PROJECT REPORT

Project Title: Ground squirrel underground baiting

Research Agency: University of California - Cooperative Extension

Principal Investigator: T. Salmon

Budget: $69,963

Background: California ground squirrels cause damage throughout California. In southern California, even though populations seem less dense than in other parts of the state, ground squirrels still cause significant damage in agricultural settings including avocado, citrus, nut orchards, other fruits, vines and nurseries. Ground squirrel populations in parks, school yards and other areas where close contact with people occurs are also common. In many sites, including nurseries, parks and agricultural properties near the suburban/urban interface, ground squirrel control is impacted by proximity to non-agricultural workers and the general public. In many cases, these individuals interfere with control programs.

The most common control method for ground squirrels in San Diego County is the use of anticoagulant baits. These are available commercially and through the Agricultural Commissioned's office. In meetings with pest control operators and county personnel, it appears that in-burrow baiting or use of underground bait stations are common strategies used in this area. According to these individuals, these baiting methods reduce primary bait exposure to non-target species, including children and pets.

Little or no published information is available concerning the efficacy of in-burrow baiting or underground bait stations.

Objectives:

1. Test efficacy and practicality of in-burrow baiting for California ground squirrel control using CDFA 0.005% diphacinone or chlorophacinone bait (whichever is available).

2. If appropriate, develop outreach materials including concept, design and use instructions of in-burrow baiting strategy.

3. Test efficacy and practicality of an underground bait station using a plastic sprinkle box design.

4. Develop outreach materials including concept, design and use instructions for above and below ground bait stations.

Progress to Date:

October - December 2004: Funds for this project have just been received. We are interviewing for the Staff Research Associate that will be partially funded by this project. We anticipate this position will be filled in early January 2005, at which time the project will begin.

January - March 2005: Funds were received during this quarter and the project initiated. A 40-acre farm in Valley Center, California, has been identified as a preliminary test site for the project. The farm has 25+ acres of dry land oat crop being grown for on-site horse feed. This crop has experienced yearly damage due to squirrel activity. The farm and squirrel burrows are being mapped using GPS devices and the map will be incorporated into GIS software. The number and type of burrows and colonies are being characterized to determine appropriate locations of replications for in-burrow, above-ground and underground baiting for the layout of the studies. Literature review regarding bait station designs is being conducted.

April - June 2005: The protocol received approval by UC Davis Animal Care and Use Committee this quarter. Field studies are underway at a 40-acre oat farm in Valley Center, CA. Squirrel feeding behavior is being examined using food consumption measurements, Trailmasters, still cameras, video cameras, as well as newly developed in-burrow squirrel cameras. These observational tools are located at underground sprinkler-box bait stations, above-ground T bait stations, and in-and-around burrows.

July - September 2005: Four studies are in progress where data is being collected and computerized for analysis.

Sprinkler Box Underground Bait Station: The sprinkler-box design as a novel underground bait station is compared with a modified-T bait station in one study. The study employs video surveillance both within the sprinkler box bait stations and above ground, Trailmasters to track entry at all entry points at the bait stations, measurement of clean oat food consumption, and still photography at the modified-T bait stations. The study will allow an understanding of the food consumed per squirrel, the number of trips into the bait station at what time of day, and an estimate on the number of individuals using the underground bait station.

In-Burrow Baiting: A second study uses video surveillance to observe the different feeding behavior of squirrels when baited with 1/8th cup of clean oats placed in the burrow, in the entrance of the burrow and on the apron of the burrow. This study employs a newly constructed in-burrow camera. From this study the average number of feeding visits per oat pile and the time spent feeding at each location will be defined.

Pulse Baiting: The squirrel population observed in the above sprinkler box underground bait station study is used in a pulse baiting trial. This study on efficacy uses a five day pulse of treated 0.005% Chlorophacinone bait alternated with clean oats. Food consumption and bait station visitation is monitored in the underground and modified-T bait stations.

Choice Test: To answer questions about whether certain bait stations are preferred over others,

four of each type of bait station including a sprinkler box bait underground bait station, a straight-T, and a modified-T bait station, were placed in an area of squirrel infestation. The stations were observed for food consumption, followed by observations on bait consumption.

October - December 2005: The field study portion of this project has been completed, including a comparison of underground sprinkler box bait stations with T-bait stations, and observations of in-burrow baiting. Data analyses and final report preparation are underway. A request for a no-cost extension has been submitted to VPCRAC in order to complete the grower survey portion of the grant.

January - March 2006: Activities have been focused on summarizing the project data and writing up results, as well as presenting oral presentations to the 22nd Vertebrate Pest Conference in Berkeley and the Agrochemicals Division of the American Chemical Society in Atlanta. The results of the field tests demonstrate underground bait stations with the irrigation valve box as an effective option for use in California ground squirrel baiting. Information was gained from a choice test between standard T-bait stations, modified-T bait stations and underground bait stations, as well as video surveillance of underground bait stations. Video of squirrel behavior around in-burrow, in entrance, and on apron baiting is also being evaluated. A no-cost grant extension request has been approved by CDFA to complete the grower survey portion of the grant.

April - June 2006: The ground squirrel underground baiting project was granted a no-cost extension in order to complete data collection for a survey of bait station users as well as to gather additional field data on in-burrow baiting methods. Survey respondents are purchasers of bait at the San Diego Office of the Agricultural Commissioner as well as attendees to IPM workshops sponsored by UC Extension San Diego. The field trials of in-burrow baiting at several sites in San Diego County are in progress. The writing of the final report is also underway.

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