1991 ENTOMOLOGY RESEARCH REPORT

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TURF INSECTS 1991

The most devastating injury this year was the widespread damage to home lawns caused by Japanese beetle and European chafer grubs in the southern three tiers of counties in the lower peninsula. Some entire neighborhoods turned brown in late September. These two species continued to expand their range in Michigan, accounting for the unexpected infestations in some areas. Michigan is on the leading edge of the westward range expansion for both species (Figure 1). Japanese beetle adults also seemed to be more abundant than usual in some areas this year. This led to more grubs and greater damage than usual in September. Heavy emergence of adult beetles in 1991 may be related to frequent precipitation in May and June, allowing the larvae to successfully pupate and emerge as adults; or it may be a result of the general increase and spread of these beetles in Michigan. In several cases, lawn care professionals claimed that various insecticides were not effective for grub control. In most cases, these reports could be explained by one of the following:

1. Expectations of insecticide control were too high. Lawn managers were expecting to find zero grubs after insecticide application when 50 to 80% control is more likely.
2. No irrigation was applied after insecticide treatment.
3. Applicator did not wait long enough to evaluate activity of slow acting formulations such as Oftanol 5G (wait three weeks to evaluate).

In some cases, insecticide failures could not be explained. Because of the widespread distribution of Japanese beetle and European chafer in southern Michigan, lawn managers are encouraged to check lawns for grub activity in late August. Home lawns with more than 7 grubs per square foot should be irrigated frequently or treated with an insecticide. Lawns with more than 15 grubs per square foot are likely to show some damage by October, unless an insecticide is applied.

Chinch bugs and bluegrass billbugs continued to damage a small portion of home lawns in almost every county in the state. Although only one in twenty lawns may be heavily infested, the damage may be severe enough for a customer to drop their current lawn care service. Preventive insecticide applications are not recommended because they may cause thatch build-up and future insect problems. Home lawns should be observed in July for potential chinch bug and billbug problems

Sod webworm, cutworm, greenbug, and ataenius were rarely reported as a problem on home lawns.

The most widespread insect problem on golf courses across the state was the turfgrass ataenius. About one in five courses had scattered ataenius damage to fairways, and one in ten had larger patches of dead turf, with some of them being more than 20 feet long. For an unknown reason, ataenius problems seem to be more frequent in the last three years than they were previously. Grub injury is always more widespread in dry years when turf is water stressed. However, weather conditions alone do not seem to adequately explain an increase in ataenius problems. One factor may be the lack of natural enemies of ataenius on golf courses. Natural enemies seem to be effective on home lawns where ataenius is rarely a problem. Perhaps some management practice is suppressing an important pathogen or predator of ataenius grubs.

Ants continue to be a problem on many golf courses, particularly ones with sandy soil. Soil insecticides such as Dursban and Triumph suppress ant mounding for 2 to 4 weeks after each application. Superintendents do not like the burden of monthly insecticide applications to tees and greens because of the cost of labor and pesticide, and the hazards associated with insecticide handling. In some places, the ant mounding on fairways is also a problem. This presents an even greater problem because frequent insecticide applications are almost cost prohibitive on fairways.

Some golf courses in southern Michigan that never had grub problems before developed a problem this year. Most of the damage was to roughs and not fairways, probably because of daily irrigation and insecticide use on fairways. In many cases, the skunk damage in September was worse than the grub damage. Superintendents found various ways to remove skunks, including a trap and release method.

Black cutworms were occasionally a problem on tees and greens. Insecticides were sometimes used to prevent them from making pencil-sized tunnels in the green, and clipping grass blades around their tunnels, leaving golf ball-sized yellow marks.

Billbug, chinch bug, June beetle grubs, and greenbugs were rarely found to be a problem on golf courses this year. Some nuisance insects became abundant toward the end of the year. Yellow jacket wasps and the even larger cicada killer wasps were abundant in some places. Generally, a soil insecticide sprayed over the ground where they are nesting, followed by irrigation, is effective in eliminating them from areas where they may be a nuisance.

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Most home lawns and golf course fairways do not need insecticide treatment, and may actually be hurt by unnecessary applications. Insecticides eliminate natural enemies, suppress decomposers, and cause a build-up of thatch. The best approach is integrated pest management (IPM). In IPM, low populations of pest insects are tolerated, and other management strategies such as daily irrigation and the planting of resistant cultivars are used as much as possible. A key component of IPM is the use of a threshold value for insect pests. When the pest species is below threshold level, no insecticides are used. When it exceeds the threshold, an insecticide may be applied to prevent turf damage. Better information is needed to determine accurate thresholds for grubs in turf.

