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***Abstract*:** Our experiment demonstrated that black-tailed prairie dogs(*Cynomys ludovicianus*) will consume rodenticide underground in their burrows. We demonstrated the efficacy of Rozol Pocket Gopher Bait containing the active ingredient chlorophacione (0.005%) 21 days post treatment for managing black-tailed prairie dogs in their burrows in Kansas. Active prairie dog burrows were reduced 90% when 54 grams of Rozol was placed in the burrow without prebaiting. Results indicate use of this toxicant when placed in the burrow can be an effective means of managing prairie dogs. In-burrow application of rodenticides for black-tailed prairie dog management should markedly reduce exposure of birds to toxic bait.

***Key words*:** chlorophacinone, control, *Cynomys ludovicianus*, management, prairie dog, toxicant.

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INTRODUCTION

The black-tailed prairie dog (*Cynomys ludovicianus*) is a controversial species on western rangelands. These diurnal burrowing rodents are highly social and live in colonies that range in size from one acre to thousands of acres of rangeland in short or mixed-grass prairie. This pattern of distribution and high population densities make the prairie dog the subject of control programs (Hansen 1982). Since the 1800s, attention has focused on eliminating forage competition between livestock and prairie dogs.

Widespread control programs for prairie dogs on the Great Plains began during the late 1800s and early 1900's, when it was estimated that 256 prairie dogs could consume as much forage as one cow (Merriam 1902). Where prairie dogs occur, rangelands appear to be dramatically altered relative to surrounding vegetation (Uresk 1984, Koford 1958). Prairie dogs reduce the amount of forage present and may change the species composition of rangelands from predominately grasses to forbs (Bonham and Lerwick 1976, Fahnestock and Detling 2002). Perceived competition between domestic livestock and prairie dogs for range forage has been the main justification for control (Merriam 1902, Taylor and Lotfield 1924, Hansen and Gold 1976).

Zinc phosphide, formulated as a grain bait or processed pellet (2% active ingredient) has been the most widely used toxicant in recent years for prairie dog control (Hygnstrom and Virchow 1994). Concerns about efficacy, bait avoidance, extra labor involved with pre-baiting and the potential exposure to birds and other nontarget wildlife to toxic bait have caused managers to seek

alternatives. Rozol Pocket Gopher Bait has been used in Kansas since about 1991. Letters from both the United States Environmental Protection Agency and the Kansas Department of Agriculture authorize the use of the product but state the product must be applied in the burrow. This project was initiated to determine the efficacy of Rozol Pocket Gopher Bait introduced into burrows to control prairie dogs.

MATERIALS AND METHODS

We conducted the study on 15 colonies found in shortgrass prairie in west-central Kansas during March in 2004 (Figure 1). Study sites included colonies in Sherman, Logan, Gray and Kearney counties in western Kansas. The landscape was characterized by prairie upland rangeland interspersed with large expanses of cropland. Topography varied from flat upland plains to gently sloping hills, 600 to 1000 m above sea level. Annual precipitation varied somewhat by county but the normals from 1971- 2000 are from 470 to 585 mm per year. In all but one county and only one year the average annual precipitation for the five years prior to the trial was < 90% of the normal. Most of the region has been classified as severe or extreme drought conditions by USDA (2004). Growing season varies by about 10 days between Gray county in southwestern Kansas to Sherman County, approximately 165 km to the northwest in extreme western Kansas (USDA-NRCS 2005).

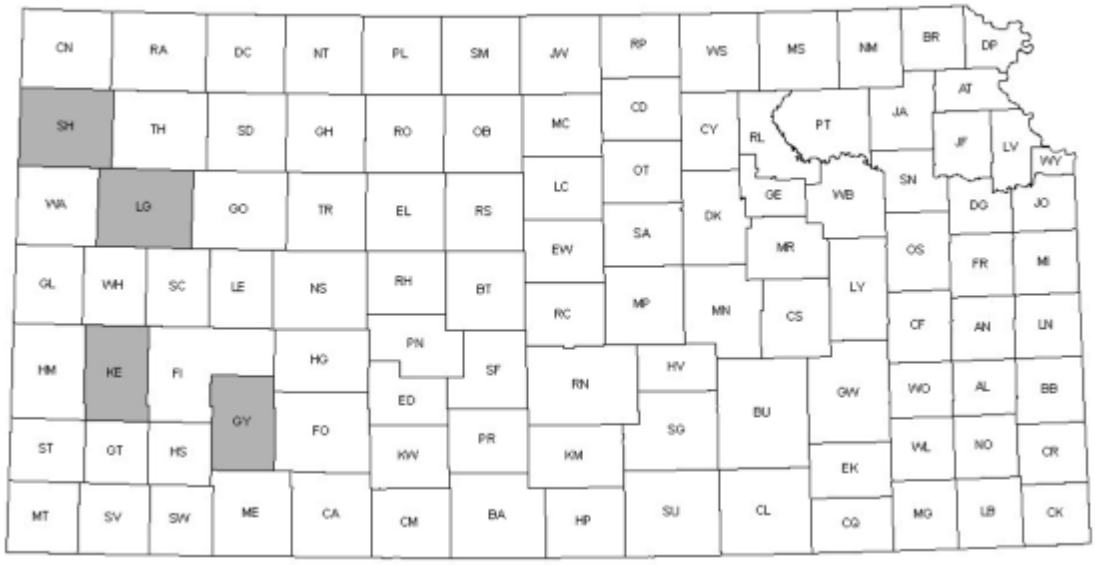

Figure 1. Kansas counties where Rozol treatments were applied in 2005.

