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Controlling Vole Damage in No-Till Corn and Soybeans

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Row crop production using conservation tillage farming systems has expanded dramatically in recent years throughout Missouri. No-till systems typically involve minimal soil disturbance in fields where plant residues cover about 90 percent of the soil surface. The conservation and agronomic benefits of no-till are numerous. However, several rodent species, particularly the prairie vole *(Microtus ochrogaster)*, have the potential to damage germinating seeds and small seedlings of corn and soybeans in certain fields.

Prairie voles require a full canopy cover for protection from predators. Established grass or legume sod fields and field borders (including wheat or rye stubble, CRP fields and cover crop seedlings) provide an ideal habitat for rodent populations. Plant stand reductions may reach 80 to 100 percent in fields with dense vole populations (typically more than 30 per acre). These conditions occur primarily in fields where the vegetative cover has been maintained for more than a year before the start of no-till crop production.

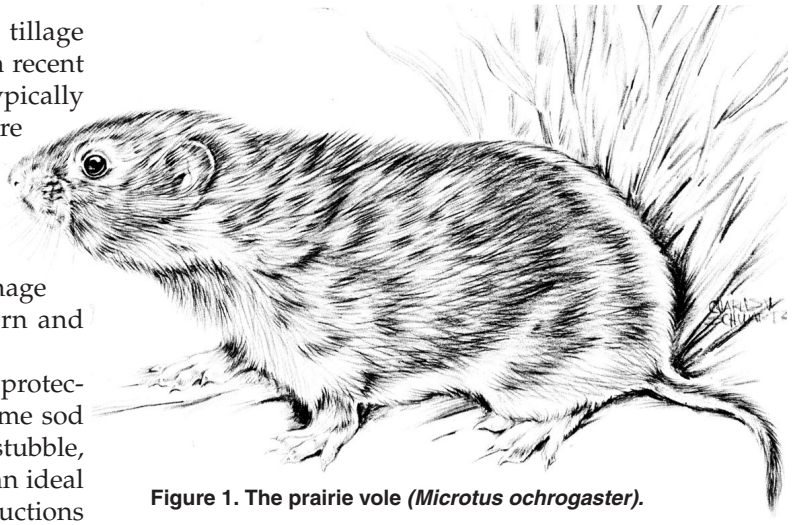

Figure 1. The prairie vole *(Microtus ochrogaster).*

Prairie vole biology and habits

An understanding of the prairie vole's habits, life cycle, habitat preferences and damage characteristics is essential before damage prevention measures can be implemented for no-till crop production.

The mature prairie vole is reddish brown to gray and is larger than a field mouse but smaller than a rat (Figure 1). The ears of a vole are very small. The prairie vole has a torpedo-shaped body about 4 to 5 inches long with small ears and a short tail.

Under ideal conditions, voles reproduce from March through October. Voles can produce litters of three to eight young about every 21 days. The females can mature in 35 to 40 days and start raising litters of their own. Large field populations can develop rapidly, depending on habitat quality, severity of winter weather and the type of crop residue in the field at planting. Population changes from March to planting time in early May can be dramatic.

The life span of a prairie vole varies from about two to 16 months. However, the mortality rate of some litters may be as high as 80 percent during the first month if food supplies are short and predators are abundant. Vole populations usually peak every two to three years and tend to be higher during spring to fall seasons.

Prairie voles are opportunistic feeders; they consume a variety of foods. They are active day and night throughout the year. They do not hibernate. In a no-till field, voles typically select the dry ridge of a rolling hill field that has a closed canopy of lush vegetation. At such locations, voles will build a network of 1- to 2-inch-wide, aboveground runways under the vegetative canopy (Figure 2). These runways connect to shallow, mounded underground burrows. When they are in use, these mounded burrows usually are the home of at least one pair of adult voles and their young. One colony can represent the home of many adults.

The feeding range of an active vole colony can be as small as 10 to 15 feet from the burrow if the food supply is abundant. However, the average feeding range of a colony is about one-fourth of an acre.

