

Vertical distribution of free living and plant parasitic nematodes inhabiting hop gardens in Moravia (Czech Republic)

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Abstract. Soil nematode fauna and its vertical distribution in four 10-cm-layers were studied in two hop gardens in the Tršická hop growing area (Moravia, Czech Republic). In total nematodes belonging to 51 genera (15–36 genera per layer per 100 g of soil) were found. The abundance of nematodes, recorded at the two localities investigated was 1306 and 2846 individuals per 100 g of soil (38–1468 per layer), respectively. The most frequent and eudominant trophic groups were bacterial feeders followed by fungal feeders and plant parasites, whereas only low numbers of omnivores and predators were recorded. Six plant parasitic genera were found (11.8% of the total number of genera). No potential vectors of plant viruses belonging to the superfamily Longidoroidea and family Trichodoridae were recorded at the localities studied.

Key words. Soil zoology, ecology, trophic groups, hop gardens, vertical distribution, Nematoda, *Heterodera humuli*, Czech Republic.

INTRODUCTION

Hop (*Humulus lupulus* L.) is grown in the Czech Republic in three regions, i.e. Žatecká, Tršická and Úštěcká, where the total area planted with hops in 2008 was 5345 ha and the tradition of growing hops extends over more than a thousand years. Hops are still one of the most important crops grown in the Czech Republic. It is a perennial plant of the family Cannabaceae with roots of up to twelve metres long. Based on these facts it is predicted that the composition of nematode communities and occurrence of some plant parasitic nematodes, which are K-strategists, is similar to that in vineyards (Kumari 2007) or fruit orchards (Erbenová 1976) with similar types of soil and soil structure. However, there are no detailed studies on the communities of nematodes in the Czech Republic with the exception of those on the occurrence of *Heterodera humuli* made by Šály & Kříž (1961) and Šedivý (1963). There are studies on the communities of free-living and plant-parasitic nematodes in hop gardens in South Africa (Malan et al. 1991), Switzerland (Hogger 1998), Tasmania (Hay & Pethybridge 2003) and Slovakia (Lišková & Renčo 2007). The objectives of this preliminary study were to determine the distribution of free living and plant parasitic nematodes in the soil profile and identify the rate of soil erosion and effect of human activity on the composition of nematode communities in two hop gardens in Moravia.

MATERIAL AND METHODS

This study was conducted in the Tršická hop growing area in Moravia. The localities investigated were Senice na Hané (M1) – N49 37.192, E17 06.611 (256 m a. s. l.) and Kokory (M2) – N49 29.738, E17 22.147 (182 m a. s. l.). The climate of the area is continental with an average annual temperature of 8.5–9.5 °C (the monthly average ranges from –1.5 °C

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in January to 20.1 °C in July) and an annual precipitation of 500–530 mm; during the vegetation period the temperature is 15.3 °C and rainfall 342 mm. The soils are deep, permeable, loamy or loamy-clay, soil type Luvisol with pH 6.5–7.5. Hop gardens are limed every four years and fertilized regularly each year with standard amounts of industrial fertilizers. In order to obtain data on nematodes ten replicated profiles in each hop garden were sampled (with a 5 cm width subcylindrical corer) to a depth of 0–40 cm in August 2007 and subdivided into layers of 0–10, 10–20, 20–30 and 30–40 cm. Isolation of nematodes from 100 g soil of bulk samples were done using Cobb's flotation-sieving method (Cobb 1918). Nematodes were killed and fixed in 4% formalin and transferred to glycerine using the modified Seinhorst method (Seinhorst 1959). Afterwards, the species of the nematodes mounted in glycerine on slides were determined using a light microscope. Cysts were isolated from 100g of dry soil using a Thomas can, which is based on the flotation principle. The Maturity Index (MI) (genus *Ditylenchus* included) and Plant Parasite Index (PPI) (all specimens of the trophic groups plant parasites and root-fungal feeders included) were calculated with c-p values (r-K continuum) according to Bongers (1990) and the Σ Maturity Index (Σ MI) according to Yeates (1994). Nematodes were assembled in the following trophic groups: bacterivores (B), fungivores (F), plant parasites (PP), omnivores (O), predators (P) and insect parasites (IP) according to their feeding habits as outlined by Yeates et al. (1993), and Tylenchidae were classified as root-fungal feeders (RFF). The Shannon index (H' gen) based on natural logarithms was calculated for nematode genera (Shannon-Weaver 1949). Ratios of trophic groups [B/F, (B+F)/PP, (B+F+RFF)/PP, (B+F)/(RFF+PP), (O+P)/(B+F+RFF+PP)] were calculated according to Wasilewska (2004). Statistical calculations were performed using STATISTICA (StatSoft 2001). The nematode genera were characterized as eudominant at $D > 10\%$, dominant at $D = 5\text{--}10\%$, subdominant at $D = 2\text{--}5\%$, recedent $< 2\%$ (Losos et al. 1984).

