WASHINGTON STATE UNIVERSITY
KING COUNTY EXTENSION

Community Horticulture Fact Sheet #28

Beneficial Nematodes

What are nematodes?
Entomopathogenic nematodes (aka beneficial nematodes) are tiny worm-like animals that love to feast on soil bugs. They have a unique and complex life style. The infectious juvenile nematodes are non-feeding and spend much of their time in search of prey. Juvenile nematodes can either swim through the soil (cruisers) looking for a host, or sit and wait (ambushers) for an insect host to pass by. The nematodes can find their insect hosts by smelling "bug breath." Nematodes use CO^2 given off by hard-breathing insect grubs to locate their hosts.

Once a host is found, the juvenile nematode gains entrance by the closest available hole (you can use your imagination here) and penetrates the body cavity. If the insect host is unable to fend off this horrid infection, the nematode then uses its deadly partner-in-crime to rapidly kill the host. The nematode spits out a symbiotic bacteria that finishes off the insect by turning it into a putrid soup. This liquid lunch is gobbled up by the juvenile, causing it to mature into an adult. Depending on the species, the nematode can self-fertilize as an adult or reproduce the old fashioned way. Nematodes reproduce rapidly, and in a matter of a few weeks, the insect cadaver bursts open with hundreds of thousands of reproductive juveniles ready to seek out other insects.

Sound fascinating, yet horrible? Well, good news! You can witness this terrible feat in your own backyard! Many nurseries and garden centers carry beneficial nematodes for use in your garden.

Following Are Tips on Using Beneficial Nematodes
Beneficial nematodes may be used to control root weevils and other soil insect pests, but application must be made correctly to be successful. Following are tips describing best techniques for helping nematodes do their job. As with pesticides, ALWAYS read the label to avoid failure of the product.

Soil temperature must be 54^o For higher. Use a soil thermometer or a common kitchen meat thermometer to measure soil temperature. (Reserve this thermometer for garden use only.) Measure the temperature at a depth of 4 to 6 inches. In the Seattle area, soils usually reach this temperature in mid-to-late May, and warm soil conditions remain into October.

Clean up debris. The nematodes will want to work their way into the soil, so leaves and other debris in the application area prevent them from getting to the soil readily. Cleaning up debris, such as fallen leaves, will also make a less welcoming environment for adult root weevils.

Light conditions. Nematodes, which dwell underground, may be killed by ultraviolet light, so it is important not to apply them in bright daylight. Applying them at dusk right before the sun does down or on one of our foggy days is ideal. Direct light should not be shining on the area to which they are being applied.

Nematodes need moisture to survive. Thoroughly wet the areas where you will be applying them. After application, wet again. If practical, keep those areas moist for the next few days.

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Timing. Nematodes attack only the root weevil larvae (also known as grubs), not the adult root weevil. Therefore, it is important to apply beneficial nematodes before the grubs have turned into adults. In the Seattle area, the previous year's grubs are still in the ground in late May, and a new cycle of grubs appear in August. Since the soil must be 54^{o}F or higher, applying nematodes before the soil has warmed in May will not be effective. The best time to apply nematodes for root weevils is around October.

Buying nematodes. Gardening specialty stores and farm supply stores may carry beneficial nematodes. Call in advance to determine availability and inquire about product freshness. Significant mortality of the nematodes can occur if stored for too long. Make sure the package indicates the nematodes are for controlling the particular pest you are concerned with, such as root weevils. *Steinernematid* and *Heterorhabditid* nematodes are the two genera of nematodes available for purchase. On the ride home from the store, take care that they are not exposed to heat or sunlight. **Keep as cool as possible**, and immediately put them in the refrigerator until you are ready to use them. This will keep them dormant for a short while. Follow the labeled directions for storing nematodes.

Application. Although nematodes are not known to be harmful to humans, we recommend using disposable latex gloves. Nematodes are usually supplied on a foam pad or in clay nuggets. Place the pad or measured amount of clay carrier in 1 - 2 gallons of barely lukewarm water and stir well (but not vigorously). Keep mixture agitated, so the nematodes do not settle out. Nematodes can be poured directly on moist soil using a watering can, or sprayed on the soil. After application, moisten soil again. NOTE: if you use a sprayer, be sure that your nozzle size is large enough to let the nematodes through.

Did your nematodes work? There are a couple of ways to test whether the nematodes were effective. Before your application, bury a Galleria wax worm (available at your local fishing bait store) with a little soil housed in a tea strainer (or otherwise porous container that would allow nematodes to get through) in four to six inches in the area you want to treat. Remove the container the following day and place the wax worm and soil in a wax paper cup and store in a dark and cool spot. If the nematodes worked, you will see the wax worm change color. *Steinernematid* will turn the wax worm yellow or brownish while *Heterorhabditid* will turn the wax worm red or purple in just a few days. Another way to test if your nematodes worked is to collect soil samples from four inches deep, 4 to 10 hours after your application. Put a small amount of soil in a wax cup and set a Galleria wax worm on top of the soil. Observe the wax worm for any color changes. Wax worms are very susceptible to nematode attacks and work great for monitoring nematode activity. You can even use this method for testing your soil to see if good nematodes are already roaming around your yard!

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