IDENTIFY -- Then Get Busy

By George C. Decker, Entomologist
Iowa State College*

SUCCESSFUL control of turf infesting insects depends largely upon recognition of the infestation in its incipient stages and accurate identification of the insects involved. In view of this fact, it is important that greenkeepers and others charged with the responsibility of maintaining high quality turf be able to detect the first signs of insect activity, and whenever possible anticipate outbreaks and thereby prevent them.

For the sake of convenience, turf infesting insects may be divided into three groups: (1) those which feed upon leaves, including sod webworms and cutworms; (2) those subterranean forms which feed upon the roots, such as white grubs; and (3) those which, like the chinch bug, suck the juices from the plants. In general it may be said that the proper insecticide to use and the best method of applying it is more or less automatically determined when the insect pest is properly placed in one of the above mentioned categories.

Many Species of Sod Webworms

Although seventy or more species of moths belonging to the genus *crambus spp* (sod webworms), are known to occur in the United States the geographical distribution of the species is such that probably not more than 25 or 30 species occur in any one state and of this number not more than 5 or 6 species can be regarded as pests of economic importance. The others either feed upon weeds and comparatively valueless vegetation or are so suppressed by natural forces that they have never become sufficiently abundant to attract attention. The adult moths are particularly noticeable as they flit about the grass just at dusk.

When at rest these moths hold their wings very close to the body, in fact almost wrapped around them, and this characteristic is used to distinguish them from other moths and accounts for the name, "Close-Winged Moths," commonly applied to the group. For the most part they are gray, whitish, or yellowish with varied color markings. The species also vary in size. The smaller moths are approximately one-half inch long and not quite as large in diameter as a common match whereas the larger moths are fully twice that size.

All of the species for which the life cycle is known spend the winter as partly grown larvae in small cocoons or hibernacula which are usually attached to the base of the plants. With the advent of spring the larvae emerge, resume feeding and when full grown they retreat into their burrows where they pupate in especcially prepared cells. Two or three weeks later the adult moths emerge, mate, and deposit their eggs which are dropped indiscriminately to the ground or into the grass as the moths flit about or as they come to rest upon some plant.

Eggs Hatch Within 10 Days

Most of the eggs are deposited within the first one or two hours of activity in the evening and since the moths tend to remain quiet and more or less secluded in tall grass during the day, it is not uncommon to find increased oviposition in the rough, in low spots, around bunkers and near water hydrants. The eggs hatch in a week or ten days depending upon prevailing weather conditions. The newly hatched larva begins at once to feed upon the leaves of the first accessible grassplant it finds and also begins to spin a web about itself and the grass blade. As the larva grows it extends its web to the surface of the soil or deserts it and starts a new web. In time it constructs a rather extensive network of silken tunnels at, or in some cases, slightly below the surface of the soil. Once established in its subterranean home the larva feeds by advancing to the open end of the tunnel, cutting a leaf off near the base and then drawing it into the retreat where it can be consumed at leisure.

* G.S.A. Convention Address.

•

Annual dinner meeting of the service section committee of the Massachusetts Golf Assn. and the Greenkeepers Club of New England was held at the Brae Burn CC, West Newton, Mass., April 4.

Principal speaker was O. J. Noer, Milwaukee Sewerage Commission, who spoke on the trying conditions experienced by many courses last year. He illustrated his talk with colored slides. Chairman Harry Hood of the service section committee was toastmaster.

During its lifetime each larva consumes between 1,000 and 2,000 linear millimeters of bluegrass leaves and since they are small and eat so little at first, about two-thirds of this amount is eaten during the last week or so of larval life. This in part at least explains why many people erroneously feel that a webworm outbreak is something that comes on suddenly and leaves almost as abruptly.

During the summer months the time required for a larva to complete its development from the egg to the pupal stage varies from four weeks to over two months depending upon weather conditions and the species of webworm involved. Thus, the bluegrass webworm *Crambus teterrellus* Zn. frequently has three complete generations a year in Iowa, and *C. trisectus* wk. and *C. mutibilis* clem normally have two generations a year. The fact that the overwintering larvae of *C. vulgivagellus* clem. and *C. ruricolellus* enter a resting stage when they reach maturity in early summer and do not pupate until August, results in these species having but one generation each year. This quirk of nature may be a rare bit of good fortune for the greenkeeper for when we consider the situation year after year these latter species are usually the most common of all the crambid moths to be seen on Iowa grass lands during August and September.

A rather wide variety of insecticides have been used in the control of sod webworms and each has had at least a temporary sponsor. All have their advantages and also their disadvantages.

Treat with Lead Arsenate

Lead arsenate was one of the first compounds used and it has undoubtedly gained more favorable recommendations than any other insecticide yet suggested, but it has also received its share of criticisms many of which appear to have been rather unfair and reflect erroneous use of the material rather than the inability of lead arsenate to destroy the worms. The author began using lead arsenate for the control of webworms in 1931 and since then, lead arsenate has been used with marked success whenever webworms were sufficiently abundant to warrant control measures, and a great deal of valuable information on the use of lead arsenate has been accumulated.

