Depth to Seed Fourwing Saltbush

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Highlight

De-winged seeds of fourwing saltbush were sown at 0.5, 1.0, 1.5, and 2.0-inch depths in two soils. Total seedling emergence at the end of 30 days was greater, and the rate of emergence higher from the shallower depths of seeding. Seeding depths of 0.5 to 1.0 inch are suggested for dewinged seeds.

Seeding fourwing saltbush (Atriplex canescens (Pursh) Nutt.) for range improvement has become a common practice in the Southwest. Land-managing agencies as well as ranchers are seeding this species, either alone or in mixture with grasses. Some seedings have resulted in appreciable improvement, but many have failed. The causes for failure, though not always apparent, have been traced to adverse weather or damage from rabbits, rodents, insects, or premature grazing by wildlife and livestock.

Experience indicates seeding too deeply also could be a cause for failure. Seedings failed for two consecutive years at a site with coarse-textured soil in central New Mexico. Few seedlings emerged, even with favorable precipitation. In both years, de-winged seeds² of fourwing saltbush were sown in furrows 3 to 5

¹ Central headquarters maintained at Fort Collins in cooperation with Colorado State University; research reported here was conducted at Albuquerque in cooperation with the University of New Mexico. inches deep. The intent was to cover the seeds with 1 inch of soil, but each year the seeds became covered with 2 to 3 inches of soil that sloughed off the sides of the furrows.

In earlier studies in New Mexico, Wilson (1928), Cassady (1937), and Bridges (1941) all found that seedling emergence dropped off rapidly when seeds were planted more than 0.5 inch deep. Their studies, however, were all with winged seeds.

To evaluate this depth-of-seeding factor with de-winged seeds, a study was established at Santa Fe, New Mexico in 1965. Seeds were planted at depths from 0.5 to 2.0 inches in coarse- and fine-textured soils from a nearby range site representative of the pinyon-juniper type. The soils, derived from the Santa Fe formation, are described as follows:³

- A1 0-4 Brown (10 YR 5/3); sandy inches loam; dark yellowish brown (10 YR ¾) when moist; moderately coarse platy structure breaking to weak fine granules; soft, friable, non-sticky and non-plastic, abundant fine roots; few medium pores; non-calcareous, neutral (pH 7.2) abrupt smooth boundary.
- B2t 4-11 Reddish brown (5 YR inches 4/4); clay loam; dark reddish brown (5 YR ¾) when moist; strong fine and medium angular blocky structure; hard, slightly firm, slightly sticky and plastic; common moderately thick
- ² The prevailing practice is to remove the wings from the seeds by hammermilling to facilitate seeding with mechanical equipment.
- ³ Prepared by Donald W. Meister, Soil Scientist, Santa Fe National Forest.

clay films; plentiful fine roots; few fine pores; non-calcareous, mildly alkaline (pH 7.6).

The B horizon soil was included because seeds are placed in that horizon when site preparation methods such as deep furrows, pits, or basins are used.

Methods

The sandy loam A horizon soil was kept separate from the clay loam B horizon soil. Basins 10 ft long, 3 ft wide, and 5 inches deep were dug and filled with either the A or B soil. Two basins of each soil horizon were prepared. These 10 x 3-ft strips of soil were divided into 3 plots approximately 3 ft square (Fig. 1). Each plot was carefully leveled with a hand level and trowel.

Rows 0.5, 1.0, 1.5, and 2.0 inches deep were made by hand in each plot (Fig. 2). One hundred de-winged seeds were distributed evenly in each 3-ft row. Seeds were covered to the prescribed depth. In half of the plots, the soil over the seeds was firmed by rolling a wheelbarrow up and back the full length of the rows to obtain closer contact between the seeds and the soil. The plots were sprinkled daily to keep the soil moisture near field capacity.

The seeds, collected near Bernalillo, New Mexico in 1963, had been de-winged in a hammermill. They averaged 3.0 mm in diameter and 5.7 mm in length. Cutting tests showed 75% of the seeds contained an embryo.

