CURRENT STATUS OF DOGWOOD CANKER

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Abstract A stem and trunk canker of undetermined cause has been damaging flowering dogwood for the past 13 years in Virginia Fungicides applied to the leaves and stems were ineffective in preventing cankers Pruned trees had fewer cankers per tree and there were fewer cankered trees among them

We have observed cankers of undetermined cause on the stems and trunks of white flowering dogwood *(Cornus florida)* in nurseries in Virginia for the past 13 years (2). During this time we have been unable to isolate the fungus *Nectria galligena* (4), the cause of perennial target canker, or the fungus *Phytophthora cactorum* (1), the cause of crown cankers, from any cankered trees. In some cases two-year-old seedlings planted in our experimental field developed cankers by the end of the first growing season following transplanting to the field. We have noticed that canker development varied among different lots of trees. For example, there was no canker development after five years in one lot of 25 trees from an out-of-state source when they were planted at Virginia Polytechnic Institute and State University (VPI & SU) in Blacksburg.

Symptoms of disease. Cankers are of two different forms, appearing either as a sunken canker, or as a severe roughening of the bark at localized areas above the ground. The sunken canker frequently causes early girdling and death of the top with sprouting of shoots below the canker. The cankered trees break easily in the wind. Rough bark cankers on the trunk become slightly swollen and pronounced. Cankers are commonly invaded by insects, which can be very damaging. A small number of trees that were previously free of trunk cankers have developed cankers in the upper limbs (Figure 1).

Observations on canker incidence and control. Several different fungi including species of *Alternaria* and non-sporulating fungi have been cultured consistently from the margin of newly-formed cankers; but when inoculated into healthy seedlings, none of these have been observed to produce cankers.

When three groups of 25 two-year-old seedlings from three different nurseries in three different states were planted in the same research plot near VIP & SU and grown under the same conditions, incidence of canker after the first growing season was 0% in one group and over 50% in another group.

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[1] Associate Professor and Professor, respectively

Fungicide treatments. Two-year-old seedlings were immersed so that the entire plants were soaked for 30 minutes in solutions of different concentrations of potassium azide and benomyl (Benlate®) and planted in the field. The trees soaked in a solution of 1000 ppm of benomyl had 75% cankers at the end of the first growing season compared to 41% cankered trees in the control. None of the low or intermediate concentrations of potassium azide were effective in reducing canker and the highest concentration (4000 ppm) was toxic to the trees (Table 1).

Table 1. Chemical soaks for canker control[1]

Rate, ppm	Percent surviving	Percent cankered	
	10-29	6-20	10-29
Nontreated	100	33	41
500 ppm KN_3	100	9	50
1000 ppm KN_3	100	0	50
1000 ppm Benomyl	100	16	75
2000 ppm KN_3	100	16	42
4000 ppm KN_3	0	16	0

[1] Plants 24-30" in height treated April 23, 1974, 12 plants/treatment

Spring and summer applications of several different registered fungicides at recommended rates repeated bi-weekly to both the developing foliage and trunks failed to prevent canker development (Table 2). In the same treatment, some trees were killed and others were free of cankers.

Table 2. Fungicide sprays for protection against canker[1]

Treatment	rate/100 gallons	Foliage[2] rating	Canker development[3]	Growth index (cm)[4]
Daconil 2787 F	1 5 pt	2 7	3 1	41 7
MF-586 75W	1½ lb	2 2	2 3	39 7
Benlate 50W	1 lb	3 0	3 0	37 2
Daconil 2787 75W	1½ lb	3 1	3 0	34 8
Phaltan 75W	1½ lb	2 0	2 8	38 2
Control	—	3 1	3 0	37 0

[1] The adjuvant Exhalt 800 was added to all treatments except Daconil, at the rate of one pint/100 gallons Eight trees/treatment

[2] 1 = a healthy tree, 2 = off color, 3 = wilt and yellow leaves, 4 = premature reddening and leaves smaller than normal, 5 = top of tree dead

[3] 1 = healthy trunk, 2 = a single canker, 3 = 2 to 3 cankers, 4 = 4 or more cankers, 5 = top of tree dead above canker

[4] Growth index = height above soil line added to canopy at greatest diameter divided by two

Observations on the effect of pruning on canker development. We have reported that there was no evidence that pruning had any effect on the incidence of canker on white seedling dogwood after two growing seasons in the field (3). However,

after a third growing season there were among the pruned trees fewer cankered trees and fewer cankers per tree (Table 3). Similar experiments are being conducted in other states adjacent to Virginia.

Figure 1. Stem canker of dogwood. *Left*. Sprouting below a canker that has girdled the top of the tree. *Center*. Rough bark canker on the main trunk. *Right*. Cankers on the upper limbs of a previously healthy tree.

Table 3. The effect of pruning on canker development on white dogwood seedlings[1].

	1979		1980	
	Pruned	Unpruned	Pruned	Unpruned
No. of cankered trees	29	30	24	32
No. of cankers per tree	1.01	1.06	1.17	2.00
No. of surviving trees	45	44	39	40
No. of healthy trees	16	14	15	8
Percent cankered trees	58	60	61	80

[1] One hundred 2-year-old seedlings planted March 1978. One-half of the trees were pruned and the other half left unpruned.

DISCUSSION

Nurserymen in Virginia have experienced a considerable loss of salable dogwood trees due to canker infection. The source of trees appears to be important. At planting, all of the trees in our research have been visibly free of canker, but a large number have become cankered after only one growing season. If the cankers are of the sunken type, the trees will probably die above the canker and frequently break off. The below-canker portion of the trunk and the roots may remain alive and continue to produce shoots. We have observed that some of the shoots will become cankered. On the other hand, trees that were apparently

free of canker for several years (as determined by close visual examination of the main trunk) have recently developed cankers in the upper branches. This late cankering has occurred on trees growing in close proximity to trees that are cankered but have survived for 5 years.

Fungicides ordinarily applied for leaf spot disease protection have been ineffectual against dogwood canker. This would suggest a systemic pathogen that is untouched by fungicides applied to outer plant surfaces, if the pathogen is indeed a fungus Dogwood trees are usually pruned to develop a single trunk and pruning wounds may serve as entry points for pathogens. However, unpruned trees in our plots had more cankers than pruned ones. No common fungal pathogen has been isolated from cankers. All attempts at causing cankers with fungi isolated from cankers has been unfruitful. Other pathogenic organisms should be considered as possible causal agents.

LITERATURE CITED

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RHODODENDRON PRODUCTION

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Rhododendron production in the U.S. was for many years centered in the Pacific Northwest, particularly in the Oregon and Washington area. It has gradually moved east and is progressing further south. We feel that the significant differences in our production are that we are growing finished plants in full sun at lower elevation and further south than has previously been reported on a commercial scale Otherwise our techniques are traditional.

Rhododendron production at Kinsey Gardens accounts for about one-third of our nursery sales. Our other major crops are azaleas and conifers. We are presently growing about 25 large-leaved rhododendron cultivars and several dwarf or small-leaved ones. Most of these are of H-1 or H-2 hardiness. The majority of