RESULTS

In total, in the two hop gardens, representatives of 51 genera belonging to nine orders of Nematoda (15–36 genera per layer in 100 g of soil, Table 1) were found. There were 1306 and 2846 nematodes in 100 g of soil (38–1468 individuals per 100 g of soil per layer) at the localities investigated. The most frequent and eudominant trophic groups were bacterial feeders followed by fungal feeders and plant parasites (Fig. 1). The eudominant and dominant genera of free living

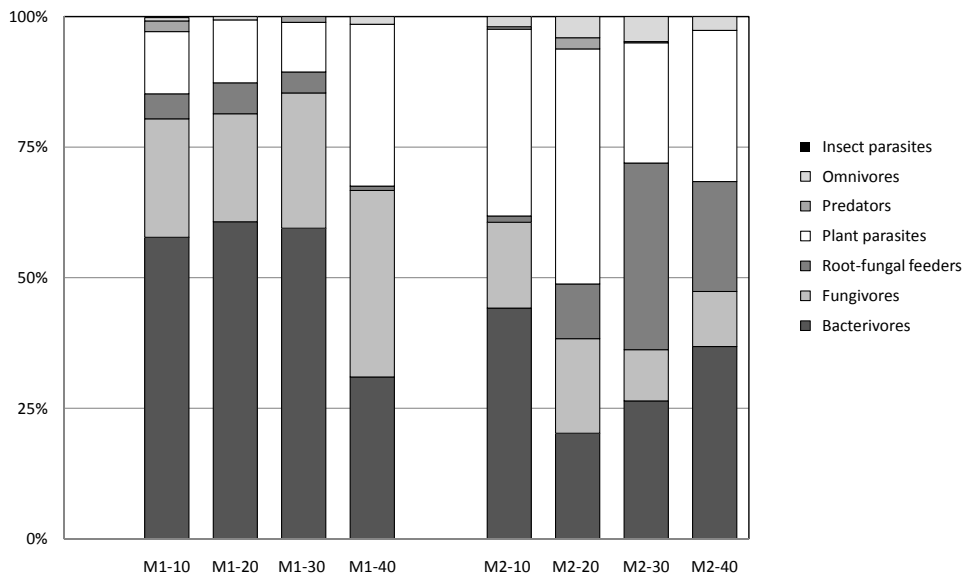


Fig. 1. Distribution of the trophic groups of nematodes within the soil profile of hop gardens in Moravia. Abbreviations: M1 – Senice na Hané, M2 – Kokory.

