Dutch Elm Disease Control[1]

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On November 27 and 28 I attended a meeting of most of the research workers in the United States who work on Dutch elm disease control. Much research was presented on the use of Benlate to control the disease and the data was extensively discussed. In view of the results presented, I feel that a complete review of our control recommendations is warranted.

In this discussion we will not be concerned with other aspects of the disease. Anyone interested in DED control or anyone responsible for making control recommendations should be completely familiar with MSU Extension Bulletin 506, revised 1971, entitled Dutch Elm Disease Control.

Before we start to discuss the details of DED control, I would like to make one very important point--one I feel is often overlooked. There is no one single control program which is correct for all elms. The initial question which must be answered is, "How valuable is that elm tree to me and what am I financially willing to spend on control?" There are, as we will see, different degrees or levels of control. But the important point is to match the level of control to the value of the trees and financial resources of their owner. What is right for one city is not necessarily right for another. A group of owners whose average income is $10,000 and average property value is $25,000 would not be justified in carrying out a DED control program to the same level as a group where average income and property values are 3 or 4 times that amount.

The control of DED can be discussed in two ways. First, I would like to discuss each of the various methods of control and, second, to discuss how these methods fit together in an integrated control program.

1. Sanitation. Sanitation is the foundation of any community control program and without it all other actions are fruitless. Sanitation alone, if properly carried out, can significantly reduce the losses caused by the disease. Several communities with good sanitation programs are holding their annual losses to 3-5%. As the wild elms around these communities are eliminated, the degree of control achieved by sanitation alone is increasing. Certainly the greatest return per dollar comes from those spent on sanitation. Trees killed by the disease (or any other cause) located in urban or suburban areas must be removed sooner or later because of their liability to property and people. Prompt removal not only solves this problem, but is also the most important step a community can take in reducing DED.

To achieve a high degree of sanitation all trees must be checked for DED and the presence of elm bark beetles at least twice a year--late June and again in late July or early August. All diseased, dead or beetle infested

wood located in the first survey should be immediately destroyed. Similar material found later in the summer should be destroyed before May 1 of the following year.

2. Destruction of root grafts. The fungus which causes DED can move from diseased trees to healthy trees through root connections. Although the control of the vectors (elm bark beetles) has until recently received more attention than controlling the fungus, careful studies have shown that over 50% of the trees lost, particularly in communities with good sanitation and vector control programs, become diseased via root grafts. Any community seriously interested in controlling the disease should destroy any potential root grafts between diseased and healthy trees by mechanical or chemical means as described in Bulletin 506.

3. Insecticides. Methoxychlor, although perhaps not as effective or as inexpensive as the illegal DDT, clearly results in a significant reduction in the population of elm bark beetles and hence directly reduces disease levels. Again, see Bulletin 506 for details of use.

4. Sanitary pruning of diseased elms. Two recent studies on pruning diseased wood out of trees have shown that 20-30% of the diseased trees can be saved at least temporarily. Pruning must be done promptly, and the greater the development of the disease within the tree, the less are the chances of success. Any tree with multiple infections or with more than 10% of the foliage showing symptoms are poor candidates for sanitary pruning. If the pruning cut is made at least 6 feet below the last visible discoloration in the wood, the chances of successfully eliminating the disease are doubled. Sanitation pruning is probably only justified where the disease is restricted to a small portion of a specimen tree with high value. Communities with a good integrated control program should not allow pruning to weaken their sanitation program.

5. Benlate. Benlate is a systemic fungicide currently registered as an aid in DED control. Only trained, licensed pesticide applicators are permitted to use this chemical and then only as directed. A great deal of confusion about the merits of this compound has resulted, mainly because its use was approved before sufficient information on its effectiveness was available. Although there is still some disagreement among researchers concerning its effectiveness, many of the unknowns have been elucidated during the past summer.

Benlate, if properly used, will reduce the chance of an elm contracting the disease. However, it is not a cure-all and should never be used as a substitute for other control methods. It is the least effective and most expensive method of DED control.

There are three ways and only three ways that Benlate can be lawfully used as an aid in DED control: (1) mist blower application to the foliage of healthy trees, (2) injection into the trunk of healthy trees using some type of gravity feed, and (3) injection into the trunk of diseased trees using some type of gravity feed mechanism. Each of these uses will be discussed separately.

Tests in Michigan and Wisconsin have shown that when Benlate is applied to the foliage in late May or early June with a mist blower at a rate of 8 lbs per

100 gallons (enough for 15-30 trees) subsequent disease development is reduced as compared to disease development in unsprayed trees in the same area. This type of application will not protect trees against root graft transmission of the disease. In these studies, where DED incidence was already low, DED resulting from vector infections was reduced about 60%. This means a great many trees have to be sprayed and a large number of dollars expended to save a small number of trees. For example in Flint, Michigan, the incidence of disease in sprayed trees due to bark beetle infections was 1.2% versus 3.1% in untreated trees, or stated in another way, if one sprayed 1000 trees one would expect to lose 12 trees instead of 31 trees if no spraying occurred. Obviously, this use of Benlate is only justified on very valuable trees.

Additional points to remember about this type of application are:

1. It is totally ineffective as a cure for previously infected trees.

2. Applying the material with a hydraulic sprayer is not a registered method of application.

The injection of healthy trees with Benlate will also reduce the number of trees subsequently diseased by about 60%. This method of application has the advantage of restricting the application of the pesticide only to the tree--none is allowed to escape into the environment. However, no deleterious effects on the environment have been demonstrated from spray application. Another advantage is that no expensive equipment is necessary. Disadvantages are that the treatment must be made annually and hence the trees are wounded each year. Again, the most effective time of treatment is late spring or early summer which, because of the rather long time necessary to treat a single tree, makes it difficult to treat large numbers of elms economically. While effective to a degree like foliar application, this is a rather ineffective method of disease control from a cost-benefit point of view, and its use would only be justified on elms of unusually high value.

