

# **PHYTOPHTHORA SPECIES ASSOCIATED WITH ROOT AND CROWN ROT OF BORONIA IN CUT-FLOWER PRODUCTION**

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## **INTRODUCTION**

The Australian wildflower, *Boronia heterophylla* and related hybrids are cultivated on the Sapphire Coast in South-Eastern NSW for the export cut-flower market. Severe losses are experienced during the 5-year cropping period, particularly after the first pick of flowers (approximately 18 months after cutting-grown tubestock are planted). Wilting and rapid death of plants are the most common symptoms associated with losses.

*Phytophthora drechsleri* has been recorded from *Boronia megastigma* (1, 2), but there have been no detailed reports on the diseases of the *Boronia* cultivars growing on the Sapphire Coast.

## **MATERIALS AND METHODS**

**Pathogen culture** Eight properties near Bega, on the NSW South Coast, were surveyed in February 2000. Forty-five samples from plants with wilting symptoms were collected from the cultivars *B. heterophylla*, *B. 'Carousel'*, *B. 'Lipstick'*, *B. 'Morande Candy'*, and *B. clavata*, two samples were collected from a *B. clavata*, which appeared to be healthy. Whole plants were dug out with as much soil adhering to roots as possible. Each evening of the survey, plants were clinically examined and root lesions were washed in sterile water and plated to a range of culture media: acidified potato-dextrose agar (PDA); water agar plus 50 ppm Rifampicin (WAR); potato-carrot agar plus 10 ppm Pimaricin and 50 ppm Rifampicin (PR); and potato-carrot agar plus 10 ppm Pimaricin, 50 ppm Hymexazole and 50 ppm Rifampicin (PRH). Plates were incubated at 22°C and fungal colony development was observed by light microscopy over the following 7 days. Sub-cultures were further characterised by morphological taxonomy. *Phytophthora* isolates were forwarded to Dr A. Drenth for molecular taxonomy using an IT-PCR and restriction enzyme digest analysis (3).

**Pathogenicity testing** was carried out in greenhouse assays on potted *Boronia heterophylla* plants. Healthy 12 month-old plants growing in 10 cm pots were inoculated with *Phytophthora* isolates and grown-on for 8 weeks. One each of three *Phytophthora* species (*P. cinnamomi*, *P. cryptogea* and *P. drechsleri*) were compared in bioassays with uninfected control treatments: They were cultured on PDA for 5 days at 25°C. Two inoculation methods were compared: an agar block (5 mm<sup>3</sup>) inserted into a cleft cut into the lower stem (50 mm above the soil surface), and an aqueous suspension of coarsely homogenised fungus from a PDA plate. A 100 ml suspension was drenched into two holes cut into the potting medium with a 10 mm diameter cork borer to a depth of 100 mm. Control plants were inoculated with sterile agar blocks or aqueous homogenate. Plants were placed in a greenhouse in a replicate complete block design.

Mortality was scored daily and plants surviving for 8 weeks were washed clean of soil mix and rated for root necrosis and vascular discoloration of stems. Affected root and stem tissues were plated to PRH medium to confirm presence of individual *Phytophthora* isolates.

## RESULTS & DISCUSSION

Surveys of wilting plants and taxonomic studies demonstrated that three *Phytophthora* species were consistently associated with field losses. They were: *P. cinnamomi*, *P. cryptogea* and *P. drechslera*. Other potential pathogens were less commonly isolated: *Pythium irregulare*, a *Pythium* sp., and root knot nematodes (*Meloidogyne* spp.). These often occurred in conjunction with one or more of the *Phytophthora* species. *P. cryptogea* was the most frequently isolated species and was detected on *B. heterophylla*, *B. 'Carousel'* and *B. 'Lipstick'*. *P. drechslera* was only recovered from *B. 'Lipstick'* while *P. cinnamomi* was isolated from *B. 'Lipstick'*, *B. 'Carousel'* and *B. 'Morande Candy'*. Greenhouse assays confirmed pathogenicity of the three *Phytophthora* species to *B. heterophylla*. *P. cryptogea* was the most aggressive species causing 100% mortality in two trials when inoculated via the lower stem. This form of inoculation gave higher mortality rates for the three *Phytophthora* species. Despite lower mortality of *P. cryptogea* when applied to roots (40%), plants were clearly infected since they displayed necrotic root lesions and vascular browning in stem tissue.

## CONCLUSIONS

This study determined that three *Phytophthora* species cause root and crown rots of *B. heterophylla* and related hybrids. Current work is applying the pathogenicity assay to: 1. screen a potential rootstock, *B. clavata*, for tolerance to these *Phytophthora* species, and 2. determine the relative pathogenicity of other potential pathogens (*Pythium irregulare*, *Pythium* sp. and a *Rhizoctonia* sp.) in *B. heterophylla* and *B. clavata*.

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