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## VOLE CONTROL IN FIELD CROPS

Jerry P. Clark

California Department of Food and Agriculture, Ceres, California

# VOLE CONTROL IN FIELD CROPS

JERRY P. CLARK, Senior Biologist, California Department of Food and Agriculture, Ceres, California 95307

ABSTRACT: There are five species of meadow voles found in California. The two that are most economically important are Microtus californicus and Microtus montanus. Meadow vole populations are extremely cyclic, reaching a peak every four to six years. During these periods when the vole population is increasing in numbers, damage to crops like alfalfa, artichokes, potatoes, and sugar beets can occur. The best time to survey for vole activity is before the crop is planted. The grower or farm operator should look for vole activity in grassy borders around the crop or along roadsides and ditch bank areas. Snap-trapping may also be used to confirm the presence of voles.

Clean cultivation and weed control on grassy borders adjacent to crops will help reduce potential harborage for voles. A small or localized vole population on a crop border is much easier to control than if the voles become established in the crop. Rodenticide-treated baits are very effective in reducing vole populations. Bait distribution may be done by spot-baiting, placing bait by hand, or by broadcasting, scattering bait over the entire infested area.

## RANGE

Of the five species of Microtus found in California, only M. californicus and M. montanus are economically important. Microtus californicus is found in the Owens and lowland valleys and along the Coast Range into southwestern Oregon. Microtus montanus occurs in the higher elevations in the Sierra and in the northeastern plateau region of Lassen, Modoc and Siskiyou Counties.

## DESCRIPTION

Meadow mice, or voles, are easily distinguished from other small field rodents by their short tails, which are less than one-third of their total length, and by their short hairy ears which hardly project above the fur. Adult voles average about six inches in length and are robust-bodied with long, soft, rough-appearing pelage. Color may vary seasonally, but normally the upper parts are black with darkish grey underparts.

## BIOLOGY

Meadow mouse populations are extremely cyclic, reaching a peak about every four to six years, then falling to a period of relative scarcity, which is then followed by another breeding surge. The gestation period is approximately 21 days, with an average litter size of eight. Breeding can occur throughout the year. Meadow mice are very short-lived animals. Their maximum life span has been estimated as being from 10 to 16 months, but in all probability, few individuals ever attain such age. Meadow mice do not hibernate. They forage at any time during the day or night. Meadow mice are primarily territorial, occupying a home range of a few square yards. The young adults of each litter, after being weaned at the age of two or three weeks, will normally seek new territorial domains, providing there is suitable food and cover.

Vole infestations in good habitat like alfalfa, sugar beets and grain, will normally begin as small isolated colonies on grassy borders adjacent to the crop. As the vole population increases in number, the young adults will move into the crop.

The runways of meadow mice are mainly on the surface of the ground under grass or other sheltering litter. The runs are about 1-1/2" wide and are worn hard and smooth by the frequent travel of the mice. The runs are often quite extensive with many branches. They may lead to shallow burrows with nests of dead grass. The burrows are approximately 2" in diameter with entrances open.

## DAMAGE

Meadow mice damage a wide variety of crops in California including permanent pasture, hay, alfalfa, artichokes, brussel sprouts, carrots, cauliflower, potatoes, sugar beets, tomatoes, grains, nursery stock and the bark of citrus, cherry and olive trees. Serious meadow mouse damage occurs to crops when these population cycles surge upward. Mouse populations will build up over a period of time on ditch banks or noncultivated land around the crops. Mice then move into these crops where a continued source of cover and food are abundant.

