Assessing Christmas Tree Planting Procedures©

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INTRODUCTION

Christmas tree growers in the Northeast United States utilize a range of methods for planting conifers, including motorized augers, mechanical planters, and hand planting with shovels or planting bars. Varying levels of weed control are employed prior to planting and supplemental irrigation is rarely used. Sub-optimal site topography and soil characteristics often increase the stress levels experienced by the stock during this critical establishment period. Tree mortality can be high under these conditions, particularly during drought years. Growers are increasingly adopting the use of commercial root treatments prior to planting in an effort to improve tree survival and growth. The objectives of this project were to (1) assess the impact of planting method on tree survival and growth, and (2) assess the impact of several commercial root treatments on tree survival and growth.

MATERIALS AND METHODS

Abies fraseri (Fraser fir), *Pseudotsuga menziesii* (Douglas-fir), *Picea pungens* (Colorado spruce), and *Abies concolor* (concolor fir) (2-2) transplants were obtained from a commercial source and planted at the Pennsylvania State University Horticulture Farm at Rock Springs, Pennsylvania, during April 2002. Trees were planted using a mechanical planter, manual planting bar, motorized auger planted at grade, and motorized auger planted 4 inches below grade. A group of concolor fir was also intentionally J-rooted at planting. In addition, tree roots of the four species were treated with the following three commercial root treatments prior to planting: Bioplex, LiquaGel, and Roots. Control plants were soaked in water for 1 h prior to planting. Plant height, plant width, survival, and overall plant quality were measured through the 2002 and 2003 growing seasons.

OBSERVATIONS AFTER TWO SEASONS: COMMERCIAL ROOT TREATMENTS

Plant Growth Rate. BioPlex, Roots, and LiquaGel did not significantly improve the growth rate of Douglas-fir, Fraser fir, concolor fir, or Colorado spruce through the first 24 months of this study (data not shown). Dipping the seedling in water, prior to planting was as beneficial as the three tested products.

Plant Survival. Dipping seedlings in water prior to planting resulted in the highest rate of survival, followed by Roots, LiquaGel, and BioPlex (Table 1). Overall survival rates for Douglas-fir and Colorado spruce were highest (95% and 93.4%, respectively) followed by concolor fir and Fraser fir.

Plant Quality. Very little difference in plant quality was observed between root dip treatments. Colorado spruce was rated as having the highest overall plant quality (7.8) after 24 months in the field compared to Fraser fir with the lowest score (6.8).

Table 1. Effect of commercial root treatments on survival and overall quality of Christmas tree transplants, 2 years after planting.

	Species				
	Plant survival/plant quality[z]				
Root treatment	Fraser fir	Colorado spruce	Douglas-fir	Concolor fir	Average
Water Soak	86.7/6.8	96.7/8.1	100/7.5	90.0/7.0	93.4/7.4
LiquaGel	93.3/7.5	100/8.3	83.3/6.6	83.3/6.5	90.0/7.2
BioPlex	80.0/6.4	80.0/6.7	96.7/7.7	93.3/7.7	87.5/7.2
Roots	76.7/6.4	96.7/8.2	90.0/7.4	90.0/7.4	90.9/7.4
Average	84.2/6.8	93.4/7.8	92.5/7.3	89.2/7.2	

[z] Survival expressed as % of 30 trees planted; quality based on 1–10 scale; 1=worst, 10=best.

Table 2. Effect of planting method on survival and overall quality of Christmas tree transplants, two years after planting.

	Species				
	Plant survival/plant quality[z]				
Root treatment	Fraser fir	Colorado spruce	Douglas-fir	Concolor fir	Average
Planting bar	90.0/7.2	96.7/8.5	100/7.8	86.7/6.5	93.4/7.5
Mechanical planter	70.0/5.9	76.7/6.5	100/7.8	70.0/5.0	79.2/6.3
Auger	83.3/6.5	76.7/6.4	96.7/7.1	90.0/6.4	86.7/6.6
Auger, 4-inch deep	86.7/6.6	73.3/8.5	96.7/6.8	60.0/4.5	79.2/6.6
Average	82.5/6.6	80.9/7.5	98.4/7.4	76.7/5.6	

[z] Survival expressed as % of 30 trees planted; quality based on 1–10 scale: 1=worst, 10=best.

OBSERVATIONS AFTER TWO SEASONS: PLANTING METHOD

Plant Growth Rate. Choice of planting bar, auger, or mechanical planter did not appear to have a large influence on growth rate within the first 24 months in the field. However, all species planted 4 inches too deep with an auger except white fir had reduced width and suppressed terminal growth (data not shown).

Plant Survival. The planting bar method had the highest survival rate (93.4%) across all species followed by auger (86.7%) (Table 2). The mechanical planter and deep planting each had survival rates of 79.2%. Of the species included in the study, Douglas-fir had the highest survival rate (98.4%) across all planting methods, followed by Fraser fir (82%), Colorado spruce (80.9%), and white fir (76.7%). "J-rooting" of concolor fir further reduced survival to 46.7%. Planting method had the smallest impact on Douglas-fir, with a variation of only 4% survival rating between planting methods.

Plant Quality. Planting method had the smallest effect on Douglas-fir quality and the greatest effect on Colorado spruce. Few clear trends in overall plant quality are apparent at this point, except that use of the planting bar generally yielded the highest quality rating across all species.

CONCLUSIONS

Based on the results of this study, the commercial root treatments did not improve either plant survival or overall plant quality. The water dip control treatment had ratings as good or better, than any of the three products tested. Using a planting bar yielded higher survival rates across all species, followed by augering and mechanical planting. Intentionally deep planting adversely affected survival of concolor fir but not Douglas-fir, Colorado spruce, or Fraser fir. Overall, Douglas-fir exhibited the best performance in this study.

Medium Development, Micropropagation, and Acclimatization of Difficult-to-Propagate Hazelnut (*Corylus* sp.) Hybrids©

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A series of hybrid hazelnuts have gained interest as potential alternative crops for farmers in mid-western U.S.A. These hybrids possess tolerance to the harsh winter temperatures of the region and are relatively disease resistant, but they are difficult to propagate by conventional methods. Successful micropropagation has been achieved in our laboratory for selected genotypes by employing a medium based in part on the composition of the hazelnut kernel (Nas and Read, 2004). Acclimatization and subsequent establishment in the field proved to initially be an obstacle, but direct rooting of the microcuttings in rehydrated compressed peat pellets under conditions of high humidity, moderate light, and temperature led to successful production of potted plants of 0.5 to 1 m in height. Use of direct rooting in special plastic containers, together with a regimen of dilute nutrient sprays has facilitated more efficient and rapid multiplication, resulting in improved potential for scaled-up acclimatization and field establishment of the micropropagated hazelnut hybrids. Field plantings have been made in several locations and are being evaluated for trueness to type, winter survival, disease tolerance, growth characteristics, and productivity.

INTRODUCTION

Micropropagation success is generally considered to be significantly influenced by the chemical composition of the culture medium (Nas and Read, 2000; Preece, 1995). Development of tissue culture media has often been time-consuming and laborious, e.g., the more than 5 years spent in finalizing the classic MS medium (Murashige and Skoog, 1962). Using hazelnut as the test species, we set out to create a systematic approach to the development of a tissue culture medium that may be suitable for other difficult-to-culture plants.