Turfgrass Entomology Report 1988

D. Smitley, Department of Entomology
Michigan State University, East Lansing, MI 48824

Introduction

The first half of the growing season in 1988 set new records for the least amount of precipitation in 2, 3 and 4 month periods. Insect injury was a minor concern compared to drought stress injury to turfgrass. The extreme weather conditions provided an unusual opportunity to observe turfgrass insect pests under drought conditions. In this report I first discuss my observations of insect problems throughout the state of Michigan in 1988. These comments are based on what I saw in my limited travel around the state, and do not reflect my scientific endeavor. Secondly, I will briefly discuss 1988 turfgrass insect research projects.

Golf Course Insect Problems in 1988

In general, golf course insect pests were not affected by the drought. An exception may be the tendency of black cutworm and bluegrass billbug adults to move into irrigated fairways to deposit eggs. There may have been more movement away from dry roughs and into fairways in 1988 because some turfgrass roughs were so dry that they were no longer suitable for oviposition. Several golf courses reported unusual cutworm damage in 1988. I also observed an unusually high level of bluegrass billbug injury to some golf course fairways. Superintendents tend to overlook billbug damage because it can only be correctly diagnosed during a brief period (from July 1 to August 1 in central Michigan).

Golf courses throughout Michigan continued to have problems with ants. Insecticides such as Turcan or Dursban seem to suppress ant mounding for only 1 to 3 weeks per application. More work is needed on ant control on golf courses. And at the same time we need to learn more about the beneficial effects of ants in turfgrass. These questions will probably be studied by reviewing the available literature and evaluating experimental turf plots in 1989.

Japanese beetle continues to slowly expand its range in southern Michigan. The most heavily infested areas are around Monroe, Ann Arbor, Detroit, Jackson and Kalamazoo.

In contrast to Japanese beetle, European chafer is rapidly expanding its range around Detroit and Grand Rapids. At this rate, we could see a continued band of infestation from Detroit to Grand Rapids by 1995.

Black turfgrass Ataenius continues to plague golf courses throughout the state. Some 10% of all golf course managers feel they have enough Ataenius grubs to justify applying insecticide to prevent injury.

Home Lawn and Recreational Turfgrass Insect Problems in 1988

In most cases, insect problems were of little concern compared to drought injury. However, because of the drought, some unusual things happened. In some areas, home lawns became so dry that chinch bugs and billbugs either died or moved to areas with more moisture. By July chinch bugs and billbugs were difficult to find in completely dry lawns. This may be because there was not enough moisture left in the drying grass crowns to support billbug or chinch bug feeding. The highest population and greatest injury was found on irrigated lawns or in areas of the state that received enough rain to keep home lawns alive.

Sod webworms, June beetle grubs (Phyllophaga spp.), Japanese beetle and European chafer continue to be a problem in localized areas. More home lawns are becoming infested with European chafer grubs around Detroit and Grand Rapids.

Chinch Bug Research

1988 was the third and final year of a project designed to determine what types of lawns are most likely to have chinch bug problems. The third year of study confirmed findings from the first two years: lawns at the highest risk of chinch bug infestations have a high proportion of fine fescue and a dense thatch layer. For a detailed report on this work see another paper in this proceeding report by Kortier and Smitley.

Biological Control of Japanese Beetle Larvae with Insect Parasitic Nematodes

On May 19, 1987, nine 1.0 ft^2 plots were each seeded with 26 Japanese beetle grubs. These plots plus an additional set of nine plots not receiving grubs were treated with insect parasitic nematodes (Neoaplectana carpocapsue + Heterorhabditis HP-88) on May 20. A final set of nine control plots did not receive grubs or insect parasitic nematodes. The plots were distributed equally among irrigation block replications at the Hancock Turfgrass Research Center at Michigan State University. Irrigation treatments were daily irrigation, irrigation to 80% PAN, and no irrigation. Three replications of nine treatments (Table 1) were analyzed for change in the number of grubs per plot and differences in the number of plant parasitic nematodes.

Conclusion

The number of grubs per square foot found in plots treated with insect parasitic nematodes was more reduced in irrigated blocks (6.7 or 2.7 per ft^2) than in the no irrigation blocks (12.0 per ft^2). Apparently the ability of the insect parasitic nematodes to locate the grubs, or their survival is considerably reduced in dry soil compared to moist soil. The results of this experiment suggest that the use of insect parasitic nematodes as a microbial insecticide for control of grubs in turfgrass is more practical for irrigated sites.