In alfalfa fields the mouse infestation will usually appear on the high centers of the field and then spread into the checks as the population expands. Extensive runways that lead to numerous burrows are readily observed when walking through the alfalfa. Active burrows are easily recognized by numerous droppings at the entrance and often alfalfa stems will protrude from these openings. Mice feed on the alfalfa stems, leaves and underground roots. This extensive feeding will often kill the alfalfa plants leaving large brown patches of dead vegetation. In sugar beets and potatoes the extensive mouse runways are difficult to observe because they are covered by a dense canopy of leaves. When walking through these crops you may spot plants that are wilted or collapsed from mice feeding on these roots

and tubers. Extensive feeding will hollow out these roots and tubers which are often used as nesting sites. In artichokes, mice will burrow beneath the plants. They will feed on the root system, stalk and stems and the artichoke. Extensive feeding over a period of time may cause the plant to collapse. Cereal grains of barley, oats, and wheat are often seriously damaged. Mice will feed on the young seedlings as well as the mature grain heads. Mice will damage or kill fruit trees by gnawing through the bark to the cambium layer. Complete or partial girdling of the trunk from just below the soil line up to as far as they can reach on the trunk frequently occurs.

#### SURVEY AND TREATMENT

The best time to survey for vole activity is before the crop is planted, and/or at monthly intervals during the growing season. The grower should look for signs of vole activity in non-crop areas such as grassy borders adjacent to crop, weedy ditch banks, roadside and railroad rights-of-way. An individual should walk through these areas looking for vole runways, fresh soil at burrow openings, fecal deposits in runways, and cutting of grass in runways or protruding from burrow entrances. Voles may also be seen darting down the runways.

Snap-trapping enables an individual to detect or confirm the presence of voles in crops or adjacent grassy areas. One hundred baited (oatmeal or peanut butter) mouse snap-traps are set about 10 feet apart in a transect line across the area to be sampled. The traps are set at locations which would increase likelihood of success (i.e., runways or burrows) and are serviced and reset daily for two or three days. The number of mice caught per 100 trap nights will serve as a population index at the time of trapping. Normally a 5% to 10% vole catch per 100 trap nights warrants control of the mouse population. Painting the traps a fluorescent orange and marking the trap location with orange survey tape will aid in finding the traps the next day.

#### CONTROL

Cultural Practices: Clean cultivation and weed control on grass borders adjacent to crops, ditch banks, railroad rights-of-way, and roadsides are important preventive measures. Since these areas furnish a reservoir in which wintering mouse populations may expand and immigrate to adjacent crops, it is important to keep these areas clean of vegetation.

Natural Controls: Predators such as coyotes, foxes, badgers, weasels, owls and gulls, feed on voles; however, they probably play little role in regulating mouse populations.

Poison Baits: Toxic baits are very effective in reducing vole infestations in crops. When broadcast to control voles, adequate bait must reach the runways where most vole feeding occurs. The most commonly used grain baits are steam-rolled whole oats or crimped oat groats.

Grain baits treated with zinc phosphide\* (1.0-2.0 percent) are commonly used for meadow mouse baiting. They are formulated at the rate of one or two pounds of zinc phosphide powder to 100 pounds of grain bait with mineral or vegetable oil used as an adherent. The one percent formulation is used for spot-baiting which involves scattering teaspoon quantities of bait (about 80 baits per pound) in runways near active burrows. Two percent zinc phosphide treated grain is used for broadcasting by hand, mechanical spreader, or aircraft through the infested area at the rate of 5 to 10 pounds per acre, depending on the density of the infestations.

Another acute toxicant Compound 1080\* is used for meadow mouse control. One- and two-ounce formulations are used for spot- and broadcast baiting. The baiting procedure and application rates are the same as for zinc phosphide.

Because of their increased safeness to non-target species, anticoagulant-treated baits (chlorophacinone, diphacinone, Fumarin®, Pival®, and warfarin) are used where acute rodenticides such as zinc phosphide or Compound 1080 are considered too hazardous. Anticoagulant-treated grain should be scattered lightly in tablespoon amounts (1/4 to 1/2 ounce) near active burrows or in runways. Repeated applications should be made every other day for three treatments.

#### LITERATURE CITED

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\*In California a permit is required from the County Agricultural Commissioner when zinc phosphide is used for field rodent control. Use of Compound 1080 in the field is restricted to governmental agencies.