

Assessing Soil Health Through Nematode Community Analyses in Organic and Low Tilled Conventional Farming Systems

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Nematodes have potential to serve as bioindicators of soil health. The major goal of agricultural nematologists is to enhance the population build up free living or beneficial nematodes and prevent the population buildup of harmful plant parasitic nematodes. Fungivore and bacterivore nematodes are primary consumers and involved in nutrient cycling. Therefore agricultural practices should aim at enhancing the population of free-living nematodes.

As opposed to conventional farming systems, organic farming relies heavily on tillage and organic inputs. We hypothesized that the organic matter inputs counteract the effect of intensive tillage in organic systems leading to a nematode community structure similar to the low tilled conventional system. In 2000 a long-term field experiment was established at the OARDC, representing the two farming systems. Conventional plots had corn and soybean rotation and received synthetic inputs. Organic plots had corn, soybeans, oats and hay rotation and received beef and poultry manure. Soil samples were collected each year during spring and before addition of organic matter, and in fall after senescence. Three cores of soil (7.5 cm diameter and 15 cm deep) were collected from each plot using soil auger. Collected soil samples were mixed thoroughly and large plant parts or stones were removed from soil and a sub sample was taken from composite soil sample for further processing of nematode extraction. Nematodes were extracted using 10g soil, collected after 72 hours and each specimen identified to family and genus level at 40X magnification using various diagnostic keys. Identified nematodes were assigned a trophic group (plant parasitic, fungivore, bacterivore, carnivore or omnivore) and a colonizer value (c-p). Maturity Index, Combined Maturity Index, Structure Index, Plant Parasitic Index using c-p value of the nematode family. Shannon diversity, Richness and Evenness Indices were also calculated using standard formulae.

Population of bacterivore nematodes was significantly higher in organic than the conventional farming system. Populations of fungivore, omnivore and carnivore nematodes were not significantly different among the farming systems, however the differences were significant between the years. Ratio of plant parasitic to free living nematodes, proportion of free living nematodes and population of root lesion nematodes, *Pratylenchus crenatus*, were significantly different between organic and conventional farming systems. Significantly lower population of plant parasitic nematodes in organic farming system could be due to the detrimental effects of organic amendments. Maturity Index, Combined Maturity Index, and Shannon diversity Index showed no significant differences between the farming systems indicating similar level of disturbance among the farming systems. Application of a recently proposed model, which provides a framework for soil food web diagnostics, to our data, revealed that despite differences in tillage intensity both organic and conventional farming systems resulted in similar nematode community structure (Figure 1). Our results indicate that the combination of low tillage with organic inputs would increase the sustainability of agro-ecosystems.

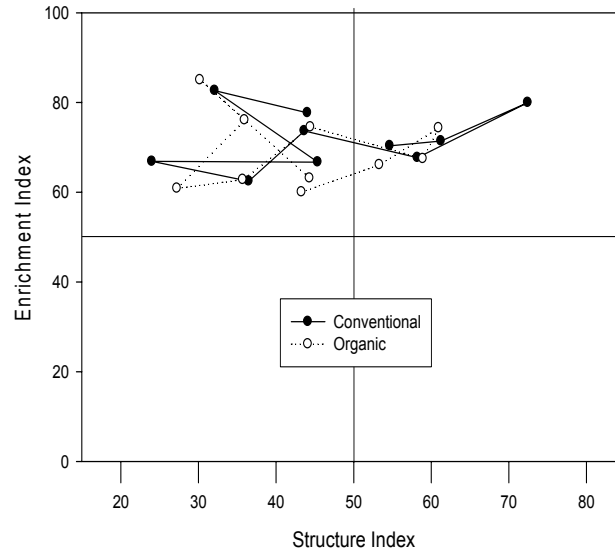


Figure 1 : Comparison and temporal progression of food web indicated by nematode faunal analysis in organic and conventional farming systems from spring 2000 to autumn 2004