

MN 2000 EF 569

Agricultural Extension Service
University of Minnesota

Extension Folder 569
1981

DUTCH ELM DISEASE CAUSE AND PREVENTION

William J. Phillipson and Asimina Gkinis

UNIVERSITY OF MINNESOTA
DOCUMENTS
JUL 1 1981
PAUL CAMPUS LIBRARIES



Figure 1

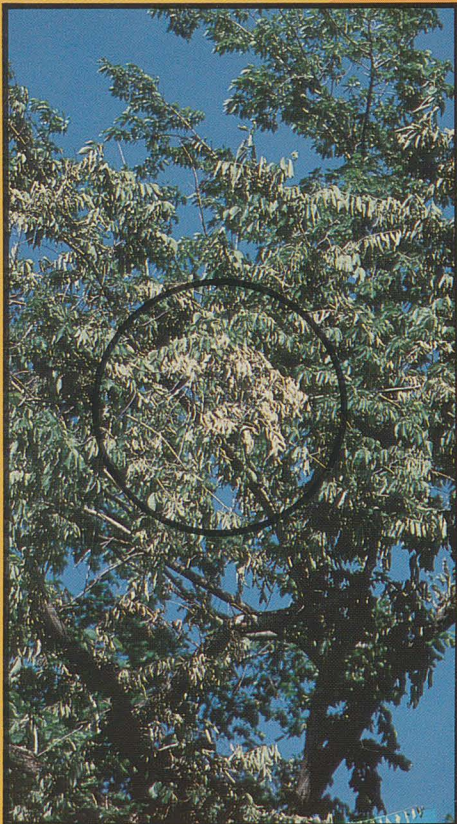


Figure 2

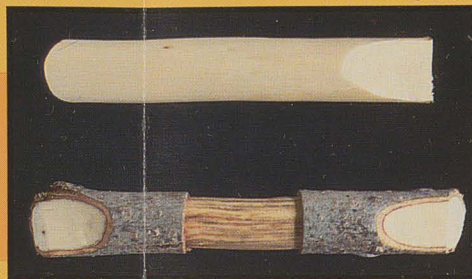


Figure 3



Figure 4



Figure 7



Figure 6



Figure 5



Dutch elm disease (DED) affects all native and introduced elm species. It is caused by the fungus *Ceratocytis ulmi*, which invades the water-transporting vessels of elms. The tree reacts to the fungus by producing gums and internal growths that plug the vessels, preventing the uptake of water and causing the tree to die. The leaves wilt, curl, turn yellow or brown, and eventually drop (figure 1). The wood directly beneath the bark becomes stained with brown or gray-to-blue streaks (figure 2).

The fungus is spread in two ways: (1) by beetles feeding on elm trees and (2) through roots connecting diseased and healthy trees.

Two kinds of beetles transmit the fungus: the smaller European elm bark beetle and the native elm bark beetle (figure 3). Both kinds are found only on elms. Beetles contaminated with fungus spores transmit the fungus to healthy elms during feeding. European beetles feed in small twig crotches in the tree's crown; native beetles feed in the larger branches.

After feeding, the beetles fly to dying or recently dead elms to lay their eggs in galleries they construct under the bark. Elm firewood as well as standing dead elms provide excellent breeding sites for the beetles (figure 4). The egg-laying galleries of the European beetle are parallel to the

wood grain (figure 5), whereas those of the native beetle lie across the wood grain (figure 6). In places where the disease has not occurred before, infections are always initiated by feeding beetles. Once in the tree, the fungus moves downward, invading the trunk and roots and eventually spreading to adjacent elms through root grafts, which are roots naturally fused together (figure 7). When the crowns of mature elms are touching, root grafting has probably taken place.

