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A FIELD COMPARISON OF 0.20, 0.35, AND 0.50 PERCENT
STRYCHNINE GRAIN BAITS FOR CONTROLLING
RICHARDSON GROUND SQUIRRELS

by

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A field comparison of 0.20, 0.35, and 0.50

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ABSTRACT

A field investigation conducted in Wheatland County, Montana, during July 1981, determined that 0.20 percent strychnine grain bait adequately reduced Richardson ground squirrel activity. Application rates of one tablespoon or one teaspoon per burrow of 0.20 percent strychnine bait appeared to be equally effective. An accurate comparison among the efficacies of 0.20, 0.35, and 0.50 percent strychnine baits was not possible because of unusual variations and growth of vegetation which adversely affected bait acceptance. Tablespoon quantities of applied bait per burrow left excessive amounts of residual bait under the conditions of this study. One apparent nontarget species fatality, a jackrabbit, was observed on a plot treated with 0.20 percent bait.

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PLEASE RETURN

INTRODUCTION

In 1976, strychnine, as a field rodenticide, was placed in the Rebuttable Presumption Against Registration (RPAR) process because of potential hazards to nontarget species, accident history, and acute oral toxicity. As a result, in 1980, the U.S. Environmental Protection Agency released the Strychnine Position Document 2/3 (U.S. Environmental Protection Agency 1980) with recommendations concerning the continued above ground uses of strychnine. Among EPA's recommendations were standardization of ground squirrel baits at 0.20 percent strychnine and increasing the rate to one level tablespoon of bait per burrow. Montana agricultural interests are concerned that the recommended concentration and rate would not be efficacious, and that alternative rodenticides for ground squirrel control are ineffective. Several Montana agencies requested that EPA delay its final decision until studies could be conducted to investigate effective concentrations and rates of application.

Strychnine grain baits currently registered in Montana have concentrations of 0.35, 0.44, and 0.50 percent active ingredient. The application rate is one teaspoon per burrow for ground squirrels. These baits provide the only effective and economical method for managing Richardson ground squirrels at this time. Alternatives including zinc phosphide, anticoagulants, 1080, and gas cartridges have been ineffective, unproven, not registered, or too expensive (Swick 1976, Sullins 1977, Albert and Record 1979, Swick 1980). Until such time as viable alternatives are developed and registered, it is imperative that strychnine bait be available for management of damage caused by Richardson ground squirrels.

This study was conducted to help determine the minimum concentrations and rates of active ingredient that will provide consistent economic control of Richardson ground squirrels. A variety of currently used strychnine concentrations were tested along with EPA's recommended 0.20 percent.

OBJECTIVES

The objectives of this study were to determine if 0.20 percent strychnine bait would provide efficacious control of Richardson ground squirrels and to compare observed control with that obtained with 0.35 and 0.50 percent strychnine grain baits.

STUDY AREA

Nine study plots were selected on privately owned property approximately 20 miles north of Harlowton, Montana. The plots were located on dryland alfalfa-grass pasture and were similar in vegetation type and physical aspects. Unusually wet spring and early summer conditions (over twice the normal amount of precipitation) resulted in above normal amounts of vegetation on the study area.

METHODS AND MATERIALS

Using three concentrations of strychnine grain bait, 0.20, 0.35, and 0.50 percent active ingredient on slightly crimped whole oats, field efficacy tests were conducted on eight separate plots (two replications for each test) inhabited by Richardson ground squirrels. A ninth plot received no treatment and was used as a control. Plots varied in size from 0.7 to 3.3 hectares (1.7 to

6.6 acres) and each plot was surrounded by a treated buffer zone (100 yards) to prelude reinvasion. Baits were applied by hand using calibrated dippers. The application rates for the 0.20 percent bait were both one teaspoon and one tablespoon per burrow (on separate plots). For the 0.35 and 0.50 percent baits, the application rate was one teaspoon per burrow as per labeled instructions. These baits were applied in late July after juveniles reached adult size.

To quantify the effectiveness of each treatment, visual counts were conducted with binoculars pre-and-post treatment to generate activity indices (AI). Visual counts consisted of three counts at five minute intervals on each plot for three consecutive days pre-and-post treatment. Counts were conducted early in the morning during peak periods of foraging activity. Pre-and-post treatment activity indices were then computed by averaging the 9 pre-or-post treatment visual counts. Percent reduction in activity due to strychnine baiting was computed as follows:

$$\text{Percent Reduction in Activity} = \frac{\text{Pretreatment AI} - \text{Post treatment AI}}{\text{Pretreatment AI}} \times 100$$

Residual bait counts were conducted one day and seven days post treatment to determine amounts of unconsumed bait remaining on the ground. In one plot of each treatment, bait kernels were counted at each of 20 randomly selected burrows.

