Nematode Management Strategies

Reviewed by Marisol Quintanilla – September 2021

The soil contains many nematode species, and some species are parasites of plants and animals. Even so, most plants can be parasitized by at least one of the plant-parasitic nematodes. Most plant-parasitic nematodes feed on roots while some feed within leaves.

Plant-parasitic nematode feeding does not necessarily result in characteristic secondary (aboveground) symptoms. For this reason, nematode problems often go undiagnosed. Typical aboveground symptoms of nematode infections include stunting, yellowing, and wilting. In some situations, nematodes can cause considerable yield losses; however, nematodes can reduce yields without plants showing any noticeable aboveground symptoms.

The best defense against nematodes is to avoid them. It is possible to prevent moving nematodes that are not present in your field by following simple sanitation methods such as washing machinery after using it in an infested field. Once a nematode is established in your field, eradicating is usually not a viable option. There are many different types of plant parasitic nematodes, some are more serious than others and some specialize on a specific crop. Most soil has at least a few plant parasitic nematode species. Due to their microscopic nature and abundance in soil, avoiding nematodes is nearly impossible, so nematode infestations in some fields are inevitable, but it is possible to prevent or delay the movement of nematodes not found in your field with sanitary practices.

Nematodes can travel long distances on machinery, human foot traffic, in plant material, on animals, in water, and in the wind. The bottom line: Anything that moves soil, may move nematodes. Many of these factors are uncontrollable. However, growers can control how they move and sanitize their machinery. If field samples indicate that pathogenic nematode species are present at damage threshold levels, take steps to reduce the population densities of these organisms.

Here are five effective tactics for controlling nematode populations.

Cultural Controls

Cultural nematode management are one of the most effective methods of managing nematodes. Cultural methods that can be effective are: crop rotation with non-hosts, options include choosing crop plants or cover crops that are not hosts for the problem nematode, selecting the optimal planting date, planting companion plants, and so on. We recommend rotating with a non-host. For example, grasses are non-hosts to northern root-knot nematodes, so rotating with a grass (such as corn, wheat, etc.) will reduce northern root knot nematode populations. Using cultural tactics requires you to properly identify which plant-parasitic nematodes are present.

Genetic Controls

Plant resistance is often one of the most sustainable control tactics. For example, many tomato varieties have resistance to root-knot nematodes. However, most vegetables do not have resistance against nematodes, and currently, there are no genetically modified varieties available. Some vegetable varieties may better tolerate nematode feeding, but this information is not always readily available.

Chemical Controls

Nematicides are compounds that kill nematodes. There are two main types of synthetic nematicides: fumigants and nonfumigants.

Fumigants are typically sold as liquids or gases that react with water in the soil to produce gases that kill a wide variety of organisms (including plants) depending on the compound. They are wide- spectrum biocides. If you fumigate, you should do it in the fall (preferably) or spring when soil temperatures are adequate and before the crop is planted. Fumigating can be effective, but also quite costly, so in many cases using a nonfumigant nematicide will make more economic sense.

Nonfumigant nematicides do not volatilize in soil water. They can be applied before, during, or even after planting in some situations. These compounds are often not as broad in their spectrum as fumigants. Nonfumigants may be less detrimental to beneficial organisms since some of these compounds are more specifically targeted to nematodes and some are systemic in the plant and thus target mostly nematodes feeding on the plant. It is important to select a nematicide to meet your nematode management needs and economic thresholds.

Fumigant and nonfumigant nematicides labeled for use in vegetable production are shown in the Nematicide Table.

Biological Controls and Bionematicides

Most nematodes in the soil are beneficial. They typically feed on bacteria, fungi, or small animals including other nematodes. Some methods to increase soil health is crop rotation, reducing tillage, using cover crops, and using compost and manures.

In addition, many other organisms are parasites or pathogens of nematodes. Most of these occur naturally in soils, but they

often do not sufficiently control plant-parasitic nematodes enough to keep their population densities below damage threshold levels. Some manufacturers market products as biological nematicides. See Nematicide Table.

Physical Controls

Physical nematode control options include using heat, steam, or water (flooding) to reduce nematode population densities. In field situations, these types of controls are often not feasible in the Midwest. However, in glasshouse or poly-house production, growers may use heat or steam to sterilize growing media.

Sampling Nematode Populations

Plant-parasitic nematodes are microscopic organisms with aggregate (often highly clumped) distributions in fields. As a result, the symptoms their feeding causes often occur in circular or elliptical patterns. If you observe plant symptoms are uniformly distributed, the cause of the problem is typically not nematodes.

All sound nematode management programs include rigorous sampling. Since nematodes are microscopic and typically do not always produce noticeable symptoms that indicate their presence, it is necessary to sample to detect nematodes and avoid problems.

A great deal of research has gone into sampling nematode populations. Here are three important points:

1. Due to their microscopic nature, the only way to diagnosis a plant-parasitic nematode problem is to collect a soil and/or plant tissue sample(s) and send it to a nematode diagnostic lab for analysis (see State Contact Information table). It is critical to properly identify the nematode's genus or species to provide specific management recommendations. Please refer to any bulletin or other publication devoted to sampling for these organisms for more detailed instructions.
2. When collecting soil samples for plant-parasitic nematodes, the more soil cores you can gather, the better the sample. Collecting roughly 20 soil cores is usually adequate. You can combine and mix these
3. cores. A lab usually only requires you to submit a pint to a quart of soil. You should place nematode samples in plastic bags and close them to retain moisture. Keep the samples out of the sun and heat to ensure that nematodes arrive in good condition for identification at the diagnostic lab.
4. Use different methods for different sample areas. It may be a good idea to separate different areas of the field when sampling. For example, high or low areas of the field or changes in soil types may require different samples.