The number of plant parasitic stunt nematodes (Tylenchorhynchus) per plot was reduced in irrigated plots treated with insect parasitic nematodes (40-55 per 50 cc soil) compared to irrigated control plots (85-117 per 50 cc soil). The suppression of plant parasitic nematodes after application of insect parasitic nematodes has not been well researched. The results of this test should be confirmed by additional experiments.

Table 1. Survival of Japanese beetle grubs and plant parasitic nematodes in experimental plots four weeks after applying Heterorhabditis (HP-88) and Neoaplectana (NCA11) nematodes. Data in table are expressed as the mean of 3 replications per treatment.

Treatment	Initial number of grubs per ft^2	Final number of grubs per ft^2	Plant parasitic nematodes (stunt) per 50 cc soil
Daily irrigation + nematode treatment (HP88 + NCAII)	26	6.7	40
Daily irrigation + nematode treatment (HP88 + NCAII)	0	0	55
Daily irrigation control	0	0	117
80% PAN + nematode treatment (HP88 + NCAII)	26	2.7	47
80% PAN + nematode treatment (HP88 + NCAII)	0	0	38
80% PAN control	0	0	85
No irrigation + nematode treatment (HP88 + NCAII)	26	12.0	81
No irrigation + nematode treatment (HP88 + NCAII)	0	0	77
No irrigation control	0	0	39

Japanese beetle insecticide test

A grid of 3' x 3' plots separated by 1'-wide buffer strips was established in irrigated rough adjacent to a fairway at Rochester Golf Club in Rochester, Michigan. Six replications of 19 insecticide treatments were applied on September 15, 1988. Liquid products were applied with an R&D sprayer at 40 psi with an 80° LF3 nozzle. Insecticides were mixed in water and applied at a rate of 136 ml per 9.0 ft^2 (175 gal/A). Granular insecticides were applied with a hand shaker. Temperature at application time was 65°F with partly cloudy skies. The experiment was evaluated 22 days later (10-7-88) by digging 0.75 ft^2 sections from the center of each plot and examining thatch and soil for live grubs. This test was on Kentucky bluegrass with 1/4"-thick thatch layer and sandy loam soil.

All insecticide treatments except RH5849 at 0.5 and 1.0 lb ai/A, Diazinon Ag 500, and AC 299 486 at 7.0 and 5.0 lbs ai/A significantly reduced the number of grubs per plot compared to control plots. Diazinon Ag 500 was mistakenly applied at 4.0 oz/1000 ft^2, slightly lower than the recommended rate of 4.6 oz/1000 ft^2. Dylox 5 G and 80 SP, Sevin 4SC, Sevimol and Mocap 5G and 10G were highly effective against Japanese beetle grubs in this test. AC 290 713 and AC 290 230 showed a good rate response with the higher rates (7.0 lb ai/A) providing good control of grubs. RH 5849 worked better at higher application rates with the highest rate (2.0 lbs ai/A) also providing good control of grubs.

Conclusions

- Dylox 5 G, Sevin 4 SC, Sevimol 4 SC, Mocap 5 G, Mocap 10 G, and Dylox 80 SP provided good control.
- Phytotoxicity observed in Mocap treatments, particularly if it is not applied evenly.
- RH 5849, an insect growth regulator (IGR), has excellent potential.
- AC 290713 and AC 290230 have good potential for development into commercial products.
- Add Dylox 5 G to list of best products for grub control: Oftanol, Triumph, Turcam, and Proxol. Also -- Sevin is a good alternative because dermal and oral toxicity is considerably lower than the other products listed.

Japanese Beetle Larval Control
Rochester Golf Club, Rochester, MI
1988

Treatment	Rate (lbs ai/A)	Mean[1] number of grubs per square foot
Dylox 5G	8.0	1.8 a[2]
Sevin 4 SC	8.0	2.0 a
Sevimol 4SC	8.0	2.2 a
Mocap 5G	5.0	2.7 ab
Mocap 10G	5.0	2.9 abc
Dylox 80 SP	8.0	3.1 abc
AC 290 713	7.0	3.5 abc
AC 290 230	7.0	4.0 abc
RH 5849 + Triton	2.0 + 5.6 oz	4.7 abc
AC 290 713	3.0	4.7 abc
AC 290 230	3.0	5.1 abc
AC 290 230	5.0	5.5 abc
AC 290 713	5.0	6.0 abc
RH 5849 + Triton	1.0 + 5.6 oz	6.7 abcd
AC 299 486 3G	5.0	8.0 abcd
RH 5849 + Triton	0.5 + 5.6 oz	8.2 abcd
AC 299 486 3G	7.0	9.3 bcd
Diazinon AG 500	5.5	9.5 cd
Control	---	12.4 d

[1]Mean of six replications.

