Black Walnut Growth Increased When Interplanted With Nitrogen-Fixing Shrubs and Trees

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Introduction

Because black walnut (*Juglans nigra* L.) trees are valuable for both wood and nuts, new ways are always being sought to accelerate their growth. Recently, it was found that walnuts grow more rapidly when interplanted with nitrogen-fixing plants. We conducted this study to determine which species of nitrogen-fixing plant has the greatest affect on walnut growth.

Methods

In the spring of 1967, 1-year-old nursery-grown walnut seedlings were planted at an 11- by 11-foot spacing in southern Indiana on a well-drained Parke silt loam soil with a 2 to 6% slope.[1] Two years later, autumm olive (*Elaeagnus umbellata* Thumb.), European alder (*Alnus glutinosa* (L.). Gaertn.), and black locust (*Robinia pseudoacacia* L.) were interplanted with the walnuts and lespedeza clover (*Lespedeza striata*) was broadcast sowed with the walnut seedlings. The nurse trees were planted between the walnut trees, which altered the spacing to 11- by 5½-feet after interplanting. Each treatment plus a pure walnut control was randomly assigned in each of three replications. The interplanted plots contained six rows of six walnut seedlings, five rows of six nurse trees, and a border row of walnut and nurse trees surrounding the 36 walnuts being studied.

Weeds were controlled for 5 years with amazine at a rate of 4 pounds active ingredient per acre in all plots except lespedeza clover. An 18-inch strip of the herbicide was sprayed between the rows each spring. Alder and black locust were especially susceptible to the herbicide and autumn olive was somewhat susceptible. All dead interplanted trees were replanted after the first two growing seasons. Herbicide was not used in the lespedeza plots, and the clover was never established, even after resowing.

After the fifth growing season some of the locust trees were overtopping the walnut trees so all locusts were killed by frill-girdling. The walnut trees were correctively pruned as needed (2). Height and diameter of the study trees have been measured annually and difference verified by analyses of variance.

Results

Height differences among treatments were apparent after the second growing season (Fig. 1). Walnut trees interplanted with European alder were tallest after the second and third growing seasons and differences among

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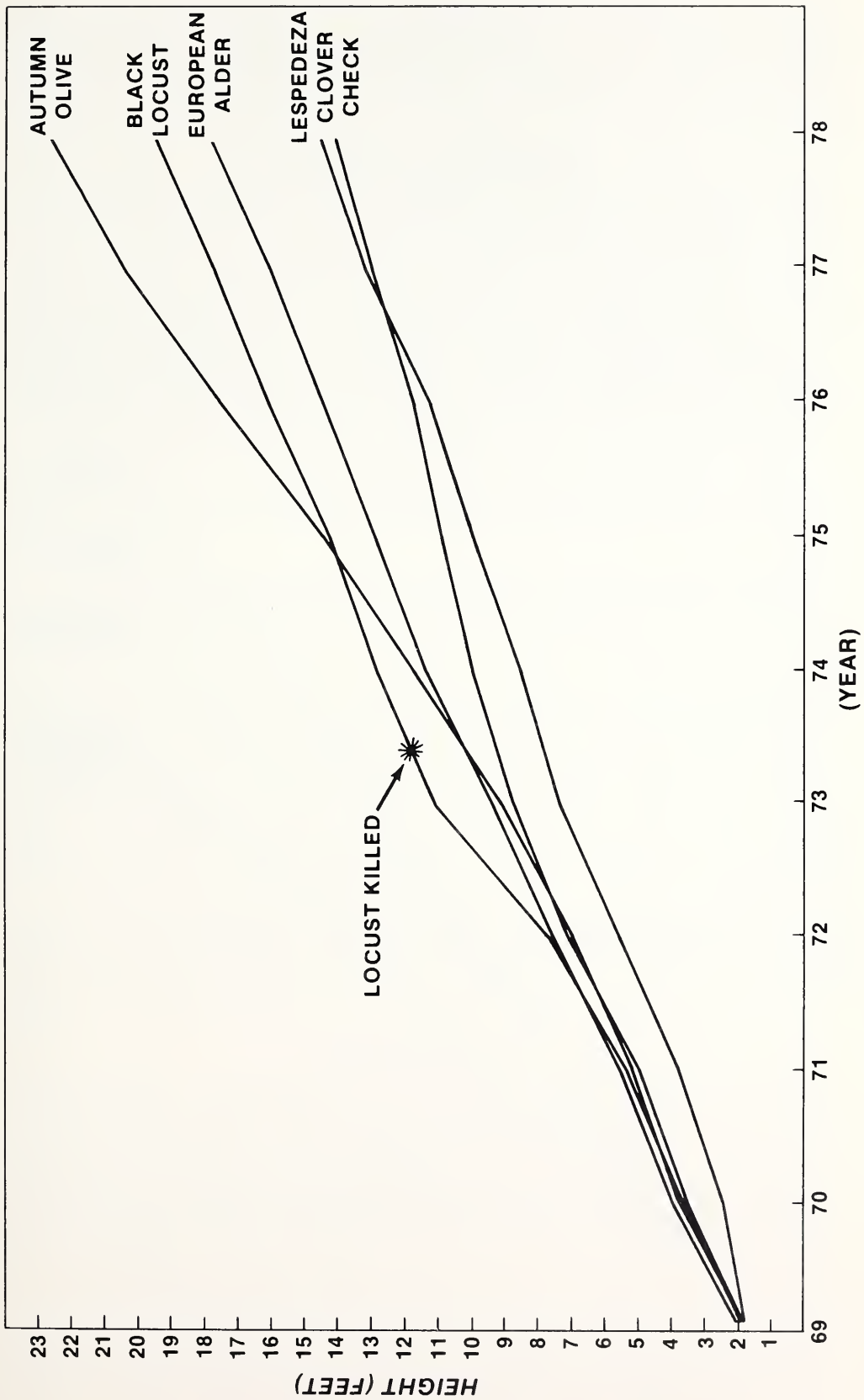

