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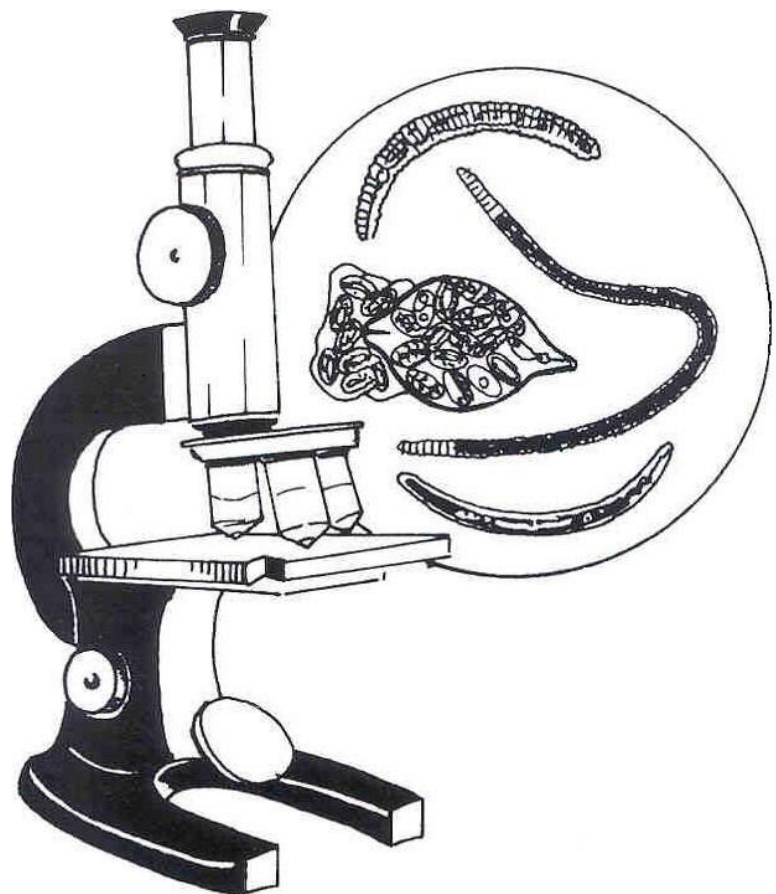
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Nematode Analysis

THE IMPORTANCE OF NEMATODE ANALYSIS

Nematodes are microscopic organisms which are found everywhere in the soil. They are known by such common names as eelworms, nemas, round worms, threadworms, and worms. Many varieties live freely in the soil and feed on bacteria, fungi and algae. There are varieties, however, which are parasites and feed on virtually all animals and plant life. They can cause severe damage to crops. All crops are subject to nematode damage. Laboratory analysis is the only sure way to determine the presence of parasitic nematodes.

Nematode populations are subject to seasonal fluctuations. The largest populations generally occur when root growth is most rapid in your particular area for the crop you are growing. Damage in crops is usually very patchy in the areas that it occurs. Populations and nematode activity will decrease as root growth declines and soil temperatures cool below 60°F or raise above 85°F. The optimum soil temperature range for sampling is between 60-80°F. Moisture content of the soil also affects nematode populations and activity. Optimum moisture content should be 40%-80% of field capacity.

GENERAL INFORMATION ON NEMATODES

There are two general types of nematodes. They include ectoparasitic and endoparasitic nematodes. Ectoparasitic nematodes spend their entire life cycle outside of the host. They feed by inserting a stylet or spear into the plant usually at the root system. Some examples of ectoparasitic nematodes include: lance, sting, spiral, stunt, stubby root, dagger, and ring. Endoparasitic nematodes spend part or all of their life cycle within the plant. These include: cyst, root knot, lesion, and stem and bulb nematodes. Soil samples taken at the root level will usually reflect populations of even endoparasitic nematodes through larval populations which have not yet entered the plant root system.

SYMPTOMS OF NEMATODE DAMAGE

Symptoms of nematode damage vary greatly with type of nematode, the age of the plant, and the plant part that is affected. Some classic symptoms associated with nematode damage include:

- A. Root knots or galls**
- B. Stunted growth**
- C. Excessive root branching**
- D. Root Lesions**
- E. Devitalized root tips**
- F. Leaf, flower, stem, and seed Damage**

It is important to note that knots on roots are not always associated with nematode damage. Nitrogen fixing nodules appear much like root knot nematodes on the root. They are naturally produced by some plants. It is also important to note that knots need not be present to have a nematode problem. If one or more of the above symptoms are present, testing for nematode damage is indicated.

HOW TO SAMPLE

Proper sampling techniques are important to ensure the best possible data. The following are guidelines to use when taking soil samples for laboratory analysis.

- A. Sample soil when it is moist.**
- B. Collect all samples in Waypoint sample bags or a plastic bag to keep the soil from drying out.**
- C. Two (2) cups of soil is needed for each sample to be analyzed. A larger sample is preferred if possible to allow for thorough mixing before testing is done.**
- D. Keep samples cool. Overheating does kill nematodes. If it is impossible to send the sample immediately, refrigerate the sample until it can be shipped to the laboratory.**

When sampling for a specific type of crop certain guidelines should be followed.

1.) TURF AND ORNAMENTALS

Sample should be taken at a depth of 3"-6" or at the root level. Areas around the periphery of the damage should be sampled as nematodes move to thriving areas as they kill one area out. Make a composite sample of 10-20 locations per area sampled. This will provide a more uniform sample as nematodes are not distributed evenly throughout the soil.

