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# Age of Hybrid Poplar Stools At First Cut Influences Third-Year Cutting Production

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**ABSTRACT**.—Reports that omitting first-year harvest of hybrid poplar stoolbeds increased third-year cutting production by 230 percent.

KEY WORDS: Stoolbed management, cutting age, hybrid poplar, cutting production.

Short rotation intensive culture (SRIC) hybrid poplar plantations are usually planted with unrooted hardwood "cuttings" of genetically identical clonal material (Hansen *et al.* 1983). Cuttings are made from 1-year-old stems of clonal material obtained from nursery stoolbeds. Stoolbeds consist of stumps (stools) containing multiple stems or coppice of 1-year-old shoot growth. The stools are generally planted at 1- by 1-m spacing or less (Dickmann and Stuart 1983, Hansen and Netzer 1986).

Stoolbeds are often cut after the first growing season to harvest the available cuttings and to encourage multiple stem development in the second growing season. However, the first year's growth consists mostly of small single stems, and few cuttings are produced. Removing the aboveground portion of a tree during this important phase may weaken the tree and prolong its establishment period. Stoolbeds commonly need 3 years to reach full production.

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As demand increases for hybrid poplar planting stock for various tree planting programs, farm woodlots, or energy plantations, new ways will be needed to rapidly increase nursery cutting production.

We conducted a study to determine if stool age at first harvest influenced the number of cuttings produced in later years. Specifically, does a stool first cut at 2 years produce more cuttings in the third harvest year than a stool cut at both 1 and 2 years?

## METHODS

The study area was located at the North Central Forest Experiment Station's Harshaw Forestry Research Farm near Rhinelander, Wisconsin. Hybrid poplar research has been conducted at this location since 1975. Soils are Padus loam (mixed, frigid, coarse loamy Alfic Haplorthod). Soil texture ranges from a silt loam to a sandy loam with a plow pan at 25 cm; pH ranges from 6 to 7.

A hybrid poplar production stoolbed was established in the spring of 1987 by planting unrooted hardwood cuttings. It contained 35 DN (*Populus deltoides* x *P. nigra*) clones and 8 NE clones of various parentages developed at the Northeastern Forest Experiment Station (table 1). The stoolbed consisted of one 5- by 6-m block of each clone. Thirty stools were planted at a 1- by 1-m spacing in each clonal block with a 2-m lane around each block. The clones were not replicated because the stoolbed was originally planted for production purposes. This study was superimposed after differences were noted in production between cutting treatments.

Weeds were first controlled by applying linuron at 2.2 kg/ha active ingredients (a.i.) in the fall of the year before planting. Thereafter, reinvading weeds were controlled with herbicides applied each spring before bud-break. The herbicides consisted of linuron at 2.2 kg/ha a.i. and glyphosate at 1.1 kg/ha a.i. The 2-m lane between clonal blocks was rototilled to control weeds as necessary. The stoolbed was irrigated when soil water potential reached -0.05 MPa as determined with tensiometers.

The first stoolbed harvest was in the fall of 1987 after the end of the first growing season. One-half of each clonal block (15 stools) was cut 7.5 cm above ground level. During the second harvest (fall 1988), the same 15 stools of each clone were recut and the remaining 15 stools were cut for the first time. At the end of the third growing season (fall 1989), the number of cuttings produced were counted for both of the harvesting sequences for each clone. Cutting length was 25 cm with a minimum diameter at the small end of 1.3 cm. From preliminary subsampling, we determined that not all stools had to be measured to show significant treatment effects. Consequently, only three stools from the center row of each harvesting treatment were measured to determine cutting production. Although one border stool was included in each group of three stools, comparisons made by ANOVA showed no bias in cutting numbers/stool between border stools and interior stools.

Cutting production for the first and second year was not measured. Based on prior experience, we knew there would be few cuttings the first year, and an increased number the second year, either from coppice of stools harvested the first year or from the terminal and upper branches of those not harvested until the end of the second year. However, we had no data with which to compare production during that time period.

Average number of cuttings produced per stool during the third year was calculated for each clone and treatment. Cutting production differences between harvesting treatments and between parentage groups were tested with the t-test. Significant differences were determined at $p = 0.01$. Because there were no replications, we could not determine if there were significant differences between individual clones.

## RESULTS AND DISCUSSION

There were large differences in third-year stoolbed cutting production between the two harvesting treatments (table 1). Third-year production of stoolbeds not harvested the first year was more than double (230 percent) than that of stoolbeds harvested both the first and second years. These production differences were highly significant and were consistent for all 43 clones regardless of parentage except for NE242. There was no significant difference in treatment response between the deltoides x nigra clones and clones of other parentages.

These findings substantiate our previous observations and recommendations to wait until after the second growing season before harvesting a stoolbed for the first time (Hansen *et al.* 1983). Nursery managers who will need large numbers of cuttings in the future may be able to significantly increase future production by foregoing the first-year harvest. We did not measure the effect of cutting treatment on second-year production, or on fourth-year and later production. Production differences in these years, when combined with the third-year production, may accentuate or offset the third-year production differences found in this study. Also, because various factors such as soils, culture, and climate may affect these results, it would be prudent for nursery managers to test cultural techniques like this under local conditions before applying them on a large scale.

