HELMINTHOLOGIA, 33, 1: 27—29, 1996

Communities of soil nematodes on the localities polluted with acid and alkaline emissions

M. SABOVÁ, B. VALOCKÁ

Parasitological Institute SAS, Hlinkova 3, 040 01 Košice

Received January 19, 1996

Summary

Soil nematode communities were studied over the years 1994—1995 by basic trophic groups on two localities with different emission type.

The differences were found in the occurrence of nematode trophic groups as well as in the value of M/B ratio. The family C e p h a l o b i d a e showed a marked tolerance to the magnesite dumping grounds.

Key words: nematode communities; trophic groups; emission types

Introduction

Soil nematode communities represent a very important constituent of the edaphon. They are active in soil areation, in decomposition of organic matter and represent a large potential of biomass and the stored energy values in the complex of biological activity and soil fertility. Soil nematodes can be divided into various ecological groups and their trophic classification was made by W a s i l e w s k a (1971).

Nematode communities have been found to react sensitively to changes in the environment. In this study, particular attention has been given to the structure and character of nematode communities in natural and disturbed ecosystems. (S o h l e n i u s *et al.*, 1987; W a s i l e w s k a, 1979, 1991b, Y e a t e s, 1979).

This work deals with nematode communities on two localities polluted with acid and alkaline emissions in the Slovak Republic.

Material and Methods

Nematode communities were studied over the years 1994—1995 by basic trophic groups in two localities of the Slovak Republic in the region highly polluted by industrial emissions. Nematodes were isolated from soil samples, collected during the vegetation period from the rhizosphere of plants at various distance from the pollution source (2, 4, 6 km). The values for the heavy metal load of soil from the emission field (Pb, Cd, As, Cu, Zn, Hg) were assessed by the method of atomic absorption spectrophotometry and by trace mercury analysis. The values detected at sample collection sites exceeded the indicative values of the above elements studied. The flora of the particular ecotope was botanically identified at the soil sample collection sites.

Characteristics of localities

I. Krompachy - emission type acid with metallurgical dusts, altitude 379 m, mean total annual rainfall 623 mm, localities exposed to the effect of emissions at the distance of:

a) 2 km - grass stand, sunny, dry site
b) 4 km - grass stand, partially waterlogged
c) 6 km - grass stand in a currant plantation

II. Jelšava - emission alkaline - magnesite type, altitude 258 m, mean total annual rainfall 702 mm, localities exposed to the effect of emission at the distance of:

a) 2 km - dumping ground covered with grass
b) 4 km - grass stand partially waterlogged
c) 6 km - grass stand on a sunny sloping ground.

Results

Tables 1 and 2 show the number of nematodes of individual trophic groups relative to the distance of the pollution source, their biomass in 1994 and 1995 and the dominant genera of nematodes.

Nematode community composition was as follows: On locality Krompachy - acid emission type with metallurgical dusts was the order of trophic groups: phytophages, mycophages, omniphages, bacteriophages, predators, whereas on locality Jelšava - alkaline emission type: phytophages, bacteriophages, mycophages, omniphages, predators.

Tab. 1. **Nematode community structure on Krompachy locality in 1994—1995**

Emission type: acid with metallurgical dusts

Trophic	1994			Total	Dominant	1995			Total	Dominant
Group	a	b	c		genus	a	b	c		genus
Bacteriophages	116	142	334	592	*Cephalobus*	62	94	150	306	*Cephalobus*
Biomass	20.501	23.755	41.281		*Chiloplacus*	12.856	15.017	25.118		*Anaplectus*
Mycophages	628	512	400	1540	*Filenchus*	434	178	284	896	*Tylenchus*
Biomass	110.570	91.447	71.976		*Aphelenchus*	74.019	33.970	49.497		*Psilenchus*
Phytophages	702	938	570	2210	*Helicotylenchus*	202	762	412	1376	*Helicotylenchus*
Biomass	71.120	96.869	63.331		*Paratylenchus*	21.889	77.377	45.558		*Paratylenchus*
Ommiphages	352	196	318	866	*Eudorylaimus*	81	74	238	393	*Eudorylaimus*
Biomass	273.636	166.818	233.970		*Dipterophora*	81.125	81.935	165.889		*Pungentus*
Predators	22	61	158	240	*Clarkus*	19	38	50	107	*Clarkus*
Biomass	92.340	231.475	646.381		*Mylonchulus*	84.772	171.444	221.415		*Mylonchulus*
Total	1820	1848	1780			798	1146	1134		
Biomass	567.667	610.364	1036.439			276.661	379.743	505.477		
M/B ratio*	5.4/1	3.6/1	1.19/1			7.0/1	1.89/1	1.89/1		

* Mycophages / Bacteriophages

The group of phytophages was the largest on both the localities, predominately represented by root ectoparasitic genus *Helicotylenchus*. In the acid type environment the genus *Paratylenchus* predominated and in emission alkaline type, the genus *Tylenchorhynchus*.

