What are nematodes?

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Nematodes are worms without segments. Four out of five animals on earth is a nematode. There are more of them than all other animals on earth. A single square yard of soil from a forest or a farm field can contain several million nematodes. When most of us think of worms we think earth worms. Earth worms are round like nematodes, but earthworms have segments, nematodes do not. About the best way to describe a nematode is to say it is a round worm without segments. There are many different kinds of nematodes many of which are parasites, but only a very few that will damage our landscape plants. In the landscape it is difficult to identify nematode damage and just as hard to control it.

Nematodes have been on earth for over a billion years. They were originally marine or salt water animals, as all animals were a billion years ago. Since that time they have adopted into almost every environment on earth from the tropics to the poles. They can be found in salt water and freshwater, in the Arctic and Antarctic ice as well as high mountain glaciers. They are also in the soil of farmlands, tropical and temperate forests, on mountains, in grasslands and even in deserts. In other words, they are everywhere. The only place they are not is in the sky.

Most nematodes are microscopic, you can see them only with a microscope, but there are some exceptions. The largest nematode is Placentonema gigantissima. It lives in the placenta of whales and can grow to 30’ in length. In humans, such diseases as hookworm, river blindness and elephantiasis are caused by nematodes. The earliest references to nematodes are found in Chinese literature dated to around 2700 B.C.

The remainder of this article will deal with soil nematodes. Many of these nematodes are parasites, but many others are just free-living, feeding on bacteria, fungus, protozoans, other microscopic organisms and other nematodes. Of the total number of nematodes less than 1% are harmful. Of the nematodes that are parasites, most are parasites of other animals. Here in Florida only a few are parasites of plants.

All of the plant-parasites, unlike most other nematodes, have a fixture called a stylet as their mouths. The stylet looks like a spear or a straw with a very sharp end. The nematode uses this spear to stab cells and then to inject...
Plant-parasitic nematodes are classified in two ways: the first way is whether they are migratory or sedentary, the second way is whether they feed inside or outside the plant. So the four categories are migratory internal feeders, migratory external feeders, sedentary internal feeders, and sedentary external feeders.

The migratory internal feeders wander into the plant, usually into the roots, and then wander through the interior of the plant causing damage wherever it moves. One example of this type of nematode is the stubby-root nematode. Two others are the “sting” and the “awl” nematodes.

The migratory external feeders usually attack only the roots. They wander around the outside of the roots and attack where they want. Examples of this type are the “dagger”, the “sting”, the “spiral” and the “ring” nematodes.

The sedentary internal feeders move into the plant roots and then stay in one place. They cause a lot of damage but only at that one spot. Two examples of this type of nematode are the root-knot nematode and the Cyst nematode. These are both very damaging nematodes to Florida’s crops. There are many different root-knot nematodes, but each species only attacks one kind of plant. For example, a species may attack tomatoes but not anything else. One cyst nematode is a very serious pest of potatoes.

The sedentary external feeders attack only one place on the roots but then stay there feeding. The citrus nematode is an example of this type of nematode.

The lifestyle of many nematodes is to be a predator. We can use that fact to help us control other pests using a nematode predator of those pests. For example, there is a nematode called Steinernema scapterisci or S. scapterisci or Mole cricket nematode. This nematode preys on mole crickets that are a pest of Bahia grass lawns and more seriously Bahia grass pastures. Others prey on grasshoppers, cockroaches, mosquitoes, root weevils, flies, fungus gnats, billbugs and various grubs.
Nematode damage to turf, vegetables and ornamentals is hard to see. Nematodes attack the roots of the plant. In so doing, they prevent the roots from absorbing nutrients and water. The above ground damage looks like any other root problem such as a root rot or highly compact soil. Plants look straggly, they have less leaves, less stems, and are smaller than they should be. They don’t look like healthy plants: nematode damaged plants just do not thrive. The only way to be sure nematodes are causing the problem is to send a sample of the dirt and the plant to the University of Florida Entomology and Nematology Assay Laboratory: http://nematology.ifas.ufl.edu/assaylab/. The web site has directions on how to take the sample, where to send it and costs.

If you think you have nematodes there are a few things you can do. The first and probably most important is to use nematode resistant varieties of plants. There are nematode resistant tomatoes, for example. If you cannot find nematode resistant variety you need to plant something the nematode dies not attack.

In a vegetable garden you should solarize the soil every few summers. This process will kill most soil nematodes, fungus, and weed seeds. For information on solarizing se the UF/IFAS article “Introduction to Soil Solarization”: http://edis.ifas.ufl.edu/pdffiles/IN/IN85600.pdf .

One chemical product Melocon GW has shown some effectiveness in vegetables and for annuals. It suppresses nematodes but will not cure a plants of them. A second chemical, Nortica, a biological product based on a bacterium, will control root damage in turf. It protects the grasses roots and is more of a preventative treatment than a curative one. Because it is very sensitive to the right conditions for use, the time of day, and the season of the year, it is best to have a licensed professional apply it.

There are also beneficial nematodes that are mass-produced and sold commercially. You can purchase them from some big-box stores, garden stores or on the internet. Before you buy you should know the insect you are trying to control and only purchase nematodes that will control that insect. If the package does not tell you the name of the nematode, don’t buy it. You can learn more about these nematodes and find a list of them and the pests they control in the UD/IFAS article “Using Nematodes to Control Insects: Overview and Frequently Asked Questions”: http://edis.ifas.ufl.edu/pdffiles/IN/IN46800.pdf .

Beneficial nematodes are fragile, if not handled correctly they will die before they are useful. Most, but not all, require refrigeration. The manufacturer should tell you the best way to store them. More importantly, if you buy some, use them right away. They do not like heat or light, so apply them as soon
as you get them. It is best to apply in the early morning or late evening. The soil needs to be wet when nematodes are applied so irrigate both before and after. Applying in a light rain is good.

Nematodes are not only the most abundant animal on earth they have the second most variety of species. Only a few of the microscopic ones attack our plants here in Florida. It is difficult to diagnose nematode problems and even more difficult to control that damage. A careful selection of plants and use of good gardening practices are the best ways to control them.

General info on nematodes
http://www.apsnet.org/edcenter/intropp/PathogenGroups/Pages/IntroNematodes.aspx

Interesting article from Scientific American
http://blogs.scientificamerican.com/artful-amoeba/2013/02/09/parasitic-roundworms-own-this-place/

The University of Florida/IFAS as a number of good articles on nematodes:
http://edis.ifas.ufl.edu/results.html?q=nematodes
An especially useful article for understanding nematodes is: http://edis.ifas.ufl.edu/ng006