

DOUGLAS-FIR CONTAINER STOCK GROWN WITH FERTILIZER-AMENDED MEDIA: SOME PRELIMINARY RESULTS

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Key Words

Controlled-release fertilizer, fertilizer incorporation, fertilizer treatments, outplanting performance

Incorporating fertilizer directly into the container growing media is a very new practice. Previously, it was believed that such a practice would result in toxicity due to direct contact with the root system and/or over fertilization. However, with the improved technology for controlled-release fertilizer, there is renewed interest in this practice. The objective of this study is to quantify the seedling response to various fertilizer treatments as compared to unfertilized seedlings and plug+1 seedlings.

MATERIALS AND METHODS

Container-grown Douglas-fir (*Pseudotsuga menziesii* Mirb. Franco) seedlings were grown in 1997 at The Timber Company nursery (Cottage Grove, OR). Seedlings were grown under standard nursery practices with the exception of the fertilizer in the media. Transplant seedlings (plug+1) were sown in 1996 at The Timber Company nursery and then transplanted at the Lewis River Reforestation nursery. Although sown in different years, container-grown and transplant seedlings are from approximately the same seedlot.

The effects of four fertilizers (Simplot's 13-13-13 and 17-5-11; Scotts Company's 18-5-12 and 15-9-10) which were mixed in the container media are being evaluated on styro-20 stocktype (20 in³ cavity size). In addition, unfertilized styro-20

and P+1 transplant stock were included. Seedlings were outplanted on January 9, 1998 at a site near Siletz, OR. The study was installed in a completely randomized block design with four replications. An additional study (reported elsewhere) was installed to assess styro-8 and styro-15 seedling stocktypes as well.

Initial field height and stem diameter were measured and recorded on each seedling prior to budbreak. At the end of the first and second growing seasons (August 18, 1998 and August 20, 1999) seedlings were again measured for survival, height and stem diameter. Instances of browsing, chlorosis, frost damage, multiple tops, dead tops, and browning were also recorded. Seasonal growth was calculated by subtracting height values. In addition, foliar samples from two seedlings per treatment in each block were collected at the end of each season, dried, weighed, and composited for nutrient analyses.

RESULTS

Initial morphology showed significant differences among treatments at the time of planting (Table 1). Stem diameter of unfertilized control seedlings was significantly smaller than the fertilized treatments. Initial height was more variable, but Scotts 18-5-12 seedlings tended to be the tallest.

After two growing seasons, the fertilized plug trees at the Toledo site had significantly greater field performance than the unfertilized controls (Table 1). Fertilized trees had up to twice the height growth of the control seedlings during the first season and continued to have significantly greater growth than the controls during the second season. The Scotts 18-5-12 seedlings had significantly more height and stem diameter growth than any of the other treatments and by the end of the second season, mean height and stem diameter for seedlings in that treatment were 33% and 38% greater, respectively than the unfertilized controls. Mean height and stem diameter of seedlings from the other fertilized treatments were 20 to 22% and 17 to 23% greater, respectively than the controls (Table 1).

Transplant seedlings did very poorly compared to all other treatments. In fact, despite initial stem diameter of the transplant seedlings being significantly greater than the styro-20 seedlings,

the mean stem diameter of transplant seedlings was the smallest after two seasons of growth (Table 1).

Foliar nutrient concentrations did not differ meaningfully at the end of the first season (data not shown). Nitrogen concentrations did not differ significantly among treatments. Controls tended to have the highest concentrations of P, K, B, Cu, Zn, and Mn which is most likely due to the lower growth rate of unfertilized seedlings. Foliar dry weight of fertilized seedlings was much greater than unfertilized styro-20 or plug+1 seedlings. As a result, the nutrient contents for fertilized seedlings tended to be higher than that of the unfertilized seedlings despite a lack of difference among concentrations. Nutrient data for the second season samples are not yet available.

Field performance will continue to be assessed annually and data will be reported in the literature.

Table 1. Mean field morphology at Toledo site. Within a column, means followed by the same letter are not statistically different at $\alpha \leq 0.05$. (Note: all styro-20 seedlings except plug+1 unfertilized transplant seedlings).

Treatment	Height (cm)					Stem Diameter (mm)					Survival (%)
	March 1998 initial height	Growth 1998	Growth 1999	Total Growth	August 1999 total	March 1998 initial diameter	Growth 1998	Growth 1999	Total Growth	August 1999 total	
None (control)	40.9 ab	19.7 b	48.1 a	67.9 a	108.7 a	4.8 a	4.0 b	8.3 a	12.3 b	17.1 a	99
Simplot 13-13-13	41.2 ab	34.6 c	57.3 bc	91.2 b	132.3 b	5.7 b	6.3 c	9.0 a	15.3 c	21.0 b	100
Simplot 17-5-11	39.3 a	33.7 c	59.2 bc	91.6 b	130.9 b	5.7 b	6.5 c	8.6 a	15.0 c	20.6 b	99
Scotts 18-5-12	44.1 b	40.6 d	62.9 c	101.0 c	144.9 c	6.2 b	7.9 d	9.7 a	17.5 d	23.6 c	98
Scotts 15-9-10	38.1 a	36.7 c	56.0 b	91.7 b	129.9 b	5.8 b	6.0 c	8.1 a	14.2 c	20.0 b	100
plug+1 unfertilized	45.8 b	13.1 a	49.6 ab	62.0 a	108.0 a	9.2 c	1.6 a	5.8 a	7.4 a	16.6 a	100