The second numerous group were mycophages on Krompachy locality (acid emmission type) with a dominant genera *Tylenchus* and *Filenchus*, and bacteriophages on Jelšava locality (alkaline type) with a dominance of family C e p h a l o b i d a e. The tolerance of the family C e p h a l o b i d a e was manifested markedly to the magnesite dumping grounds where these were the only nematodes found. They occurred also in the rhizosphere of first plants on this magnesite dumping grounds.

On both the emission types a high M/B ratio was recorded with on the converse values (acid type 7.0/1 to 1.19/1, alkaline type 1/8.2 to 1/1.9). This fact allows to presume the bioindicative properties of the mentioned trophic groups in acid and alkaline emission types.

The groups of omniphages and predators were the smallest on the alkaline type locality and relatively more represented on the acid emission locality. The greatest numbers of nematodes of this trophic group occurred at the longest distance from the pollution source on both the localities.

The difference observed in the nematode community structures may result from the effect of emmission types, since the way of selecting on the localities excludes the effect of cultivation disturbance on the occurrence of nematodes trophic groups.

Discussion

The results suggest that phytophages - parasitic nematodes were the largests group in both the emission types. According to W a s i l e w s k a (1991b), obligatory parasites in many cases become a dominant trophic group in response to disturbed ecosystems. The genera *Helicotylenchus, Paratylenchus* and *Tylenchorhynchus* are typical root parasites of grasstands, genus *Paratylenchus* is known for its tolerance to drying (S o h l e n i u s *et. al.*,1987; W a s i l e w s k a, 1991a).

Another largest group consisted of mycophages in the acidic environment, represented by the genera *Tylechus* and *Filenchus* in particular, and of bacteriophages in the alkaline environment, represented mostly by the family C e p h a l o b i d a e. The M/B ratio reached the extreme values on both of emission types. Only at a farther distance from the pollution source were the values comparable with those reported by S o h l e n i u s and S a n d o r (1987) for grasses. The differences in M/B ratio make it possible to envisage the bioindicatory abilities of the mentioned trophic groups in the acidic and the alkaline emission type.

Tab. 2 Nematode community structure on Jelšava locality in 1994—1995
Emission type: alkaline

Trophic	1994			Total	Dominant	1995			Total	Dominant
Group	a	b	c		genus	a	b	c		genus
Bacteriophages	282	452	414	1148	*Cephalobus*	126	148	240	514	*Cephalobus*
Biomass	94.251	177.148	155.254		*Rhabditis*	43.038	45.640	89.998		*Rhanditis*
Mycophages	34	158	210	402	*Tylenchus*	—	42	88	130	*Filenchus*
Biomass	6.842	31.115	36.761		*Aphelenchus*	—	7.877	65.014		
Phytophages	18	98	1118	1234	*Helicotylenchus*	—	70	798	868	*Helicotylenchus*
Biomass	2.910	13.979	146.855		*Tylenchorhynchus*	—	11.128	104.635		*Coslenchus*
Omniphages	8	21	72	100	*Eudorylaimus*	—	—	82	82	*Eudorylaimus*
Biomass	11.612	23.970	87.035		*Axonchium*			89.850		
Predators	—	8	4	12	*Clarkus*	—	—	—	—	
Biomass	—	29.080	15.551							
Total	342	737	1818			126	260	128		
Biomass	115.615	265.592	441.456			43.038	64.645	349.497		
M/B ratio*	1/8.2	1/2.8	1/1.9			—	1/3.5	1/2.7		

* Mycophages / Bacteriophages

The group of omniphages and predators was represented particularly by the genera *Eudorylaimus* and *Clarkus*. Their greatest numbers were detected at the longest distance from the pollution source. This finding corresponds to the knowledge that this is the group most sensitive to disturbed ecosystems (W a s i l e w s k a, 1979).

As suggested by the above facts, the nematodes are very sensitive and represent miscellaneous component of edaphon. This was confirmed by our two years of investigations. None the less a further study of this topic and several years of examinations of nematode community structures are needed.

