

COMPLETED PROJECT REPORT

Project Title: Zinc phosphide: a field efficacy study with California ground squirrels

Research Agency: National Wildlife Research Center

Principal Investigator: G. Matschke

Budget: \$101,599

Background:

The U.S. Environmental Protection Agency (EPA) requested that the California Department of Food and Agriculture (CDFA) provide data on the efficacy of their 1.0% and 2.0% zinc phosphide baits on California ground squirrels. EPA determined that previous field study data were insufficient to maintain the current registrations for zinc phosphide. CDFA, in cooperation with the National Wildlife Research Center, conducted this research.

Objectives:

To determine the efficacy of both 1.0% and 2.0% zinc phosphide grain baits applied by either hand or broadcast baiting for reducing populations of California ground squirrels in rangeland.

Summary:

Two zinc phosphide grain bait concentrations (1.0% and 2.0%) were applied by hand and ground-based broadcast baiting for controlling California ground squirrels (*Spermophilus beecheyi*). Twelve treatment units (8 zinc phosphide treated [two 2.0% broadcast, two 1.0% broadcast, two 2.0% hand baiting, and two 1.0% hand baiting] and 4 control [two 0.0% broadcast and two 0.0% hand baiting]) were established on annual rangeland near Fountain Springs, California. Ground squirrel mortality was measured by determining the fate of 300 squirrels using post treatment radio-tracking and pre- and post treatment visual counts. The squirrels were offered placebo bait three days before applying the control and zinc phosphide treated baits. For the hand baiting trials, 11 grams of 1 % or 2% zinc phosphide treated bait or 11 grams of 0 % control bait were hand baited on 6 pre-selected, randomized treatment units on bare ground adjacent to each active burrow entrance. For the broadcast baiting trials, 6.7 kg/ha (6 lbs/acre) of 1 % or 2 % zinc phosphide baits and 6.7 kg/ha of 0 % control bait were mechanically broadcasted to 6 pre-selected, randomized treatment units on sites of active ground squirrel colonies. Of 114 radio-equipped animals on the 8 zinc phosphide treatment units, 104 died (91.2 %), 5 survived (4.4 %), 2 (1.8 %) were consumed by predators, and 3 (2.6 %) discarded their transmitters. No significant differences in mortality occurred between the 1 % and 2 % concentrations ($P = 0.60$) or hand baiting and broadcast baiting ($P = 0.69$). None of 57 radio-equipped control animals died during the test. Pretreatment visual counts on the 12 treatment units totaled 293 animals; 232 on the 8 treatment units, and 61 on the 4 control

treatment units. Post treatment, 51 animals were counted; 10 on the 8 treatment units and 41 on the 4 control treatment units. Visual count reductions on the 1 % and 2 % hand baited treatment units averaged 98.2 % and 93.8 %, respectively; whereas the 1 % and 2 % broadcast baited treatment units averaged 93.8 % and 90.2 %, respectively. Reduction on the hand baited and broadcasted control treatment units averaged 30.8 % and 41.6 %, respectively. A difference was detected between pre- and post treatment counts ($P = 0.0157$) which was related to the effects of the treatments and the estivation of some animals before treatment.

Zinc phosphide residues were present in the stomachs and small intestines of all ground squirrels collected dead after baiting on the surface. Mean zinc phosphide residues recorded in stomachs for the 1% hand baited and 1% broadcast baited gophers were 27.5 and 12.9 mg, respectively; whereas for the 2% hand baited and 2% broadcast baited pocket gophers means were 62.1 and 11.5 mg, respectively. Zinc phosphide present in small intestines averaged 13.3 and 6.5 mg for the 1% hand baited and 1% broadcast baited pocket gophers, respectively; whereas the means were 18.8 and 8.7 mg for the 2% hand baited and 2% broadcast baited pocket gophers, respectively. Animals collected from the hand baited treatment units had significantly more residue in the stomachs ($P = 0.0222$) and intestines ($P = 0.0017$) than animals from the broadcast treatment units.

Post treatment, the non-target mortality observed was on 6 of the 8 zinc phosphide treatment units, where 79 Heermann's kangaroo rats (*Dipodomys heermanni*) died although desert wood rats (*Neotoma lepida*) were also present on these treatment units. On 3 treatment units (1, 4, and 9) 3 desert cottontails (*Sylvilagus audubonii*) were found dead; 1 on the day of treatment and 2 the following day. Twenty-four bird species were recorded on or near the 12 treatment units. Two species were seed eaters, the mourning dove (*Zenaida macroura*) and California Quail (*Callipepla californica*). No bird mortality was observed on any of the 12 treatment units. Known mortality of the radio-equipped ground squirrels for all treatments exceeded the minimum standard of 70% mortality established by the Environmental Protection Agency for rodenticides (EPA 1982). Visual counts resulted in more than a 70% decrease in activity among zinc phosphide treated units. However, the activity of control animals was reduced by 11.8 - 71.4%.

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