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Abstract: Little research has been conducted on rodent control techniques in livestock feedlot situations. We tested efficacy of several treatments including two anticoagulant baits, an acute toxicant and snap trapping to reduce rodent populations at the Beef Cattle Research Center at Kansas State University. Among the four treatments utilized, Contrac®, Blox®, and Ditrac® Tracking Powder reduced the number of active burrows. ZP® Rodent Bait had no observed effect on the rodent population and no rodents were taken with snap traps. Burrow activity appears to be a better census method when compared to corn consumption when rodents have access to unlimited food.

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Key Words: Norway rats, *Rattus norvegicus*, house mice, *Mus musculus*, rodent control, toxicants

INTRODUCTION

An infestation of Norway rats (*Rattus norvegicus*) and house mice (*Mus musculus*) exists at the Beef Cattle Research Center (BCRC) at Kansas State University. Rodents consume and contaminate the animal feed, cause structural damage by undermining feed bunk aprons and manure waste water dams, and carry diseases including leptospirosis, trichinosis, salmonellosis and rat bite fever (Timm 1994). Feedlot producers report negative reactions from customers when they observe rats and mice.

Several commercial products are available to treat rodent infestations. Little research, however, has been conducted in livestock feedlot situations to determine the efficacy of these products at feedlots. Dr. Jim Drouillard, BCRC Manager, contacted Extension Wildlife Specialist, Charles Lee, about rodent control options. Mr. Lee coordinated with the wildlife damage control class taught by P. S. Gipson to assess the efficacy of several treatments.

METHODS

To reduce the rodent population, we applied four treatments which included two anticoagulant baits, an acute toxicant, and snap trapping. The protocol (Table 1) followed recommendations by Spaulding and Jackson (1983).

Table 1. Protocol for rodent control treatments and evaluations at the Beef Cattle Research Center at Kansas State University, Manhattan.

Dates	Activities	Data
23-25 Jan.	Pre-treatment census Bait consumed	Open burrows
26-27 Jan.	Pre-treatment lag phase	
28 Jan.- 7 Feb.	Two toxicant treatments - Contrac® Blox® - ZP® Rodent Bait	Toxicants consumed
8-10 Feb.	Post-treatment census 1	Open burrows Bait consumed
9 Feb.	Pre-baited snap traps	
10-14 Feb.	Set snap traps	Rodents captured
15-18 Feb.	Post-treatment census 2	Open burrows Bait consumed
18 Feb.-13 March	Tracking powder treatment - Ditrac® Tracking Powder	Burrows treated
14-17 March	Post-treatment census 3	Open burrows

An initial pre-treatment population census was conducted before treatments were applied. Following each treatment we conducted a post-treatment population census to evaluate success.

Initially, we used feed consumption, one of six techniques recommended by Spaulding and Jackson (1983), to provide a relative index of the size of the rodent population (Table 2). Problems were encountered with the technique because of poor acceptance of the feed (corn in this case) by rodents and the variation in weight of the corn caused by changes in moisture resulting from rain, snow, humidity, and wet rodents entering bait boxes. These problems necessitated use of an alternate census technique. We switched to monitoring burrow activity as a measure of rodent abundance (Jackson 1979). A pre-treatment census of rodent populations was conducted by counting open burrows the morning following closure of all burrows.

Table 2. Consumption of corn as an index to rodent abundance at the Beef Cattle Research Center at Kansas State University, Manhattan. One hundred grams of corn was initially placed at each station.

Test-phase	Day	Total number of stations	Total corn weight change (g)	Avg. weight change (g)/station
Pre-treatment	1	16	-2.3	-0.1
	2	16	+5.3	+0.3
	3	16	-1.4	-0.1
Average Pre-treatment		16	+1.6	+0.03
Post-census 1	1	16	+25.4	+1.6
	2	16	+5.4	+0.3
Average Post-census	1	16	+30.8	+0.96
Post-census 2	1	16	+10.6	+0.7
	2	16	-10.0	-0.6
	3	16	+22.0	+1.4
Average Post-census 2		16	+22.6	+0.47

The first treatment consisted of the use of 29 blocks of a commercial anti-coagulant, Contrac® Blox® (active ingredient 0.09% bromadiolone), and 29 of pellets of an acute toxicant, ZP® Rodent Bait (active ingredient 2% zinc phosphide). Both toxicants were applied in plastic bait stations, Rodent Baiter® (Bell Laboratories, Inc., Madison, WI) designed to minimize exposure of nontarget animals and to protect bait from adverse weather. Each toxicant was assigned to two rodent populations and applied for 11 consecutive days. A post-treatment burrow activity census was conducted the following three days.

Because of poor consumption of baits, we then decided to test the efficacy of snap traps to control the population. We placed unset Victor® professional rat traps (Woodstream Corp., Lititz, PA) baited with peanut butter in position along feed bunks overnight to allow rodents to acclimate to the traps. The traps were then set for five days, but no rodents were captured. A post-treatment burrow activity census was conducted the following three days.

We decided to try a fourth treatment since the number of open burrows showed rodents were still present, and none were caught with traps. The fourth treatment, a commercial anti-coagulant tracking powder, Ditrac® Tracking Powder, was applied by placing three tablespoons of powder into open burrows and then covering the burrows. This treatment was applied for 20 days, with tracking powder applied each day to open burrows. The final post-treatment burrow activity census was run for four consecutive days.

RESULTS

Among the four treatments utilized, Contrac® Blox® (Figure 1) and Ditrac® Tracking Powder (Figure 2), reduced the number of active burrows. The rodent population that was given the Contrac® Blox® treatment, however, soon recovered to near pre-treatment levels of burrow activity. ZP® Rodent Bait had no observed effect on the rodent population, and no rodents were caught with snap-traps. The results from Ditrac® Tracking Powder show a marked reduction in the number of active burrows.

