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Distribution of root-knot nematodes on agricultural plants, harm and their host plants

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DISTRIBUTION OF ROOT-KNOT NEMATODES ON AGRICULTURAL PLANTS, HARM AND THEIR HOST PLANTS

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Abstract

The article presents data on the spread of root-knot nematodes on crops, harm and host plants in the conditions of the Tashkent oasis. It has been established that 5 species of root nematodes are found in cultivated and wild plants - *Meloidogyne javanica, M. arenaria, M. incognita, M. acrita, M. plum*, which are common in vegetables and melons and cause great damage to these plants. Nematode M.javanica was found in the roots of plants such as sunflower, cabbage, watermelon, cucumber, pumpkin, zucchini, melon, corn, tomato, beets, eggplant and carrots, in the foci of infection of the plant 20-60 %, the level of damage to the root system is 4-5 points; damage to plants such as cucumber, pumpkin, tomato and potato by the nematode M. arenaria is 20-60 %, damage to the root system is 4-5 points, damage to sunflower, radish and dill is 20-35 %, damage to the root system is 1.0-2.8 points, the damage to plants such as clover and onions was 15-20 %. Damage to plants such as beets, cabbage, pumpkin, melon, beans, onions, hot peppers, tomatoes, potatoes and celery by the M. incognita nematode was 30-45 %, the damage to the root system was 3-5 points; damage to plants such as tomato, cucumber, watermelon, melon and beans was 50-80 %, damage to the root system was 3-4 points, and plants such as corn, clover and wheat were not damaged by nematodes. Damage to plants such as sunflower, radish, and tomato nematode M. hapla was 3-4 points, damage to the roots of clover and peanuts was 1 point. Nematodes of the genus Meloidogyne were found in 82 species of cultivated and wild plants belonging to 24 families, including 31 species of agricultural plants, 51 species of wild plants, of which 31 species are host plants of root nematodes, discovered for the first time in Uzbekistan. Due to the high prevalence and great damage to nematodes of the genus Meloidogyne in agricultural crops, preventive and agrotechnical measures have been developed and recommended to combat these dangerous parasites.

Keywords: *root-knot nematodes, agricultural plants, host plant, damage levels, prevention, agrotechnical measures.*

1 Introduction

Scope of problem. Currently, global environmental changes around the world lead to the widespread spread of parasitic organisms among cultivated plants in agriculture and their increase in the scale of parasitic influence. As a result of the influence of

plant parasitic nematodes, a significant decrease in the yield of cultivated plants in the agricultural sector is observed. It was found that the annual damage from plant parasitic nematodes to the global economy is $ 77 billion [13].

Nematodes of the genus Meloidogyne G*ö*eldi, 1987 are considered dangerous parasitic pathogens of cultivated and wild plants. It is known that nematodes of this kind cause damage to more than 4000 species of vegetables, melons, cereals, legumes, industrial plants, berries and ornamental plants [16]. The damage caused by nematodes of the genus *Meloidogyne* is very large and reduces the yield of agricultural plants by 60-80 %, therefore, nematodes are one of the most dangerous parasites of crops [9].

In Uzbekistan, the nematodes of the genus Meloidogyne G*ö*eldi, 1887 are one of the most dangerous pathogens that parasitize cultivated and wild plants, causing serious damage to agricultural plants. Due to the favorable soil and climatic conditions of the republic for the development and distribution of root-knot nematodes, these nematodes are currently widely distributed on open and closed soils throughout the country. In particular, the intensive cultivation of some crops leads to an increase in the number of nematodes of the genus Meloidogyne and the formation of a holistic host-parasite system between the nematode and the plant and contributes to the widespread occurrence of meloidognosis among cultivated plants. Accordingly, the development and implementation of effective measures to combat meloidoginosis of crops, based on the distribution, harm and mutual relations of each type of parasitic hosts of Meloidogyne nematodes, is of great scientific and practical importance. Therefore, we set ourselves the goal of finding out the distribution of root-knot nematodes of the genus Meloidogyne in agricultural plants and the level of infection of plants with these nematodes, as well as the determination of their host plants.

