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Article

Systematic Analysis of Phytonematodes in Wheat Plants

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Annotation: The article provides information about the studies of species diversity and distribution of phytonematodes found in plant organs and root soil of wheat. As a result of research, 93 species of plant nematodes belonging to 3 subclasses, 8 genera, 9 subgenera, 23 families and 44 genera were registered in plant organs and root soil of wheat.

Keywords: wheat, species, phytonematodes, distribution, root parasitic nematodes, species diversity

1. Introduction

After the independence of the Republic of Uzbekistan, the problem of providing the country's population with food appeared. Because by the beginning of 2023, the population of Uzbekistan reached 35.3 million people. This is 712 thousand people (2.1%) more than at the beginning of 2022 [1].

Therefore, it is important to provide the population with food security, to grow products that are in high demand in the domestic market, and to form the necessary reserves. In this regard, in order to provide the population with wheat and flour products in 2023, wheat was planted on an area of 1 million 27 thousand hectares, as a result, it is planned to grow 7 million 679 thousand tons in June-July, this indicator is 1 million tons more than in 2022 [2].

In addition, 6 million 656 thousand tons of wheat were grown in the 2022 wheat harvest. Of this, 2 million 533 thousand tons were stored in regional enterprises of JSC "Ozdonkhusulot" for grain reserves of the Republic. 4 million 123 thousand tons remained at the disposal of farmers and residents.

In order to increase the productivity of wheat plants, in addition to studying the effects of various diseases and pests that negatively affect their growth, development and productivity, the study of phytonematodes parasitizing them is not only scientific but also practical. is also important. Because parasitic phytonematodes have been found to reduce the yield of agricultural crops from 10-15% to 100%. For example, in the USA, phytonematodes cause 53 million dollars of economic damage to agriculture in one year. It has been determined that wheat yield is reduced by 5-8% under the influence of parasitic phytonematodes.

Today, protection of cultivated plants from various pests and diseases, identification of organisms that harm them and development of measures to combat them is one of the most urgent issues in the world today. In this regard, it is important to identify the features

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of adaptation of harmful organisms, especially parasitic nematodes, to the new environmental conditions in the future by expanding the cultivated areas through the development of new lands.

In order to increase the productivity of wheat plants, in addition to studying the effects of various diseases and pests that negatively affect their growth, development and productivity, it is also of scientific and practical importance to identify phytonematodes that parasitize them is enough.

2. Materials and Methods

For the purpose of the study, phytonematodes of wheat plant roots and root peripheries were selected from wheat crops in Sherabad, Angor, Termiz, Muzrabot, Kyziriq, Boysun, Zharqorgan and Bandikhon districts of 8 districts of Surkhandarya region. This study was conducted between 2021 and 2023. The route method accepted by most researchers in phytohelminthology was used to collect samples from the soil around the roots of wheat plants [3], [5], [6], [7].

In our work, we used Berman's funnel method to isolate phytonematodes from plant organs and soil around roots [3−7]. The plant was divided into root, stem, and leaf parts, washed in tap water, then the plant parts were cut into 0.5 cm lengths using scissors and the specified amount (20 g) was weighed. A rubber tube was put on the funnel, a test tube was put on its bottom, and clean water was poured into it. After that, a copper mesh was placed on the funnel, and then each sample was placed in a milk filter and placed in the funnel. Special sieves were also used for this. After the samples were placed in the funnel, each sample was labeled with where, when, and what part of the plant it was taken from.

The phytonematodes come out of the plant and soil into the water and are collected in a test tube. Since the samples were placed in the summer time, after 24 hours the test tube was pulled out by squeezing the rubber tube inserted into the funnel by hand. Part of the water in the test tube was removed using a pipette, replaced with 4 percent formalin solution, and a plug was placed in his mouth. The body of some phytonematodes fixed with formalin may become twisted and twisted.

In order to restore it to its original state, the test tube was placed in hot water baths of 50-55 Co. After that, in order to determine the types of phytonematodes and to find out their number, the phytonematodes in the test tube were poured into a Petri dish and looked at under a microscope. When phytonematodes are seen alive, their body structure and morphological signs are better than when they are fixed. We used the Seinhorst method to prepare a permanent preparation. In this case, phytonematodes were collected with a special needle on a watch glass, 4-5 drops of distilled water. After picking, 4 drops of the first mixture (20% alcohol, 1% glycerin, 79% distilled water) were added to it in order to clarify phytonematodes, and it was placed in a thermostat with 20-30 Co for 24 hours. The thermostat helps to evaporate alcohol and water. After 24 hours, the second mixture (95% alcohol, 5% glycerin) was dripped into it, and it was placed in a thermostat at 20-30°C for 2-3 hours.

Identifying the species and genus of phytonematodes using the N-300M trinocular model (MD101,5,0M,11 screen) microscope, K.I. Institute of Systematics, Ecology and Evolution of Nematodes named after Scriabin and "A.N. Problems of ecology and evolution named after Severtsov" used atlases of phytonematodes prepared at scientific research institutes [30, 31]. De Man's (1880) formula, accepted by most scientists, was used to determine the size of phytonematodes [32].

3. Results and Discussion

As a result of the research, the phytonematodes found in the soil around wheat plants and roots belong to 3 subclasses, 8 genera, 9 subgenera, 13 large families, 23 families, 44 genera, and 93 species. Our materials include 2 species of the genus Enoplida, 3 species of the genus Mononchida, 10 species of the genus Dorylaimida, 1 species of the genus Monhysterida, 2 species of the genus Plectida, 28 species of the genus Rhabditi, 18 species of the genus Aphelenchida and 29 species belonging to the genus Tylenchida were identified.

