

PROJECT REPORT

Project Title: An efficacy test of a cholecalciferol plus diphacinone rodenticide bait for California voles resistant to chlorophacinone baits

Research Agency: National Wildlife Research Center

Principal Investigator: Gary Witmer

Background:

Anticoagulant (chlorophacinone and diphacinone) and acute rodenticides (zinc phosphide) are used to control vole populations, primarily by placing bait in runways near burrow openings, or by spot-baiting or broadcasting over the infested area. In California artichoke fields, the rodenticides are often applied through an oil-based coating on artichoke bracts. It appears, however, that the efficacy of anticoagulants for vole control has dropped off in recent years (Salmon and Lawrence 2006). It is possible that voles in California's intensive vegetable production areas have developed a genetic or physiological resistance to some anticoagulants (Katherine Horak, NWRC, personnel communication). It is also possible that the high vitamin K content of green vegetables may reduce the effectiveness of anticoagulant rodenticides because vitamin K is the antidote to anticoagulant poisoning. Witmer (2010), however, found that voles from the Fort Collins area fed a diet high in vitamin K-rich plants along with the anticoagulant rodenticides did not reduce the efficacy of chlorophacinone baits, but may have reduced the efficacy of diphacinone baits. Consequently, there is a need to identify new rodenticides that will have a high efficacy on California voles so that agricultural production losses to rodents can be substantially reduced.

Researchers in New Zealand are investigating a new "combination" rodenticide, one having 2 active ingredients (cholecalciferol and coumatetralyl) and have found promising results with rats and mice (Eason et al. 2010). Interestingly, they are able to obtain high efficacy with lower concentrations of the active ingredients than the concentrations used when either active ingredient are used as the only rodenticide in a commercial bait. Hence, there may be some synergistic effect. This is noteworthy because if lower concentrations can be used to effectively control rodent populations, there could be a lower risk of harm to non-target animals.

The objective of this study was to determine the efficacy of a cholecalciferol plus diphacinone rodenticide baits on California voles in both no-choice and 2-choice trials, using wild-caught voles in a controlled setting.

Results:

All trials of the C+D pellets and C+D oil dipped artichoke bracts resulted in significantly higher (all values of $P < 0.024$) mortality than in the control group.

(Note: no control animals died during the course of the study so the mortality for that group was 0%). The average days- to-death of the C+D pelleted bait (6.3 days) versus the C+D oil dipped bracts (5.5 days) was not significantly different ($P = 0.215$; Table 1). Hence, both rodenticide formulations seem to have potential for control of anticoagulant resistant voles in artichoke fields in California. We recommend that a field efficacy be conducted with these rodenticide baits to confirm their value to the reduction of agricultural damage by California voles.