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Phytonematodes of Grape Agrocenoses in the South of Uzbekistan

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ABSTRACT
Ecological and faunal complex of phytonematoids found in root and pre-root soils of vine agrocenoses of Surkhandarya region of the southern regions of the Republic of Uzbekistan was studied, as well as their density in individuals in the population and its impact on plants were scientifically analyzed.
Key words:
Phytonematoda, fauna, flora, phytoparasitism, pararizobionts, stiletto, phytohelminthiasis, mycosis.

Introduction

In Uzbekistan, in particular in Surkhandarya region, extensive research has been conducted on the fauna of plant phytohelminths, but there are very few sources of phytohelminths and their damage in vine agrocenoses, which are not enough to solve phythelminthological problems of our time and therefore require additional research. Lack of information on phytohelminths, which are the main parasites of vine plants, and the pathological conditions they cause, leads to a sharp decline in the high yield that can be obtained from the plant. Based on this, our goal is to identify the fauna of parasitic phytohelminths and develop a system to combat them.

Methods

The development of viticulture in Uzbekistan is an urgent task in solving the problems of providing the population with high-quality and various medicinal food products.

To increase the efficiency of viticulture, it is directly related to the introduction into practice of new, more suitable grape varieties for certain environmental conditions, which are resistant to unfavorable abiotic and biotic environmental factors, as well as increased productivity in combination with a good harvest quality. In addition, the productivity of grape plants and the quality of their berries and bunches from biotic factors can be limited by the wide spread of pests and diseases on them, in particular, the most dangerous of them are phytoparasitic nematodes that affect plants, caused as diseases of phytohelminthiasis. According to foreign researchers, the causative agents of phytohelminthiasis, lead to small-leaved and dwarf bushes, a sharp decrease in productivity and cause significant damage to the quality of berries and grapes [1,9]. They cause numerous and varied damage to the root system of the plant; in addition, they play an even greater role in the spread of mycotic, viral, bacterial and other diseases. Therefore, phytohelminthological studies of this culture, the study of the faunistic complex of phytonematodes of grape plants and the identification of parasitic species are relevant in viticulture.

In order to determine the species composition of the faunistic complex of phytonematodes of grape agrocenoses, as well as to analyze the population density and elucidate trophic relationships with the plant in the period from 2018-2020. We collected phytonematodes from the root soil and root system of plants in 26 farms from 13 districts of the Surkhandarya region. The studies were carried out by the generally accepted route method [2,3,4].

During the phytohelminthological study, 1280 samples of soil and root system of grape plants were collected and analyzed. In the field, each soil sample, along with plant roots, was placed in a separate cellophane bag and labeled. The collected samples were analyzed in the phytohelminthological laboratory. First, the roots of the plant were carefully examined for nematode infestation. Then, the root soil and root system were examined separately. To isolate nematodes from the soil and root system of plants, a modified Berman funnel method was used [1,5,6]. Exposure at room temperature + 250C was 20-28 hours, at a temperature of +300 + 350C - 10-12 hours. Soil samples for the presence of cyst nematodes were usually analyzed by the Decker method [3,7,8].

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A 4-6% formalin solution was used to fix the nematodes. Enlightenment of nematodes was carried out in a mixture of glycerol with alcohol (1: 3), and permanent preparations on glycerol were prepared for in-office processing of the material according to the Seinhorst method [6,9]. Preparations for determining the species of root-knot nematodes were prepared according to the well-known method of E.S. Kiryanova, E.L. Krall [2].

The species composition of nematodes were studied under an MBR-3 microscope using light filters and a phase contrast device. When determining the species belonging of plant nematodes, the works of domestic and foreign authors were used, as well as the atlas of plant nematodes compiled at the Institute of Problems of Ecology and Evolution named after A. N. Severtsov of the Russian Academy of Sciences.

To determine the species, we used morphometric parameters that are obtained according to the generally accepted de Mann formula modified according to Micoletzky [5].

Results

As a result of the carried out phytohelminthological studies in grape agrocenoses in the southern region of Uzbekistan, we found 118 species of phytonematodes belonging to 54 genera, 39 subfamilies of 33 families, 20 superfamilies, 13 suborders, 9 orders and 2 subclasses. In total, the detected nematodes by orders are distributed as follows: Order Monhysterida is represented by 5 species, Enoplida-1, Mononchida-6, Dorylaimida-23, Alaimida-5, Rhabditida-7, Teratocephalida-25, Aphelenchida-19 and order Tylenchida-27 species (Table-1).

Table-1.

