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A Vertebrate IPM Project In Nebraska

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ABSTRACT: An Integrated Pest Management project in Nebraska is assisting farmers, particularly pork producers, in controlling damage caused by Norway rats, house mice, house sparrows, and starlings. This extension program also provides information on control of pocket gophers in alfalfa and on rangelands. Integrated control recommendations include rodent- and bird-proof construction, limitation of food and shelter, traps, and toxicants (rodenticides and avicides). The project is attempting to gather data on economic damage, including structural damage to confinement buildings, caused by these pests. This information will be used to assist producers in deciding when to initiate control.

An extension project to assist livestock producers and others in dealing with rodent damage problems was begun in Nebraska in 1978. The project was initiated because pork producers needed information on controlling Norway rats (Rattus norvegicus) and house mice (Mus musculus) in swine confinement facilities. Also, the project was intended to assist alfalfa growers in controlling pocket gopher damage. Support for this work is from USDA Integrated Pest Management funds granted to the Cooperative Extension Service in Nebraska.

RODENT DAMAGE IN SWINE HOUSING

The swine industry in Nebraska and other midwestern states is using an increasing amount of confinement housing. Modern, insulated buildings provide protection to swine from extreme weather conditions, thus improving potential efficiency of swine production. Often, these buildings also provide ideal habitat for commensal rodents, which can be destructive to such swine facilities. They gnaw and tunnel through insulation, using it for nesting material in many cases. Rats commonly gnaw holes in wooden feeders, damage inner wall materials, and burrow under cement slabs or building foundations. Their extensive burrowing sometimes causes structural collapse when heavy machinery is driven over undermined slabs or floors. Both rats and mice may gnaw insulation off electrical wiring, causing fire hazards. They may also gnaw into water lines or into flexible gas lines used on space heaters in confinement buildings. These rodents eat livestock feed and contaminate additional feed with their urine and feces. Contaminated feed may be rejected by pigs (Timm and Moser 1980). Commensal rodents are potential reservoirs or vectors for diseases which affect swine or other livestock (Joens 1980).

Although commensal rodent damage to livestock facilities may be obvious in some instances, in others it is not. The presence of house mice inside wall spaces or attics, where they can damage insulation materials (Figure 1), may not be noticed by producers until substantial damage has occurred.

AN INTEGRATED CONTROL APPROACH

Our project has made rodent control information available to pork producers who have sought assistance. We also have attempted to stimulate other producers' awareness of potential or actual rodent damage which may affect their facilities and livestock.
Figure 1. House mouse damage to fiberglass batt insulation inside a wall of a swine finishing building. This damage occurred in less than 3 years.
Our rodent control recommendations are presented in an "integrated" manner: we offer a variety of preventive and corrective measures and emphasize to each producer the need to build a control program which suits his situation. Components of the program are as follows:

**Rodent-proof Construction**

Ideally, rodents should be excluded from livestock confinement facilities. Few new or existing confinement buildings show much attention to rodent-proof design. Commonly, corrugated metal siding is used as the exterior wall material. The corrugations often left open at the bottom edge of the siding panels provide openings for mice to enter the walls (Figure 2). In some types of confinement buildings, ventilation or manure-removal systems provide access to rodents. It is not always possible or economically feasible to correct such design problems. For example, to prevent rodent entry through some ventilation windows or openings would require they be covered with %-inch hardware cloth or other similar material. This is not recommended because it would severely reduce ventilation efficiency, and such wire screens can freeze completely over during severe weather and cause swine to suffocate. For some buildings, a practical approach is preventing rodent entry into walls or attic spaces rather than completely excluding them from the building itself. We encourage producers to give greater attention to use of rigid, rodent-resistant materials wherever possible.

**Food and Shelter**

Sanitation is often a key element of commensal rodent control in urban and suburban areas. On farms it is much more difficult to eliminate sources of food or shelter which rats or mice might use. Where livestock are housed and fed, food availability will usually not be a limiting factor for commensal rodent populations. Nevertheless, there is value in preventing rodent access to livestock feed wherever possible. Feed should be stored in rodent-proof buildings or bins. If stored in sacks, feed should be stacked on racks above floor level and away from walls and other objects. In this way, rodent activity can be detected more readily and control measures are more easily implemented.

