# Shifts in the composition of plant parasitic nematodes under different tillage sytems, living mulch, and compost application

**J.H. Schmidt[1], A. Šišić[1], J. Bacanovic[1], J. Hallmann[2] and M.R. Finckh[1]**

d

[1] **Department of Ecological Plant Protection, University of Kassel, Nordbahnhofstr. 1a, 37213 Witzenhausen, Germany**

[2] **Julius Kühn-Institut (JKI), Federal Research Centre for Cultivated Plants, Institute for Epidemiology and Pathogen Diagnostics, Toppheideweg 88, 48161 Münster, Germany**

**E-mail:** jschmidt@agrar.uni-kassel.de

## Introduction

The overall aim of the EU-Project OSCAR (Optimizing Subsidiary Crop Applications in Rotations) is the development of land use systems based on minimum tillage, living mulches, and compost application. However, permanent crop growth may increase nematode incidence. Therefore, nematode species and densities were monitored throughout the crop rotation of 2 years clover-grass, wheat, and potatoes.

## Material and methods

A field experiment was set up to study effects of tillage, living mulch, and compost applications (Table 1). Soil samplings were done before sowing of winter wheat in the clover grass and after the harvest of wheat. Twenty soil cores were taken per plot for analysis. The nematode extraction was done via centrifugal-flotation method and in the following nematode genera were identified microscopically.

## Results

- Overall nematode population density increased (Fig. 1)
- *Paratylenchus was* after 11 months still the dominant species in the eastern part of the field but density overall decreased
- Increasing number of *Pratylenchus* in almost all plots
- Patchy occurrence of high numbers of *Meloidogyne* after the harvest of winter wheat (Fig. 1B)
- **Minimum tillage** enhanced number of nematodes one year after the start of the experiment (Fig. 2):
  - The number of *Pratylenchus* and *Helicotylenchus* increased.
  - Few changes were found for both *Tylenchorynchus* and *Meloidogyne*.
  - *Paratylenchus* only decreased in the treatment eco-dyn + compost.
- With **ploughing** nematode numbers did not change, however the population composition:
  - The number of *Paratylenchus* spp. decreased.
  - Contrary, the number of *Pratylenchus* increased.
  - Additionally, increasing numbers of the genera *Meloidogyne* and *Helicotylenchus* were counted.

