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Fauna and Distribution of Phytonematodes of Apple Orchards in the Northern Regions of the Surkhandarya Region of Uzbekistan

Bekmurodov Abdujabbor Sattorovich
Associate Professor, Doctor of Philosophy in biology (PhD), Department of Zoology, TermezStaty University, Termez, UZBEKISTAN

Abdujalilova Maftuna Isakjonovna
Lecturer, Department of Zoology, TermezStaty University, Termez, UZBEKISTAN

Abstract: *The article provides data on the fauna and distribution of phytonematodes in the root soil and root system of apple plants in the northern regions of the Surkhandarya region of Uzbekistan. As a result of the research, 34 species of phytonematodes were identified, belonging to 21 genera, 13 families, 5 orders and 2 subclasses. Numerous species in the phytonematode fauna of apple plants were Cephalobuspersegnis, Chiloplacussclerovaginatus, Panagrolaimusrigidus, Aphelenchusavenae, Aphelenchoidesparietinus, A.composticola, A.limberi, andA.blasthophthorus.*

Keywords: *Apple trees, phytonematodes, fauna, root soil, root system*

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Surkhandarya region is the southernmost part of the Republic of Uzbekistan. The subtropical climate of the region is very favorable for the active life of various pests and diseases of wild and cultivated plants, including apple trees. Of these, the most dangerous phytoparasitic nematodes are that they infect apple plants, causing the disease "phytohelminthiasis" and cause enormous damage to the harvest of these crops [6, p. 373-394].

The faunistic complex, ecological features, patterns of distribution of phytonematodes of apple orchards in the southern regions of Uzbekistan were first studied by E.T. Turaev, T.S. Skarbilovich [4, p. 58-61]; Sh.Kh. Khurramov, E.T. Turaev [5, p. 115-124].

Material and research methods. In order to study the faunistic complex of phytonematodes of apple plants in the period from 2020-2021. We collected phytonematodes from the root soil and root system of plants in shirkat farms from 5 northern districts of the Surkhandarya region of the Republic. The studies were carried out by the generally accepted route method [2, p. 338-369; 3, p. 3-11].

During the phytohelminthological study, 500 samples of soil and root system of apple plants were collected and analyzed. Phytonematodes were removed by the Berman funnel method and fixed with 4% formalin solution. Enlightenment of nematodes was carried out in a mixture of glycerin with alcohol (1: 3), and permanent preparations on glycerin were prepared for office processing of the material according to the Seinhorst method [7, p. 67-69]. Soil samples for the presence of cyst nematodes were usually analyzed according to the standard Decker method [1, p. 1-445].

Research results. As a result of the phytohelminthological studies carried out in apple orchards of the northern regions of the Surkhandarya region of Uzbekistan, we found a total of 34 species of phytonematodes belonging to 21 genera, 13 families, 5 orders and 2 subclasses. In total, the detected nematodes are distributed by orders as follows: Order Enoplida is represented by 1 species, Dorylaimida-6, Rhabditida-9, Aphelenchida-7 and order Tylenchida-11 species.

The research results show that phytonematodes of the apple tree root system and its root soil differ significantly from each other, both in species composition and in the number of individuals.

In the root soil of the apple tree, 1471 individuals (62.2% of the total number of detected phytonematodes) were registered, belonging to 34 species. *Eudorulaimusparvus, E.pratensis, E.similis, Aporcelaimellusobtusicaudatus, Tylencholaimusminimus*, and *Diphtherophoracommunis* were common pararisobionts. *Cephalobuspersegnis, Eucephalobusoxyuroides, Acrobeloidesbuetschlii, Chiloplacusquintastriatus, Ch.sclerovaginatus*, and *Panagrolaimusrigidus* dominate among the daisies, and *Rhabditisbrevispina* was often found among eusaprobionts. Among the representatives of phytohelminths of nonspecific pathogenic effect, *Aphelenchusavenae, Aphelenchoidesparietinus, A.blasthophthorus, A.composticola, A.limberi*, and *Ditylenchusmyceliophagus* prevailed, while *Xiphinemaopisthohysterum, Bityotlenchisdubyspratensis, Paratylenchushamatus*, and *Ditylenchusdipsaci.*

The main faunal complex of phytonematodes in the basal soil of the apple tree is represented by the species *E.pratensis, D.communis, C.persegnis, E.oxyuroides, A.buetschlii, Ch.sclerovaginatus, P.rigidus, Rh.brevispina, A.avenae, A.parietinus, A.bicaudatus, A.blasthophthorus, A.composticola, A.limberi, Q.capitatus, H.erythrinae, P.pratensis* and *D.dipsaci.*

In the root soil of plants, the most diverse orders are Tylenchida-11 species, Rhabditida-9, Aphelenchida-7, Dorylaimida-6. Among the above orders, in terms of species composition, representatives of the order Tylenchida dominate, containing 32.4% of all species found in the root soil. At the same time, in terms of the number of individuals, representatives of the Aphelenchida order prevail, which is 41.6% of all registered individuals in the root soil of apple plants (Table 1).