FIGURE 1. *Height growth of black walnut interplanted with four nitrogen-fixing species.*

treatments were statistically highly significant. Height differences of the walnut among treatments were not statistically significant after the fourth growing season but trees interplanted with black locust were tallest. The height advantage of walnut interplanted with locust continued through the fifth and sixth growing season and differences among treatments were significant, statistically. Walnut interplanted with autumn olive became tallest after the seventh growing season and have remained tallest through the tenth growing season. Differences among treatments have been statistically highly significant. After the 1978 growing season, 10 years after interplanting, walnut interplanted with autumn olive was 3.1 feet taller than walnut interplanted with locust, the second best nurse species, and 8.4 feet taller than walnut in the check plots.

Diameter differences among treatments were not statistically significant until after the eighth growing season (Fig. 2). Walnut interplanted with autumn

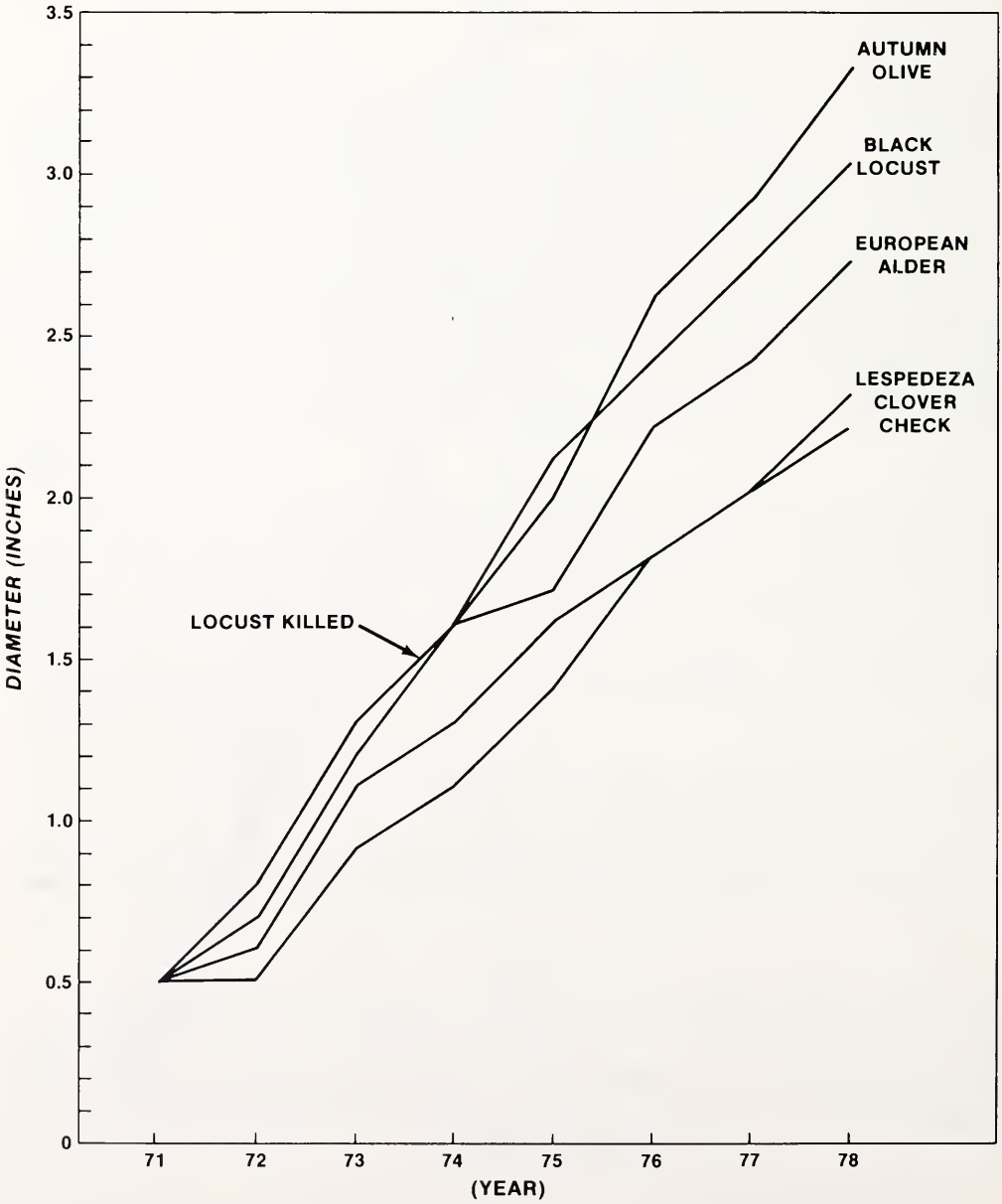

FIGURE 2. *Diameter growth of black walnut interplanted with four nitrogen-fixing species.*

olive had the largest diameters after the eighth season and continued to have the largest diameters through the tenth growing season. After the tenth season, diameter of the walnut interplanted with autumn olive was 0.3 inch larger than those interplanted with locust and 1.1 inch larger than trees in the check plots.

Discussion and Conclusions

