EFFECT OF HARVEST DATE AND DRYING PROCEDURES ON GERMINATION OF *KOCHIA PROSTRATA* (L.) SCHRAD.

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Five species of *Kochia* commonly are found in the United States. Two are native, perennial, half-shrubs, *Kochia americana* and *Kochia californica*, and three are annual, introduced forbs, *Kochia alata*, *Kochia trychophylla*, and *Kochia scoparia*. *Kochia* is a member of the Cheonopodiacea or Goosefoot family which includes such desirable species of the western range as saltbrush *(Atriplex)* and winterfat *(Eurotia)*. Most members of the *Kochia* genus are considered to be weeds, especially the annual, introduced forbs. Their main economic importance has been due to the cost of control and crop losses occurring with heavy infestations. However, several members of this genus also have exhibited potential as forage sources. During the droughts of the 1930s and again during 1976 in South Dakota, *Kochia* was baled and fed to livestock when other forage was unavailable.

Several accessions of another species, *Kochia prostrata* (L.) Schrad., commonly called prostrate summer cyprus, were introduced into the United States in 1959 by the New Crops Research Branch of the Agriculture Research Service. It is a perennial, half-shrub, native to the arid and semiarid regions of Russia, central Europe, and the eastern Mediterranean. This polymorphic species ranges from one to four feet in height. Utricle type seeds are born on the upper portion of the stem in the axis of reduced leaves. The seed perianth consists of a persistent calyx that develops five dorsal wing-like appendages at maturity.

Kochia prostrata has exhibited potential as a very useful plant for revegetation of critical areas on western rangelands. In its native habitat, it is drought resistant, salt tolerant, and considered to be a desirable forage plant, particularly for big game animal browse. *Kochia* has been reported to be easily established from seed, grow rapidly and, under favorable conditions, to reach sexual maturity in one year. Once established it appears to be a good natural spreader. These characteristics make *Kochia prostrata* a potentially valuable shrub for areas normally dominated by big sagebrush in the intermountain area. However, limited research has been reported on the germination characteristics of the available varieties.

EXPERIMENTAL PROCEDURE

A cooperative research project between the Squaw Butte Experiment Station of Oregon State University, Burns, Oregon, and the University of Nebraska-Lincoln was initiated in 1978 to document germination characteristics of two varieties, *Kochia prostrata* var. *virescens* (green) and *Kochia prostrata* var. *canescens* (gray). This research was designed to complement the current investigations by researchers at the Squaw Butte Experiment Station regarding

the usefulness of *Kochia prostrata* as a rehabilitation species for eastern Oregon. The effect of harvest date and the type of drying procedure on germination were evaluated for both varieties.

