Utah Extension IPM and Sustainable Agriculture Mini Grant Program

Title: Comparing Different Methods of Controlling Townsend's Ground Squirrels in Irrigated Crop Ground

Project Personnel: Mark Nelson (Project Leader). Nicki Frey (Project Co-leader) Cooperators: Mark Whitney, Beaver County Commissioner; Tammy Pearson, Beaver County Commissioner, Arlan Mayer, SCD Chairman; Keith James, grower.

Justification:

Townsend's ground squirrel's (*Spermophilius townsendi*) populations on agricultural lands in Beaver County, Utah are increasing. Hundreds of acres of alfalfa ground in western Beaver County are currently infested with the ground squirrel. High populations of ground squirrels can compete with livestock for forage; destroy food crops, golf courses, and lawns; and can be reservoirs for diseases such as plague. Their burrowing activities alter irrigation systems. Burrow mounds not only cover and kill vegetation, but can damage haying machinery.

Since 2009, we've implemented a population control program that consisted of prebaiting and then baiting with Zinc Phosphide (Nelsen et al. 2012). For the first several years this baiting program helped reduce the number of squirrels; however, in the past 2 years the squirrel numbers have significantly increased.

Ground squirrels hibernate during the coldest part of the winter. Males usually become active above ground 1 to 2 weeks before the females in the spring, sometimes as early as late February or early March. Breeding occurs immediately after hibernation and the young are born after a 4-to 5-week gestation period. Generally, only one litter of 2 to 10 young is produced each year. Densities of the ground squirrel populations can range from 2 to 20 or more per acre. At this density it is difficult for a farmer to obtain a profit from the harvest, due to the amount of damage incurred to the property and crop.

Our current control programs targets the ground squirrels from when they first come out of hibernation, before they start breeding, usually starting in the middle of February and lasts till the alfalfa greens up around the middle of March. This is only a 30-day - or less - window of control. Sometimes, due to snow or cold temperatures, this window of application might only last 2-3 weeks. Unfortunately, it appears our current method is not flexible in order to coincide with the biological activity of ground squirrels each spring. In an effort to reduce ground squirrel populations, some farmers have suggested baiting ground squirrels at a bait station through May 31. This would work to control males, females, and new offspring each spring. Additionally, some farmers have also tried trapping squirrels in addition to our implemented baiting program.

We would like to compare several different types of traps to baiting and prebaiting programs, to determine the most effective method and the best timing for each strategy. Additionally, we would like to train farmers to effectively use a successful combination

of methods such that the community of farmers collaborates to control ground squirrel populations across the landscape. A collaborative, systematic control strategy would be more effective at decreasing the population of ground squirrels in the landscape and decrease the overall individual effort needed from each farmer from year to year.

Objectives

1. To train Beaver County farmers impacted by ground squirrels about integrated pest management approaches to Townsend Ground Squirrels in irrigated crop ground.
2. To compare the effectiveness of different rodenticides registered in Utah and traps in field trials to control ground squirrels.
3. To determine a best management practice for controlling ground squirrels in Beaver county and train a collaborative community of farmers in Beaver County to implement these practices.

Procedures

At our Beaver County Crop School held the end of January 2015, I will inform the farmers of the research we are planning on conducting on the ground squirrels and find farmers who would like to take part in the study.

These field trials will be conducted in cooperation with local alfalfa producers in Beaver County. Field trials will consist of the following treatment types: control, 2 types of lethal traps, bait station, and current prebait/bait method. Ground squirrels home range is generally < 70 meters in diameter. Thus we will locate our treatments within a field such that an entire colony is encompassed in one treatment. Depending on the size of the field, we will randomly assign a combination of at least 2 treatments to each field, up to a total of 5 treatments. Each treatment will be distributed over 0.5 acres, and at least 400 meters from any other treatment. We will have a minimum of 4 replicates of each treatment, but will increase replicates in accordance to the number of farmers that volunteer for our experiment.

Prior to the beginning of the treatments, we will conduct a visual survey of each plot to determine ground squirrel activity. We will count all ground squirrels on the study plots during a 3-day period prior to treatment and for three days after treatment. Each plot will be scanned 4 times during a 10 minute period. All squirrels observed during each scan will be recorded. The order that each plot is counted will be varied daily.

Effect of Treatments

We will use the maximum number of ground squirrels observed during the four scans as an index of the population density in each plot for the day counted. We will calculate the average maximum number of squirrels recorded for each 3-day count period for each plot. We will use Kolmogorov-Smirnov nonparametric test to compare the number of ground squirrels recorded in pre- and post-treatment periods. We also will use a one-way

ANOVA and Duncan's multiple range test to compare results from pre- and post-treatment counts. The measure of the success will ultimately be a reduction in the numbers squirrels counted.

