Wire Girdles Increase Male Flower Production on Young Loblolly Pine Grafts

Gordon White and J. A. Wright

Research and development supervisor, Alabama Timberlands, Champion International Corp., Courtland, AL, and graduate student, Oxford Forestry Institute, University of Oxford, England

Wire girdles applied near the branch base of 4-year-old loblolly pine (Pinus taeda *L.) grafts increased by fourfold the yield of male flower clusters over an equal number of ungirdled branches. Wire girdling is now being used as a routine operation to increase pollen production for accelerated breeding in industrial breeding orchards.* Tree Planters' Notes 38(3):33-35; 1987.

The Alabama Timberlands of Champion International Corporation has selected 105 phenotypically superior loblolly pines (*Pinus taeda* L.) from old-field plantations in northern Alabama, south-central Tennessee, and north-central Mississippi. These selections, along with 3,000 additional selections by other members of the North Carolina State University--Industry Tree Improvement Cooperative, will make up 84% of the Cooperative's future genetic base for loblolly pine in the southern United States (5).

Members of the Cooperative are committed to an ambitious, but realistic, goal of breeding these plantation selections by 1992 (6). The best individual trees of the best families from this breeding effort, as determined by progeny tests, will then be incorporated into second- and third-generation operational seed orchards and breeding clone banks for the fourth generation production orchards.

The operational plantings from this tree improvement effort are estimated to produce 50% or more volume per acre over a 30-year rotation than plantations established with unimproved seed. The total process is expensive and any technique that can shorten this breeding and testing cycle will pay handsome dividends.

Breeding requires that pollen be available from the correct male parent at the time the selected female parent is receptive, and breeding cannot be completed until each male and female parent produce flowers in sufficient quantities to systematically breed the target population. Male flower development and pollen production usually lag behind the female flower development, although this can vary considerably from clone to clone. Therefore, the lack of sufficient pollen from a designated male parent to pollinate a particular female parent can delay the breeding process and greatly lengthen the time required to complete the necessary crosses, test the progeny, and incorporate the material into production orchards.

One method demonstrated to hasten male flower development and production of pollen in pines is to apply a wire girdle near the base of potential pollen-bearing branches (2). Bark-girdling techniques have been used for many years to stimulate early flowering in the horticultural trade. Partial girdling of pines has also been tried in attempts to achieve similar results, but the success has been variable and often poor (4).

Treatment of 7-year-old loblolly pine with branch girdles, gibberellic acid, and naphthaleltic acid resulted in an eightfold increase in male flowering (3). The girdle was made by removing strips of bark, each strip covering three-fourths of the branch circumference. This method of girdling resulted in nearly 50% mortality of the branches treated. A simple wire girdle applied in February has been used to promote male flowering on loblolly pine grafts the year following the application of the girdles (1,2).

Methods

In February 1982, three clones were selected in a breeding orchard that had been grafted in 1979 and 1980. In the lower third of the crown of each selected graft, four branches were chosen on two ramets of the three clones. Two branches were selected as controls and were not girdled, the other two branches were girdled. An 8-in. segment of 17-gauge electric wire was snugly fastened near the base of the branches (fig. 1). The following

Figure 1—*Wire girdle on loblolly pine branch to promote male flower production. Additional wire loops with flagging used to support girdled branch.*

spring all branches were inventoried for male flowers. The results were sufficiently encouraging to increase the number of girdles in 1983.

In February 1983, branches on two ramets of 40 clones, three ramets of one clone, and one ramet of three clones were girdled. A total of 251 girdles were attached to these 4-year-old grafts. Branches were selected in the same manner as in the initial trial in 1982. These were inventoried in the spring of 1984.

Results and Discussion

There were 71 branches lost to mechanical or natural causes, leaving 180 girdled branches. Each girdled branch was inventoried for male flower clusters and an equal number of ungirdled branches on the same tree were also inventoried for male flower clusters (table 1). Pollen production varied by clone, but clone by girdling interactions were not analyzed. Girdled branches remaining from the 1982 trial continued to produce pollen in two subsequent years. Tests on 2-year-old field grafts did not produce pollen.

This test girdling of 4-year-old field grafts increased male flower production when branches in the lower third of the crown of grafts receiving intensive cultural treatment were stressed with wire girdles. The current technique uses

Table 1—*Results of branch girdling of 4-year-old loblolly pine grafts*

Treatment	No. of branches	No. of branches with male flower clusters (No.)	(%)	Total No. of male flower clusters
Girdled	180	131	73	452
Ungirdled	180	10	6	113

preformed 7-in. black 18-gauge wire and a twister used in the construction trade to fasten reinforcing rod prior to the pouring of cement.

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