Comparison of Germination Rates of *Pinus strobus* for Two Seed Sorting Techniques at Vans Pines Nursery©

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Pinus strobus is a major crop species for Vans Pines Nursery. We started slowly moving conifer propagation out of field seedbeds and into Jiffy forestry pellets that are propagated inside greenhouses in 1998. As 2000 was the last year we sowed conifer seeds in field seedbeds, this placed a much greater importance on our greenhouse plug production. Because greenhouse space is expensive when compared to field space, we quickly realized that greenhouse propagation cost were inversely proportional to seed lot germination rates. Higher germination allowed for more efficient use of greenhouse space thus lower plug production cost.

The problem is conifer seeds have poor germination rates. To overcome this, many plug growers like us, multiple sow 2- to 5 seeds in each cell then a few weeks later go back through and thin the crop to one tree per cell. While this solves the problem of efficient use of greenhouse space, it creates additional labor expense for thinning and wastes a lot of seed. When sowing *Pinus strobus* seed straight from collectors, with no sorting, we got 36% full plugs for one seed per plug. A better solution than multi-sowing is to sort the seed for high germination rates of 90%+, so we looked at different ways to sort seed to achieve higher germination rates. The two seed sorting methods we chose for this experiment were sorting seed on a gravity table and sorting seed in water using the sink/float method. Using the gravity table, the seeds were sorted into three lots, A, B, and C with Lot C the lighter or empty embryos (Figs. 1 and 2).

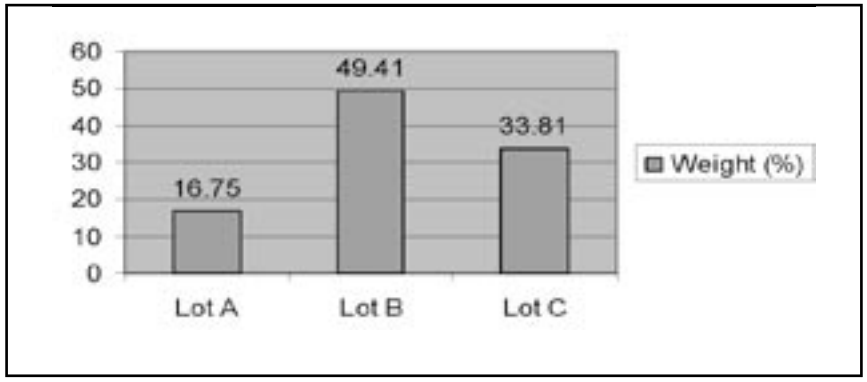

Figure 1. Seed weight percentage by gravity table sorting (A to C, good to poor quality).

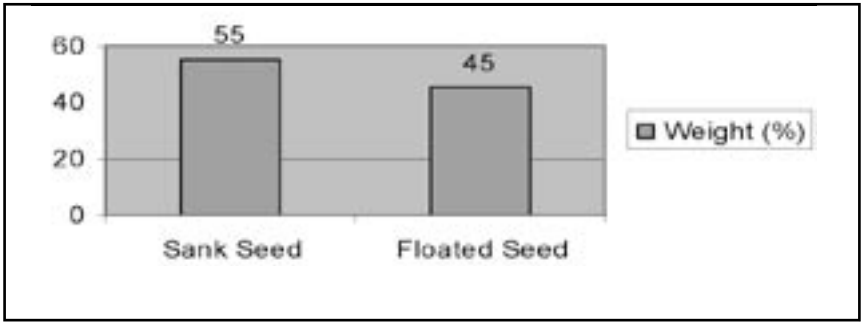

Figure 2. Seed weight percentage by water sink/float sorting.

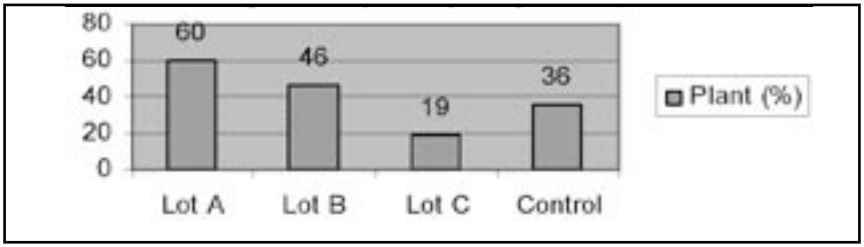

Figure 3. Plant percentage (1 seed per plug) after gravity table sorting (A to C, good to poor quality seed).

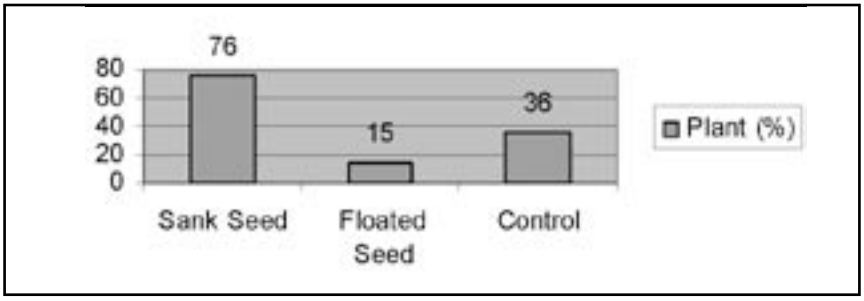

Figure 4. Plant percentage (1 seed/plug) after water sink/float sorting)

