

Public Abstract

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Title:PRESCRIPTIONS FOR TREE ESTABLISHMENT IN TALL FESCUE BASED SILVOPASTURE

Silvopasture offers Midwest landowners the opportunity to plant trees in their pastures without significant loss of forage production. However, much of the pasture in the Midwest is dominated by tall fescue. Researchers are unsure why, but tall fescue is known to inhibit tree growth. It may be competition for moisture and nutrients, or possibly allelopathy. To improve the adoption of silvopasture, this research was conducted to delineate factors that may affect tall fescue's competitiveness and to create recommendations that minimize the effects of these factors on tree growth. Three experiments were conducted. The first study evaluated eastern black walnut, northern red oak, black locust and pitch x loblolly pine growth in tall fescue, orchardgrass, and Kentucky bluegrass. Four tall fescue varieties were used that differed in growth habit and endophyte status. The second study assessed how much weed control is necessary to maximize black walnut growth in tall fescue pasture. And, the third study evaluated three types of black walnut planting stock and mycorrhizae inoculation when planting in tall fescue pasture.

In the first study, black walnut, red oak, and black locust growth was reduced up to 90 percent when grown with grass competition compared to that in vegetation-free controls while pitch x loblolly pine growth was similar in grasses and in vegetation-free plots. Black walnut growth was less in tall fescue than in Kentucky bluegrass and orchardgrass. Northern red oak growth was greater in Kentucky bluegrass than in the tall fescues or orchardgrass, and growth in orchardgrass was similar to at least two of the four fescues. Black locust height growth was less in two of the four tall fescues than in the other grasses, but diameter growth was similar across grass species. Pitch x loblolly pine growth was similar across grass species and growth in grasses was similar to that in vegetation-free plots.

Neither dry matter yield of grasses nor tall fescue's endophyte association affected tree growth. The effect of grass competition on tree growth could not be alleviated with supplemental irrigation and fertilization. Soil moisture and stomatal conductance measurements during drought suggest that irrigation is affecting black walnut seedlings. Nonetheless, growth was not improved with irrigation suggesting that factors other than competition for moisture reduce growth when black walnut is planted into grass. When fertilizer was applied at twice the standard rate for black walnut, tree growth did not improve. Fertilizer and irrigation did not improve tree growth in vegetation-free plots suggesting that these factors are not limiting to tree establishment and growth on good sites when weed control is used.

Results from the second study suggest that weed control should extend a minimum of 1.21 m from black walnut seedlings in tall fescue pastures to maximize height and diameter growth. More weed control may not result in greater tree growth and would require greater weed control costs and remove more land from forage production. Diameter growth in larger zones continued through unfavorable conditions in July and August while growth in smaller zones slowed or ceased. Late season diameter growth appeared to be a good indicator of conditions in the different sized zones and suggests that tall fescue competition for resources may be limited beyond a distance of 0.90- 1.21 m.

In the third study, bare-root and containerized seedlings transplanted well and were larger than seeded seedlings after two years in the field. Containerized seedlings had a larger diameter than that of bare-root seedlings at planting and after two years of growth but heights were similar throughout the experiment. There are considerable cost differences between containerized and bare-root stock, and that suggests that bare-root stock may be the best choice. However, producers wishing to plant improved black walnut varieties may be limited to containerized stock because improved bare-root seedlings are not often available. Mycorrhizae inoculants had no effect on the establishment of any stock type.