Table 2 shows that corn consumption was minimal, but corn weight changed daily, depending upon humidity and precipitation. Corn consumption weights were standardized using Rodent Baiter® Boxes in which the corn was inaccessible to rodents.

DISCUSSION

We conclude that Norway rats and house mice in livestock feedlot environments, similar to the BCRC, may be difficult to control with snap traps or toxic baits. We attempted to follow an established protocol (Spaulding and Jackson 1983) for placing and monitoring baits and traps, and a widely used measure of rodenticide efficacy - corn consumption (Jackson 1979). Consumption of corn, however, was not effective as a population index because rodents had an abundance of silage-corn livestock feed mix, and they did not readily consume corn in bait boxes.

In our field trial neither Norway rats nor house mice readily consumed Contrac® Blox® or ZP® Rodent Bait. There was a short term decrease in the number of open burrows following treatment with Contrac® Blox®, suggesting a temporary reduction in rat and mouse numbers. The number of open burrows, however, increased to near pre-treatment levels within one week. This may reflect a temporary depression of rodent activity, or some rodents may have been killed, followed by a rapid immigration of rodents from adjacent areas. Surprisingly, snap traps baited with peanut butter failed to capture a single rat or mouse, even though tracks of rats and mice were observed around traps.

An abundance of livestock feed, silage mixed with cracked corn, was available to rodents throughout the feedlot. This large amount of food available to rodents and their long term use of it, may have prevented rats and mice from being attracted to the commercial toxic baits and snap-traps. Other research (Shafi et al. 1990) has shown black rats (Rattus rattus) prefer baits with an egg yolk additive.

Ditrac® Tracking Powder placed directly in burrows was effective in reducing rodent populations. The success of this product probably relates to its application: rodents indirectly ingest this toxicant when

grooming themselves. In contrast, Contrac® Blox® and ZP® Rodent Bait depend upon direct consumption, and these bait formulations may not be preferable to silage and other foods available at feedlots.

Interestingly, burrows detected during the post-treatment census following application of Ditrac® Tracking Powder, were all made by mice. This suggests that mice may have started to invade areas formerly inhabited by rats. Other Norway rat trials (Quy et al. 1994) have suggested that rodenticide treatments fail because of: 1) little or no bait consumption, 2) resistance to the active ingredient, or 3) reinvasion. This trial was not designed to determine which factor might be responsible for lack of efficacy of rodenticides.

RECOMMENDATIONS

Ditrac® Tracking Powder may be effective in feedlots similar to BCRC. When applied according to label directions, the risk of exposure to livestock and other non-target species is minimal. Burrows on both sides of the bunks should be treated only if livestock are not in the pen. Burrow openings should be covered with a loose plug of grass or hay. Covering burrows with soil may result in reduced tracking powder effectiveness due to tracking powder being exposed to moisture in the soil or being covered with soil.

We recommend that additional field tests be conducted to determine the efficacy of Contrac® Blox® and ZP® Rodent Bait in feedlot environments. If results confirm our findings that Contrac® Blox® and ZP® Rodent Bait are not readily consumed by rats and mice in a feedlot situation, more attractive baits or other delivery methods should be developed.

Burrow activity appears to be a preferred census method compared to corn consumption in areas where rodents have access to unlimited food.

ACKNOWLEDGMENTS

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Figure 1. Mean number of open burrows per day, before and after treatment with ZP® Rodent Bait and Contrac® Blox®.

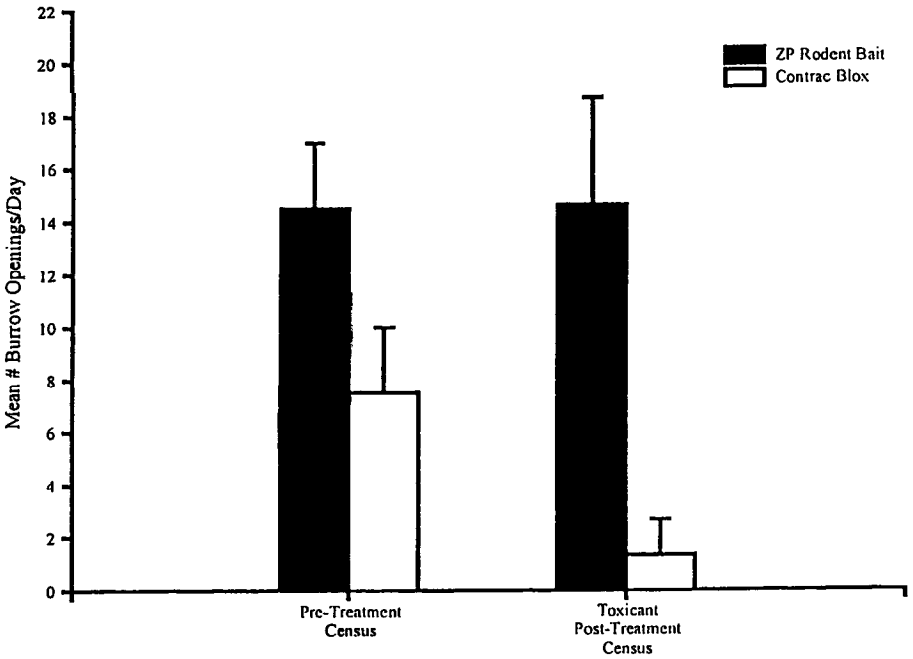

Figure 2. Mean number of open burrows per day, before and after treatment with ZP® Rodent Bait, Contrac® Blox®, snap trapping, and Ditrac® Tracking Powder. Number of open burrows were combined for Treatments 1 and 2.