Post baiting searches were conducted to determine nontarget mortalities resulting from strychnine poisoning.

RESULTS AND DISCUSSION

A comparison of pre-and-post treatment activity indices (Table 1) indicate that the treated strychnine baits reduced Richardson ground squirrel activity within a range of 66 to 86 percent. This reduction was considerably less than the preferred 90 percent or greater. Unusually lush green vegetation was present throughout western and central Montana due to much higher than normal precipitation in the spring and early summer months. The abundance of vegetation on the study site may have been a major factor in reduced overall bait acceptance. While some livestock grazing had previously occurred on some of the study plots, abundant vegetation was still present.

The 0.20 percent treatment with the one teaspoon per burrow rate reduced activity by 85 and 86 percent as compared to 84 and 86 percent for the one tablespoon per burrow rate. These reduction rates were considerably greater than the 0.35 (74 and 66 percent reduction) and 0.50 (79 and 80 percent reduction) percent strychnine baits. However, it should be mentioned that green vegetation was much more abundant on the 0.35 and 0.50 treatment plots, which may have influenced bait acceptance.

There was no apparent difference in the reduction of ground squirrel activity between the one teaspoon and one tablespoon rates of 0.20 percent strychnine baits. Although vegetation prevented accurate counts of residual bait left after baiting operations, it was evident that far too much bait remained on the ground four days after bait application with the one tablespoon rate. Considerable amounts of residual bait were also left on the ground on plots treated with one teaspoon rates where hole density was great. This residual bait could be decreased by properly scattering one teaspoon of bait near several closely adjacent holes rather than placing one teaspoon at each hole.

Post treatment searches revealed only one apparent nontarget fatality - a whitetail jackrabbit was found on a plot treated with one tablespoon of 0.20 percent strychnine bait.

CONCLUSIONS

Under the environmental conditions of this study (above normal precipitation and vegetative growth), 0.20 percent strychnine grain bait appeared to be effective in reducing Richardson ground squirrel numbers. However, a direct comparison in efficacy between 0.20, 0.35, and 0.50 percent strychnine grain baits was not possible in this study due to variations in and above normal vegetative growth on the various test plots. An application rate of one tablespoon of bait per burrow was considered to have left excessive residual bait on the ground after baiting operations.

It is recommended that this study be continued to obtain data under more normal field conditions, perhaps in early spring after the squirrels emerge from hibernation but before green vegetative growth becomes a controlling factor. The bait concentrations used in this study should also be field tested on other pest rodent species to determine comparative efficacy.

TABLE 1. ACTIVITY INDICES, PERCENT REDUCTION IN ACTIVITY, AND NONTARGET MORTALITIES ON PLOTS TREATED WITH 0.20, 0.35, AND 0.50 PERCENT STRYCHNINE GRAIN BAITS TO CONTROL RICHARDSON GROUND SQUIRRELS (July 1981).

INDICES	TREATMENT								
	Control	0.20% Strychnine		0.20% Strychnine		0.35% Strychnine		0.50% Strychnine	
		1 Teaspoon per burrow Plot A	Plot B	1 Tablespoon per burrow Plot A	Plot B	1 Teaspoon per burrow Plot A	Plot B	1 Teaspoon per burrow Plot A	Plot B
Pre-Treatment Activity Index ^a	15	26.5	25.0	26.0	35.3	14.3	21.3	23.5	21.2
Post-Treatment Activity Index ^b	16	4.0	3.5	4.2	4.8	3.7	7.3	5.0	4.3
Percent Reduction ^c	--	85.0	86.0	84.0	86.0	74.0	66.0	79.0	80.0
Nontarget Species ^d	--	--	--	--	1 white-tailed jack rabbit	--	--	--	--

a) Average of 9 counts of active squirrels per plot during 3 days prior to baiting.

b) Average of 9 counts of active squirrels per plot during 3 days after baiting.

c) Formula: $\frac{\text{Pre-Treatment AI} - \text{Post-Treatment AI}}{\text{Pre-Treatment AI}} \times 100$

d) Nontarget species carcasses found on or near treated plots within 3 days after baiting.

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