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INFLUENCE OF ABIOTIC FACTORS ON DYNAMICS OF WHEAT PHYTONEMATODE IN MUGHAN PART OF AZERBAIJAN

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Abstract. The article deals with the impact of abiotic factors on the dynamics of wheat phytonematode in the Mughan part of Azerbaijan. To study the population dynamics of phytonematodes of wheat and its rootstock soil under Azerbaijan conditions, soil and plant samples were collected by stationary method monthly from March to June during 2018-2023. In the wheat field, 45 species of nematodes were recorded during the vegetation period. In both roots and rootstock of wheat, the highest number of phytonematode individuals was observed at the beginning of the study (March), then their density began to decrease sharply and reached a minimum at the end of the growing season (June). In aboveground parts, the highest peak of phytonematode abundance occurs in mid-spring (April), followed by a decline in abundance at the following dates. The lowest abundance is recorded in summer before harvesting. The recorded phytonematodes were distributed in the following ecological groups: polytrophs - 8 species, typical saprobionts - 2, devisaprobionts - 15, potential parasites - 12, true parasites - 8 species. Ecological groups of phytonematodes respond differently to changes in the conditions of existence. At the same time, the effect of ecological factors depended on the habitat of phytonematodes. It is known that in the Mughan region of Azerbaijan, the influence of abiotic factors on the dynamics of wheat phytonematodes mainly includes elements such as soil structure, climatic conditions, sunlight and water supply. These abiotic factors determine the level and distribution of nematode populations and affect the yield of crops. As a result of the changing influence of various abiotic factors, the population levels of nematodes also change, which affects the effectiveness in the crop field. In this regard, the understanding and management of these factors is important for improving the quality and production of wheat products. Preventive and preventive measures, depending on the completeness and timeliness of this information, allow you to create optimal conditions and get a stable harvest from plants. The above-mentioned issues have been extensively investigated and reflected in the article.

Keywords: *Azerbaijan, Mughan, wheat, phytonematode, heat, abiotic factors.*

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1. Introduction

Among plant pests and diseases, one of the main places is occupied by phytonematodes, which cause enormous economic damage to agriculture, expressed in a significant reduction in yield. In Azerbaijan, wheat is one of the main agricultural crops. The cultivation of wheat in large areas of the Republic and the lack of knowledge of the faunal complex of phytonematodes, as well as the influence of abiotic factors on their

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species composition and abundance, served as the basis for conducting phytohelminthological studies on this crop.

The Mughan region of Azerbaijan is located in the south-eastern part of the country and has historical, cultural and ecological significance. This area is a large-area region with a special connection to the Mugan plain in the North. The territory of mughan covers a very ancient history and culture. This area is known as one of the places where the first people lived and many archaeological finds have been discovered from here. The Mughan region was also inspired by the famous folklore and songs of Azerbaijan. From an ecological point of view, the territory of Mughan is close to Tabriz bedali Lake, which is one of the famous natural resources of Azerbaijan in the South. This lake is important to biological species around the region. The Mughan region, known for its historical and cultural riches, is one of the most popular tourist destinations in Azerbaijan and is the focus of attention of both domestic and foreign tourists (Akhundov, 2005).

These plains are large areas and form the ideal environment for grain fields. The mughan region is also known as an ornithologically and biologically important place, as it is home to various species of birds and other creatures.

2. Materials and methods

In order to identify the patterns of formation of the wheat phytonematode fauna and establish the factors influencing their numbers, the dynamics of the number of wheat phytonematodes and its root soil in the conditions of Azerbaijan was studied. Soil and plant samples were collected using a stationary method during the wheat growing season 2018–2023. To isolate nematodes from soil and plant organs, a modified Berman funnel method was used. The volume of soil sample for analysis was 10 cm3. Soil samples for the presence of cyst nematodes were analyzed according to the method of RYSS (2017).

When determining the species of plant nematodes, the works of domestic and foreign authors were used.

3. Results and discussion

During the growing season, 45 species of nematodes were recorded in the surveyed wheat field. The greatest diversity of phytonematode species both in the roots and in the root soil of wheat was noted at the beginning of the growing season.

