

# PINE AND MEADOW VOLE CONTROL IN ORCHARDS

R. E. BYERS<sup>1</sup>

Virginia Agricultural Experiment Station  
Virginia Polytechnic Institute and State University  
Winchester, Virginia 22601

Pine and meadow voles (small rodents) cause serious economic losses in orchards each year. Large productive orchards that have taken many years and a sizeable investment to establish can be destroyed in a single season if effective control measures are not taken. Population carry-over from the previous year is probably the most important factor influencing the current season's vole population. Populations may be very high or very low among individual trees or sections of an orchard. Proper vole management requires close observation and monitoring of the populations regardless of control methods.

The optimum time for rodenticide treatment to reduce vole damage to trees is in late fall (October, November, December). Snow gives the animals a great deal of cover and may prevent the grower from treating during this period. Since reproduction rates are high in the late summer and early fall, the optimal time for vole control is after harvest and just prior to the damaging period. In addition, early spring applications (February) of rodenticides can greatly reduce vole populations for the following season. February is also a time when pine vole runways can be easily seen and treated.

## POPULATION MONITORING

The potential for damage should be determined prior to and after treatment. To evaluate an orchard treatment, growers may place a whole apple (with a one-inch slice off the side) in an active vole run or tunnel at 20 to 40 tree intervals in each block prior to treatment. Twenty-four hours after placement, the apple can be checked for vole teeth marks. The percent of apples with gnawing provides an estimate of the percentage of trees that could be damaged. After the orchard is treated, a second 24-hour check for activity (after a 20-day interval and using new apples) can reflect the degree of control achieved. The maximum effect from baiting will be about 20 days after treatment. To mark the original location of the apple placement site, sites may be covered with split rubber tires, sections of straw, wood slabs, shingles, tar paper, etc. If a herbicide strip exists, vole monitoring must be done in adjacent cover because voles will seldom range on bare ground.

---

<sup>1</sup> Professor of Horticulture

## CONTROL MEASURES

**Anticoagulant vs Acute Baits.** Recent studies have shown that rodent baits usually kill more meadow voles than pine voles, and anticoagulants (chlorophacinone) kill more pine than meadow voles. For this reason, if only one application is to be made, the toxic choice should be made so that chlorophacinone is used against pine voles and ZP rodent bait is used against meadow voles. If two applications are made against heavy populations of meadow voles, the zinc phosphide should be used first and followed 2 to 6 weeks later with chlorophacinone. For pine voles, two chlorophacinone applications may be used. Multiple applications of zinc phosphides (even different formulations) is not recommended because voles will become bait shy after the first application and survivors will remain bait shy for 2 to 4 months.

**Hand Baiting.** Hand placement of bait will only be effective if placed directly in active vole runway systems. No site cover is necessary, but they have many obvious advantages. Site covers (made of split tires, rubber mats, wood slabs, tar paper, odd lots of shingles, or large metal shipping container lids) can greatly increase contact with the vole population, decrease baiting time, and increase or prolong effectiveness of the rodenticide. Split tires are convex and work very well in keeping bait in good condition. To further prevent absorption of soil moisture by bait, proper quantities of the rodenticide may be placed in open plastic cups or containers under split tires. Site covers should be placed under the trees (at least one per tree) 2 to 3 months ahead of baiting. Random placement of covers prior to baiting may result in 50 to 80% of the covers with good activity. If no runway exists under the cover at the time of baiting, it should be moved to an active run or hole since voles will not be attracted under covers before the bait spoils. Place site covers in under tree grassy areas, not in the herbicide strip.

A) Chlorophacinone (Rozol or Parapel) bait has achieved excellent control of pine voles if applied in two applications at 10 lb/A ( $\frac{1}{4}$  lb/tree on a 40 tree per acre base) each spaced about 20 to 40 days apart. This program has given the most reliable control of the animal if done properly. Do not cut the rate per acre. If populations are not high, one application should be sufficient.

B) New pelleted zinc phosphide formulations are now available to the apple industry. One of these formulations made by Bell Laboratories is much superior to grain baits for control of pine and meadow voles. Label rates for hand placement of 1 to 3 lb/A are adequate for control. Do not follow with a second application for at least 3 months since voles will likely be "bait shy".

C) Diphacinone (Ramik-Brown) bait has achieved good control if applied in two applications at 10 lb/A each, but additional toxi-

cant in the bait would provide better control since this rodenticide is not as toxic as chlorophacinone.