Reduction of available shelter is potentially an important method of controlling rats and mice. Where rodents have no place to rest or to hide from predators (including humans), they cannot persist. Producers who remove rodent shelter and food by removing weeds from near buildings, disposing of refuse promptly, and preventing buildup of manure and waste feed can expect to have fewer problems with commensal rodents.

**Traps**

Traps, although requiring considerable labor input, can be useful in reducing rodent numbers in and around farm buildings. Traps are probably more effective against house mice than against Norway rats. In demonstration trials, we have nearly eliminated large populations of house mice inside swine confinement buildings during a two-week trapping effort. For house mice, snap traps are highly effective when used in sufficient numbers and set in suitable locations. Automatic multiple-capture traps also are effective but often are more difficult to place in suitable locations because of their size. Glue boards have an advantage over other traps by requiring less effort, but if
Figure 2. Open corrugations on metal siding are a common design flaw in livestock facilities. They allow commensal rodents, particularly house mice, to enter wall spaces.
left unprotected they will lose their effectiveness after a few days because of dust which settles on the glue's surface. We have provided information to pork producers and others concerning the availability and proper use of the various types of traps.

**Rodenticides**

Rodenticides offer the most efficient and cost-effective method for achieving a quick reduction in rodent numbers in and around livestock facilities. Their usefulness to pork producers is limited by (1) the unavailability of single-dose poisons to persons who are not certified pesticide applicators, (2) the relative unavailability of some anticoagulant bait formulations (e.g., canary grass seed bait or concentrates to make liquid bait), and (3) their inexperience in using these products in the most effective manner.

Proper selection of bait formulation is often critical to the success of rodent control when using rodenticides. This is because baits must compete with readily available, high-quality hog feed in most cases. Commonly-available grain-based anticoagulant rodenticide formulations may not be well-accepted by rats or mice in such circumstances. We therefore may recommend use of zinc phosphide or other single-dose poisons mixed into canned pet food, to control large populations of Norway rats. Such use should be supervised by a certified pesticide applicator. We have achieved up to an estimated 80% reduction in rat activity when a single application of zinc phosphide bait was made following at least 5 consecutive nights of prebaiting. Alternatively, liquid anticoagulant baits may be well-accepted and effective if located in places of rat activity. For house mice, we have found an anticoagulant canary grass seed bait to be effective and capable of nearly eliminating mice from confinement buildings, even where hog feed is readily available. House mice will also accept liquid baits if they are properly placed.

It may be difficult to find appropriate locations to place rodent bait within swine confinement buildings. Swine are susceptible to anticoagulant poisoning. For this reason, special care should be taken when using rodenticides within these facilities. It may be possible to place baits or bait stations in attics, on the tops of pen dividing walls, in empty pens, around the building perimeter, or in alleys and walkways. Bait boxes are useful for preventing bait spillage and protecting bait from dust and moisture.

Pork producers often ask about fumigating buildings to control commensal rodents. We discourage building fumigation because of the hazard to humans and the expense of hiring a professional exterminator to conduct the fumigation. However, for rat burrows under concrete slabs, around building foundations, or in similar locations we recommend the use of incendiary gas cartridges. These are readily available through the U.S. Fish and Wildlife Service, Division of Animal Damage Control.

**DECIDING WHETHER AND WHEN TO CONTROL**

An important component of IPM programs is basing control decisions on sound economic information. There have been no comprehensive evaluations of actual or potential economic loss caused by rodents in livestock confinement facilities. Thus, there is little information available for use in formulating an economic decision-making model. We have observed several sites where significant damage has occurred, and some pork producers have given us
estimates of repair costs sustained in remodeling buildings damaged by rodents. In general, the cost of rodent control appears to be small in relation to the potential economic loss from rodent damage, especially structural damage to insulated buildings. Currently we are planning to conduct laboratory trials to better quantify rodent damage to insulated walls. We intend to measure the rate of insulation destruction by a given rodent population as well as the potential heat loss through damaged wall panels. We also intend to try to measure production efficiency losses which result from rodent consumption and contamination of livestock feed. These measures, along with estimates of the cost of rodent control methods in typical livestock facilities, will enable us to build a simple decision-making model which will be helpful to pork producers.