2.) VEGETABLE AND FIELD CROPS

Sample should be taken at a depth of 3"-6" or at the root level. Samples should be taken at pre-plant to ensure vigorous growth of the plant. Young, unestablished plants will be more severely affected by lower nematode populations. Take about 10-20 plugs per sample to ensure a more uniform sample. Even if crop rotation is used it is important to identify nematodes that may affect a new crop.

3.) TREES, WOODY ORNAMENTALS, AND VINES

Take sample far enough from the trunk to include feeder roots along with the soil sample. Several cores should be taken per area and mixed thoroughly to ensure a more uniform sample.



INTERPRETATION OF DATA

Interpretation of nematode counts is crop dependent. It is therefore very important that crop information be included when the sample is submitted for testing.

If this information is not included you will receive a more general interpretation of the results as to whether treatment is needed or not. It is important to remember that different plants are more susceptible to different types of nematodes. The data will normally be reported to you on the basis of nematodes per 100 cc. of soil. When requested they may also be reported per pint of soil. Root samples are analyzed on a per gram of root basis. This will vary with sample type and will be clearly noted as to the per gram weight volume

on the report form. Cyst nematodes may be reported as either larva per 100 cc. or as eggs per gram of soil.

The report to you will include the following:

- A. Identification at the genus level and the common name for the nematodes found during analysis.
- B. Information on the type of crops known to be damaged by the nematodes present in the samples.
- C. A suggestion as to whether or not to treat, considering the type and populations of nematode found in your sample for your particular crop.

Please note that Waypoint Analytical will not make recommendations for the use of a particular nematicide. Further

interpretation of the data can be acquired from your state or county extension agency or agricultural services. They will be able to advise as to recommended levels and treatment for your particular crop and area of the country.

CONTROL

If the nematode data you receive suggests that control of a problem is warranted, there are two methods which can be considered to achieve this goal. They are cultural and chemical control methods. A combination of the two can also be used to help eliminate future problems.

A. CULTURAL CONTROL

Cultural control of nematode problems include: crop rotation, flooding, weed control, use of resistant varieties, and use of natural enemies. Weed control is a very important yet easy way to help reduce nematode populations as nematodes are obligate parasites and will die if there is nothing for them to feed on.

B. CHEMICAL CONTROL

Chemical control consists of two broad methods of control. They include fumigants and non-fumigants. Fumigants are injected into the soil and must be applied several weeks before a crop is planted. They cannot be used on an already established crop. Non-fumigants can be used on an already existing crop and are usually applied as a contact nematicide by mixing them with water.

Nematicides are highly toxic to humans. They are specifically labeled for use as to the crop type and application rates that they may be applied at. This varies state to state in many cases. If you do decide to use a nematicide to treat an existing problem, you should contact your extension service, chemical dealer, or consult your state's nematicide applications handbook.

NEMATODE SUSCEPTIBILITY CHART

CROP	COMMON DAMAGING NEMATODES
ALFALFA	root knot, stem, lesion, cyst, pin, stubby-root
BEANS	root knot, sting, pin, cyst, stubby-root, stunt
BANANA	root knot, burrowing, lesion, lance
CITRUS	citrus, burrowing, lesion, sting, dagger
CORN	sting, lesion, stubby-root, lance, cyst, needle
COTTON	root knot, sting, lance
GRAPES	root knot, dagger, sting
OATS	cyst, anguina, lance
ORNAMENTALS	root knot, lesion, spiral, reniform
POTATO	root knot, golden nematode, lesion
RASPBERRIES	lesion, dagger
SOYBEANS	cyst, sting, root knot, stunt
STRAWBERRIES	spring & summer crimp, lesion, sting, root knot
TOBACCO	root knot, lesion, sting, cyst
TOMATO	root knot, dagger, sting
TURF	root knot, cyst, lance, sting, spiral, ring, bentgrass nematode, stunt, sheath, Peltamigratus, sheathoid
WHEAT	cyst, anguina, sheath, root knot, pin, stubby-root, sting, needle

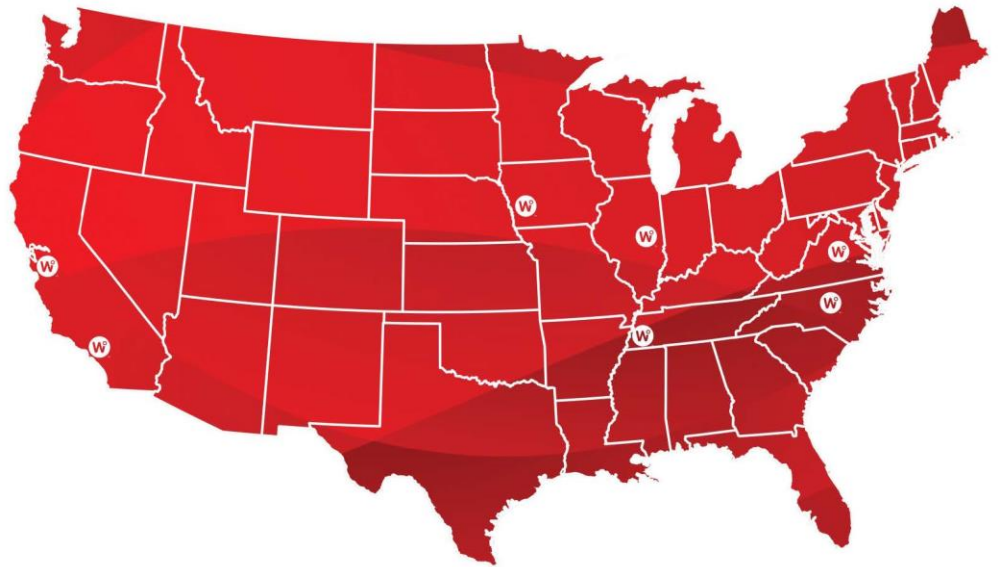
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