Educational Products:

The purpose of the study is to provide information of the best practices to reduce ground squirrel numbers to local farmers. Therefore, our study results will be disseminated directly to local farmers and via open-access forums.

- Peer-reviewed paper presented at professional meetings and published in an open-access peer-reviewed journal.
- A PowerPoint presentation will be put together to use at local and state farmer meetings. This presentation will be posted on the extension.usu.edu/wildlifeconflicts website for future public access.
- Extension Bulletins and Fact Sheets will be written describing the research results. The Bulletin will be a Best Management Practices guideline.
- The results will be discussed in the county extension newsletters and presented at local and regional farmer meetings including the Pesticide Recertification Classes held in Delta and Richfield.

Professional Development

- The results of the research will be presented at the National Agricultural Agents Association National meeting.
- The information will also be shared with other USU Extension Agents at the Utah Ag Agent meetings and will be distributed in the proceedings.
- The fact sheet will be peer reviewed and posted to the Extension Website.
- The operation of the most effective methods will be demonstrated during the annual USU Extension conference.

Evaluation

We will conduct a post growing season survey, to assess cooperator application of control measures, success and satisfaction, will also ask them how much it is costing them to control the squirrels and if they feel like our control program is helping them lower their damage costs. We will repeat ground squirrel surveys in the following spring to determine the effectiveness of our methods to reduce ground squirrel numbers on a landscape level.

Project Timeline: All research conducted during the 2015 growing season

January	Beaver County Crop School Discuss the research project with farmers who are having squirrel problems.

February	Buy bait stations, squirrel traps and bait and prebait.
March	Monitor fields for ground squirrel infestation. Identify sites to conduct the trial and contact cooperating farmers.
April 1	Confirm research sites and flag out study areas
April 10-30	Conduct the trial.
May	Monitor fields for ground squirrels.
June	Present the results of the trial at the Utah Extension Agents Summer Meeting
October	Present the results of the trial at the Western Region Ag. Agents Annual Meeting
November	Present the results of the trail at the Regional Pesticide Recertification workshops
June - December	Create the Bulletins and Fact Sheets Create the peer-reviewed publication and submit
March 2016	Demonstrate methods at the USU Extension Conference

Budget

Budget

Wages	Unit price	Units	Total
Technician Salary	$120 day	18 days	$2,160.00
Technician Benefits		@ 8.3%	$17.00
Travel			
Technician to Field Site	$48 trip	18 trips	$864.00
PI To Field Site, Cooperators' Meetings			$500.00
Co-PI to Field Site to Prep Site	$48/trip	5 trips	$240.00
National Professional Meetings			
NACAA			

Registration	$150.00	1	$150.00
Hotel	$120.00	5	$600.00
Airfare	$650.00	1	$650.00
Vertebrate Pest Conference			
Registration	$250.00	1	$250.00
Airfare	$500.00	1	$500.00
Supplies			
Squirrel Traps			
Tube Trap Squirrel Trap	$46.55	20	$931.00
Squirrelinator	$65.40	20	$1,308.00
Bait Stations	$35.34	20	$706.80
Other Direct Costs			
Publication Fees			$250.00
Total			$9,126.80

Wages: We are requesting $2177 in funds to support a technician to collect data. One undergraduate technician will be hired at a rate of $12/hour. This person will work 10-hour days, including travel. During the 1-month trial period, the technician will work 18 days.

Travel: We are requesting $3754 in travel funds. The technician will be hired via Dr. Nicki Frey, through Southern Utah University. Traveling out of Cedar City, an estimated round-trip cost is $48 per trip, for 18 trips. Dr. Frey will also travel to the study sites an estimated 5 times, to set up the study, at a cost of $48/trip. Mr. Nelsen will travel within Beaver County to obtain volunteers for the study, attend collaborator meetings and assess field conditions. Additionally, we are asking for funds to support Mr. Nelsen's travel to the National Association of County Agricultural Agents, to present our study's findings. The estimated costs of travel are listed above, totaling $1400. Finally, we are requesting funds to partially support Dr. Frey's travel to the Vertebrate Pest Conference in March 2016. Because the conference date is beyond the scope of the projected, we are requesting only those funds that can be used prior to January 2016. The requested funds total $750.

Supplies: We are requesting $2945 in funds for supplies to by squirrel traps and materials to create bait stations. Additionally, we are requesting $250 to support publications fees for publishing in an open access professional journal.