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COMMUNITIES OF SOIL NEMATODES IN THE AGROCENOSIS OF LEGUM CROPS IN CONDITIONS OF GRAY-MEADWAY SOILS

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Abstract
This article examines the diversity, ecological groups, and abundance of nematodes common to mung bean crops on sierozem-meadow soils. It is shown that the highest nematode populations are found in the root system and root zone of mung bean crops on light loamy soils, fewer species are found on medium loamy soils, and the fewest species are found on heavy soils.

Keywords: Soil nematodes, ecotrophic groups, sierozem-meadow soils, mung bean, mechanical composition, salinization.

Introduction

It is known that the soil fauna is the most important part of the soil biota , it is numerous and diverse. Nematodes, with the participation of microflora, participate in the processes of soil humification, in the decomposition and transformation of organic matter [Paramonov, 1; 446 p., Yeates , 2; 173-179 p., Kozlovskaya, 3; 211 p., Shmatko , 4; 281-283 p., Matveeva et al., 5; 16-32 p.], also soil nematodes participate in soil gas exchange [Overgaard - Nielson , 6; 131 p.]. Phytoparasitic nematodes play a large role in the development and condition of plants, the creation of their biomass [Kiryanova, 7; 160 p.,

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Tulaganov , 8; 227 p., Tulaganov , 9; 376 pp., Mavlyanov , 10; 109-115 pp., Eshova , 11; 66 pp., Khurramov , 12; 65 p.].

Despite the large number of soil nematodes and their significant role in soil formation processes, soil evolution, and soil transformation, the characteristics of their ecotrophic groups in arid conditions remain poorly understood. Therefore , the aim of this study was to investigate the distribution and population dynamics of soil nematodes in the widespread semihydromorphic sierozem-meadow soils of the Hungry Steppe.

Object and methods of research

The study was conducted from 2020 to 2024 in the sierozem-meadow soils of the Hungry Steppe. The region's climate is characterized by high aridity , with precipitation ranging from 200-312 mm per year, evaporation of 1510-1691 mm, and a moisture deficit of 1310-1379 mm. The average air temperature is 15.6 ˚C. Groundwater mineralization varies from 3-5 to 50-100 g/l and is found primarily at depths of 2-3 to 3-5 m. The mineralization type is sulfate-magnesium-sodium or sulfate-sodium, and less commonly sulfate-chloride or chloride-sulfate.

For the study, key areas under the legume crop of the «Durdona» variety of mung bean were selected in the territory of the Yangiyer massif with sierozem-meadow soils of varying degrees of salinity and mechanical composition.

To characterize the morphological, agrochemical, and agrophysical properties of the genetic horizons, soil samples were collected from the soil profiles of key sites. To study soil nematodes, samples were collected at depths of 0-10, 10-20, and 20-30 cm in triplicate. Samples were collected in spring, summer, and winter. The study of the horizontal distribution of nematodes in sierozem-meadow soils used the methods of Metlitsky O., Matveeva M. [13; 24-25 p., 14; 20-24 p.]. Soil nematodes were isolated using the Berman method, followed by fixation of the nematodes in 5% formalin at a temperature of 60 ^{0} C. The nematodes were counted, gradually transferred to glycerol and into preparations using the standard Hall method. G. [15, 320 p.]. The isolated nematode species were divided

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according to trophic preference by Wasilewska L ., Yeates G. [16; 123-132 p., 17; 315-331 p.].

Results and discussions

The soils of the region are serozem-meadow, these are semi-hydromorphic soils and the morphological structure of their profile is expressed meadowiness, the presence of restorative processes, and intense manifestation of solonchak processes. The granulometric composition of the studied soils is differentiated by the profile and is represented mainly by light and medium loams , in places by heavy loams and sandy loams. In terms of humus content (0.7-1.2%), the soils are mainly classified as «low» - and in places as « moderately» supplied, decreasing towards the lower horizons (0.2-0.3%). The distribution of total nitrogen along the profile follows the same pattern as humus. The highest value was found in the surface layers, reaching 0.12-0.20%, decreasing towards the lower layers to 0.05-0.08%. Mobile forms of phosphorus due to soil formation conditions – carbonate content , high physical clay content in places, slightly alkaline environment, low biological activity, etc. – are determined in small values (9.0-18 mg/kg of soil), and in terms of availability they are mainly classified as «low» supplied. Total potassium content varies from 1.12-2.00%. In terms of availability of exchangeable potassium, the soils are « moderately»- and «low» supplied , and their values vary from 110-144.0 to 192.0 – 279.3 mg/kg of soil. General physical properties of the studied soils are characterized by some compaction – in the upper horizons the soil density is 1.28-1.35 g/cm^3, increasing towards the illuvial horizon and parent rock to 1.46-1.55 g/cm^3. Accordingly, soil porosity also changes from 38 to 50%. Based on the degree of soil salinity, the soils are primarily weakly and moderately saline, with some highly saline soils also identified. In these soils, the total salt content averages 0.66-1.25%, reaching 2.10-2.70% in some places. The salinity types are sulfate, chloride-sulfate, and, in some places, sulfate-chloride.

