2-23-1978

Herbaceous Cover Spray of Chlorophacinone for Meadow Mice Control in Apple Orchards

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ABSTRACT: Very effective control of the short-tailed meadow mice (Microtus spp.) was obtained by means of grass and weed spraying in two orchards with Chlorophacinone. This toxin was applied in one orchard with a boom-type tractor sprayer and in another orchard with a hand-gun nozzle operated from the tractor manually. The anti-coagulant rodenticide in each orchard was mixed in spray tanks at the rate of one pint per 100 gallons water. Spray was directed to an area two feet on each side of apple tree rows applying six pints of the concentrate per treated acre. A five-foot strip of dense grassy area bordering the orchards was also sprayed to prevent mouse invasion. We found no injurious affect to wildlife or domestic animals that were in the vacinity of orchards following toxicant treatment.

INTRODUCTION: The short-tailed meadow mouse causes considerabe damage to fruit trees throughout the orchard regions of Washington. Mice gnaw and peel the bark from trunks and roots of trees at or just below the ground line. Mouse injury can weaken trees while also serving as points of infection of various root rot diseases. When severly girdled, the trees die unless bridge-grafted.

This species of mice is medium-size, stout (1.5-2.0 ounces) with small, black, beadlike eyes and small, fur-covered ears. An important designating feature is its short tail (1/3 of head and body length) which is covered with hair. The feet do not have black guard hairs.

We find very significant differences in the palitability of fruit tree bark to the short-tailed meadow mice. Young apple trees are preferred over all over fruits. Pear is much less acceptable than apple, but preferred over stone fruits. Peach and, in some instances, cherry trees can be attacked while apricot, plum and prune are rarely fed on.

The volume of bark and trunk is important. In contrast to large, mature trees, a young tree has only a limited amount of bark, and a few mice can readily girdle. Meadow mice prefer the relatively soft and susceptible young or inner bark. Thus, older trees with heavy, thick bark are less susceptible to serious injury or loss.

HABITAT: In orchards, mice runways tend to be concentrated more heavily under the drip line of the trees. In hedge-row plantings, they extend up and down the row. Nests are often located near or close to the trunk of the tree. Rarely are the various colonies well-distributed in or near the orchard. They are more common or frequent where the soil is deep, fertile, well covered with grass and weeds and well drained. Activity is evident by small piles of brownish droppings and short grass clippings scattered along the path under the canopy of the cover. The freshness of these droppings and clippings is indicative of recent activity. How closely the vegetation along the sides of these paths is clipped as well as the width of the path is a fair indication of the presence of mice and population numbers.

The failure to find evidence of much activity in these runways requires some interpretation. This may be the result of a heavy mouse kill, or indication that mice have abandoned the area or path. Regardless, once established, this network may be readily re-invaded and worked.

The meadow mouse in Washington orchards lives in an environment just below or above the soil surface. Here it forms an extensive network of runways. It feeds on the succulent stems and roots of grasses, legumes, and weeds above these paths. It nests just below the soil surface, in dense cover, often at the base of trees where there is little disturbance and good protection from its natural enemies: hawks, owls, shrikes, snakes, badgers, coyotes and skunks.

Its enormous appetite combined with prolific breeding causes much of the problem. Each mouse may eat its weight in forage daily. It can produce as many as eight to ten litters per year with an average of six and up to eleven young per litter. The new females become sexually mature and can begin breeding at just four weeks of age.

We observe that mouse populations are eradic both within and between years. Their number is lowest in the spring and highest in the fall. Peaks in population occur approximately every four years in Washington state. These peaks and the ability to multiply so rapidly have often been misinterpreted as a migration of heavy mouse populations into the orchard. While such migrations do occur, they are usually of only limited distance from around or within the orchard.

SELECTION OF PLOTS: Two five-year-old semi-dwarfed apply orchards with mice activity were selected for Chlorophacinone plot establishment. Both sites were located on well drained, very fine silt loam soils with a sloping topography. Each orchard block had a dense strip of grass and weed cover (annual and perennials) around trees. Between tree row, summer beating had been maintained from eight to ten inches from trees.

Orchard "A" had a heavy amount of mice activity -- network of runways and holes in ground between rows and around trees while orchard "B" had only moderate activity of mice.

