Propagation of Nevada Shrubs by Stem Cuttings

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Highlight: Stem cuttings of 54 Nevada shrub species varied in rooting capacity. Among those species most easily propagated were *Artemisia spinescens, Atriplex lentiformis, Ceratoides lanata, Grayia spinosa, Lepidospartum latisquamum, Prunus andersonii, Rosa woodsii, Salvia dorrii,* and *Vitis arizonica.* Semihardwood cuttings were superior to either softwood or hardwood cuttings in rooting success. Differences in rooting potential among cuttings of the same species taken from different sites were also apparent.

Native western shrubs are being used more and more in revegetation of disturbed wildland sites. Use of rooted cuttings to help meet the demand for such shrubs has been suggested by Plummer et al. (1968, 1974) and Nord and Gooding (1970). Vegetative propagation by rooted cuttings is a standard nursery practice for many shrub species that are difficult to grow from seed. Cuttings also provide a means by which large plants can be produced in a short period of time and superior plant material increased without loss of genetic integrity. Fundamentals of propagation by cuttings have been adequately discussed by Chadwick (1953), Edmond et al. (1964), and Hartmann and Kester (1968).

Shrub species from areas adjacent to Nevada have been successfully propagated from stem cuttings by Shreve (1951), Everett (1957), and Charles (1962), Chase and Strain (1966), Nord and Goodin (1970), and Carlson (1974). Stem cuttings of several shrubs from the southern Great Basin and northern Mojave Desert were shown to have the capacity to root, but no quantitative information was provided (Wieland et al. 1971). This paper reports a screening program to find shrub species that readily root from stem cuttings.

Methods

Stem cuttings were taken from 53 native species representing 32 genera and 15 families to determine rooting potential. Cuttings of individual species were taken from one or more sites within Nevada. Stem cuttings were taken of softwood (succulent, leafy shoots), semihardwood (leafy, matured annual or secondary growth), or hardwood (dormant or leafless secondary growth). Size of cuttings ranged from approximately 0.3 to 2.0 cm in diameter and 15 to 30 cm in length, depending on species and cutting type. Phenologic stage of the parent plant was noted at the time of collection; but, cuttings were not segregated as to age of the parent plant nor as to whether the cutting was from a lateral or a terminal shoot.

Cuttings were submersed in water immediately after they were severed from the parent plant. They were then wrapped in wet newspapers and put in a styrofoam box for transportation (4 to 72 hours) to a mist bench. Basal ends of the cuttings were wounded, dipped in a commercial talc preparation of 0.8% indole-3 butyric acid, and placed in coarse perlite on the mist bench. Bottom heat was not used because its effect on rooting success of cuttings from Great Basin shrubs was inconsistent among species and detrimental in some instances (Wieland et al. 1971). An intermittent mist system activated by evaporative demand was used to keep plants moist. A fungicide (Captan-50 WP)[1] diluted with water (0.41g/liter) was applied to the surface of the mist bench at a rate of 1.6 liters/m^2 at the time of planting to reduce cutting loss from disease.[2]

Cuttings of individual species were removed from the mist bench when large numbers had rooted or degenerated. A constant rooting period was not used because rate of rooting and susceptibility to mist bench pathogens varied considerably among species. A cutting was considered to be rooted if a root 1 cm in length was produced. Cuttings were left on the mist bench as long as 3 months, but 3- to 12-week periods were more common. All rooted cuttings were then placed in individual paper containers filled with sandy loam soil and transferred to the lathhouse for continued observation.

Results

Ability of cuttings to root varied among families and taxa of lesser rank including accessions (Table 1). Greater success in rooting was attained for cuttings from plants in the Caprifoliaceae (honeysuckle), Chenopodiaceae (goose-foot), Compositae (sunflower), Cornaceae (dogwood), Labiatae (mint), Oleaceae (olive), Rosaceae (rose), Rhamnaceae (buckthorn), Salicascae (willow), Saxifragaceae (saxifrage), and Vitaceae (grape) families than for plants in Ericaceae (heath), Garryaceae (silktassel), Leguminosae (pea), or Ephedraceae (ephedra). Genera in which two or more sampled species were readily propagated by cuttings include *Atriplex* (saltbush), *Artemisia* (sagebrush), *Salix* (willow), and *Symphoricarpos*

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[1] Use of trade or firm names is for reader information only, and does not constitute endorsement by the U.S. Department of Agriculture or Foresta Institute for Ocean and Mountain Studies of any commercial product or service.

[2] This publication reports research involving pesticides. It does not contain recommendations for this use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

Table 1. Rooting success of cuttings by family, genera, and species.

