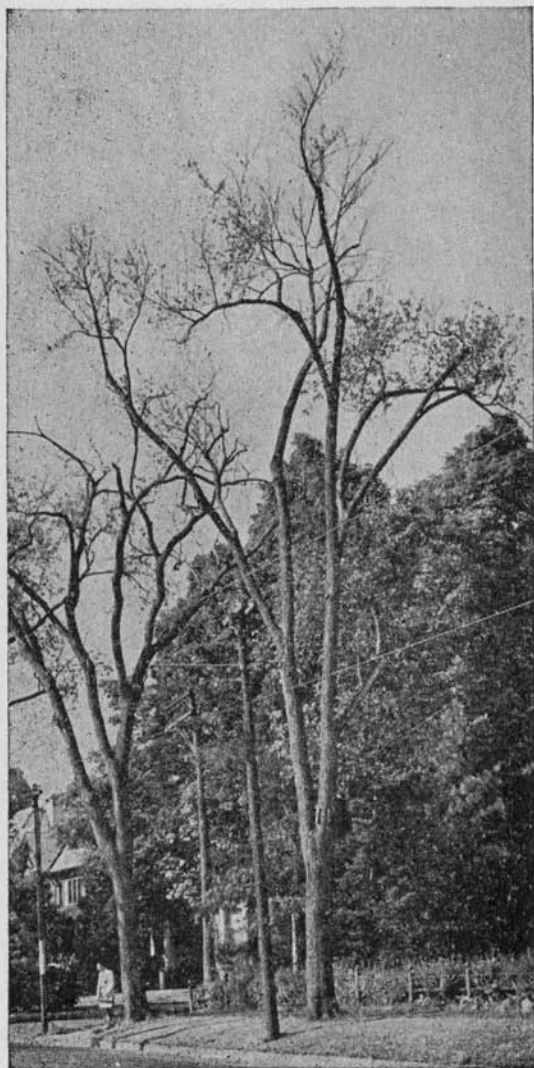


Combating the Dutch Elm Disease

A. E. Dimond and G. H. Plumb



**CONNECTICUT AGRICULTURAL EXPERIMENT
STATION, NEW HAVEN, CONNECTICUT**

Dutch elm disease continues to spread in Connecticut. Its probable future and, in brief, methods of combating it, are discussed in a companion leaflet, "Saving Your Valued Elms". This leaflet gives these methods in more detail so that the owner of trees may become familiar with what can be done to protect elms.

The information contained here is based on a careful evaluation of what we know about Dutch elm disease from research and from field observations.

Dutch elm disease is caused by a fungus that grows in the water-conducting parts of the elm. Its growth results in stoppage of these water vessels. The Dutch elm disease fungus is most commonly carried from tree to tree by elm bark beetles, although sometimes it passes from one tree to a nearby elm through root grafts beneath the soil.

There is still no sure way of preventing a tree from becoming diseased nor of curing a sick tree. Certain practices, however, are helpful in combating the disease.

Dutch elm disease may be fought in three ways: by making the tree more resistant to the disease with good general care; by attempting control of the elm bark beetles that spread the disease from tree to tree, or by combating the fungus that causes it.

Of the procedures given here, two are definitely still in the experimental stage. These are the use of highly concentrated DDT sprays to prevent twig crotch feeding by elm bark beetles and the use of oxyquinoline benzoate as a chemotherapeutic agent against the fungus.

Field tests conducted to date with the DDT formulations given below (see Protection of Healthy Trees, Step 3) indicate that crotch feeding by elm bark beetles may be prevented in most cases. Trees of small or medium size can usually be better protected than large trees since they are easier to spray and coverage is apt to be more thorough. Care must be taken not to over-spray when the trees are in foliage, or some damage to the leaves may result. A number of other plants, including Japanese maple and barberry, may be injured by spray drift or drip, or by careless spraying.

Oxyquinoline benzoate has been used experimentally in two ways in combating Dutch elm disease. It has been applied to healthy trees to protect them

from becoming diseased and to diseased trees in an effort to make them recover or at least to lessen the symptoms of disease. Used on healthy trees, oxyquinoline benzoate appears to give practical protection. Treated healthy trees do not become infected as readily as untreated healthy trees do. Trees diseased when treated usually die from Dutch elm disease although they may die more slowly than untreated trees would. Treating a diseased tree, therefore, is not practical in general. A few large trees have been cured by treatment, however.

Below are given procedures which may be followed by those wishing to protect trees now healthy or treat those showing disease symptoms. Some may be carried out by the individual himself; others require the services of a tree expert.

I. Recognition of Dutch Elm Disease

- A. Early symptoms may appear at any time during the growing season.
 1. The leaves on a twig or branch may suddenly turn yellow or brown, or may suddenly wilt.
 2. The sapwood, just under the bark, is always discolored in an affected twig or branch. This discoloration may be either a solid or discontinuous ring in cross section; the surface of the wood under the bark is brown. *Discolored sapwood is the most reliable indication of the presence of the disease.*
- B. Later symptoms on affected branches occur during the growing season. These consist of:
 1. Discolored sapwood.
 2. Thin foliage.
 3. Sucker growth along branches.
 4. Dead branches.