In the first place, successful control depends upon detection of the worms when they are still half grown or smaller. As already mentioned, once they have entered the last stage of larval development their food requirements are greatly increased and damage to the turf progresses with such rapidity that a slow acting treatment must be abandoned in favor of a treatment which will show immediate results. Also in cases of very severe damage there is often insufficient green foliage left within reach of the worm to carry a lethal dose of the poison.

Tests for Webworm Presence

A week or more after crambid moths have been abundant, or when for any other reason the presence of webworms is suspected, the turf should be tested by treating small sample areas with pyrethrum solutions which will bring the webworms to the surface where they may be counted. Sometimes this is accomplished by temporary flooding. If several larvae emerge from each square foot of treated turf it is time to make an application of lead arsenate. Two pounds of lead arsenate in twenty gallons of water applied to each 1,000 square feet of turf with a spray machine maintaining at least 90 pounds pressure, has given the best results. In several instances, however, fair results have been obtained by using only 1 or 1½ pounds of lead arsenate. Also fair to good results have been obtained when the poison was applied dry with an efficient hand duster.

In all cases it is necessary that watering of the greens be delayed for at least 48 hours after the poison has been applied. Larvae discontinue feeding for a period of from 24 to 48 hours at moulting time and therefore an earlier sprinkling might wash the poison off the grass blades and into the soil before many of the worms have a chance to feed upon the poisoned foliage. Lead arsenate solutions applied with sprinkling cans, ejectors or other proportioning devices have invariably given very inferior results, partly because the large water drops strike the grass and run off carrying the poison with them.

Naturally the recommendation of washing the poison down into the turf is erroneous and this should never be followed, for although the worms dwell in tunnels in or near the soil, they feed on green leaves and to be effective the poison must remain on the leaves until it is eaten. The cost of materials is reasonably low, being approximately 25 or 30 cents per 1,000 sq. ft. of turf treated. Lead arsenate will not injure grass, and is not apt to react unfavorably with other chemicals subsequently used as fungicides or as fertilizers. Repeated applications also

tend to build the lead arsenate content of the soil up to a point where it acts as a prophylaxis or a control measure for grubs, earthworms and other subterranean pests.

When an infestation is not detected until damage is well advanced it is often desirable, if not absolutely necessary, to resort to some other treatment, using such insecticides as pyrethrum extracts or oil emulsions.

Pyrethrum for Advanced Cases

A number of pyrethrum sprays are on the market and these vary considerably in their pyrethrin content and in cost. The product selected should be used in accordance with the manufacturer's recommendations but it is well to check these recommendations with the pyrethrin content of the product and see that you are using approximately one gallon of solution containing 0.004 percent pyrethrin on each square yard of turf treated. These solutions may be applied with a sprayer or with an ordinary sprinkling can. Materials will probably cost between $2.00 and $3.00 per 1,000 sq. ft. of turf. Pyrethrum solutions are non-injurious to the grass and are not apt to have any effect whatever on subsequent treatment of the green. They show immediate results and a moment or two after treatment the worms can be seen wriggling their way to the surface where they soon die. The only objection to the extensive use of pyrethrum is its high cost.

Home-made kerosene emulsions diluted at the rate of 1 part to 50 parts of water and applied at the rate of 1 gallon to each sq. yd. of turf have given good control of sod webworms. Like pyrethrum the oil emulsion brings the worms to the surface in a very short time but the cost of materials is much lower, being about 25 cents per 1,000 sq. ft. of turf. The principal disadvantage in its use is the uncertainty of getting a good stable emulsion. Ordinarily a poor suspension is obtained in which case the free kerosene causes serious burning. In some cases this burning has proved more serious than the webworm outbreak. Since soap is used in making the emulsion, ammonium sulphate should not be used to stimulate the greens after treatment because of a chemical reaction which releases free ammonia with disastrous effects on the grass.

Several species of cutworms frequently infest lawns and golf greens and their work is very often confused with or mistaken for webworm injury. The mature worms are from 1½ to 1¾ inches long and about the diameter of an ordinary lead pencil. They are usually dirty-white, grayish or brown in color and nearly always marked with a series of stripes lengthwise of the body. Their more robust bodies and longitudinal stripes make even cutworms rather easy to distinguish from the slender and more conspicuously spotted webworms.

The Goodall Company's round-robin tournament, which will be played at Fresh Meadow CC (N. Y. Met. district) June 1-4, has been getting a big publicity build-up. Fourteen leading pros will compete for the $5,000 the makers of Palm Beach cloth put up. The event, inaugurated at Cincinnati last year, takes the place of Goodall's annual award to the best-dressed pro, a publicity stunt that had strong effect on men's summer apparel business.