References

Sohlenius, B., Boström, S., Sandor, A. (1987): Long-term dynamics of nematode communities in arable soil under four cropping systems. *J. Appl. Ecol.*, 24: 131—144

Sohlenius, B., Sandor, A. (1987): Vertical distribution of nematodes in arable soil under grass (*Festuca pratensis*) and barley (*Hordeum distichum*). *Biol. Fertil. Soils*, 3: 19—25

Wasilewska, L. (1971): Nematodes of the dunes in the Kampinos forest. II. Community structure based on numbers of individuals, states of biomass and respiratory metabolism. *Ekol. Pol.*, 19: 651—688

Wasilewska, L. (1979): The structure and function of soil nematodes communities in natural ecosystems and agrocenoses. *Pol. Ecol. Stud.*, 5: 97—145

Wasilewska, L. (1991a): Communities of soil nematodes of drained fen differentiated by peat origin. *Pol. Ecol. Stud.*, 17: 155—178

Wasilewska, L. (1991b): Direction of changes in communities of soil nematodes in mandisturbed ecosystems. *Acta zool. fenn.*, 196: 271—274

Yeates, G. W. (1979): Soil nematodes in terrestrial ecosystems. *J. Nematol.*, 11: 213—229

New books

M e h l h o r n, H., D ü w e l, D., R a e t h e r, W.: *Diagnose und Therapie der Parasitosen von Haus-, Nutz- und Heimtieren*. 2nd expanded and revised edition. Gustav Fischer Verlag, Stuttgart, Jena, New York 1993. XIII + 529 pages. Format 170 x 240 mm. Hardcover, price DM 128,- ISBN 3-437-30706-1

The first author is professor at the chair of special zoology and parasitology in Bochum. The other two authors are renowned investigators in the pharmaceutical research of the Hoechst Company in Frankfurt on the Main. As emphasized in the preface, the first edition aroused a great interest. Moreover, Spanish and English translations appeared in print. The names of parasitic diseases are presented here according to the standardized nomenclature of animal parasitic diseases (SNOAPAD) published (*Vet. Parasit.*, 29, 1988: 299—326) by the expert committee, appointed by the Executive Committee of the World Association for the Advancement of Veterinary Parasitology. The volume consists of 11 chapters which are subdivided using the decimal system. Chapter 1 is intended to give an introduction to laboratory methods for identification of parasites. Macroscopical methods cover the preparation and staining of flukes, tapeworms and roundworms. Microscopical methods deal with examinations of blood, saliva, lymph, urine, mucous membranes and tissues, further on with examinations of ectoparasites, soil samples and feed-stuffs, antibody tests, with animal experiments (identification *in vivo*) and sending specimens to a reference laboratory. Among microscopical methods looked at are the anal swabs, wet mounts, concentration techniques, cultivation, stained films, and histological techniques. Chemicals and solutions for the preparation of reagents are also presented here. In the chapters 2 to 11 listed here are the parasites of dogs and cats, of swine, solid-hoofed animals, ruminants, hare, rabbit and laboratory animals, birds, hedgehog, fishes, reptiles and amphibians and finally of honey-bee. In particular chapters described are the parasite life forms, occurring in faeces or in the intestine, in blood, in the saliva, in the urine and in various organs - in the liver, spleen, in the muscle tissue, in the stomach, in brain and eyes, in the trachea, in the genital and on the body surface in the skin, in hair and feathers. In each chapter keys for determination of parasites are situated. Parasite species are described in detail in their most frequent host or in place of their most probable findings. In particular parasitic diseases due to protozoans, helminths or arthropods the geographical distribution in Europe, the morphological and biological characteristics of the pathogen and clinical symptoms are listed. Diagnosis includes references to the causative life form of particular parasites and to the diagnostic method. Moreover, listed are the transmission ways, the prophylaxis, prepatent and patent periods and specific treatment.

The volume is extensively augmented by 206 high-quality line drawings, and light, transmission or scanning electron photomicrographs which characterize the host or parasite animals as a whole or in detail, dissected organs and histological structures. Many of them constitute full-page plates composed of several pictures. In 17 tabular reviews there are instructions for the therapy. This book presents a practical laboratory manual. It is primarily designed for veterinary parasitologists. Moreover, it can be of great value for biologists and medical professionals interested in parasitic diseases and zoonoses.

J. Jíra

(**Helmintologia**, 33, 1996, 1: 30)