

COMPLETED PROJECT REPORT

Project Title: Broadcast application of 2% zinc phosphide steam-rolled-oat groats to control gray-tailed voles in alfalfa: an enclosure-type efficacy study

Research Agency: National Wildlife Research Center

Principal Investigator: R. Sterner

Budget: \$160,500

Background:

Zinc phosphide is an acute rodenticide having diverse agricultural applications. The California Department of Food & Agriculture sought to extend the existing special local need registration titled "Rodent Bait Zinc Phosphide Treated Grain (2.0%)" for control of California (*Microtus californicus*) and montane voles (*M. montanus*) in alfalfa crops.

Objectives:

1. Determine the efficacy of mechanical broadcast pre-bait and bait applications of 0.0% (control) and 2.0% zinc phosphide on oat groats (10 lb/ac) to reduce known populations of gray-tailed voles (*M. canicaudus*) in alfalfa.
2. Determine changes in the concentration of 2.0% zinc phosphide applied in alfalfa under agronomic and climatological conditions present during the 14-day bait exposure period.
3. Evaluate the use of 1-ft² "rodent/avian-sign plots" as a technique for monitoring vole/avian activity and bait pickup during the efficacy study.
4. Determine residue levels of zinc phosphide in the carcasses of gray-tailed vole.

Summary:

This report describes an enclosure-type efficacy study of a single broadcast application of 2% zinc phosphide oat groats (test) bait (11.2 kg/ha or 10 lb/ac) to control gray-tailed voles (*M. canicaudus*) in standing alfalfa. The research was conducted during Sept.-Nov. 1993 in 18 0.2 ha (0.5 ac) rodent enclosures at the Hyslop Crop Science Field Lab., Oregon State University. All enclosures had a 2.5 year growth of alfalfa.

A total of 428 gray-tailed voles was distributed within the enclosures (23 or 24 voles each). Voles were allowed 6-18 days acclimation. Initial height/density measurements of alfalfa were collected, with 8 30.5cm² (1 sq ft) "rodent/avian-sign plots" inserted at random locations within

each enclosure and monitored for activity (presence/absence) and bait removal. Daily carcass searches for target and nontarget animals were conducted, with necropsies performed on most recovered carcasses.

Following acclimation of the voles, all enclosures were broadcast with control steam-rolled oat groats; and 2 days later half of the enclosures were selected randomly and broadcast with 2% zinc phosphide groats and half were broadcast a second time with control bait. Chemical analyses revealed that the zinc phosphide baits were formulated at exactly 2.0% (+/- 0.12); samples of this dry-stored bait collected at broadcast and at study termination also yielded a 2.0% (+/- 0.32) zinc phosphide. Analyses of control bait samples were always below the Method Limit of Detection (MLOD <0.001%). A 14-day test-/control-bait exposure period followed; and an 18 day vole trapout period concluded the study.

Three categories of voles were identified for statistical analyses: residents (enclosure-released, ear tagged voles), immigrants (non-enclosure-released, ear tagged voles trapped within enclosures), and untagged voles (recruited/lost-eartag/non-eartagged voles trapped within enclosures). Recaptures of resident voles, as well as captures of immigrant and untagged voles (recruitment), decreased significantly subsequent to the baiting with zinc phosphide. These data are equivalent to 94.4 and 95.7% efficacy on zinc phosphide trap grids based upon residents recaptured (i.e. 12 resident voles divided by 214 distributed residents) and total vole numbers captured on all grids (i.e., 28 resident/immigrant/untagged voles divided by 652 total recaptures/captures post study). ANOVA for proportions of resident voles recaptured yielded a significant main effect for rodenticide vs. control bait ($P=0.0001$). Results of a similar analysis using total numbers of voles captured /grid during trapout indicated the main effect for zinc phosphide vs. control-bait broadcast was significant ($P=0.0001$).

Daily carcass searches yielded 30 vole carcasses during the 14 day bait exposure period, 25 and 5 carcasses in the zinc phosphide- and control-bait enclosures, respectively. Thirteen (52%) of the 25 voles recovered from zinc phosphide-baited enclosures were found within 2 days after broadcast. Fifteen vole carcasses were necropsied during the first 9 days of the bait exposure period. The stomach contents from all carcasses contained a mass of green-pulpy material (probably partially digested alfalfa). Stomach contents of 3 carcasses found in zinc phosphide-baited enclosures contained several 1 sq cm portions of grayish material believed to be zinc phosphide.

Three nontarget carcasses were found within enclosures: a Savannah sparrow (*Passerculus sandwichensis*) and 2 vagrant shrews (*Sorex vagrans*). A Brewer's blackbird (*Euphagus cyanocephalus*) and a Pacific tree frog (*Hyla rigilla*) were found outside the enclosures. Only the sparrow death was considered to be zinc phosphide induced.

Results confirm low hazards to passerines of a single 11.2kg/ha, 2% zinc phosphide oat groat broadcast application in alfalfa. Reduced percentages of voles (94-96%) on treated grids exceeded the 70% EPA guideline for efficacy studies.

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