

Meet the Beetles!®

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A problem is much more a problem when it is not recognized as a problem. This is the situation with the Oriental beetle.

WHITE GRUBS — THE SCARAB BEETLES

White grubs have been a nursery problem for years, with the Japanese beetle being dominant. There have also been problems with the European chafer and the Asiatic garden beetle. In reviewing grub samples identified by the Rutgers plant diagnostic lab during 1999, Oriental beetles take top honors for sheer number by a wide margin. Since nurseries are subject to inspection for white grubs, they need to be controlled to avoid restrictions placed on shipments of nursery stock. The group is known as scarab beetles.

Each member of this selected beetle group was imported into the continental United States during the first half of the 1900s. All were probably imported in the soil of nursery stock. The Japanese beetle (*Popilla japonica*) was imported from Japan to New Jersey in 1916. The Asiatic garden beetle (*Maladera castanea*) is native to Japan and China and was first found in New Jersey in 1921. The European chafer (*Rhizotrogus majalis*) was probably imported from western or central Europe and was first located in New York in 1940. The Oriental beetle (*Exomala orientalis*) was imported from the Philippines to Japan and then to Hawaii in 1908 and Connecticut in 1920. The Oriental beetle was formerly known by the generic name *Anomala*.

The Japanese and Asiatic garden beetles feed on both the roots and tops of plants while the European chafer and the Oriental beetles feed almost exclusively on the roots of plants. While some of the beetles have plant preferences, the grubs of the Oriental beetle eat a wide variety of plant roots.

Identification of the adults is by size, shape, and color. Identification of the grubs is by raster patterns and the shape of the anal slit. Excellent line drawings of both the adults and raster patterns can be found on the Cooperative Extension web sites of Ohio (<http://www.ag.ohio-state.edu/~ohioline/hyg-fact/2000/2510.html>) and Massachusetts (<http://www.umass.edu/umext/turf/pestid/whitegrubintro.htm>). As pests, there is general recognition of all but the Oriental beetle.

The Oriental Beetle. The Oriental beetle is about the size of a Japanese beetle. Most of the adults are straw colored with some black markings on the elytra (those

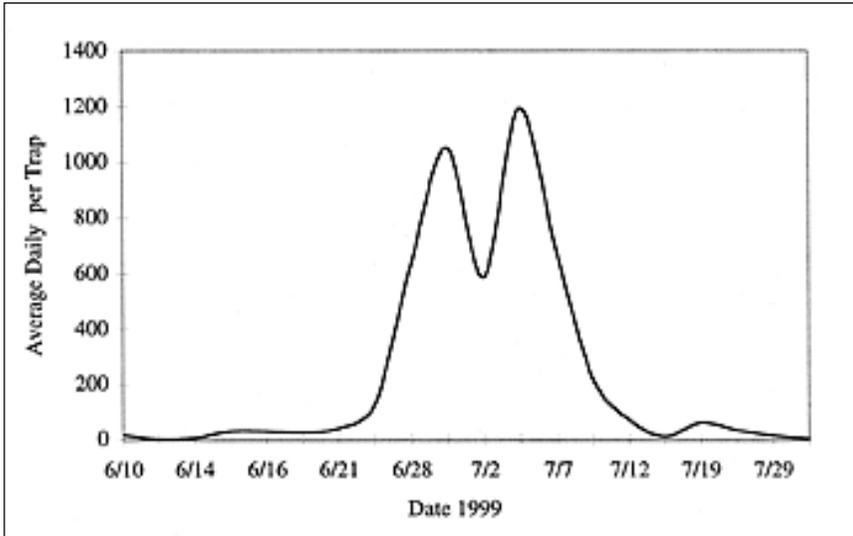


Figure 1. Seasonal Oriental Beetle Catch

hard covers to the wings). Beetles can range from fully straw colored to fully black. There are eight recognized variations to the patterns. If you haven't noticed adults flying, you may have been looking in the wrong place or at the wrong time. The adults seem to be more active during the evening or at night than during the day. When they fly during the day, they normally will be no more than 1 to 3 ft above the ground.

The life cycle starts with adult emergence from early June through early August. A graph of adult emergence is a standard bell curve with the peak occurring in the first 5 days of July (Fig. 1). The population depression indicated in Fig. 1 was probably from cool, wet weather. The adults mate and the female lays eggs deep in the soil or media (5 to 9 inches). The eggs hatch and grow into a larva that feeds on roots of numerous types of plants. After overwintering, the larvae will continue feeding in the spring prior to pupation and emergence as an adult. Small percentages require 2 years to complete their life cycle. As noted earlier, only the grubs cause feeding damage. The grubs seem to feed on almost all plant roots but do seem to have some preferences. A nurseryman in New Jersey decided to treat all his plant material with the exception of Junipers since there was no known problem with them. The following year his Junipers were heavily infested with Oriental beetles.

For the nursery industry, the problem is that this is a pest problem without an ideal solution. Even more importantly, we have a problem without recognition of having one. It appears most nurserymen that have an Oriental beetle problem don't know it. Symptoms range from loss of growth to death. Most nurserymen have attributed losses to winter injury, nutritional problems, root rots, and other physiological problems.

For Rutgers Cooperative Extension, the Oriental beetle has been a recognized pest problem since late 1998. Work on the Oriental beetle has also been done on turf grasses in New York and on blueberries in New Jersey. In addition to Connecticut, New York, and New Jersey, Oriental beetles have been reported in Delaware, Florida, Georgia, Maine, Maryland, Massachusetts, Michigan, New Hampshire, North Carolina, Ohio,

Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, West Virginia, and Wisconsin. It has also been reported in Canada and Italy.

