

# Postharvest Quality of Concolor Fir Affected by Seed Source

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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 in Concolor fir as a Christmas tree has increased 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 specimen. 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 four seed sources 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 3 age classes of live foliage, and were U.S. No. 1 grade according to USDA standards. Twenty trees, 6-7 feet tall, of uniform vigor and density were harvested from each seed source and 5 trees from each source were either displayed immediately in water or allowed to dry outside, unballed 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  $\pm$  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 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 water stress within the trees were observed as a function of seed source. These results indicate that seed source influences certain post harvest quality characteristics, such as needle retention and overall tree quality, 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. Results of this and others studies indicate that several Concolor fir seed sources yield trees with acceptable postharvest quality when the cut trees are displayed fresh. When trees are permitted to become dry prior to, or during display, certain seed sources such as Apache exhibit unacceptable levels of needle loss. This implies that Concolor fir holds potential in Pennsylvania as a choose-and-cut species, but certain Concolor seed sources are problematic under conditions that allow trees to dry such as distant shipping destinations or poor handling practices on retail lots.

## **REFERENCES CITED**

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**Table 1.** Average needle loss during a 35-day display period for Concolor fir from four National Forest seed sources.

Seed Source	Needle Loss Rating <sup>z</sup>				
	Days on Display				
	7	14	21	28	35
San Juan N.F.	.25 a	.75 a	.75 a	1.0 a	1.0 a
Rio Grande N.F.	0.0 a	.50 a	1.0 a	1.25 a	1.25 a
Lincoln N.F.	.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

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

<sup>y</sup> 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 seed sources.

Seed Source	Quality Rating <sup>z</sup>				
	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

<sup>z</sup>Quality was rated on a 1-5 scale, where 5 = excellent, 4 = good, 3 = fair, 2 = below average, 1 = poor, unacceptable.