Ecological analysis of peanut nematodes in Surkhondaryo region

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Abstract. The article carried out an ecological analysis of nematodes recorded in peanut crops in the Surkhandarya oasis. In order to study phytohelminthological fauna in 2019-2022, 442 samples of peanut plant roots and 442 samples of the soil around the roots were taken in 26 farms belonging to 13 districts of Surkhandarya oasis. Systematics of 136 species of nematodes found in the peanut plant as a result of the research are presented. According to the ecological analysis, there were 27 species of pararhizabionts, 13 species of eusaprobionts, 34 species of devisaprobionts, 39 species of non-pathogenic phytohelminths, and 23 species of pathogenic phytohelminths. According to the ecological analysis, the number of individuals in 5 ecological groups was distributed as follows: pararhizobionts - 839, eusaprobionts - 837, devisaprobionts - 6048 , non-pathogenic phytohelminths - 4882 and 3947 individ pathogenic phytohelminths. Among the parasitic nematodes noted to be economically important for the peanut plant are: *Meloidogyne arenararia, M. javanica, M. incognita, Ditylenchus dispsaci, Xiphinema diversicaudatum, X. elongatum* and *X. pachtaicum*.

1 Introduction

To meet the food needs of the population, this need can be met by obtaining a bountiful harvest of agricultural crops, including peanuts. Peanuts are grown in more than 100 countries around the world, and more than 95% of the planted area is in Asia and Africa [4]. Currently, peanuts are planted on 3825 hectares of farms in Surkhandarya region (as of January 1, 2022). Peanut seeds contain 60% oil, 35% protein, vitamins such as A, E, K, D, and the grain is widely used in food and in the confectionery industry. The stems and leaves are valuable feed in livestock farming; peanut pods are used to make insulating materials and as fuel (firewood) [4,6]. One of the most important to increase the productivity of the walnut plant creation and introduction of new high-yielding varieties resistant to especially the fight against nematodes is of practical importance. Currently, a number of studies are being conducted around the world to study the parasitic nematodes found in the peanut plant and their negative impact on crop yields.

In particular, a single parasitic nematode, *Meloidogyne arenaria*, has been reported to reduce peanut yields by 3–15% per year in the southern United States, as well as parasitic nematode species *Pratylenchus coffeae, P. brachyurus, P. zeae* and *P. neglectus* in 9

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provinces of China for 3 years, In South Carolina, 105 species of parasitic nematodes were found on plants such as peanuts and greenhouse crops. In India, peanuts and other plants were studied, and Meloidogyne spp., Rotylenchulus reniformis, Heterodera, which are economically important in these plants. spp. species of nematodes have been identified and physical, chemical, biological methods of combating them have been developed [1-3, 5].

In our country, including in the Surkhondarya region, there is no such research until now, it is urgent to study the fauna of nematodes found in the peanut plant, to identify parasitic species and to develop harmonious, ecologically clean, and economically inexpensive methods of combating them [15].

2 Materials and Methods

Phytohelminthological faunistic studies 2019-2022 442 samples from the roots of peanut plants and 442 from the soil around the roots were collected from 26 farms belonging to 13 districts of Surkhandarya region using the route method [7].

Nematodes were isolated from these samples in the Scientific Laboratory of Helminthology of Termiz State University using classical phytohelminthological methods, that is, the funnel method[8]. Isolated nematodes were fixed with 4% formalin solution. For the analysis of nematodes, 330 temporary and 1120 permanent preparations were prepared based on the Seinhorst method[9]. To determine the type and sex of nematodes, a trinocular microscope N-300M was used, as well as nematode identification books and atlases [16-21]. To determine the size of nematodes, the De Man formula was used, accepted by most researchers and modified by Mikoletsky [10]. In our work, we used a system of plant nematodes developed by A. A. Paramonov based on the methods of evolutionary morphology and ecological-morphological analysis [11-14;].