2 Materials and methods

The territory of Uzbekistan, by the nature of the relief, is divided into 2 large territories: mountainous, piedmont, and lowland. Dark and gray-earth soils are common in mountainous and foothill territories. The plain territory consists of a typical serozem [6]. The research materials were collected from cultivated and wild plants of mountainous, foothill and lowland areas of the Tashkent oasis.

In 2012-2018 under the conditions of the Tashkent oasis, various agricultural plants were studied to study the species composition of nematodes of the genus Meloidogyne G*ö*eldi, 1887, the distribution and damage of host plants of nematodes. We also studied wild plants growing in and around agrocenoses with a high density of nematode populations in order to elucidate the natural foci of nematodes of the genus Meloidogyne. We also examined plants infected with parasitic nematodes in greenhouse conditions. While observing the spread and damage of nematodes of the genus Meloidogyne in the Tashkent oasis, 4100 samples were collected. In the field, root-knot nematodes were observed using the route method [4, 10]. The intensity of damage to the root system of plants by root-knot nematodes was determined using a 5-point system [4]:

- 1 point - if one or two knots s is observed in the plant roots, the damage to the root is up to 10 %;
- 2 points - if the root is infected with a nematode from 10 to 35 %;
- 3 points - the root system is infected with a nematode from 35 to 70 % and some parts of the root are deformed;
- 4 points - over 70 % of the root system is covered with knot s, the main part is subjected to deformation;
- 5 points - almost the entire part of the root is damaged by nematodes [5].

To isolate larvae and female nematodes of the genus Meloidogyne from plant roots and soil, we used Berman funnels [4] and the root incubation method [6]. In order to clarify the species composition of root-knot nematodes, preparations were prepared from the perinal part of the body of their mature females. In this part, there are signs resembling "fingerprints" that are specific to each type of nematode and these signs are important in determining the type. Preparation of preparations was carried out by the method of E.S. Kiryanova and E.L. Krall [4]. When identifying the species of root-knot nematodes, identifying the morphological characteristics of their females, invasive larvae and males, as well as comparing the characters in the perinial part of their body, we performed on the basis of data presented by E.S. Kiryanova, E.L. Krall [4], A.L. Taylor, T.N. Sasser [15], O.M. Mavlyanov [5].

3 Results and discussion

Nematodes of the genus Meloidogyne G*ö*eldi, 1887, are also called root nematodes (root-knot nematodes), which parasitize in the roots of plants and are pathogenic organisms that cause serious damage to plants and are common in open and closed soils [9]. The anatomical and morphological features of the nematodes of the genus Meloidogyne differ from each other in the nature of various plant damage, as well as in their host plants and habitat [7]. Currently, nematodes of the genus Meloidogyne are widespread on Earth and include 97 species [3]. The diversity and differentiation of nematode species causes difficulties in their identification. Some species of nematodes of the genus Meloidogyne are nematodes, the southern root-knot nematode - Meloidogyne incognita, the Javanese root-knot nematode - M. javanica, the root-knot peanut nematode - M. arenaria, the northern root-knot nematode - M. hapla, the main plant parasites [3, 12]. One of the main features of root-knot nematodes is their polyphagy; geographically widespread species are polyphages [14]. Human activity also plays an important role in the spread of root-knot nematodes. The homeland of root-knot nematodes is South America. According to published data, the prevalence of nematodes on Earth is as follows: Meloidogyne incognita 52 %, Meloidogyne javanica 31 %, Meloidogyne arenaria 8 %, Meloidogyne hapla 7 %, other species 2 % [2].