In 1990, we initiated a project designed to define thresholds for grub injury to turf and how these thresholds are affected by irrigation practices. Part of the confusion for turf managers is that when the soil is moist, root-pruning injury may not be expressed as a visible symptom. The blades may remain green and apparently healthy even when the root system has been seriously injured by grubs. Then, under dry weather conditions and water stress, the grass suddenly wilts and dies.

In initial tests, rooting boxes worked well as a method of evaluating root damage caused by grubs. In 1990, a negative correlation was found between the number of grubs per square foot and root strength. However, no correlation was found between percent brown or dead turf and the number of grubs per square foot. This was expected for irrigated turf and supports the initial hypothesis that some kind of root strength parameter is needed to evaluate grub injury.

In 1991, we refined the rooting box method to obtain better information on grub feeding damage to turf. Zero, 10, 20 or 30 grubs were placed inside each rooting box after the turf was well established and the roots had grown through the wire mesh into the soil below the boxes. The boxes were pulled up six weeks later and the force required to lift them was measured.

A strong relationship was found between the number of grubs per square foot and the force necessary to lift the rooting boxes (Figure 2). The data from this test indicates that 15 - 18 grubs per square foot will remove about 50% of the turf root system within six weeks. This agrees with some recent thresholds for grubs estimated to be 15 - 20 grubs per square foot. This seems to be a good working threshold because the turf will remain green and appear to be healthy, even with 20 grubs per square foot, as long as it is not severely water stressed. More research is necessary to determine thresholds for water stressed turf.

EUROPEAN CHAFER TEST

(Table 1) A grid of 3 ft x 3 ft plots separated by 1 ft wide buffer strips was established at Blythefield Country Club in Belmont, Michigan. The plots were established on irrigated rough with sandy soil. Each insecticide treatment was replicated six times. Granular insecticides were applied with modified "salt" shakers. Insecticides were mixed with 1500 ml of water and applied at a rate of 137 ml/9ft^2 (175 gal/acre) with single nozzle, hand-held wand CO_2 sprayer from R&D Sprayers. The application was made at 50 psi through an 8003 flat fan nozzle.

Several of the NTN 33893 treatments were applied in June and July prior to egg laying, and the rest of the treatments were applied to second and third instar grubs in August. All treatments were applied between 10:00 AM and 12:30 PM. The entomophagus nematodes from Biosys and the Triumph treatment were applied while the grass was wet with dew, then hand irrigated with ¼" of water applied through a watering can immediately after application. European chafer larvae were counted on September 16 by removing a 14 in x 14 in area from the center of each plot.

All of the insecticide treatments and none of the nematode treatments reduced the number of European chafer larvae compared with the control (Table 1). NTN 33893 applied in June or July as a granular or flowable formulation provided the best control (0.0 to 1.2 grubs per sample). Mocap and Dylox were also very effective (1.0 and 2.2 grubs per sample, respectively) compared with the control treatment (15.8 grubs per sample) but not as effective as when it was applied in June or July. Lesco 19299 and 19312, Sevin 7G, Triumph, and Sevimol also reduced the number of grubs per sample (5.3, 5.5, 7.8, 8.0 and 10.2, respectively) when compared with the control treatment (15.8, Table 1).

ANT TEST

(Table 2) 12 ft x 12 ft plots (144 ft^2) separated by 3 ft buffer strips in a fairway infested with ants at the Ionia Golf Club in Ionia, Michigan were used for this test. Treatments were applied July 25. Each treatment was replicated six times. Plots were sprayed with an R&D hand-held boom sprayer with four 8006 nozzles at 50 psi for 24 s (to give 4 gal/1000 ft^2). Granular products, which had been pre-weighed, were applied evenly throughout the plots with custom-made hand shakers. The fairway was irrigated 3-5 times per week depending on rainfall. Active ant mounds were counted just prior to insecticide treatment and once per week for 5 weeks afterward. Ant mounds were counted from a standing position.