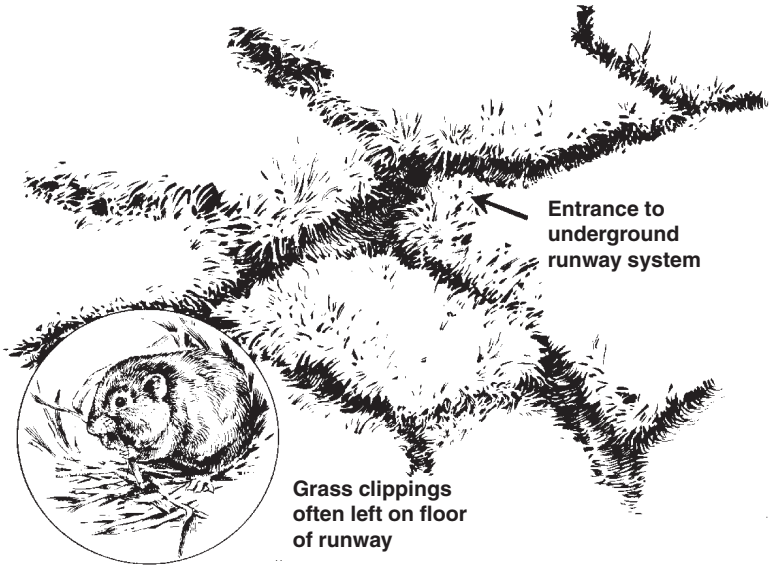

Figure 2. The surface runway system of the prairie vole.

Voles are primarily forage and root feeders, preferring succulent grasses and legumes. Established stands of alfalfa, clovers and other legumes often develop large vole populations. Undisturbed, established grass sod in the spring and fall also provides ideal habitat. Feed grains such as corn and wheat are also high on the list of preferred foods when they are available. Seeds, underground tubers, insects and some animal remains are also used for food.

Scouting

The first step to prevent losses from rodents is scouting fields and field borders at least 30 days before planting no-till corn. This should usually occur in mid to late March.

Look for active vole colonies and runways while scouting. Start scouting in field areas with good drainage and soil aeration. Dark green, high spots in a grass area usually signify a colony. Urine and feces deposited close to the burrow opening usually fertilize the vegetation and produce a dark green color. If a colony is found, inspect the opening to determine whether it is in use. The presence of fresh clippings or fresh feces next to a slick, open hole is a sure sign of activity.

If at least five active vole colonies per acre are identified, damage prevention control measures should be planned. This guide is based on the reproductive potential of the prairie vole and the population per acre required at planting to signal the presence of an intense vole population.

Integrated pest management

When voles start to cause significant damage to crops, they are considered pests. A rodent damage control program should be implemented to address your problem. Using an integrated pest management approach that accurately assesses the problem and uses the best control options will save you time, expense and frustration.

Damage in no-till field corn usually occurs during the first 21 to 28 days after planting. Prairie voles will burrow or dig into the planter slot to eat the germinating seed and small seedlings. Once the corn kernel is decayed or the plant reaches 8 to 10 inches in height, feeding damage usually stops.

Vole damage prevention

Predators

Natural predators of voles include snakes, hawks, owls, coyotes and foxes. Although they are useful allies, natural predators have not been found to be a successful control for large populations of voles. Although natural predators help reduce the population, other control measures will be required if large vole populations exist on the proposed planting site.

Cultural control

Destroying the vole colony, cover and food supply by clean tilling or plowing before planting is an effective way to control and prevent damage. Voles will not occupy an area that does not provide food and cover. However, this practice has several disadvantages:

- The benefits of no-till in reducing soil erosion are lost.
- The benefits of moisture conservation through mulch cover are lost.
- In sod, the natural allelopathic release from decaying sod may cause reduced stands in conventional tillage.
- The cost of tillage increases production cost.

