

Pre-germination seed soaking effect on germination time

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Summary: Short germination times are desirable in competitive giant pumpkin growing. Shorter germ times allow the gardener to get seedlings established faster, as well as regain lost time if first-round seedlings are lost early in the season. An experiment was undertaken to determine the effect of pre-soaking giant pumpkin seeds in a warm water bath prior to planting on total germination time. Measurements showed that seeds soaked in a warm water bath for 8 hours before potting provide a 1 day advantage over no soak seeds.

Methods: 64 seeds from a 1546lb pumpkin grown in 2013 were selected for the experiment. The lot was broken into two sets of 32 seeds. In each 32 seed replication, one control group and three experimental groups of 8 seeds each were allocated: 0 hour soak (control group), 1 hour soak, 4 hour soak, 8 hour soak.

Each soak group was immersed into a warm (75 degrees F) water bath for the designated time. Soaks were staggered such that all 32 seeds in each replication were planted at the same time (time=0hrs). All seeds were planted $\frac{3}{4}$ " deep into 3 inch pots containing standard seed starting mix with adequate, consistent moisture. A 32-pot flat containing the four groups was then placed on a heating mat inside a miniature greenhouse, maintaining a soil/air temperature of ~75 degrees F.

32 seed flat setup, replication #1

0 hours	0 hours	1 hour	1 hour	4 hours	4 hours	8 hours	8 hours
0 hours	0 hours	1 hour	1 hour	4 hours	4 hours	8 hours	8 hours
0 hours	0 hours	1 hour	1 hour	4 hours	4 hours	8 hours	8 hours
0 hours	0 hours	1 hour	1 hour	4 hours	4 hours	8 hours	8 hours

32 seed flat setup, replication #2

1 hour	1 hour	0 hours	0 hours	8 hours	8 hours	4 hours	4 hours
1 hour	1 hour	0 hours	0 hours	8 hours	8 hours	4 hours	4 hours
1 hour	1 hour	0 hours	0 hours	8 hours	8 hours	4 hours	4 hours
1 hour	1 hour	0 hours	0 hours	8 hours	8 hours	4 hours	4 hours

Observations were made on 12-hour intervals, at 6am and 6pm each day until the experiment was complete. All 64 seeds germinated and contributed to the data set. Time to germination was defined as the ability to visibly observe any portion the hypocotyl arch without disturbing the potting mix surface (see figure 1.)



Figure 1. Giant pumpkin seedling emergence

The “hypocotyl arch” is always the first part of the seedling to break the soil surface.

When data was collected on the first 32 seed setup, the experiment was repeated on the second 32 seed replication. To avoid perimeter bias, the position of the outer sets was reversed with the inner sets (see tables above).

Data: All 64 seeds emerged, providing 16 data points for each control and experimental group. When calculating the hours to germination, the amount of soak time was added to each respective experimental average. For example, the 8 hour group emerged in an average of 110.75 hours, however, the 8 hours of soak time is added to this number for a total of 118.75 hours.

Soak time (hrs)	0	1	4	8
n=	16	16	16	16
Average hours to germination	143	129.75	129.75	118.75
% difference		-9%	-9%	-17%
hours difference		-13.25	-13.25	-24.25

Discussion: The data from this experiment suggests that an 8 hour warm water soak prior to planting accelerates emergence by 17% (24.25 hrs) vs no soaking. Both a 4 hour and 1 hour soak provide a 9% (13.25 hr) advantage over no soaking. The 118.75 hour time to emergence for the 8 hour soak group equates to exactly 5 days. The 143 hour interval for the no soak group equates to 6 days. As described above, an 8 hour pre-soak gives the grower a one day advantage over not soaking.

Temperature is a critical factor in time to emergence. The equipment used here only allowed for experimentation at 75 degrees F. Given the possibility of accelerated emergence under higher temperatures (say, 85 degrees F), one could speculate that a higher temperature environment may offer even greater advantage when rapid seed germination is needed. Beyond 85 degrees F, however, the biochemical processes involved in germination become increasingly inhibited and no advantage is likely to be gained.