

## **Management Notes for *Sirococcus clavignenti-juglanda***

**Preventative measures:** Recently, the wide host range of the pathogen inciting butternut canker has attracted international concern. Many Juglan species which including butternut, black walnut, Japanese walnut, Persian walnut and heartnut are all economically important and highly valuable trees, which support many wood-using and nut-processing industries worldwide.

Breeding for disease resistance is a future possibility. Already some healthy trees were present amount the severely diseased ones (Orchard *et al.* 1981). In addition to these apparently healthy trees, other trees exhibit the capacity to callus over the cankers completely as a possible disease resistance mechanism. Such trees should be preserved in seed orchards to produce seed for future breeding in disease-resistance programs.

Since the pathogen is internally seed borne, it could possibly be spread by the infected seeds and seedlings on nursery stock, not only within a country but also internationally. So **national and International quarantine regulations** against the import of butternut canker fungus are warranted.

Schlarbaum *et al.* (1999) states that, "The USDA Forest Service, North Central Experiment Station, initiated a cooperative effort with northern states and northern National Forests to locate surviving butternuts and graft putative resistant trees into clone banks to preserve the germplasm. Cooperators are instructed on identification of butternut canker and conservation of germplasm (Nicholls *et al.* 1978, Ostry *et al.* 1994). Research is being conducted to develop laboratory and field protocols to screen trees for resistance, host range studies, in vitro clonal propagation (Pijut, 1993), and the role of insects in dissemination of the fungus. A continuing series of progress reports document the research activities of this group."

Schlarbaum *et al.* (1999) also reports that, "A coalition has been formed in the southeastern United States, by the University of Tennessee, USDA Forest Service, Southern Region and Southern Forest Research Experiment Station, Great Smoky Mountains National Park, Tennessee Division of Forestry, and USGS Biological Research Division. This coalition is working to locate surviving trees or populations, characterize sites, identify trees with putative resistance, develop screening methodology for disease resistance, study fungal physiology, and preserve germplasm."

Furnier *et al.* (1999) states that, "Butternut was listed under Category 2 of the Endangered and Threatened Plants list of the U.S. Endangered Species Act of 1973, meaning that there was evidence of vulnerability but not enough data to support full listing (Ostry, 1997). This category has since been discontinued and butternut and other species formerly listed in this category can be considered "species at risk."

**Biological:** Anderson (1996) states that, "There is no known control for *S. clavignenti-juglandacearum*. Fungicides have been tested with some success but are not ready for field use. Agents which would be antagonistic to the fungus such as hypo virulent fungal strains have not been detected. However, a number of trees have been observed recovering from butternut canker. This pattern of major loss of tree followed by recovery of the remaining trees is typical of hypovirulent fungal strains and needs exploration. "

Anderson (1996) states that, "Disease free trees are rare but have been found in 19 states. These trees are growing along side of severely cankered trees. The rapid spread of the fungus also indicates that these trees have received prolonged exposure to the fungus. Each tree is tagged and placed into a superior tree selection program. Scion wood is collected from each of the disease free trees in February to March. The scion wood is grafted on root stock at the University of Tennessee and at the North Central Forest Experiment Station in St. Paul, Minnesota. Nuts are also collected and grown in a nursery when available. These tree

selections, grafted and seedling are placed into progeny tests and evaluated for growth traits, screening tests for relative resistance and placed in seed orchards for future use. It is too early to evaluate the success of selecting for disease resistance but the preliminary data is promising."

Anderson (1996) states that, "Butternut also hybridizes with trees such as heartnut. Some of these hybrids have been located in the field and are being evaluated. These trees provide the potential for using back crosses to produce progeny which contain a small amount of heartnut but are resistant."

Halik (1999) states that, "If efficient vectors of *S. clavigignenti-juglandacearum* are identified, the insects could be managed in a plantation or forest stand by sanitation, trapping, or chemical methods, and dissemination of the fungus could be reduced."

Chemical: Tisserat and Kuntz (1984) state that, "Felling or treating cankered trees with a silvicide failed to prevent fungal colonization and sporulation."