

## Comparison of planting stock for establishing black walnut in central Kansas

WAYNE A. GEYER<sup>1</sup> AND FREDERICK D. DENEKE<sup>2</sup>

1. Forestry Division, Throckmorton Hall, Kansas State University, Manhattan, KS 66506 (wgeyer@ksu.edu). Author for correspondence.
2. USDA Forest Service, Cooperative Forestry, Washington, D.C.

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Reliability and cost of different types of planting stock under various climatic and site conditions are important. We tested three types of planting stock for survival and growth: bare-root seedlings, nuts, and container stock of black walnut. In this study, in which we had good soil fertility, weed control, and moisture, we found no difference in the success between the three types of plantings. If seed predation problems may exist, using bare-root, dormant seedlings in the spring for establishing typical forestry plantings is encouraged; otherwise seeds may be used if in an open field site.

*Keywords:* Black walnut, *Juglans nigra*, planting stock, containers, nuts, seedlings.

### INTRODUCTION

More than 3,000 landowners plant nearly 700,000 trees and shrubs each year through the Kansas Forest Service Conservation Tree Planting program. Low-cost materials are provided for use in establishing field, home, and livestock windbreaks; woodlots; and riparian, wildlife, and Christmas tree plantings. Black walnut (*Juglans nigra* L.) is an important species distributed in this program, in as much as it is the most valuable timber tree species in the central states.

In the early 1960s generally poor results were obtained in black walnut tree planting, but seedlings were more successful than planting seed (Rambo 1966). Planting seeds offer several advantages over planting seedlings, such as development of normal taproots, ease of storage and movement, spring or fall planting, and use of seeds selected for high-quality trees instead of run-of-the-mill seedlings (Van Sambeek 1988). Direct seeding is also a cost-effective technique (Robison, Yoder, and Hoss 1997). Because problems arise with rodent pilferage of the nuts, direct seeding is not often used (Erdman 1966) and results with direct seeding have been mixed

(Den Uyl 1949, Rogers 1949, Siedel 1961). Successful seeding has been experienced essentially where the rodent populations are low or when planted a considerable distance (300 feet, 90 m) from field/woods borders because predators are reluctant to stray far from cover (Schlesinger and Funk 1977). Container stock is employed in areas where acute stress is experienced, such as reclamation of strip-mine coal spoils or regions of limited rainfall. An extensive lateral root system may allow containerized seedlings to adapt better to adverse sites more quickly. Container planting is the most expensive of the three methods of establishment.

This field study was designed to test whether there is an advantage to using direct seeding with stratified nuts or container stock materials, compared with the generally more-reliable bare-root seedlings.

### MATERIAL AND METHODS

In 1976, materials used by the Kansas Forest Service tree distribution program were planted in a field trial located near Manhattan, Kansas. Annual precipitation in this

continental climate zone is about 80 cm (32 inches). One-year-old, common nursery-run, bare-root seedlings, stratified walnut seed, and container seedlings were hand planted in a randomized complete-block design on a 12-foot by 12-foot spacing. Container seedlings were grown in one-quart milk containers measuring 2x2x8 inches, containing a mixture of equal amounts of soil, vermiculite, and peat moss. Ten replications of four-tree plots each were established, for a total of 120 plants.

The planting site was an old field site of deep, fertile, silt loam soil with no nearby trees to harbor squirrels. A KBC planting bar was used to hand plant the materials in February 1976. Three stratified nuts were planted at a 5-cm (2-inch) depth and covered with soil. Shortly after germination, they were thinned to one plant. Soon after planting, it became evident that the containerized plantings were infected with phytophthora root rot (*Phytophthora citricola*) and many subsequently died. All vacant containerized seedling positions were replanted in June with current-season containerized plants (six to eight weeks old). The area was cultivated for three years after planting. Survival and tree measurements (height and dbh – “diameter at breast height,” 1.4 m (4.5 feet) above the ground) were made at four, nine, and twelve years. Data were analyzed by using the analysis of variance (ANOVA) statistical procedure. Significance is at the 5% level.

## RESULTS

In this study, survival remained nearly 100% for all 12 years (Table 1). At age 20, some overtopped trees had begun to die, and the stand was thinned from below to increase diameter growth of those remaining. Mean total height growth was 12.6, 30.8, and 40.0 feet, respectively, at 4, 9, and 12 years. No significance difference among planting stock types was found at any age. Mean diameter growth was 5.5 and 6.7 inches, respectively, for 9 and 12 years. Again no difference was found between types.

## SUMMARY AND CONCLUSIONS

Reliability and cost of different types of planting stock are important under various climatic and site conditions. The standard method for planting is use of bare-root seedlings. Direct seeding with walnut seed is encouraging because of its low cost, and could be used if adequate rodent protection is assured. Under more stressful site conditions, container stock may be desirable. In this study, in which we had good soil fertility, weed control, and moisture, we found no difference between the use of three types of planting stock. Dierauf and Garner (1984) found the same results in a 7-year study in Virginia. If predatory problems may exist, using bare-root, dormant seedlings in the spring for establishing typical forestry

Table 1. Growth of black walnut trees by planting method. No significant differences were found ( $p = 0.05$ ) for any type of stock at any age.

Type	Four years		Nine years			Twelve years		
	Survival %	Height (ft)	Survival %	Dbh (in)	Height (ft)	Survival %	Dbh (in)	Height (ft)
Container	100	11.9	100	5.2	30.7	100	6.4	38.9
Seed	100	12.8	100	5.7	30.7	100	7.2	40.9
Seedling	100	13.0	100	5.6	31.0	99	6.6	40.3

plantings is encouraged; otherwise seeds may be used if in an open field site.

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