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WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION

CONTROL HEMLOCK CANKER

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Control Hemlock Canker[1]

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Introduction

FOR the past several years an undescribed resinous canker of hemlock, *Tsuga canadensis* (L.) Carr., has been killing plants in nurseries and home plantings. Nurserymen who grow hemlocks commercially have been particularly concerned with the disease. The disease has been observed in numerous nurseries; in some, 50 per cent or more of the plants have been destroyed. The canker affects the lower trunk and lower branches of small trees that are under cultivation. Hemlock canker may kill the trees, or may render them unsaleable because of the dead branches and discolored foliage which result from the disease.

Description of the Disease

Hemlock canker can be recognized by the resinous material that exudes from cankered areas on the lower trunk (Figures 1, 2). Soil particles caught in the resin while it is still fresh add to the mass and give it a somewhat scaly appearance. Affected trees usually can be detected in the field by their off-color and by dead and dying branches (Figure 3).

Early symptoms which frequently appear in the spring may be limited to the abnormal coloration. As the canker develops, the lower branches usually die first. The whole tree dies when the canker girdles the trunk. This may require a period of several years, depending on the size of the tree and on growing conditions. The bark frequently splits in cankered areas; the cracks may involve some of the bark on lower branches. Cankers may be confused with wounds made during the cultivation.

Cankers have been observed on trees from the seedling stage to trees more than 15 feet tall. They usually occur on trees less than 36 inches in height, the size group commonly found in nurseries.

The purpose of this bulletin is to report the cause of the disease, the conditions which favor it, and a practical method of control.

Distribution of Canker

Hemlock canker has been found in nurseries and ornamental plant-

[1]Taken in part from a thesis by the junior author submitted in partial fulfillment of the requirements for the M.S. Degree, West Virginia University.

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Figure 1. The early resin symptoms of hemlock canker.

Figure 2. An old canker showing the typical dried resin deposits.

ings throughout West Virginia. It is known to occur also in some of the surrounding states, and evidence would indicate that it may be found wherever hemlock is grown as an ornamental plant. The disease appears in locations where the plants are grown on heavy, poorly-drained soils, or areas in which frequent flooding may occur. Therefore the canker could be present wherever transplanted hemlock encounters excessive soil moisture.

Conditions Which Cause Hemlock Canker

Cankered hemlocks were usually found in poorly-drained bottomland or areas which were frequently flooded during the growing season.

The percolation rate of water into the soil in disease-affected areas was always considerably slower than the movement of water into the soil of disease-free sites. Percolation rate is a measure of the rate of water passage down through a saturated soil.

Some diseased trees have been found on hillside sites where surface drainage would appear to be good, but in such locations, the soil was found to be heavy and the internal drainage poor. The poorly-drained soil may be complicated still further by the planting hole, which often serves as a water container, particularly during wet weather.

Figure 3. Dead and dying branches may be evidence of the presence of a canker.

The fact that hemlock canker has not been found affecting trees growing under natural conditions is further evidence that it is not caused by a parasite. Hemlock normally grows in moist but well-drained sites in nature. It may also grow in relatively wet areas such as mountain bogs, but here the very widespread and shallow root system is apparently sufficient to maintain the plant despite the high water content of the soil.

Perhaps the difference in the type of root system found in wild and cultivated plants may have considerable bearing on canker development in wet locations. Hemlock in nature has a shallow, far-spreading root system; cultivated plants that have been root pruned have a relatively deep, compact type of root development.

Hemlock canker resembles a number of fungus diseases of evergreens and other woody plants. After testing the pathogenicity of *Micropera abietina* (Pk.) Hoehn. and other fungi, no evidence has been found that a fungus or any other parasitic organism is involved in the development of hemlock canker.

A number of other possible causes for the disease have been suggested and these were also explored. No evidence was found that this condition is correlated with the availability of nutrients or with soil acidity. Likewise, the type of pruning or shearing and the occurrence of cultivation injuries on the base of the plant can not be correlated with the presence or absence of the disease. The original source of the plants is also not a factor.