This type of treatment is very much in the news at the moment. But remember that some of the glowing reports you may read in the press refer to new experimental methods rather than those approved for use. Any type of pressure injection or acid modification of Benlate is not labelled for use. People applying Benlate using these or other non-approved modifications are subject to heavy penalties if prosecuted.

The third method of using Benlate for DED control registered by EPA is the injection of Benlate into diseased trees with less than 5% of the foliage showing symptoms at the time of treatment. Extensive testing of this method by several states during the past two years revealed that while Benlate injections delayed symptom development, it does not prevent tree mortality. This method of use, while still legal, will no longer be recommended by Michigan State University.

Research workers checking trees every 2-5 days have found it extremely difficult to detect diseased trees while symptoms are still restricted to 5% of the tree. Often symptoms of 5% will increase to 10% in a single day. To expect city crews to detect a significant portion of the diseased trees with only 5% crown infection is unrealistic. Even though it is only 20-50% effective, sanitary pruning is the best control method when a tree is partially infected.

REMEMBER, ALL other applications of Benlate for DED control are not registered, even though they may, in some areas, be widely used. Any person or group using or recommending any such modification are in violation of the law.

We have now discussed the various methods of DED control Now, how can these methods be integrated into a successful DED control program, first for a community and secondly for an individual elm owner outside of a control area?

DED can be controlled on a community-wide basis. The necessary technology has been available for at least 20 years and many municipalities have controlled the disease using this knowledge. Exactly what can and should be done depends on the value of the elms and the economic resources of the owners. The bare minimum that any group should do is sanitation, for these funds must be spent sooner or later to remove the dead trees. A good sanitation program costs little more than no program at all.

The second level of control would be to add root graft control and/or methoxychlor application. If properly done this 3-prong attack should keep annual losses to less than 2%. Those communities that have the resources and want to do everything possible to control DED should use Benlate as an additional protectant. Trees which for some reason or other could not be sprayed with methoxychlor would be treated with Benlate. Especially valuable trees could be treated with both materials as the protective value would be additive.

The individual who owns an elm outside of a control area is going to have an extremely difficult job in preventing DED mainly because no meaningful sanitation program can be carried out. However, disease control might be possible for the few elms which for some reason remained alive after most of the surrounding elms have died. By this time nature has conducted her own sanitation program and the number of elm bark beetles and the amount of fungal material have been greatly reduced compared to the epidemic years. Certainly the least expensive program and perhaps as effective as any other program under these circumstances would be to watch the tree very carefully for any symptoms of DED. At the first signs of wilt, the diseased portion would be pruned. An owner with greater economic resources and a valuable tree should consider spraying with methoxychlor or treating with Benlate. While the degree of control achieved with these materials would not be as great as when used in a community program, certainly their use would decrease the risk of DED. If more than one tree is involved and they are less than 30 feet apart, then root graft control will be necessary. This could be done even before any of the trees become infected to be sure the grafts are non-functional.

While the odds are heavily against an individual saving any particular elm, those owners who have the resources and inclination can save some of these elms or at least prolong their life.

Other methods of combatting DED have been suggested or are under investigation. DED resistant elms are a possibility and some selections have already been released. If a truly disease-resistant tree with desirable horticultural traits could be developed, this would be the ultimate in DED control as, once established, no additional expense would be required. However, no such tree exists and it is doubtful if it will exist in the near future. Recent research has shown the fungus which causes DED to be very variable with some strains much more pathogenic than others. The Dutch who worked to develop resistant trees for 50 years have found that some of their most promising selections are susceptible to these new strains of the fungus. There are many other problems involved in the development of disease resistant trees such as susceptibility to other diseases, especially phloem necrosis, and winter hardiness.

Occasionally, one reads about other DED cures such as zinc nails, kerosene, epsom salts or some other mysterious potion for which the creator claims great things. Many of these materials have been carefully tested as control agents in federal or state laboratories. None have significantly reduced DED and none are registered for use in Michigan.

Hopefully, we have learned a lesson from DED; Diversity. Never again can we allow 50-90% of the shade trees in a community to be of a single species. While man may like to have a whole avenue or subdivision of one type of tree, this is extremely hazardous because nature can retaliate dramatically and destructively against uniformity. Many midwestern communities lost nearly all their shade trees in a decade or less because nearly all their shade trees were elms. Much of nature's strength lies in her diversity. Rarely does a single factor such as disease wipe out a species in undisturbed nature. It is only when man enters the picture and unifies the environment that the stage is set for an epidemic. Most serious plant diseases are host specific. Therefore, even if a serious pest does attack, only a small portion of the total need be lost if the original risk was spread among many species.

In summary, what would I do if the trees and money available for control were mine? My decision on my final course of action would be heavily dependent on the value of the trees and on my financial resources, as should be the case with any group charged with this responsibility. Priorities would have to be established between elms based on their relative value to me and on the various control methods available based on their cost and relative effectiveness. But assuming I had reached the opinion that the trees were worth saving and I had only a single dollar available, I would spend that on sanitation. If a second dollar were available, I would use that one for root graft control. The third dollar would be spent on chemical control. Depending upon a number of variables already discussed, this dollar would go for methoxychlor spraying or for a combination of methoxychlor and Benlate treatment.

My fourth and last dollar would go for research. It is this last dollar, so rare in recent years, that will in the long run prove to be the most wisely spent.