THE ORIENTAL BEETLE — RESEARCH AND CONTROL

In response to damage caused by the Oriental beetle, an applied research program was developed by Rutgers Cooperative Extension. During 1999, literature was reviewed to determine the knowledge base of the pest, the population was monitored with pheromone traps under various cultivation schemes in nurseries, a catch and release study was conducted to determine flight distances, and two chemical control treatments were evaluated. During 2000, populations were further monitored and a pheromone disruption study was initiated.

How extensive are the problems caused by the Oriental beetle?

During 1999, adult males were trapped using pheromone lures. From 100 traps, 1,100,000 Oriental beetles were caught. One thing we don't know is the percentage of males to females in the population.

During 2000, 170,000 male beetles were caught from 10 traps.

A southern New Jersey nurseryman plowed down a field of nursery stock valued at \$60,000 because of poor root systems. Pheromone trapping after the plants were removed indicated high numbers of Oriental beetles.

A container grower was experiencing losses from 10% to 15% of certain taxa. An inspection of root systems resulted in the problem being attributed to Oriental beetles.

In several nurseries, losses attributed to winter injury were determined to be Oriental beetle damage.

What have we learned from our work at Rutgers Cooperative Extension?

- Males do not fly very far (reliably from 50 ft and no more than 150 ft).
- Males do not live very long.
- Under normal circumstances, females don't move very far. They typically only come to the soil surface to attract a male and to mate.

Successful control measures depend on identification of the grubs on your property. For control of all but the Oriental beetle, chemical applications should be made early

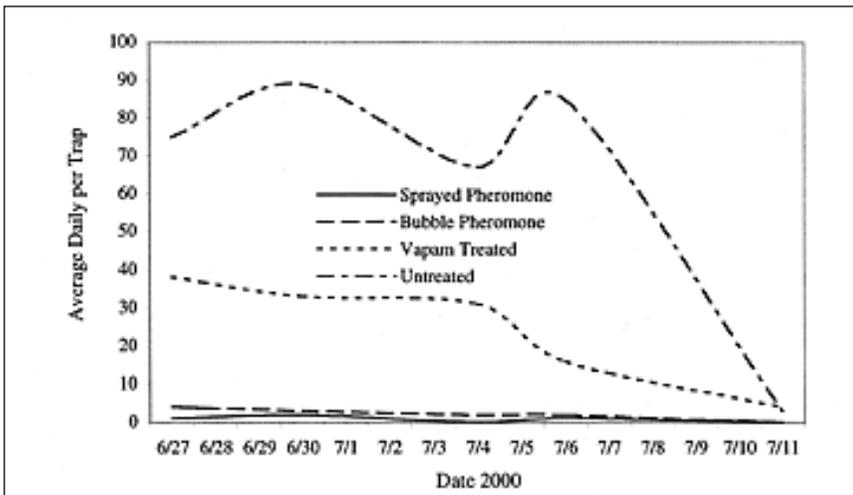


Figure 2. Treatment effects on Oriental beetle populations

to mid-August. A variety of chemicals are effective. For effective control of the Oriental beetle, the only labeled chemical, imidacloprid (Marathon) must be applied in early to mid-June. An August application will have little or no control benefits.

Biological control measures have been attempted. Oriental beetle grubs have limited susceptibility to milky disease. Studies have found the disease in only 5% of grubs in the fall after treatment. The parasite *Scolia manilae* was successfully introduced in Hawaii but was unable to survive Philadelphia winters. Predators, including birds and mammals feed similarly on Oriental beetle grubs to the others in the white grub complex.

The use of Vapam as a soil fumigant prior to cropping will reduce grub numbers. Results from work conducted during 2000 indicated an average reduction of 62% during the peak flight period from 30 June through 6 July (Fig. 2). Longer-term benefits will be determined during 2001.

Pheromone disruption may offer the best potential for cost-effective control of these grubs. Depending on the method of treatment, trap counts were reduced from 96% for a bubble treatment and 99% for a spray treatment (Fig. 2). While it seems to be effective, the question of how the female beetles respond to not being mated remains. The treatment may cause her to move to a more desirable location to mate. While promising, the pheromone is an experimental chemical and has not yet been registered through the Environmental Protection Agency (EPA). More research is necessary prior to submission to the EPA.

Unfortunately, pheromone research is costly. Because of the buffer area required, plot sizes were 3 acres. With three treatments, it required 9 acres per nursery, and there were three nurseries involved in the research project. The largest hurdle, however, is that there is presently little recognition of this pest as a problem. Companies will not support research without recognition of this pest as a problem. Growers must be able to recognize the problem and let industry representatives know there is one.

CONCLUSIONS

We do have a problem with the Oriental beetle as a pest of nursery stock. It is a pest that has, along with the rest of the white grub complex, spread through the sale of nursery stock. Any nurseryman who purchases potted or B&B nursery stock is at risk.

If you really want to determine if you have Oriental beetles, try using a pheromone trap. They are highly effective in drawing the adult males. If you determine there is a problem, strategies that might prove effective in reducing the impact of the Oriental beetle include a shorter crop rotation, soil fumigation prior to cropping, and possible future use of pheromone disruption to reduce mating.

The Oriental beetle problem is also a problem without adequate recognition that a problem exists. From a research perspective, the problem is that companies will not support research toward control measures when the problem is not recognized. During 1999, a company commissioned a survey to determine the extent of the problem. The conclusion they came up with was that there was no problem. The result was no research funding. Without research, there is little hope of finding a solution.

If you believe you have an Oriental beetle problem, contact your Cooperative Extension organization and get involved. Work with your Extension agent and/or Extension nursery entomologist. It is in everyone's best interest to create an effective strategy for control of this pest. Get the word out. This is a national problem. We need it solved.