DON RUSK: Do you get better plants of *Ribes sanguineum* when you use hardwood rather than softwood cuttings?

CHARLES TUBESING: There is a potential for getting a bigger plant by using heavy, 2-year-old wood cuttings, with a large diameter. You get a stouter plant right away. It is a less expensive method than using your valuable mist space for leafy cuttings.

VOICE: I find in the Portland area that *Vaccinium ovatum* will propagate from cuttings very readily taken almost any time during the year. Here it grows best in the shade.

PROPAGATION OF SOME NATIVE DECIDUOUS SHRUBS

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Propagation of deciduous native plants can be accomplished by seed or, in many cases, softwood and/or hardwood cuttings. The choice of techniques is usually species specific though, in some cases, may be dependent on availability of the propagating material.

This paper will deal with the following species: *Alnus crispa*, *Amelanchier alnifolia*, *Rosa acicularis*, *Rosa woodsii*, *Shepherdia canadensis*, and *Vaccinium parvifolium*. The paper will summarize approximately 7 years of experience with these species as well as results from controlled experiments.

PROPAGATION BY SEED

Many of the species grown at Reid, Collins Nurseries come from northern British Columbia or Canadian prairie provinces. Species such as *Shepherdia canadensis*, *Rosa acicularis*, *Rosa woodsii*, and *Amelanchier alnifolia* exhibit both physical and physiological seed dormancy. Physical dormancy is usually due to hard seed coats, whereas physiological dormancy is directly due to metabolic conditions within the embryo.

Methods of Breaking Seed Dormancy. A standard method of breaking dormancy due to hard seed coats is soaking of the seed in concentrated sulfuric acid for various periods of time, or by warm stratification. This is followed by cold stratification to break the physiological dormancy.

Table 1 shows that optimal results are obtained from a warm stratification followed by cold stratification. Extensive

work done by King *et al* in 1983 found that for native roses of Alberta that 60-day warm stratification followed by 90-day cold stratification was the optimal combination to maximize seed germination. Recent results from both experimental trials and full scale production at Reid, Collins Nurseries confirm these findings. Use of acid scarification does not seem to enhance germination. Longer periods of acid scarification than we used may be needed to significantly affect the seed coat.

Table 1. Germination percentages of *Rosa woodsii* and *R. acicularis* seed under various stratification treatments.

Species/Provenance	Treatment	Percent germination	Data source
Rosa acicularis	118 day warm, 25°C 90 day cold, 3°C	90+	Desmond, Zasada-1977
R. woodsii, Banff	120 day cold, 3°C	0	Reid, Collins
R. acicularis, Fort McMurray	60 day warm, 20°C 90 day cold, 3°C	45	Reid, Collins
R. acicularis, Fort McMurray	120 day cold, 3°C	10	Reid, Collins
R. woodsii, Alberta	60 day warm, 20°C	49	King, *et al*-1983
R. acicularis, Fort McMurray	1 hour H_2SO_4 300 day cold, 3°C	30-50	Reid, Collins

An alternate method to the warm/cold stratification is to sow into outside seed beds in the fall. This usually results in 25 to 35% germination during the second year. At Reid, Collins Nurseries, both the seed bed method and the controlled stratification methods are used. This insures protection from total germination failure due to poor seed or equipment malfunction in the stratification procedures.

Table 2 shows a very wide range of results under varying treatments for *Shepherdia canadensis*. In general, acid scarification seems to result in enhanced germination. The effects of cold stratification after acid treatment may be debatable based on results from Heit, 1970. One of the major problems with *Shepherdia canadensis* is the quality of the seed. Our experience has shown widely varying germination percentages from year to year under identical treatments. This seems to be due to poor embryo development; it is therefore important for seed collectors to check their seed before collection to insure proper embryo development has taken place.

Alnus crispa seed does not seem to need pregermination treatments as can be seen from Table 3. Stratification does, however, speed up the germination process. This makes it much easier to produce an even crop which is particularly important for alder. If seedlings of various sizes are in a single tray, the smaller ones quickly die, due to shade intolerance. We have also found that germination percentages are enhanced by 30-day moist-cold stratification when using seed

that has been stored for one or more years. This could be due to relatively low moisture content of the seed and the need to imbibe water before germination can take place.

Table 2. Germination of *Shepherdia canadensis* seed.

Species/Provenance	Treatment	Percent germination	Data source
Shepherdia canadensis, Saskatchewan	15 min. acid 30 day cold	89	Cram 1978
S. *canadensis*, Fort Murray, 1981	90 day cold stratification	30-40	Reid, Collins
S. *canadensis*, Hinton	Fermented in pulp 5° 290 days	50-60	Reid, Collins
S. *canadensis*, Banff	120 day cold stratification	14	Reid, Collins
S. *canadensis*, Fort Murray, 1980	15 min. acid 30 day cold stratification	0	Reid, Collins
S. *canadensis*, Fort Murray, 1982	7 min. acid 30 day cold stratification	50-60	Reid, Collins
S. *canadensis*	20-30 min. acid No stratification	71-80	Heit 1970

Table 3. Germination results from various treatments of *Alnus crispa* seed.

