PLANT AND SOIL NEMATODES

DIAGNOSIS OF POTENTIAL NEMATODE PROBLEMS IN PERENNIAL HORTICULTURAL CROPS

Plant-parasitic nematodes debilitate the root systems of many tree and vine crops, and this causes unthriftiness and reduces yield. This fact sheet explains how growers can determine whether nematodes are likely to be causing problems in a vineyard; in a banana, pineapple, kiwifruit, or blueberry plantation; or in orchards planted to citrus, almond, apple, peach, or other tree crops.

Collection of samples

Fields to be planted to a perennial crop

Whenever a perennial crop is to be planted in a field, it is advisable to collect a soil sample well before planting and have it assessed for nematodes. The reason this should be done is that the result will indicate 1) whether the newly planted crop is likely to suffer nematode damage; 2) whether a nematode resistant or tolerant rootstock should be considered; and 3) whether a pre-plant nematicide treatment should be applied. The sample should be collected in the following way.

- Use a sampling tube 20-25 mm in diameter or a narrow spade to collect soil to a depth of about 20 cm. If it is possible, collect the sample when the soil is moist.
- Walk in a grid pattern and collect a handful of soil (approx. 100 mL) from at least 20 randomly selected points in each hectare. If weeds are present that may be hosting plant-parasitic nematodes that could potentially damage the next crop, include some soil from the root zone of those weeds.
- Place each sub-sample in a bucket, and when the sampling process is complete, mix the soil carefully and place about 500 g in a zip lock plastic bag. As the soil contains nematodes and other organisms and it is important to keep them alive, handle the soil GENTLY whenever it is added to a bucket or being mixed.

Newly established plantings

Aboveground symptoms such as uneven growth and unthriftiness are sometimes seen in newly planted perennial crops. These symptoms usually appear in the first year after planting and are most likely to occur in fields where the same crop, or a closely related crop, was grown previously.

Plant-parasitic nematodes are sometimes the primary cause of such problems, but they may also interact in some way with other pathogens that are associated with the disease. Thus, it is wise to check whether nematodes are involved in the problem.

- Note the distribution of the disease. Fields often vary in soil type, slope, previous cropping history, or some other factor, and so it is important to check whether symptom severity is influenced by any of these factors.
- If a factor such as soil type appears to be influencing growth (e.g. symptoms are worse in a particular soil type in one area of the field), then subdivide the field into two or more sampling areas.
- Once the areas to be sampled have been selected, choose some healthy plants, some plants showing moderate symptoms, and some plants showing more severe symptoms from each area (see photographs below). Collect about 500 g soil from each group of plants, place each sample in a zip lock plastic bag and label it appropriately. Always ensure that some roots are included in the sample, as they are useful for diagnostic purposes.

Established plantings

When a nematode analysis is required on a crop that has been growing for many years, it should be sampled in much the same way as a newly established planting. If all the plants in the orchard or plantation are in much the same health, then a single sample should be collected. However, if there is some variability, then plants with different levels of disease severity should be sampled.

When samples are being collected from a perennial crop to check whether plant-parasitic nematodes may be contributing to a poor growth problem, it is important to collect samples from plants showing different levels of damage. For example, some five-month-old blueberry plants were growing poorly in one field, and so samples were collected from healthy plants (left), plants showing mild symptoms (middle), and plants with severe symptoms (right).

Forwarding samples to a nematology laboratory

Once samples are collected, keep them cool and out of direct sunlight and forward them via express delivery to a laboratory that provides a nematode diagnostic service. Some state government and commercial laboratories offer such a service but it is important to check that they have professional staff with the skills required to identify nematodes and diagnose disease problems.

Whenever samples are submitted for nematode analysis, always ensure that details of each sample are sent to the diagnostic laboratory. Key details include:

- Why is a nematode analysis required?
- The crop or cultivar that was sampled and the symptoms observed on those plants
- The recent history of the field (particularly crops grown in the last two years)
- Background soil, agronomic and management information (e.g. soil type, nematicides applied, recent tillage events, type of irrigation, presence of weeds)
- If a pre-plant sample was collected, what was the condition of the field (i.e. a bare or weedy fallow), and what crop is to be planted and when?

Results from a nematode analysis and their interpretation

A diagnostic report should contain three sections: 1) Methods: the weight or volume of soil processed, the method used to retrieve nematodes, and its approximate extraction efficiency; 2) Results: counts of all plant-parasitic nematodes extracted (identified at least to genus level), and comments on any symptoms observed on roots; and 3) Interpretation: what do the results mean?

There is no simple way to interpret the results of nematode analyses because the number of nematodes that will cause damage is influenced by many factors, including soil type, environmental conditions such as soil moisture and temperature, management practices, and the biological status of the soil. Nevertheless, the diagnostic laboratory should be able to use the damage thresholds that have been published for various nematodes and crops to indicate the key nematode pests in the sample and whether they are likely to be causing damage or have the potential to cause damage.

Ideally, the report should also contain counts of the total number of free-living nematodes in each sample, and the proportion of the nematode assemblage in various trophic groups, as this provides information on the capacity of the soil biological community to suppress populations of nematode pests.

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