A study of the fauna of soil nematodes in sierozem-meadow soils, taking into account the specific soil and climatic conditions of the region, showed that the

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nematode species identified in soils under mung bean crops were divided into two subclasses: Adenophorea and Secernenta.

In the root system and root zone of mung bean, 333 species of nematodes were found, including 115 species in the root system and 218 species in the root zone (Table 1).

Table 1 Species and numbers of nematodes common in the root system of mung bean in sierozem-meadow soils

(on average – specimens/10 ^{cm3})

No.	Types of nematodes	Number of individuals		Total
		root	root circumference	
1	P l e ctus parietinus	-	8	8
2	Prismatolaimis intermedus	-	11	11
3	Prismatolaimis primitive	-	1	1
4	Rhabditis brevispina	2	12	14
5	Ironus ignavis	-	1	1
6	Aporcelaimellus obtusicaudatus	3	6	9
7	Eudoraylaimus monohustera	-	12	12
8	Eudoraylaimus pratensis	-	4	4
9	Eudoraylaimus labiatus	-	3	3
10	Eudoraylaimus parvis	-	6	6
11	Eudoraylaimus sulphasae	1	-	1
12	Cephalobus nanus	19	13	32
13	Cephalobus persegnis	-	1	1
14	Chiloplacus lentus	12	23	35
15	Ch. s u mmetricus	11	18	29
16	Eu with ephalobus oxyur o ides	-	1	1
17	Eu with ephalobus striatus	-	1	1
18	Clarcus papillatus	-	1	1
19	Mylonchylus solus	-	1	1
20	Acrobeloides emarginatus	-	1	1
21	Acrobeloides budetschlii	-	1	1
22	Meso doraylaimus Bastian	-	1	1
23	Aphelenchus avenae	7	15	22
24	Aphelenchoides limberi	17	-	17
25	Aphelenchoides parietinus	13	-	13
26	Aphelenchoides xylopinus	-	19	19

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27	Tylenchus davaini	1	-	1
28	Aglenchus agricola	3	17	20
29	Filenchus leptosome	4	8	12
30	Ditylenchus dipsaci	6	17	23
31	Bitylenchus dubius	3	5	8
32	Fylenchus filiformus	2	4	6
33	Helicotylenchus multicinctus	11	7	18
	Total species	16	23	33
	Total number of individuals	115	218	3 33

Aphelenchoides species were found in the roots. limberi and Aphelenchoides parietinus . The most common species in the root are Cephalobus species nanus , Aphelenchoides limberi , Aphelenchoides parietinus , Chiloplacus lentus , Ch . summetricus and Helicotylenchus multicinctus . The remaining nematodes were found in the root in quantities ranging from 1 to 7 specimens. This Aphelenchus avenae , Ditylenchus dipsaci , Filenchus leptosoma , Bitylenchus dubius , Aporcelaimellus obtusicaudatus , Rhabditis brevispina , Fylenchus filiformus , Aglenchus agricola . The most common species in the soil around the root are Chiloplacus lentus , Ch . Symmetricus , Aglenchus agricola , Ditylenchus dispaci , Aphelenchoides xylopinus And Aphelenchus avenae . It turned out that rest types meet from 1 copy up to 13 copies .

12 species nematodes - Rhabditis brevispina , Aporcelaimellus obtusicaudatus Cephalobus nanus , Chiloplacus lentus , Ch. symmetricalcus , Aphelenchus avenae , Aglenchus agricola , Cephalobus persegnis , Acrobeloides buetschlii , Chiloplacus lentus , Ch. summetricus , Aphelenchus avenae , Ditylenchus dispaci , Bitylenchus dubius , Fylenchus filiformus , Filenchus leptosoma And Helicotylenchus multicinctus - common species found in rhizosphere soils.

When analyzing by ecological groups, the following frequency was noted: pararhizobia – 12 species 51 (15.3% of individuals), devisaprobionts – 9 species 109 (32.7%), eusaprobes – 1 species 14 (4.2%), specialized phytohelminths – 4 species 55 (16.5%), non-specialized phytohelminths – 7 species 104 (31.3%).

Nematodes are sensitive to the mechanical composition and physical properties of the soil, and it has been found that they are more common in light, sandy,

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sierozem-meadow soils. In light, loose loamy soils, nematodes have little difficulty moving, but in heavy loamy soils with a low humus content and small, agglomerating particles, their movement is somewhat hindered. Our research included a comparative analysis of the species composition of nematodes found in light, medium, and heavy soils.

