A comparison of three methods of black walnut plantation establishment

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Growth and survival of black walnut (Juglans nigra L.) tubelings, 1-0 nursery stock, and direct-seeded nuts were compared in a plantation establishment trial in eastern Iowa. The tubelings were grown in 5 cm (2 in.) by 38 cm (15 in.) solid-wall paper tubes filled with a soil-peat-perlite mixture. Results after three growing seasons showed that the tubelings had poorer height and survival than either the 1-0 seedlings or the plants from the direct seeding.

Introduction

In 1970 a field trial was initiated in eastern Iowa to compare the survival and growth of black walnut *(Juglans nigra* L.) using three planting methods: (1) tubelings (seedlings grown in soil-filled paper tubes); (2) 1-0 nursery stock; and (3) direct. seeded nuts. Plantings were set out on two old-field sites on two dates; final measurements were made in 1972 after the third growing season in the field,

Methods

Two old-field sites in eastern Iowa were planted: an upland sandy loam site and a bottomland sandy site. Drainage was good on both areas, and mottling was not seen in either soil. The sites were plowed and disked before planting, and weeds were controlled periodically by cultivation or herbicides the first 2 years.

The plantings were set out in blocks consisting of three 10-tree rows-one row for each planting method. Two such blocks were established at both sites on both dates. Thus, a total of 80 1-0 seedlings, 80 tubelings, and 80 seed spots were planted.

Plantings were established on June 11 and June 30. Originally, planting dates had been scheduled in April. May, June, and July to test seedling response to planting date, but the first two plantings were unavoidably delayed, and the planting scheduled for mid-July was planted June 30 when the tubelings were ready earlier than anticipated.

The 1-0 seedlings had been lifted from the nursery the previous fall and stored over winter in a cooler. At the time of planting, their height and diameter 5 cm (2 in.) above the root collar averaged 23 cm (9 in.) and 7.1 mm (9/32 in.).

Nuts for the direct seeding and the tubelings had been collected near Amana. Iowa, the previous fall and stratified over winter in plastic bags at around 3°C (38°F). Two nuts were planted about an inch deep at each seeding spot and covered with a screen cone to protect them from animals. The cones were removed when the seedlings were several inches tall. Where both nuts produced a seedling, the smaller of the two was removed.

The tubelings were grown in solidwall paper tubes 38 cm (15 in.) long and 5 cm (2 in.) in diameter, which had been made using waterproof, nontoxic glue. The top 5 cm (2 in.) of each tube was dipped in melted paraffin to eliminate any "wicking" effect the paper may have had on soil moisture after planting. The tubes were then filled with an equal-volume mixture of soil, peat, and perlite.

The tubelings were grown in the greenhouse 11 weeks before the first planting and 5 weeks before the second planting. At the time of field planting, both sets of tube seedlings averaged 23 cm (9 in.) in height and 3.6 mm (4-5/32 in.) in diameter.

Final height and survival measurements were made in late July 1972 after the height growth for that

year had been completed. "Survival" for the direct-seeded nuts was the percentage of seeded spots on which at least one seedling survived.

Results

An analysis of variance based on the 10-tree row means showed that the method of establishment significantly affected the height and survival of the seedlings. Average heights and survival rates were as follows:

Planting method	*Height*		*Survival*
	Cm	*Inches*	*Percent*
1-0 seedlings	88	35	72
Planted nuts	73	29	74
Tubelings	67	26	50

Time of planting significantly affected seedling height. but there was also a significant interaction between time of planting and planting site. The June 6 seedlings were taller than the June 30 seedlings on the upland site but shorter on the bottomland site. However, the average height of all June 6 seedlings (both sites) was greater than the average height of all June 30 seedlings-80 cm (31 in.) vs. 72 cm (28 in.). Survival was not significantly affected by planting date.

The greatest differences in height and survival were associated with the two planting sites. The average height and survival (over both planting dates and the three establishment methods) for the upland site was 106 cm (42 in.) and 82 percent: comparable values for the bottomland site were 46 cm (18 in.) and 48 percent. These differences may have been partly caused by greater weed competition on the bottomland site, even though the weeds and grasses were controlled periodically on both sites the first 2 years.

Overall. 69 percent of the tree mortality occurred the first year and the remaining 31 percent the second and third years.

Several seedlings established by each of the three methods were dug at the end of the first growing season. By that time, the paper tubes had completely disintegrated. but in none of these was there any lateral roots growing beyond where the tube walls had been. On these tubelings, the tap root extended several inches to a foot or so below the bottom of the tube. and numerous lateral roots extended from this lower portion of the tap root. In contrast, the seedlings established from nursery stock or direct seeding had lateral roots on the entire length of the tap root. Average air-dry root weights at the end of the first growing season, based on 6 to 8 seedlings each, were: 44 g for the 1-0 seedlings: 7.6 g for the direct-seeded seedlings: and 6.4 g for the tubelings.

Discussion

Obviously, the tubeling method as used here offered no advantages for either height growth or survival of the seedlings. The lack of lateral roots inside the tubes indicates that some condition(s) there inhibited first-year root growth. In a study in Michigan, White et al. (1970)[1] attributed slow growth of black walnut tubelings grown in a loam-peat medium in solidwall paper tubes to poor aeration.

Although both of these studies have shown poor results for the solidwall, soil-filled paper tubes, other types of containers or filling media may give considerably better results for black walnut and should be tested.

'D. P. White. G. Schneider, and W. Lemmien. Hardwood plantation establishment using container grown stock. Tree Planters' Notes 21(2): 20-25. 1970.

News and Reviews

Fall seed crop was low to moderate, so beware! Don't use the wrong seed source just for the sake of having adequate numbers of seedlings to plant next spring. One of the biggest mistakes made in tree planting is planting seedlings from the wrong source. This is especially true for coastal loblolly: the seed crop was nil this year. If you have any seed source questions. request "Guide for Planting Southern Pines" from Southeastern Area, State and Private Forestry, 1720 Peachtree Rd., N.W. Atlanta. Ga. 30309. Also helpful is "Results of the Southwide Pine Seed Source Study Through 1968-69" by Ossie Wells. Write him at Southern Institute of Forest Genetics, Gulf port, Miss. 39501.

Effects of site preparation on pine survival and wildlife habitat were measured recently in study of three. year old plantations by North Carolina Division of Forest Resources. David B. South found that best survival and the most free growing loblolly pines were found on bladed and piled areas in the Piedmont and sandhills: fireplow furrows and burned-only areas were best for sandhills longleaf and slash pine plantations. (Free growing trees are seedlings with at least their terminal leader growing and free of competing vegetation.) Chopping and burning seemed to work better on poorer sites. All methods provided fairly good wildlife habitat.
Caution: These were 3-year old plan. rations: the situation later may be different. Write for Forestry Note 9 to: North Carolina Division of Forest Resources, P.O. Box 27687, Raleigh. N.C. 27611.

(Above, courtesy Jan. 1975 **"Forest-Gram South.")**