White Rocks Road Immigrant Forage Kochia Trial Seedings

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Much of Western Utah Bureau of Land Management (BLM) Great Basin rangelands now support annuals, such as cheatgrass, halogeton, and tumbleweed, rather than shadscale saltbush, bottlebrush squirreltail, and other native perennials. This annual vegetative type covers more than 1 million acres of Utah's desert ecosystems.

Experience by BLM, Agricultural Research Service, and Utah State University personnel and others indicate the Immigrant forage kochia (*Kochia prostrata* var. Immigrant) can be successfully seeded into desert ecological sites (Rasmussen and Newhall, 1989 a-c). The Immigrant strain was selected ". . . for its ability to compete with cheatgrass and halogeton on depleted rangelands" (Soil Conservation Service management fact sheet). A 1989 study by Stevens and McArthur (1989) found that Immigrant forage kochia essentially replaced halogeton over a 7-year period. They found that "after emergence forage kochia continues to grow but halogeton remains in the two-leaf stage." A study by McArthur et. al. (1989) showed that forage kochia and bulbous bluegrass were not materially affected by burning.

In Rush Valley, Utah *Kochia prostrata* ssp. grisea and virescens transplants (closely related to Immigrant) were found to have an average survival rate of 94 percent after 6 years and 62 percent at the end of 12 years (Pendleton, et. al. 1992). This U.S. Forest Service study showed cheatgrass and other introduced annuals ". . . tended to be absent in kochia-dominated areas."

The decline of native vegetation on desert ecological sites has been associated with burning. In 1983, two large fires totaling 250,000 acres occurred in the Cedar Mountain Range and adjoining Skull Valley. These fires virtually eliminated the remaining unburned islands of shadscale, sagebrush, and other natives. By 1993, bottlebrush squirrel had become reestablished on a nearby monitoring plot which previously supported annual vegetation composed of cheatgrass, halogeton, burr buttercup, and/or Russian thistle.

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The objective of these trial seedings was to field test establishment potential of forage kochia, on a desert loam ecological site, using a variety of conventional seeding techniques.

Location and History

Seeding trials were established approximately 7 miles north of Dugway, Utah, on a Timpie silt loam, deep, well-drained soil. This desert loam site (028AY124UT) receives 5-8 inches of annual precipitation. The site has been mostly occupied by annual species for the last 25 years. Parker 3-step vegetative transect studies showed that during the late 1950's, vegetative cover over most of the area was shadscale saltbush and bottlebrush squirreltail. By 1965, repeated fires had caused a vegetative shift to cheatgrass, halogeton, or other annuals, with scattered bottlebrush squirreltail. The composition of the potential natural vegetative community should be approximately 5 percent forbs, 10 percent grass, and 85 percent shrub.

Methods

Individual trial field plots were approximately 50 by 1,320 feet. Forage kochia seed was applied using either a Tye Pasture Pleaser (a minimum-till drill with 1/4-inch-deep bands) or a cyclone broadcast seeder mounted in the bed of a pickup. Seedbed conditions include: no preparation, cultivation with a spring toothed cultivator prior to seeding, and spike toothed harrowing before and after broadcast seeding. Seed was applied at 1, 3, and 6 pounds pure live seed (PLS) per acre during fall, winter, and spring seasons. Seed was applied to the previously mentioned range conditions by drilling, broadcasting, or harrowing before or after broadcasting. A total of 24 different planting treatments were conducted during each planting season.

The fall seeding was made on November 4 and 5, 1991, when the soil surface was dry and unfrozen. The winter seeding was made on December 9 and 10, 1991, with a 20-40 percent snow cover on frozen soil. The spring seeding was made February 27, 1992, when surface soils were moist and unfrozen.

Forage kochia seedling density and associated plant cover measurements were made using a Daubenmire 20 by 50 centimeter (cm) frame during late May and early June 1992 and 1993. Twenty vegetative observations were made at 5-foot intervals along a 100-foot tape in each

seeding treatment. In 1992, cheatgrass had grown to a height of 2-4 inches and dried. All forage kochia seedling had developed secondary leaves and were at least 1/4 to 1/2-inch tall. Many well-established forage kochia plants had developed by 1993.

The precipitation records for the 1992 water year for Dugway, Utah, (7 miles south) was 7.07 inches (87 percent of normal). Precipitation during March 1, 1992, to May 31, 1992, (seedling establishment period) was only 1.38 inches. The month of April was unusually hot and dry in 1992 (0.04 inches). In the 1990 and 1991 water years, precipitation was well below the average, and this extended drought resulted in key forage plants being in low vigor, with little or no production. Tall and pubescent wheatgrass appear to be diminishing because of drought.

Results

Successful seedings (where 0.9 forage kochia plants or more per square foot were established) resulted in 63, 69, and 6 percent of the trials evaluated in 1993 from fall, winter, and spring seeding dates, respectively. Seeding in the winter produced the greatest number of trials having a plant density of 0.9 plants or more per square foot. Some new, young plants were observed in 1993 indicating delayed germination. Broadcast seeding resulted in higher plant densities in the 1992 and 1993 evaluations. The minimum-till drill produced the greatest number of successful drilled stands in the winter season (shallow seeding depth easier to maintain). Spring seeding is not recommended since only 2 out of the 24 different trials conducted produced successful stands. Tilling prior to seeding produced slightly higher plant densities compared to the nontilled sites. Generally, tilling and harrowing prior to seeding produced slightly higher plant densities compared to no treatment. Sufficient increased plant establishment, however, did not give results which would justify using tilling or the spike-toothed harrowing treatments in the fall and winter prior to seeding. Results show that the higher the seed application rate, the higher the seedling and 2-year-old plant densities. Broadcast treatments at all seeding rates produced successful seedings during the fall and winter season. Treatments which produced the higher number of seedlings suffered the greatest reduction in plant density when followup measurements were made the second year. This is a reflection of the productive capacity of a desert ecological site.

In summary, these trials confirmed that successful stands of forage kochia can be established by broadcasting in the fall or winter at 1, 3, or 6 PLS/lb./ac. rate. This option provides land management agencies/owners, etc., with a alternative seeding procedure for replacing undesirable annuals on desert ecological sites in the Great Basin desert ecosystem.

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