## LITERATURE CITED

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Table 1.—*Third-year cutting production by clone and parentage*[1]

| Clonal number | Populus parentage | First-year harvest treatment | | | |
|---|---|---|---|---|---|
| | | Cut | Standard deviation | No-cut | Standard deviation |
| | | Cuttings per stool | | | |
| DN128 | deltoides x nigra | 3.0 | 1.7 | 9.7 | 3.8 |
| DN129 | deltoides x nigra | 6.0 | 3.5 | 15.3 | 6.6 |
| DN130 | deltoides x nigra | 5.0 | 3.5 | 9.0 | 3.6 |
| DN132 | deltoides x nigra | 3.7 | 0.6 | 7.7 | 1.5 |
| DN133 | deltoides x nigra | 7.0 | 1.7 | 8.3 | 6.6 |
| DN134 | deltoides x nigra | 3.3 | 2.1 | 8.3 | 2.1 |
| DN135 | deltoides x nigra | 2.7 | 1.2 | 3.7 | 1.5 |
| DN137 | deltoides x nigra | 1.7 | 1.2 | 9.3 | 2.3 |
| DN138 | deltoides x nigra | 5.7 | 4.0 | 12.3 | 2.3 |
| DN139 | deltoides x nigra | 3.0 | 1.0 | 12.0 | 2.6 |
| DN141 | deltoides x nigra | 6.3 | 4.7 | 7.3 | 1.5 |
| DN142 | deltoides x nigra | 3.0 | 1.0 | 11.3 | 3.2 |
| DN143 | deltoides x nigra | 3.3 | 1.2 | 6.5 | 0.7 |
| DN144 | deltoides x nigra | 2.7 | 2.1 | 3.3 | 1.5 |
| DN145 | deltoides x nigra | 1.7 | 1.2 | 9.3 | 3.5 |
| DN147 | deltoides x nigra | 5.0 | 3.0 | 9.0 | 2.6 |
| DN148 | deltoides x nigra | 3.7 | 0.6 | 4.3 | 2.5 |
| DN150 | deltoides x nigra | 2.3 | 0.6 | 8.0 | 2.8 |
| DN151 | deltoides x nigra | 3.7 | 1.5 | 16.0 | 0.0 |
| DN153 | deltoides x nigra | 5.7 | 5.0 | 11.0 | 3.0 |
| DN154 | deltoides x nigra | 2.7 | 1.5 | 4.7 | 2.5 |
| DN156 | deltoides x nigra | 4.3 | 1.2 | 15.3 | 6.0 |
| DN157 | deltoides x nigra | 4.3 | 3.2 | 11.0 | 4.0 |
| DN159 | deltoides x nigra | 4.3 | 1.5 | 12.3 | 2.3 |
| DN160 | deltoides x nigra | 4.3 | 3.5 | 12.3 | 8.3 |
| DN161 | deltoides x nigra | 4.0 | 3.6 | 14.3 | 5.8 |
| DN162 | deltoides x nigra | 3.0 | 1.7 | 7.3 | 2.1 |
| DN164 | deltoides x nigra | 4.0 | 1.7 | 13.3 | 1.5 |
| DN165 | deltoides x nigra | 6.7 | 1.2 | 8.7 | 2.5 |
| DN166 | deltoides x nigra | 1.7 | 0.6 | 3.7 | 0.6 |
| DN168 | deltoides x nigra | 4.0 | 2.0 | 9.0 | 1.0 |
| DN169 | deltoides x nigra | 6.3 | 3.0 | 10.7 | 2.3 |
| DN170 | deltoides x nigra | 3.7 | 2.9 | 9.3 | 1.2 |
| DN171 | deltoides x nigra | 1.0 | 0.0 | 5.3 | 1.5 |
| NE 20 | 'Charkowiensis' x 'Caudina' | 5.0 | 1.0 | 10.0 | 2.8 |
| NE 50 | maximowiczii x 'Berolinensis' | 5.7 | 2.1 | 12.5 | 12.0 |
| NE52 | maximowiczii x 'Plantierensis' | 2.0 | 1.0 | 3.5 | 0.7 |
| NE225 | deltoides x 'Caudina' | 3.7 | 2.5 | 5.0 | 5.2 |
| NE237 | deltoides x 'Volga' | 1.7 | 0.6 | 8.0 | 1.7 |
| NE242 | deltoides x 'Plantierensis' | 6.3 | 2.1 | 4.0 | 1.4 |
| NE285 | nigra x trichocarpa | 3.7 | 2.5 | 6.3 | 5.8 |
| NE300 | Betulifolia x 'Plantierensis' | 5.5 | 2.1 | 16.0 | 3.5 |
| | Average = | 4.0 | 2.0 | 9.1 | 3.1 |

[1] Cutting number is average of three stools.