•

In Iowa the 2 lbs. of lead arsenate in 20 gals. of water recommended for webworms has given better than 90% control of cutworms in practically all cases but a few species are not easily controlled by lead arsenate and when these are encountered the use of the regular poison bran bait is recommended.

Formula for poison bran bait:

Wheat Bran	25 lbs.
White Arsenic*	1 lb.
Molasses	2 qts.
Water	8 qts.

**One pound of paris green or sodium fluosilicate may be substituted for the white arsenic.*

The moist bait should be scattered thinly but uniformly over the infested grass at the rate of 2 lbs. of bait to each 5,000 sq. ft. of turf. To obtain the best results the bait should be scattered in the evening, preferably about sundown.

White grubs, which are the larvae of the common May beetle or June beetle, frequently seriously damage lawns, and recreational turf areas as well as agricultural grass land.

June Beetle Life Cycle

The winter is passed in the soil in both the larval and adult stages. About the time that trees put forth leaves in the spring the adults emerge. They leave the soil at dusk and fly to nearby trees where they spend the night feeding upon the tender leaves. At dawn the beetles suddenly leave the trees almost as if by a military command and return to the soil

where the females deposit their eggs. The eggs hatch in 2 or 3 weeks and the young grubs begin at once to feed upon the roots of grasses and other plants. In the fall the grubs, which are then about ½ inch long, migrate to lower soil levels, usually below the frost line. The warmth of spring brings the grubs to the surface again and feeding on the grass roots is resumed.

Now with their increased size and proportionately increased appetites and a full growing season ahead, they are capable of doing serious damage. Very often by midsummer the grubs have so completely destroyed the grass roots that large sections of the turf can be rolled up like carpet. Cold weather again sends the grubs to lower levels for the winter and in the spring of the third season they return to the surface where they feed for only a few weeks and then pupate. Later in the summer they change to the adult stage, but these adults do not leave the pupal cells until the following spring. Most of our common species follow this three year life cycle and as a rule grub damage is most severe the second year, i. e., the year following the season of heavy June beetle flights.

Don't Treat Unnecessarily

Efficient control of white grubs presupposes the early detection of the infestation, otherwise emergency methods and increased quantities of insecticides will be required. This, however, does not necessarily mean that all turf should be treated as a general precaution against a possible attack by grubs. Where grubs are a serious problem year after year such a practice is unquestionably commendable but in areas where grubs seldom if ever do appreciable damage to grass-lands wholesale treatment is unwarranted. In such areas the practice of sampling the turf and checking the grub population each year would seem to offer a more logical approach to the problem. The finding of a few stray grubs would serve as a warning, whereas the finding of several grubs per sq. ft. would be interpreted as a demand for immediate treatment of the turf.

Of all the insecticides that have been tested for grub control, acid lead arsenate repeatedly has given the most satisfactory results. When applied early as a preventative measure, 5 lbs. of lead arsenate per 1,000 sq. ft. of turf has given good control; but when an infestation is not detected until the grubs have attained considerable growth and injury is quite conspicuous, applications as high as 10 pounds per 1,000 sq. ft. are frequently recommended. The manner of applying the poison is unimportant. It may be applied as a dry dust, a spray, or in combination with a topdressing or fertilizer. It is, however, important that the poison receive uniform distribution and that it be washed into the soil, preferably without flooding which might result in large accumulations of the poison in low spots.

Manufacturers Take Over Course at Ohio Equipment Show

GOLF course superintendents and club officials within a 300 mile radius of Columbus, Ohio, are expected to attend an outdoor equipment demonstration to be staged at the Brookside CC, Columbus, Monday, May 22.

This event, sponsored by the Ohio Golf Course Supt's Ass'n, will be handled differently than other outdoor exhibits, in that each manufacturer will be allotted a separate fairway from tee to green to demonstrate his product. Lots will be drawn for selection and the dealers must depend upon their own promotional ability to attract the spectators. Material dealers not handling moving equipment will be given locations suitable for their displays also.

Mack Burke, veteran greenkeeper at Brookside, will act as ring-master for this equipment circus and all manufacturers will be required to furnish their own "barkers" and "pitch-men".

Plans for the evening include a banquet at the clubhouse with Fritz Howell, state A.P. sports chief, acting as toastmaster. "Red" Troutman, president of the American Baseball Assn', is slated to speak, along with his honor, Governor of Ohio, John Bricker.

The Columbus contingent is secretly nourishing a plan to promote the national G.S.A. annual conference some time in the near future in conjunction with an outdoor show, and consequently is making every effort to make this event a gala success.

Lawrence Huber, Wyandot CC, Columbus, president of the O.G.S.A., and John McCoy, secretary-treasurer, greenkeeper at the University GC, Columbus, are assisting Mack Burke with his plans for this interstate event.