Proceedings of the Iowa Academy of Science

Volume 56 | Annual Issue Article 12

1949

# Direct Seeding of Black Locust for Production of Posts in Southern Iowa

J. M. Aikman
*Iowa State College*

G. R. Cooper
*Iowa State College*

# Direct Seeding of Black Locust for Production of Posts in Southern Iowa *

By J. M. AIKMAN AND G. R. COOPER

Probably no woody plant has been introduced as widely, in as great numbers, in as short a period of time as was the black locust, *Robinia pseudoacacia* L. in the middle 1930's. The desirable qualities of this species have been emphasized by a few enthusiastic advocates since the latter part of the seventeenth century. It was because of these early favorable reports, based chiefly on limited observations rather than on scientific investigations, that the black locust came to be regarded as a tree which would survive under the most unfavorable conditions and led to its selection in 1934 as a post tree for general planting in gullies for soil holding purposes, and on sites of every degree of erosion for soil building purposes.

Subsequent failure, for no predictable reason, of the tree to become established and grow in numerous sites has resulted in the initiation of many experiments in an attempt to solve various phases of the problem of the ecological requirements of black locust. The conflicting results obtained have prevented any decisive conclusion as to the relation of site quality and cultural methods to establishment and growth of the species.

Based on a critical evaluation of pertinent literature and of their own research, however, Grant (6) and Grant and Readey (7) have emphasized certain deductions which in general would seem to be valid: 1. That locust growth is variable. 2. That certain soil conditions are important factors in limiting the growth of locust. 3. That this species makes its best growth on deep, fertile, moist but well-drained soils. 4. That it makes its poorest growth on excessively drained (underlaid by coarse sand) or poorly drained soils (underlaid by a tight impermeable layer). 5. That the growth of black locust is not likely to be of economic value on eroded soils even where there is good subsoil drainage. 6. That locust establishment may be obtained on some abandoned and eroded fields provided the proper cultural treatments of plowing, harrowing, mulching, and fertilizing are carried out. 7. That there is need to continue study of soil relationships to the growth of black locust to provide concrete and specific measurements and descriptions for the use of those charged with the responsibility of site selection and management of this species.

* Journal Paper No. J 1646 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project No. 1010.

The experimental results of several workers are in general accord with these conclusions. Roberts (9) found that correlation between depth of surface soil and locust height growth cannot be expected if this species is planted on thin soil in eroded fields or on other poor sites. Auten (2), from a study of existing locust stands in central-eastern United States, was unable to show any significant correlation between the 50-year height growth of dominant trees and the amount of soluble phosphorus, organic carbon, total nitrogen or the pH value of the site, but determined that there was a close correlation between height growth and physical soil properties of the site which effect drainage and aeration, such as soil plasticity, compactness and structure.

Turner (10) reported that in Arkansas low, poorly drained land and extremely steep or rocky hillsides, especially those with southern exposure usually devoid of vegetation, should be avoided as black locust sites. He recommended cultivation for at least two years after planting.

Meginnis (8) showed that cultivation of young black locust resulted in increased leaf area, both through increased size and through an increased number of leaves. Measurement of the season's growth of branches indicated that cultivation induced much more satisfactory growth. Contrary to results obtained by other workers, Gibbs (5) reported that the value of furrowing as a means of encouraging growth of pines and locusts was not sufficient to justify the time and expense involved. In contrast he emphasized the value of selection and mulching.

Barger (3) and Cooper (4) reported results of the same experiment on the effects of site preparation on the growth of black locust on eroded Lindley silt loam at the close of the first and seventh years of tree growth. The location of the experiment was at the Floris experiment station in southern Iowa. Barger obtained satisfactory establishment of the locust under narrow bench-terrace treatment on the contour, with and without cultivation, and also under heavy mulch treatment on the contour without other site preparation. Trees planted on the contour with only scalping for weed control were not well established. Based on growth data covering the entire 7-year period, Cooper found that the differences in rate of growth between the first 3 treatments and the scalping treatment were still maintained with the possible exception of the mulch treatment. Although the depth of top soil was less (4 inches) than is usually recommended for locust planting, an adequate sample of cut posts from the uncultivated, narrow bench-terrace treat-

ment had an average butt diameter of 3.75 inches and a top diameter (at 7 feet) of 2.45 inches in seven years. The same measurements for the trees of the scalped treatment were 2.95 and 1.92 inches.

The experiment on the direct seeding method of producing black locust posts was initiated in 1940 on a south-facing slope adjoining the 1941 site preparation experiment. Tree growth conditions were comparable except that on the direct seeding site, the average top-soil depth was 3 inches. The two sites were in the same field and had lain idle since abandonment in 1935.

The narrow bench-terrace method was used in preparing the site for this experiment in 1940. Three furrows on the contour, were plowed all one way, progressively more shallow from the down-hill furrow which was only 6 inches deep. The narrow bench was levelled and a shallow furrow was opened down the middle of it with a one horse plow. The planting furrows on the benches were on the contour and were therefore not equally spaced at all points. The average spacing between the rows was approximately 8 feet.