Habitat modification without tillage. Voles live where they have adequate overhead cover from predators and a sufficient food supply. Changing the amount of food and cover can be an effective way to control the vole population at a particular location. Habitat modification does not directly reduce the vole population, but it reduces food supply and cover. It may force the voles to relocate, often to areas where natural mortality is higher. Good management and planning is the key to safe and effective use of this control option.

Hay removal. Removing hay just before planting corn as a means of habitat modification can be successful for vole damage control.

Using early preplant herbicides. Early preplant (EPP) herbicides can be used to kill vegetative cover about one month before planting no-till. This process removes the food supply of the vole for an adequate time to allow vole migration to another area. Consult with your University Outreach and Extension center for recommended EPP herbicides.

Low mowing. Keep field borders clipped low enough to discourage vole movement into your growing crop. Low mowing in late fall in fields that you plan to plant next spring is also effective. When this practice is combined with EPP sprays, no other vole control should be required. However, be aware of the food and cover benefits that field edges have for other wildlife such as songbirds, bobwhite quail and cottontail rabbits.

Alternative feeding

The first 21 to 28 days after planting is the most critical time to prevent vole damage in no-till fields. Therefore, if alternative feeding is to be effective, it must be

- As attractive to the vole as is the planted seed.
- Applied before planting.
- Applied in a sufficient amount to feed the vole population for at least 21 days.
- Applied in an even distribution across the areas of the field populated by voles.
- Free of weed seeds.

Research has indicated that both coarse cracked corn and whole-kernel corn have been effective as an alternative food source. Whole soybeans may also be a potential alternative food source for preventing vole damage. Use a fertilizer buggy to broadcast the seed over the field one or two days before planting. The existing vegetation should be dry when this application is made. Set the applicator according to the test weight of the grain (pounds/cubic foot = grain test weight in pounds/bushel x 0.8) to apply the desired number of pounds per acre.

Although alternative foods have been successful in reducing vole damage to no-till corn, results have been mixed. Coarse cracked corn provides control without concern for the development of volunteer plants. Four bushels of coarse cracked corn per acre provides about the same level of damage prevention as two bushels per acre of whole kernel corn.

Research indicates that alternative feeding may not be as successful in no-till soybeans. The emerging cotyledons appear to be too attractive to voles. The only alternative feeding that appears to be effective in no-till soybeans is the use of two bushels of broadcast whole soybeans per acre. However, more research is needed to support this recommendation.

Repellents

Products that contain the active ingredient capsaicin (the *hot* in hot peppers) are taste repellents labeled for use against voles in field crops. These products are labeled for use in a spray that can be applied between crop emergence and when edible portions of the plant begin to form. Effectiveness is reduced during periods of wet weather, and little data is available for use in no-till crops.

Seed treatments containing thiram are labeled for use on corn and soybeans. Although past research has indicated some effectiveness in repelling voles, these products are not labeled for that use in no-till crops. Again, the effectiveness is reduced in wet soil conditions.

Injecting 10 cubic centimeters (about 2 teaspoons) of turpentine into a bag of seed corn about 24 hours before planting has been suggested as an effective treatment to control vole damage. Recent research indicates that this treatment may have some beneficial effect in dry years, but has little effect during wet springs. Turpentine has no label as a rodent repellent or for legal application directly to seed.

Toxicants

Approval of a federal label for the application of 2 percent zinc phosphide pellets at planting *in no-till or reduced tillage corn* provides producers another rodent control option. The label is for the use of 4 to 6 pounds per acre of Prozap Zinc Phosphide Pellets (⅛ inch). This pelletized bait is labeled for the control of small rodents such as voles and other field mice. It must be applied in-furrow and must not be crushed in the process. One 50-pound bag of bait treats about 10 acres.

This option is labeled only for corn. It may prove most beneficial for use on corn planted into high residue or grass sod/green cover crops that have the potential for being heavily infested with large rodent populations. Recent research using this treatment at planting suggests that there are advantages for using this treatment versus other available options.

