The Center for Urban Ecology's Dogwood Anthracnose Research Program

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Periodically, new forest diseases suddenly arise which can have significant and lasting effects on the environment Chestnut blight, which was introduced into the United States at the turn of the century, and Dutch elm disease, which appeared in the early 1930s, are the most noted examples. Recently, two of our native dogwood, the flowering dogwood, *Cornus florida* L , and the western flowering dogwood, *C. nuttallii* Audub., have been threatened by a new disease (Byther and Davidson, 1979; Hibben and Daughtry, 1988; Salogga and Ammirati, 1983) Dogwood anthracnose, caused by a coelomycetous fungus in the genus *Discula,* was first reported affecting *C. florida* in the northeast in the mid 1970s (Hibben and Daughtry, 1988). Interestingly, the disease was also found affecting *C. nuttallii* in the Pacific Northwest at about the same time and now occurs in Washington, Oregon, Idaho and British Columbia (Byther and Davidson, 1979).

In about 15 years dogwood anthracnose has moved south along the Appalachian Chain to northern Georgia and as far west as northwestern Alabama Almost 20 percent of the natural range of *C. florida* is now affected.

The disease is of particular concern to the National Park Service because of its mandate to preserve and protect natural resources for future generations The flowering dogwood is a prominent understory species in many parks of the East including the parks of the Appalachian Chain; Shenandoah National Park, the Blue Ridge Parkway, and the Great Smokey Mountains; as well as smaller, yet heavily visited parks, such as Harpers Ferry National Historical Park in West Virginia, Rock Creek Park in the heart of Washington, D.C., and the Catoctin Mountain Park, which surrounds Camp David in Maryland Not only is the dogwood a significant aesthetic element in these parks, but most importantly, it provides a major source of food for over 40 species of birds and 12 mammals (Mitchell, et al. 1988)

In 1983 dogwood anthracnose was confirmed in Catocin Mountain Park, a 6000 acre national park located in north-central Maryland. A survey conducted in 1984. found that 33% of the dogwoods were dead and only 30% of the stems were free of disease symptoms (Mielke and Langdon, 1986). A second survey conducted four years later determined that the loss had risen to 79% in the survey plots (Schneeberger and Jackson, 1989). The rapid spread and severity of the disease prompted the National Park Service and the U.S Department of Agriculture to support and conduct studies to further our understanding of this new disease and to determine the impact it will have on our native dogwoods. The following discussion will review some of the initiatives undertaken by the Center for Urban Ecology.

Critical to understanding and management of this disease is knowledge of the pathogen, particularly since the specific identity of the fungus had not been made. The Center has supported Dr. Scott Redlin of the USDA's Systematic Botany and

Mycology Laboratory in describing and identifying the *Discula* sp. associated with the disease. Other species of *Discula* are known to cause anthracnose diseases of other tree species; however, Dr. Redlin has determined that the dogwood pathogen is a new species of *Discula*. The description and species name will soon be published in the Journal Mycologia. The origin of this pathogen is still in question. However, its sudden occurrence on both coasts at approximately the same time supports the theory that it was a recent introduction to the United States

Controlled inoculations, which provide reliable and uniform infection, are essential in conducting many tests such as screening resistance, testing fungicides, and determining the environmental parameters necessary for infection and disease development. However, like other anthracnose diseases caused by pathogens in the genus *Discula*, successful artificial inoculations is difficult to achieve. At the Center we are exploring the use of excised leaf discs maintained in water agar as a testing alternative to whole plant inoculation. We have found that successful infection can be achieved if discs are wounded by heating the center of the disc prior to inoculation. We are exploring this technique as a potential mechanism for rapidly determining disease resistance or susceptibility.

There are over 40 species in the genus *Cornus*, yet only two are recognized as highly susceptible to dogwood anthracnose. We are currently examining other species of *Cornus*, both exotic and native, for field resistance or susceptibility to the disease. Potted saplings of both native and exotic species are being placed in a forest environment where the natural disease incidence and severity are high and the probability for infection is good. These will be evaluated over several years for leaf spot and dieback and compared with *C. florida* controls. Leaf discs from these species are also being tested in the bioassay as part of the species study.

The National Park Service is participating with other agencies in testing several major commercial cultivars of *C florida* for resistance to natural infection. Cultivar plantings are being established at six locations along the East Coast where they will be evaluated over several years. The Center is maintaining one planting at Catoctin Mountain Park and one at the Center's experimental nursery in Alexandria, Virginia. The project is being coordinated by the USDA Forest Service, Southeastern Forest Experiment Station.

In order to increase the options for managing the disease in ornamental landscape, the Center is cooperating with the USDA Agricultural Research Service's Florist and Nursery Crops Laboratory at Beltsville, Maryland, in evaluating alternatives to conventional fungicide treatments. Vegetable and petroleum oils such as neem and Sun Spray, are being tested on containerized trees maintained in the forest where the disease is well established. It is hoped that some oils may be sufficiently protective and eradicative to control dogwood anthracnose in landscape settings.

The long term development and progression of the disease is being monitored in a series of permanent one-tenth acre plots established in Catoctin Mountain Park, Rock Creek Park,and Prince William Forest Park in Virginia. In each plot all dogwoods over six feet tall are mapped and monitored annually for disease development. Dogwood regeneration within the plot is also being evaluated.

In the event that dogwood anthracnose may eliminate the flowering dogwood in some parks, an effort is being made to preserve the dogwood germplasm. Through a cooperative program between the National Park Service, the Soil Conservation

Service, and Agricultural Research Service, seed has been collected from several parks and will be cleaned and then preserved by liquid nitrogen cryo-preservation It is hoped that dogwood anthracnose will not eliminate this valuable species and that seed storage will not be necessary to preserve the native genotypes. However, only through a better understanding of the disease and its effect on the natural and ornamental landscape will we be able to anticipate the consequences of dogwood anthracnose and manage the disease wherever practical.

LITERATURE CITED

Byther, R.S., and **R.M. Davidson Jr** 1979 Dogwood anthracnose Ornament Northwest Newsl 3 20-21.

Hibben, C.R., and **M.L. Daughtry**, 1988 Dogwood anthracnose in northeastern United States Plant Dis 72 199-203

Mielke, M. and **K. Langdon**, 1986. Dogwood anthracnose fungus threatens Catoctin Mt Park Natl Park Serv Park Sci , Winter pp 6-8

Mitchell, W.A., P.A. Gibbs, and **C.O. Martin**, 1988. Flowering dogwood (*Cornus florida*) Section 7 5 9., US Army Corps of Engineers Wildlife Resources Management Manual, Tech Report EL-88-9, US Army Engineer Waterways Exp Sta , Vicksburg, MS 24 pp

Salogga, D.S. and **J.F. Ammirati**, 1983 *Discula* species associated with anthracnose of dogwood in the Pacific Northwest Plant Dis. 67 1290

Schneeberger, N.F and **W. Jackson.** 1989 Impact of dogwood anthracnose on flowering dogwood at Catocin Mountain Park USDA Forest Service, Northeast Area State and Private Forestry (Unnumbered report) 16 pp