

ESTABLISHMENT RATES FOR DIFFERENT BAREROOT GRADES OF TREES^{1,2}

by Margaret Litzow and Harold Pellett

Abstract. Establishment rates of eleven grades of bareroot green ash were compared at two locations for three growing seasons. Three whip and two branched grades consistently showed the greater percentage increases in trunk diameter than the other six grades. There were large differences in growth rates and survival between the two locations. In the clean-cultivated plots all trees survived and after three growing seasons 8'-branched and smaller grades had at least doubled in trunk diameter. Similar size trees planted at a different location in high grass and mulched with wood chips had poorer survival rates with no grades doubling in average trunk diameter.

In city and park reforestation projects, tree and tree planting costs are critical. Larger grades of shade trees cost more and require more labor to plant but offer more immediate landscape effects than do smaller grades. If smaller grades can "catch up" to larger more costly grades one or two years after planting then greater numbers of small trees that are easier to handle can be planted at an equal cost.

A study was initiated in the spring of 1979 to compare establishment, survival and initial growth rates of shade trees of different sizes.

Materials and Methods

Five trees of each of eleven grades of green ash (*Fraxinus pennsylvanica*) (see Table 1), from 3' whips to 2" bareroot and 2" B & B were planted at each of two locations. One group was planted April 18, 1979, at the University of Minnesota Landscape Arboretum in Chanhassen and grown under clean cultivation. Another group was planted on May 31 at Hyland Lake Park in Bloomington, Minnesota. The Hyland Lake trees were planted in high grass and mulched with wood chips to cover a 4-6' diameter around the trunk. No supplemental watering or fertilizing was done in either location. A completely random design was used at both locations. Soil analyses of the

Arboretum clean-cultivated plot and the Hyland Lake plot indicate that the soils are similar in pH, texture and nutrient analysis. The locations are about twelve miles apart.

On April 28, 1980, three grades of linden (*Tilia cordata* 'Greenspire') and four grades of Norway maple (*Acer platanoides*) were placed at the Horticultural Research Center in Excelsior, Minnesota and grown under clean cultivation. Five trees per grade were planted.

Growth measurements for the green ash study were made at the end of each of three growing seasons and for the linden-maple study at the end of each of two years. Measurements were taken of trunk circumference 30 cm from the soil line. Bud break data were taken on the linden-maple study on June 13, 1980.

Results and Discussion

The three whip (3', 4' and 5') and two branched (3' and 4') grades of green ash consistently showed the greatest percentage increase in growth at both locations (Table 1). The data for the 3'-branched grade at Hyland are limited due to small sample size. The 8'-branched grade showed little difference from the larger grades until after three years at which time it had doubled in trunk diameter (Table 1). Of the remaining grades (1 1/4" - 2") the percent increase decreased as the grades got larger. At the end of three growing seasons, no grade above the 8'-branched had doubled in trunk diameter. There was little difference in growth rates between the 2" bareroot and B & B grades.

In the green ash study planting location resulted in large differences in tree survival and growth rates. All trees survived the transplanting operation. However, smaller trees concealed in high

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Table 1. Final average diameter, average % increase in diameter and % survival for different grades of green ash after three growing seasons.

<i>Tree grade</i>	Hyland Park			Arboretum		
	<i>Final diameter (cm)</i>	<i>% Increase</i>	<i>% Survival</i>	<i>Final diameter (cm)</i>	<i>% Increase</i>	<i>% Survival</i>
3' Whip*	2.0**	88	33	4.1	305a	100
4' Whip	2.4**	69	20	5.2	288a,b	100
5' Whip	2.6	75	80	5.4	243b,c	100
3' Branched	2.5	57	40	5.2	251b	100
4' Branched	3.0**	74	20	5.5	198c	100
8' Branched	3.7	26	100	6.3	108d	100
1¼"	4.3	22	60	6.7	85d	100
1½"	4.9	19	80	6.5	69d	100
1¾"	5.3	11	60	7.1	65d	100
2" Bareroot	5.6	10	100	7.6	60d	100
2" Balled & Burlapped	5.6	15	100	7.9	57d	100

*Only three trees of this grade were planted at Hyland Lake Park

**Based on one tree

*Mean separation by Duncan's multiple range test, 5% level. Means not followed by the same letter differ significantly at the 5% level.

Table 2. Average diameter increase, average % increase in diameter and % survival for different grades of 'Greenspire' littleleaf linden and Norway maple after one and two growing seasons.

<i>Tree grade</i>	First Year			Second Year		
	<i>Increase in diameter (cm)</i>	<i>% Increase</i>	<i>% Survival</i>	<i>Increase in diameter (cm)</i>	<i>% Increase</i>	<i>% Survival</i>
'Greenspire' Linden						
6' Branched	0.1	3	80	0.4	20	60
7'	0.1	5	60	0.9	38	60
1½"	0.1*	2	20	0.4*	9	20
Norway Maple						
4' Whip	0.1	11	100	0.9	89	100
6' Whip	0.2	18	100	1.1	82	100
1"	0.1	3	100	0.7	23	100
1¼"	0.2	4	100	0.6	17	100

*Based on one tree

grass at Hyland Lake Park were susceptible to damage by maintenance equipment. All trees were stressed from grass competition.

Table 2 summarizes the first and second years' growth and percentage survival for the linden-maple study. All grades of Norway maple had 100% survival with the two whip grades showing the greatest percentage increase in growth. The lindens had poor transplant survival and growth rates. On June 13, 1980, two trees of the 6'-branched grade, one of the 7' grade and one of the 1½" grade had no bud break. By fall, 1980, only one of the 1½" grade was alive.

Although limited in scope, this study can be used when choices must be made among different tree grades for planting in landscape situations. There is no standard best grade: rather, many factors must be considered. Often larger grades are used because they offer an "instant landscape" effect. Smaller grades, however, grow faster and may be able to "catch up" to the larger grades after a few years. Survival rates of

different grades within a species or cultivar must also be considered. Lindens under adverse growing conditions might have better survival rates if smaller trees are planted. Smaller trees on the other hand are more subject to vandalism or injury by maintenance equipment. All trees, regardless of size, suffer dramatic reductions in growth rates when grown where ground cover competes with the trees for water and nutrients (Table 1).

More research is needed to determine transplant success and growth rates not only for trees of different grades but also for different species. More research is also needed on survival of trees of these smaller grades in cities and other areas of high human pressures. These types of data will aid in determining practical and economical planting guidelines.

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ABSTRACT

Chapman, Douglas J. 1982. **Coffeetree works well as city tree.** *Weeds, Trees & Turf* 21(1): 66.

Kentucky coffeetree is an exciting tree that offers potential in parks, as a city street tree or in the individual landscape. It is tolerant of difficult soil conditions, is a good competitor, will thrive when grown in grassy areas, and has few or no insect problems. There are no catastrophic insect or disease problems to affect this plant. It joins a select list of trees well suited as city street trees — hackberry, scarlet oak, honeylocust, and common horsechestnut.