

GERMINATION OF NATIVE DESERT SHRUBS

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Germination and depth-of-emergence were studied in seven species of desert shrubs, because the shrubs are of potential use as vegetative cover on disturbed desert sites. All the shrubs germinated adequately in the laboratory. Field emergence from a depth of 1 or 2 cm (0.4 or 0.8 in.) was adequate for the four larger-seeded species, but even at 1 cm it was poor for two species and zero for the smallest-seeded species. Emergence of all species was inhibited by planting depths of 4 cm (1.6 in.) and greater.

CONSTRUCTION ACTIVITIES often scar the landscape unavoidably. Some shrub species may be useful in revegetation of such sites in the Mojave Desert of California. Little is known, however, about germination processes in most shrubs native to the desert. Germination characteristics were therefore investigated in seven shrub species: fourwing saltbush (*Atriplex canescens*), cattle spinach (*Atriplex polycarpa*), Mexican tea (*Ephedra viridis*), burrow weed (*Franseria dumosa*), cheese bush (*Hymenoclea salsola*), creosote bush (*Larrea divaricata*), and scale broom (*Lepidospartum squamatum*).

Seed lots were supplied by a commercial seed collector who had obtained them near Mojave, California, from December 1970 to October 1971. The approximate numbers of seeds per pound were determined on random samples. Samples of seeds were cut open to determine the percentage that contained an embryo. Tetrazolium tests for live embryos were made by a commercial seed-testing laboratory within one month of collection (see table).

For germination testing, each of four replicates of 100 seeds was placed on a blotter supported by a plastic backer, covered with a layer of tissue, and sprayed with tap water. Then each unit was placed upright in a tray of tap water so that the bottom of the blotter was immersed. The trays were kept in the dark at 17°C for 48 hours and then at 21°C for 12 more days. Each day, the seeds that had germinated (radicle 1 cm long) were counted and removed. *Hymenoclea* and *Ephedra* had the highest percentage of germination, and *A. polycarpa* the lowest (see table).

Some desert seeds have germination-regulating mechanisms, such as an inhibitory substance that needs to be leached away before the seeds will germinate. There was no evidence of any inhibitory action even in the bottom rows on the blotters. However, seed coats were manipulated on the three species that had low germination. *A. canescens* seed coats were scored with a razor blade, *A. polycarpa* seed coats were removed simply by rolling between the fingers, and *Larrea* seed coats were removed by excision with a dissecting instrument. The seeds were germinated under the same conditions as above, with two replications of 50 seeds each. The germination of *A. canescens* was improved and median germination time (days to germinate) was reduced markedly (see table). Treatment nearly doubled germination of *A. polycarpa* and also reduced its median germination time. *Larrea* germination was reduced by excising the seed. This may have been due to injury in the excising process, as other investigators show increased germination.

For testing emergence, a frame 4.2 × 1.5 × 0.3 m was placed in the open and filled three-fourths full with washed

TABLE 2. PERCENTAGE OF VIABLE SEED (UNTREATED) EMERGING AND DAYS TO EMERGENCE OF SEVEN DESERT SHRUB SEEDLINGS FROM TWO PLANTING DEPTHS

	Emergence		Median emergence (time)	
	1 cm	2 cm	1 cm	2 cm
	Per cent		Days	
<i>Atriplex canescens</i>	122	40	6.0	8.0
<i>Atriplex polycarpa</i>	0	0	—	—
<i>Ephedra viridis</i>	95	62	9.0	10.5
<i>Franseria dumosa</i>	16	2	7.0	—
<i>Hymenoclea salsola</i>	74	28	6.0	7.5
<i>Larrea divaricata</i>	82	60	9.0	10.5
<i>Lepidospartum squamatum</i>	8	0	8.0	—

plaster sand. The frame was divided into four replications, in each of which were established four depths of planting (main plots): 1, 2, 4, and 8 cm (0.4, 0.8, 1.6, and 3.2 inches). Seeds of the seven species were planted in subplots on May 6, 1972, in rows 6 cm apart. The wings or bracts were left on the seed of *A. canescens*, whereas the other seeds were as tested in the untreated laboratory germination tests. The number of seeds planted was adjusted to obtain 50 viable seeds per replication. After the seeds were planted, chicken wire was placed over the frame to exclude birds, etc. Seeds that emerged were counted and removed daily.

A. canescens emerged rapidly from the 1-cm depth, and the number emerging exceeded the germination of untreated seed by 22%—suggesting reduced inhibitor action in field germination even though the bracts were present. Emergence from 1 cm was excellent also for *Ephedra*, *Hymenoclea*, and *Larrea*. It was poor for *Franseria* and *Lepidospartum*, and zero for *A. polycarpa* (the three smallest-seeded species). Seeding even shallower than 1 cm may be better for those three species.

Four species emerged fairly well from the 2-cm depth: *A. canescens*, *Ephedra*, *Hymenoclea*, and *Larrea*. None emerged from 4 cm except a very few seedlings of *A. canescens*, and none at all emerged from 8 cm. Table 2 shows the percentage of viable seed (untreated) emerging and number of days median emergence time at the 1 cm and 2 cm depths. It thus appears that shallow depths of seeding comparable to those used for small-seeded crop species are most likely to be successful for these shrub species. Either careful seedbed preparation of the planting site or specialized planting methods to control depth of seeding is essential.

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TABLE 1. VIABILITY CHARACTERIZATION FOR SEED OF SEVEN DESERT SHRUBS

Species	No. seeds	Filled seed	Tetrazolium test—live embryo	Germination		Median germ. time	
				Untreated	Treated	Untreated	Treated
	per lb	%	%	%	%	days	days
<i>Atriplex canescens</i> (dewinged)	32,000	62	23	26	44	7.0	2.5
<i>Atriplex polycarpa</i>	546,000	68	38	13	24	8.5	5.0
<i>Ephedra viridis</i>	18,000	90	60	56	—	5.0	—
<i>Franseria dumosa</i>	138,000	27	26	20	—	6.0	—
<i>Hymenoclea salsola</i>	56,000	67	70	57	—	5.0	—
<i>Larrea divaricata</i>	82,000	74	60	24	10	9.0	7.0
<i>Lepidospartum squamatum</i>	488,000	35	—	36	—	3.0	—