The seeds were planted July 19, 1965. Seedlings were counted at intervals from the 7th to the 30th day after seeding. No emergence was found after the 24th day. Seedling emergence percentages as of the 30th day were analyzed by analysis of variance.



FIG. 1. Fourwing saltbush seedlings in a basin of sandy loam soil at the end of the 30-day study. Note differences in emergence among four depths of seeding. Middle plot was not firmed; other two plots were firmed after seeding.



FIG. 2. Rows of different depths were made in each plot; from left to right, rows are 1.0, 2.0, 1.5, and 0.5 inch deep. One hundred seeds were planted in each row.

Results

More fourwing saltbush seedlings emerged from the shallower depths of seeding (Table 1). About three times as many seedlings emerged from seeds planted at the 0.5-inch depth as from seed planted at 2.0 inches.

Seedlings also emerged more slowly from the more deeply planted seeds (Fig. 3). For example, 7 days after seeding, emergence was 67% completed for seed planted 0.5 inch deep, compared to only 12% for seeds planted 1.5 inches deep.

Essentially the same number of seedlings emerged from soils of the A and B horizons. None of the differences in seedling emergence between the horizons was statistically significant, though the trend was towards more seedlings from the greater depths in the B horizon soil.

Firming the soil had no significant effect on emergence of the saltbush seedlings. Likewise there was no interaction between the firming treatment and soils.

Discussion and Conclusions

The results indicate that de-winged seeds of fourwing saltbush should not be planted more than 1.0 inch deep. Regardless of the method of seeding, precautions should be taken where there is danger of soil sloughing from the sides of furrows, or of additional soil being washed or blown in over the seeds.

Although seedling emergence was practically the same in the B as in

Table	1.	Average	percent	emergence	of	fourwing	saltbush	seedlings	from
fo	ur	depths of	seeding						

		Seeding depth (inches)				
Soil	Treatment	0.5	1.0	1.5	2.0	
A (sandy loam)	Firmed	34.7	25.7	10.0	4.0	
	Not firmed	38.3	29.7	16.7	16.7	
B (clav loam)	Firmed	25.7	31.3	25.7	13.7	
	Not firmed	36.0	26.7	19.0	9.3	
Average		33.7a*	28.4ab	17.8bc	10.9c	

*Values followed by the same letter do not differ significantly at the .05 level.

the A horizon soil in this study, soil texture could be a consideration in depth of seeding. Optimum depth probably would be deeper in a sandy soil than in a clay soil under range conditions, where available moisture usually fluctuates from day to day. Further research is needed to clarify the relationships between depths of seeding and soils.

The delay in seedling emergence from the deeper seeding depths could be another factor affecting seeding success under range conditions. Moisture was maintained near field capacity for more than 3 weeks during the study. Soil moisture would rarely be sustained so long or be as abundant on Southwestern ranges. Fairly rapid emergence during periods of favorable moisture, such as resulted from the 0.5-inch depth of seeding, probably would be advantageous. On the other hand,



FIG. 3. Rate of seedling emergence of fourwing saltbush from four depths of seeding.

TECHNICAL NOTES

seeding at a 1.0-inch depth could be an advantage on areas where the surface soil dries out rapidly.

The soil firming treatment tested in this study had no effect on seedling emergence. Studies are needed in different soils to determine the effects of various degrees of firming at different soil moisture levels.

Summary

De-winged seeds of fourwing saltbush were sown 0.5, 1.0, 1.5, and 2.0-

inch depths in two soils. Total seedling emergence at the end of 30 days was greater, and the rate of emergence higher, from the shallower depths of seeding. Seedlings emerged about the same in sandy loam soil on an A horizon and clay loam soil from the B horizon. Firming the soil over the seeds had no effect on seedling emergence. Seeding depths of 0.5 to 1.0 inch are suggested for dewinged seeds.

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