	Orchard "A"	Orchard "B"
Tree Spacing	10' X 20' (218 trees/A)	10' X 20' (218 trees/A)
Root stock	Malling Merton 106	Malling VII
Varieties	Red & Golden Delicious	Red & Golden Delicious
Irrigation	Sprinkler - overhead	Rill
Ground cover - % grass	85	50
- % b.leaf	15	50
Ave. ht. ground cover around tree	14 inches	26 inches

DETERMINING MICE POPULATIONS: Three methods were used to determine the activity and population of mice in the two orchards before treatment: (1) observation on both sides of tree rows to determine presence of active recent surface trails, holes, grass clippings and fresh droppings in forage ground cover. (2) placement of thirty 5/8-inch pealed slices of apples in active runways or holes. Twenty-four hours later, apple slices were checked for mice tooth markings and recorded and, finally, (3) placement of thirty wooden snap-type mouse traps baited with apple slices (one per tree) near active run trails or holes in ground. Traps were checked daily for following three days, re-baited and re-set when necessary. Thirty trees were used per orchard plot. Results were as follows:

Method:	Orchard "A"	Orchard "B"
(1) Observation	26 trails, 7 holes, 14 piles grass clippings, 4 dropping piles	8 trails, 2 holes, 4 piles grass clippings, 1 dropping pile
(2) Apple slices chewed on	28	11
(3) Mice trapped	17	6

TOXICANT: To the knowledge of the writer, this is the first test plots to be established in tree fruit orchards within the state of Washington to employ Chlorophacinone 2-/(p-chloraphenyl) phenylaceryl/-1,3-Indandione (contains 0.40 pounds chlorophacinone per gallon) as a herbaceous cover spray for the control of short-tailed meadow mice.

The toxicant was sprayed on ground forage in six acres of orchard "A" with a handgun nozzle operated manually from tractor. Orchard "B" used tractor equipped with spray boom. The anti-coagulant rodenticide in each orchard was mixed in spray tanks at the rate of one pint per 100 gallons water. Spray was directed to the ground forage area two feet on each side of apple tree rows applying six pints of the concentrate per treated acre. A five-foot strip of dense grass and weedy area bordering the orchards was also sprayed to prevent mouse invasion.

Treatments were made in early November on a clear day, no wind and temperatures near 50°F.

RESULTS FOLLOWING TOXICANT TREATMENT: New 30 tree plot sites were selected within treated areas of orchards skipping three rows over from "check plot" and four trees down. Using same procedure as described in "Determining Mice Population", results were:

Table #1 EFFECT OF CPN GROUND SPRAY ON MEADOW MICE ACTIVITY

Days From Treatment-CPN Spray	Orchard "A"	Check*	Orchard "B"	Check*
	Apple Slices Chewed On			
8	2	11	0	4
18	0	-	0	-
28	0	-	0	-
	Mice Trapped			
29	0		0	
30	0		0	
31	0		0	

* Apple slices were placed in the checks 8 days following treatment, but not subsequently.

EVALUATION AND DISCUSSION: The two cooperating orchardists, who have had considerable experience with short-tailed meadow mice problems, and the writer are enthusiastic with the mice killing effect of the toxicant. Results following treatment show that mice populations were reduced even below what is considered a safe level in Washington tree fruit orchards. No mice activity was observed in the orchards following the melting of a six-inch snow cover in early January.

There are presently three rodenticides labeled for use in Washington orchards: (1) zinc phosphide, a poison used to mix with various kinds of baits; (2) Ramik Brown, a pellet bait incorporating the anti-coagulant diphacinone; and, (3) Endrin, a chlorinated hydrocarbon insecticide used in spraying the orchard floor and/or borders for long-term control.

Where the application of rodenticides has been our principle means of controlling mice, there are other practices we feel which may be used to reduce the hazzard of extensive short-tailed meadow mouse damage to trees. These are important because even the loss or weakening of a few trees in a planting can be very costly in loss production. Mouse damage can occur in our orchards at almost any time during the year.

Maintaining an area free of vegetation around each tree can greatly reduce the hazzard. Mice do not nest in or like to cross ground where there is no ground cover.

Mechanical guards can be constructed to encircle young trees. These can be wire guards of one-half inch hardware cloth cut to 18 inches square and closed with simple hog rings around a loose collar about six inches in diameter around the tree. Plastic guards also are made available for this purpose.

Mechanically cutting up the sod cover is another method which can be used to reduce mouse populations. This breaks up runways and disturbes the mouse population.