Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/11755
DOI URL: http://dx.doi.org/10.21474/IJAR01/11755

RESEARCH ARTICLE

BIODIVERSITY OF THE FAUNISTIC COMPLEX OF THE PHYTONEMATODES OF THE EXAMINED WILD CEREAL PLANTS OF UZBEKISTAN

Alisher Shukurovich Khurramov[1] and Lobar Abdusamatovna Bobokeldieva[2]

1. Doctor of Biological Sciences, Associate Professor, Faculty of Natural Sciences, Termez State University, Termez, Uzbekistan.
2. Doctoral student, Faculty of Natural Sciences, Termez State University, Termez, Uzbekistan.

Manuscript Info

Manuscript History
Received: 20 July 2020
Final Accepted: 24 August 2020
Published: September 2020

Key words:-
Wild-Growing Cereals, Faunistic Complex, Phytonematodes, Dominants, Subdominants, Precedents, Sub-Precedents

Abstract

The article provides data on the study of the faunistic complex of phytonematodes of wild-growing cereal plants. Common methods in phytohelminthology were used to study the fauna of nematodes. As a result of research in plants and root soil of wild-growing cereals, 110 species of phytonematodes were registered. Their distribution by organs, as well as the degree of dominance of phytonematodes in the organs and root soil of the studied plants were studied. It is also argued that wild cereal plants are reserves of parasitic nematodes, and can serve as a hotbed of preservation of nematode invasion for cultivated plants.

Introduction:-

The study of phytonematodes of wild flora is of great interest for the establishment of host plants and biotypes. This question is also interesting because many polyphagous parasitic nematodes can easily pass from cultivated plants to wild ones and vice versa. In this sense, plants of wild flora can ensure the preservation of the parasite in nature. Studies show that wild plants can have a fairly diverse fauna. Studies of the nematode fauna of wild-growing cereals show that the species and ecological composition of plant nematodes in a certain way depends on the conditions of plant growth. For this reason, conducting a large-scale phytohelminthological survey to study phyto nematodes of wild-growing cereal plants growing in and around wheat fields, as well as the defeat of wild vegetation by parasitic nematodes, is of great scientific and practical importance and served as the basis for conducting phytohelminthological studies on these crops.

Materials And Methods:-

The material for phytohelminthological studies was samples of wild-growing cereals such as bulbous bluegrass (Poa bulbosa L.), wild-growing barley (Hordeum spontaneum C. Koch.), Louis oats (Avena ludoviciana L.), intoxicating chaff (Lolium temulentum L.) and wild rye (Secale sylvestre Host.) collected by the route method during 2015-2018. [1]. Collected and analyzed 764 soil and 1438 plant samples. The collection of soil and plant samples was carried out in agrocenoses and the entire surrounding territory of Uzbekistan. Soil and plant samples were collected in mid-spring (April) and early summer (June). To isolate nematodes from soil and plant organs, the modified Berman funnel method was used. Part of the soil sample was examined for the presence of cyst nematodes according to the standard Decker method [2]. For fixation of nematodes, 4–6% formalin was used, and glycerol preparations were made according to the Seinhorst method [3].

Corresponding Author:- Alisher Shukurovich Khurramov
Address:- Doctor of Biological Sciences, Associate Professor, Faculty of Natural Sciences, Termez State University, Termez, Uzbekistan.

Anatomical and morphological study of phytonematodes was carried out using temporary and permanent preparations. When determining the species of nematodes, the works of domestic and foreign phytohelminthologists were used, as well as morphometric indicators obtained according to the generally accepted de Mann formula modified according to Mikoletki [4].

The degree of dominance of phytonematodes in plant and soil samples was determined by the percentage state of individuals of certain species to the number of all individuals found during research on each culture. In this case, according to the classification of Crogerus [5].

Results And Discussion:-

During the period of research on wild-growing cereals and in their root soil, 110 species of nematodes were registered. The identified species of nematodes of the surveyed wild grasses were distributed according to the orders as follows: Chromadorida - 1 species, Plectida - 2, Enoplida - 2, Mononchida - 3, Dorylaimida - 19, Rhabditida - 34, Aphelenchida - 15, and Tylenchida - 34 species. In terms of the number of species and the number of individuals, representatives of the orders Rhabditida and Tylenchida prevailed, followed by the orders Dorylaimida and Aphelenchida in descending order. In a small number of species and numbers of individuals, phytonematode species of the orders Chromadorida, Plectida, Enoplida, and Mononchida were identified.

