics of *P. boroniae* were examined by light and scanning electron microscopy, utilising herbarium and fresh specimens. Spores were removed from the sori and mounted in lactoglycerol for analysis. The structure of the telium, pycnium and inter/intracellular fungal structures was examined in cleared and stained handsections, using a modified version of Quilliam and Shattock (2).

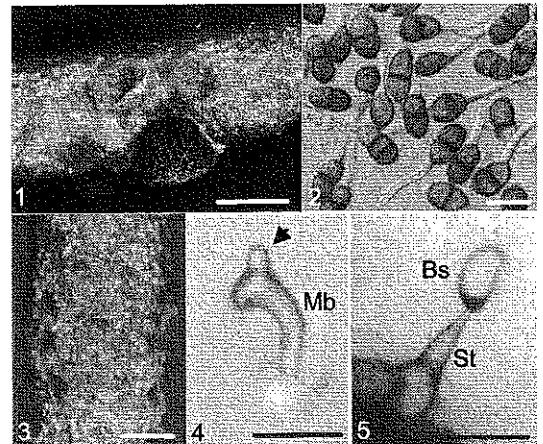
Teliospore germination was examined by exposing intact telia to moisture for 1–4 h at 15 ± 1 °C in the dark, plating onto 2% distilled water agar plates and incubating at 10–25 °C. Telia were examined for germination between 1–24 h.

Healthy *B. heterophylla* plants were inoculated with basidiospores of *P. boroniae* by placing branches heavily infected with telia on the canopy of the plants, and incubating at high humidity in a growth cabinet (20 °C, 12 h photoperiod).

RESULTS

Urediospores and aeciospores were not observed on any specimens examined. Telia were subepidermal, erumpent and pulvinate, amphigenous on leaves, stems and parts of developing flower buds (Fig. 1). Teliospores were borne singly on pedicles, predominantly 2-celled (Fig 2), often single celled mesospores were observed, with rarely 3 or 4 celled teliospores present. Intracellular hyphae typical of monokaryotic haustoria were observed in the mesophyll cells beneath and adjacent to telia. Bright orange pycnia were observed at a single plantation on the leaves of *B. megastigma*, present in clusters on both the adaxial and abaxial leaf surface (Fig 3). Their structure conformed to Type 4 (3).

Figs 1–5 Morphology of spore stages of *P. boroniae*. 1. Telia; 2. Teliospores; 3. Pycnia; 4. Metabasidium with developing sterigma (arrow); 5. Mature basidiospore (Bs) on sterigma (St). Bars (1–5) = 1mm, 25µm, 0.25mm, 20µm, 20µm.



Teliospores germinated without dormancy, producing a septate metabasidium on which a single, ovate to elliptical basidiospore developed on a sterigma at the sub-terminal end (Figs 4 and 5).

Telia were observed on *B. heterophylla* 21 days after inoculation; pycnia were not observed.

DISCUSSION

This study reports for the first time descriptions of teliospore germination, basidiospore formation and pycnia of *P. boroniae*. It was also conclusively shown that *P. boroniae* is microcyclic. This is the first record of the pycnial stage of *P. boroniae*, with no other collections from different host species or locations in Western Australia observed to exhibit the pycnial stage. Currently it is unknown whether the pycnial stage is still functional in the lifecycle of the rust fungus.

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