LONG-TERM SOLUTIONS FOR OUTBREAKS OF EUROPEAN CHAFER AND JAPANESE BEETLE, AND MANAGEMENT OF ANTS ON GOLF COURSES
David Smitley
Michigan State University

I. European Chafer: Immediate Strategies and Long-Term Solutions.

David Smitley and Suleiman Bughrara

Problem Statement: The European chafer is native to western and central Europe. It was introduced accidentally into the Newark, New York area a few years before 1940 (Gambrell et al. 1942). Without the proper complement of natural enemies the European chafer infestation built-up quickly and began to spread east and west (Tashiro 1987). In the early 1980's it was first found in Michigan when ½ mile-long stretches of turf along the Lodge Freeway embankments in Detroit began to die. In the last 20 years it has spread throughout the southern half of Michigan, causing extensive turf damage in almost every county south of a line between Midland and Muskegon. In Jackson, Michigan, different neighborhoods around the city experienced extensive turf loss for 5 - 10 years, as populations of European chafer shifted from one area to another. We can expect similar problems in other parts of the state as European chafer spreads northward. In addition to home lawns, golf course roughs, cemeteries, parks, school grounds, city boulevards and highway turf managed by the Michigan Department of Transportation have all suffered heavy losses.

Project Goal: Reduce turf damage caused by the European chafer in Michigan, and ultimately in the North Central United States, by finding resistant turf types, enhancing predator populations with cultural practices, and evaluating an intestinal parasite of European chafer found in New York.

Objective 1: Find the best ways to build predator populations in home lawns and recreational turf by altering irrigation and fertility practices (Dave Smitley, Suleiman Bughrara, David Gilstrap).

Objective 2: Develop a greenhouse screening method for evaluating turf resistance to European chafer (Suleiman Bughrara, Dave Smitley).

Objective 3: Determine infection levels of pathogens of European chafer larvae in Michigan compared with upstate New York (Dave Smitley).

Progress Report through January 2003

- **Irrigation as an alternative to Diazinon.** Homeowners may be able to minimize grub damage to their lawns with consistent irrigation. In our experiment at the Hancock Turf Research Center 239 European chafer larvae were introduced in August and September to each of 18 plots maintained under 3 different irrigation practices. In November plots were sampled to determine grub survival. A mean of 22.1 grubs per ft^2 were found in the non-irrigated plots, 17.0 grubs per ft^2 in the plots irrigated once per week, and 8.2 grubs per ft^2 in the daily irrigated plots. Daily irrigation reduced the survival of European chafer by 63%, a level of control comparable to that obtained by applying Diazinon. These results were confirmed by an experiment at Jackson Country Club in 2001 (see Figure 1).

- **Develop a method for screening turf for resistance to European chafer and begin testing of turf and ground covers for resistance.** New methods were devised for the testing of 18 cultivars of turfgrass in the greenhouse (3 cultivars each of: Kentucky bluegrass, perennial ryegrass, fine fescue, tall fescue, warm-season (C-4) turfgrasses, and commercially available native grass species. European chafer consumed between 5 and 95% of the grass roots over an 8-week test period. Six of the 9 most susceptible turf cultivars were either Kentucky bluegrass or fine fescue, the type of turf grown in 90% of all Michigan lawns. Cultivars of tall fescue were the more resistant to European chafer. Our data suggests that there may be more benefit from planting resistant turf types than previously believed.

- **Field testing of turf resistance work.** The same cultivars of Kentucky bluegrass, perennial ryegrass and tall fescue used in our greenhouse tests were established in field plots at the Hancock Center in November, 2001. European chafer and Japanese beetle grubs were added to the plots in September, 2002. Plots were harvested in late October to determine percent root loss from European chafer and Japanese beetle grubs. Field plot results will be compared with results from the greenhouse tests.

- **Sampling for pathogens and parasites of European chafer larvae at Michigan research sites.** European chafer larvae were collected from a minimum of 10 ft^2 samples at 30 locations in Michigan, and at 5 sites in upstate New York. Pathogens were more abundant in New York than Michigan (Table 1). The species and perhaps genus of gregarine that we found in European chafer is new. We are collaborating with Dr. Richard Clopton, Peru University in Nebraska, to publish a description of it.