In the nematodofauna of wild barley (Hordeum spontaneum C. Koch.) And its root soil, 45 nematode species belonging to 2 subclasses, 6 orders, 19 families and 30 genera were found. In the root soil of barley, 45 species of nematodes were found, in the root system -30, stems and leaves -4 species. Common to the fauna of plant nematodes and its root soil are 4 species.

Of the species of nematodes found in plants and root soil of barley, wild-growing dominants are 5 species, subdominants - 12, to precedents - 12 and sub-precedents or rare - 16 species.

Thus, wild barley rhizosphere nematodes are represented by 45 species in the amount of 691 individuals. The dominant species in the root soil include Panagrolaimus rigidus, Bitylenchus dubius, Chiloplacus propinquus, Cephalobus persegnis and Chiloplacus lentus the first of which was found in all analyzed samples with the highest frequency of occurrence. 10 types are subdominants, the rest of the types are referred to as referents (12 types) and to sub-precedents (16 types).

In the rhizosphere of wild barley, according to the species composition, representatives of the order Rhabditida (18 species) and Tylenchida (11) prevail. The orders Dorylaimida and Aphelenchida are represented by 6 species, Plectida and Enoplida by 2 species. The Rhabditida orders are comparatively rich in numbers. Species from the families Cephalobidae, Aphelenchoididae and Dolichodoridae are relatively common in the nematode fauna in the root soil of wild barley.

In the root system of wild barley, 30 species of nematodes were found in the amount of 430 individuals. The dominant species in the roots include 6 species: Bitylenchus dubius, Panagrolaimus rigidus, Chiloplacus propinquus, Ch lentus, Aphelenchoides parietinus and Cephalobus persegnis. 7 species are subdominants, the remaining 17 species are registered in an insignificant amount and are referred to as precedents and sub-precedents.

In terms of species composition, the roots are dominated by representatives of the order Rhabditida (16 species). The order Tylenchida is significantly inferior in species composition (8). The order Aphelenchida is represented by three species, the order Enoplida is represented by one species.

In the stems and leaves of wild barley, 4 species were registered in the amount of 80 individuals. The faunal complex of the stem and leaves is characterized by species from the families Cephalobidae (3), Panagrolaimidae (1).

In plants of wild barley and its basal soil in terms of species composition and number of individuals, the order Rhabditida prevails, represented by 18 species and 670 specimens, the order Tylenchida is represented by 11 species and 301 specimens. The order Aphelenchida contains 6 species and in the amount of 119 individuals, Dorylaimida - 6 species and in the amount of 68 individuals, Plectida - 2 species and 24 individuals, Enoplida - 2 species and 19 individuals.

In the fauna of wild barley nematodes and its root soil, 5 species of true parasites were found, among which Bitylenchus dubius and Tylenchorhynchus tener dominated.

60 species of nematodes belonging to 2 subclasses, 8 orders, 23 families and 36 genera were found on the plants of the wild-growing Louis oats (Avena ludoviciana) and in its root soil. Including 60 species of nematodes were found in the root soil of oats, 37 species in the root system, and 6 species in stems and leaves. Common to the fauna of plant nematodes and its root soil are 6 species. Of the species of phytonematodes found in the plants and root soil of Louis oats, 3 species are dominant, 10 subdominants, 23 to recedents and subrecedents or rare - 24 species.

In the rhizosphere of oats, 1115 individuals of nematodes belonging to 60 species were identified. The dominant species in the rhizosphere are 3 species Bitylenchus dubius, Panagrolaimus rigidus, Cephalobus persegnis. The first 2 species were found in all analyzed samples. There are 10 types of subdominants and 47 types are referred to as precedents and sub-precedents.

In the rhizosphere of oats, the order Rhabditida (19 species), Tylenchida (17), and Dorylaimida (13) is relatively diverse.

The order Aphelenchida includes 6 species, Mononchida - 2, Chromadorida, Plectida, and Enoplida one species each. Species of the families Qudsianematidae, Cephalobidae and Aphelenchoididae are often found in the root soil of oats.

In the root system of oats, 37 species of nematodes were found in the amount of 507 individuals. The dominant species, both in the rhizosphere and in the roots of oats, are 3 species: Bitylenchus dubius, Panagrolaimus rigidus and Cephalobus persegnis, with 15 species as subdominants. All the other 19 species are found in insignificant numbers and belong to the precedents and sub-precedents.

In the roots, the order Rhabditida (17 species) is the most diverse in terms of species composition. Order Tylenchida includes 13 species, order Aphelenchida - 3, Dorylaimida - 2 species, and order Plectida - only one species. In the root system of wild oats, the family Cephalobidae (11 species) is relatively diverse.

