

# English Oak Grows Better Than White Oak of Comparable Seedling Size<sup>1</sup>

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*Large-grade seedlings of English and white oak survived better than those of medium grade and small grade. English oak averaged 24-percent taller than white oak at age 8, but height was related to seedling size in both species.*

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Thirteen-year-old English oak (*Quercus robur* L.) trees were reported to have 45 percent greater height and twice the diameter of southern Michigan white oaks (*Q. alba* L.) of the same age (8). The apparent superior growth of the English oak may, however, be related to initial seedling size because English oak nursery stock tends to be larger than white oak stock (3), and seedling size has been shown to affect subsequent performance in several hardwood species. For example, trees grown from large stock of birch (*Betula pubescens* Ehrh. and *B. pendula* Roth), yellow poplar (*Liriodendron tulipifera* L.) and sweetgum (*Liquidambar styraciflua* L.) survived better and were taller than those grown from smaller stock (2, 5, 1). Similarly, large seedlings also produced taller trees of sycamore (*Platanus occidentalis* L.), northern red oak (*Q. rubra* L.),

American elm (*Ulmus americana* L.), and green ash (*Fraxinus pennsylvanica* Marsh) (7, 4, 6). Therefore, the objective of this study was to compare the survival and growth of English oak and white oak seedlings of three size classes.

## Methods

Acorns were sown in the fall of 1973 in the Union County Nursery near Jonesboro, Ill. The white oak acorns were collected locally, and the English oak acorns came from trees of unknown geographic origin planted on the Michigan State University campus at East Lansing, Mich. The seedlings were lifted in the fall of 1974 and kept in cold storage until the following spring. Seedlings of both species were sorted by stem caliper into lots of 100 each of three grades: Small (4/32 in), medium (6/32 in), and large (8/32 in).

In March 1975, the seedlings were planted on the Trail of Tears State Forest in Union County, Ill. The site is on Haymond silt loam and had been planted in corn the previous year; therefore, no ground preparation was done before planting. Six 33-tree rows were planted in each of three blocks at a spacing of 12 feet (3.66 m) between rows and 6 feet (1.83 m) within rows. Because this plantation was intended as a demonstration planting, one row of small English oak was followed by a row of small white oak; next came one row of medium English oak followed by a

row of medium white oak; and then came one row each of the large grade. The same systematic arrangement was used in all three blocks. No herbicide was used the year of planting; but in the spring of 1976 and 1977, each row was strip-sprayed (1 .2 m wide) with Simazine herbicide at a rate of 5.6 kilograms of active ingredients per hectare.

Tree height and survival were recorded after seven growing seasons in the field (age 8 from seed). Analysis of variance and Duncan's multiple range test were used to test for differences between species and among size classes after arcsin transformation of survival percentages.

## Results

Survival averaged 82 percent in both English oak and white oak. Although survival tended to improve with increasing seedling size in English oak, the differences among grades were small (table 1). Small white oak seedlings survived slightly better than medium seedlings, but the difference was not statistically significant (table 1). Because survival was about equal in the two species, the data were combined and analyzed for differences among grades. The result showed that large seedlings had significantly better survival than those of medium and small grades, which did not differ from each other.

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<sup>1</sup>This study was carried out in cooperation with the Division of Forest Resources and Natural Heritage, Illinois Department of Conservation.

**Table 1.**—Mean survival and height of English oak and white oak of three seedling grades after 8 years

Species	Stock size	Survival <sup>1</sup>	Height <sup>1</sup>	C.V. <sup>2</sup>
		%	M	%
English oak	Large	88.0ab	2.58a	54
	Medium	85.7ab	2.25b	49
	Small	71.8c	1.810	31
White oak	Large	89.4a	2.13b	61
	Medium	75.8bc	1.68c	46
	Small	78.0abc	1.56c	40

<sup>1</sup> Means followed by a common letter do not differ significantly at  $P = 0.05$ .

<sup>2</sup> C.V. = coefficient of variation.

English oak averaged 2.24 meters in height at age 8 and was significantly taller than the white oak, which averaged 1.80 meters. Height was, however, related to seedling size in both species (fig. 1). In English oak, trees grown from the medium -grade and large-grade seedlings were, respectively, 24 percent and 42 percent taller than those grown from small seedlings. All differences among English oak grades were statistically significant (table 1). Medium-grade white oak trees were 8-percent taller than small-grade trees, but the difference was not significant. Large-grade white oaks were 36-percent taller than the small grade and significantly taller than those of the medium and small grades (table 1). When the data for the two species were combined, the differences in height among the three grades were all significant.

Although English oak, on the average, was taller than white oak, some white oak trees grew as well as or better than certain English oak trees. For example, large-grade white oaks were taller than small-grade English oaks and not significantly shorter than medium-grade English oaks (table 1). Individual trees of each species varied greatly in height (table 1) as was also found in a previous study (3). Much height variation was also observed within each seedling size class. The tallest individual white oak (3.9 m) was a large-grade tree; in comparison, the tallest English oak (5.2 m) was a medium-grade tree.

#### Discussion

This study shows that, although seedlings of English oak and white oak survived equally well, large-



**Figure 1.**—Eight-year-old English oak (left) and white oak (right) grown from seedlings of large grade (top), medium grade (center), and small grade (bottom). The pole is 5 feet (1.5m) tall.

grade seedlings had better survival than those of medium and small grades. English oak, on the average, was 24 percent taller than white oak at age 8, which confirms

previous reports of its superior early height growth. However, height was closely related to initial seedling size in both species, so substantial growth gains can potentially be obtained by using larger seedlings. Because of the large amount of height variation in white oak, it may be possible, through progeny testing and selection, to find some white oaks that grow as well or better than English oak.

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