3 Results and Discussion

Collected from the farms of 13 districts of Surkhandarya oasis, i.e. Sherabad, Muzrabot, Angor, Termiz, Jarkurgan, Kumkurgan, Kyziriq, Bandihan, Altinsoy, Shorchi, Denov, Sariosiyo, Uzun districts. 136 species of nematodes were found in root and soil samples of peanut. The nematodes identified in our extensive phytohelminthological researches are those of A.A. Paramonov [12, 13] 5 groups were identified based on ecological classification these are: pararhizobionts - 27 (19.85% of total nematodes), eusaprobionts - 13 (9.56%), devisaprobionts - 34 (25.00%), non-pathogenic phytohelminths - 39 (28.68%) and pathogenic phytohelminths - 23 (16.91%). According to the ecological classification, the number of individuals in 5 ecological groups was distributed as follows: pararhizobionts - 839 (5.69 of all detected nematodes), eusaprobionts - 837 (5.06%), devisaprobionts - 6048 (36.54%), non-pathogenic phytohelminths - 4882 (28.87%) and pathogenic phytohelminths - 3947 (23.84%) (Table 1).

Table 1. Distribution of nematodes identified in the peanut root and surrounding soil by ecological groups.

№	Ecological groups	Number of species	%	Individuals	%
1	Pararhizabionts	27	19,85	839	5,69
2	Eusaprobionts	13	9,56	837	5,06
3	Devisaprobionts	34	25,00	6048	36,54
4	Non-pathogenic phytohelminths	39	28,68	4882	28,87
5	Pathogenic phytohelminths	23	16,91	3947	23,84
Total		136	100	16553	100

According to our analysis, there are more types of pathogenic phytohelminths, pararhizobionts and devisaprobionts than nematodes in the peanut root and soil around the root. Non-pathogenic phytohelminths and eusaprobionts were found to be low. it was noted that devisaprobionts, non-pathogenic phytohelminths, and pathogenic phytohelminths were somewhat more frequent, while pararhizobionts and eusaprobionts were less frequent. 27 species of ecological groups of nematodes, depending on the species, belong to the Enoplida order of pararhizobionts - 2 species, Mononchida - 3 species, Dorylaimid - 15 species, 3 species to the Alaimida order, 4 species to the Monhysterida order; a total of 13 species of eusaprobionts belong to the Mononchida order - 1 species, to the Rhabditida order - 12 species; a total of 34 species of devisaprobionts - 2 species in the order Monhysterida, 32 species in the order Teratocephalida; a total of 39 species of non-pathogenic phytohelminths to the Aphelenchida order - 21 species , tylenchida order- 18 species; it was noted that a total of 23 species of pathogenic phytohelminths belong to the order Dorylaimida - 3 species and the order Tylenchida - 20 nematodes (*Table 2*).

Table 2. Distribution of ecological groups of nematodes identified in the peanut root and surrounding soil, by orders

Orders name	Num. of species	Pararhiza-bionts	Eusaprobionts	Devisaprobints devisaprobiont	Nonpatho-genic phyto-helminths	Pathogenic Phyto-helminths	%
Enoplida	2	2	-	-	-	-	1,47
Mononchida	4	3	1	-	-	-	2,94
Dorylaimida	18	15	-	-	-	3	13,24
Alaimida	3	3	-	-	-	-	2,21
Monhysterida	6	4	-	2	-	-	4,41
Rhabditida	12	-	12	-	-	-	8,82
Teratocephalida	32	-	-	32	-	-	23,53
Aphelenchida	21	-	-	-	21	-	15,44
Tylenchida	38	-	-	-	18	20	27,94
Total:	136	27	13	34	39	23	100

Ecological groups of nematodes belonging to the Adenophorea subclass were analyzed by families. 27 species of pararizobionts: *Onchulidae* family - 2 species (1.47% of total species), *Mononchidae* family - 2 species (1.47%), *Mylonchulidae* family - 2 species (1.47%), *Dorylaimidae* family - 5 species (3, 67 %), *Qudsianematidae* family - 4 species (2.94 %), *Nordiidae* family - 1 species (0.74 %), *Aporcelaimidae* family - 1 species (0.74%), *Discolaimidae* family - 2 species (1.47%), *Tylencholaimidae* family - 1 species (0.74%), *Nygolaimidae* family - 1 species (0.74%), *Alaimidae* family – 1 species (0.74%), *Diphtherophoridae* family – 2 species (1.47%), *Axonolaimoidae* family – 1 species (0.74%), *Monhysteridae* family – 3 species (2.20%); *Mononchidae* family of 13 species of eusaprobionts - 1 species (0.74%); 34 species of the *Plectidae* family of devisaprobionts - 2 species (1.47%), no species of the non-pathogenic ecological group were recorded in this subclass; 23 species of pathogenic phytohelminths *Xiphinemidae* - 3 species (2.20 %). In general, in the recorded families belonging to the Adenophorea subclass, pararhizobionts - 27 species (19.85%), eusaprobionts - 1 species (0.74%), devisaprobionts - 2 species (1.47%), pathogenic phytohelminths - 3 species (2.20%).