In the stems and leaves of plants, 6 species of nematodes were recorded in the amount of 124 specimens. Species of the family Cephalobidae (3), Panagrolaimidae (1), Aphelenchoididae (1), Anguinidae (1) were relatively common in the aboveground organs.

In the fauna of wild oat nematodes and in its root soil, both in the number of species and in abundance, representatives of the order Rhabditida prevail - 19 species and in the amount of 799 specimens, of the order Tylenchida - 17 species and 478 specimens. And the order Dorylaimida - 13 species and in the amount of 247 specimens. The Aphelenchida order is represented by 6 species and 123 specimens, Mononchida - 2 species and 43 specimens. The orders Plectida, Enoplida, and Chromadorida are represented by one species.

The nematodafauna of the bulbous bluegrass (Poa bulbosa L.) and its root soil is represented by 52 species. 52 species of nematodes were registered in the root soil of bluegrass, 31 species in the root system, and 6 species in stems and leaves. Common to the fauna of plant nematodes and its root soil are 4 species. Of the species of nematodes found in plants and root soil of bluegrass, 4 species are dominant, 14 are subdominants, 12 are referents and 22 are sub-or rare species.

In the root soil of bluegrass, a total of 1010 specimens were found. nematodes. The dominant species include 3 species: Chiloplacus propinquus, Panagrolaimus rigidus and Bitylenchus dubius. There are 17 types of subdominants, the rest of the types are referred to as precedents and sub-precedents.

In the rhizosphere of bulbous bluegrass, representatives of the order Rhabditida (18 species) and Tylenchida (12), Dorylaimida (11), Aphelenchida (8) are relatively diverse and numerous.

Representatives of the families Cephalobidae and Aphelenchoididae predominate in the root soil of bulbous bluegrass.

In the root system of bluegrass, 31 species were found in the amount of 436 individuals. individuals. The dominant species are Bitylenchus dubius, Panagrolaimus rigidus, Cephalobus persegnis, Acrobeloides buetschlii, Chiloplacus propinquus, Ch. sclerovaginatus. There are 11 types of subdominants, the rest of the types are referred to as precedents and sub-precedents.

In the root system of bluegrass, according to the diversity of species composition, representatives of the order Rhabditida predominate - 14 species. Order Tylenchida is represented by 8 species, Aphelenchida - 6, Plectida and Enoplida - one species each. Representatives of the families Cephalobidae and Aphelenchoididae are relatively common in the roots of bluegrass as in the root soil.

In the stems and leaves of plants, only 6 species were recorded in the amount of 109 individuals. Representatives of the families Cephalobidae, Panagrolaimidae, Aphelenchoididae, and Anguinidae are often found in terrestrial organs. All these families are represented by 1 - 3 species.

In the root soil, the order Rhabditida predominates in terms of the qualitative and quantitative composition, represented by 18 species and 757 specimens. From the squad

Tylenchida, 12 species and 440 individuals were identified, Dorylaimida - 11 species and 195 specimens, Aphelenchida - 8 species and 132 specimens. The orders Plectida and Enoplida are represented by the same species and are extremely rare.

In the tissues of wild rye plants (Secale sylvestre Host.) And in its root soil, 52 species of nematodes belonging to 6 orders were found.

Of the species of nematodes found in plants and root soil of wild rye, 4 species are dominant, 11 are subdominants, 19 are referents and 18 are sub-or rare species.

In the root soil of wild rye, 52 species of nematodes were recorded, in the root system - 32, in stems and leaves - 6 species. Common to the fauna of plant nematodes and its root soil are 6 species.

In the root soil of wild rye, 934 specimens of nematodes belonging to 52 species were found. Among the detected nematodes in the soil, Bitylenchus dubius, Panagrolaimus rigidus and Chiloplacus propinquus dominate, the first of which was detected in all analyzed samples. 11 species belong to subdominants, the remaining 38 species of nematodes belong to recedents and sub-precedents.

In the rhizosphere, representatives of the orders Tylenchida (16 species), Rhabditida (15), and Dorylaimida (12) prevail in terms of the number of species and the number of individuals. In terms of species composition, representatives of the orders Aphelenchida (5) Plectida (2) and Mononchida (2) were small in number. Species from the families Qudsianematidae, Cephalobidae, and Dolichodoridae are characteristic of the root soil.

The roots are dominated by 5 species - Cephalobus persegnis, Chiloplacus propinquus, Ch. sclerovaginatus, Panagrolaimus rigidus and Bitylenchus dubius. There are 12 types of subdominants, the rest of the types are referred to as precedents and sub-precedents.

In the roots, species of the orders Rhabditida (16 species) and Tylenchida (12) are relatively common. The families Cephalobidae and Dolichodoridae predominate in the plant root system in terms of species composition. All other species of families in the roots are few in number.