II. Protection of Healthy Trees

- Watering, Fertilization**
1. Water trees periodically and fertilize them with a complete fertilizer as needed. Trees so treated die less rapidly from Dutch elm disease if they contract it.
 2. Protect elms against leaf-eating insects (elm leaf beetle, cankerworm and Japanese beetle) and defoliation diseases (elm leaf spot). Elms which have been heavily defoliated are more

Control of Leaf-Eating Insects and Foliage Diseases

apt to contract Dutch elm disease and die more rapidly if they do become infected.

Leaf-eating insects can be controlled with either lead arsenate (6 pounds lead arsenate in 100 gallons of water, sprayed on the leaves when they are half unfolded and again three weeks later) or DDT sprays (2 pounds 50 per cent wettable DDT powder in 100 gallons of water, applied on the same schedule as given for lead arsenate, or see formulations given under Step 3 just below). The first spray application indicated below will at the same time control cankerworms. Elm leaf spot can be controlled by applying two sprays of Bordeaux mixture (2-2-50) two weeks apart, after the leaves are fully expanded and before the leaf spot disease appears.

3. (*Experimental. This procedure may be modified after further trial but is our best information to date.*) Apply DDT sprays for preventing crotch feeding by the elm bark beetle. Use the following formulations and spray schedule.

Thorough spraying cannot be done when high winds are blowing. Be sure emulsification is complete.

HYDRAULIC SPRAYER

	Apply April 15 to May 15	Apply July 1 to 15
DDT (Tech. grade).....	16 lbs.	8 lbs.
Xylene (Indus. grade) ..	4 gals.	2 gals.
Triton X-100.....	1 pint	½ pint
Water—to make.....	100 gals.	100 gals.

Xylene is highly inflammable and should be handled with caution. Apply the above with tree-spraying equipment, covering the tree thoroughly, especially the top. A large (30-inch diameter) tree may require 30 gallons of spray.

Solvents such as xylene are injurious to rubber spray hose and rubber gaskets. Spraying equipment should be washed out thoroughly immediately after using.

Control of the Elm Bark Beetle

MIST BLOWER

	Apply April 15 to May 15	Apply July 1 to 15
DDT (Tech. grade) . . .	10.0 lbs.	5.0 lbs.
Xylene (Indus. grade) . .	2.8 gals.	1.4 gals.
Triton X-100	1.0 pint	0.5 pint
Water—to make	10.0 gals.	10.0 gals.

Precise data cannot be given as the crown volumes of the trees will vary greatly with diameter. Approximate dosages for representative diameters are: For a 10-inch tree, 1 gal.; 20 inches, 3 gals.; 30 inches, 5 gals. Since this is a concentrated formula, the danger of injuring plants may be great, under some circumstances. Among trees that are susceptible to injury by it are Japanese red maples and barberry.

4. (*Experimental. The application of oxyquinoline benzoate is an experimental treatment which improves the chances that a healthy tree will resist infection. Trees may become diseased despite treatment, however.*) Apply oxyquinoline benzoate in solution to the soil around the feeding roots of the tree between May 1 and 15. This may be done by dissolving 13 ounces of the chemical in 100 gallons of water, and injecting this solution under 100 to 300 pounds pressure around the feeding roots at the rate of 5 gallons per inch diameter of the trunk. At this rate, a 24-inch tree receives a pound of chemical.
5. Trees seriously affected by Dutch elm disease (an entire main branch or more dead) should be removed and made harmless (see Treatment of Diseased Trees, Steps B-2, 3 below) if they stand nearer than 600 feet from trees to be protected.

**Control of
the Fungus**

**Removal of
Diseased
Trees**

III. Treatment of Diseased Trees

- A. Trees showing early symptoms of disease.
1. Become thoroughly familiar with the symptoms of Dutch elm disease.

These are given under Section I above.

2. Prune out infected wood and make it harmless (see Steps B-2, 3 below). To do this, see how far back from the outer tip of the branch the discolored wood extends. A length of healthy clear wood at least equal in length to that of the discolored wood should be pruned from this branch, if possible. Paint the wound with shellac and antiseptic tree paint if the wound is large. Early detection of symptoms and prompt pruning are imperative.
3. Water and fertilize the tree (see Protection of Healthy Trees, Step 1).
4. Protect against leaf-eating insects and defoliation diseases (see Protection of Healthy Trees, Step 2).

Pruning

- B. Trees showing advanced symptoms of Dutch elm disease. Such trees will eventually die.

1. Cut the tree down. Trees dead for more than one year will not spread Dutch elm disease.
2. Spray bark of felled trees completely with a 1 per cent solution of DDT in fuel oil to kill any bark beetles present therein as they emerge. This should be done between May 1 and 15, if the tree is felled between those dates, and between July 1 and 15, if felled after May 15. This spray is inflammable and injures grass and other plants. It also attacks rubber spray hose.

**Destruction
of Felled
Trees**

3. As an alternate to such spraying, peel off all bark except on branches an inch or less in diameter and destroy it by burning; or burn wood and bark. Such burning should be done before May 15, if the tree is felled before that date, or before July 15, if felled after May 15.