D) Zinc phosphide grain baits applied by hand have not given adequate control of pine voles, and for meadow voles is not as good as ZP Rodent Bait AG from Bell Labs. Zinc phosphide coated apple slices are more effective than grain baits but neither are adequate in a single baiting per year. Since zinc phosphide is not a good repeat bait, another toxicant must be chosen for a second application.

**Broadcast Baiting.** Broadcast baiting may not work if heavy thatch or bluegrass cover prevents bait from reaching pine and meadow vole runways and surface feeding areas. Under these conditions, hand baiting is recommended. However, in clump grass cover, good control has been achieved for both pine and meadow voles with broadcast baiting. At least 3 days of good weather should follow the treatment, but good kills have been achieved when only 24 hours has lapsed before a rain. Broadcasting bait requires distribution over the area where trails and runways are found, thus close examination of the orchard floor for runs is necessary. Commercially-made feed, seed, or fertilizer spreaders may be used for broadcasting bait uniformly. In case of spilled pellets while loading equipment, pick up and reload pellets or dispose of properly. Caution should be taken to use spreaders which dispense bait at a uniform spreading rate. Many spreader hoppers should contain at least 75 lb or more to obtain a uniform rate per acre. Voles will not pick up bait in herbicide strips. Apply to ground cover adjacent to the herbicide strip. Rates per acre are based on orchard acres and not just on acreage spread.

A) Chlorophacinone (Rozol or Parapel) baits broadcast evenly by ground equipment at the rate of at least 15 lb/A will generally control pine voles. When populations are extremely high, a second application should be made one month after the first treatment.

B) New zinc phosphide pellets ( $\frac{1}{8}$  in. diameter) will give adequate control at labelled rates of 6–10 lb/A. The Bell Laboratory formulation is much superior to grain baits and most other pelleted baits. Do not apply within 3 months of a previous application. If a second treatment is required, select one of the anticoagulants (chlorophacinone or diphacinone).

C) Diphacinone (Ramik-Brown) has also achieved good control if applied in two applications 20 to 40 days apart at 20 lb/A, but this bait would perform better if additional toxicant were added to the formulation.

D) Zinc phosphide grain baits have not given good control of pine or meadow voles, particularly where populations are high. Taste aversion caused by this treatment will reduce the effectiveness of ZP rodent bait.

**Cultural Control.** The use of cultivation equipment such as the Smitty Tree Hoe three times a year has reduced pine vole popula-

tions to control levels in some orchards but has not in others. These differences are probably due to soil factors, invasion potential, frequency of cultivation, middle row mowing, and other activities. The use of residual herbicides in combination with the Tree Hoe will further reduce populations; however, residual herbicides alone have had almost no effect on reducing existing populations. The use of cultural control has been most successful where it has been started prior to the establishment of a pine vole population. In addition, bare ground herbicide strips have been effective in preventing initial infestations as long as the strip is wide, kept bare, and frequent middle row mowing is practiced. Wide band cultivation and herbicide strips may interfere with the application of broadcast baits or with stations used for hand placement of bait, and will cause more soil erosion.

Meadow vole populations are more easily affected by changes in cultural practices and thus are more economical. But, chemical methods have been found to be less expensive for control of pine voles in orchards than the practice of clean culture (combinations of herbicides, mowing and cultivation). Broadcast baiting, while less labor intensive than hand baiting, was found to be just as expensive since larger quantities of bait are needed for treatment. The costs of broadcast or hand placed baiting were found to be less for acute toxicants, since the quantity of bait required for a lethal dose is less.

The use of tree planters has aggravated vole control since the slit in the soil allows voles an underground trail of loosened soil from tree to tree down the row. This slit may be in the soil for years and voles may tunnel deeper making control more difficult.

FRED HESER: How long can the baits stand water?

ROSS BYERS: Not long. Each one is quite different but none stand more than one week. They must be protected from direct contact with water or snow.

JIM CROSS: Do you see cycles in population?

ROSS BYERS: Yes, but most cycles in commercial orchards are not related to natural cycling but related to whether the owner got good control or not.

PETER VERMEULEN: Given the high value of ornamental crops would it be better to go with both types at the same time?

ROSS BYERS: No, it would be better to kill off the major part of the population with an effective zinc phosphide first, then follow up with an anticoagulant. If you are going to cover the plants it is possible to use both types at the same time. However, separate the two rodenticides into different places.