Table 1. Abundance of Nematoda (individuals per 100 g of soil) in both hop gardens and their dominance (D, in %) in individual soil layers per 10 cm. Abbreviation of trophic groups (TG): B – bacterivores, F – fungivores, RFF – root-fungal feeders, PP – plant parasites, O – omnivores, P – predators, IP – insect parasites; c-p – colonizer-persister values

| nematodes | | TG | c-p | 0-10 | D | 10-20 | D | 20-30 | D | 30-40 | D | X±SD | D |
|--|-----|----|-----|-------|-----|-------|-----|-------|-------|-------|-------|--------------|-------|
| ARAEOLAIMIDA | | | | | | | | | | | | | |
| <i>Aulolaimus</i> de Mann, 1880 | B | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0.14 | 0 | 0 | 0.25±0.43 | 0.02 |
| <i>Chronogaster</i> Cobb, 1913 | B | 2 | 0 | 0 | 0 | 0 | 0 | 8 | 1.12 | 0 | 0 | 2±3.46 | 0.19 |
| <i>Plectus</i> Bastian, 1865 | B | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0.14 | 0 | 0 | 0.25±0.43 | 0.02 |
| RHABDITIDA | | | | | | | | | | | | | |
| <i>Acrobeloides</i> Cobb, 1924 | B | 2 | 395 | 21.12 | 104 | 11.58 | 60 | 8.46 | 8.46 | 51 | 7.81 | 152.5±141.44 | 14.76 |
| <i>Acrobelus</i> von Linstow, 1877 | B | 2 | 7 | 0.37 | 25 | 2.78 | 3 | 0.42 | 0.42 | 4 | 0.61 | 9.75±8.93 | 0.94 |
| <i>Cephalobus</i> Bastian, 1863 | B | 2 | 35 | 1.87 | 37 | 4.12 | 35 | 4.91 | 4.91 | 11 | 1.68 | 29.5±10.71 | 2.85 |
| <i>Cervidellus</i> Thome, 1937 | B | 2 | 47 | 2.51 | 45 | 5.01 | 37 | 5.19 | 5.19 | 67 | 10.26 | 49±11.05 | 4.74 |
| <i>Diploscaptes</i> Cobb, 1915 | B | 1 | 25 | 1.34 | 9 | 1.00 | 0 | 0 | 0 | 0 | 0 | 8.5±10.21 | 0.82 |
| <i>Chiloplacus</i> Thorne, 1937 | B | 2 | 170 | 9.09 | 27 | 3.01 | 26 | 3.65 | 3.65 | 21 | 3.22 | 61±62.97 | 5.90 |
| <i>Ereptonema</i> Anderson, 1966 | B | 2 | 12 | 0.64 | 23 | 2.56 | 14 | 1.96 | 1.96 | 11 | 1.68 | 15±4.74 | 1.45 |
| <i>Eucephalobus</i> Steiner, 1936 | B | 2 | 71 | 3.80 | 33 | 3.67 | 39 | 5.47 | 5.47 | 19 | 2.91 | 40.5±19.05 | 3.92 |
| <i>Heterocephalobus</i> Brzeski, 1960 | B | 2 | 5 | 0.27 | 4 | 0.45 | 0 | 0 | 0 | 0 | 0 | 2.25±2.28 | 0.22 |
| <i>Mesorhabditis</i> Osche, 1952 | B | 1 | 86 | 4.60 | 10 | 1.11 | 9 | 1.26 | 1.26 | 3 | 0.46 | 27±34.17 | 2.61 |