Healthy plants transplanted to unfavorable sites in the fall may develop canker symptoms early the following summer. One would expect plants to die over a period of years if a large planting were made in an unfavorable site.

On the basis of the available evidence, it is believed that the disease is not caused by a parasite but by periodic, prolonged flooding of the root system.

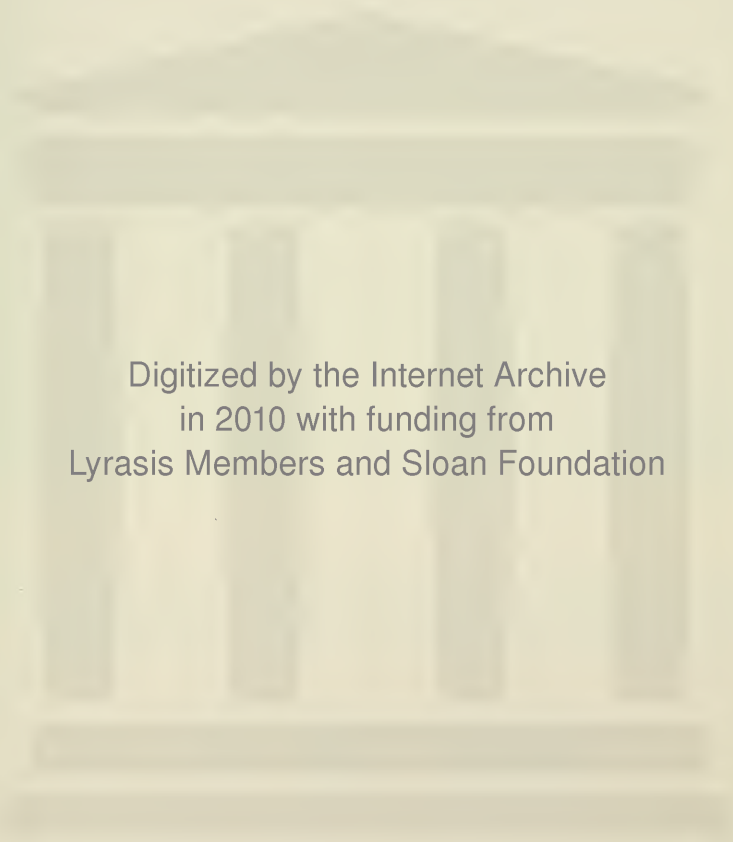
Control Measures

Since hemlock canker is always associated with soils having a very slow percolation rate and since no pathogenic organism has been associated with the disease, control is relatively simple. This disease can be avoided by selecting a favorable planting site for home or nursery plantings. It is most important to plant hemlock in a porous soil that has good internal drainage. In most instances, soils having a high percentage of sand and organic matter are the most favorable.

Soils having an underlying hardpan and soils subject to flooding by streams or those having a high water table should be avoided. In general, soils having a high clay content should not be used. It is also important to recognize that a sloping terrain does not necessarily indicate that the internal drainage is good. Heavy soils with poor internal drainage may occur on steep sloping terrain; these are just as unfavorable as wet, poorly-drained bottomland soils.

Some plants showing the early stages of hemlock canker can be salvaged by moving them to a favorable location. Once in a suitable location, the canker or cankers on the bottom of the trunk do not increase further in size and in later years are gradually overgrown. The effectiveness of this moving operation is mainly influenced by the stage of development of the canker and the availability of water after transplanting. The marked success of this control measure is additional evidence that a pathogenic organism is not involved in the development of this disease.

One other suggestion can be made for diseased hemlock in ornamental plantings. If it is desirable to leave transplanted hemlock in an unfavorable site after cankers have started to form, evidence indicates that the progress of the disease could be stopped by providing drainage away from the roots. This may be accomplished by ditching and placing a field tile drain to the side and below the level of the root system. This is particularly applicable to hemlock hedges. Tile drainage may also offer a solution to the problem of establishing plantings in recognized unfavorable sites, for example, in foundation plantings on a heavy, poorly-drained soil.



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