Ecological groups of nematodes related to Secernentea subclass were analyzed by families. In this subclass, species of pararhizobiont ecological group were not recorded, 13 species of eusaprobionts, *Rhabditidae* family - 11 species (8.08% of total species),

Diplogasteroididae family - 1 species (0, 74 %), 34 species of devisaprobionts, *Cephalobidae* family - 23 species (16.91 %), *Panagrolaimidae* family - 9 species (6.61 %), 39 species of non-pathogenic phytohelminths, *Aphelenchidae* family - 4 species (2.94 %), *Paraphelenchidae* family – 4 species (2.94%), *Aphelenchoididae* family – 13 species (9.56%), *Tylenchidae* family – 8 species (5.88%), *Psilenchidae* family – 2 species (1.47%), *Anguinidae* family – 5 species (3.67%), family *Sychnotylenchidae* - 1 species (0.74%), family *Neotylenchidae* - 2 species (1.47%) and 23 species of pathogenic phytohelminths: family *Dolichodoridae* - 4 species (2.94%), *Rotylenchulididae* family - 1 species (0.74%), *Hoplolaimidae* family - 6 species (4.41%), *Pratylenchidae* family - 3 species (2.20%), *Meloidogynidae* family - 3 species (2.20%), Paratylenchidae family - 2 species (1.47%), *Anguinidae* family - 1 species (0.74%). In general, in the registered families belonging to the subclass Secernentea, there are 12 species of eusaprobionts (8.82%), 32 species of devisaprobionts (23.53%), 39 species of nonpathogenic phytohelminths (28.68%), and 20 specific pathogenic phytohelminths species (14.70%).

4 Conclusion

Collected from the farms of 13 districts of Surkhandarya oasis, i.e. Sherabad, Muzrabot, Angor, Termiz, Jarkurgan, Kumkurgan, Kyziriq, Bandihan, Altinsoy, Shorchi, Denov, Sariosiyo, Uzun districts. 136 species of nematodes were found in root and soil samples of peanut. Of the 33 species of nematodes belonging to the Adenophorea subclass, pararhizobionts - 27 species, eusaprobionts - 1 species, devisaprobionts - 2 species, and pathogenic phytohelminths - 3 species. Species of the ecological group of non-pathogenic phytohelminths were not found in this subclass. Of the 103 species of nematodes belonging to the Secernentea subclass, 12 species were eusaprobionts, 32 species were devisaprobionts, 39 species of non-pathogenic phytohelminths and 20 pathogenic phytohelminth species. No species of the pararhizabiont ecological group were found in this subclass. The largest number of species according to ecological groups, that is, 39 species of nematodes, belonged to the group of non-pathogenic phytohelminths. According to the ecological groups, the least number of species, that is, 13 species of nematodes, belonged to the group of eusaprobionts. According to ecological groups, the largest number of individuals, i.e. 6048 individuals of nematodes, belonged to the group of devisaprobionts.

According to ecological groups, the least number of individuals, i.e. 837 individuals of nematodes, belonged to the Eusaprobionts group. The order Tylenchida has the most species – 38 species. The order Enoplida has the fewest species - 2 species. Based on the research results, among the detected nematodes, 23 species of parasitic nematodes were found. Among them, *Meloidogyne arenaria, M. javanica, M. incognita, Ditylenchus dipsaci, Xiphinema diversicaudatum, X. elongatum* and *X. pachtaicum*, which are economically important for the peanut plant, occupy a special place, and these parasitic species A dense population damages the plant's roots and causes a specific disease. This has a negative effect on the death of plants and productivity. Therefore, the use of environmentally friendly and economically inexpensive combined measures to fight these plant parasites based on species and quantity in crop fields can significantly increase the productivity of agricultural crops.

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Authors' contribution

Collecting the foreign sources on nematodes, peanut plant root and soil samples were done by S. Choriyev. Isolation of nematodes from samples, fixation, preparation of temporary and permanent preparations were carried out by S. Choriyev and D. Mardonayeva. Identification of nematode species and genus, ecological analysis and conclusions were carried out by A. Khurramov and Sh. Khurramov. Writing and sending of the article according to technical requirements was done by S. Choriyev.

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