| <i>Panagrolaimus</i> Fuchs, 1930 | B | 1 | 26 | 1.39 | 9 | 1.00 | 4 | 0.56 | 0.56 | 2 | 0.31 | 10.25±9.44 | 0.99 |
| <i>Pelodera</i> Schneider, 1866 | B | 1 | 7 | 0.37 | 0 | 0 | 0 | 0 | 0 | 3 | 0.46 | 2.5±2.87 | 0.24 |
| <i>Protorhabditis</i> Osche, 1956 | B | 1 | 7 | 0.37 | 12 | 1.34 | 6 | 0.84 | 0.84 | 0 | 0 | 6.25±4.26 | 0.60 |
| <i>Rhabditis</i> Dujardin, 1845 | B | 1 | 31 | 1.66 | 10 | 1.11 | 10 | 1.40 | 1.40 | 4 | 0.61 | 13.75±10.26 | 1.33 |
| <i>Rhabditis</i> Dujardin, 1845 juvs. | B | 1 | 85 | 4.55 | 18 | 2.00 | 8 | 1.12 | 1.12 | 6 | 0.92 | 29.25±32.51 | 2.83 |
| <i>Steinernema</i> Travassos, 1927 juvs. | IP | 1 | 3 | 0.16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.75±1.30 | 0.07 |
| APHELENCHIDA | | | | | | | | | | | | | |
| <i>Aphelenchus</i> Bastian, 1865 | F | 2 | 94 | 5.03 | 37 | 4.12 | 15 | 2.10 | 2.10 | 41 | 6.28 | 46.75±29.02 | 4.52 |
| <i>Aphelenchoides</i> Fischer, 1894 | F | 2 | 167 | 8.93 | 35 | 3.90 | 55 | 7.71 | 7.71 | 127 | 19.45 | 96±53.39 | 9.29 |
| <i>Paraphelenchus</i> Mikoletzky, 1922 | F | 2 | 57 | 3.05 | 21 | 2.34 | 7 | 0.98 | 0.98 | 16 | 2.45 | 25.25±19.00 | 2.44 |
| <i>Setinura</i> Fuchs, 1931 | P | 2 | 32 | 1.71 | 8 | 0.89 | 3 | 0.42 | 0.42 | 0 | 0 | 10.75±12.60 | 1.04 |
| TYLENCHIDA | | | | | | | | | | | | | |
| <i>Basiria</i> Siddiqi, 1959 | RFF | 2 | 18 | 0.96 | 19 | 2.12 | 26 | 3.65 | 3.65 | 3 | 0.46 | 16.5±8.38 | 1.60 |
| <i>Boleodorus</i> Thome, 1941 | RFF | 2 | 2 | 0.11 | 3 | 0.33 | 1 | 0.14 | 0.14 | 2 | 0.31 | 2±0.71 | 0.19 |
| <i>Bitylenchus</i> Filipjev, 1934 | PP | 2 | 84 | 4.49 | 46 | 5.12 | 68 | 9.54 | 9.54 | 5 | 0.77 | 50.75±29.66 | 4.91 |
| <i>Costenchus</i> Siddiqi, 1979 | RFF | 2 | 2 | 0.11 | 1 | 0.11 | 0 | 0 | 0 | 0 | 0 | 0.75±0.83 | 0.07 |
| <i>Ditylenchus</i> Filipjev, 1936 | F | 2 | 83 | 4.44 | 84 | 9.35 | 37 | 5.19 | 5.19 | 34 | 5.21 | 59.5±24.03 | 5.76 |
| <i>Filenchus</i> Andrassy, 1954 | RFF | 2 | 48 | 2.57 | 48 | 5.35 | 135 | 18.93 | 18.93 | 8 | 1.23 | 41.75±25.48 | 5.78 |
| <i>Helicotylenchus</i> Steiner, 1945 | PP | 3 | 31 | 1.66 | 18 | 2.00 | 5 | 0.70 | 0.70 | 50 | 7.66 | 26±16.63 | 2.52 |
| <i>Heterodera</i> Schmidt, 1871 | PP | 3 | 168 | 8.98 | 145 | 16.15 | 9 | 1.26 | 1.26 | 8 | 1.23 | 82.5±74.45 | 7.98 |