During the growing season, the number of species decreases gradually and reaches a minimum in the summer season. The decrease in the qualitative composition of plant nematodes is in direct correlation with changes in soil moisture and inverse correlation with environmental temperature.

In the aerial parts, the number of phytonematode species remains more or less constant during the first three periods of the study. A more noticeable decrease in their diversity was observed only at the end of the study.

A somewhat different fluctuation was found in the dynamics of wheat phytonematodes abundance. In the root soil, the highest density of phytonematodes was observed in March. In April and May, a decrease in the number of phytonematodes was observed, but the most significant decline occurred in June.

In the root system of wheat, the greatest number of phytonematodes was observed at the beginning of the study (March), then their density began to decrease sharply and reached a minimum at the end of the growing season (June).

In wheat stems, the highest peak of abundance occurs in mid-spring (April), followed by a decline in abundance in the following dates of the study. The lowest abundance was observed in the summer period before harvesting. At the same time, the decrease of phytonematode abundance in roots, partly in soil (starting from mid-April), is in direct dependence on soil moisture and there is an inverse relationship between phytonematode abundance and air temperature.

Phytonematodes collected from wheat plants and root soil during the growing season are distributed by ecological groups as follows: Polytrophs - 6 species and 295 individuals (1.7%), typical saprobionts - 4 species and 374 individuals (1.6%), devisaprobionts - 30 species and 19335 individuals (81.0%), potential parasites - 33 species and 2059 individuals (12.9%), true parasites - 4 species and 339 individuals (2.3%).

Ecological groups of phytonematodes respond differently to changes in the conditions of existence. At the same time, the effect of environmental factors depended on the habitat of phytonematodes. Soil polytrophs, usually inhabiting soil capillary moisture, are more common in the spring period (March), when temperature and especially soil moisture are most optimal for their habitat. As temperature increases and soil moisture decreases, their numbers begin to gradually decrease and reach a minimum during the hot and dry summer period.

In the root system of wheat, polytrophs are very rare and occur in sporadic numbers during the spring (March, May) months. Typical saprobionts are few in number during the vegetation period of plants. At the beginning of the study (March) at optimal soil moisture and temperature, they are relatively common in the root system of plants.

During the subsequent periods of the study, they are few in number in the roots and are found mainly in the root soil. Typical saprobionts are very rare in root soil and plant tissues.

Semi-saprobiotic forms are the most diverse and numerous group, determining the overall picture of the dynamics of phytonematodes both in the root soil and plant organs. In the dynamics of the number of semisaprobiont phytonematodes in the root system, the highest peak occurs at the beginning of the study, when the soft tissues of the roots favor the mass reproduction of this group of nematodes. As the tissues of the root system become lignified, the number of devisaprobionts gradually decreases and reaches a minimum at the end of the growing season.

A slightly different picture is observed in the fluctuations in the number of hemi-saprobionts in plant stems. Their number in stems in the initial periods of the study remains low, even close to minimal. Subsequently, a significant increase in numbers is noted (April), which again begins to decline and reaches a minimum by the end of the plant growing season.

It is important to clarify many factors related to the dynamics of nematodes, such as the surface area of the environment, plant type, soil composition, water regime, Marine residues and crop cycle. These data help in developing intervention strategies for plant protection and product quality improvement (Jafarov, 2005).

The dynamics of wheat phytonematodes is also related to the change in biological variety, crop cycle, crop rotation and different crop installations. Since phytonematodes cause damage to the areas where the crop is mined, these issues should be paid attention to. Also, appropriate crop protection measures and plant protection protection measures are also important to reduce nematode penetration. Constant research and monitoring

should be organized to bring wheat phytonematodes under control and improve product quality (Chen, 1995).

In leaves, the number of devisaprobionts remains low throughout the entire growing season of plants. Their greatest numbers occur in April. During subsequent periods, the number of that group gradually decreases and by the end of the growing season it becomes minimal.

The root soil differs from plant organs in the diversity of species composition throughout the entire study period. Semi-saprobiotic species of plant nematodes were numerically dominant throughout the entire study period. Their greatest numbers were noted in April; by the end of the plant growing season, their numbers dropped to a minimum.