Family genus species[1]	Number of accessions	Phenologic stages[2]	Cutting types[3]	Total no. of cuttings	Mean % rooted	Range in % rooted	Rooting period (wks)
Caprifoliaceae							
Sambucus							
caerulea	3	[4]1*,2,3	sh,h	185	4	0-14	4,12*
Symphoricarpos							
longiflorus	1	3	sh	25	56	0	4
oreophilus	1	5	sh	25	28	0	20
other species	1	4	sh	41	76	0	16
Chenopodiaceae							
Atriplex							
canescens	5	1,3,4*	so,sh*	305	11	0-48	4
confertifolia	5	4,5	so,sh	320	0	0	4
lentiformis	4	3*,5	so,sh*	206	32	0-68	3,4*
Ceratoides							
lanata	4	3,4*	so,sh*	235	16	0-63	3,4*
Grayia							
spinosa	16	1,2,3,4*,5,6	so,sh*,h	1,286	33	0-95	3,4*,8,12
Kochia							
americana	1	3	sh	45	0	0	12
Compositae							
Artemisia							
arbuscula	1	3	sh	100	0	0	4
cana	1	2	sh	48	21	0	8
spinescens	4	5,6*	sh,h*	201	22	3-60	4,8*
tridentata	2	3	sh	90	0	0	8
Baccharis							
glutinosa	1	5	sh	30	23	0	12
Brickellia							
multiflora	1	1	h	55	44	0	12
Chrysothamnus							
nauseosus	16	2,3,4*	so,sh*	1,018	9	0-63	4*,6,8
viscidiflorus	5	3,4	so,sh	275	0	0	8
Hymenoclea							
salsola	2	1,4*	sh	74	15	0-30	4*,8
Lepidospartum							
latisquamum	5	1,2*,3	sh*,h	346	30	0-96	4,8,12*
Pluchea							
sericea	1	5	sh	30	23	0	12
Tetradymia							
glabrata	1	3	sh	60	0	0	6
tetrameres	1	3	sh	50	0	0	8
Cornaceae							
Cornus							
stolonifera	2	1,3*	sh*,h	105	18	0-36	4*,8
Ephedraceae							
Ephedra							
nevadensis	2	1,4	sh,h	30	0	0	4,6
viridis	6	1,4*	so,sh*,h	299	2	0-9	8,10,16*
Ericaceae							
Arctostaphylos							
nevadensis	6	3,4,5,6*	sh	568	7	0-30	8,12*16
Garryaceae							
Garrya							
flavescens	2	1,3	sh	161	0	0	8
Labiatae							
Salvia							
dorrii	7	1,2*,3	sh	625	22	13-45	4,8,12*
Leguminosae							
Dalea							
fremontii	2	3	sh	85	0	0	8

(continued)

Table 1. (continued)

Family genus species[1]	Number of accessions	Phenologic stages[2]	Cutting types[3]	Total no. of cuttings	Mean % rooted	Range in % rooted	Rooting period (wks)
Oleaceae							
Menodora							
spinescens	1	6	sh	25	40	0	16
Rhamnaceae							
Ceanothus							
cordulatus	1	5	sh	20	10	0	20
greggii	2	4	sh	95	0	0	4,8
prostratus	1	4	sh	40	32	0	6
velutinus	3	4,5	sh	125	0	0	12
Rosaceae							
Amelanchier							
alnifolia	1	5	sh	40	0	0	4
utahensis	1	1	h	43	0	0	6
Cercocarpus							
ledifolius	1	4	sh	48	0	0	12
Cowania							
Mexicana							
stansburiana	3	1,3*	sh*,h	175	1	0-4	4
Holodiscus							
discolor	3	3,5*	sh	186	1	0-2	4,8,20*
Prunus							
andersonii	13	1,4,5*,6	so,rs,sh,h	1,459	26	0-85	4*,8,12,16
fasciculata	3	1,3	sh,h	97	0	0	4,8,12
virginiana							
demissa	3	1,2,5*	sh*,h	170	5	0-11	4
Purshia							
tridentata	2	4*,5	sh	110	4	0-9	4*,8
Rosa							
woodsii	3	1*	sh,h*	261	43	2-65	4
Salicaceae							
Salix							
bebbiana	1	4	sh	55	89	0	4
exigua	7	1,3,4*,5,6	rs,sh*,h	444	86	30-98	4*,8,20
myrtillifolia	1	3	sh	62	54	0	4
other species	6	1*,3,4	sh,h*	411	88	67-100	4,8,12*,20
Saxifragaceae							
Ribes							
aureum	4	1,4,5*,6	sh*,h	177	7	0-28	4*,8,12
cereum	2	1,5*	sh*,h	70	1	0-3	8,20*
viscosissimum	1	5	sh	15	46	0	4
Vitaceae							
Vitis							
arizonica	3	2*3,5	sh	133	60	30-100	2,12*

[1] Nomenclature after A.H. Holmgren and J.L. Reveal, 1966.
[2] Phenology stage: 1, Dormant; 2, Leaf growth; 3, Twig growth; 4, Flowers; 5, Seed; 6, Predormancy quiescence.
[3] Cutting type: so—softwood; sh—semihardwood; H+hardwood; rs—root sprout—soft wood.
[2]* Indicates an estimate of the best treatment, as not all possible treatment combinations were tested.