Table 1. (continued)

| nematodes | TG | c-p | 0-10 | D | 10-20 | D | 20-30 | D | 30-40 | D | X±SD | D |
|---|-----|-----|------|------|-------|------|-------|------|-------|-------|-------------|------|
| <i>Hexanylus</i> Goodey, 1926 | F | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0.77 | 1.25±2.17 | 0.12 |
| <i>Meritinus</i> Siddiqi, 1970 | PP | 3 | 25 | 1.34 | 21 | 2.34 | 31 | 4.35 | 77 | 11.79 | 38.5±22.51 | 3.73 |
| <i>Paratylenchus</i> Micoletzky, 1922 | PP | 2 | 4 | 0.21 | 4 | 0.45 | 6 | 0.84 | 21 | 3.22 | 8.75±7.12 | 0.85 |
| <i>Pratylenchus</i> Thorne, 1949 | PP | 3 | 4 | 0.21 | 9 | 1.00 | 8 | 1.12 | 40 | 6.13 | 15.25±14.41 | 1.48 |
| <i>Safianema</i> Siddiqi, 1980 | F | 2 | 0 | 0 | 2 | 0.22 | 0 | 0 | 0 | 0 | 0.5±0.87 | 0.05 |
| <i>Tylenchus</i> Bastian, 1865 | RFF | 2 | 1 | 0.05 | 2 | 0.22 | 6 | 0.84 | 0 | 0 | 2.25±2.28 | 0.22 |
| MONHYSTERIDA | | | | | | | | | | | | |
| <i>Eumonyhystera</i> Andrassy, 1981 | B | 2 | 19 | 1.02 | 0 | 0 | 8 | 1.12 | 0 | 0 | 6.75±7.79 | 0.65 |
| ALAIMIDA | | | | | | | | | | | | |
| <i>Alaimus</i> de Man, 1880 | B | 4 | 0 | 0 | 3 | 0.33 | 7 | 0.98 | 0 | 0 | 2.5±2.87 | 0.24 |
| <i>Amphidelus</i> Thorne, 1939 | B | 4 | 2 | 0.11 | 0 | 0 | 2 | 0.28 | 4 | 0.61 | 2±1.41 | 0.19 |
| <i>Paramphidelus</i> Andrassy, 1977 | B | 4 | 0 | 0 | 5 | 0.56 | 1 | 0.14 | 0 | 0 | 1.5±2.06 | 0.15 |
| MONONCHIDA | | | | | | | | | | | | |
| <i>Mylonchulus</i> Cobb, 1916 | P | 4 | 0 | 0 | 1 | 0.11 | 1 | 0.14 | 0 | 0 | 0.5±0.50 | 0.05 |
| DORYLAIMIDA | | | | | | | | | | | | |
| <i>Aporcelaimus</i> Heyns, 1965 | O | 5 | 2 | 0.11 | 0 | 0 | 5 | 0.70 | 0 | 0 | 1.75±2.05 | 0.17 |
| <i>Aporcelaimus</i> Thorne et Swanger, 1936 | O | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.31 | 0.5±0.87 | 0.05 |
| <i>Epidorylaimus</i> Andrassy, 1986 | O | 4 | 0 | 0 | 1 | 0.11 | 0 | 0 | 0 | 0 | 0.25±0.43 | 0.02 |
| <i>Eudorylaimus</i> Andrassy, 1959 | O | 4 | 2 | 0.11 | 4 | 0.46 | 0 | 0 | 0 | 0 | 1.5±1.66 | 0.15 |
| <i>Discolaimium</i> Thorne, 1939 | O | 5 | 4 | 0.21 | 0 | 0 | 0 | 0 | 7 | 1.07 | 2.75±2.95 | 0.27 |
| <i>Mesodorylaimus</i> Andrassy, 1959 | O | 4 | 0 | 0 | 0 | 0 | 1 | 0.14 | 0 | 0 | 0.25±0.43 | 0.02 |
| <i>Microdorylaimus</i> Andrassy, 1986 | O | 4 | 7 | 0.37 | 12 | 1.34 | 12 | 1.68 | 1 | 0.15 | 8±4.53 | 0.77 |
| <i>Torumanawa</i> Yeates, 1967 | O | 4 | 2 | 0.11 | 0 | 0 | 3 | 0.42 | 0 | 0 | 1.25±1.30 | 0.12 |
| TRIPLONCHIDA | | | | | | | | | | | | |
| <i>Diphtherophora</i> de Man, 1880 | F | 3 | 0 | 0 | 3 | 0.33 | 0 | 0 | 0 | 0 | 0.75±1.30 | 0.07 |

