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New Information on Postharvest Freshness

by Dr. Gerard C. Adams, Extension Specialist
 Department of Botany & Plant Pathology, Michigan State University

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For the end user, Christmas tree freshness is often the most important quality of the product. Each year we are reminded of this at Christmas time when fire marshals and others voice their concerns for safety in radio, television and newspapers. The loss of needles during displays destroys the esthetic quality of the trees and signals the time to discard the yule tree. For Michigan residents close to the choose-and-cut and wholesale growers in the state, tree freshness is seldom of concern. However, the Michigan Christmas trees is being shipped to further and further retail markets to Florida, Texas and even Washington state. The freshness of Michigan trees are often our competitive edge.

Our attention has been focused at the production level of Christmas tree growing with emphasis on speed of growth, straightness, and color. Lately though, Michigan growers have begun to place greater concern on marketing quality trees. The Michigan Snow Fresh effort addresses this concern but growers have little control on tree quality once the trees arrive at the distant retail lot.

In the Fall 1989, Michigan Christmas Tree Journal, page 48-49, I summarized most of the published information on horticultural and scientific information on factors affecting postharvest freshness and needle retention. Only seven research articles concerning freshness were known in late 1989, but this year alone three new studies appeared and a fourth is being conducted. This article will discuss the four new approaches which examine White fir, Fraser fir, Scotch pine and Douglas fir.

One fundamental truth about tree freshness is that optimum tree freshness is guaranteed by immediately placing cut trees into water; rapid protected transportation to the retail lot, recutting the stump and displaying in

water at the lot and in the home. In addition to displaying trees in water, other factors can significantly alter freshness and keepability.

Chemicals Added to Water

A number of additives to water are used in the flower market to retain freshness. The horticulturists Hinesley and Blankenship evaluated Fraser fir displayed in 11 such solutions for freshness and needle retention. Substances were added to display water as recommended by manufacturers or as by folk wisdom. Results are listed in Table 1 from best to worst.

Table 1. From Hinesley and Blankenship.

Additive	Approximate concentration in water	Rating for needle retention
Just water	—	Best
Sugar	1%	equal to water
7-up	95%	equal to water
Keep-It-Green (Hughes Mfg. Co.)	0.8%	good
Crop-Life (Polyner Technologies, Inc.)	8%	good
Tree Care (Hydrosol, Inc.)	6%	poor
Floralife (Floralife, Inc.)	1%	bad
Yule Prolong (Plantabbs Corp.)	1.5%	bad
Tree Life (The Kirk Co.)	10%	bad
Aspirin	one tablet/Qt	worse
Bleach	6% of product	worst

Unfortunately as you can see, none of the treatments improved the freshness or the needle retention of Fraser fir over water (distilled water). Needles on trees displayed dry lost color, became very dry and became fire hazards although brown needles tended to remain on branches.

Antitranspirants

These were discussed in the Journal in Fall 1989; only VaporGard helped

retain moisture but tended to make trees sticky and glossy.

Needlecast Diseases and Freshness

Dr. Gary Chastagner in the state of Washington discovered a number of years ago that harvested Douglas fir that had the Swiss needlecast disease lost significantly more needles during display than uninfected trees. The increased needles loss of disease causes the casting of 2- and 3-year-old needles. However, postharvest trees lost current years needles during display if they were infected by the fungus causing the Swiss needlecast disease.

I began to wonder whether the *Cylaneusna* needlecast disease which causes casting of 2- and 3-year-old needles on Scotch pine in the field also might increase loss of needles during postharvest display. The Michigan Christmas Tree Association funded a research project to address this question during the winter of 1989-1990. We harvested 40 6-year-old Scotch pine trees ('Riga') donated by the Mathiesen Tree Farm. Twenty trees had been protected with the high rate of Bravo 720 F and 20 trees had not been protected with fungicides in the same field. The protected and unprotected trees were harvested from test plots after 3 years of study. Needles were collected from all sides of each tree. Two hundred needles were collected from the current years foliage and 200 from the older years foliage per tree.