- **Pathogenicity of a new Gregarine pathogen of European chafer**. Healthy European chafer larvae from a population where no gregarines have been found were placed into pots with grass and soil that were previously occupied by either healthy grubs or gregarine-infected grubs. After 22 days 38 of 42 grubs in pots previously occupied by infected grubs were infected. There were no gregarines recovered from grubs in control containers. Fewer gregarine-infected grubs (54%) survived than control grubs (67%) (P=0.057). Weight gain may also be slower for gregarine-infected grubs (36.4 mg) compared with control grubs (45.1mg) (P=0.23), but a larger test is needed to discern these differences.

II. Research and Demonstration Tests for Management of Ants and Earthworms on Golf Courses.

David Smitley and Terry Davis.

The last few years golf course superintendents have reported poor results from insecticides applied to reduced ant mounding on fairways, tees and greens. Although we have tested new products for ant control at Ionia Country Club almost every year, we have not been able to include some of the older products in the test, and we have not tested these products in the northern part of Michigan where the ant species and site conditions may be different. In 2002 we conducted 3 field tests: a research test at Muskegon Country Club, a demonstration test at Dunham Hills Golf Club, and a demonstration test at The Legend. Superintendents were able to see the results at The Legend during a field day on July 25. We had a good turn-out for the field day (about 80 people). Complete results of both tests are attached.

Conclusions from the 2002 Ant Research and Demonstration Tests:

- Dursban Pro and Talstar GC gave the best control of ants in our research test at Muskegon Country Club (90% reduction in ant mounding for 3 weeks after one application). The high rate of DeltaGard also worked well (70% reduction in mounding).

- Sevin, the new ant baits, and the low rate of DeltaGard did not work well.

- Merit gave some suppression of ant activity in the demonstration tests, but not the research test. Also, Dylox worked well in the demonstration tests. More testing of Merit and Dylox are needed.

III. Introduction of Two New Pathogens of Japanese Beetle to Leading Edge Infestations in Michigan

Dr. David Smitley[1], Dr. Jennifer Stoyenoff[2], David Cappaert[1]

[1]Department of Entomology, Michigan State University
[2]Dow Gardens, Midland, Michigan

Problem Statement: Japanese beetle (Popillia japonica Newman) is a costly pest for the nursery, landscape, turf, blueberry and grape industries in Michigan. For landscapers and golf course superintendents, adult Japanese beetles may be the most serious tree and shrub pest in southern Michigan, frequently defoliating lindens, sycamores, Japanese maple, birch, chestnut, sassafras, hibiscus, crabapple, ornamental cherries, roses, mountain ash, and Virginia creeper (Johnson & Lyon 1988). In heavily infested areas, insecticide applications must be repeated frequently to maintain foliage on these plants. Japanese beetle larvae are also the most damaging pests of golf courses in Michigan (Potter 1998). Adults are attracted to moist turf where they prefer to lay their eggs. The larvae feed on turf roots, sometimes causing extensive damage. Costly insecticides are applied to prevent turf injury. Recreational turf, industrial turf, home lawns and sod farms also may be damaged from Japanese beetle larvae (Vittum 1995).

Currently, exotic white grubs are just developing as pests in the Saginaw Valley region. Catches of Adult Japanese beetles indicate they are present, but at far lower levels than in the well-established range further south. European chafer is also present, but has not been recorded at the epidemic levels seen in Lansing and Ann Arbor. Thus we are presented with the opportunity to document the process of Japanese beetle range expansion, and to introduce *Ovavesicula popilliae* and the Eugregarine pathogen, *Stictospora sp*. before populations reach damaging levels throughout the region.

Objectives:

1. Provide early information on population trends of Japanese beetle in areas of the state where it is now spreading into, and assist turf and nursery managers, extension staff, and the general public in making proactive management decisions.