Table 2. Diversity indices and sums of nematode communities in both hop gardens sampled. H' gen – Shannon index of generic diversity, D – Simpson diversity index, ΣMI – sum maturity index, MI – maturity index, PPI – plant parasitic index. For abbreviation of trophic groups, see Table 1

| soil layer [in cm] | 0–10 | 10–20 | 20–30 | 30–40 | mean |
|---|------|-------|-------|-------|--------|
| Σ Nematoda (inds. per 100 g of soil) | 1870 | 898 | 713 | 653 | 1033.5 |
| number of genera | 37 | 36 | 39 | 29 | 35.25 |
| H' gen | 2.88 | 3.05 | 2.99 | 2.76 | 2.92 |
| D | 0.09 | 0.07 | 0.08 | 0.09 | 0.08 |
| ΣMI | 2.05 | 2.24 | 2.22 | 2.34 | 2.21 |
| MI | 1.85 | 1.96 | 2.08 | 2.04 | 1.98 |
| PPI | 2.82 | 2.77 | 1.43 | 2.94 | 2.49 |
| PPI / MI | 0.66 | 1.41 | 1.17 | 1.44 | 1.17 |
| B / F | 2.58 | 2.05 | 2.45 | 0.92 | 2.00 |
| $(B+F) / PP$ | 1.47 | 2.29 | 3.09 | 2.13 | 2.25 |
| $(B+F+RFF) / PP$ | 4.66 | 2.59 | 4.42 | 2.19 | 3.47 |
| $(B+F) / (RFF+PP)$ | 3.64 | 2.76 | 1.33 | 2.00 | 2.43 |
| $(O+P) / (B+F+RFF+PP)$ | 0.02 | 0.03 | 0.03 | 0.01 | 0.02 |

nematodes in the four layers of the soil profiles studied were: 0–10 cm – *Acrobeloides* (21.12%), *Chiloplacus* (9.09%), *Heterodera* (8.98%), *Aphelenchoides* (8.93%), *Aphelenchus* (5.03%); 10–20 cm – *Heterodera* (16.15%), *Acrobeloides* (11.58%), *Ditylenchus* (9.35%), *Filenchus* (5.35%) and *Bitylenchus* (5.12%); 20–30 cm – *Filenchus* (18.93%), *Bitylenchus* (9.54%), *Acrobeloides* (8.46%), *Aphelenchoides* (7.71%), *Eucephalobus* (5.47%), *Cervidelus* (5.19%) and *Ditylenchus* (5.19%); 30–40 cm – *Aphelenchoides* (19.45%), *Merlinius* (11.79%), *Cervidelus* (10.26%), *Acrobeloides* (7.81%), *Helicotylenchus* (7.66%), *Aphelenchus* (6.28%), *Pratylenchus* (6.13%) and *Ditylenchus* (5.21%). Two species of cyst nematode were found: *Heterodera humuli* Filipjev, 1934 and *Heterodera schachtii* A. Schmidt, 1871.

Nematode assemblages in hop gardens in Moravia were generally characterised by a low number of plant-parasitic species and predators. Species of ix plant-parasitic genera were found (11.8% of the total number of genera): *Bitylenchus* (*B. dubius* (Bütschli, 1873) Filipjev, 1934), *Helicotylenchus* (*H. digonicus* Perry, in Perry, Darling & Thorne, 1959), *Heterodera* (*H. humuli* Filipjev, 1934, *H. schachtii* A. Schmidt, 1871), *Merlinius* (*M. brevidens* (Allen, 1955) Siddiqi, 1970), *Paratylenchus* and *Pratylenchus* spp. (*P. thornei* Sher & Allen, 1973, *P. neglectus* (Rensch, 1924) Filipjev & Schuurmans Stekhoven, 1941). Only two genera of predators were recorded: *Seinura* (1.04%) and *Mylonchulus* (0.05% – only two juveniles). The dominant trophic group was bacterial feeders. The most abundant genera were: *Acrobeloides*, *Chiloplacus*, *Cervidelus*, *Cephalobus*, *Mesorhabditis* and *Rhabditis*. The most abundant genus in the fungal feeder group was *Aphelenchoides* (*A. limberi* Steiner, 1936, *A. bicaudatus* (Imamura, 1931) Filipjev & Schuurmans Stekhoven, 1941) followed by the genera *Ditylenchus* and *Aphelenchus*. The proportion of omnivores and root fungal feeders varied within localities, the most abundant genera were *Microdorylaimus* (0.77%) and *Filenchus* (5.78%) (see Table 1). The values of the community indices recorded in the different soil layers are summarized in Table 2.