In the stems and leaves of plants, 6 species were recorded in the amount of 89 individuals. The stem and leaf nematode fauna is characterized by species from the families Cephalobidae (3), Panagrolaimidae (1), Aphelenchoididae (1), and Anguinidae (1).

On the plants of wild rye and its root soil, according to the diversity of species and the number of individuals, the order Tylenchida is represented by 16 species in the amount of 457 specimens, Rhabditida - 15 species in the amount of 670 specimens. and Dorylaimida - 12 species in the amount of 203 specimens. The species of the orders Aphelenchida, Plectida, and Mononchida were few in number and belong to rare species.

Thus, as a result of studying the faunistic complex of wild rye nematodes and its basal soil, 52 species were identified, of which 9 were real parasites, among which Bitylenchus dubius dominated. But the diseases caused by this nematode have not yet been identified.

In the plants of the intoxicating chaff (Lolium temulentum L.) and its root soil, 46 species of nematodes were found, in the amount of 770 individuals.

In the root soil of the chaff, 46 species of nematodes were registered, in the root system – 28, in the stems and leaves – 4 species. Common to the fauna of plant nematodes and its root soil are 4 species. Of the species of nematodes found in plants and root soil of the chaff, 4 species are dominant, 11 are subdominants, 16 are referents and 15 are sub-precedents.

In the rhizosphere of the chaff, there are 46 species and in the amount of 770 nematodes. Three species are registered as dominant species of root soil: Cephalobus persegnis, Chiloplacus propinquus, Bitylenchus dubius; 17 species are subdominants. Most of the nematode species are both recedent and sub-precedent.

Representatives of the order Rhabditida (16 species), Tylenchida (12) and the families Cephalobidae and Qudsianematidae predominate in the rhizosphere of the intoxicating chaff, both in terms of qualitative and quantitative analysis.

In the root system of the chaff, 28 species are recorded. 5 species dominate: Cephalobus persegnis, Chiloplacus propinquus, Ch. sclerovaginatus, Panagrolaimus rigidus, Bitylenchus dubius. There are 9 types of subdominants, the rest of the types are referred to as precedents and sub-precedents.

In the roots, representatives of the order Rhabditida (13 species) and Tylenchida (9) and the family Cephalobidae prevail in terms of the number of species and abundance.

In the stems and leaves of plants, 4 species were recorded in the amount of 71 individuals. The faunal complex of the stem and leaves is characterized by species from the families Cephalobidae (3) and Panagrolaimidae (1).

In the root soil, the orders Rhabditida and Tylenchida are represented by species composition and abundance.

As a result of studying the fauna of the intoxicating chaff nematodes and its root soil, 5 species of the registered nematodes are parasites, among which Bitylenchus dubius was dominant.

Of the 110 species of plant nematodes found in plants and the rhizosphere of wild-growing cereals, 4 species were found only on wild barley, 7 species only on Louis oats, 5 species only on bluegrass bulbous, 8 species only on wild rye and 2 species only on intoxicating chaff, and also 8 species were found to be common for all examined crops.

Conclusions:-

As is known, wild cereal plants are reserves of parasitic nematodes and can serve as a hotbed for the preservation of nematode invasion. This proves that phytoparasites can be transferred to crops from wild cereals.

Taking into account the influence of wild cereal plants as a source, including especially pathogenic species, on cultivated plants, it is necessary to conduct a systematic fight against wild cereals, which can also be considered as a fight against phytohelminths.

Thus, there is every reason to assert that weediness of crop rotation fields with heavily and moderately affected wild plants can have a negative impact on the effectiveness of anti-nematode crop rotations.

References:-

1. Парамонов А.А. О некоторых принципиальных вопросах фитогельминтологии // Москва,1958. С. 3-11.
2. Decker H. Schädliche Nematodenarten des Getreides und der Gräser. Berlin. 1974.: 221-237.

3. Seinchorst J. W. A rapid method for the transfer of nematodes from fixative to anhydrous glycerin. Nematologica. 1959. V.4.: 57-69.
4. Micoletzky G. Die freilebenden Erd-Nematoden, mit besonderer Berucksichti-gung der Steiermark under Bukowina, Zugleich mit einer Revision Samtlicher nicht mariner, freilebender Nematoden in Farm von esenus – Beschreibungen und Bestimmungs. Schlusseln. Arch. Naturgesch. 1922. 87.
5. Krogerus R. Oekologische Studien nordis Mootarthropoden. Comment boil. Soc. Sci. Fenn. 1960; 21 (3): 1-239.