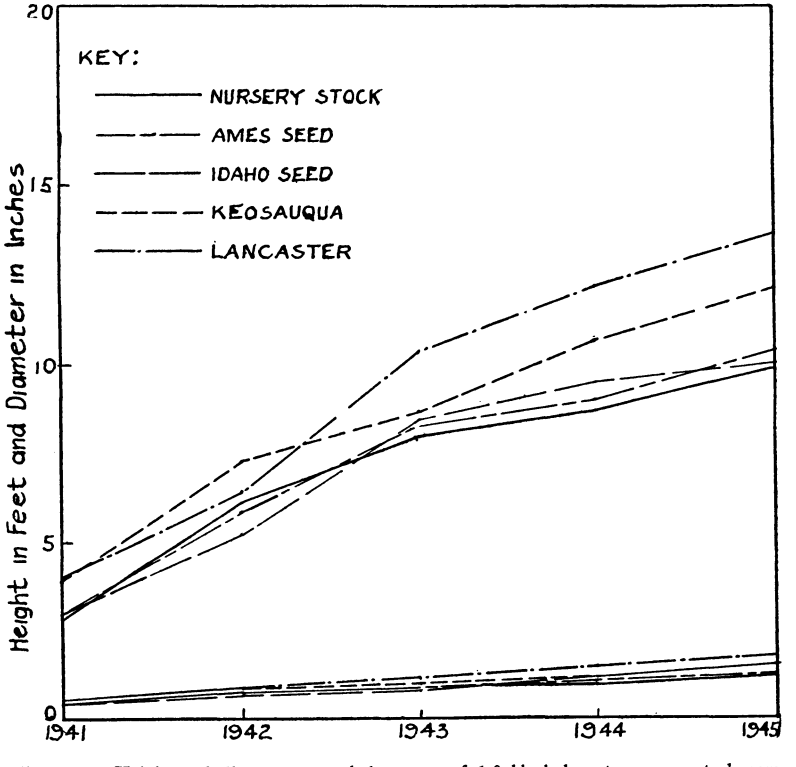


Figure. 1. Height and diameter growth by years of 1-0 black locust nursery stock compared to direct seeding from four different seed sources.

Black locust seeds from an Idaho source were obtained for comparison with selected seed from well-formed and apparently adapted trees at Ames, Iowa and, as near the planting site as possible, at Keosauqua, Iowa and Lancaster, Missouri. The seeds were scarified in a quart fruit jar with a handful of pebbles. The planting rows were divided into segments of ½ chain (33 feet) and the seeding order in the row was at random. There were 8 replications.

The seeds of the four selections were planted in May at an approximate rate of 6 to the foot. They were cultivated with a single row corn cultivator once before thinning and once after thinning the first year and twice the second year. In late July either the east or west half of each 33-foot segment was selected at random for thinning at approximate 2-foot spacing. Even-sized and spaced plants were selected and the remaining ones were pulled or hoed out.

All of the seedlings were removed from the other half of the segment and in late April of the second year, 1941, matched 1-0 nursery stock was transplanted in this end of each segment at the 2-foot spacing. Idaho seeds of the same source as those planted in the seeded segments of Idaho seed the previous year, were used in growing the nursery stock at the Soil Conservation Service, Ames nursery. At the end of the 1941 growing season each row segment contained 16 black locust plants of the same age, 8 of which were well established 1-0 transplants and 8 were thinned seedlings from one of the four seed sources, grown in place. They seemed to be well matched for size with a possible advantage in favor of the nursery grown plants which had suffered some disturbance from transplanting.

Growth curves based on average height and diameter measurements are shown in figure 1. It may be noted that the growth rate of the transplants the first year was slightly higher than that of the direct seeded plants of the Idaho and Ames seed sources, which indicated that the nursery stock showed no ill effects from transplanting. The trees which were grown in place from seed selected in the general vicinity of the experiment seemed to have a distinct advantage. Degree of establishment may have constituted part of the advantage but the seeded trees from the other two sources should have had the same advantage. The rate of growth of the trees from locally selected seed was higher following establishment, and this advantage is shown from the growth curves not to be a temporary one.

There would seem to be little to be gained in the direct seeding method of establishing black locust from commonly used Idaho

seed except that the expense and difficulty of buying and shipping stock could be eliminated. However, the growth data indicate that it would be advantageous to use the direct seeding method in establishing black locust trees from superior trees selected locally.

**Literature Cited**

1. Aikman, J. M. 1945. Put hilly land to work. Iowa State Col. Farm Sci. Reporter. 6, 4:8-11.
2. Auten, John T. 1936. Soil profile studies in relation to site requirements of black locust and black walnut. Central States For. Exp. Sta. Note 31.
3. Barger, G. L. 1942. Response of black locust seedlings to variations in environmental conditions in the field. Unpublished M. S. Thesis. Library, Iowa State College, Ames, Iowa.
4. Cooper, George R. 1948. Some responses of black locust to planting site treatment. Unpublished M. S. Thesis. Library, Iowa State College, Ames, Iowa.
5. Gibbs, J. A. 1940. Five years of tree planting in the Ohio Valley. Soil Conserv. 6:146-149.
6. Grant, Theodore J. 1940. A method for judging quality of planting sites for black locust. Soil Conserv. Serv., U. S. Dept. Agr. TP-34.
7. Grant, Theodore J. and J. C. Readey. 1939. Preliminary report of black locust growth in relation to soil site requirements. Soil Conserv. Serv., U. S. Dept. Agr. Typewritten manuscript.
8. Meginnis, H. G. 1934. The effect of cultivating young black locust. Journ. For. 32:569-71.
9. Roberts, E. B. 1939. Soil depth and height growth of black locust. Journ. For. 37:583-4.
10. Turner, Lewis M. 1937. Growing black locust. Rev. Ed. Univ. of Ark. Col. of Agr. Ext. Cir. 327.

DEPARTMENT OF BOTANY
IOWA STATE COLLEGE
AMES, IOWA