VOLE (MICE) CONTROL IN COMMERCIAL APPLE ORCHARDS

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Vole damage to apple trees in Illinois and many mid-western states can be devastating unless preventative measures are taken to reduce their population. In Illinois, vole population is very high, especially from Spring to early Fall when there is plenty of grain and vegetation for these animals to feed on. Tree damage from vole occurs during late Fall to early Spring, particularly if the ground is covered with snow. During this period, there is very little vegetation for these animals to feed on, because corn and beans have been harvested and the ground cover is frozen or dormant. As a result, the animals will likely feed on less desirable woody plants such as apple and occasionally peach trees.

Vole Species

There are three species of vole in Illinois and most of the mid western states. These species are:

a. Pine vole (*Pitymys pinetorum*). This species has a relatively small body, short tail (about the length of the hind-leg), a pointy nose, sunken eyes, and a brownish fur. Pine voles are usually very shy of venturing into the open, so they tend to feed mostly underground on young root and root bark. Pine voles are very damaging to apple trees, because it is very hard to detect injury to the root system until it is too late to save the tree. It is also difficult to correct the problem by bride grafting.

b. Meadow vole (*Microtus pennsylvanicus*). This species has a larger body than pine vole, it had a longer tail (about two times the length of the hind-leg), prominent eyes, and dark grayish fur. Meadow voles are less shy than pine voles and so they tend to feed in the open, especially if there is enough groundcover to hide under. They will also feed immediately under the soil surface. Most of the injury to apple trees from this species occurs at the soil surface. They use their sharp teeth to peel off the bark, especially of young trees. However, the damage is not restricted to young trees, I have seen twenty year old trees girdled by meadow voles.

c. Prairie vole (*Microtus ochrogaster*). This species is very similar to meadow vole in appearance and eating habits.

Identification of Vole Species and Population Monitoring
Growers need to determine the potential for tree damage before they apply any treatment. Vole species and population size are two very important factors for predicting the extent of the damage and for deciding on what control measure are needed to reduce the population.

To identify vole species in an orchard, place approximately 20 traps per orchard close to active runs and in heavy cover areas. Measure the length of the tail relative to the hind leg. If the tail is very short relative to the hind leg and the fur is brownish, then it is likely that it is a pine vole. However, if the tail is about the length of the hind leg and the fur is grayish, then chances are it is a meadow vole. Estimate percentage of the population is pine versus meadow vole. As I will discuss in the chemical control section, it is important to know what percent of the population is pine versus meadow vole.

The most effective way of determining vole population is to place a half apple close to tree trunk or at the site of an active run. Depending on the size of the orchard, place an apple slice every 4 to 5 trees in an orchard of 2 to 3 acres. In larger orchards, place an apple slice every 20 to 30 trees in each block. Distribute the apple so they are not close to one another. If there are shrubs adjacent to the orchard, place an apple slice every 10 to 20 feet in that area as well. Approximately, twenty-four hours after placing the apple slices in the orchard, check them for gnaws (teeth marks). Percent of apples with teeth marks will give an approximate percent of trees that will be damaged if the vole population is not controlled.

**Orchard Vole Control Program**

a. Non-chemical. Mowing on a regular basis, especially during early fall, is the most effective treatment for vole control. When mowing an orchard, it is as important to mow between the trees as it is to mow within the row. Any tall grass between the trees will likely be a haven for pine and meadow vole. I have seen an apple orchard in Illinois in 1994 where every tree within a row was damaged by voles because the grower failed to mow between the trees. It is also important to keep a clean area of about 150-200 feet around the orchard to prevent any meadow voles from moving into the orchard. Such practices can cut vole population by more than 50% in any given year. A herbicide strip or a circle around the tree can also be effective in reducing pine and meadow vole populations. Herbicide strip alone, however, will not eliminate the problem of vole damage, especially of meadow voles. When combined with chemical treatment, herbicide strips will reduce vole populations. Another important non chemical practice is to encourage vole predators to move into your orchard. A good example is to encourage cats to live in and around the orchard. Also build an observation tower for owls, hawks, and other predatory birds. This observation tower can be as simple as a 10 to 15 foot pole with a “T” top.

b. Chemical baits. At the present, there are two types of chemical baits available for vole control in apple and peach orchards. These baits are: Acute baits (Zinc phosphide) and anticoagulants (Chlorophacinone and Diphacinone). Deciding which of these chemical baits to use depends entirely on the vole species. Although these chemicals will provide some control of both vole species, zinc phosphide has been shown to be more effective against meadow vole, while Chlorophacinone and Diphacinone have been shown to be more effective against pine vole. Zinc phosphide baits are marketed either
as weather resistant pellets or combined with several types of grains, such as cracked corn and oats. When vole population is very high an additional application of zinc phosphide may be made within 1 to 2 months. Zinc phosphide grain baits applied by hand were found not to be very effective against pine vole, however, better control was achieved when apple slices were coated with zinc phosphide liquid at the rate of one teaspoon per quart of water. Phacinone baits are marketed in a weather resistant pellet form. Several days of continuous feeding on these formulations are needed for an effective control. A second application may be added within 3 to 4 weeks after the first one, but not within 2 weeks, because the first application will not take its effect until about 18 to 20 days.

**Methods and Timing of Bait Application**

Baits can be applied in several different ways, however, not all of these methods are effective.

a. **Hand baiting in the active run.** This method involves placing baits in the active runs at each hole. This method is very effective, however it is not practical in large planting with sever vole population. An alternative method is to place the bait under a bait station, as will be described in the next section. This method is more practical and effective for vole control. It is also less hazardous to other animals and birds in the orchard.

b. **Broadcast baiting.** This method is effective for control of meadow vole, but not for pine vole. Other animals and birds may be harmed by broadcast bait and, therefore, it is not recommended.

c. **Trail baiting.** A trail building machine may be used to apply the bait in furrows. This method is not very effective for control of meadow vole and only slightly effective for pine vole.

d. **Spray.** Zinc phosphide spray in late fall was found to be somewhat effective against meadow vole population. However, this practice is harmful to the environment and to other animals and, therefore, we do not recommend it.

Placing bait by hand under bait stations is a better way of controlling voles in apple orchards. The best time to apply these chemicals is late summer through early spring when there is little vegetation for these animals to feed on.

**Bait Stations.** The most effective bait station is the one that will provide dark shelter with some ventilation to prevent the bait from molding. Shingles, PVC pipes, metal sheets, split tires, and many other types of stations have been used to cover chemical baits. Metal stations may damage the blades of mowers. If you do use metal stations make sure to remove them in early spring. Ross Beyers from Virginia found that split tires were more effective than other stations that he tested. The tires are split in half along the thread.

It is very important to place bait stations in the field by mid summer so the animals will get accustomed to their presence. However, there is still time to place the stations before any snow buildup.
**General Recommendations.**

1. Mowing is critical especially during late summer and early fall to prevent any over growth. Mow between rows and between trees in each row.
2. Remove any shrubs and tall grass at least 200 feet around the orchard.
3. Never place straw or any type of mulch around the tree that will attract vole.
4. Place bait stations 2 to 3 months before baiting.
5. Check bait periodically for mold.
6. Move stations to active runs.
7. Avoid placing bait immediately before or immediately after a rain storm.
8. Zinc phosphide is not a good repeat bait.
9. Read the label and follow it carefully.
10. Acquire any necessary permits before you apply any type of bait.

An eight year old apple tree girdled by Prairie/meadow Vole

Tracks of prairie/meadow vole in the snow