Utah IPM/SA Mini-Grant Report Format for 2009

Project Title: Using IPM techniques to Improve Cooperator Effectiveness to Mitigate Damage Caused by Townsend's Ground Squirrels (*Spermophilius townsendii*) in Irrigated Alfalfa

Location of Project (Counties in Utah): Beaver County

Total Grant Award: $1200.00

Principal Investigator: Mark Nelson

Co- Principal Investigator(s): Terry Messmer

Cooperators: Billy Dalton, Beaver County Commissioner; Arlan Mayer, SCD Chairman; Tim Marshall, grower.

Objectives of Project:

1. To train Beaver County cooperators impacted by ground squirrels about integrated pest management approaches to mitigate damage in irrigated alfalfa fields.
2. To assess landowner application of integrated pest application approaches, levels of success, and satisfaction in response to training.
3. To compare the effectiveness of pre-baiting in field trials using rodenticides registered in Utah to control ground squirrels.

Summary of Project:

We held a workshop at the Beaver County Fairgrounds in Minersville in January 2009 to educate producers on the biology and methods that could be used to mitigate damage caused by Townsend ground squirrels (*Spermophilius townsendii*) producers. The workshop was attended by 45 producers. The instructors were Mark Nelson, USU Extension Beaver County Agent and Terry A. Messmer, USU Extension Wildlife Specialist.

After welcoming statements, a pre-test containing 20 questions about ground squirrel biology and damage control methods was taken by 42 workshop participants. After completing the pre-test, a power-point presentation that reviewed species biology and methods to control ground squirrel damage was presented. Prior to the presentation, participants were encouraged to ask questions and share experiences. Many of the workshop participants had experience with using several of the control methods. Dr. Messmer discussed the advantages and limitations of each method. He emphasized the importance of timing and the use of pre-baiting when using grain-based toxicants. Workshop participants were how to prebait with a crimped oat and then following up several days later with grain bait containing zinc phosphide. This control program has several advantages over other treatments producers were currently using. These advantages included: 1) squirrels are much more likely to eat and develop a taste for the grain bait if they were provided a untreated grain pre-bait shortly after they emerge from hibernation and prior to vegetation green-up, 2) both

prebait and bait can be applied quickly using a spreader on a four wheeler compared to other methods where you have to treat each individual hole, and 3) by applying the bait when adults emerge from hibernation, you can target the breeding population thus preventing reproduction.

Because zinc phosphide is a restricted-use bait, Mark Nelson reviewed the legal requirements for using the bait and the process for producers to follow to obtain licenses to purchases and use the bait. Producers attending the workshop who currently had restricted licenses were able to earn two pesticide credits toward keeping their licenses. After these presentations, a post-test containing 20 new questions was administered to workshop participants. After completing the post-test, workshop participants enjoyed a lunch that was provided by the Beaver County Commission.

Throughout the rest of the year, Mark Nelson followed up with producers to assist them in implementing the new control program. Additionally, to demonstrate to producers the effectiveness of the pre-baiting, we established trials to compare the effects of no baiting, baiting and prebaiting. To establish these trials, Mark Nelson worked with four different cooperators to set up plots within their fields. We selected 12 plots, 3 in each cooperators field. Each plot was 50 X 50 m and at least 400 meters from each other. Each treatment consisted of a plot that was pre-baited and then baited with zinc phosphide, 1 plot baited with zinc phosphide without baiting and 1 plot that received no treatments. Each plot was observed for 4 days before treatment and 4 days after treatment to determine if the number of squirrels decreased. The plots were prebaited with crimped oats using a hand spreader. The bait was spread using the same spreader.

Results of Project:

Educational Impacts and Outreach

To assess change in producer knowledge and skills, we administered pre- and post-tests during the workshop and mailed workshop participants a follow up survey in the fall. The pre-test was completed by 40 workshop participants. The average score was 63% (range 45-90%). The post-test was completed by 32 workshop participants. The average score was 84% (range 65-100%).

Follow-up surveys were sent to 32 workshop participants who were identified as the primary landowners. We asked the participants specific questions regarding damage control techniques implemented and their effectiveness. We received 28 completed surveys back (88%).

Twelve participants (42%) reported spending less than 50 hours implementing control measures. Participants reporting more than 50 hours implementing control measures also reported using zinc phosphide bait. Of these, 8 participants (29%) spent 50-100 hours 7 (25%) 100-200 hours, and 1 (3%) over 200 hours implementing control measures.

Of the 28 workshop participants who responded, 18 (64%) reported using zinc phosphide bait as their primary control method. Of these 14 (78%) reported using pre-bait. Of those who reported using zinc phosphide bait, 9 (50%) reported their control efforts as being highly effective, 6 (33%) as moderately effective, and 3 (17%) as being not effective. Those reporting higher effectiveness also reported using pre-bating.

Eleven participants (40%) also reported using fumigants. Of these 3 (27%) reported fumigants as being highly effective, 6 (55%) moderately effective, and 2 (18%) not being effective.

