Final Report
Plant Resources for Horticulture, Forestry and Phytoremediation in Alaska

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by

Dr. Patricia S. Holloway
Associate Professor of Horticulture
Department of Plant, Animal and Soil Sciences
P.O. Box 757200
University of Alaska
Fairbanks, Alaska 99775

Telephone: (907)474-5651 FAX (907)474-1841
email: ffpsh@uaf.edu

Project Summary

The 2000 season marked the second full test of a field propagation system for Alaska native and introduced plants. The cold frames equipped with an automated intermittent mist propagation system were a highly successful environment for root production on a variety of stem cuttings. Locally available media such as coal ash and sand may be substituted for the more expensive (and imported) perlite and vermiculite. Successful propagation has been demonstrated with black currant (*Ribes nigrum*), false spiraea (*Sorbaria sorbifolia*), redosier dogwood (*Cornus sericea*), hybrid rose (*Rosa* sp. 'Lac Majeau), Miyabei spiraea (*Spiraea miyabei*) and mockorange (*Philadelphus coronarius*).

We attempted to overwinter rooted cuttings *in situ* during the winter of 1999-2000. Only one species, false spiraea, *Sorbaria sorbifolia*, survived. All other species died indicating they were not well rooted by the time soils froze. A cold storage unit will be necessary to maintain rooted cuttings in winter.

Problems remaining to be solved include development of a low-cost water recycling and filtering system to minimize water usage and timing for multiple cropping to maximize the seasonal production system during peak summer hours.

Project Objectives

The objectives of my project were to develop technology necessary for the diversification and expansion of Alaska's greenhouse/nursery/landscape industry involving the production of hardy plant materials and native plants for use in horticulture, forestry and phytoremediation. Specific goals included:

a) development of a low-cost competitive system of propagation useful in both rural and urban areas of Alaska that will encourage new or existing growers to propagate woody fruit crops, ornamentals, and native species useful in forest revegetation, phytoremediation and horticulture,

b) to develop protocols for the propagation of Alaska-bred and native plants that are more appropriate for Alaska conditions as well as nonnative plants currently available only from "lower 48" sources,

c) and to promote the growth and economic development of Alaska businesses based on locally-available resources and to disseminate that message through presentations, interpretive programs, and publications.

Methods:

Six cold frames were constructed of double-wall polycarbonate sheets (left over from the re-covering of the West Ridge Greenhouse) and UV-stabilized fiberglass panels purchased locally. Frames consisted of surplus steel shelf supports cut to the appropriate size. Cedar "wiggle" board was used to frame the fiberglass sheets. All cold frames were equipped with a timer-controlled intermittent mist system constructed of a single mist nozzle inserted into 1-inch PVC pipe and connected via garden hose to a water supply. We had difficulty getting the right mist controllers. Consequently, the timing of the experiments were modified and extended.

Cold frames were erected at the Agricultural and Forestry Experiment Station Georgeson Botanical Garden. They were erected on tilled, Tanana silt-loam soil to permit root development into soil following root initiation. A four-inch layer of a propagating medium was placed in the bottom of the boxes and consisted of sand/coal ash (1:1, v:v), perlite/vermiculite (1:1, v:v), sand, sand/peat (1:1, v:v), peat, and coal ash/peat (1:1, v:v).

Duing the 1999 season, we concentrated on two species of plants for propagation among the different rootimg media: false spiraea, *Sorbaria sorbifolia* and redosier dogwood, *Cornus sericea*. These species were collected on 10 July and treated with a quick dip of 0.8 percent Indole-3-butanoic acid (IBA). Cuttings were left in the frames until late September when all but one treatment was harvested. One flat of cuttings in perlite/vermiculite was left to overwinter in the ground.

Treatments consisted of two species and five propagation mixes replicated three times. Data included rooting percentages, length of longest root and a root abundance rating:

0= no roots
1= poor rooting, most roots not branched, survival of cutting questionable
2= average rooting, some secondary branching, not well developed
3= abundant roots, well developed, not countable as individuals

Data were analyzed using analysis of variance for randomized complete block design for three replicates composed of 12, 6- to 8-inch cuttings each.

The lids of the cold frames were removed in mid September, 1999, and cuttings were acclimated under natural autumn conditions. The sides of the cold frame were kept in place to capture snow. Cutting survival was recorded in July 2000.

