

Exposing the Enigma of *Dothistroma* Needle Blight Using Molecular Markers – a Progress Report

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Extended abstract – *Dothistroma septosporum* is a fungal pathogen causing a disease known as either red band needle blight or *Dothistroma* needle blight (DNB) on *Pinus* species worldwide. The three morphological varieties of this pathogen originally recognized based on differences in conidial length (Thyr – Shaw 1964, Ivory 1967) have not been supported by DNA sequence analyses (Barnes et al. 2004). However, phylogenetic relationships of *Dothistroma* isolates from various countries, based on DNA sequences for portions of the rDNA ITS, β -tubulin and TEF 1- α gene regions, revealed that DNB is caused by two distinct fungal species (Barnes et al. 2004). One species, *Dothistroma septosporum*, has a world-wide distribution and a very wide host range (Barnes et al. 2004, Bradshaw 2004, Bednářová et al. 2006). It is the pathogen responsible for the devastating losses to pine plantations in many Southern Hemisphere countries (Gibson 1974). The teleomorph state of this fungus is *Mycosphaerella pini* (Funk – Parker 1966). In contrast, *Dothistroma pini* is known only from the non-native *Pinus nigra* in the North-Central U.S.A and from *P. pallasiana* plantations in Ukraine and South-Western Russia, outside the natural range of this pine species (Barnes et al. 2004, Barnes et al. 2007).

Although morphologically very similar, conidial widths for *D. pini* are on average, slightly wider than those of *D. septosporum*. Despite this, unambiguous identification of these two fungi based solely on morphology is virtually impossible. Specific mating type primers were developed for both *Dothistroma* species (Groenewald et al. 2007). The primers have a dual function in that they can be used to discriminate between *D. septosporum* and *D. pini* and also to identify the mating type of individual isolates. Screening populations from various countries using the primers has shown that both mating types of *D. septosporum* are present in Europe, America and Africa, but that only one mating type is present in some of the countries in the Southern Hemisphere, with monoculture plantings of *Pinus radiata* and where the sexual state has not been found. The fact that both mating types of *D. pini* are present in the U.S.A. provides a clue to where a teleomorph for this species might be found.

Microsatellite markers that have also been designed specifically for *D. septosporum*, support the mating type results. These indicate that clonal populations exist in some of the Southern Hemisphere countries, while populations in Europe, on native tree species, have

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high levels of diversity. Ongoing research using these markers will provide an opportunity to study the population structure and world-wide movement of these pathogens. The emerging results should also be valuable in facilitating the development of management strategies to reduce the impact of *Dothistroma* needle blight, by either containing the pathogens within areas or minimizing their introduction into other countries.

***Dothistroma pini* / *Dothistroma septosporum* / *Mycosphaerella pini* / mating type genes / microsatellite markers / phylogeny**

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