(snowberry). Cuttings from species in *Amelanchier* (serviceberry), *Chrysothamnus* (rabbitbrush), *Ephedra* (joint-fir), and *Tetradymia* (horsebrush) genera did not root readily under test conditions.

Rooting success was highly variable among accessions of individual species as previously reported by Komissarov (1968). Species that were most easily propagated by cuttings from a number of selected accessions were:

Atriplex canescens (fourwing saltbush)
Atriplex lentiformis (big saltbush)
Artemisia spinescens (bud sagebrush)
Ceratoides lanata (common winterfat)
Grayia spinosa (spiny hopsage)
Lepidospartum latisquamum (wooly scalybroom)
Prunus andersonii (Anderson peachbrush)
Rosa woodsii (rose)
Salvia dorrii (sage)
Salix sp. (willow)
Symphoricarpos sp. (snowberry)
Vitis arizonica (canyon grape)

Cuttings from *Artemisia cana* (silver sagebrush), *Baccharis glutinosa* (seepwillow Baccharis), *Brickellia multiflora* (Inyo brickellia), *Ceanothus prostratus* (squawcarpet ceanothus), *Cornus stolonifera* (redosier dogwood), *Menodora spinescens* (spiny menodora), and *Ribes viscosissimum* (sticky currant) also had high rooting success, but too few accessions were collected to assess species' rooting potential.

Cutting type was also important in rooting success. Semihardwood cuttings were superior to either hardwood or softwood cuttings when phenologic stage and collection site were the same. Softwood cuttings were very susceptible to disease and several accessions were lost during transport or on the mist bench. In most instances, hardwood cuttings did not root as rapidly or as consistently as semihardwood cuttings. Semihardwood cuttings from root sprouts of Anderson peachbrush rooted successfully when stuck directly in soil-filled containers and placed under mist conditions.

The best phenologic stage for rooting success was not always the same among species (Table 1). In general, cuttings taken during vegetative and reproductive phenologic stages rooted better than cuttings taken during dormancy. Notable exceptions to this generality were cuttings from bud sagebrush, rose, and elderberry (*Sambucus caerulea*). Species that rooted well from cuttings also seemed to have the highest survival rate following transplanting into containers, but this is only an observation.

Discussion and Conclusions

Rooting results for these shrubs were in general agreement with previous findings for other species in the tested plant genera. Cuttings from species of sage, burrobrush (*Hymenoclea* sp.), pluchea (*Pluchea* sp.), saltbrush, snowberry, and willow were easily rooted as previously reported (Everett 1957; Chase and Strain 1966; Nord and Goodin 1970; Ellern 1972; and Carlson 1974). Rooting capacity of big saltbush, spiny hopsage, and common winterfat was similar to that reported by Wieland et al. (1971), but we did not get rooting from cuttings of shadscale (*Atriplex confertifolia*), Gray Kochia (*Kochia americana*), or green ephedra (*Ephedra viridis*), as reported. Differences in plant materials and propagation methods were likely causes for conflicting results.

Although some species did not root well from cuttings, they might if different collection and propagation procedures were used. If cuttings were collected from plants growing under excellent conditions and if transportation time to the mist bench were reduced, rooting success of several species might be increased. Hormone, misting, and perlite combinations used in this study were probably not the best for rooting stem cuttings of tested species. Cuttings from some species, such as shadscale and common winterfat that rapdily degenerated under misting, would be more likely to root successfully under less moist conditions (Wieland et al. 1971). Also, some rooting ecotypes of apparently nonrooting species may exist but were not sampled.

Rooting results for tested species may not be the best that could be attained, but they do give an indication of species' rooting potential. More information is needed of the effects of certain factors—season of collection (Hess 1963), "plant juvenility" (Hackett 1964), phenologic stage, stem position (Hartmann and Kester 1968), bottom heat (Chadwick 1953), and hormones—on the rooting capacity of native shrubs before the best propagation procedures can be formulated for each species.

The variability in rooting success among accessions of a species points out the necessity for careful selection of cutting stock. Rooting success should be substantially improved once superior rooting ecotypes are selected and cutting made under excellent conditions (Hess 1963; Komissarov 1968).

Large plants of several shrubs (Anderson peachbrush, bud sagebrush, common winterfat, sage, snowberry, spiny hopsage, and willow) were obtained in 3 to 12 weeks after transplanting them into containers. These plants would have taken as long as 6 months to grow to the same size from seed. More efficient growth of native plant materials should lower propagation costs and make native materials easier to obtain for use in reclamation and horticulture.

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