Field Experiments- Results and Discussion

Both species rooted well from stem cuttings (Table 1). No differences occurred among media. Root length as well as the visual rating of root quality and abundance were best on media containing local sand. With both species, local media can easily substitute for the imported vermiculite/perlite mix. Any one of the media may substitute for the perlite/vermiculite mix.

The original intent to allow rooting into the soil and overwintering *in situ* is not possible. Only one species survived, *Sorbaria sorbifolia.* This species roots easily in about 2 weeks, and therefore had very well developed roots by autumn, 1999. Roots of all other species did not grow beyond the rooting medium and were too undeveloped to survive. A better system will be to use flats of a variety of media that can be removed and replaced in rotations. The use of peat is not recommended because it becomes green with algae very quickly and is an excellent medium for germination of weed seeds. Peat media were choked with weeds prior to sticking of cuttings, and hand weeding was necessary at least twice during the growing season.

Water drainage continued to be a problem with the outdoor propagation system. The silt loam soils became saturated with water, and drainage was impeded. The area in front of (downhill) the cold frames was mucky and dangerous. Two systems might work to remedy the situation. Drainage tiles may be installed to alleviate the worst of the problem. However, another addition to the cold frames might make them usable for people who have limited water supply (without wells). A recycled water systems including filter might allow for a catchment system for rain water or for recycling of propagation water to minimize expense of water delivery. It would be interesting to put a meter on the water hose to monitor how much water the system uses currently. Considering the depth of the muck in front of the frames[z], it is probably considerable. [y]

Table 1. Rooting of *Sorbaria sorbifolia* and *Cornus sericea* softwood stem cuttings in a variety of media using cold frames equipped with an intermittent mist propagation system.

Medium	Rooting Percentage	Length of Longest Root (cm)	Root Quality/Abundance Rating
		Sorbaria sorbifolia	
Coal ash/sand	86.0	3.7	1.8
Peat	64.0	2.4	1.6
Perlite/vermiculite	77.7	3.3	2.2
Sand/peat	91.7	4.1	2.3
Sand	100.0	5.6	2.6
		Cornus sericea	
Coal ash/sand	91.6	2.8	1.7
Peat	88.7	3.6	2.2
Perlite/vermiculite	100.0	4.1	2.6
Sand/peat	78.7	3.7	1.9
Sand	86.1	3.5	2.0

[z] Based on 12 cuttings per replicate, three replicates per treatment, 180 cuttings total

[y] Based on the following rating system:

- 0= no roots
- 1= poor rooting, most roots not branched, survival of cutting questionable
- 2= average rooting, some secondary branching, not well developed
- 3= abundant fibrous roots, well developed, not countable as individuals

Schedule

2000 Fall - Write and publish final paper on propagation system

Table 1 Rooting of Ribes nigrum in cold frames on different media.

Media	Rooting Characteristics Rooting %	 Roots #	 Root Length (mm)
		Ribes nigrum #1	
Sand/coal	25	13.0	7.0
Peat	25	12.0	8.0
Peat/sand	50	11.5	7.5
Peat/coal	50	12.0	6.2
Perlite/Vermiculite	100	42.2	14.0
Sand	0	0	0
		Ribes nigrum #2	
Sand/coal	75	39.6	16.6
Peat	25	22.2	8.0
Peat/sand	75	54.3	12.0
Peat/coal	50	25.0	16.2
Perlite/Vermiculite	100	14.3	10.8
Sand	100	18.2	13.7
		Ribes nigrum #3	
Sand/coal	100	39.2	18.7
Peat	75	10.0	18.0
Peat/sand	100	30.2	15.0
Peat/coal	50	32.0	12.8
Perlite/Vermiculite	25	6.0	13.0
Sand	75	8.7	9.0

Table 2 Rooting of *Ribes triste* in cold frames on different media.

Media	Rooting characteristics: Rooting %	Roots #	Root Length (mm)
	Ribes triste #1		
Sand/coal	0	-	-
Peat	50	10.0	6.1
Peat/sand	75	11.6	9.7
Peat/coal	25	10.2	8.1
Perlite/Vermiculite	75	5.7	15.0
Sand	0	-	-
	Ribes triste #2		
Sand/coal	100	35.5	12.2
Peat	100	20.5	15.9
Peat/sand	100	22.2	23.0
Peat/coal	100	32.7	22.2
Perlite/Vermiculite	100	12.7	11.5
Sand	100	11.2	13.6