

Needle Retention of Concolor Fir from Four Seed Sources[®]

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INTRODUCTION

Concolor or white fir (*Abies concolor* [Gord. and Glend.] Lindl.) is a high-elevation tree native to the Sierra Nevada Mountains and southern Rocky Mountains. In recent years, interest has developed in the use of concolor fir as a Christmas tree in the Eastern United States. Concolor fir is generally considered to have high quality foliage, excellent aroma, good form, and a relatively rapid growth rate. In addition, many Christmas tree growers market concolor fir as a landscape plant. However, one of the most important qualities of any Christmas tree species is the ability to maintain a fresh appearance for a reasonably long display period. Christmas tree postharvest quality deteriorates over time and is a function of water status (Chastagner, 1986). Common postharvest quality problems include premature needle drop, poor foliage color, fragrance loss, and reduced branch flexibility (Hinesley, 1984). Little is known concerning the postharvest characteristics of concolor fir. Genetic variation within the species is high and is related to geographical source. Differences in growth rate and foliage color have been noted from various provenances. Seed source may also impact important postharvest characteristics. This study was initiated to determine the influence of seed source on postharvest needle retention and needle color.

METHODS

Whole tree postharvest experiments were conducted between December 2001 and January 2002. Transplants (2–2) derived from seed collected in the Apache, San Juan, Rio Grande, and Lincoln National Forests were planted in 1995 and harvested December 2001. Trees were grown under uniform conditions and fertility, appeared free of insect and disease damage, had at least three age classes of live foliage, and were U.S. No. 1 grade according to U.S.D.A. standards. Twenty trees, 1.8 to 2.1 m tall, of uniform vigor and density were harvested from each seed source and five trees from each source were either displayed immediately in water or allowed to dry outside, unbaited for 1, 2, or 3 weeks. Prior to transfer to the postharvest display room, a 2- to 3-cm section was removed from the base of the trunk on each tree. The trees were displayed in a post harvest display room maintained under continuous standard fluorescent lighting, at $48\% \pm 5\%$ RH, and 18 ± 1 °C. During display, water was added to each tree stand to ensure that the water level in the stand was always maintained above the base of the tree. Water use was recorded for each tree and change in moisture status was recorded with a pressure chamber. Extent of current season needle loss was evaluated on a 0 to 10 scale where 0 = none, 1 = 1%–10% ..., 10 = 91%–100% loss. Overall tree quality was measured periodically and rated on a 1 to 5 scale where 5 = excellent, 4 = good, 3 = fair, 2 = below average, 1 = poor, unacceptable. Needle color was measured using a Minolta colorimeter.

CONCLUSIONS

Trees from Rio Grande and San Juan sources exhibited very low needle loss during the 35-day display period (Table 1). Needle loss for the Apache source was high within the first 7 days and continued to deteriorate throughout the display period. Lincoln

Table 1. Average needle loss during a 35-day display period for concolor fir from four National Forest (N.F.) seed sources.

Seed Source	Needle loss rating ^z				
	Days on display				
	7	14	21	28	35
San Juan N.F.	0.25 a	0.75 a	0.75 a	1.0 a	1.0 a
Rio Grande N.F.	0.0 a	0.50 a	1.0 a	1.25 a	1.25 a
Lincoln N.F.	0.50 a	1.25 a	1.75 ab	2.0 b	2.0 b
Apache N.F.	2.25 b	2.25 b	3.25 c	3.5 c	3.75 c

^z Needle loss was rated on a 0-10 scale, where 0 = none, 1 = 1%-10% ..., 10 = 91%-100% loss.

^y Means in columns followed by the same letter are not significantly different.

Table 2. Quality rating during a 35-day display period for concolor fir from four National Forest (N.F.) seed sources.

Seed Source	Quality rating ^z				
	Days on display				
	7	14	21	28	35
San Juan N.F.	4.75	4.75	4.5	4.5	4.25
Rio Grande N.F.	5.0	4.25	4.25	4.25	4.25
Lincoln N.F.	3.5	3.5	3.0	3.0	2.75
Apache N.F.	3.0	2.25	1.75	1.75	1.5

^z Quality was rated on a 1-5 scale, where 5 = excellent, 4 = good, 3 = fair,

2 = below average, 1 = poor, unacceptable.

exhibited good needle retention initially, but had unacceptable rates of needle loss after 28 days on display. Needle color was rated as blue to blue-green for Apache, San Juan, and Rio Grande sources and varied little during display. Lincoln foliage was rated green. The green color rating of Lincoln resulted in a lower overall quality rating (Table 2) even before needle loss increased. San Juan and Rio Grande trees were rated as excellent-good throughout the display period. No significant differences in stem xylem water potential were observed as a function of seed source. These results indicate that seed source influences certain post harvest quality characteristics, such as needle retention, in concolor fir Christmas trees. Previous work with other species suggests that needle retention is a highly hereditary characteristic (Hinesley and Snelling, 1997). It may therefore be possible to identify concolor fir seed sources that possess better needle retention traits. If this is possible, the postharvest quality of concolor fir may be improved through selection and breeding programs.

LITERATURE CITED

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