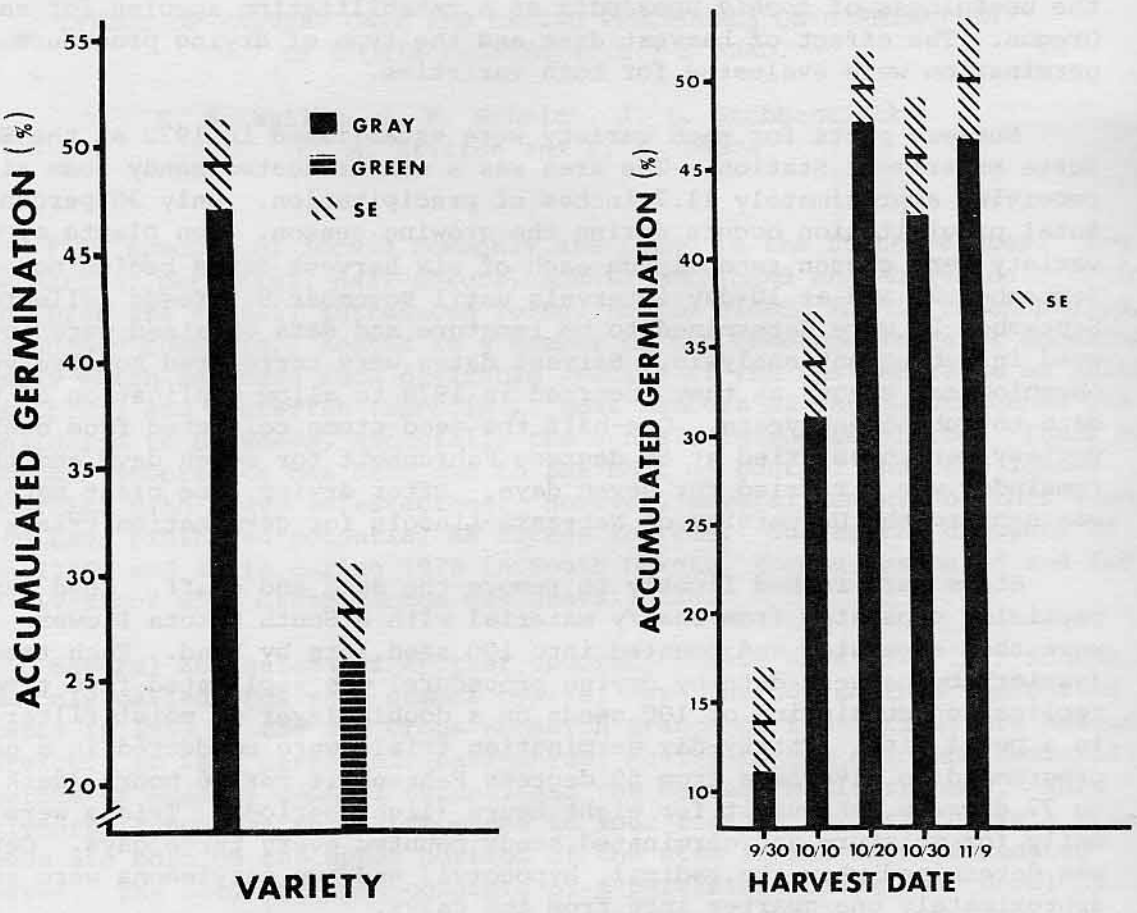
Nursery plots for each variety were established in 1970 at the Squaw Butte Experiment Station. The area was a non-irrigated sandy loam site receiving approximately 11.7 inches of precipitation. Only 30 percent of the total precipitation occurs during the growing season. Ten plants of each variety were chosen randomly on each of six harvest dates beginning on September 20 and at 10-day intervals until November 9. Seeds collected on September 20 were determined to be immature and data obtained were not used in subsequent analysis. Harvest dates were correlated to observe phenological stages as they occurred in 1978 to allow application of this data to subsequent years. One-half the seed stems collected from each variety were oven dried at 86 degrees Fahrenheit for seven days and the remainder was air dried for seven days. After drying, the plant material was sent to the University of Nebraska-Lincoln for germination trials.

Stems were rubbed lightly to remove the seed and chaff. Seed was partially separated from chaffy material with a South Dakota Blower. Seeds were then separated and counted into 100 seed lots by hand. Each treatment (variety by harvest date by drying procedure) was replicated five times, a replication consisting of 100 seeds on a double layer of moist filter paper in a petri dish. Thirty-day germination trials were conducted in a germinator programmed to alternate from 59 degrees Fahrenheit for 16 hours (dark period) to 77 degrees Fahrenheit for eight hours (light period). Trials were checked daily for moisture and germinated seeds counted every three days. Germination was determined when the radical, hypocotyl, and two cotyledons were extended approximately one quarter inch from the calyx.

RESULTS AND DISCUSSION

Percentage germination after 30 days was significantly different for the two varieties (Figure 1a). Regardless of harvest date or drying procedure *K. prostrata* var. *canescens* consistently exhibited higher germination percentages than *K. prostrata* var. *virescens* (48 and 28 percent, respectively). Both varieties exhibited the highest percent germination, averaged over drying methods, on the last harvest date with approximately 63 percent for the gray variety and 36 percent for the green variety. The gray variety consistently germinated earlier in the trial and obtained a higher percentage germination than did the green variety at all harvest dates.

Harvest date also significantly affected germination. Neither variety exhibited any germination from seeds collected September 20. Percentage germination, averaged over variety and drying method increased from approximately 14 percent on September 30 to 50 percent on the last harvest date (Figure 1b). The last three harvest dates exhibited approximately the same germination percentage. The majority of the ungerminated seeds were not mature until the fourth harvest date. This may indicate a seed maturation process that was occurring during the first three harvest dates.



(a) (b)

Figure 1. Thirty-day germination percentage for *Kochia prostrata* var. *canescens* (gray) and *K. prostrata* var. *virescens* (green) averaged over five harvest dates and two drying procedures (a) and the effect of harvest date on 30-day germination averaged over variety and drying procedure (b).

The drying method did not have a significantly different effect on percentage germination, when averaged over variety and harvest date. Oven-dried seeds had approximately 38 percent germination, while 39 percent germinated from the air-dried treatment. Moisture content in air-dried and oven-dried seeds was approximately the same for both varieties at each harvest date. The small difference in percentage moisture between undried and dried seeds may explain why significant differences did not exist between drying methods.

Variation between years because of precipitation, length of growing season, and mean daily temperature affects the germination characteristics of both varieties. However, this research does provide valuable information concerning what variety will provide the higher percentage germination, approximately when to harvest the seed for maximum germination, and the influence of seed drying procedure on germination harvest.