

Sexual Propagation: Effects of Seed Coat Removal, Treatment with GA₃, Seed Drying, and Cold Stratification on the Germination of Apple Seeds

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Introduction to Treatments Used

Treatments are separated into two groups:

- Cold Stratified
 - Intact Seed Coat - No GA₃
 - Intact Seed Coat - GA₃
 - Removed Seed Coat - No GA₃
 - Removed Seed Coat - GA₃
 - Dried Seed
- Direct Sow
 - Intact Seed Coat - No GA₃
 - Intact Seed Coat - GA₃
 - Removed Seed Coat - No GA₃
 - Removed Seed Coat - GA₃
 - Dried Seed

Plant material

Malus domestica (Apple; Rosaceae, Rose Family)

Results

Here are the final results and observations for this experiment:

Of the seeds that were cold stratified in the coolers for 6 weeks, all that germinated during the stratification survived. No additional plants have sprouted from the stratified seeds. Of the seeds that were not cold-stratified, nearly all (90%) germinated the second week of observations. By the final week's observations, all the germinated seedlings were out-growing their small plugs, and were ready for re-potting into larger containers. Most of the seedling's leaves were bright green and free from blemishes.

Of the stratified seeds with seed coats intact, all five seeds treated with GA₃ germinated, while only 3/5 of the non-treated seeds germinated. Of the stratified seeds with no seed coats, 4/5 of the treated seeds germinated and only 3/5 of the non-treated seeds germinated. For the dried and stratified seeds, all 5 germinated. This might lead us to believe that there is some sort of chemical inhibitor to germination present in the seed coat. When the seed coat was removed, the seeds had a slightly higher germination rate. When the seeds were treated with gibberelin GA₃, it appeared to help the seeds to overcome their chemical inhibition.

For the non-stratified, also known as direct-sow, seeds, the seeds with an intact seed coat grew worse than the seeds with no seed coat. This helps solidify our hypothesis of a chemical in the seed coat that inhibits the germination. For GA₃ treated seeds with a seed coat intact, two of five germinated. For the seeds with an intact seed coat, but not GA₃ treated, the germination rate was 5 out of 5. For seeds without a seed coat, for both treated and non-treated seeds, all five seeds germinated for each group. For non-stratified, dried seeds, only two of five germinated.

Tables

Number of Germinated Seeds for <i>Malus domestica</i>		
	Stratified	Direct Sow
Intact Seed Coat - No GA ₃	5	2
Intact Seed Coat - GA ₃	3	5
Removed Seed Coat - No GA ₃	4	5
Removed Seed Coat - GA ₃	3	5
Dried Seed	5	2

Discussion

Overall, the hypothesis of this experiment, that apple seeds have a chemical inhibition to germination present in the seed coat, appears to be valid. While most of the stratified seeds sprouted while in stratification, which isn't supposed to happen, the numbers still show a very slight advantage towards stratified seeds, as well as seeds that have their seed coat manually removed. It is unknown what the effect of drying is supposed to have on the germination of apple seeds. The gibberelin, GA₃, appears to have a mostly positive influence on apple seed germination, however, for non-stratified, GA₃ treated seeds, only 40% germinated. When trying to find a 'best' practice, we must compare both across the stratification option, but also the gibberelin treatment option and the seed coat removal option. While stratification appeared to help, the most consistent helper was to remove the seed coat. However, this is an extremely time consuming task, especially for a large number of seeds, such as an apple seedling nursery or orchard. For these large, commercial operations, cold stratification or treatment with GA₃ would be more feasible.

Recommendation

For propagating apple trees, *Malus domestica*, from fresh seeds, the most reliable treatment is to remove the seed coats prior to planting.