Foliage of the walnut trees interplanted with autumn olive, black locust, and European alder was noticeably greener during the 1978 growing season than walnut foliage in the check plots. The lush green color may be an indicator of greater nitrogen content, but foliage samples have not been analyzed for mineral content. The walnuts in the check plots are not as straight and have required more pruning than those in the other plots. Therefore, the nurse trees must have helped the walnut trees grow straighter and aided in naturally pruning them.

Besides increasing walnut growth, the nurse trees provide economically and ecologically beneficial products. Autumn olive, with its dense shrubby habit and bountiful berry crop, provides cover and food for several wildlife species and pulpwood and fence posts can be obtained from European alder and black locust, respectively.

Herbicides were not used in the lespedeza clover plots and through the eighth year the competition resulted in an even slower growth rate for the walnut than the check plots.

Results from this study show that autumn olive is an excellent nurse species to interplant with black walnut. Walnut interplanted with autumn olive was tallest after the seventh growing season and increased in superiority through the next three growing seasons. European alder and black locust also increase height and diameter growth of the walnut over pure walnut, but walnut interplanted with autumn olive grew fastest. Funk *et al.* (3) reported similar growth increases for interplanted walnut in Missouri and Illinois plantations.

Autumn olive's only possible drawback is that it is widely spread by the birds and other wildlife that use the berries for food (1). Although its invasion to surrounding areas detracts from its desirability as a nurse tree, unwanted autumn olive may be controlled by regular mowing.

Literature Cited

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