

SEEDLING QUALITY: SUMMARY OF A WORKSHOP

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Abstract.--The results of discussion group presentations at a workshop on seedling quality are summarized. The concept of seedling quality held by most of the participants was based primarily on seedling morphological characteristics. The ideal loblolly pine (Pinus taeda L.) or slash pine (P. elliottii Engelm.) seedling is described based on the group presentations.

INTRODUCTION

In 1979, at a workshop on evaluating seedling quality, a world-wide group of scientists, nursery managers and foresters agreed on the following definition: "The quality of planting stock is the degree to which that stock realizes the objectives of management (to the end of the rotation or achievement of specified sought benefits) at minimum cost. Quality is fitness for purpose" (Willén and Sutton 1980). At the Eastern Session of the Southern Nursery Conference in Savannah, we assessed the participants' concept of seedling quality in two concurrent workshops. After a brief introduction in which morphological and physiological indicators of seedling quality were presented, the participants divided into discussion groups of about 10 people. Each group developed its own concept of seedling quality and then shared its views with the whole workshop. Each session of the workshop consisted of five groups. What follows is a summary of those 10 presentations.

RESULTS

The consensus of each workshop was quite different. The participants in the first session felt that seedling quality can only be assessed at the nursery. They reasoned that what happens to stock after it leaves the nursery may affect field performance, but does not reflect upon its quality. The participants in the second workshop session, however, argued that field performance is the ultimate indication of seedling quality.

The group presentations emphasized southern pine (Pinus spp. L.) planting stock. Some attempted to quantify loblolly pine (P. taeda L.) and slash pine (P. elliottii Engelm.) seedling quality. Nine of the groups discussed quality in terms of observable or measurable characteristics. The shoot to root ratio was the characteristic most often mentioned. Although 8 groups considered shoot-root ratio an indication of seedling quality, only 1 group quantified it by saying that a desirable ratio is 2:1, shoot to root.

The next most mentioned characteristic was the root system. Seven groups discussed the importance of root morphology to seedling quality. The

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need for a fibrous root system was often stated. Some groups quantified what they considered a good root system. The recommended overall length varied from 5 to 7 in. (13-18 cm). One group specified that the root system should be greater than 25 percent of the total seedling weight.

Root collar diameter, "dormancy", and absence of disease were each cited by 6 groups as important indicators of seedling quality. Some quantified desired root collar diameter, others did not. Two groups indicated that the caliper should be between $4/32$ and $1/4$ in. (3-6 mm). One group specified $3/16$ to $3/8$ in. (5-10 mm) as the acceptable range of root collar diameters. While no attempt was made to physiologically define dormancy, it was specified that quality seedlings should be "dormant" (not actively growing) for outplanting. Freedom from disease was also specified by a majority of the groups.

Half of the groups said that seedling height and the presence of mycorrhizae were characteristics useful in evaluating planting stock quality. The range of heights mentioned varied from 7 to 12 in. (18-30 cm) with planting method a consideration. One group specified desired height by location. For Texas they recommended seedlings be 7 to 9 in. (18-23 cm), for North Carolina 10 in. (25 cm), and for Georgia 9 to 10 in. (23-25 cm). While mycorrhizae were recognized as being characteristic of quality seedlings, none of the groups quantified the amount of mycorrhizal roots desired.

Other morphological characteristics cited by 1 to 3 groups included bud condition, presence of secondary needles and woody bark, freedom from injury, and seedling form and vigor. Some groups discussed the importance of seed processing and nursery culture on seedling quality. Two groups suggested crop uniformity as an indication of quality. None of the groups mentioned the effects of lifting, handling and storing on the quality of planting stock.

Carbohydrate or starch reserves and root growth potential were cited by 3 and 2 groups respectively as important physiological characteristics of seedling quality. While the importance of such physiological indicators is recognized, the need for field applicable assessments was stressed.

Half of the groups mentioned the impact of genetic considerations on seedling quality. Selection of the best species and seed source for the intended planting site was emphasized. Two groups specified genetic improvement as a characteristic of quality planting stock. Including genetic implications in a discussion of seedling quality was controversial in one workshop session but no consensus was formed.

SUMMARY

We did not attempt to arrive at a definition of seedling quality at these workshop sessions. However, in assessing what was presented it must be concluded that the general concept of stock quality is based primarily on morphological characteristics of the seedlings. Based on the 10 group presentations the ideal loblolly or slash pine seedling could be described as follows:

1. -being of the appropriate species and seed source for the planting site

2. -having a balanced shoot-root ratio, perhaps approximately 2:1
3. -having a fibrous root system 5 to 7 in. (13-18 cm) long with abundant mycorrhizae
4. -the root collar diameter should be 4/32 to 3/8 in. (3-10 mm)
5. -having a good bud set indicating a low state of physiological activity in the stem
6. -being free from disease and injury
7. -being 7 to 12 in. (18-30 cm) tall, depending on the intended planting site and planting method
8. -having secondary needles and a woody stem
9. -having sufficient stored food reserves and the potential for rapid and prolific root growth after outplanting.

Evaluating seedling characteristics may allow us to predict field performance, but as one group pointed out; "Morphological and physiological characteristics are not 'quality' but are indicators of quality. We need to know how well these indicators tell us about quality."

LITERATURE CITED

- Willén, P. and R. F. Sutton. 1980. Evaluation of stock after planting. *New Zealand J. of For. Sci.* 10(1): 297-299.