2. Reduce the pest status of Japanese beetle through the introduction of *Ovavesicula popilliae* and *Gregarina sp.*

Summary of results of research in 2002.

- *Populations of Japanese beetle increased (doubled in some places) in 2002 at sample sites in the Saginaw Valley. Fairways were damaged at two locations.*
- Stictospora *and* Ovavesicula *were introduced to 5 plots at 3 different golf courses in 2002. Neither pathogen was found in the region prior to pathogen introduction, except a low incidence of* Stictospora *at Brookwood (Table 1).*
- *Grubs were collected from research plots in October, 2002.* Stictospora *was found in 5/5 plots where it was introduced and 1/5 in control plots (Table 3).*
- Ovavesicula *was found in 1/5 plots where it was introduced and 0/5 control plots.*

Table 1. Sites in the Saginaw Valley Region where Japanese beetle larvae were collected and examined for infection by pathogens, May 16 to June 13, 2002

Pair	County	Irrigation	Location	n	% Gregarines	% Ovavesicula
1	Bay	Yes	Bay County G.C.	0	-	-
		No	Bay Landscaping	0	-	-
2	Bay	Yes	Maple Leaf G.C.	0	-	-
		No	Maple Leaf G.C.	0	-	-
3	Genesee	Yes	Brookwood G.C.	122	12.6	0
		No	Brookwood G.C.	78	0	0
4	Genesee	Yes	Captain's Club G.C.	0	-	-
		No	Captain's Club G.C.	0	-	-
5	Midland	Yes	Currie Mun. G.C.	68	0	0
		No	Currie Mun. G.C.	8	0	0
6	Midland	Yes	Dow Gardens	0	-	-
		No	Dow Gardens	0	-	-
7	Midland	Yes	Sanford Lake Park	0	-	-
		No	Veteran's Mem. Park	0	-	-
8	Saginaw	Yes	Crooked Creek G.C.	56	0	0
		No	Crooked Creek G.C.	118	0	0
9	Saginaw	Yes	Fortress G.C.	0	-	-
		No	Fortress G.C.	0		
10	Saginaw	Yes	Saginaw Cntry Club	1	0	0
		No	Saginaw Cntry Club	0	-	-
11	Saginaw	Yes	Swan Valley G.C.	0	-	-
		No	Kluck's Nursery	0	-	-

Table 2. Density of Japanese beetle larvae in paired plots where infected larvae were introduced to one plot (introduction plot) and not to the other (control plot). Data are from samples collected in spring and fall of 2002. Infected larvae were introduced immediately after larvae were sampled on May 13 – 15.

Golf course	Treatment	Japanese beetle larvae per 0.1 m^2	
		May 13 – 15	October 25
Currie Mun. G.C. #2	Introduction	8.9	5.1
	Control	7.8	8.7
Currie Mun. G.C. #5	Introduction	5.2	6.8
Control		8.1	6.0
Currie Mun. G.C.#8	Introduction	7.7	2.8
Control		19.4	3.5
Brookwood G.C.	Introduction	13.2	2.2
Control		15.3	2.9
Crooked Creek G.C.	Introduction	33.1	5.3
	Control	29.2	7.6

Table 3. Incidence of Stictospora at 5 pairs of sites where Japanese beetle larvae infected with Stictospora, Ovavesicula and milky disease were introduced to one of the paired plots (introduction) and not to the other (control). Data are from samples collected in spring and fall of 2002. Infected larvae were introduced immediately after larvae were sampled on May 13 - 15.

		May 13 – 15		October 25	
Golf course	Treatment	No. larvae dissected	% Stictospora infected	No. larvae dissected	% Stictospora infected
Currie Mun. G.C. #2	Introduction	10	0	30	27
	Control	28	0	30	0
Currie Mun. G.C. #5	Introduction	10	0	27	11
	Control	28	0	30	3
Currie Mun. G.C. #8	Introduction	10	0	18	22
	Control	28	0	20	0
Brookwood G.C.	Introduction	10	10	19	58
	Control	10	10	23	30
Crooked Creek G.C.	Introduction	10	0	30	53
	Control	10	0	25	0