Table 1.Phytonematodes found in root soil of apple plants by order

Orders	Number of species	%	Number of individuals	%
Enoplida	1	2,9	12	0,8
Dorylaimida	6	17,6	148	10,1
Rhabditida	9	26,5	334	22,7
Aphelenchida	7	20,6	612	41,6
Tylenchida	11	32,4	365	24,8
Total:	34	100	1471	100

In the root system of the apple tree, 894 individuals (37.8% of the total number of detected phytonematodes) were found, belonging to 21 species. Among pararisobionts, only *D.communis* is found in the root system. C.persegnis, *E.oxyuroides, Ch.quintastriatus, Ch.sclerovaginatus*, and *P.rigidus* prevailed from the group of devisaprobes. Among eusaprobes, *Rh. brevispina*. Among the representatives of phytohelminths of nonspecific pathogenic effect, *A.avenae, A.parietinus, A. bicaudatus, A. blasthophthorus, A.composticola*and *A.limberi* dominate. From the group of phytohelminths with a specific pathogenic effect, *Q.capitatus, H.erythrinae, P.pratensis,* and*D.dipsaci* prevailed.

The main phytonematode community of the apple root system is made up of the species *C.persegnis, Ch.sclerovaginatus, P.rigidus, Rh.brevispina, A.avenae, A.parietinus, A.bicaudatus, A.composticola, A.limberi, Q.capitatus, H.erythrinae, P. pratensis*and *D.dipsaci*.

In the root system of apple plants, the most diverse orders are species Tylenchida-8, Rhabditida-5, Dorylaimida-4, Aphelenchida-4. In terms of species composition, representatives of the order Tylenchida dominate, containing 38.1% of all detected species in the root system of plants. In terms of the number of individuals, representatives of the order Aphelenchida prevail, which is 49.4% of all registered individuals in the roots of apple plants (Table 2.).

Table 2.Phytonematodes found in the root system apple plants by order

Orders	Number of species	%	Number of individuals	%
Dorylaimida	4	19,0	17	1,9
Rhabditida	5	23,9	157	17,6
Aphelenchida	4	19,0	442	49,4
Tylenchida	8	38,1	278	31,1
Total:	21	100	894	100

The following species dominants in the root soil and root system of apple plants: *C.persegnis, Ch.sclerovaginatus, P.rigidus, Rh.brevispina, A.avenae, A.parietinus, A.bicaudatus, A.blasthophthorus, A.composticola, A.limberi, Q.capitatus, H.erythrinae, P.pratensis* and *D.dipsaci*.

During the study period, on apple orchards of the northern districts of the Surkhandarya region, we identified 34 species of phytonematodes belonging to 2 subclasses, 5 orders, 13 families and 21 genera. All detected phytonematodes by orders are distributed as follows: Order Tylenchida is represented by 11 species, Rhabditida-9, Dorylaimida-6, Aphelenchida-7, Enoplida-1. (Table 3.).

Table 3. Taxonomic composition of apple plant nematodes (by order)

Orders	Number of species	%	Number of individuals	%
Enoplida	1	2,9	12	0,5
Dorylaimida	6	17,6	165	6,9
Rhabditida	9	26,5	491	20,8
Aphelenchida	7	20,6	1054	44,6
Tylenchida	11	32,4	643	27,2
Total:	34	100	2365	100

Among the orders in terms of species composition, the first place is occupied by the order Tylenchida, accounting for 32.4% of all detected species of apple nematodes. This is followed by the order Rhabditida (26.5%), followed by Aphelenchida (20.6%) and the order Dorylaimida (17.6%). In terms of the number of individuals among the orders, the first place is occupied by the Aphelenchida order - 44.6% of the total number of detected phytonematodes. Then the orders Tylenchida-27.2%, Rhabditida-20.8% and Dorylaimida-6.9%.

In the faunal complex, apple plant nematodes are represented by 13 families. The most diverse in terms of species composition is the Cephalobidae family, which accounts for 18.2% of all detected species of phytonematodes of apple plants. Aphelenchoididae ranks first in terms of the number of individuals among families. Itcontainsthemainnumber (34.3%) ofindividualsofphytonematodes.

The analysis of the conducted studies showed that in the conditions of the northern regions of the Surkhandarya region, phyto-nematological studies of apple orchards have been insufficiently studied. Therefore, carrying out large-scale phytohelminthological research, determining the faunistic complex of phytonematodes of apple orchards in this area and justifying measures to combat parasitic species are of great scientific and practical importance in the fruit growing of the Republic.

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