The amount of *Cylaneusna* infection was determined in the laboratory for each tree and the trees were boxed and shipped to Washington state with the generous help of the Happy Holiday Tree Farm. There Dr. Chastagner's technician tagged specific branches of each tree and counted the total number of needles and needle scars on the branches. The trees were then tested

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for their moisture level on arrival and after 1 day in water, with the use of an expensive and highly precise instrument that measures "water potential" (in bars = atmospheres of pressure).

Half the trees were displayed in water and half dry for 28 days. Needle loss and loss of moisture were measured on each tree everyday for 28 days of display indoors.

These trees, stored and transported like Michigan SNOW FRESH trees, were very fresh on arrival in Washington.

The results of this experiment are interesting. First we found that Scotch pine trees that had been protected with fungicide applications had 13% more 2-year-old needles than unprotected trees. As expected the numbers of current-year-needles were equal between protected and unprotected trees.

Trees displayed dry lost 12% of their needles while those displayed in water lost 2% after 28 days. Trees arrived with -18 bars moisture and after 28 days, dry-displayed trees had reached -70 bars moisture [as dry as can be measured] and wet-displayed trees -25 bars moisture [not much drier than when received].

The amount of *Cyclaneusna* needlecast disease had no effect on the number of needles lost during postharvest display regardless of whether trees were displayed wet or dry. These results are in sharp contrast to those of Douglas fir with Swiss needlecast. Such results are a happy finding for those losing the battle against the needlecast infection. The disease does not cause double-trouble like the Douglas fir disease.

Seed Source and Freshness

Dr. Gary Chastagner has been cooperating with a number of other researchers in the nation in studies of Christmas trees. The Washington state industry does not grow Scotch pine or

White fir (*Abies concolor*). The Douglas fir grown in Washington is a coastal variety resistant to the *Rhabdochloa* needlecast disease but susceptible to winter damage in climates like Michigan's. The New Mexican and British Columbian inland varieties of Douglas fir that we prefer are devastated by disease in Washington state.

In cooperation with Dr. Dan Barney at the University of Idaho, Dr. Chastagner has examined a number of seed-sources (provenances) of White fir for differences in needle retention and freshness. These results are valuable to Michigan growers and may significantly alter the choice of seed-source in future plantings in our state. Seventy 9-year-old trees were harvested in Idaho and shipped to Washington. The trees were of 7 provenances (10 trees/seed-source) and half were displayed wet and half dry. The provenances and results of the study are listed in Table 2.

Table 2. Overall White fir quality rating (freshness and percent needle retention).

Provenances	Displayed dry	Displayed wet
Rio Grande	best	better
Cibola	better	better
San Isabel	better	better
Lincoln	good	better
Santa fee	fair	good
Kalbab	poor	good
Siskiyou	worst	fair

This research uncovered major differences in the freshness, needle-retention and keepability among the seven seed-sources of *Abies concolor*. Kaibab and particularly Siskiyou seed-sources were much worse than the other provenances. Rio Grande, Cibola, San Isabel and Lincoln seed-sources performed the best.

All trees benefitted from wet display and dry-displayed trees absorbed the same amount of water when they were placed in water after the 5 week experiment.

With four provenances of White fir to select from when planting new

stock, we should begin studies to determine which provenances have winter hardiness, rapid growth, straightness, small handle diameter, and color.

Douglas Fir

For the winter of 1991-1992 we located six seed-sources of Douglas fir in one field in Michigan for tests of postharvest freshness and keepability. Sixty trees (10 trees per seed-source) were donated by the Mathlesen Tree Farm, and shipped in boxes to Washington with the kind help of the Happy Holiday Tree Farm. Within a few month the results of this study will be available and if differences are evident we may expand the number of seed-sources of Douglas fir and test these the following year. Because provenances, we are curious whether a north to south gradient of provenances will reflect a best to worst gradient of keepability. We are looking forward to support from the Michigan Christmas Tree Association in our quest for the quality Christmas tree.



MICHIGAN SNOWFRESH