Species/Provenance	Treatment	Percent germination	Data source
Alnus crispa, Fort McMurray	None	50-60	Reid, Collins
A. crispa, B.C.	30-day cold stratification	67	McLean 1967
A. crispa, Rogers Pass B.C.	14-day cold stratification	50	Reid, Collins

Table 4 shows that with *Amelanchier alnifolia* seed cold stratification from 90 to 120 days, or warm stratification followed by cold stratification, produce nearly identical results. Cold stratification for 90 to 120 days in our experience has proved adequate to insure good germination. One problem encountered with *Amelanchier alnifolia* during the cold stratification period is control of fungus. The seed seems to be very prone to heavy infestation of fungus which can quickly destroy the seed. This can be controlled by adding captan to the stratification medium.

PROPAGATION BY CUTTINGS

Propagation by cuttings of the species mentioned earlier has been attempted. However, the rose species are the only genus with which we have had much success. *Rosa woodsii* and *Rosa acicularis* taken from softwood cuttings and treated with #2 hormone have rooting success of approximately 80%.

Table 4. Germination results from various treatments of *Amelanchier alnifolia* seed.

Species/Provenance	Treatment	Percent germination	Data source
Amelanchier alnifolia, Fort McMurray	90 day cold stratification	60-70	Reid, Collins
A. alnifolia	4 month warm, 4 month cold	95	Heit 1971
A. alnifolia	120 day cold stratification	98	McLean 1967

One species not mentioned in seed propagation that has recently been propagated successfully by cuttings is *Vaccinium parvifolium*. Cuttings were taken in October, 1984, and treated with both #2 and #3 rooting hormone and stuck into a 50% peat, 50% perlite propagating mix on heated benches. Under both treatments success was 95% based on two hundred pots in each treatment. This is the first time that propagation of *Vaccinium parvifolium* has been successful at our nursery. We believe the reason for success was the quality of the cutting wood. The cuttings were "semi-hardwood", taken from plants grown under nursery conditions thus producing considerable new one-year wood for cuttings.

SUMMARY

The species discussed in this paper can be propagated in large numbers with reasonable reliability by seed germination or by rooting cuttings, following the methods outlined. Most are hardy and rapid growing and need minimal maintenance and thus are ideal in both land reclamation and in low maintenance landscape settings.

VOICE: What time of year do you take your *Vaccinium parvifolium* cuttings? And how long are they?

BRUCE McTAVISH: September or October (in Aldergrove, B.C.). The cuttings are 4 to 5 in long.

ALLAN ELLIOTT: What is your procedure for collecting and cleaning *Amelanchier* seed?

BRUCE McTAVISH: For cleaning, we put them in a commercial macerator, then float the pulp off. It is quite easy. Our problems are with fungus diseases in the seed stage. During stratification a great mass of mold will appear all through the seeds. We have been using captan in the peat-perlite stratification mixture, then sowing that — with varying degrees of success.

VOICE: What is your method of propagating *Populus tremuloides*?

BRUCE McTAVISH: We have had little success with seed propagation — but I know some people do. You have to collect the seed in the exact maturity stage — 3 or 4 days either way will not do. We use root division very successfully. Or we use sprouts from root pieces over bottom heat for cuttings — and these will root. Under our weather conditions *P. tremuloides* is very susceptible to a leaf blight. Young plants set out-of-doors soon defoliate and die.

VOICE: We have had good success with softwood cuttings of *P. tremuloides*, taken in early spring from trees at 8000 ft. Also from our 1 and 5 gal. containers plants. Take cuttings when new growth is 6 to 8 in long and slightly hardened.

PROPAGATING CEANOTHUS

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Ceanothus, the wild lilacs, are horticulturally among the most interesting and popular of western North American native plants. At least half the 40-odd western species and many hybrids have been cultivated during the past century. Yet they are regarded to this day as cranky and unpredictable by nurseryman and gardener alike. I would like to consider this group from a propagator's viewpoint, perhaps separating some myth from fact while describing how several nursery friends and I deal with the problems we encounter[1]. We will briefly review three alternative methods of propagation, each with unique problems and applications.

Cuttings. The overwhelming majority of *Ceanothus* in commerce are propagated by cuttings. This is not only because most have shown themselves amenable to cutting techniques but they also exhibit enormous genetic diversity in the traits for which they are valued most — such ornamental features as plant size and shape, abundance and color of flowers, and disease resistance — making clonal selection and perpetuation nearly a must.