Control of Parry Rabbitbrush on Mountain Grasslands of Western Colorado

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Highlight

Parry rabbitbrush was controlled with Tordon 22-K at 2 lb/acre. Treatments significantly increased grass, with a corresponding decrease in forbs.

The increase of numerous brush and other undesirable species on rangelands of the West is a serious and ever-increasing problem. On Black Mesa, which is approximately 30 miles west of Gunnison, Colorado, one of the most noxious species is Parry rabbitbrush (*Chrysothamnus parryi* (A. Gray) Greene). In some areas this species constitutes a sizable portion of the vegetation. Moreover, it is a vigorous competitor for soil moisture, nutrients, and space. Where it is abundant, there is a marked decrease in herbage of other species, many of which are valuable forage plants for livestock.

Parry rabbitbrush is widely scattered through the intermountain west, being reported from Wyoming, Nevada, Colorado, and Utah. Elevations at which it has been found range from 6,000 to 11,000 ft.

As with other species of rabbitbrush, Parry rabbitbrush sprouts prolifically from the underground roots. Injury to the aerial portion of the plants frequently triggers the physiological response which develops sprouts. These may soon function as independent plants, and result in a larger number of plants than were present in the original stand.

Efforts to control rabbitbrush by various herbicides, burning, rail dragging, and plowing have been reported, all with varying degrees of success (Robertson and Cords, 1957; Hyder et al., 1958; Blaisdell and Mueggler, 1956; and Cook et al., 1965). Because rabbitbrush is usually not as susceptible to control measures as sagebrush with which it is commonly associated, sagebrush control often merely releases the rabbitbrush from plant competition, thereby creating a more difficult problem (McKell and Chilcote, 1957). If rabbitbrush is only partially killed, the remaining plants soon reach normal size and abundance. Once controlled, however, rabbitbrush reinvades slowly, particularly where understory herbaceous vegetation is abundant (Frischknecht et al., 1953).

The Study Method

To determine whether Parry rabbitbrush was susceptible to control, cooperative research was initiated in 1964 on Black Mesa. The chemicals used were Tordon 22-K[2] (4-amino-3, 5, 6 trichloropicolinic acid) and 2,4-D. Additional trials were made in 1965 with Tordon 22-K and Tordon Beads, which contain 2% 4-amino-3, 5, 6 trichloropicolinic acid with sodium tetraborate as a carrier.

Treatments in 1964 were made on two dates that coincided with two recognizable stages of rabbitbrush growth. The first application was made June 24, when new growth of rabbitbrush was up to 3 inches in length. The second treatment was applied on other plots in the same area July 14, when rabbitbrush growth was from 3 to 6 inches long.

Each treatment was applied at three locations where rabbitbrush was abundant together with a grass-forb understory. Ten 1/100-acre plots were marked at each location and treatments were assigned at random.

Treatments within a date consisted of:

1. 2,4-D isopropyl ester at 3 lb/acre acid equivalent in 5 gal water.
2. Tordon 22-K at 0.25 lb in 100 gal/acre water.
3. Tordon 22-K at 0.5 lb in 100 gal/acre water.
4. Tordon 22-K at 2 lb in 100 gal/acre water.
5. Control.

Observations on the plots consisted of counts of rabbitbrush plants before treatment and again in July 1966. Sometimes it was difficult to identify individual plants because of the sprouting characteristics of the species. Therefore a group of stems was arbitrarily considered as an individual plant where the stems emerged from the soil within an area 6 inches in diameter.

In addition to counting the rabbitbrush on each plot, samples of the forbs and grasses were clipped before treatment and at the peak of growth in 1965 and 1966. Herbage was clipped within three 5-ft^2 subplots randomly located at each clipping date in each 1/100-acre plot.

Treatments in 1965 were applied on plots 15 $\times$ 100 ft at one location on Black Mesa. Three treatments were applied August 17 when rabbitbrush was in the early flowering stage. Each treatment was randomly located and replicated twice; a seventh plot was reserved as a check.

Treatments were as follows:

1. Tordon Beads—200 lb/acre.
2. Tordon Beads—100 lb/acre.
3. Tordon 22-K—2 lb/acre in 100 gallons of water.

Prior to treatment, density of rabbitbrush and Fremont geranium (*Geranium fremontii* Torr.) plants was estimated on the area according to the point-centered quarter method described by Cottam and Curtis (1956). In 1966, complete counts of these two species were made on individual plots.

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[2] Trade names are used for the benefit of the reader and do not imply endorsement or preferential treatment by the U.S. Department of Agriculture.

Table 1. Percent kill of Parry rabbitbrush, and herbage production (lb/acre) in 1966 following herbicide applications in 1964. Black Mesa Experimental Forest and Range, Colorado.

Treatment		Rabbitbrush kill	Herbage production	
Herbicide	lb/acre		grasses	forbs
Early Applications				
2,4-D	3	—*	1,398	582
Tordon	0.25	8	1,921	294
Tordon	0.5	—*	1,926	134
Tordon	2	65	2,418	36
Late Applications				
2,4-D	3	30	1,690	365
Tordon	0.25	16	1,423	284
Tordon	0.5	22	1,913	146
Tordon	2	82	2,474	19
Control		—	1,575	1,043

* Actual increase in number of plants.