Qualitative and quantitative ratio of nematode species of grape agrocenoses by order

№	Detachments	Number of species	%	Number of individuals	%
1	Monhysterida	5	4,2 %	176	1,3
2	Enoplida	1	1,0 %	28	0,2
3	Mononchida	6	5,0 %	153	1,2
4	Dorylaimida	23	19,5 %	844	6,4
5	Alaimida	5	4,2 %	110	0,8
6	Rhabditida	7	5,9 %	697	5,4
7	Teratocephalida	25	21,2 %	3747	28,6
8	Aphelenchida	19	16,1 %	2070	15,9
9	Tylenchida	27	22,9 %	5261	40,2
	Всего:	118	100	13086	100

The order Monhysterida is represented by 2 families: Plectidae, Monhysteridae; 4 genera: Anaplectus, Plectus, Proteroplectus, Monhystera; 5 species (which is 4.2% of the total number of species) and a total of 176 specimens (1.3% of the total number of detected plant nematodes).

The order Enoplida includes one family: Onchulidae; one genus: Prismatolaimus and 1 species (0.9%), a total of 28 specimens (0.2%) of phytonematodes.

The order Mononchida includes 2 families: Mononchidae, Mylonchulidae; 3 genera: Mononchus, Clarcus, Mylonchulus and 6 species (5.1%), a total of 153 specimens (1.2%) of phytonematodes.

The Dorylaimida order is represented by 8 families: Encholaimidae, Nygolaimidae, Dorylaimidae, Qudsianematidae, Aporcelaimidae, Discolaimidae, Nordiidae, Xiphinemidae;

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11 genera: Enchodelus, Nygolaimus, Paradorylaimus, Mesodorylaimus, Dorylaimellus, Eudorylaimus, Aporcelaimus, Aporcelaimellus, Discolaimium, Longidorella, Xiphinema; 23 species (19.5%), a total of 844 individuals (6.3%) of phytonematodes.
The order Alaimida includes 2 families: Alaimidae, Diphtherophoridae; 2 genera: Alaimus, Diphtherophora and 5 species (4.2%), a total of 110 specimens (0.8%) of phytonematodes.
The order Rhabditida includes 2 families: Rhabditidae, Diplogasteroididae; 4 genera: Mesorhabditis, Pelodera, Rhabditis, Mesodiplogaster; 7 species (5.9%), a total of 697 individuals (5.3%) of phytonematodes.
The order Teratocephalida is represented by 3 families: Panagrolaiminae, Cephalobinae, Acrobelinae; 8 genera: Panagrolaimus, Heterocephalobus, Cephalobus, Eucephalobus, Acrobeloides, Chiloplacus, Acrobeles, Cervidelus; 25 species (21.2%), a total of 3747 individuals (28.9%) of phytonematodes.
The Aphelenchida order is represented by 3 families: Aphelenchidae, Paraphelenchidae, Aphelenchoididae; 4 genera: Aphelenchus, Paraphelenchus, Aphelenchoides, Bursaphelenchus; 19 species (16.1%), a total of 2070 individuals (15.8%) of phytonematodes.
The order Tylenchida includes 8 families: Tylenchidae, Dolichodoridae, Psilenchidae, Hoplolaimidae, Rotylenchulididae, Pratylenchidae, Meloidogynidae, Paratylenchidae; 13 genera: Tylenchus, Filenchus, Aglenchus, Lelenchus, Tylenchorhynchus, Bitylenchus, Psilenchus, Helicotylenchus, Rotylenchus, Pratylenchus, Pratylenchoides, Meloidogyne, Paratylenchus; 27 species (22.9%), a total of 5261 specimens (40.2%) of phytonematodes.
The above analysis shows that among the orders in terms of species composition, the order Tylenchida occupies the first place, which is 22.9% of all detected species of nematodes of grape plants. Then the order Teratocephalida (21.2%), the order Dorylaimida (19.5%) and the order Aphelenchida (16.1%).
In terms of the number of individuals among the orders, the first place is occupied by the order Tylenchida, which is 40.2% of the total number of detected phytonematodes. Then the order Teratocephalida (28.9%), the order Aphelenchida (15.8%) and the order Dorylaimida (6.3%).
Phytonematodes identified from the roots and rhizosphere of grape plants, according to the ecological classification of A.A. Paramonov [3], belong to 5 ecological groups: pararisobionts - 29 species (24.6% of the total number of species), 970 individuals (7.4% of the the total number of detected phytonematodes); devisaprobionts - 11 species (9.3%), 797 individuals (6.1%) of phytonematodes; eusaprobionts - 29 species (24.6%), 3871 individuals (29.6%) of phyto-nematodes; phytohelminths of nonspecific pathogenic effect - 30 species (25.4%), 3661 individuals (28.0%) of phytonematodes; phytohelminths of specific pathogenic effect - 19 species (16.1%), 3787 individuals (28.9%) of phytonematodes (Table 2.).
Pararisobionts belong to the orders: Monhysterida, Enoplida, Mononchida, Alaimida, Dorylaimida and are represented by the families Monhysteridae, Onchulidae, Mononchidae, Mylonchulidae, Encholaimidae, Nygolaimidae, Dorylaimidae.
Representatives of this ecological group were found mainly in the rhizosphere, where 94.6% of the total number of nematodes were recorded.

Table-2.

