

BLACK WALNUT WITH AUTUMN-OLIVE AS A NURSE PLANT

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ABSTRACT

Autumn-olive, *Elaeagnus umbellata* Thunb., was interplanted with black walnut *Juglans nigra* L. in a bottom field in southwest Tennessee to study its effect on tree growth. Compared with a control planting the black walnut intermixed with autumn-olive averaged 75.5% taller and 83.5% greater diameter growth over a ten-year period. Soil nitrogen in the mixed plot increased to 87 ppm compared to a relatively unchanged 59 ppm in the control stand.

INTRODUCTION

A number of studies have been made in which trees have been interplanted with nitrogen-fixing plants to study growth patterns (Carlson and Dawson, 1984; Friedrich and Dawson, 1984; Ponder, 1984; Rietveld *et al.* 1983; Hansen and Dawson, 1982; Jorgensen, 1981; Clark and Williams, 1979; Funk *et al.* 1979; Ashby and Baker, 1968). Much of this work has been conducted on strip mine land with black locust, *Robinia pseudoacacia* L., as a nurse tree for various species on spoil banks and other disturbed sites. Autumn-olive, *Elaeagnus umbellata* Thunb., is another species that is being studied as to its effect on the growth of trees when interplanted.

Funk *et al.* 1979, found that in 5 plantations in Missouri, Illinois, and Indiana walnut grown in mixture with autumn-olive averaged 82% taller after a 9-year period than walnut planted in pure stands. They also noted that interplanting with autumn-olive in two southern Illinois sites resulted in a 134% increase in walnut height compared with walnut grown alone. Knowing of this study in progress at Southern Illinois University it was decided to conduct a similar study in West Tennessee.

A study of the effect of autumn-olive on the growth of black walnut, *Juglans nigra* L., was begun in 1973 at the Memphis State University Edward J. Meeman Biological Field Station in north Shelby County, Tennessee, and terminated in 1985.

METHODS

Two walnut plantations were established on a bottom-land field with convent silt loam soil. Each plantation was planted with 144 one-year old black walnut seedlings spaced 3m x 3m. Each planting consisted of 12 rows of 12 black walnut trees per row. The outer most rows of walnut trees served as a buffer or isolation line, and these three were not included in the tabulation of data. This left 100 trees per block for the study. The plantations were mowed the first two years to reduce weed competition. Survival was 96%, and missing trees were replaced with surplus trees planted adjacent to the study area.

In the spring of 1975, the third growing season, autumn-olive was interplanted between each black walnut in one plantation while the other plantation was left as a pure stand of black walnut. Tree heights were measured at the end of each growing season along with the diameter at breast height (1.37m) when the trees had reached suitable height (4th year). Ten soil samples were taken at 10-20 cm depth from each plantation each year and soil nitrate, phosphorus and potassium content in parts per million was measured.

RESULTS AND DISCUSSION

There was no apparent difference between the two plots in tree growth during the first 3 years following the planting of autumn-olive. The effect of the interplanting became more and more apparent the last 7 years of this study with the interplanted walnut trees averaging 75.5% greater height and 83.5% greater diameter (Figures 1 & 2).

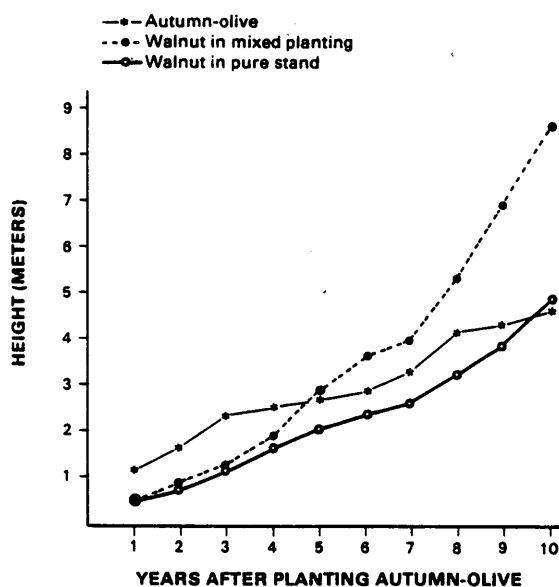


Figure 1. Height of plants in pure planting and mixed planting (Mean value based on 100 measurements)

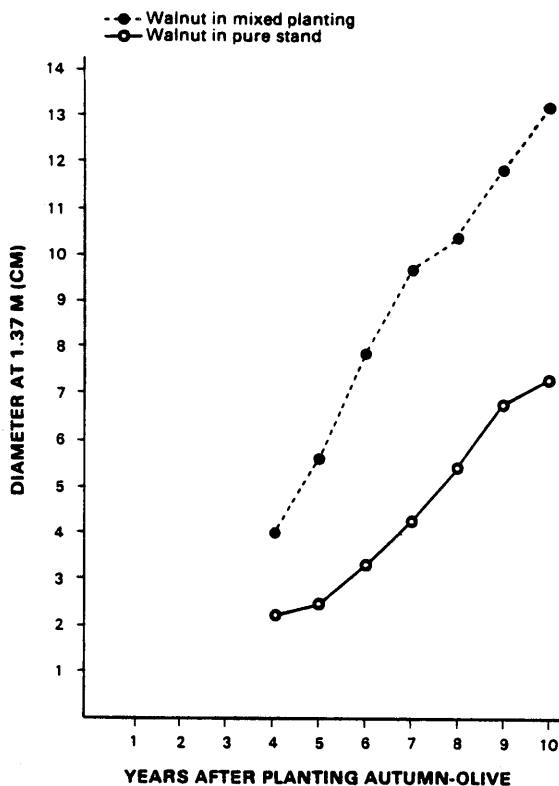


Figure 2. Diameter of black walnut in pure and mixed stand (Mean value based on 100 measurements)

There was no noticeable difference in soil phosphorous and potassium content in either study area, whereas soil nitrogen averaged 59 ppm under the pure walnut stand and 87 ppm in the mixed walnut stand at the end of the final year. The soil nitrogen in both stands ranged from 58 to 60 ppm during the first five years after the establishment of the plots including three years following the planting of autumn-olive.

The interplanting of autumn-olive resulted in a dramatic increase in both the height and diameter growth of the black walnut trees. The amount of soil nitrogen also increased during the last 7 years following the introduction of autumn-olive. There should be little doubt that autumn-olive can serve as an efficient nurse plant for black walnut, but its exact role is still unknown.

It should be noted that while the result of the mixed planting in West Tennessee was quite impressive results in other studies such as Funk *et al*, 1979, were quite varied depending upon location.

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