Results and Discussion

Tordon 22-K was the most promising treatment in terms of rabbitbrush kill and subsequent grass production (Table 1). There was no significant difference in herbage production between dates of spraying but there were fewer rabbitbrush plants in 1966 on plots which had been sprayed July 14. Tordon sprayed at 2 lb/acre had achieved an average 82% kill. When sprayed 3 weeks earlier, this same rate produced a 65% kill of rabbitbrush.

Rabbitbrush plants on other plots sprayed early (June 24) increased an average of 15% by 1966. Although the top growth of many plants was killed, the spray treatment, except at the heaviest rate, stimulated sprouting and resulted in more plants in 1966. Also, because leaf growth was not complete at the time of treatment, some plants developed new leaves on the old stems.

Tordon 22-K at 2 lb/acre gave significantly higher kills of rabbitbrush than 2,4-D or the lower rates of Tordon; however, for the late treatments, 2,4-D was second only to the heaviest rate of Tordon. There was no difference in the percent kill of rabbitbrush between the two lighter rates of Tordon application.

The treatments reduced the crown cover of rabbitbrush noticeably. After two years, the stems of most plants consisted primarily of young succulent growth. Where herbicides had not entirely wet the foliage, the characteristic "flags" were left on older stems. A second spray application, as has been recommended by Cook et al. (1965), might increase the kill substantially.

Because previous research (Cook et al., 1965) had recommended adequate soil moisture when rabbitbrush is treated, gravimetric samples for soil moisture determinations were observed on each plot at the time of treatments in 1964. On the earlier date, soil moisture averaged 12.7% and 19.7% at 0 to 6 inches and 6 to 12 inches, respectively. Three weeks later it averaged 10.0 and 11.3% at these same depths. Thus, it appears that sufficient leaf development is more critical for the reduction of Parry rabbitbrush than is higher soil moisture.

On Black Mesa, moisture in the upper foot of soil frequently will not be limiting for plant growth from mid-July through August, due to the usual pattern of increased precipitation at that time. Consequently, adequate soil moisture and full leaf development at this period may combine for maximum kills of rabbitbrush. This possibility is supported by the 1965 treatments made August 17, after nearly 4 inches of precipitation had been received in July.

Prior to treatment in 1965, rabbitbrush averaged 12,866 plants/acre on the site, or about one plant per 3.4 ft^2. Counts of living plants in July 1966 indicated a 99% kill on the two plots sprayed with Tordon 22-K at the rate of 2 lb/acre. Tordon Beads at 200 lb/acre produced a 45% kill of rabbitbrush, but at 100 lb/acre there was no reduction compared to the check plot.

In the 1965 rabbitbrush treatments, the same chemicals were very effective on Fremont geranium. This species has in the past been difficult to control. Since it produces more herbage than any other forb on the area, but is worthless for forage, it is of interest that all three treatments produced satisfactory kills. From an average of 1,267 plants/acre in 1965, the following reductions were indicated by the 1966 records:

	Percent Kill of Geranium
Tordon Beads 100 lb/acre	78
Tordon Beads 200 lb/acre	96
Tordon 22-K 2 lb/acre	100

Furthermore, it is likely that the kill by Tordon Beads will increase since pronounced epinasty of leaves was observed on surviving geranium plants in 1966.

Total herbage production on the plots sprayed in 1964 averaged within 50 lb of that on the control plots 1 year later. The composition was altered, however, from 55% grass on the control to 87% grass herbage on the treated plots. The following year, production averaged 60 and 89% grasses on the control and treated plots, respectively.

The treatments significantly reduced the herbage production of broad-leaved species. Tordon at the 2-lb rate reduced the forbs in 1966 to less than 2% of the composition. The 0.5-lb treatment with Tordon was almost as successful; it changed the herbage composition to 93% grasses and 7% forbs. There were no significant differences in forb production between dates or sprays.

FIG. 1. Forage utilization in October 1965 on plot sprayed with Tordon 22-K at 2 lb/acre. Compare with unsprayed areas on the right and in the background.

Total herbage production on the sprayed plots averaged 490 lb/acre less than on the control plots in 1966. Plots sprayed with Tordon at 2 lb/acre averaged only 144 lb/acre less. Because of the conversion to a grass stand and the elimination of many worthless forb species, there was considerably more forage available following the treatments.

The areas have been grazed by cattle in the summer and early fall. On these small plots, which have been essentially converted to grass by the spray treatments, as well as on other areas up to 0.25 acre in size that had been sprayed to control the forbs, there has been noticeably heavier utilization of the grasses than on the surrounding range (Fig. 1).

In previous spray trials involving large areas on Black Mesa, the cattle were extremely reluctant to graze areas that had been sprayed. Possibly by reducing the size of the sprayed areas this problem could be avoided on sites where there is a tendency for the large bunchgrasses to become overly rank and unpalatable when the competing forbs are removed.

Conclusions

To control Parry rabbitbrush with Tordon 22-K, it was necessary to apply the herbicide as a foliage spray at the rate of 2 lb/acre. Tordon applications of 0.25 and 0.5 lb/acre and applications of 2,4-D at 3 lb/acre reduced the crown cover of rabbitbrush, but failed to produce satisfactory kills. Spraying was most successful when new growth of rabbitbrush was well advanced—from the time it reached 3 to 6 inches long until the early stages of flowering.

The spray treatments significantly increased grass production, and correspondingly decreased forbs. Total herbaceous production was approximately the same on the treated and the untreated control plots.

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