FIELD EVIDENCE CONFIRMS *CORNUS KOUSA* DOGWOOD'S RESISTANCE TO ANTHRACNOSE

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Abstract. In a moisture regime very favorable for leaf disease infections (an overhead irrigation system), *Cornus Kousa* trees were infected by the anthracnose fungus *(Discula* sp.) and some died. In an adjacent comparable area, but with no overhead irrigation, *C. florida* trees were infected and dying but trees of *C. kousa* that touched them remained healthy...as is usual with that species.

The dogwood anthracnose disease, formerly known as "lower branch dieback of dogwood," caused by *Discula* sp. (1, 2), is a serious threat to our native flowering dogwood, *Cornus florida.* From Virginia to Massachusetts, large numbers of woodland dogwoods have died since the late 1970's. Recently the disease was found also in northern Georgia.

The fungus invades the leaves first, and then numerous dark-bordered spots develop there. The lower leaves are most affected. This is usual in leafspot diseases, because after a rainfall the lower foliage stays wet longer than the upper. The infections spread to twigs and branches, thus the lower branches die earliest. Finally—in moist sites—the only remaining living parts (the upper branches) also die. Death of a whole tree may take several years.

Severity of this disease has not yet been studied experimentally on all species of *Cornus.* But without any experiment we may all expect to see soon how it can affect pagoda dogwood (= alternate-leaved dogwood), *Cornus alternifolia,* since this commonly grows wild at edges of woods in Massachusetts near properties where flowering dogwood is planted.

Cornus kousa, on the other hand, is generally regarded as much more resistant to dogwood anthracnose (4). Many think it more beautiful than flowering dogwood because of its variegated bark and because its white bracts appear late, when foliage creates a dark background.

C. kousa has been variously known as Chinese dogwood, Asiatic dogwood, or Siberian dogwood, but there are drawbacks to all of these names. Since nothing else except *C. kousa* could be meant by "kousa dogwood," and since this species is rather widely known in the trade by this name, we shall call it kousa dogwood in this article.

Since this species is widely planted at homes and in parks, its reputation for anthracnose resistance has greatly comforted those who worry about the future of flowering dogwood.

Recently that comfort was disturbed by rumors that kousa dogwood might not, after all, be resistant. The Shade Tree Laboratories considered it vital to examine any suspect trees in Massachusetts to see: a) whether they actually suffered from anthracnose, and b) whether, if so, they had a history of an unusual stress which might temporarily weaken or by-pass their resistance.

For clarity, a brief definition of disease immunity versus resistance follows. Immunity is very different from resistance, because immunity is absolute while resistance is relative. A tree that's "immune" to a disease **cannot** be infected with it. For example, eastern white pine cannot get Dutch elm disease, no matter what you do to the pine tree.

But a tree that's "resistant" to a disease at best puts up a good fight. It may not become infected, it may get only a mild case, or it may be only slightly invaded by the pathogen. For example, in Massachusetts one individual of the highly DED-resistant elm cultivar 'Christine Buisman' contracted a case of Dutch elm disease (3). Foliage in only part of one upper branch wilted. (The tree was destroyed anyway, to insure that some new fungal variant, able to infect resistant elms, would not be selected.)

Thus, to say that kousa dogwood is resistant to dogwood anthracnose doesn't mean it can *never* get the disease. It means that in most circumstances it's unlikely to be infected and that an

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infection is likely to be mild.

When an arborist in Massachusetts reported to the Shade Tree Laboratories, in late summer 1988, that a client's kousa dogwoods had anthracnose, we first got samples (via the arborist) to check the accuracy of the diagnosis.

From infected leaves selected from a total of 7 trees of *C. kousa, Discula* sp. was isolated and identified in 23 of 35 attempts. *Discula* sp. was also isolated from all 5 attempts from infected leaves selected from one symptomatic tree of *C. florida* growing on the same property. Conidia and conidiomata of *Discula* sp. were identified from dead leaf and shoot tissues of the kousa dogwoods. On malt agar the *Discula* cultures from kousa dogwood and from flowering dogwood looked alike.

The vein discoloration of the kousa leaves seemed a bit greater than usual with *C. florida,* and the youngest leaves on each shoot were clean.

Later we visited the trees. The property in question is a large one. The owner's hobby is growing kousa dogwoods, so there are several hundred of them, arranged in rows and varying from 5 to 12 feet tall according to the year of planting. In parts of the property flowering dogwood also grew. As elsewhere in that town, the flowering dogwoods were severely afflicted with anthracnose.

There was a notable and unexpected difference in anthracnose symptom expression in much of that property, which may have delayed realization that this was the well-known "lower branch dieback." The lower branches had NOT died first; instead, branches were dying equally at all levels in the trees.

We looked for unusual stresses. Yes, there WAS a stress—one which explained adequately and reasonably both the infection and the aberrant symptom pattern. The unusual stress, by chance, affected only about 4/5 of the property and not the other 1/5. *Significantly, the infection of kousa also occurred in that 4/5 and not in the other 1/5.*

The 4/5 where *C. kousa* trees were infected had an irrigation system: underground conduits led to a series of 2' × 2' concrete pads; from each pad a vertical pipe rose to a height of about 15 feet and bore at its top a sprinkler. So in this 4/5, all the trees were watered from overhead. In view of 1988's summer drought, we were told, the sprinklers had operated most days. Hence ALL the dogwood foliage was kept wet for many days on end, including that of the uppermost branches.

The remaining 1/5 of the property, however, had no sprinkler system. Here the *lower* branches of *C. florida* were far worse infected than the upper. And here kousa dogwood was not afflicted at all...even when its foliage was *mingled with* infected foliage of lower branches of flowering dogwood.

In their beginning course on plant diseases, students learn that leaf diseases need a prolonged wetness of leaf surface in order to infect. The owner had unintentionally created a controlled experiment which showed that continual wetness of the foliage overcomes kousa dogwood's resistance to this fungus.

The fact that the youngest kousa leaves were clean (in contrast to the youngest florida leaves) suggested that there'd been no secondary infection on kousa in late summer just before the specimens were collected. This further supported the vital role of the overhead irrigation: once that irrigation was not needed—and not used—all new kousa leaves returned to a "resistant" mode.

Naturally one cannot report a "new host" for this pathogen without completing Koch's postulates. Work toward that end is now in hand. Kousa dogwood seed is being stratified and the young trees will be inoculated.

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