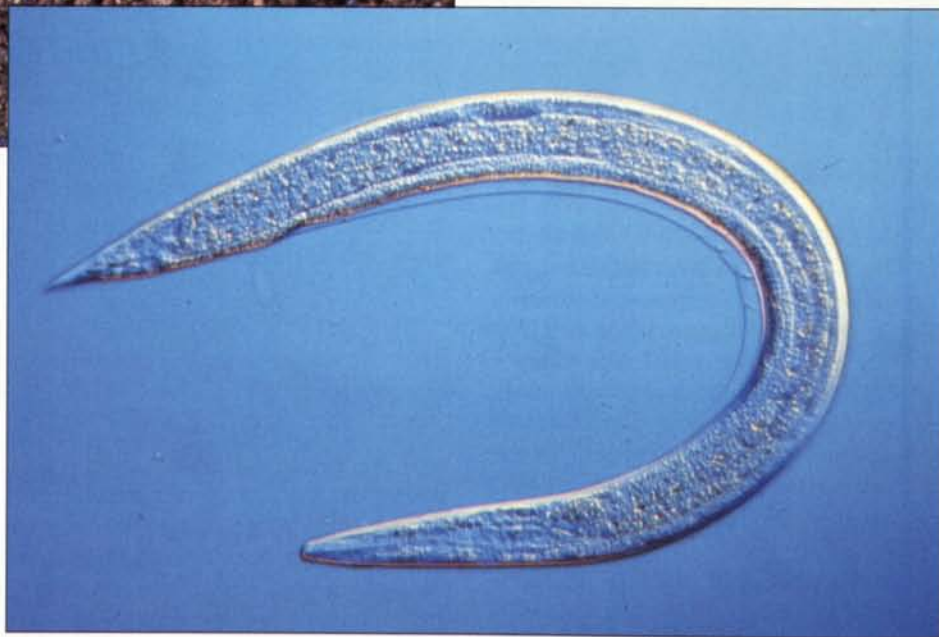


# Grubs Vs. Nematodes: The Battle Has Just Begun

By Bob Milano



At left is a healthy white grub. At right is a white grub infected with a naturally occurring *Heterorhabditis* nematode. Photo by Jack Clark, courtesy H. Kaya.



Magnified view of an infected juvenile nematode. Photo courtesy: H. Kaya.

**A**s the summer season peaks, turf managers strive to maintain pristine turf under the rigors of baseball, soccer, softball and other activities. The competitive athletic battles and struggles that turf managers fight to maintain their playing fields are obvious. But there is a third unseen battle beneath the soil: Nematodes vs. White Grubs.

For two years, this war has raged beneath the lush blades of grass at Community Baseball and Soccer Facility at the University of California, Davis. With the assistance of Harry Kays, nematology professor, beneficial nematodes have been applied to both areas as a control method for white grubs (*Cyclocephala hirta*). The war rages on, with the experimental nematodes winning most of the recent battles, and we look for complete victory someday.

## Nematode Lifestyles

Nematodes are very small, almost microscopic worms that can be divided into two types: plant-attacking and insect-attacking. Many grounds managers

have experienced the destruction wrought by plant-attacking types, which can devastate turf or landscape plantings. Most grounds managers, however, have little or no experience with insect-attacking nematodes. This group of animals has been demonstrated as effective in controlling some turf and landscape pests, and is gaining popularity. The host range of the predacious nematodes includes a wide spectrum of insects including armyworms, cutworms, sod webworms and white grubs.

Beneficial nematodes reside in the moist soil of turf and landscape areas where they either ambush or hunt down pests. In many native soils, these animals are naturally present. According to Dr. Kays, they enter their victims (white grubs in this case) through their body openings.

One difference between nematodes and chemical controls is the method of attack. Some of the most effective nematodes are mobile and actively seek out their prey. In contrast, applied chemical pesticide agents must rely on the actions of the tar-



get pest for control and/or ingestion.

Once inside the body cavity of a grub, a nematode discharges a bacteria that infects the host. This results in the pest's death, normally within 48 hours. The nematode then begin to colonize the dead host. This process includes mating, feeding, and eventually the release of a new generation of juveniles armed to begin the process anew.

#### Nematodes or Chemicals?

The control of turf pests is difficult, but chemical controls are not the only choice. Chemicals are effective, but must be weighed against the costs to the environment, worker safety, user safety, and the ever-increasing pressure in most communities to reduce overall chemical use.