Application of zinc phosphide pellets in the furrow at planting can

- Control the rodent population on site, thus preventing its movement to adjoining fields.
- Allow maximum growth and benefit from cover crops before planting, without major concern for the existing rodent population.
- Allow producers to acquire and plant land without prior application of a rodent damage control technique.
- Allow the producer to treat only field border rows that are adjacent to grass waterways, roadsides or other areas of good rodent habitat.
- Provide more consistent, economically effective control of rodent damage at planting than most other available options.

For proper application of pellets in the furrow, the planter must be slightly modified. Two available application device options have been developed. These include the use of a modified rotor for applying and metering the pellets through the planter insecticide boxes (positive placement kits – PPK), and the attachment of a GANDY PDM applicator and hoses for application through the planter seed drop tubes. Both applicators, if properly adjusted, can do an excellent job of

applying the pellets in the furrow under high residue conditions.

Zinc phosphide is labeled as a restricted-use pesticide. It is a single-dose toxicant that is acutely toxic to all vertebrates and therefore presents risks to nontarget wildlife as well as safety risks to humans. The product must be applied in-furrow ONLY, using the proper equipment to meter and apply the pellets in the proper manner. Correct application (i.e., closure of seed slot and no spillage on the ground) is imperative to reduce the exposure to nontarget species. You must follow all label directions for safe use and proper application of the product. For information on the costs and availability of these application options and the zinc phosphide pellets, contact Loveland Industries, Inc., customer services at 1-800-356-7202.

Beneficial aspects

Rodents that inhabit no-till fields consume large amounts of cutworms, wireworms, grasshoppers, grubs, weed seeds and waste grain left after harvest. These beneficial aspects should be considered when estimating costs and benefits of control. Low to moderate vole populations may be helpful.

Conclusions

Voles and other rodent species will not necessarily be a problem in all fields planted to no-till corn or soybeans. Populations are most likely to be highest in situations where crops are planted in established grass or legume sod fields.

In these situations, research has shown that using an effective damage control technique when these species are present before planting can consistently provide an additional net return at harvest of at least $100 per acre. Of all the techniques currently available and legal for controlling rodent damage in no-till corn or soybeans, a combination of "habitat modification" techniques including EPP herbicides may be the most effective, lowest cost, easiest to complete, and safest on the environment.

Second in all of these categories for no-till corn (if sod is not controlled at least 30 days before planting) would be the application of 2 percent zinc phosphide pellets in the furrow at planting and the use of PRE herbicides. Although not as consistent as the in-furrow zinc phosphide treatment, broadcasting alternative food before planting would be another effective option.

The best control prescription may be the following:

- If planting soybeans, control the cool-season perennial grasses and perennial broadleaf weeds with a spray application in the fall about six weeks after low mowing and at least two weeks before a killing frost. If sod is not controlled in the fall, plan to plant corn.
- Check fields in late winter for signs of rodents or for active vole colonies to determine the population potential.
- If more than five active colonies per acre are found in late winter, plan a control prevention program.
- If no-till early preplant (EPP) herbicides are to be used, apply them about 30 days before planting.
- Scout again for active vole colonies one week before planting. If few are found, plant when you are ready. If colonies are still active plan to use additional damage prevention options. If alternative feeding is planned — in no-till corn — apply "weed seed free" food mixed with dry fertilizer (this can save a trip across the field) within two days before planting. Make sure the vegetation is dry when spreading the mix so that it can fall to the ground. In soybeans, only broadcast soybeans appear to reduce damage.
- If using 2 percent zinc phosphide pellets in no-till corn, apply 4 to 6 pounds of the zinc phosphide pellets per acre into the seed furrow at planting.
- Regardless of the damage control technique — plant no-till.

For more information on rodent control, contact your local University Outreach and Extension center.

Information in this publication is adapted from *Rodent (Prairie Vole) Damage in No-Till Corn and Soybeans,* Ron Hines, Senior Research Specialist, Department of Agronomy, Dixon Springs Agricultural Center, Simpson, IL 62985.

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