The percentage of semi-saprobic forms in the root soil ranges from 51 to 65% of all detected individuals. These figures for the root system of wheat are 68–84%, for stems – 78–96% and for leaves – 93–98%. The high abundance of semi-saprobiotic phytonematode species in plant tissues indicates the presence of saprobiotic decay. This decay may be associated with plant damage by mycotic diseases.

Mycochilophages from a group of nonspecific parasites that feed on fungi and plant tissues are found in almost equal numbers both in the root system and in the rhizosphere of plants. In the soil, the highest peak of their numbers is observed in April, then by the end of the growing season there is a decline. In the above-ground parts of plants, representatives of mycochilophages are found periodically and in small quantities.

Representatives of parasitic plant nematodes in root soil are represented mainly by ectoparasites and migrating endoparasites. This group was small throughout the entire study period. Relatively common during the first two periods of the study. By the end of spring (May) and during the summer, their numbers become minimal. In the roots, plant parasites are relatively common in mid-spring (April), then their numbers sharply decrease and reach a minimum level by the end of the plant growing season. Parasites are extremely rare in stems and leaves. The number of their individuals never exceeded 5 specimens. in the sample.

Various species of plant nematodes are equally associated with plants. According to the degree of trophic connection with wheat plants, the discovered species can be divided into phytohelminths - true parasites, potential parasites, eusaprobionts, devisaprobionts, mycophages, polytrophs and predators. In the root soil of wheat, the most numerous group is devisaprobionts that feed on plant residues. In plant tissues, along with devisaprobionts, mycophages, inhabitants of fungal mycelium, predominate. The massive proliferation of mycophages can be explained by the infection of wheat by fungi.

The species composition of phytonematodes and their numbers on wheat and in its root soil do not remain constant, but change throughout the entire growing season of the plants. The decrease in the diversity of species composition and number of nematodes in root soil is directly dependent on humidity and inversely related to soil temperature. The greatest diversity of species and the density of their individuals is observed in the initial periods of plant vegetation under optimal humidity conditions and an increase in soil temperature leads to a sharp reduction in the number of species and the number of individuals of plant nematodes.

Phytonematodes inside plant tissue are less susceptible to external environmental factors. For this reason, changes in temperature and soil moisture affect nematodes through other factors. For example, at high humidity and moderate temperature, foci of mycotic and bacterial diseases can arise on plants, which leads to intensive reproduction

of the inhabitants of saprobic foci - typical and semi-saprobionts, as well as mycochilophages.

Different ecological groups react differently to changes in environmental factors during the vegetation period of plants. Free-living soil polytrophs are most richly represented in the initial periods of vegetation at optimal soil moisture. Decrease in soil moisture, starting from April, leads to a sharp reduction of moisture-loving soil phytonematodes, up to the disappearance of most of their species. Specific tissue parasites of plants are little affected by external conditions. Their few qualitative and quantitative composition remains relatively constant during the whole vegetation period of plants.

The most numerous group within the phytonematode fauna are the semi-saprobiotic forms. Their numbers are constantly changing depending on changes in humidity and temperature. The number of semi-saprobiotic forms increases in the beginning, and then, at moisture deficit, sharply decreases.

A more extensive study of the dynamics of the wheat phytonematode should be carried out in the mughan region. These studies should collect and analyze data related to nematode propagation defects, the effect of soil composition, the effectiveness of crop rotation, and the quality of plant products. As a result of these analyzes, appropriate protection and control strategies should be developed. In addition, product preparers and apartment owners should be informed about this issue and appropriate training and advice should be offered. This is one of the important steps to improve the yield and quality of wheat products (Lehman & Stanosz, 1993).

The influence of abiotic factors on the dynamics of wheat phytonematode in the Mughan region of Azerbaijan is one of the important factors in the area. Abiotic factors are a wide variety of natural and belonging substances that act on plant health as non-living environmental elements. Abiotic factors are natural and belonging substances, such as non-living environmental elements. These factors act in the life environment of plants and are effective for their health, arrival and development. Abiotic factors include weather conditions (heat, rain), soil properties (soil structure, drainage, pH level), sunlight, water and any chemicals. These factors are important for the consideration of plant products and instantly affect their health and crop yield.

