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How to Control Rodent and Insect *Turf Destroyers*

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FORTUNATELY the number of insect and rodent pests that destroy or damage valuable turf are not large; however, the insidious nature of their attack, their subtle methods and evasive habits make these pests formidable if not dangerous enemies.

The greenkeeper is fortunate in that he is not unduly required to pinch pennies when it comes to selecting and using effective control measures. Furthermore, he is fortunate in having available reasonably satisfactory control measures for most of the insect and rodent pests that are likely to infest or seriously damage turf grasses. Unfortunately, however, prophylactic or preventive measures are frequently more effective than remedial measures and if these preventive treatments are not applied as a matter of policy or insurance, the greenkeeper frequently finds himself face to face with an emergency problem for which there is no immediate answer. Furthermore, since injured turf cannot be immediately restored, it is extremely important that all insect outbreaks be discovered in their incipient stages and control measures, either prophylactic or remedial, must be applied before noticeable or conspicuous damage has occurred. This, of course, means that the greenkeeper must at all times be on the alert and detect insect activity or damage in the early stages.

In the practical consideration of insect control, it is frequently customary to divide insect pests into two groups. Chewing insects, which actually devour portions of the plant, are usually, though not always, most easily controlled by insecticides collectively referred to as stomach poisons; and sucking insects, which insert stylet-like mouth parts into the plant and extract the plant's juices, are usually controlled by so-called contact insecticides. The chewing insects which infest turf grasses can be further divided into those which feed upon the foliage and those which feed on the roots of the plant. Then, of course, we have a fourth group of so-called nuisance pests, such as ants and earthworms, which do not feed upon the plants but are objectionable because of the mounds or casts that they leave on the green. While it is always desirable to determine the specific identity of the insect you are attempting to control, this is not always essential. Very often the proper placing of an insect in one of the four categories just mentioned will automatically suggest an appropriate control measure. For example, most leaf-eating forms will respond to applications of lead arsenate or other suitable stomach poisons and most sucking insects will be destroyed by the same general types of contact insecticides.

Sod Webworm Control

Sod webworms are the caterpillars or larvae of a group of rather small, so-called close winged moths. Upwards of 100 species of these moths are known in the United States, and the larvae of at least a dozen or more species are known to feed upon a wide variety of grass plants. Some species have but one generation a year, whereas others may develop two or more broods a year, depending upon the species and the length of the summer season.

In general, the control measures are the same for all species. From time to time various insecticides, including oil emulsions, pyrethrum extracts, derris extracts, and dichloroethyl ether have been recommended and you can find recommendations for the use of these materials in the back numbers of your official publication and in a number of entomological journals. The writer, however, after years of experimental testing, has eliminated all of these materials in favor of lead arsenate sprays or dusts. Two pounds of lead arsenate in 20 gallons of water per 1,000 square feet of green, applied with a sprayer developing a pressure of 150 to 300 pounds when properly applied invariably gives ex-

cellent control of sod webworms. This spray should be applied when the first evidence of an infestation is noted and, of course, the greens should not be sprinkled or watered for 48 hours after treatment. In addition to giving good control of sod webworms, the use of lead arsenate has several advantages over other suggested treatments. For example, lead arsenate has a stimulating effect on most turf grasses and tends to retard the development of several common weeds, particularly poa annua and chickweed. Several species of cutworms and other grass-feeding caterpillars are readily controlled by this spray and the lead arsenate when washed into the green tends to accumulate in the soil where it aids in the control of earthworms, white grubs, Japanese beetles and other soil infesting species.

Cutworm Control

Several species of cutworms frequently do more or less damage particularly on close cut bent grass greens. For the most part the caterpillars remain hidden in the mat just above the surface of the soil where they feed upon all portions of the plant within their reach. As food is needed, they move forward slowly and thus produce narrow, linear brown patches from 2 to 6 inches in length.

All of the infestations encountered in Iowa were readily controlled by the lead arsenate spray recommended for the control of sod webworms. Species which will not respond to this treatment might be controlled through the use of the poison bran bait normally recommended for the control of cutworms, armyworms and grasshoppers.

White Grub Control

White grubs, which are the larvae of the common May beetle or June beetle often observed at lights around the doors and windows of clubhouses, frequently occur in sufficient numbers to completely destroy the roots of grasses in greens and fairways.

For the time being, I know of no better control measure than the oft-repeated grub-proofing of the soil by the addition of lead arsenate. Application of 5 to 20 pounds of lead arsenate per 1,000 square feet have been recommended, the amount of lead arsenate to be used depending somewhat on the severity of the infestation, the speed of action desired and the texture of the soil. In general, heavy clay soils require heavier applications than light sandy soils. Where lead arsenate is applied for sod webworm control once or twice each year, additional applications for grub control are not required.

For practical purposes the Japanese beetle may be regarded as a white grub. This species, however, has a one-year life cycle and therefore frequently presents an annual problem rather than a tri-annual problem as is the case with most grubs which normally have a three-year life cycle.

