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To direct, fund, promote and communicate horticultural research, which increases the quality and value of ornamental plants, improves the productivity and profitability of the nursery and landscape industry, and protects and enhances the environment.

Vegetation Management Effects Growth of Leyland Cypress Grown for Christmas Trees[1]

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Abstract

Leyland Cypress trees x *Cupressocyparis leylandii* (A.B. Jacks. and Dallim.) Dallim. and A.B. Jacks. 'Haggerston Grey' were planted in the late winter of 1993 in a tall fescue (*Festuca arundinacea* Schreb.) sod. Vegetation-free circles of 0 (control), 0.6, 0.9, and 1.5 m (0, 2, 3 and 5 ft) diameters were maintained from 1993 to 1994 by a combination of commercially recommended herbicides and hand-weeding. The treatments resulted in vegetation-free areas of 0, 0.3, 0.6, and 1.8 m^2 (0, 3, 7, and 19 ft^2). Trees were measured over a 2 year period to determine the influence of vegetation-free area on growth. There were no differences in trunk cross sectional area or tree volume (calculated from height and width measurements) during 1993. By the spring of 1994, both trunk cross sectional area and tree volume increased with size of vegetation-free area. The influence of vegetation-free area on tree growth was even more pronounced by the fall of 1994. These results indicate vegetation control is important in establishing Leyland Cypress for Christmas trees. The optimum vegetation-free area appears to be between 0.6 m^2 and 1.8 m^2 (7 and 19 ft^2) during the second year of growth.

Index words: weed control.

Significance to the Nursery Industry

The amount of growth that occurs each year in Christmas and other landscape trees is an important factor in their production. Grasses and weeds compete for water and nutrients of these trees reducing their annual growth. Our research provides evidence that a vegation-free area increases tree growth. This information demonstrates tree producers should maintain various vegetation-free areas in their plantations, in order to maximize growth performance.

Introduction

Vegetation management is a concern of Christmas tree growers throughout the life of their crop, but it is especially important during the establishment of a new crop. The rather large capital investment in a new plantation needs to be offset by rapid establishment and early crop productivity. Factors which delay tree establishment and overall crop productivity should be identified and managed. However, managing these detrimental factors requires judicious utilization of inputs in the most economically efficient manner.

Leyland Cypress is being increasingly used for Christmas tree plantations in the Southeast. In addition to certain desirable marketing attributes (1), the species excels in early productivity of a marketable tree. There is considerable information available on vegetation management for orchard crops (2), however, there is limited research concerning vegetation management for Christmas tree establishment, especially Leyland Cypress in the Southeast. Undesirable vegetation can be removed via cultivation; however, tillage may damage tree root systems when conducted too close to the plant (2, 4). Because of these factors, herbicides are widely used to manage vegetation in most tree crops.Results from experiments with orchard crops suggest that some degree of vegetation-free area would be beneficial in establishing most trees (2, 3, 5) yet, the extent of the area needed for Christmas trees remains unclear.

Information concerning threshold vegetation-free areas for optimum crop establishment would benefit Christmas tree growers by decreasing the crop establishment period and by reducing herbicide and labor costs associated with 'excess' vegetation management. The objective of this research was to examine early growth of Leyland Cypress in response to varying vegetation-free areas in a fescue sod.

Materials and Methods

One-year old, container-grown (one gal), Leyland Cypress 'Haggerston Gray' plants were set at the Georgia Experiment Station in Griffin, GA into an existing fescue sod in March of 1993 in a Cecil sandy clay loam (clayey, kaolinitic, thermic Typic Hapludult). The fescue sod was well established (in excess of five years old) and was seeded over lightly two years earlier providing nearly a complete ground cover (90% coverage or greater). Plant spacing was 3.0 m (10 ft) between rows and 1.8 m (6 ft) between plants in a row. Following planting, vegetation-free circles of varying diameters were established using herbicides. Resulting treatments were as follows: 1) no vegetation control; 2) 0.6 m (2 ft) diameter vegetation-free circle; 3) 0.9 m (3 ft) diameter vegetation-free circle; 4) 1.5 m (5 ft) diameter vegetation-free circle. These treatments resulted in vegetation-free areas of 0, 0.3, 0.6, and 1.8 m^2 (0, 3, 7 and 19 ft^2). The resulting experimental design was a randomized complete block with ten replications. Herbicides used were paraquat (0.8 kg active ingredient/ha) (0.7 lb active ingredient/A) and oryzalin (3.4 kg active ingredient/ha) (3 lb active ingredient/A). The herbicide base treatment was applied one month after planting. The remaining applications were made in April and September each year. In between herbicide treatments, weed-free areas were maintained by hand weeding every four to six weeks The herbicides were tank mixed and were applied with a back-pack sprayer at a rate of 132 to 151 liters (35 to 40 gal) of water per acre. The nozzle used was a flat-fan herbicide nozzle. The planting operation did disturb the immediate area surrounding the plant (0.3 m (1 ft) diameter

