SEED SIZING: BENEFIT OR DETRIMENT

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INTRODUCTION

Sized seed is easier to plant by machinery because the uniform seed size provides an even flow of seed. An even flow of seed during planting provides the opportunity for a more uniform density (9), which in turn promotes greater nursery survival. As nursery management becomes more intensive, due to small lots of the costly seed orchard material, such a potential in greater survival is greatly welcomed. But, in reality, does all this happen? What is the real effect of seed sizing? Is the expense of obtaining a uniform product really justified in the nursery operation.

SIZING OF SEED

There are two basic methods available to the nurseryman for sizing seed. These are physical sizing (by diameter) and gravity separation (weight or density).

Physical sizing employs a sequence of screens with differing size holes. Separation by physical size does not necessarily imply any improvement in the seed, but it does provide uniformity.

Within any size there will still be empty and partially deteriorated seeds. If many empty seed were present in the mixed lot they will be distributed among the physical sizes after sizing with a slightly higher percentage in either the largest or the smallest sizes, or in both of these sizes. A true reflection of viability, in relation to size, cannot be obtained from the actual germination due to variation in the percentage of empty seed.

Gravity separation provides an array of seed according to their weight or density. Because a large empty seed may be of similar weight or density as a small sound one, these may appear together. Therefore, the following principles must be observed (12); (1) it is possible to separate seed of the same size but with different densities, (2) it is possible to separate seed with the same densities but differing in size, and (3) a mixture of seed of different sizes and densities cannot be separated in one operation. It should also be remembered that the deck must be completely covered with seed for a proper separation.

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Gravity separation is achieved through the proper balance of air control, elevation of the deck and the speed of the eccentric (vibration of the table).

Just about all the empty seed in gravity separation will be found in the lightest size which comes off the low end of the table.

PAST RESEARCH ON SEED SIZING

Seedling size is related to seed weight. Spurr (16) found a positive correlation between these factors for up to three years after germination; however, the difference decreased with time. Righter (13) also reported this relationship and further indicated that there was no relationship between seed weight and inherent vigor. Thus, he suggested that selection for genetic improvement through seed sizing was of no benefit within a progeny. Switzer (17) indicates a possible relationship of seed dormancy to seed size in Pinus taeda sized by gravity.

Roberts (14) points out that vigor is more related Lo seed density than seed volume but that most seedsmen consider the larger seed, based on physical size, better because they believed these seed to have more "initial capital". The results of physical sizing seems to vary by species. Larger sized seed from screens had an increased germination in Picea abies (2), Betula papyrifera (3), Eucalyptus citriodora (5), Pinus densiflora (7). Size had no effect on the germination of Pinus contorta var. latifolia or Picea glauca var. albertiana (1), Pinus sylvestris (19), and Pinus radiata (11), but gave a positive correlation with seedling growth in these cases. The relationship between seed size and seedling growth lasted from 5 months in Eucalyptus (8) to 5 years in ponderosa pine (1). Cozzo (8) reported an increase in germination energy but not in germination capacity with larger seed of Eucalyptus viminalis.

In Pinus pseudostrobus (4), Pinus ponderosa and Pinus jeffreyi (10), the medium sized seed germinated best, instead of the larger seed. Nursery survival is reported as being related to seed size. Large seed improved survival of Pseudotsuga menziesii while small seed improved survival of Pinus sylvestris (18). No influence was found on the nursery survival of Pinus ponderosa, Pinus jeffreyi (10) or Pinus elliottii (15).

In only one species was there a conflicting report found. Cevedo (6) reported that sizing was related to germination capacity in Pinus elliottii planted in 1 cm of sand in greenhouse flats. While Shoulders (15) reported that there is no effect due to seed size on germination capacity or field survival in nursery trials. Both agreed that all sizes germinated alike in laboratory tests. These differences were most likely due to differing seed lots or soil environments. Either way, further investigations are suggested.

CURRENT WORK

In the fall of 1973 a cooperative study on seed sizing of Pinus elliottii was undertaken between St. Regis Paper Company and the Eastern Tree Seed Laboratory.

Three seed lots were sized into four sizes with screens. Then each of the three smaller sizes were sized into three sizes by a gravity separator. Thus providing ten size classes per lot for a total of 30 treatments. Also, two lots came from St. Regis' seed orchard, while the third lot was a wild collection from the same general area.

Samples of each treatment were tested at the Eastern Tree Seed Lab for germination at 28 days, germination speed and the number of seed per pound. Each treatment was then planted in three lineal feet of nursery bed at the St. Regis nursery at Lee, Florida. Treatment selection was random with three replications of each treatment. Counts were made on nursery germination, seedling survival and seedling height during the growing season. In late fall ten seedlings per plot were dug, bagged and transported to the seed lab at Macon, Georgia. Measurements were made on stem diameter, stem length, stem wet weight, stem dry weight, root length, root wet weight, root dry weight, 10-seedling weight and top-root ratios in the wet and dry weights. The remaining seedlings were out planted in a randomized block design where height measurements and survival will be recorded.

The results proved so interesting the first year that the entire study was repeated in 1974. The data is still in the analysis stage; but, relationships between seed size and seedling height, seedling weight, nursery survival, and germination capacity appear to be real. The final results should be available by early 1976.

CONCLUSION AND SUMMARY

Seed sizing may be important to the nurseryman if there is sufficient variability in his seed to warrent it. Research indicates that no general statement can be made as to potential benefits. Evaluation must be made with each species and very likely each diverse environmental condition. The only general conclusion to be drawn from Lit. search is that seedling size is related to seed weight but this relationship diminishes with time. However, the very fact that the larger seed may produce faster growing seedlings is of prime importance to southern nurserymen because of the relatively short nursery cycle.

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