Grub proofing of the soil with lead arsenate as recommended for the control of white grubs is a common practice. The introduction of the milky white disease has been very successful in many sections of the East and persons interested in this phase of control should contact their state entomologist or the federal Japanese beetle laboratory at Moorestown, New Jersey.

The hairy chinch bug is generally distributed throughout most of the eastern states and westward to include at least part of Ohio, Michigan, Wisconsin and Minnesota. It is a typical example of the sucking type of plant bug and therefore cannot be controlled by the use of lead arsenate or other stomach poisons.

Several species of ants can usually be found nesting on or around the greens of most courses. A number of effective ant baits have been developed, several of which are on the market in prepared form and others can be prepared by the greenkeeper if he so desires. Most of the baits are effective if properly used and in most cases ants can be held under control through the use of baits alone, although at times it may seem desirable to supplement their use with injections of carbon disulphide into the nests of stubborn colonies.

DDT Control Still Experimental

The use of DDT for the control of insect pests is still in the experimental stage. While we might, on the basis of preliminary research, make a great many suggestions on where and how this new insecticide might be used, I am inclined to suggest that for the present you should rely on those insecticides you have used in the past until such time as definite recommendations for the use of DDT can be made. The extensive and promiscuous use of DDT should by all means be discouraged. At the same time, there is no reason why greenkeepers who are inclined towards experimentation should not use DDT experimentally. A few tips to the experimentors would be in order.

1. A pinch of 10% DDT dust placed on the apex or scattered around an ant hill frequently results in the extermination of the colony.

2. DDT sprays containing ¾ to 1 pound of actual DDT (in the form of a wettable powder) per 100 gallons of water and properly prepared dusts containing from 1% to 3% DDT in prophyllite or other suitable diluents have proven very effective for the control of practically all lepidopterous larvae on which they have been tested. Preliminary laboratory tests seem to show that sod webworms and cutworms that consume considerable quantities of foliage are no exception. DDT, therefore,

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may in the future replace lead arsenate for the control of sod webworms and cutworms on golf greens and other turf.

3. Federal entomologists, working with the Bureau of Entomology and Plant Quarantine have found that the Japanese beetle in both adult and larval stages is very susceptible to DDT poisoning. However, since the excessive use of DDT on trees and shrubs in making soil treatments may prove injurious to birds and other forms of wildlife, the general use of DDT for the control of the Japanese beetle and similar pests should await receipt of sound recommendations by competent authorities.

A number of other new insecticides, including benzene hexachloride, sabadilla, Ryania, Rothane and Velsicol 1068 which are now in the hands of many research entomologists may in the not-too-distant future in part replace a number of old insecticides, perhaps including DDT in some instances.

Rodent Control

The writer, being an entomologist with extremely limited training and experience in the field of rodent control, ventures into this phase of the subject with not a little hesitancy and reluctance. While the suggestions that will follow are based upon experiences and observations made over a period of years in Iowa, perhaps you will do well to verify or correct any comments that are made by contacting authorities on the subject of rodent control in your respective states or the Fish and Wildlife Service in the Department of the Interior. The rodent pests most likely to be encountered on the average golf course include ground squirrels, pocket gophers and groundhogs. Moles, although not true rodents, are included for good measure.

Trapping, shooting and drowning are methods often employed for reducing ground squirrel populations. These methods are successful if followed persistently, but if used intermittently they will tend to make the ground squirrels wary and result in scattering the population.

Poison bait can be used successfully in controlling ground squirrels on a large scale. With baits it is possible to poison most of the burrows and thus kill a large percentage of the squirrels at one time. Shelled corn or oats soaked in a solution of strychnine (1 oz. of strychnine sulphate in 2 qts. of water) are frequently used for this purpose. Grain poisoned in this fashion should be scattered around the entrance to the burrows and should never be placed out in piles where it may be picked up by other animals.

A number of fumigants including carbon disulphide, calcium cyanide and carbon monoxide (from the exhaust of an automobile or other gas engine) may be used to kill the squirrels in their burrows. In some ways the use of fumigants is more satisfactory than the use of poison bait since the fumigant penetrates to the very bottom of the burrow and usually kills all animals present. Furthermore, the possible danger of poisoning birds and animals through the careless use of bait is eliminated. In fumigating with carbon disulphide a wad of cotton or waste is saturated with the liquid and stuffed into the entrance of the burrow. Calcium cyanide either in granular or dust forms may be introduced into the burrow with a long-handled spoon or by means of a cyanide dust gun. In using car exhaust gas, attach a length of garden hose to the exhaust pipe of the automobile and insert the other end of the hose into the burrow. With any fumigant it is desirable to close the burrow entrance with a piece of sod or a quantity of moist soil following the introduction of the fumigant.

