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Soil nematodes in kiwifruit orchards

Nematodes as 'soil quality' indicators

Soil nematodes are very small roundworms that live in the soil. Soil nematode "assemblages" include nematodes that feed on bacteria, fungi and plants, as well as predacious nematodes that feed on other animals of comparable size (including each other) and omnivorous nematodes that feed on bacteria, fungi, plants and other animals. Some nematodes can cause damage to agricultural crops, such as kiwifruit, but many are beneficial to soil ecological processes (e.g. contributing to decomposition of organic matter).

Monitoring soil nematode assemblages may provide useful information on the effects of orchard management on biodiversity and soil quality.

Collecting soil nematodes

The ten ARGOS clusters of kiwifruit orchards in the Bay of Plenty were sampled in July and August of 2004. There are 3 nearby kiwifruit orchards in each cluster: one organic Hayward, one KiwiGreen Hayward and one KiwiGreen Hort 16A. KiwiGreen is an integrated pest management (IPM) system.



At each orchard, soil cores were taken from within the vine line (under the leaders) at three randomly established sites in each of three blocks. The samples within each block were aggregated to produce three aggregated samples per orchard. Ten cores were collected per sample site, each 25mm in diameter and 150mm deep. Using sieves, the nematodes were extracted from the soil. Preserved in glycerol, the abundance of nematodes per gram was measured and the nematodes were then mounted onto slides so that they could be identified and allocated to feeding groups.

Figure 1. *Hoplolaimida* from a kiwifruit orchard in the Bay of Plenty, NZ (Photo S. Richards)

Findings

The composition of nematode feeding groups was similar across the three orchard systems (see figure 1). Most nematodes were bacterial-feeders and plant-feeders. Omnivorous nematodes made a higher contribution to overall nematode assemblages in organic orchards.

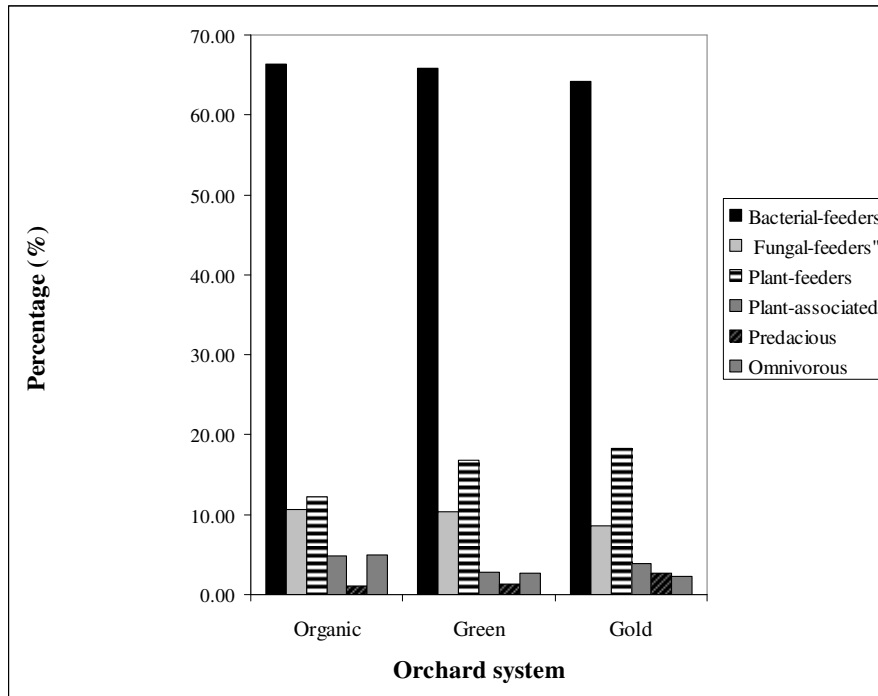


Figure 1. Feeding group composition of nematode assemblages in ARGOS kiwifruit orchards in the Bay of Plenty.

Exploration of relationships between the nematode assemblages and other soil properties measured by ARGOS at each site revealed a positive relationship between plant-feeding nematodes and soil moisture content, and a negative relationship between these nematodes and soil bulk density and potassium levels. These findings indicate that soil nematode assemblages and soil properties are related to each other. Further research with repeated measurements is needed to confirm the nature of these relationships and would help us to understand how these findings can be used to explain soil quality on kiwifruit orchards.

So are nematode assemblages useful indicators of soil quality?

The aim of the first few years of the ARGOS research programme has been to identify orchard characteristics ('indicators') that can be used to monitor the changes in the underlying ecological processes on orchard systems. Useful indicators should be simple to measure and cost-effective, as well as

fitting in with the orchardist's perceptions of how to manage their soil. Soil nematode assemblages may not be the most simple to measure and may prove to be quite costly. They are also not widely recognizable to growers. Other indicators of soil quality may be preferable. ARGOS is in the process of establishing a soil monitoring programme, and there may be opportunities within this programme to further investigate how soil nematode assemblages relate to soil quality in

kiwifruit orchards.

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