SEED GERMINATION OF STONE FRUITS[1]

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There are nearly 200 species of *Prunus* or stone fruits and they include plums, apricots, peaches, cherries, cherry-laurels (which are evergreen) and almonds. They appear in nature mostly in the north temperate zone. All can be cultivated and most kinds are hardy in the north and are not particular as to soil. They are usually propagated by seeds. Named cultivars of stone fruits can often be propagated by hardwood cuttings but usually they are budded on closely related stock. Seed germination of these rootstocks is the focus of this paper.

In nature the ripe stone fruit is eaten by an animal, depulped in digestion and worked on by the stomach acids. However, for reasons that are not clear, scarifying stone fruit seeds with abrasives or sulfuric acid (as is done with numerous other seeds) does not seem to help and may harm. On the other hand, thorough leaching with water does help, especially with seeds that have dried out. Occasionally there can be a seed lot ready to germinate which should be planted without leaching. Careful examination of the seed is essential.

To leach, seeds may be placed in running water in a porous sack for a period of three days to two weeks, depending on the seed. We have had good results with myrobolan plum by placing it in our irrigation water collection box on the mountain and allowing the water to run through the seeds for four or five weeks. We have also placed plum and apricot seeds in running creeks. We have had success putting seeds of some species under mist. If seeds must be placed in a container, the water should be changed about every 12 hours and then let drain for 12 hours. Aeration during leaching is essential to maintain seed viability. Five days in soak is about right for seeds of many species. In general, people do not leach seeds enough. Consideration should be given to the background of each seed lot: when and where was it harvested? How was it processed and stored?

Remember that seeds of stone fruits need to afterripen and may require warm, moist stratification for this. A cold stratification period is required following the warm period. This means that if seed is sown in late summer or fall, there must still be enough warm days to give the required warm period. The cold requirement is then fulfilled over the winter. Seeds of some

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[1] Presented by John E. Bennett.

stone fruits like American plum and *Prunus domestica* can take two years in the field or a year in the cooler. Other times they do not require this; it depends on the seed. Careful examination and patience are necessary.

In climates too warm to give the amount of cold necessary, you can succeed by controlled stratification, but not by planting seeds in the field after harvest. For example mahaleb cherry seedlings are grown at Modesto, California, by stratifying the seeds in a refrigerated building before planting.

It should be stressed that germination techniques vary with the species and even the seed lot. Since seeds of American plum (*Prunus americana*) and mazzard sweet cherry (*P. avium*) are often difficult to germinate they will serve as examples of stratification techniques.

If you are willing to tie up your ground for two years, you may plant the whole fruit of *P. americana*. Years ago, when we were first starting to grow this species we gathered wild plums in our county and planted them by hand, spacing and hitting them with a hammer after placing them on the bed to push them into the soil and start the pulp decomposition. The second spring 95% germinated and the spacing was great but, of course, that method is impractical for any large scale production. If the fruit can be gathered early and depulped promptly and planted so that the seeds get 60 days of warm stratification in the ground followed by cold stratification through the winter, they will usually come up the next spring. This method is not fool-proof, however, as a very wet summer or too much irrigation can cause the seed to rot.

Our best results with stored seed are obtained from placing dry seed in churning water for two weeks and planting them by mid-July. *Prunus americana* seed then germinated the next spring and an even stand was obtained. We plant the seed by machine at the bottom of furrows 1 to 1½ inches deep and fill the furrows with a sawdust mulch.

For controlled stratification with fresh seed, we recommend about six weeks of warm stratification at 60° to 70°F. followed by a cold period at 41°F. for 90 to 180 days, the average time being 120 days. It is essential to examine the seed periodically and plant when it shows signs of germinating. Figuring back from the time you wish it to germinate determines the time you should begin stratification.

In the case of our second example, mazzard cherry, freshly extracted ripe seed may be planted without soaking (usually in mid-summer). After-ripening and warm stratification, plus cold stratification, takes place in the field. This is the simplest and most used method and usually gives good results.

