SELECTION OF CHRISTMAS TREE STOCK BY USE Of PHYSIOLOGICAL METHODS

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Can morpho-physiological features of various species of *Pinus* be used to select adequate Christmas tree stock? Yes, if such features as needle moisture content, closure of stomates, color persistence, and brittleness are used as parameters. In a recent paper (*1*) it was demonstrated that of three southern pines—loblolly, shortleaf, and sand pine—sand pine consistently maintained high ratings in the above mentioned parameters. Sand pine has been received quite well by consumers in a Christmas tree acceptance trial conducted in Louisiana (personal communications[1]).

Such characteristics as moisture retention and stomatal closure also could be utilized in conjunction with progeny tests to identify specific families with desirable morphological and physiological traits. Since certain physiological characteristics are maintained from juvenile through mature stages of tree development, early progeny roguing may be possible after a definitive set of desirable characteristics has been established (*4*).

This paper reports on several proven methods that can be used with a minimum of training and equipment to delineate the above parameters.

[1]Shih-Chang Hu, School of Forestry and Wildlife Management, LSLI. Baton Rouge, La.

Needle Moisture Content (NMC)

The knowledge of NMC at specific intervals after a tree has been cut will provide information concerning how fast the tree will dry out, thus determining the "shelf life" of the Christmas tree stock. These measurements can be made with or without the addition of anti-transpirants or dyes containing a fireproof or anti-transpirant component.

Figure 1 provides a visual display of the type of data collected from NMC measurements. Of the three southern pines tested, sand pine retained moisture in its needles for a longer period of time, thus maintaining needle turgidity and presenting a healthy appearance to a potential customer. Moisture would definitely be maintained longer in the needles after the addition of an anti-transpirant. The measurement method re-

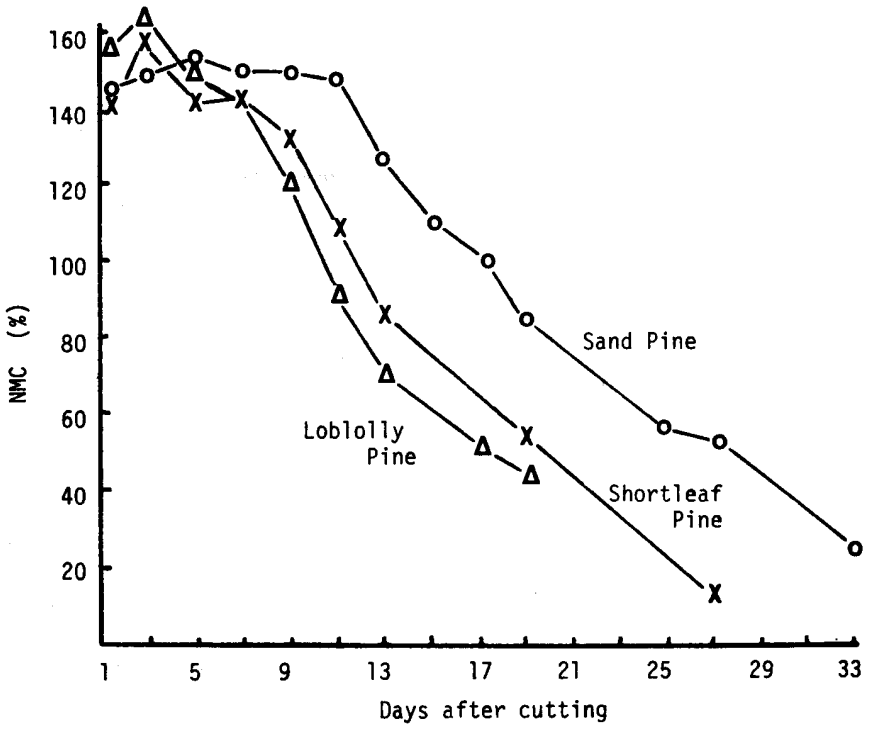

Figure 1.—*Average needle moisture content (NMC) of the species as they were allowed to dry. The trees were placed in buckets of water shortly after being cut.*

quires the removal of a mature fascicle (preferably 2 years of age) from the tree and immediately weighing it to the nearest 0.0001 gm to obtain the fresh weight. The fascicle is then placed in a petri dish or on a paper towel and placed in an oven at 85° C for 24 hours. The fascicle is then reweighed and the weights substituted in the formula below to obtain the percent NMC:

$$\text{NMC (\%)} = \frac{\text{Needle green weight - Dry weight}}{\text{Dry weight}} \times 100$$

Stomates

Stomates uniquely control the major arteries for water loss from a plant's needles. Thus, with stomates that close rapidly when the tree is cut at its base, moisture loss from the needles is reduced. This would prevent foliage droopiness and reduce fire hazards. Table 1 provides an example of the type of data collected from stomate measurements. This data when compared with the information presented in figure 1 helps to explain the reason for the relative ranking of the southern pines as to NMC. Sand pine needles dried out at a slower rate than either the shortleaf or loblolly pine needles because immediately after the sand pine stem was cut the stomates reacted by closing.

The measurement method requires removing a mature needle from the tree to be tested and immediately submerging it for 2 minutes in a solution of 0.6 grams methyl violet dissolved in 9 ml chloroform and 9 ml of ether, promptly washing it in sec-butyl alcohol, and rinsing it in distilled water. After the entire surface of the needle sample is studied ocularly through a 30 x stereo-microscope, the percentage of open stomates can be estimated (3).

Table 1.—*Average percentage of stomates open during the dry-down period for each species*

	Open stomates			
Species	Day 1	Day 5	Day 10	Day 15
	Percent			
Sand pine	5	3	2	1
Loblolly pine	77	27	20	10
Shortleaf pine	6	6	6	6

Foliage color and brittleness

Persistence of color in the foliage is another high consumer priority and should be considered when selecting growing stock. Specific families will retain their color (*2*) for a period of time after being cut; thus selection for these families would reduce the need and cost of spraying foliage to maintain adequate coloration. The degradation of needle color can be followed by comparing needles from various parts of the tree with a standard color chart, such as the one produced by the National Aeronautics and Space Administration.

Brittleness is another function of water loss and can give an indication of the flammability of the foliage. This characteristic can be determined by simply tying the needle into an overhand knot and pulling the knot tight until the needle breaks.

Table 2 provides an example of the data obtained from foliage color and brittleness tests.

Conclusion

Consumers make the ultimate decision concerning the suitability of a species as a family Christmas

Table 2.—*Color and brittleness changes occurring during drying period*

Species	Needle color[1]			Brittleness exhibited
	Elapsed days	*Original*	*Final*	*Days*
Sand pine	28	118 deep YG	120 m YG	31
Loblolly pine	18	137 dy G	110 gy.01	19
Shortleaf pine	10	125 m.01G	106.1.01G	12

[1]National Standards color chart.

tree. The use of certain physiological methods trees can help select trees that will fit consumers' requirements. This is only the first step, because then cultural practices must be developed.

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