

We attempt to control weeds with granular Casaron and liquid Lasso. Casaron 4G is applied at 150 lbs. per acre between November 15 and February 15, when temperature is below 50°F. Lasso is used throughout the summer every 4 to 6 weeks at 4 quarts per acre. Occasionally Paraquat is mixed with Lasso at the rate of one quart per acre.

We spray for dogwood borers in the early spring, using Lindane 20% E.C. mixed at the rate of 3 pints per 100 gallons of water. We start spraying in early May with three applications 2 to 3 weeks apart.

We do not dig any B/B dogwoods until after a heavy frost, around the latter part of October. Dogwoods can be safely dug both B/B and bareroot after November until buds break in the spring around the middle of April. B/B dogwoods are dug both by machine and by hand. We use a Jiffy Baller to dig 12, 14, and 16 inch sizes. Balls 18 inches and larger are dug by hand and drum-laced. Plants dug in the field are placed on pallets and handled with a forklift until they are loaded for shipment.

DOGWOOD DISEASES

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Disease may be an important factor in the production of salable flowering dogwood (*Cornus florida* L.). Recently several different virus diseases have been reported by various researchers, but little is known about their impact on the production of dogwood. Historically, fungus diseases of the foliage, twigs, roots and trunks have been considered important. These diseases occur frequently under certain environmental conditions of excess rainfall and low temperatures. More recently a fungus root rot and trunk canker of undetermined cause have assumed important positions in the commercial production of dogwood.

Foliage Diseases. Foliage diseases reported on *C. florida* have included leaf spots, blights, mildews, and viruses.

Ascochyta leaf spot, caused by *Ascochyta cornicola* Sacc., was first reported in 1942 by Hepting at Biltmore, North Carolina (7). Leaf spotting begins as early as mid-June, being characterized as round or slightly irregular areas, ranging in size from 1.5 to 6.5 mm in diameter. Tiny black puntiform spore masses form on gray to tan centers, surrounded by a somewhat prominent border of brown to red (7).

Botrytis petal blight, due to infection by *Botrytis cinerea* Pers. ex Fr., affects bracts, leaves, and young shoots. The disease generally occurs during periods of cool, wet weather. Bracts are most commonly infected, expressing brown patches of large, irregularly shaped lesions and having a wrinkled appearance. In humid weather, lesions become covered with fuzzy grayish-brown fruiting bodies. Other symptoms include discoloration or fading of bracts, leaf rotting, and the occurrence of blemishes on any floral parts, leaves and shoots (8).

Cercospora cornicola Tracy and Earle has been reported as the causal agent of *Cercospora* leaf spot, which occurs as irregular brown areas without definite borders, 5 to 10 mm in diameter. The disease appears in Georgia in late September, often causing defoliation (3,7).

Colletotrichum gloeosporioides Penz. was reported by Toole and Filler (11) to cause necrotic spots on foliage. Defoliation and dieback of one-year cuttings and seedlings due to this pathogen were also observed (11).

The disease caused by *Elsinoe corni* Jenkins and Bitancourt is referred to as blossom blight, blossom spot, or spot anthracnose. This disease was first reported by Jenkins and Bitancourt in 1948, as a disfiguring disease of the blooms (7). The fungus infects bracts, foliage, and twigs in developing stages, but petioles, peduncles, and fruit clusters may also be infected (7,8). Leaf spots are circular, angular, or elongate, ordinarily 1 mm in diameter, but sometimes larger. Spots may number over 100 per leaf. Dead tissue in the centers of spots becomes pale, yellowish-gray, and readily drops out, while surrounding tissue may darken. The disease may reduce leaf size or kill tissue outright. Owen (8) reported that trees normally infected by *E. corni* failed to produce symptoms when hot, dry weather conditions prevailed during the usual infection period. Spot anthracnose may cause damage under overhead irrigation. Dead tissue falls out of the leaves, which are small and stunted.

Elsinoe floridae, as well as *Ramularia gracilipes* Sacc. are mentioned by Pirone (9) as leaf spotting organisms on flowering dogwood. *Phyllosticta cornicola* (D.C. ex Fr.) Rabh. and *P. globifera* Ell. and Ev. are reported to be easily confused with *Ascochyta cornicola* in early spore stages (7).

Septoria cornicola Desm. is the cause of a leaf spot having small, angular, and typically haloed margins (6,9). *Septoria floridae* Tehon and Daniels, the cause of *Septoria* leaf spot, produces small angular leaf spots, limited by veins. Color is generally uniform but may become light in the center and dark at the borders. The spots range from 1.5 to 6.5 mm in diameter

and may be numerous by September. Small puntiform masses of spores form late in the summer on the necrotic centers (7).

Viruses reported on flowering dogwood include Dogwood Ringspot Strain of Cherry Leafroll Virus (DRSCLV) and Tobacco Ringspot Virus (TRV). DRSCLV was reported by Waterworth and Lawson in 1973. Leaves exhibit faint chlorotic ringspots or arcs, usually adjacent to primary veins, while other leaves may show a mild mottle. In the case reported, ringspot symptoms disappeared by early summer, and during midsummer leaves of infected trees showed upward rolling of leaves similar to CLRV-infected cherries (13).