Active prairie dog colonies were identified by county weed control personnel who had knowledge of local colony locations and knew private landowners willing to participate in the study. We selected colonies approximately 4.0 ha in size, if no other prairie dog colonies were within 800 m, to reduce emigration and immigration between colonies.

When a colony was identified, perpendicular transects were imposed over the long axis of the colony. The four endpoints were marked with a global positioning system (Garmin GPS V unit) and survey flags. Prior to 10 am each day, approximately forty burrows directly under or nearest to those transect lines were plugged with soil and counted. Plugged burrows were also marked

with a 0.5 m stripe of spray paint 2 m to the right of each opening. Twenty four hours later the burrows that had been reopened by prairie dogs were counted. At that time all active burrows in the colony were treated with 54 grams (1/4 cup) of Rozol Pocket Gopher Bait placed in each burrow. Active burrows were classified as those with fresh prairie dog fecal material or tracks and generally free of leaves, spider webs or other vegetative debris. Most bait was placed at least 150 mm below the soil surface, however some bait slid deeper within the burrow. Bait was either placed by hand using a measuring cup with a 0.5 m handle or dispensed into the burrow with a mechanical device mounted on an all terrain vehicle that dispensed 54 g of bait through a 50 mm diameter rubber hose that was inserted into the burrow opening.

Twenty one days later each colony was revisted. All burrows directly under the transects were again plugged with soil prior to 10 am. Reopened burrows were counted 24 hours later. Efficacy as indicated by reduced burrow activity was determined with modification of the procedure identified by Tietjen and Matschke (1982). The percentage of burrows that was no longer active was determined by the formula [number of active pretreatment burrows minus number of active post treatment burrows by the number of active pretreatment burrows.]. The effectiveness of the treatment was evaluated by comparing the pre- and post-treatment counts in each colony and calculating the percentage by which activity had decreased. We assumed that reduction in burrow activity was correlated with a reduction in the local populations as described by (Tietjen 1976).

RESULTS AND DISCUSSION

Rozol applied as a treatment in burrows to reduce burrow activity was effective in all counties with means ranging from 75 to 100% (Table 1). The EPA (US Environmental Protection Agency 1982) minimum standard for efficacy is 70%. Our results are considerably better than that with an overall mean for colonies of 91.4%. The colonies with the lowest efficacy were colonies in Gray and Kearney counties that were approximately 160 km south of the colonies in Sherman county with the best efficacy. Efficacy was probably influenced by the earlier green-up in Gray and Kearney counties that produced alternate forage approximately two weeks before it was available in northern Sherman county. Prairie dogs select growing rather than mature plants (Fagerstone 1981). Smith (1967) suggested prairie dogs switch from feeding on dead grass leaves and seeds in the early spring to roots and then forbs and grasses as they green up and begin to emerge. Seasonal variation in prairie dog diets has been noted by several researchers (Koford 1958, Smith 1967, Fagerstone 1981).

Tietjen (1976) and Witmer and Fagerstone (1981) reported that prairie dogs usually do not feed on baits placed inside their burrows. Our experiment showed reduced burrow activity after a 21 day period when bait was placed in the burrow. The logical explanation is that prairie dogs consumed the bait in their burrows. Researchers observed most bait was consumed within 24 hours after application. This trial was conducted during a drought period and thus prairie dog diets may have included seeds found in burrows. Other rodents observed in the area included Ord's kangaroo rats (*Dipodomys ordii richardsoni*) and deer mice (*Peromyscus maniculatus*). Some bait may have been consumed by those rodents as researchers have noted their diets include seeds (Kaufman et al. 1996, Sipos et al. 2002).

Table 1. Percent reduction of black-tailed prairie dog burrow activity for pre- and post-treatment with Rozol on 15 treated colonies in 4 counties in Kansas.

Colony	Size (ha)	Pre-trt plugged	Reopened 24 hrs later	Post-trt plugged	Reopened 24 hrs later	Reduction (%)
SH1	3.9	33	13	33	0	100
SH2	1.8	38	25	38	0	100
SH3	3.5	44	18	44	2	88.9
SH4	12.8	99	42	98	0	100
SH5	9.2	42	19	41	0	100
SH6	1.1	47	16	47	0	100
LG1	1.6	41	17	41	1	94.1
LG2	2.9	38	18	38	1	94.4
LG3	1.8	35	17	35	1	94.1
LG4	8.3	40	18	40	1	94.4
GY1	2.9	42	16	42	4	75.0
KE1	1.8	43	20	42	4	80.0
KE2	1.8	44	19	43	4	78.9
KE3	1.3	42	21	42	4	80.9
KE4	10.4	41	20	39	2	90.0

Our results indicate that black-tailed prairie dogs will consume rodenticide underground in their burrows. Further research is needed to determine the conditions when maximum consumption of baits can be achieved. We hypothesize that maximum bait consumption in burrows will occur during the one to three week period in early spring immediately before vegetation green-up. Rozol Pocket Gopher Bait placed in the burrows can be an effective prairie dog management tool, achieving up to 90% efficacy when applied during the early stages (or prior to) green-up.

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