Before insecticides were applied, all treatments had a similar level of ant activity (56-74 mounds per 144 ft^2, Table 2). Dursban 1G, Dursban 4E and Pageant ME20 reduced the number of ant mounds by 88-95% at one wk after treatment. After five weeks, the same treatments still provided ant control, but at a lower level (53-65% reduction). Orthene 5G at 3.0 lb AI, Orthene 5G at 1.0 lb AI and Orthene 76.1 S at 1.0 lb AI reduced ant mounding for 3, 2 and 1 weeks, respectively, after treatment. The greatest level of control for any Orthene treatments was a 64% reduction one week after treatment with Orthene 5G at 3.0 lb AI (Table 2).

CHINCH BUG TEST

(Table 3) A grid of 3 ft x 3 ft plots separated by 2 ft wide buffer strips was set-up in a home lawn with an infestation of chinch bugs in Okemos. Chinch bugs were counted in each plot on July 10 before insecticides were applied. Counts were made by observing each plot for a timed one minute period. The treatments were blocked out based on these counts. Afterward, six replications of each treatment was applied on July 10 between 10:00am and 3:30pm. The temperature when treatments were made was 85° - 90°F with a 0-5 mph wind. Granular products were evenly applied over the plot with hand-held shakers. Liquid products were applied with a single nozzle, hand-held CO_2 sprayer from R&D Sprayers. The application was made at 50 psi through an 8003 flat fan nozzle. Liquid insecticides were mixed with water and applied at a rate of 136.8 ml/9 ft^2(4 gal/1000 ft^2). Chinch bugs were counted again in all plots on July 17, except for NTN 33893 plots, which were counted on August 2. Each plot was observed for 3 min to determine the number of chinch bugs present. The lawn was mostly Kentucky bluegrass with ½" thatch layer and a sandy loam soil. The area was irrigated every other day before the test, but not irrigation was applied after July 10.

None of the insecticide treated plots had less chinch bugs than the control plots 7 days after application (LSD,P=0.05, Table 3). However, plots treated with M-Pede had more chinch bugs (10.8) than control plots (4.0). The Sevimol, Dursban, Mocap, and Pagaent treatments had less chinch bugs (0.3-0.8) than the M-Pede and Sevin 7G treatments (Table 3).

Table 1. Insecticides tested for control of European chafer grubs at Blythefield Country Club in August and September, 1991.

Treatment	Rate	Date applied	n	Mean number of grubs per 1.4 sq ft
NTN 33893 240F	0.335 lb AI/acre	3 Jun	6	0.0 a
NTN 33893 0.5G	0.25 lb AI/acre	15 Jul	6	0.3 a
NTN 33893 0.5G	0.375 lb AI/acre	15 Jul	6	0.5 a
NTN 33893 0.5G	0.375 lb AI/acre	3 Jun	6	0.5 a
Mocap 10G	5.0 lb AI/acre	18 Aug	6	1.0 ab
NTN 33893 0.5G	0.25 lb AI/acre	3 Jun	6	1.2 abc
Dylox 6.2G	8.0 lb AI/acre	18 Aug	6	2.2 abc
NTN 33893 0.5G	0.375 lb AI/acre	18 Aug	6	3.8 abcd
NTN 33893 0.5G	0.25 lb AI/acre	18 Aug	6	5.0 bcd
Lesco 019299	4.0 lb AI/acre	18 Aug	6	5.3 bcd
Lesco 019312	4.0 lb AI/acre	18 Aug	6	5.5 cd
Sevin 7G	8.0 lb AI/acre	18 Aug	6	7.8 de
Triumph & 1/4" Irrigation	1.5 lb AI/acre	18 Aug	6	8.0 de
Sevimol 4SC	8.0 lb AI/acre	18 Aug	6	10.2 e
Control for chemicals		--	6	15.8 f
Biosys #2	5.0 million flowable	18 Aug	6	12.7 a
Biosys #27	15.0 million flowable	18 Aug	6	17.3 a
Control for nematodes		--	6	17.8 a

Treatments followed by the same letter are not significantly different (P = 0.05, Tukey's HSD)

Table 2. Ant control test at Ionia Golf Club. Insecticides were applied to a heavily infested fairway on July 25, 1991.