In Central Asian countries, 20 species of the Meloidogyne genus nematodes are common – M. brevicaudata, M. graminicola, M. indica, M. mali, M. lucknowica, M. arenaria, M. javanica, M. acrita, M. incognita, M. hapla, M. artiellia, M. negriensis, M. peghossianae, M. carsganae, M. tadshikistanics, M. turkestanica, M. camelliae, M. enterolobii, M. microcephala, M. propera [7].

In Uzbekistan, the occurrence of five species of nematodes of the genus Meloidogyne was revealed - the Javanese root-knot nematode - M. javanica, the root-knot peanut nematode - M. arenaria, the cotton root-knot nematode - M. acrita, and the northern root-knot nematode - M. hapla [5, 10].

The prevalence, damage, and identification of each type of root nematode in crops is important for the development of control measures. Diseases that occur in plants under the influence of nematodes of the genus Meloidogyne are called meloidognosis, diseases are focal in nature, small foci of damage are formed on damaged fields. Symptoms of meloidoginosis are of great importance when finding foci of damage by nematodes.

Plants infected with root-knot nematodes differ from healthy plants in external signs of the disease. Early signs of meloidoginosis appear on the aerial parts of the plant, such as growth retardation, the leaves are light or yellow, whitish, small in size and most of the leaves fall off, the fruits shrink and ripen early, are stunted, dry out. The roots are characterized by the appearance of galls, multiple branching of the roots and other symptoms. In the conditions of the Tashkent oasis, to identify the spread of various types of root-knot nematodes, to determine their harm, agricultural plants such as beets, sunflowers, cabbage, radishes, watermelons, cucumbers, pumpkins, melons, maples, wheat, corn, peanuts, nuts, soybeans, were studied onions, cotton, hot peppers and peppers, tomatoes, eggplant, potatoes, spices, celery, carrots and other plants. It is well known that signs of damage to plants infected with root-knot nematodes are a change in the aerial parts of plants – yellowing of leaves, loss, reduction in volume, dwarfism, drying out of plants and developmental delays; and galls form in the roots and the roots are distinguished by multiple branches [1]. As a result of studies, it was revealed that five species of root-knot nematodes of the genus Meloidogyne are widespread in open fields in the Tashkent oasis - the Javanese root-knot nematode - M. javanica, the southern root-knot nematode - M. incognita, the root-knot peanut nematode - M. arenaria, the cotton root-knot nematode - M. acrita, northern root-knot nematode - M. hapla.

According to the ecological classification, nematodes of the genus Meloidogyne are part of specialized phytohelminths, which feed on living plant tissue, causing pathological changes in the plant, i.e. root root-knot formation [8]. The host-parasite relationships in the parasitic system, that is, the influence of the parasite on the plant and the development of the parasite, depending on the state of the plant, are rarely studied as a single process. The plant parasite, in turn, also affects the morphological, anatomical and physiological characteristics of the plant. In this process, the host-parasite relationship may vary depending on the state of the environment (temperature, soil condition, and others), according to the degree of damage to plants and the susceptibility of plant species or varieties to nematodes, their relationship

at the population level can lead to different models and different results [8]. Studies have shown that nematodes affect the morphological, anatomical, and physiological characteristics of plants and significantly damage plants. Two-year-old larvae of root root-knot nematodes are called invasive larvae, which are able to penetrate and damage the root of the plant. Larvae of nematodes can mechanically injure the root cells of plants, as well as chemical damage to plant cells during the secretory action of the stylet of the larvae. Enzymes contained in the secretory substances of nematodes break down plant cells and turn them into an easily digestible form for larvae. The results of biochemical studies show that this secretory substance contains enzymes such as amylase, invertase, pectinase, cellulose and a number of other enzymes that affect the carbohydrate composition, as well as proteolytic enzymes that affect plant protein molecules [5]. After invasive larvae of root-knot nematodes enter the root of the plant and after mechanical damage to the root, the parasite begins to produce enzymes from its digestive glands, as a result of which the process of cell division in plant tissue accelerates, and the cell membrane begins to dissolve. As a result, 5 to 10 times more cells are formed than normal cells. As a result of rapid cell division, the part of the root infected with nematodes begins to thicken and root galls appear [5].