Table 1. Distribution of phytonematode species identified in wheat plants by genera

No	Categories	Types the number	%	Number of individuals	%
1.	*Enoplida*	2	2,1	11	0,04
2.	*Mononchida*	3	3,3	56	0,23
3.	*Dorylaimida*	10	10,8	297	1,22
4.	*Monhysterida*	1	1,07	37	0,15
5.	*Plectida*	2	2,1	27	0,11
6.	*Rhabditida*	28	30,2	14726	60,6
7.	*Aphelenchida*	18	19,3	5489	22,6
8.	*Tylenchida*	29	31,13	3627	15,5
	Total	93	100	24270	100

As a result of the research, 3 subclasses, 8 genera, 9 subgenera, 13 large families, 23 families, 44 genera, and 93 species of phytonematodes were found in the root system of the wheat plant and in the soil around the root.

In our materials, the Adenophorea subclass includes 3 genera Tripyloidina, Mononchina, and Dorylaimida. The family Enoplida, in turn, includes 1 subfamily (Tripyloidina), 1 large family (Tripyloidea), 1 family (Tripylidae), 1 subfamily (Tripylinae), 2 genera (Trischistoma, Tobrilus) and 1 species (2 of the common species, 1% ini).

The genus Mononchida in turn includes 1 subfamily (Mononchina), 1 large family (Mononchoidea), 2 families (Mononchidae), 2 subfamilies (Mononchinae, Mylonchulinae), 3 genera (Clarcus, Mononchus Mylonchulus) and 3 species (includes 3.3% of the total species).

The family Dorylaimida, in turn, includes 1 subfamily (Dorylaimina), 1 large family (Dorylaimoidea), 4 families (Dorylaimidae, Qudsianematidae, Aporcelaimidae, Xiphinemidae), 5 subfamilies (Qudsianematinae, Mesodorylaiminae Dorylaimoinae, Aporcelaiminae, Xiphinematinae), 5 includes genera (Mesodorylaimus, Dorylaimus, Eudorylaimus, Aporcelaimus, Xiphinema) and 10 species (10.8% of total species).

The Chromadoria subclass included 2 groups, namely Monhysterida and Plectida. The order Monhysterida in turn includes 1 subfamily (Monhysterina), 1 superfamily (Monhysteroidea), 1 family (Monhysteridae), 1 subfamily (Monhysterinae), 1 genus (Monhystera) and 1 species (1 of the common species, 07 % ini). Plectida family, in turn,

includes 1 subfamily (Plectoidna), 1 large family (Plectoidea), 1 family (Plectidae), 1 subfamily (Plectinae), 2 genera (Plectus, Proteroplectus) and 2 species (2 of the common species, 1% ini).

The subclass Rhabditia included 3 groups, namely Rhabditida, Aphelenchida, and Tylenchida. The Rhabditida family, in turn, includes 2 subfamilies (Cephalobina, Rhabditina), 3 large families (Rhabditoidea, Panagrolaimoidea, Cephalobidea), 3 families (Cephalobidae, Panagrolaimidae, Rhabditidae), 5 subfamilies (Rhabditinae, Mesorhabditinae, Panagrolaiminae, Acrobelinae, Cephalobinae), includes 11 genera (Heterocephalobus, Cephalobus, Eusephalobus, Acrobeloides, Chiloplacus, Acrobeles, Panagrolaimus, Xylorhabditis, Pelodera, Rhabditis, Cuticularia) and 28 species (30.2% of total species).

Aphelenchida family, in turn, includes 1 subfamily (Aphelenchina), 1 large family (Aphelenchoidea), 4 families (Aphelenchidae, Praphelenchidae, Aphelenchoididae, Seinuridae), 4 subfamilies (Seinurinae, Aphelenchoidinae, Paraphelenchinae, Aphelenchinae), 4 genera (Aphelenchus, Paraphelenchus, Aphelenchoides, Seinura) and includes 18 species (19.3% of total species).

The Tylenchida family, in turn, includes 2 subfamilies (Tylenchina, Criconematina), 4 large families (Tylenchoidea, Hoplolaimoidea, Criconematoidea, Anguinoidea), 6 families (Tylenchidae, Dolichodoridae, Psilenchidae, Hoplolaimidae, Pratylenchidae, Anguinidae), 9 subfamilies (Tylenchinae, Tylenchorhynchinae, Merliniinae, Psilenchinae, Rotylenchoidinae, Pratylenchinae, Radopholinae, Anguininae, Nothotylenchinae), 16 genera (Tylenchus, Filenchus, Lelenchus, Aglenchus, Tylenchorhynchus, Bitylenchus, Merlinius, Psilenchus, Helicotylenchus, Pratylenchus, Pratylenchoides, Paratylenchus, Scytaleum, Neotylenchus , Ditylenchus, Nothotylenchus) and includes 29 species (31.13% of the total species).

The number of individuals of phytonematodes detected in the wheat plant in the conditions of the researched districts is distributed as follows: 11 individuals belonging to the Enoplida family, 56 individuals belonging to the Mononchida family, 297 individuals belonging to the Dorylaimida family, 37 individuals belonging to the Monhysterida family, 27 individuals belonging to Plectida family, 14726 individuals belonging to Rhabditi family, 5489 individuals belonging to Aphelenchida family and 3627 individuals belonging to Tylenchida family were found.

4. Conclusion

Based on the obtained results, the following conclusions can be drawn:

1. Found phytonematodes belong to 3 subclasses, 8 genera, 9 suborders, 13 large families, 23 families, 44 genera, and 93 species.
2. Tylenchida is the dominant group in terms of identified species, with 29 species, and the least species is found in Monhysterida, i.e. 1 species.
3. In terms of the number of individuals of the identified species, the largest number of 14,726 individuals belonging to the Rhabditi family, and the least number of 11 individuals belonging to the Dorylaimida and Enopli family were recorded.

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