Nematodes offer the advantage of public and worker safety and have no known negative effects on the environment. Currently, no Environmental Protection Agency registration is required for their use. They are easily applied with standard spray equipment. In addition, they can reproduce, thus having the potential to recycle in the environment. Ideally, if the pest population rises, so too will the nematode counts and, conversely, as the pest population drops so will the nematode count.

Dr. Kays describes the application of beneficial nematodes by stating that those who apply them are simply "augmenting naturally occurring nematodes in most soils." Although the cost of beneficial nematode application may be higher than with traditional pesticides, their advantages can easily be justified by the increased environmental safety.

#### Case Study

In the late summer of 1990, a severe infestation of white grubs was identified at the UC Davis baseball and soccer complex. In a traditional pest management fashion, several different pesticides were used to control the pests with varying degrees of success. None of the treatments resulted in full control, nor did we expect them to.

In the summer of 1991, a unique partnership was forged with the nematology department on campus. The understanding resulted in the grounds maintenance division agreeing not to utilize any more chemical pesticides. In exchange, nematology would assist in controlling grubs with beneficial nematodes. At the same time, we would both

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observe our results and perform research on new nematode strains.

In the late summer of 1991, the first experimental application of *Steinernema glaseri* nematodes was made at the rate of one-half billion per acre. This application augmented a small existing population of *Heterorhabditis* nematodes that was present in the native soil.

Almost immediately, creamy colored dead grubs were located, signaling infection by the nematodes had occurred. Occasionally, a bright red grub was

*continued on page 12*

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## Grubs Vs. Nematodes

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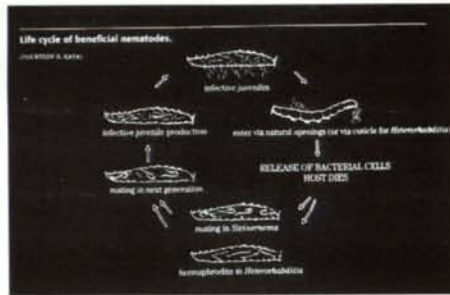
located, signaling it had been infected by the naturally occurring *Heterorhabditis* nematode.

This control technique, now beginning its third year, has proven very successful but is still under evaluation. As of yet, the *Steinernema glaseri* nematodes are unavailable to the general public. Currently, other species of nematodes are commercially available.

Keys to the trial's success included careful monitoring of the grub populations, proper timing of the application, and proper application techniques that require moist soil, cool air temperatures, minimal sunlight and post-application irrigation.

Dr. Kays also emphasizes the importance of timing the application. "Fall treatment is the most critical," he asserts. Fall soil temperatures are generally above 60°F and far more conducive to nematode activity — and thus pest control success. This is particularly true in colder climatic zones.

Our trial program will continue this summer and fall as we begin to identify any activity or damage.



**Nematode life cycle. Photo courtesy: H. Kaya.**

After two years of full field application, we anticipate that only spot treatment of any significantly affected areas will be required. According to Dr. Kays, the experimental *Steinernema glaseri* nematode is proving to be much more effective on masked chafers (white grubs) than any of the other commercially available nematodes. Most importantly, this strategy appears to be holding the pest population at an acceptable level without the application of any broad-spectrum insecticides.

### Not a Cure-All

Beneficial nematodes are by no means the answer to all turf and landscape

pest problems, but they are an alternative that should be considered. Their advantages are significant and can provide control for many pests. It is hoped that the success of this work and the accompanying data can improve the chances that a beneficial nematode aimed at white grubs will be widely available in the near future.

The complete and total elimination of all pests is not, and should not be, the goal of any turf and landscape manager. The goal should be to manage the pests at an acceptable level that maintains the natural balance of the environment as much as possible, while achieving the desired turf and landscape appearance.

*Editor's note: Bob Milano is grounds operations manager, UC Davis Physical Plant, and a board member of the national Sports Turf Managers Association. He would like to acknowledge and thank Dr. Harry Kays of UC Davis and his staff, including Tom Burlando, Graham Thurston and Gregory Wood, as well as Mark Lucas and Dennis Yates of the UC Davis grounds divisions. All have contributed greatly to the project and its continued success. □*

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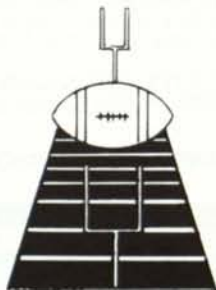
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