

**THE EFFECTS OF HOST WATER STRESS ON DISEASE DEVELOPMENT  
BY DIFFERENT *SPHAEROPSIS SAPINEA* MORPHOTYPES**

James Thomas Blodgett

Under the supervision of Assistant Professor Glen Robert Stanosz

at the University of Wisconsin-Madison

Shoot blight and cankers caused by *Sphaeropsis sapinea* damage conifers throughout the world. Disease is often associated with wounding or host stress. Two morphotypes of this fungal pathogen are recognized. For isolates of each morphotype, greenhouse, growth chamber, plantation, and/or laboratory studies were conducted to compare: necessity of wounds for infection; relative aggressiveness of morphotypes on red pine (*Pinus resinosa*) and Jack pine (*P. banksiana*); pathogen response to host water stress; influence of water stress and colonization by the pathogen on host chemistry; and *in vitro* responses to host chemicals.

Morphotypes did not differ in requirement for wounds, but did differ in aggressiveness and in response to host water stress. Both morphotypes penetrated hosts without wounding. On wounded seedlings, A isolates caused more severe symptoms and could be recovered farther from the point of inoculation than B isolates on red pine, but not on Jack pine. Moderate water stress, including that resulting from competing vegetation, resulted in more severe symptoms on red pines wounded and inoculated with A isolates, but not B isolates.

Concentrations of monoterpenes in red pine shoots varied with inoculation and water treatment. Trees inoculated with A isolates had greater concentrations of monoterpenes than did those inoculated with B isolates or controls. In plantation trees, monoterpene concentrations were greater in water stressed than in nonstressed trees.

*In vitro* responses of the two morphotypes to red pine chemicals differed. A phenolic (pinosylvin) and monoterpenes ( $\alpha$ -pinene,  $\beta$ -pinene, and  $\delta$ -3-carene) inhibited spore germination and mycelial growth of both morphotypes. However, B isolates were more inhibited by these chemicals than A isolates.

These studies indicate the importance of distinguishing between *S. sapinea* morphotypes and demonstrate the role of host condition in disease development. Site factors that induce even moderate host water stress can enhance Sphaeropsis shoot blight and canker disease. The interrelationships between host water stress, chemistry, and pathogen response are still unclear. However, these chemicals may be involved in the differences in aggressiveness observed between morphotypes on red pine and suggest the potential for ecological specialization of the morphotypes.

Glen P. Staworz