MANAGEMENT OF DUTCH ELM DISEASE

Prevention is the best way of combating Dutch elm disease. Preventive measures are most effective if organized on a community-wide basis, with the involvement and cooperation of the homeowner. Recommended disease management practices include: sanitation, root graft disruption, therapeutic pruning, fungicide injection, and insecticide application.¹

Sanitation

Sanitation—the removal and proper disposal of all dead or dying elms—is the key to a successful DED management program. It involves the following:

EARLY IDENTIFICATION

During the growing season, frequent inspections help in the detection of diseased elms early enough to retard disease spread through root grafts or by beetles. Inspections throughout the year help locate elm firewood, elm stumps, and dead elm trees and branches that may harbor bark beetles. Homeowners can aid their community DED program by identifying diseased elms or dead elm wood and relaying this information to their community forester.

PROMPT REMOVAL

Immediate removal of infected elms throughout the growing season greatly reduces the spread of the disease through root grafts or by beetles. Immediate removal of dying and dead elm wood with bark attached, grinding out of elm stumps with bark, and pruning of dead elm branches will eliminate potential breeding sites and substantial numbers of beetles.

PROPER DISPOSAL

All cut elm wood must be rendered safe from beetles and fungus if DED management is to be successful. Prompt debarking, chipping, burning, or burying elm wood are methods that make the wood unsuitable for beetle breeding. Chipping or debarking allows the wood to be used for mulch, animal bedding, trails, firewood, or other wood products.

Root Graft Disruption

Root graft disruption is the breaking of the underground root connections between diseased and healthy trees in order to prevent the disease from spreading through the roots. It must be done before the fungus moves into the roots of adjacent healthy trees. Root graft disruption can be accomplished either by mechanically trenching to a depth of three or preferably four feet around the infected trees, or by using the chemical soil sterilant Vapam. The infected tree is removed after the root grafts have been disrupted. Root graft disruption occurs immediately if a trench is installed and within 10 to 14 days if Vapam is used.²

Therapeutic Pruning

Therapeutic pruning is the removal of infected portions of an elm in an attempt to save the tree. This method is effective only if the elm has been infected via beetles and not through root grafts. If 5 percent or less of the tree's crown has wilted, and 8 to 10 feet of unstained healthy wood can be removed below the stained portion, therapeutic pruning will usually save the tree.

Fungicides

Injection of elms through numerous holes drilled in the tree's below-ground root flares can protect healthy trees from Dutch elm disease, using the highest legal dosage of the systemic fungicide Arbotect 20-S. Injection can also save infected elms, provided the wilt occurs in less than 5 to 10 percent of the crown and the symptoms appear after July 1. Carry-over infections from the year before or infections resulting from root grafts rather than from beetle feeding cannot be cured. Injection should be considered only for highly valued elms.³

Insecticides

Insecticides to control native elm bark beetles may be used to supplement sanitation and root graft disruption. In areas where native elm bark beetles are prevalent, adult beetles overwintering at the bases of healthy elms may be controlled by spraying the bottom part of the trunks of all elms in the community. Spraying entire trees to prevent beetle feeding during the spring and summer has not been effective, primarily because of the difficulty in completely covering the tree with insecticide. No amount of spraying could be as effective in eliminating bark beetles as proper wood disposal.⁴

1. A specialist should be consulted when applying control measures involving the use of any chemicals. For assistance, consult your county agricultural extension office.

2. For details on root graft disruption, see Minnesota Tree Line 4, "Root Graft Spread of Dutch Elm Disease and its Control."

3. For details on injection, see Extension Folder 504, "How to Inject Elms with Systemic Fungicides."

4. For details on trunk spraying, see Minnesota Tree Line 27, "Native Elm Bark Beetle Control."

Publications are available at county agricultural extension offices or from the Agricultural Extension Service, University of Minnesota.

Editor: Louise Jones

Designer: Rose Mauch

UNIVERSITY OF MINNESOTA



3 1951 D01 921 081 D

The information given in this publication is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Minnesota Agricultural Extension Service is implied.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Norman A. Brown, Director of Agricultural Extension Service, University of Minnesota, St. Paul, Minnesota 55108. The University of Minnesota, including the Agricultural Extension Service, is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, creed, color, sex, national origin, or handicap.

15 cents