A second method applies to stored seed. After harvesting and cleaning, seed is stored, preferably for one year. (Best results are obtained with seed stored for a full year.) The temperature of storage should be just above freezing (32° to 38°F.) with the seed having a moisture content of 7% to 10%. The Woody Plant Seed Manual mentions *Prunus avium* with a moisture content of 11% and stored in sealed bottles at 34°F. for 4½ years as only dropping from 93 to 84% viability. During storage time some after-ripening occurs. The mazzard seed is then soaked thoroughly for at least one week (using the alternating soak and drain method) and then stratified in sand. It is essential that the sand be moist but not wet. A good way to tell if the moisture content of the stratification medium is correct is to squeeze a small handful. If it forms a ball that crumbles when you touch it with your index finger, it is just right. If it doesn't form a ball, it is too dry and if the ball doesn't crumble when touched, it is too wet.

Four to six weeks of warm stratification at 60° to 70°F. is followed by up to five months of cold stratification at 41°F. The sand must be kept moist, but not wet, or the seed will rot. After about three months in the cold, the seed should show swelling signs. Frequent inspection is now necessary and when most of the hulls start to crack, the seed should be planted. In our climate it is best to have beds prepared in the fall and even sow on snow rather than let the seed stay too long after cracking occurs. Here again, in scheduling stratification, figure backwards from your last spring frost so that the seedlings will not come too early. We plant *P. mazzard* seeds one inch deep and cover with one inch of sawdust. Planting too deep in heavy soil can produce crooked seedlings. Remember to allow for some attrition of the covering.

Apricot seeds have much less cold requirement then cherries; 30 days is enough. In fact, some seed will sprout in storage if the moisture is high.

Another method sometimes beneficial in germinating *Prunus* seed is soaking dry seed in 200 ppm (average) gibberellin, but this treatment cannot be relied on to always be effective. It can replace some of the cold treatment and is sometimes helpful with old or weak seed. We usually soak the seed overnight in gibberellin solution. We are in general agreement with Heinz Jansen who, in his book, *Wuchs-und Hemmstoffe im Gartenbau* — published by Ulmer in Germany gives the recommendations in Table 1.

We find that a gibberellin treatment is more effective if the seed moisture content of the seed is below 10 to 12% when it is immersed for 12 hours (two such soaks at least are recom-

Table 1. Gibberellin Treatment for Seeds of Prunus Species

Species	GA Concentration	Effect
Prunus *armeniaca*	100 ppm	Dormancy completely overcome
P. avium	100 ppm	Dormancy ⅔ overcome when followed by 4 months (*sic*) stratification
P. cerasifera	Up to 500 ppm	No effect
P. mahaleb	100 ppm	Shortens dormancy
P. persica	500 ppm	Dormancy overcome

mended). Thus the seed takes up the gibberellin. If seed that has already been soaked is immersed in gibberellin, the effect is much less or even nil. We think that gibberellin often helps but is not to be depended on. We know that gibberellin overstimulates seed of some species such as *Robina* and *Corylus* and has little or no effect on oily seeds such as pines. Gibberellin can be purchased from Merck & Co. or locally in areas where it is used on grapes.

Finally, to successfully germinate seeds of *Prunus* species, the key to success is careful examination of each seed lot both before and at frequent intervals during seed manipulation and stratification. This involves cutting and examining a sample of the seeds under magnification. Development of the epicotyl and expansion of the cotyledons are the things to watch. You must then decide if your seed needs longer leaching or stratification or if it is ready to plant.

Failure with stone fruit seed germination comes mostly from not properly pretreating the seeds. Avoid failure by careful attention to leaching, temperature, and time factors of stratification and by frequent inspection of seeds.

BUILDING AND USING A GROWING ROOM FOR SEED GERMINATION OF BEDDING PLANTS

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Intensive use of greenhouse space to maximize one's turnover rate is a key factor in having a profitable bedding plant season. In this situation, the propagator must often compromise ideal germination and growing conditions in an attempt to produce the seed flats in the space available. Valuable time is spent in their maintenance if they are placed in different areas of the range to provide different conditions for germination. At Skagit