Two nematode species were found in light loamy soils: Acrobeloides tricornu and Acrobeles ciliatus. Ten nematode species were found in medium loamy soils: Prismatolaimis primitivus, Ironus ignavis, Mylonchylis solus, Eudoraylaimus sulphasae, Eudoraylaimus parvis, Cephalobus persegnis, Aphelenchoides xylopinus, Filenchus leptosoma, Pratylenchus mahogoni, and Paratylenchus amblycephalus.

Conclusion

A comparative study of the nematode fauna on sierozem-meadow soils under mung bean crops revealed that the fauna consists primarily of 11 nematode species. Among the nematodes, the species Cephalobus persegnis, Chiloplacus symmetricus, Aphelenchus avenae and Aphelenhoides helophilus were widely distributed across all the studied agricultural crops.

It has been noted that different soils differ significantly in the composition of the nematode community and mechanical composition: light loamy soils are characterized by Acrobeloides species tricornu and Acrobeles ciliatus ; for medium loamy soils – Prismatolaimis species primitivus , Ironus ignavis , Mylonchylis solus , Eudoraylaimus sulphasae , Eudoraylaimus parvis , Cephalobus persegnis , Aphelenchoides xylopinus , Filenchus leptosoma , Pratylenchus mahogoni and Paratylenchus amblycephalus .

References

1. Paramonov A.A. Fundamentals of phytohelminthology . – M.: Nauka, 1964. V.2. – 446 p.
2. Yeates GW Feeding types and feeding groups in plant and soil nematodes // Pedobiologia . Vol . 11. No. 2. 1971. –P. 173-179.

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Website: usajournals.org

3. Kozlovskaya L.S. The role of invertebrates in the transformation of organic matter in bog soils. Leningrad: Nauka. 1976. – 211 p.
4. Shmatko V.Yu. Comparison of the faunal complex of nematodes on the coast of fresh and salt water bodies // Environmental safety of coastal regions. Proceedings of the International Scientific Conference. dedicated to the 150th anniversary of N.M. Knipovich . Rostov-on-Don: Publishing house of the Southern Scientific Center of the Russian Academy of Sciences. 2012. –P. 281-283.
5. Matveeva E.M., Sushchuk A.A., Klinkina D.S. Communities of soil nematodes in agrocenoses with monocultures (using the Republic of Karelia as an example) // Transactions of the Karelian Scientific Center of the Russian Academy of Sciences, No. 2. 2015. –P. 16-32.
6. Overgaard-Nielson C.Studies on the soil microfauna . 2. The soil inhabiting nematodes //Fauna Jutlandica . Vol. 2. 1949. –131 p.
7. Kiryanova E.S. Some problems of nematodology of plants, soil and insects. Samarkand, 1961. - 160 p.
8. Tulaganov A.T. Plant-eating and soil nematodes of Uzbekistan (Based on the material of the Zeravshan Valley). - Tashkent, Publishing house. Academy of Sciences of the Uzbek SSR , 1949. V.1. - 227 p.
9. Tulaganov A.T., Usmanova A.Z. Phytonematodes of Uzbekistan. - Tashkent: Science, 1975. Ch. 1. – 376 p.
10. Mavlyanov O.M., Khakimov N.Kh., Narzullaev S.B. Vertical zonal distribution of nematodes of wild plants of the Zerafshan Mountains of Uzbekistan. Plant Parasites. Vol. 13. Issue 4. – Moscow, 2019. – P. 109-115.
11. Eshova H.S. Nematodes of arid zones of Uzbekistan and ways of their adaptation to habitat conditions: Abstract of a doctoral dissertation in biology – Tashkent, 2017. – 66 p.
12. Khurramov A.Sh. Wheat nematodes and wild cereal plants of Uzbekistan: Abstract . diss ... doc. biol. Sciences (Doctor of Chemical Sciences) - Tashkent, 2019. - 65 p.

Modern American Journal of Biological and Environmental Sciences
ISSN (E): 3067-7920
Volume 01, Issue 07, October, 2025
Website: usajournals.org

13. Metlitsky O.Z., Matveeva M.A. 1975. Guidelines for identifying and counting the number of nematodes on berry crops. Moscow: Kolos. -24 p.
14. Metlitsky O.Z. 1985. Ecological and technological bases for detecting nematodes // Principles and methods of ecological phytonematology . Petrozavodsk: Karelia. - P. 20-34.
15. Hall GS 1996. Methods for the examination of organismal diversity in soils and sediments. CAB International : Wallinford . -320 p.
16. Wasilewska L. Impact of human activities on nematode communities in terrestrial ecosystems // Ecology of arable land (by eds . Of Clarholm M. & Bergstrom L.) - Kluwer Academic Publishers, 1989. – P.123-132.
17. Yeates GW, Bongers T., De Goede RGM, Freckman DW, Georgieva SS 1993. Feeding habits in soil nematode families and genera – An outline for soil ecologists // Journal of Nematology. Vol . 25. -P. 315-331.