POCKET GOPHERS IN ALFALFA

Recent research at the University of Nebraska has estimated percent yield reduction in alfalfa infested by plains pocket gophers (Geomys bursarius) (Luce, Case, and Stubbendieck 1981). We are using this information along with estimates of the cost of pocket gopher control to formulate an economic decision-making model for alfalfa growers. This is not a simple situation, because any such model must take into account such factors as the expected future life of the alfalfa field, the potential reproductive rate of pocket gophers, and the economic loss to farmers from machinery damaged by running into gopher mounds. Even so, we believe a sufficiently accurate model can be built to give farmers much better guidelines for initiating pocket gopher control than are presently available.

STARLINGS AND HOUSE SPARROWS

At the beginning of Fiscal Year 1980, the project was expanded in scope to deal with two species of birds which frequently cause damage in and around livestock operations, starlings (Sturnus vulgaris) and house sparrows (Passer domesticus).

In Nebraska, starlings frequently concentrate at swine and other livestock operations in winter. Economic damage can occur as a result of feed consumption, feed and water contamination, and general sanitation problems. Starlings can also spread transmissible gastro-enteritis (TGE or "baby pig disease"), a potentially serious viral disease, between swine herds.

During the winter of 1979-80, we initiated a pilot project in Gage County, Nebraska at the request of the local pork producers' organization and with the cooperation of the local Extension Service office. More than 100 producers were trained in an integrated approach to starling control. The program's control techniques include coordinated application of Starlicide Complete toxic bait when necessary to reduce starling numbers, exclusion of birds from buildings, reduction in availability of feed and water to starlings, and dispersal techniques. Now in its third year of operation, this project has enabled Gage County pork producers to solve their starling problems with a high degree of success. Such an area-wide coordinated effort in using toxic bait has considerable merit in controlling starlings, which may travel many miles from their roost to multiple feeding sites each day. When many participants apply Starlicide Complete during the same time period, the results of the baiting can be more easily recognized than if an isolated producer applies bait. The timing of bait application is our project was improved by selecting
a group of producers to act as "scouts". These individuals, located throughout the county, regularly reported to the County Extension Service office the number of starlings observed on their property during the winter months. When starling numbers began to increase, an announcement was made for all participants to apply prebait and then bait on the designated days. Pork producers participating in this project have been extremely satisfied with the results.

House sparrows are perceived as a general nuisance by many farmers. They also cause some economic damage by consuming and contaminating feed, corroding farm equipment with their droppings, and sometimes pecking away rigid foam insulation inside buildings. Where damage occurs or may occur, we encourage farmers to take preventive and/or corrective measures including regular nest removal, bird-proofing buildings, shooting, habitat modification, and use of toxic bait where safe to do so.

RAISING AWARENESS OF PEST DAMAGE

We believe we have satisfactorily answered requests for information on rodent and bird damage control from producers who have experienced damage. A major challenge is to raise producers' awareness of potential economic losses from these pests and encourage them to take preventive measures before serious damage occurs. Many pork producers consider rodent control to be a low priority, particularly those who do not see obvious damage to their facilities. We have tried to raise producers' awareness of these vertebrate pests and associated damage by using several techniques. These have included distribution of extension guides (Timm 1979a,b; Timm 1980; Johnson and Timm 1981; Case, Stubbendieck and Gipson 1976), use of slides and slide-tape sets illustrating pest damage and control methods, production of video cassettes, displays of pest control information at producer trade shows, and direct presentations by specialists to pork producers and others at county producer association meetings and multi-county producer seminars.

TOWARD THE FUTURE

The current IPM project is scheduled to end after Fiscal Year 1982. We have received approval to initiate a new IPM project which will expand the scope of the current project to include commensal rodent damage problems in poultry, dairy, and feed storage and processing facilities. We also intend to expand our pocket gopher damage work to include rangelands and hay meadows. The new project will begin developing information on prairie dog damage and control on rangelands. We expect this to provide landowners with better guidelines for initiating prairie dog control on Nebraska rangelands.

LITERATURE CITED