[2]Treatments followed by the same letter are not significantly different at P = .05, Duncans multiple range test.

Black Turfgrass Ataenius Insecticide Test

Turfgrass Ataenius larval control, 1988: Six replications of seven insecticide treatments were applied to 4.0 ft^2 plots of creeping bentgrass and annual bluegrass fairway on July 1, 1988 at Lansing Country Club in Lansing, Michigan. Granular treatments were applied with a hand shaker. Liquid insecticides were applied with an R&D sprayer at 40 psi with an 80° LF3 nozzle. Each plot received an equivalent of 4 gal/1000 ft^2 of spray solution. The Ataenius grubs were counted 17 days post treatment (July 18, 1988) by removing six cup-cutter plugs (4'-diam.) from each plot. The thatch layer in the treatment plots averaged approximately 1/2"-thick. The sky was overcast and temperature was 85°F at application time. This area received daily irrigation.

Mocap 5G, AC 290 230, AC 290 713 and AC 299 486 had significantly less Ataenius grubs than did the control plots. Sevin SL, Proxol and Heterorhabditis nematodes did not significantly reduce the populations of grubs.

Conclusions

- AC 290230, AC 290713, and Mocap 5 G were effective against Ataenius larvae.
- Proxol 80 SP and Sevin SL did not work well.
- HP-88 nematodes did not work well.
- Oftanol, Turcam and Dylox 5 G still recommended for Ataenius control. Use granular formulations whenever possible.

Turfgrass Ataenius Larval Control
Lansing Country Club, Lansing, MI
1988

Treatment	Rate lbs ai/A	Mean[1] number of grubs per square foot
AC 290 230	7.0	0.00 b[2]
AC 290 713	7.0	0.00 b
Mocap 5G	5.0	0.32 b
AC 299 486	7.0	2.15 b
Proxol 80 SP	8.0	5.08 ab
Sevin SL	8.0	6.04 ab
HP-88 Nematodes	0.5 billion/A	8.90 a
Control	---	8.90 a

[1]Mean of six replications.

[2]Numbers followed by the same letter are not significantly different at P = .05, Duncans multiple range test.

Hairy Chinch Bug Insecticide Test

Chinch bug control in turfgrass, 1988: A home lawn in Okemos, Michigan heavily infested with chinch bugs was chosen for the test evaluation site. The Kentucky bluegrass-fine fescue lawn was watered frequently and fertilized adequately. Thatch-thickness averaged less than 1/4 in. Granular insecticides were applied to 4.0 ft^2 plots with a 1.0 ft buffer with a hand held shaker. Liquid applications were made with an R&D CO_2 sprayer at 40 lbs psi with an LF2 80° nozzle. Sevin and Sevimol plots were irrigated with 3/4" water prior to treatment. All insecticide treatments were applied on 7/29/88, one day after chinch bug precounts. All granular treatments were irrigated (3/4") immediately following application. The number of chinch bugs per plot was determined again 4 days post-treatment (8/2/88) by searching through grass and thatch for 3 min in each plot. The temperature was 90°F and the sky sunny at application time. A 1/4" of rain fell later that evening.

Chinch bug numbers in all treatments declined during the 5-day test period. This population decline is consistent with observations of chinch bug populations in early August of other years. Chinch bugs in control plots declined by 47.5% during the test period. As in previous years, the synthetic pyrethroid products caused the greatest chinch bug population reduction. Five of the top seven treatments were synthetic pyrethroids. Although the number of chinch bugs per plot was determined, it is not known if the synthetic pyrethroids are expressing a repellency action that could cause chinch bug movement out of those plots and into adjacent buffer zones or other plots.

Although there was no significant difference among treatments according to Duncans multiple range testing, the best two treatments would be significantly different from the control treatment at P = 0.1.

Conclusions

- Synthetic pyrethroids provided best population reduction in small plots (Tempo 2 C, Danitol 2.4 EC, Tempo 1 ME, Mavrik 2 EC.
- Orthene 75 (high rate), Mocap 10 G, Triumph 4 E also reduced chinch bug populations.
- Do synthetic pyrethroids cause chinch bugs to move out of treated plots?
- Oftanol 2 II, Triumph 4E, Diazinon EC, Mavrik 2 EC and high rates of Orthene 75 SP recommended for chinch bugs.