Qualitative and quantitative ratio of wheat nematodes by ecological groups

№	Environmental groups	Number of species	%	Number of individuals	%
1	Pararisobionts	29	24,6	970	7,4
2	Eusaprobionts	11	9,3	797	6,1
3	Davisaprobionts	29	24,6	3871	29,6

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4	Phytohelminths of nonspecific pathogenic effect	30	25,4	3661	28,0
5	Phytohelminths of specific pathogenic effect	19	16,1	3787	28,9
	Total:	118	100	13086	100

Species *Monhystera filiformis, Prismatolaimus intermedius, Clarcus papillatus, Mesodorylaimus bastiani, M. parasubulatus, Eudorylaimus centrocercus, E. kirjanovae, E. paraobtusicaudatus, E. parvus, E. pratensus, Aporcelaimus superbus, Aporcelaimellus abtusicaudatus, A. obscurus and Discolaimium cylindricum* root soil in large numbers.
The species *Anaplectus granulosus, Proteroplectus parvus, Mylonchulus parabrachyurus, Nygolaimus brachyuris, Paradorylaimus filiformis, Dorylaimellus mirus, Alaimus striatus* are the smallest in number of individuals.
The group of eusaprobionts in the material studied by us turned out to be the group with the smallest number of species (11 species), only 9.3% of the total number of species. Representatives of this group include the family Rhabditidae (6 species). From eusaprobes Rh. brevispina is found in large numbers in the root system of plants and root soil. The species *Mylonchulus parabrachyurus, M. solus* were found only in the rhizosphere, and in the smallest number of individuals.
The group of devisaprobionts includes 29 species (only 24.6% of the total number of species), which belong to the orders Plectida and Teratocephalida; family Plestidae, Cephalobidae and Paragrolaimidae. They were found in the root system and rhizosphere of plants.
The species *Panagrolaimus rigidus, P. multidentatus, P. subelongatus, Heterocephalobus elongatus, Cephalobus persegnis, Acrobeloides buetschlii, A. Nanus, Chiloplacus propinquus* found in the rhizosphere and root system of grape plants were the most numerous in terms of the number of individuals.
The species *Panagrolaimus armatus, P. spondyli, Chiloplacus lentus, Cervidelus insubricus* were found in insignificant numbers in terms of the number of individuals.
The species *Chiloplacus summetricus* and *Acrobeles ciliatus* are found only in the rhizosphere of plants.

Conclusion

The most numerous in terms of the number of species was the group of phytohelminths of nonspecific pathogenic effect, including 30 species belonging to the orders Aphelenchida and Tylenchida; families Aphelenchidae, Paraphelenchidae, Aphelenchoididae, Tylenchidae, Psilenchidae. Among families in terms of the number of individuals and species composition, Aphelenchoididae occupies the first place, which is 63.3% of the total number of species and 8.3% of the total number of individuals of the detected phytonematodes.
Species *Aphelenchus avenae, A. cylindricaudatus, Paraphelenchus pseudoparietinus, Aphelenchoides clarolineatus, A. dactylocercus, A. limberi, A. parietinus, A. parasubtenuis, A. trivialis, Tylenchus davainei, Filenchus filiformis, Aglenchus thornei, Neotylenchus abulbosus, Ditylenchus intermedius, D. myceliophagus, D. tulaganovi, Nothotylenchus alli*were found in the rhizosphere and root system of grapes, and were the most numerous in terms of the number of individuals.
Phytonematodes *Paraphelenchus tritici, Aphelenchoides helophilus, A. parabicaudatus, A. pusillus, A. sacchari, A. teres, Bursaphelenchus talonus* were insignificant in the number of individuals.

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Phytohelminths with a specific pathogenic effect, including 19 species belonging to the orders Dorylaimida and Tylenchida; families Xiphinematidae, Dolichodoridae, Hoplolaimidae, Rotylenchulididae, Pratylenchidae, Meloidogynidae, Paratylenchidae, Anguinidae were found in a large number of phytonematodes.

Among the true parasites, the dominant species were *Tylenchorhynchus capitatus, T. brassicae, Bitylenchus dubius, Helicotylenchus dihystera, H. erythrinae, H. multicinctus, Pratylenchus pratensis, P. neglectus, Ditylenchus dipsaci.* They were found in the rhizosphere and the root system of plants, and were the most numerous in terms of the number of individuals.

The species *Psilenchus clavicaudatus, Meloidogyne arenaria, Pratylenchoides crenicauda, Paratylenchus amblycephalus, P. macrophallus, Neoditylenchus pinophilus* were found in a small number of phytonematodes.

The analysis of the research shows that the fauna of phytonematodes of grape plants in the south of the Republic has not been studied. Therefore, carrying out large-scale phytohelminthological studies to study the faunistic complex of phytonematodes of grape agrocenoses in this territory, as well as the identification and degree of harmfulness of parasitic species, is of great scientific and practical importance in the development of viticulture in the republic.

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