For those who are willing to spend the time required to develop the art, trapping is a very successful method of handling a small gopher problem. The most successful method of controlling pocket gophers on a large scale, however, involves the use of poison bait. Since the pocket gophers feed on the roots of plants, cut carrots, parsnips, turnips, sweet potatoes, Irish potatoes and other vegetables may be used as bait. To prepare a suitable bait, cut the vegetables into pieces about ⅜ inch square and 1 to 1½ inches long. In preparing the bait it is important to get the poison evenly distributed over the individual baits. To do this, mix 1/16 oz. of powdered strychnine alkaloid with 1 tablespoonful of ordinary kitchen flour. Place the freshly cut bait in a paper sack and sprinkle one half of the strychnine-flour mixture over the bait. Close the sack and shake it vigorously for about one minute. Then add the other half of the poisoned flour mixture and shake again. In this way an even distribution of the poison over the bait is reasonably assured. As soon as the poison is applied, the baits are ready for use.

Since the pocket gophers seldom if ever leave their burrows beneath the surface of the soil, the baits must be introduced into the runways. A three foot section of broom handle pointed at one end makes a very useful probe for locating runways, and a probe of this size makes an opening large enough to permit dropping the bait down into the runway. The bait should be dropped into the main runway which can easily be located by observing the position of the high point of the mound. As a rule, the high point is near one edge of the mound and usually the mound is flat in-

stead of round at this edge. The main runway is usually from 10 to 16 inches away from the flat side of the mound. When the runway has been located and probed, two or three pieces of bait should be dropped into the burrow and the probe hole carefully closed in order to prevent the entrance of light.

Groundhogs seldom present a serious problem on open golf courses, but at times they may move in and construct dens in the banks of streams, bunkers, terraces or a grade cut. The presence of a few groundhogs may add a new spark of life and interest to the course and their destruction would be unwarranted. However, when their presence is objectionable they can be easily destroyed with any of the fumigants recommended for the control of ground squirrels. As a rule 2 teaspoonfuls of granular calcium cyanide, tossed into each entrance to the den will do the job. All openings should, of course, be closed with soil or sod to seal the gas in the den. During the summer and fall months groundhog burrows may be inhabited by any one of several harmless or valuable fur-bearing animals. Therefore, in the interest of protecting these animals, the fumigation of groundhog dens should be restricted to a short period in the spring when the young are still with the parents and there is little likelihood of other animals entering the den.

Several different species of mice inhabit permanent grass sod in open fields and semi-timbered areas. Frequently meadow mice and perhaps other species become serious pests in young orchards, nurseries and valuable landscape plantings where they may do considerable damage by breaking and girdling young trees and shrubs.

Specialists in the U. S. Fish and Wildlife Service have developed a bait and a baiting technique that will give excellent control of these pests. Anyone interested in the control of field mice can obtain instructions for preparing and using the bait by writing the U. S. Fish and Wildlife Service.

Unlike rodents, moles live chiefly on earthworms and insects that inhabit the soil. To the extent that they destroy harmful insects, they are beneficial and might be protected were it not for the fact that the ridges and mounds they produce often disfigure or damage lawns, fairways, and even greens.

Several methods for catching or destroying moles have been suggested, but since all of the methods involve tedious painstaking effort and none are completely or outstandingly effective, it is only natural that we find some difference of opinion as to the best or most effective procedures. Trapping the animals with specially designed mole traps is perhaps the most widely used method. Some operators with a thorough knowledge of moles and their habits develop considerable skill and find this method eminently successful, while others have grave difficulty in catching even a single mole.

Where hose connections are available, moles may be drowned out by flooding the runways, especially during April when the young are most likely to be in the nest and cannot escape. Some gardeners, while working in the vicinity of mole runs can detect the movement of the moles just below the surface and quickly throw them out with a shovel or fork. Systematic fumigation of the runways is often very effective. In fumigating, all of the runways should be treated at the same time, and this method will prove most effective if the fumigant (carbon disulphide, calcium cyanide, or carbon monoxide) is introduced into the runway at intervals of not to exceed 8 or 10 feet. Since the moles, on detecting the first trace of gas, may quickly construct a soil dam in the burrow, car exhaust gas and calcium cyanide dust blown into the burrows with some force are more effective than fumigants that have to move through the burrows by diffusion. Several years ago the late W. P. Flint of Illinois observed that moles were seldom present and would not persist in soil treated with lead arsenate. Whether the moles are killed by eating poisoned insects and worms or whether they are forced to move out of the area in search of food is not known. This observation is worthy of note, however, and may well deserve thoughtful consideration.

During the war at least two new rodenticides, Antu (alphanaphthylthiourea) and 1080 (sodium fluoroacetate) were developed primarily for use in rat control. Both materials have received considerable publicity and may eventually be extensively used for the control of rats and other rodents. For the time being, however, red squill is perhaps the best material to use wherever there is danger of poisoning wild or domestic animals.

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