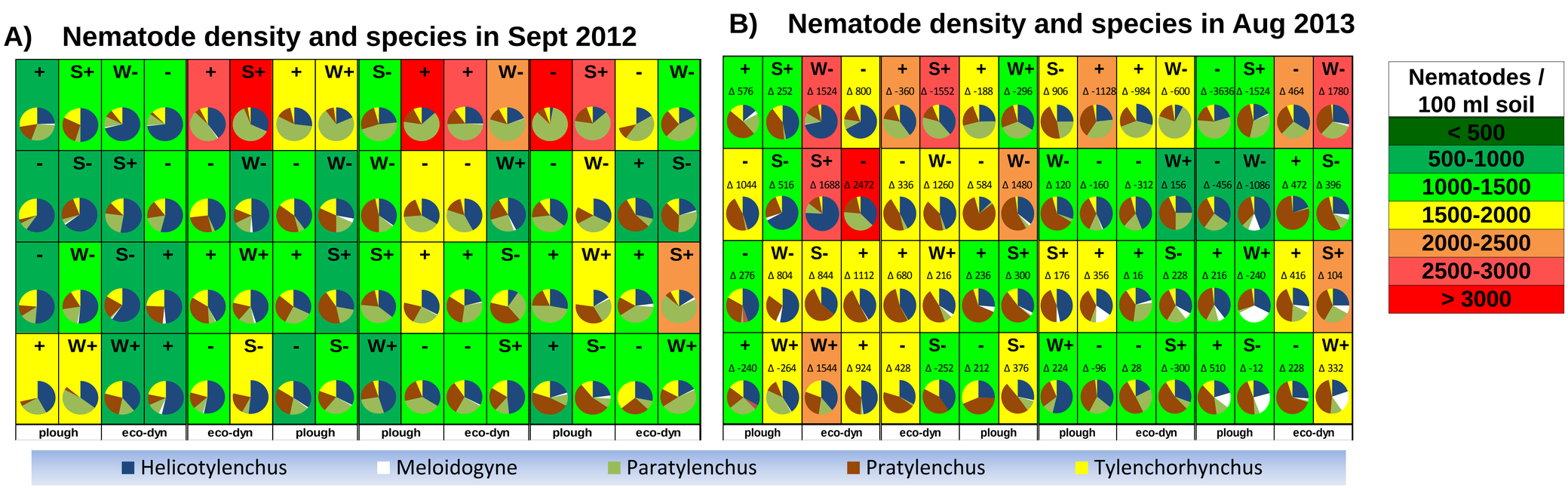


Fig. 1: Nematode counts/ plot (color of plots) and nematode composition (Pie charts) at the beginning of the field experiment (A) and one year later after the harvest of winter wheat (B). For abbreviuations see Table 1.

## Discussion and conclusions

I. Winter wheat is known to be a good host to *P. neglectus* and *P. penetrans* (Townshend & Potter, 1976, Hallmann et al., 2007), species that were identified in the field experiment, and hence, increased *Pratylenchus* overall.

II. High initial populations of *Paratylenchus projectus* were identified. This could be explained by the clover-grass pre-crop which is an excellent host (Townshend and Potter, 1973, 1976). The subsequent winter wheat was most likely a non host plant and hence, decreased the nematode populations. Volunteering rye grass in the eco-dyn system could be a reason for less decline of *P. projectus* compared to the ploughing system.

III. Amongst others, *H. digonicus* was identified as a species of the high initial *Helicotylenchus* populations. This species is known to be hosted by certain fodder crops (Townshend and Potter, 1973) which explained the high initial *Helicotylenchus* density.

IV. Tillage did not affect nematodes in the first year, However, broad host spectrum nematodes could have benefited from the minimum tillage system as it was overall weedier.

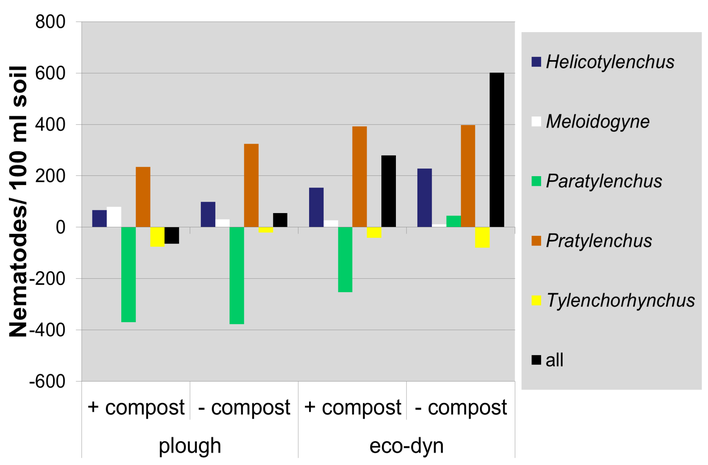


Fig. 2: Nematode population shift for the treatments tillage and fertilizer one year after beginning of the OSCAR experiment MEE'12. Bars are expressing the deviation at the sampling date after harvest of the winter wheat from the sampling date at the beginning of the experiment; N=16.

*Tab. 1: Field treatments*

| | |
|---|---|
| plough | 25 cm deep ploughing |
| eco-dyn | Minimum tilled plots |
| W | White clover living mulch |
| S | Subterranean clover living mulch |
| + | 5 t/ha yard waste compost before winter wheat |
| - | without compost |

## References

Hallmann, J., Frankenberg, A., Paffrath, A., Schmidt, H., 2007. Occurrence and importance of plant-parasitic nematodes in organic farming in Germany. Nematology 9, 869–879.

Townshend, J.L., Potter, J.W., 1973. Nematode numbers under cultivars of forage legumes and grasses. Canadian Plant Disease Survey 53, 194–195.

Townshend, J.L., Potter, J.W., 1976. Evaluation of forage legumes, grasses, and cereals as hosts of forage nematodes. Nematologica 22, 196–201.

www.uni-kassel.de/fb11agrar/fachgebiete-einrichtungen/oekologischer-pflanzenschutz/startseite.html