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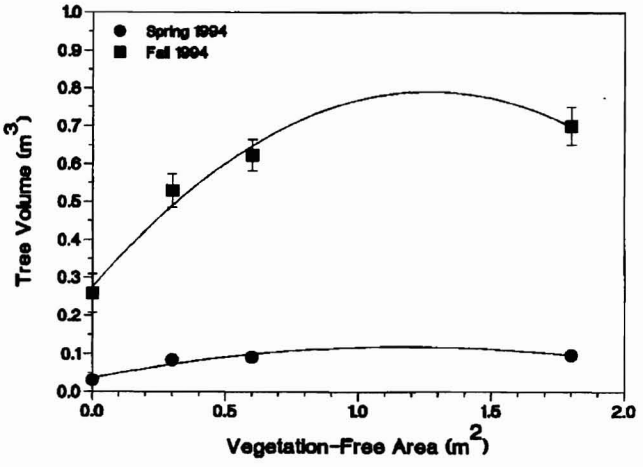

Fig. 1. Leyland Cypress tree volume (derived from canopy height and width measurements) in the spring and fall of 1994 in response to vegetation-free area. Regression equations were $y = 0.036 + 0.142x - 0.060x^2$ ($R^2 = 0.921$) and $y = 0.274 + 0.815x - 0.322x^2$ ($R^2 = 0.978$) for spring and fall, resp.

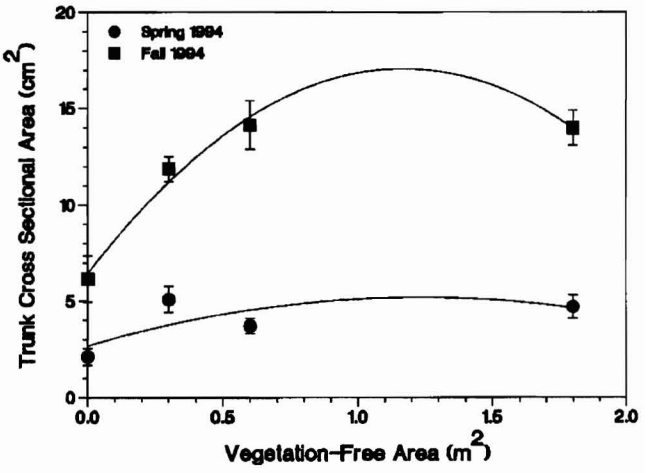

Fig. 2. Leyland Cypress trunk cross sectional area (derived from trunk diameter measurements) in the spring and fall of 1994 in response to vegetation-free area. Regression equations were $y = 2.68 + 4.10x - 1.67x^2$ ($R^2 = 0.470$) and $y = 6.45 + 18.18x - 7.78x^2$ ($R^2 = 0.983$) for spring and fall, resp.

circle). However, by early summer the first year the sod, along with annual grasses, had completely filled in that area in the untreated plot. Sod outside of the treated areas and in treatment 1 was periodically mowed to control growth. Plants were grown primarily without irrigation, with the exception of 3 overhead irrigation events (25 mm each) (0.1 in each) the first 3 months after planting.

Growth of the plants was monitored during 1993 and 1994. Tree height (h) and base width (w) were measured every 4 to 6 weeks from spring to fall each year. These measurements were used to calculate tree volume assuming the canopy was a cone. Trunk diameters were also measured and were used to calculate trunk cross sectional area. Although growth was measured several times during the growing season, only spring and fall data are presented. The data were subjected to regression analysis.

Results and Discussion

There was no significant difference during 1993 in response to treatments (data not shown). However, by the spring of 1994, tree volume began to show effects of vegetation-free area (Fig. 1). A similar and more pronounced effect was apparent in the fall of 1994. There was a positive linear and negative quadratic response of tree volume as vegetation-free area increased; however, there was generally little difference in tree volume between the 0.6 m^2 (6.5 ft^2) and the 1.8 m^2 (19.4 ft^2) vegetation-free areas. Trunk cross sectional area responded similarly to the vegetation-free areas. Again, there was no significant effect of treatments in 1993 (data not shown), but by spring of 1994 trunk cross sectional area increased with size of vegetation-free area (Fig. 2). By fall 1994, the treatment effects were even more apparent for trunk cross sectional area. The response was again positive linear and negative quadratic, with little difference between the largest two areas.

Overall, these data indicate there is an increase in early growth of young Leyland Cypress in response to increased vegetation control. It appears the optimum vegetation-free area for vigorous growth during the second year is between 0.6 m^2 (7 ft^2) and 1.8 m^2 (19 ft^2). A grower with 1.8 m (6 ft) between plants would likely get maximum growth response of young Leyland Cypress by maintaining a vegetation-free band around plants of 0.6 m (2 ft) to 0.9 m (3 ft).

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