TRV was first reported on dogwood in 1972 by Waterworth and Povish from trees in Maryland. Symptoms appeared as a general unthriftness of the trees, small and sparse flowers, and death of many twigs and leaf spots (12).

More recently Brunt and Stace-Smith have reported on tomato bushy stunt virus on dogwood (2). A witch's broom disease of *Cornus amomium* has been attributed to a mycoplasma-like organism by Raju, et. al. (10).

Twig Blights. Fungi causing twig blights reported on dogwood include *Botryosphaeria dothidea* Ces. and deNot., *B. ribis* (Tode ex Fr.) Gross. and Dug. (6,9), *Corticium stevensii* Pers. ex S.F. Gray (5) and *Myxosporium* sp. (*M. everhartii* Sacc. and Syd.) (6,9). A twig blight in the South caused by the fungus *Diplodia natalensis* Fr., may be synonymous with *Physalospora obtusa* (Schw.) Cke. (6).

Root Rots. *Armillaria mellea* Vahl ex Fr. is cited by Hepting (6) and by Batra (1) as a cause of root rot in the northern United States. *Clitocybe tabescens* (Scop. ex Fr.) Bres. is mentioned by Pirone as a root rotting organism in the South (9). Dogwood is reported to be extremely susceptible to Texas root rot, caused by *Phymatotrichum omnivorum* (Shear) Dug. (6,9). Recently a root rot caused by *Phytophthora cactorum* (Leb. and Cohn.) Schroet. has been reported (14).

Trunk and Stem Cankers. *Botryosphaeria ribis* has been reported by Hepting as a twig blight and also a canker fungus, occasionally causing dieback, killing branches and whole trees in the northeastern United States (6). Toole and Filer reported canker formation as a result of stem inoculations with *Colletotrichum gloeosporioides* (11). *Nectria galligena* Bres. causes the development of zonate cankers having conspicuous bark-free callus tissue. This area folds, and tiny red, balloon-shaped perithecia develop around the edges in wet weather (6). Crown canker, caused by *Phytophthora cactorum* (Leb. and Cohn.) Schroet. is not easily recognized in early stages, although investigation of the cankered area reveals that the inner

bark, cambium and sapwood are discolored. As the canker at the crown increases, the bark ruptures and sap oozes in the form of slime-flux. Bark over older areas dies, sheds and reveals a parabolic, zonate surface indicating different periods of growth of the pathogen. General symptoms may included a severe die-back of the crown, with defoliation associated. Leaves become small, sparse, and chlorotic. An abnormal abundance of fruit may be borne several years prior to the killing of the host (4,9).

Crown, Wood Rots and Seedling Diseases. *Agrobacterium tumefaciens* (E.F. Smith and Town.) Conn. occasionally causes stem and crown galls (6). *Fomes scutellatus* (Schw.) Cke. is mentioned by Hepting as the only wood rot fungus isolated from living trees (6). *Pythium* spp. have been the cause of seedling diseases in wet, poorly drained soils (6).

Current Important Diseases. In Virginia we have been studying root rot of *C. florida* caused by *Phytophthora cactorum* (Leb. and Cohn.) Schroet. In the nurseries this disease appears in the areas of the field considered by the growers to be poorly drained and generally tight. Diseased plants are stunted, have sparse foliage and show top decline. The roots on the diseased plants are severely rotted. When artificial inoculation of seedlings with *P. cactorum* from dogwood was compared with *Phytophthora cinnamomi* Rands. from azalea in the greenhouse, symptoms of top wilting and root rot were more severe with *P. cactorum* than with *P. cinnamomi*.

Virginia nurserymen have noticed a trunk canker disease of disturbing importance for several years. Not only are young trees damaged in the nursery, but lightly cankered trees have a poor record of survival in the landscape. The disease has been observed on trees brought in from out-of-state and planted out in Virginia nurseries. The source of trees seems to affect the development of the diseases.

Cankers produced on diseased trees are unlike those reported for Nectria canker and we have not observed the nectria fungus fruiting on the cankers. Various fungi, including several different ones frequently isolated from stems of other woody plants, have been isolated from the dogwood cankers, but none of these have been successfully introduced into experimental trees. Tests to date with fungicides have failed to prevent an increase in the number of cankers or severity of disease. Several different experiments, including work on fertility, are in progress to determine the cause and effect on growth.

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FLETCHER FLEMMER: Dr. Lambe, what insecticide do you use for borers?

DR. LAMBE: We have found the organophosphates more effective than Lindane.

DAVE BYERS: Could herbicides or mechanical damage increase susceptibility to disease?

DR. LAMBE: Fungi can enter wounds caused by mechanical damage at the ground level. Collar canker entering in this way causes symptoms resembling *Phytophthora*.