Treatment	Rate lb (AI)/acre	Mean number of ant mounds per 144 ft^2 plot 25 Jul	1 Aug	7 Aug	14 Aug	20 Aug
Dursban 1% G	2.5	67.3 a	6.8 a	10.0 a	7.8 a	14.5 ab
Orthene 5% G	1.0	56.2 a	27.7 bc	34.5 bc	17.1 bcd	25.0 c
Orthene 76.1 S	1.0	67.0 a	34.2 c	44.3 cd	20.3 cd	36.8 d
Dursban 4E	1.0	74.2 a	2.6 a	8.8 a	8.5 a	13.3 a
Pageant ME 20	1.0	64.3 a	4.8 a	11.0 a	10.8 ab	15.2 ab
Orthene 5% G	3.0	66.0 a	19.8 b	26.8 b	14.8 abc	23.7 bc
Control	--	68.0 a	57.8 d	53.5 d	23.3 d	32.7 cd

Treatments followed by the same letter are not significantly different (P = 0.05, LSD)

Table 3. Control of chinch bugs in a home lawn in Okemos, Michigan. Insecticides were applied on July 10, 1991.

Treatment	Rate	n	Mean number of chinch bugs per plot 17 July	2 Aug
Sevimol 4SC	6.0 lb Al/acre	6	0.3 a	
Dursban 50W	1.0 lb Al/acre	6	0.3 a	
Mocap 10G	5.0 lb Al/acre	6	0.5 a	
Pageant ME 20	1.0 lb Al/acre	6	0.5 a	
Dursban 4E	0.5 lb Al/acre	6	0.7 a	
Dursban 4E	1.0 lb Al/acre	6	0.8 a	
Tempo 20WP	0.14 lb Al/acre	6	1.3 ab	
NTN33893 240F	0.5 lb Al/acre	6	1.5 ab	
M-pede	1%	6	3.3 ab	
Dylox 80	5.4 lb Al/acre	6	3.5 ab	
Control	- -	**6**	**4.0 ab**	
Tempo 2EC	0.14 lb Al/acre	6	4.3 ab	
Sevin 7G	6.0 lb Al/acre	6	6.0 bc	
M-pede	2%	6	10.8 c	
NTN33893 240 F	0.5 lb Al/acre	6	10.8 c	5.8 a
Control	--	6		9.3 a

Treatments followed by the same letter are not significantly different (P = 0.05, LSD)

Figure 1. Japanese beetle and European chafer distribution in the United States in 1987 (from Turfgrass Insects of the United States and Canada, H. Tashiro).

Japanese Beetle

European Chafer

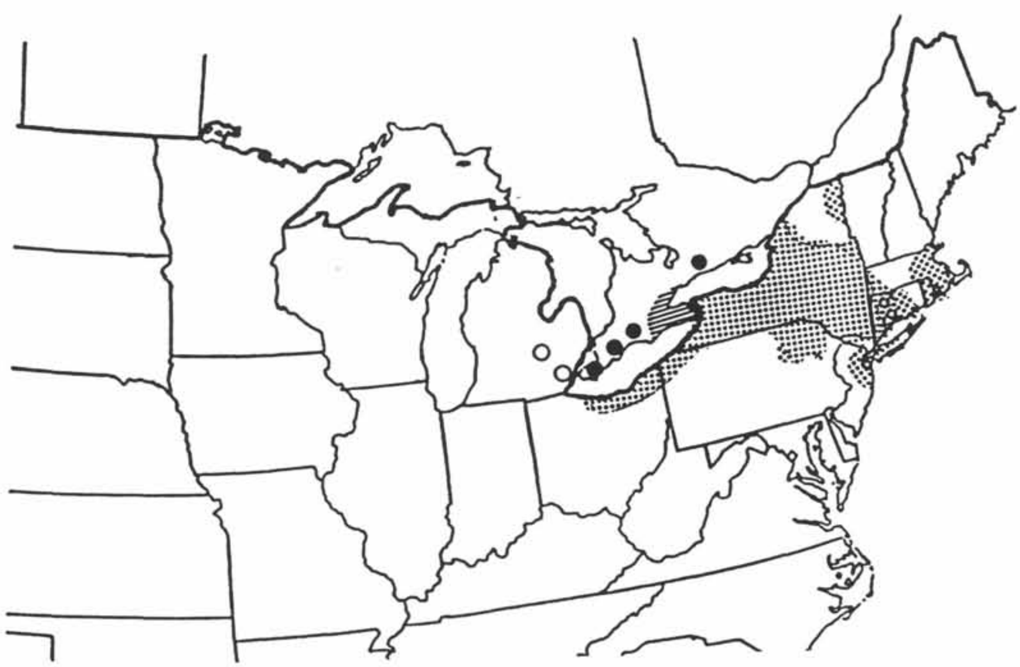

Figure 2. The amount of root damage to turf grown in rooting boxes with different numbers of Japanese beetle grubs.