As a result of studies in the studied areas, the distribution of each species of nematodes of the genus Meloidogyne, the occurrence in plants and the difference in the level of damage to the root system of plants by these nematodes were revealed. Javanese root-knot nematode - M. javanica is a typical representative of the fauna of tropical and subtropical regions. The homeland of this nematode is the Javanese Islands, from where they are distributed throughout the world. It is found only on the internal soils of Russia [11]. Distributed in Uzbekistan in Tashkent, Surkhandarya, Bukhara regions and Karakalpakstan. Damages plants such as vegetables and melons and corn, peas and other crops [5]. In the studied areas, it was noticed that the Javanese root-knot nematode was found in cucumber, pumpkin, sunflower, tomatoes, and eggplant roots and was found together with the peanut root-knot nematode - M. arenaria. In the studied areas, it was found that tomatoes are infected with 3 species of root-knot nematodes - peanut nematodes, Javanese root-knot nematode, and cotton root-knot nematode. It has been established that beans are infected with 2 species of nematodes - peanut root-knot nematode and southern root-knot nematode. In the Bekabad district, the Javanese root-knot nematode parasitizes on sunflower, cabbage, watermelon, cucumber, pumpkin, gherkin, melon, corn, tomato, beets, eggplant and carrots. In this area, the roots of sunflower and tomato were infected with 2 species of root-knot nematodes - mint nematode and cotton nematode. It turned out that in the farms of the Yangiyul district, the nematode damaged tomatoes and cucumbers, and foci formed in areas affected by the nematode. It was shown that the plants in the affected areas have a low height and differ from healthy plants, and in most cases the seedlings dry out.

In the process of evolution, as a result of the relationship between plants and their parasites, a trophic relationship is formed between plants and their parasites. As a result of this relationship, individual plant species become infected with some species

of nematodes of the genus Meloidogyne. It is known that diseases caused by invasive nematodes can be resistant to plants, strong or weak, and the intensity of different plant roots with nematodes is not the same. Nematode-resistant plants are divided into 4 groups: group 1 - resistant plants that do not penetrate the invasive larvae of nematodes; Group 2 is a slightly infected plant that includes invasive larvae in the root of the plants, but does not develop or does not develop well. Larvae are not mature enough to lay eggs. At the root, a small number of protrusions, the degree of damage is 10 %; Group 3 - moderately damaged plants include invasive larvae of nematodes in the root of the plant, the root level of which is 30 %, which lags behind the growth and development of plants; Group 4 - the most damaging plants, the growth and development of root nematodes in the roots is activated. The root system is covered with large anomalies; the degree of damage is 50 %. The intensity of the development of nematodes in disease-resistant or poorly tolerant plant roots is low [7]. Observations showed that the frequency of nematodes M. javanica was 20-60 %, and damage to the root system was 4-5 points. It should be noted that the intensity and intensity of damage to plants depends on the mechanical, chemical and physical properties of the soil. On sandy, loamy and moist grassy soils, the level of damage to the root system is always high.

A typical habitat for the root-knot peanut nematode is M. arenaria, Florida (USA). This is a common species, especially on internal soils. In the field, it is common only in the southern regions. It is found in greenhouses and greenhouses of Russia [11]. In Uzbekistan, this species is widespread in the Tashkent, Surkhandarya, Ferghana and Kashkadarya regions. Vegetables and melons, especially tomatoes and cucumbers are seriously damaged [5]. In the course of our research, it was found that peanut root-knot nematodes were common in Tashkent, Yangiyul, Urtachirchik, Buka and Bekabad areas. More than 50 crops were found that damaged the roots of radishes, radishes, beets, cucumbers, pumpkins, alfalfa, beans, onions, mulberries, tomatoes, eggplants, potatoes, turnips, grapes, sunflowers. Especially plants, such as cucumbers, pumpkins, tomatoes and potatoes, are very sensitive to this type of disease. The incidence of these plants with peanut root-knot nematodes is 20-60 %, and damage to the root system is 4-5 points. The incidence of sunflower, radish, and dill is 20-35 %, moderate damage to the root system is 1.0-2.8 points. Lack of damage to plants such as alfalfa, onions and root system is 15-20 %. The extensibility and intensity of plant damage depends on many factors. In sandy and sandy soils, the degree of damage to plants is high. This nematode on the roots forms large galls.

