Delayed Germination of *Prunus avium* and *Sophora microphylla*©

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I would like to draw attention to Norman C. Deno, Professor Emeritus of Chemistry from Penn State University, and his 2nd ed. of *Seed Germination Theory and Practice*. His experiments cover 145 Families, 805 Genera, and about 2500 species. He states, "Every species has some mechanism for delaying germination until after the seed has been dispersed. The challenge in germinating seeds is to overcome these delay mechanisms. With 95% of the species studied, the delay mechanisms are chemical in nature. Typically these chemical blocking systems are destroyed by drying, light, or varying temperature cycles.

In the first principle of mechanistic chemistry if treatment A, or conditions A are required to get germination under conditions B, critical processes were taking place during A and these were likely taking place at their optimum rates (greatest speeds). Thus if a period of 3 months at 4°C is required to get germination at 21°C, the period at 4°C was a time when something was happening (typically destruction of germination inhibitors), and it is misleading to refer to this period as a period of dormancy or a period of breaking dormancy.

There is a special ability of biological systems to show enormous changes in rate with temperature. These can be the result of configuration changes in proteins from enzymatically active configurations to inactive ones, or the result of structural changes in membranes that alter their permeability. These changes can be complete over a temperature range as little as 3°C.

Germination patterns are related more to the ecological environment in which species grow than to their taxonomic position. Thus a range of patterns can be found in a single genus.

Seeds of the common garden vegetables and annuals can be conditioned by simply drying the seeds, but most species of horticultural importance have more complex germination patterns and requirements. It is common for a species to have more than one chemical blocking system which must be removed in sequence and by different conditions. The remaining 5% of species use a physical system for delaying germination, nearly always an impervious seed coat" (Deno, 1993) (available on the internet, and two supplements are available from U.S.D.A. National Agricultural Library online site as free downloads, 12 MB and 5 MB).

PRUNUS AVIUM

Appletons Tree Nursery regularly grows over 400 species of trees and shrubs from seed and we try to copy what happens in nature to bring about germination. Mazzard cherry (*P. avium*) is an example of the chemical blocking and the correct sequence of different conditions. This edible cherry is used as an understock for fruiting and ornamental cherries.

Both humans and birds feed on the fruit, the flesh being eaten and the seed discarded to lie dry on the ground through summer. If left in the flesh the germination inhibitor in the flesh prevents germination. Sowing seed fresh after removal from the flesh and covering with sawdust to keep moist overwinter results in very low germination, so the drying stage is very important. Autumn rains come and leaves start to fall, moistening the seed when temperatures are still mild. This is followed by low temperatures for 3 months, and then in August germination commences and is completed quite quickly as soil temperatures rise.

In practice the seed is raked up under cherry trees in late March after the drying period. Seed is sieved from the leaves and soaked in water to float off empty seed and light

debris. The moist, sound seed is coated in acrylic paint with an insecticide (Mesurol®) and a fungicide (Thiram®) to deter rats and pheasants. Seed is sown in the warm soil in April and remains covered with sawdust through the winter until germination in late August and early September. After the main germination very few germinate as the soil temperature rises. A few seeds will lie over for 12 months and emerge at exactly the same time, a year behind the others.

To prevent sawdust blowing off the seedbed, Kerilea® hoops support an arch of hail cloth stretched along the bed and remains for 5 to 6 months keeping out chaffinches that eat emerging cherry seedlings. At emergence frosts are common on clear nights and spray irrigation pulses round the nursery coating everything in ice, the hail cloth tunnels become igloos of ice protecting the seedlings. As the risk of frost diminishes and germination is completed the covers are removed.

SOPHORA MICROPHYLLA

South Island kowhai (*S. microphylla*) is an example of an impervious seed coat, which can delay germination for years. Before the seed coat hardens, green seed will germinate rapidly sown in warm temperatures. Once hardened the seed coat must be penetrated by abrasion or concentrated sulphuric acid, and then seed soaked in water will swell to twice the size in 24-48 h and germinate in 3 to 4 weeks. Seedlots can vary in hardness of the seed coat and testing a sample in warm water for 24 h will show if any are soft and able to swell. Damaged seeds will swell and can be discarded.

Literature Cited

Deno, N.C. 1993. Seed germination theory and practice 2nd Ed. Published by Norman C. Deno, 139 Lenor Drive, State College, Pennsylvania 16801, U.S.A.

United States Department of Agriculture-National Library. <http://naldc.nal.usda.gov/catalog/41277, 41278, and 41279>.