DISCUSSION

In the hop gardens studied nematodes belonging to the genera *Acrobeloides* (14.76%), *Aphelenchoides* (9.29%), *Heterodera* (7.98%), *Chiloplacus* (5.9%), *Filenchus* (5.78%) and *Ditylenchus* (5.76%) dominated. The composition of the communities of free living and plant parasitic nema-

todes in Moravia are similar to those in Slovakia in several aspects (Lišková & Renčo 2007). For example, the absence of potential vectors of plant-parasitic viruses, such as longidorid and trichodorid species. Both Moravian and Slovakian communities of free living and plant parasitic nematodes in hop gardens are characterised by a low number of genera, including a low number of omnivores and predators. In contrast, the most abundant trophic groups were bacterivorous nematodes (cp-2) followed by fungivores (cp-2). The dominance of cp-2 bacterivorous nematodes indicate less enriched conditions and that the role of rhabditids is taken over by *Acrobeloides* spp.: *A. nanus* (de Man, 1880) and *A. buetschlii* (de Man, 1884).

Values of MI were low because of the few K-strategists (omnivores and predators) in the cp-4 and 5 groups. The MI slightly increases with increasing depth in accordance with more stable and less stressed and enriched nutrient soil conditions (Table 2). The (B+F+RFF)/PP ratio varied in the different soil profiles from 4.66 (0–10 cm), 2.59 (10–20 cm), 4.42 (20–30 cm) and 2.19 (30–40 cm). According to Wasilewska (1997) the high values for this ratio indicates a slow cycling of elements in the ecosystem, because the breakdown of dead tissue by bacteria and fungi consumed by bacterivorous and fungivorous nematodes releases bioelements at a rate slower than that caused by phytophagous nematodes.

Specimens of six plant parasitic genera were found during the survey: *Heterodera* (7.98%), *Bitylenchus* (4.91%), *Merlinius* (3.73%), *Helicotylenchus* (2.52%), *Pratylenchus* (1.48%) and *Paratylenchus* (0.85%). Notwithstanding that the number of plant parasitic genera observed in Moravian hop gardens was low population densities of the genera *Heterodera*, *Bitylenchus* and *Merlinius* were high nearly throughout the whole of the soil profile sampled. The plant parasites, other than the genera *Heterodera* and *Bitylenchus* were most abundant at 30–40 cm. The vertical distribution can be affected by various factors such as plant root systems (hop rooting up to 12 metres), soil type, depth of soil and date sampled (Háněl 1997). The high occurrence of the genus *Heterodera* (7.98%) is in accordance with findings of Lišková & Renčo (2007) and Šedivý (1963). Šedivý (1963) found infestations of *H. humuli* at all of 45 hop gardens studied and presumed that *H. humuli* was present in all the Czech hop growing areas.

In spite of hop being a perennial plant the potential vectors of plant viruses belonging to the superfamily Longidoroidea and family Trichodoridae were not found in Moravian hop gardens. In contrast, *Longidorus elongatus* (de Man 1876) was recorded, occurring frequently and sometimes at high levels of infestation in hop gardens in the Žatecká hop growing region, during the monitoring of virus vector nematodes in agrocenoses by the State Phytosanitary Administration (Čermák & Gaar, unpublished). Nevertheless, some fields can temporally show “better” or “worse” nematode communities, which may be the result of long term undetected changes in the landscape (Háněl 2003).

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