Abiotic factors have round significance on Plant Health and crop yields. For example, proper soil drainage, plant planting cycles and the fertilizing and water content of vegetables ensure that plants thrive in optimal conditions and harvest quality. But uncomfortable soil from drying out or flooding, or in measures of high heat or freezing temperatures, negatively affects the health and productivity of plants. For this reason, the variability and control of abiotic factors are critical for the quality and quantity of the product.

In this region, abiotic factors, such as temperature, rainfall, soil structure, water regime, pH level, drainage and fertilization, can affect the population and activity of wheat phytonematodes. For example, constituent rains can lead to an increase in the nematode population or changes in soil pH can lead to a closer connection of nematodes with field plants.

Taking these factors into account is an important issue for controlling wheat phytonematodes and improving product quality. A good understanding of the dynamics of these factors contributes to appropriate interventions and informed decisions (Trudgill & Blok, 2001).

Based on additional data on the influence of abiotic factors on the dynamics of wheat phytonematode in the Mughan region of Azerbaijan, changing defects of the

environment, soil and climate may have positive and negative effects on the population and activity of these nematodes. For example, dust storms that accelerate during founding periods can reduce productivity by causing nematodes to spread. Changes in soil structure, mainly issues such as drainage problems and water area elevation, can lead to changes in the composition and distribution of phytonematodes. Also, the principles of land processing and fertilizing can also determine the penetration of these nematodes and regulate their activity.

There are limitations and difficulties to combat the influence of abiotic factors, but there are various measures to reduce the penetration of wheat phytonematodes. For example, improving drainage systems and increasing soil suzerainty is important for limiting the living conditions of nematodes. Also, supporting phytonematodes with crop crops and applying different crop rotation cycles are important for strengthened soil health and reduced penetration of nematodes. With these, suitable plant protection benefits and basement conditions are important to minimize nematode losses.

Through research and monitoring, a more precise understanding of the effects of abiotic factors on nematodes is possible. This helps in taking nematodes into account and determining control measures in different planting periods. Good management of the environment and arable land is important for reducing the penetration of wheat phytonematodes and improving crop quality (Zuckerman & Mai, 1978).

4. Conclusion and offers

The results and proposals on the influence of abiotic factors on the dynamics of wheat phytonematode in the Mughan part of Azerbaijan can be as follows:

Abiotic factors, such as soil structure, drainage and pH level, affect the distribution and population figures of wheat phytonematodes. Climatic conditions, mainly heat and rainfall, determine the activity and spread of nematodes. Sunlight can affect the strength of phytonematodes to stay and survive in the soil. The way they touch water supply and manure creates potential farces to increase or decrease the population of nematodes.

Offers:

1. Improving soil structure and drainage is a fundamental measure to limit the spread of nematodes.
2. For the treatment of nematodes, it is recommended to use fertilizers suitable for plants and appropriate inks.
3. In the fight against nematodes, it is important to focus on phased gentlemen, as well as the application of biotic fighting techniques.
4. It is recommended to continue research and organize constant monitoring programs to bring the dynamics of nematodes under control.

Thus, based on the results of the study, it can be said that the fluctuation of phytonematodes of certain ecological groups, especially those inhabiting green plants, is probably related to the condition of plant tissues. For this reason, the hardening of the tissue of the root system and above-ground organs of wheat leads to a decrease in the number of phytoparasitic nematodes by the end of the vegetation of plants.

Conducting more detailed studies on this topic is important in order to accurately determine the influence of abiotic factors (such as soil ratio, temperature, precipitation) on the nematode population. In addition, in our country, documentation and policies on the integration of the results of research in this area into practice and the implementation of drastic measures are important.

An important role on the topic is also played by the conduct of more detailed studies and laboratory tests on the application of innovative technologies, biopesticides or treatment methods developed to combat wheat phytonematodes in our country and similar landscapes. This can help in finding the most effective ways to get phytonematodes under control and increase crop yields.

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