COMPLETED PROJECT REPORT

Project Title: Efficacy of Oat and Pellet Anticoagulant Baits Combined with Pretreatment of Oat and Pellet Zinc Phosphide Baits and Implications for Secondary Hazard Management

Research Agency: University of California Cooperative Extension

Principal Investigator: Terrell P. Salmon

Budget: $60,030.01

Background:

VPCRAC research has demonstrated that the anticoagulants diphacinone and chlorophacinone are extremely effective ground squirrel control materials. VPCRAC funded work also established that anticoagulants accumulate in the tissues of squirrels that ingest these baits. Research has shown that most poisoned squirrels contain only small amounts of anticoagulant and that predators and scavengers were not negatively impacted by operations squirrel control on rangeland sites. However, issues persist about the potential for secondary poisoning of these materials.

Secondary poisoning potential is a serious concern for all rodent control programs but especially where pets, predators and scavengers are common to the control site. The potential problems are exacerbated when the population of squirrels is high since the number of carcasses above ground (e.g. exposure) is almost certainly proportional to the number of animals killed in the control operation.

Zinc phosphide is an alternative to anticoagulants for ground squirrel control. VPCRAC funded research has demonstrated that it is an effective but somewhat inconsistent control material. Often, it is not the bait material of choice because of this unreliability. For operational control with zinc phosphide, 50-60% efficacy is a likely outcome. However, a major advantage to zinc phosphide is the fact that little secondary poisoning occurs with this material because the toxic chemical does not accumulate in the carcass of the target species. A disadvantage of zinc phosphide is its propensity to produce bait shyness if a lethal dose is not consumed.

To reduce secondary hazards from anticoagulant ground squirrel control program, we propose back to back treatments of various formulations of zinc phosphide and anticoagulant baits. The first treatment, with both oat grout and pellet formulations of zinc phosphide baits, will likely produce a population reduction of 50-60%. Any resulting above ground carcasses would not present a secondary hazard to predators or scavengers. If squirrels survive the zinc phosphide

treatment, we would follow with a second treatment, with both oat grout and pellet formulations of anticoagulant baits. We anticipate that this treatment combination would produce fewer anticoagulant contaminated carcasses above ground, thus reducing the secondary hazard risk. However, this is a theoretical calculation. Significant questions remain about the efficacy of this approach. The primary question regards the potential for bait shyness by squirrels that survive the zinc phosphide treatment. While they will likely be shy to the taste of zinc phosphide, they may also be shy to the carriers (oats or pellet formulations) which is the same for zinc phosphide and anticoagulants. Or they may be shy of eating anything unusual in their environment. In either case, they might not eat the anticoagulant bait formulations.
The concept of this proposal is to test the combined treatments for zinc phosphide followed by anticoagulant for ground squirrel control. If successful, this could be an important approach to improve overall ground squirrel control and, at the same time, reduce the potential secondary hazards associated with anticoagulants.
The initial zinc phosphide portion of the project will be conducted as part of a trial funded by my various donors program for wildlife pest management. The follow-up anticoagulant treatments and any follow-up zinc phosphide work will be funded by this project.

Objectives:
1. Determine the efficacy of oat grout and pellet formulations of 0.01% anticoagulant baits broadcast for control of *Spermophilus beecheyi* previously (within 2 weeks) treated with oat grout and pellet formulations of zinc phosphide bait.

2. Assess the potential secondary hazards of this treatment regime.
3. Develop outreach materials about this treatment regime including modifying the Ground Squirrel Best Management Practices website.

Summary

This study was undertaken to demonstrate the efficacy of oat and pellet type anticoagulant baits (0.01% diphacinone) when used following an initial treatment of 2% zinc phosphide oat and pellet type baits for controlling California ground squirrels. Broadcast baiting by means of mechanical broadcast was the application technique for all bait treatments. While pre-baiting for zinc phosphide baits is recommended on the labels of both materials we used, we chose not to pre-bait since our intent was to target squirrels that survived the zinc phosphide baiting. In theory at least, pre-baiting would have led to fewer squirrels surviving our initial zinc phosphide treatment. Both broadcast oat and pellet anticoagulant treatments following zinc phosphide treatments resulted in apparently good control although the power our pellet tests was not strong because of failure in the control plots. The application rate for the broadcast method apparently supplied adequate bait to achieve efficacy and, our observations on the plots lead us to conclude that minimal excess bait was left in the environment. Anticoagulant bait use, on a per acre basis was well below the allowed application rate (10 pounds/acre) because it was applied only where active ground squirrel burrows were present after controlling the entire population with zinc phosphide. This led to relatively large areas of the treatment sites being “untreated” with anticoagulants because no squirrels were present. Few dead ground squirrels were found after the zinc phosphide treatment and none after the anticoagulant treatments. No non-target species were found effected by the zinc phosphide or anticoagulant treatments.

As a baiting strategy the combination of zinc phosphide combined with the subsequent selective application of anticoagulant baits was successful. This approach will lead to significantly fewer squirrel carcasses with anticoagulant residues since most are killed with zinc phosphide and subsequently do not pose a significant secondary risk to predators, scavengers or pets. This baiting strategy has the potential to significantly reduce secondary hazards from ground squirrel baiting.

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