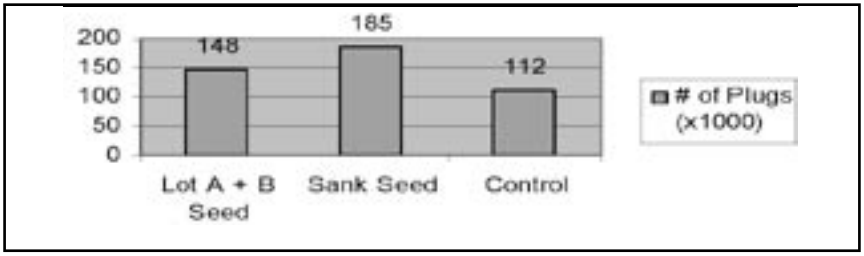

Figure 5. Number of plugs producable from the whole seed lot (25 lbs.) targeting over 90% plug percentage (A+B, 3 seeds/plug, control 6 seeds/plug).

Table 1. Comparison of *Pinus strobus* seed weight and plant percentage through the sorting of gravity table (Lot A, B, C) and water sink/float.

Seed Type	Weight (lbs)	Weight (%)	Purity (%)	Cut test(%)	Plants (%)
Control	25.42	100	89	67	36
Lot A	4.26	16.75	95	93	60
Lot B	12.56	49.41	90	76	46
Lot C	8.60	33.81	83	27	19
Sank seed	14.01	55	95	95	76
Floated seed	11.41	45	83	29	15

Table 2. Plant percentage of *Pinus strobus* seed through sowing different seeds per plug.

	Seeds per plug					
Seed Type	1 seed	2 seed	3 seed	4 seed	5 seed	6 seed
Control	36	59	74	83	89	93
Lot A	60	84	94			
Lot B	46	71	87	93		
Lot C	19	34	47	57	65	72
Sank Seed	76	94				
Floated Seed	15	28	39	48	56	62

In looking at Table 1, we see that Lot C is approximately one third of the total seed lot and this seed lot is basically not usable with a 27% cut test and with only 19 plants growing out of 100 plugs sown. Both Lots A and B are usable seed lots for sowing, producing 60 and 46 plants respectively when sowing one seed per plug out of 100 plugs sown (Fig. 3). Our control (seed with no sorting) produced only 36 growing plugs out of 100 plugs sown. While Lots A and B are much better than our control, they still do not reach our standard germination rate of 90%+ to be profitable. Comparing to our sink/float method we see that seeds that sank resulted in 76 growing plugs out of 100 plugs sown (Fig. 4). Again, this does not meet our standard germination rate of 90% + to be profitable. Looking at Table 2, we see that by sowing two seeds from the seed lot that sank, per plug, we can achieve our standard of 90%+ (94% actual) but we needed to sow three seeds per plug from seed lot A or four seeds per plug from lot B to achieve our 90%+ standard germination rate.

Because Lot A is only 16.75% of the total seed lot from the gravity sorting, in the real world, we would combine Lot A and Lot B and sow three seeds per plug. This would achieve our 90%+ standard germination rate and allow us to sow two/three of the seed from the original lot and only discard the 1/3 from Lot C. For the seeds that sank we would be able to use 55% of the seed from the total seed lot, but because we sow only two seeds per plug we still get more growing plugs in total (185,632 growing plugs, i.e., 26,500 seeds/lb.). With Lot A and B at 16.82 lbs., and three seeds per plug we get 148,576 growing plugs (Fig. 5). Furthermore, sinking seeds require

less thinning and the machine sowing is slightly faster which helps lower these production costs.

Best of all the sink/float method requires no expensive equipment like a gravity table, sorting only requires a container of water. In looking again at Table 2, with the control seed we must sow six seeds per plug to get our 90%+ standard germination rate and the entire lot will only get us a total of 112,271 plugs. Also we must now spend more time sowing and thinning than the sorted seed, not to mention the amount of seed wasted. Also note that even when sowing six seeds per plug for both Lot C or the floated seed lot, you cannot achieve the 90%+ rate of plugs full with seedlings.

SUMMARY

Because conifer seeds have poor germination rates, seed sorting to achieve higher germination rates can lower propagation cost by greatly reducing lost greenhouse space from empty plugs. Seeds that sank proved to be the best sorting method compared to the gravity table method as it resulted in the highest germination rates using the least amount of seeds per plug and gave the greatest number of total plugs produced.

New Hostas From Seeds©

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INTRODUCTION

Hostas are the number-one-selling perennial in North America, and much of that is attributed to cultivar diversity as well as hardiness and ease of use in the landscape. Much of the recent interest is in new distinct cultivars. There are about 250 new cultivars registered each year bringing the current total to about 3000 different cultivars.

Hosta cultivars can be propagated by division and tissue culture, or also by seed for those few species that have a market. The diversity and unpredictability of sexual propagation does not lend to production of true-named cultivars, however it is an excellent source of new and improved cultivars.

Breaking down the various characteristics into all the possible forms shows a huge potential for different cultivars. If we examine the various attributes of hostas we find there to be conservatively 136 different traits. Assuming half of these to be linked, i.e., large plant size with large leaf size, or lance leaf shape with tapered leaf base, we still find there are enough combinations of qualities to produce well over 500 million distinct hostas. That's enough for everyone living in North America to have at least one of their very own unique hostas capable of being keyed out and identified by its special characteristics.

HOSTA HYBRIDIZING PROCEDURE

As with any hybridizing program, breeders must first start with a thorough understanding of the genus. Growing many different species and cultivars of hostas is essential, and a healthy comprehension is also a must. The American Hosta Society