Baiting Field Trials

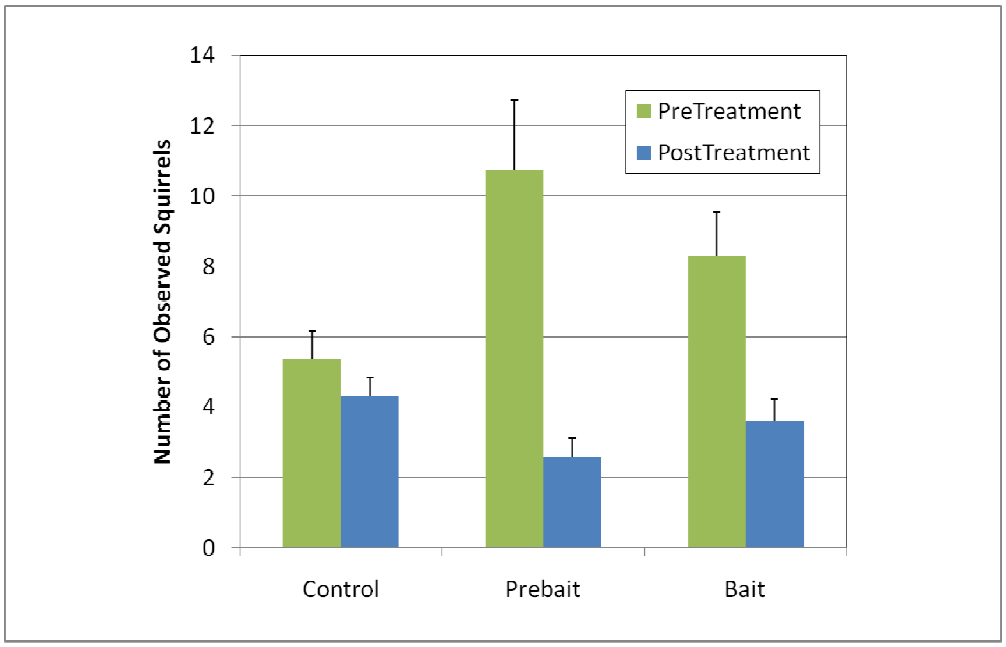
The effect of treatment on the number of ground squirrels was assessed using an analysis of variance of a two-way factorial in a split-plot design. The whole-plot unit was a site, and the whole-plot factor was treatment (control, prebait, and bait). Sites were blocked by plots. The split-plot unit was a repeated measure on each site, and the split-plot factor was period (pre- and post-treatment). Multiple days within each period were incorporated as subsamples. The difference between periods was evaluated for each treatment using pairwise mean comparisons. Period differences were compared among treatments using contrasts. Counts were square-root transformed prior to analysis to better meet the assumptions of normality and homogeneity of variance.

Data for 17 March 2009 were omitted from the analysis; treatments were implemented on this date but would not yet have been expressed. Data for 31 March and 7 April were omitted from the analysis because squirrel detectability was appreciably lower due to alfalfa growth. Data were analyzed using the MIXED procedure in SAS/STAT® for Windows Release 9.1.3. Because this study follows a BACI (Before and After, Control and Intervention) design, evidence of a treatment effect is provided by the interaction of treatment and period: if a treatment is effective, the pre-post difference for that treatment will be different from the pre-post difference for the control.

The differences we observed between period (pre-treatment and post-treatment) counts were not equal for all treatments (Treatment × Period $F_{2, 9.01} = 5.50$; $P = 0.028$, Figure 1). The difference between periods was not shown to be different from zero for the control treatment ($F_{1, 9.01} = 0.41$; $P = 0.538$); while the post-treatment count was smaller than the pre-treatment count for both prebait ($F_{1, 9.01} = 28.25$; $P = 0.001$) and bait ($F_{1, 9.01} = 10.88$; $P = 0.009$) treatments. The decrease in the number of ground squirrels following the prebait treatment was greater than the period difference for the control treatment ($t_{9.01} = -3.31$; $P = 0.009$). Similarly, although with less statistical support, the decrease in the number of ground squirrels following the bait treatment was greater than the period difference for the control treatment ($t_{9.01} = -1.88$; $P = 0.093$). The period differences for the prebait and bait treatments were not shown to be different ($t_{9.01} = -1.43$; $P = 0.188$)

In summary, fewer ground squirrels were observed on the treatment sites than the untreated sites. The treatment sites that were pre-baited exhibited the greatest reduction in ground squirrel numbers after baiting. These observations support the premise that the use of pre-baiting as part of a integrated ground squirrel damage control program using zinc phosphide resulted in a greater reduction of the population than bating alone (Figure 1).

Figure 1. Means and standard errors of the number of observed ground squirrels before and after each treatment.



Educational Outreach:
We are in the process of putting together a factsheet on the best ways to control the ground squirrels. This information will come from the farmers that have been surveyed in the county.

I presented the results of our research at the 2009 Pesticide Recertification Workshop in Delta, UT. I will also present this information at grower meetings in the county in the spring of 2010. I will also present this research at National Ag. Agent Association meetings in Tulsa, Ok in July of 2010.

Educational Products Produced
We are making a power point presentation to use at farmer and association meetings. I will also make a fact sheet and try to get the information published in a professional journal.

Impacts
We had 45 farmers attend our ground squirrel control meeting that we held in January when we started the project. We had 28 farmers participate in the survey that followed up on the control programs of farmers in the county. All of the participants said that they had less squirrel problems this year than they did in 2008 because of our control program.