Chinchbug Control at
a Home Lawn in Okemos, MI
1988

Treatment	Rate (lbs ai/A)	Mean[1] initial chinch bug per plot	Mean number of chinch bugs per plot post-treatment	Mean percent reduction in population
Tempo 2C	0.14	44.3	6.8	89.5 a[2]
Danitol 2.4 EC	0.8	31.8	5.0	76.7 a
Tempo 1 ME	0.14	31.8	12.0	71.5 a
Orthene 75 SP	1.0	42.3	18.0	68.7 a
Mocap 10G	5.0	29.0	8.5	68.5 a
Mavrik 2EC	0.27	34.5	7.0	66.8 a
Danitol 2.4 EC	0.4	23.0	8.0	65.9 a
Triumph 4E	0.5	43.5	14.8	65.0 a
AC 299 486	7.0	40.0	16.8	61.2 a
Sevin 4SC	8.0	35.3	17.3	60.0 a
AC 290 713	7.0	34.5	11.8	58.3 a
Dursban 4E	0.5	43.5	18.8	54.3 a
Sevimol 4SC	8.0	27.8	19.0	48.6 a
Control	---	37.5	13.0	47.5 a
AC 290 230	7.0	37.8	22.8	45.4 a
Dursban 4E	1.	29.5	16.5	44.2 a
Mocap 5G	5.0	39.5	21.5	42.4 a
Orthene 75 SP	0.5	32.8	22.5	41.6 a

[1]Mean of four replications.

[2]Numbers followed by the same letter are not significantly different at P = .05, Duncans multiple range test on arcsin square root of percent population reduction.

Bluegrass Billbug Insecticide Test

Adult billbug control, 1988: Insecticide treatments were applied to fescue rough at Warwick Hills Country Club. Plots were 11'-11' in size with a 3' buffer between plots. Insecticides were applied with an R&D CO_2 sprayer at 40 psi with an 80° LF3 nozzle. Insecticides were mixed in water and the solution applied at a rate of 175 gal/A. The entire plot area received irrigation twice during the test period to reduce drought injury to the turf. Each treatment was replicated six times except the 0.5 lb ai rate of Diazinon and the 0.8 lb ai Danitol. These treatments had only five replications because of an error during application. Diazinon was applied at approximately 1/6 and 1/12 the recommended rate for the purpose of comparison to the same amount of active ingredient of Dursban. Insecticides were applied on June 9, 1988. It was cloudy and 70°F with a trace of precipitation later that day. Plots were evaluated on July 13 and 14 by removing nine cup-cutter (4"-diameter) plugs from each plot and examining them for damaged grass plant crowns and billbug larvae. Each plug was cut in half with a shovel, and each half torn twice to look for damage and larvae.

The number of billbug larvae and damage was greater in some insecticide treated plots than damage found in control plots. The low rate of Orthene treatment came very close to having a significantly greater number of grubs and damage than the control treatment. Apparently some biological factor reducing billbug activity in control plots was suppressed by insecticide treatment. The only significant difference between treatments was between Triumph, the most effective treatment, and Orthene at 0.375 lb ai rate, the least effective treatment. Triumph probably had a toxic effect on larvae in the soil as well as on adult billbugs still active on June 9th. There is a good relationship between application rate of Danitol and effect on billbug activity. Danitol was the next most effective treatment after Triumph.

Conclusions

- Triumph 4 E and Danitol 2.4 EC look promising
- Some insecticide treatments seemed to have more billbug injury than the control treatment. Suppression of predators?
- Triumph, Turcam, Oftanol, Proxol, and Dylox recommended for larvae in soil. Dursban is recommended for adults in May. Do not apply insecticide unless there is a damaging population present.

Bluegrass Billbug Adult or Larval
Control at Warwick Hills Country Club
Flint, MI
1988

Treatment	Rate lbs ai/A	Mean number of grubs per square foot
Triumph 4E	1.0	4.2 a[2]
Danitol 2.4 EC	0.8	5.3 a
Danitol 2.4 EC	0.6	6.6 a
Dursban 4E	0.75	7.3 a
Control	---	7.8 ab
Danitol 2.4 EC	0.4	8.2 ab
Dursban 4E	1.0	9.0 ab
Orthene 75 SP	0.75	9.2 ab
Diazinon Ag 500	1.0	10.2 ab
Diazinon Ag 500	0.5	10.4 ab
Dursban 4E	0.5	10.8 ab
Orthene 75 SP	0.375	15.8 b

[1] Each damaged crown observed and each billbug larva were counted as one unit. Number of larvae and number of damaged crowns were added together. Mean of six replications per treatment.

[2] Treatments followed by the same letter are not significantly different at P = .05, Duncans multiple range test.