The West Virginia Department of Agriculture American Chestnut Program

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ABSTRACT.— The objective of the West Virginia Department of Agriculture chestnut program is to improve blight resistance in American chestnut by selective breeding. Living American chestnut trees displaying blight resistance are being located throughout West Virginia. Presently, two of the more promising trees are heavily cankered. Most blight-resistant trees occur singly in isolated areas. They produce no nuts because of the lack of other chestnuts for cross pollination. To solve the pollination problem, a seed orchard of blight-resistant American chestnut is being established by grafting American Chestnut scions to Chinese chestnut rootstock. Although there have been incompatibility problems, the technique appears to be successful enough to warrant continued work. Open pollinated seed from the orchard will be collected, stratified, planted, and the resulting seedlings screened for resistance. The selection and breeding of blight-resistant progeny will be repeated in an effort to produce an American chestnut with a high degree of blight resistance.

The West Virginia Department of Agriculture's American chestnut (*Castanea dentata* [Marsh.] Borkh.) program began in 1973 as a response to interest expressed by departmental personnel. The method chosen to restore the American chestnut is a selection and breeding program modeled after work conducted in the 1950's at West Virginia University (Childs, 1968) and more recently at the University of Tennessee (Thor, 1973).

This program involves only the use of American chestnut with the following principles being employed:

1. Blight-resistant American chestnut must be located and evaluated.
2. A breeding orchard from resistant trees will be established.
3. The time between generations must be reduced.

FINDING AND EVALUATING TREES

In the search for blight-resistant American chestnut trees, beauty is not considered and trees that are not infected are avoided. Even saplings less than 2.0 cm in diameter are acceptable provided they are cankered but still continue to grow. Over 50 trees displaying some degree of blight resistance have now been located. The selection of suitable trees is a continuous process so that a broad genetic base for resistance will be maintained.

Two types of cankers are acceptable in the selection of blight-resistant trees. The first is defined by the production of roughened corky swellings that encircle the stem at the point of infection. The second is a typical sunken lesion accompanied by a ridge of callus tissue at the edge of the canker that apparently restricts the infection. In either response, several years are required for the fungus to overcome the host reaction.

Two of the more promising trees were found in Doddridge County, West Virginia. These large old trees are heavily cankered but still alive. Two sprouts apparently displaying blight resistance have been located near one of these trees. This suggests that suspected blight resistance in these sprouts may have resulted from the sexual recombination of resistant parents.

ESTABLISHING A BREEDING ORCHARD

As a rule, trees with breeding potential occur singly in isolated areas and produce no nuts because of self-sterility. To establish a breeding orchard, a technique is needed to asexually reproduce the blight-resistant trees. Large trees cannot be transplanted and there has been little success with air layering and rooting. Thus, at the present, grafting appears to be the most appropriate means to asexually reproduce these trees. With the better clones represented at one location, the chances of a superior seedling being produced through open pollination are greatly enhanced.

Chestnut grafting is difficult because of problems with graft incompatibility. However, moderate success has been achieved with both bark and cleft grafts when used to unite scions with three to five year old chestnut root stock (Bailey, 1920). Bark grafts have also shown promise in top working mature Chinese chestnut (*Castanea mollisima* Bl.) trees.

To date only Chinese chestnut seedlings have been used as rootstock in the West Virginia program. One advantage is that some American clones tend to bear early when united with Chinese chestnut rootstock. Future work will include rootstocks from Japanese chestnut (*Castanea crenata* Sieb. and Zucc.) and chinkapin (*Castanea pumila* [L.] Mill.) in an effort to overcome incompatibility problems.

REDUCING THE TIME BETWEEN GENERATIONS

Once the initial breeding orchard is established and producing seed, open pollinated seed will be collected, stratified, and planted. The resulting seedlings will then be grown to a size of 2.0 cm in diameter, inoculated with virulent isolates of *Endothia parasitica* (Mum) P. J. & H. W. And. and screened for blight resistance. The most promising seedlings will be selected and used to produce subsequent generations.

When dealing with crops such as the American chestnut, a number of years are required for a seedling to reach nut-bearing age. Several generations may be required to produce a tree with a high degree of blight resistance. It is therefore essential that a means be found to decrease the time between generations. In an effort to minimize this problem, large Chinese chestnut trees will be top grafted with scions from the most promising seedlings. These grafted scions are expected to bear seeds within four years. By combining the top grafting technique with the rearing and screening program, the time between generations could be reduced to less than ten years.

Many of the trees located to date are not suitable American chestnut trees that would survive to maturity. Yet, through man's intervention, a blight-resistant American chestnut may be produced. It is essential that breeding orchards be established and germ plasm exchange initiated to hasten the development of blight-resistant trees.

LITERATURE CITED

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