Southern root-knot nematode M. incognita is the most common species among nematodes of the genus Meloidogyne. A typical habitat is the state of Texas [11]. Distributed in Uzbekistan in the Surkhandarya, Tashkent and Ferghana regions and in Karakalpakstan. Extremely damages potatoes, cucumbers, melons, tomatoes, carrots, onions and other crops [5]. In our study, we found that the southern root-knot nematode is found in plant roots such as beets, cabbage, pumpkin, melon, beans, onions, hot peppers, tomatoes, potatoes, and celery. The degree of damage to these plants was 30-45 %, and the level of the root system was 3-5 points, with the most serious damage to the nematode. Especially serious damage was observed in the roots

of plants, such as tomatoes, cucumbers, pumpkins, and beans. In the farms of Bekabad district, especially in Dalvarzin, a large number of nematodes are found in the roots of cabbage, pumpkin, melon, beans, onions, hot peppers, tomatoes, potatoes, and celery. Also in the system of potato roots of the Urtachirchik farms there were 2 species of species - southern root-knot nematodes and peanut root-knot nematodes.

Cotton root-knot nematode - M. acrita is widespread in Uzbekistan in the Surkhandarya region. This species is very harmful to cotton [5]. In our study, a cotton root-knot nematode was found in the roots of tomatoes, peppers, watermelons, melons and potatoes, as well as in the roots of trees. It was found that at the root of tomato and pepper this parasite causes morphological damage to the root. The frequency of occurrence of these nematodes in plants such as tomatoes, cucumbers, watermelons, melons and beans was 50-80 %, and damage to the root system was 3-4 points. It was found that crops such as corn, alfalfa and wheat were not infected with the nematode M. acrita. There is evidence in the literature that this species is widespread in the southern regions of the country, parasitizes on cotton and produces large larvae on plant roots [5]. In the areas we studied, it was found that this species parasitizes on cotton roots in the Dalvarzin region of the Bekabad district.

Northern root-knot nematode - M. hapla develops and breeds in average climatic conditions except for greenhouses. Distributed to the territory of the Russian Federation extends from the northern regions to the central ones. In subtropical and tropical regions, this nematode is found in high mountain regions (above 1000 m above sea level) [11]. This root-knot nematode was found in the roots of wild plants, common in mountain and foothill regions of the Republic of Uzbekistan [5, 10]. In the course of our study, it was found that the northern root-knot nematode is common in foothill areas - Parkent, Bostanlyk, Akhangaran areas. This species is found in the roots of sunflower, radish, alfalfa, tomatoes, dill, celery, pepper, carrots and potatoes. These nematodes are also found in wild plants on the banks of irrigation canals. It was found that the roots of sunflower, radish, alfalfa, tomatoes, flax, celery, pepper, carrots and potatoes were infected with the northern-root-knot nematode. The roots of sunflower, radish, and tomatoes were up to 3-4 points, alfalfa and stalks of pepper - 1 point. The most damage was found in tomato.

Due to infection of plants with root-knot nematodes, in most cases, deformation of damaged plants, excessive branching and multiple formations of lateral roots are observed. The root system of intact plants develops correctly and no pathological changes are observed.

Due to the fact that the Bekabad and Buka areas are located in the southern part of the oasis and mainly on sandy soils among the studied areas, the occurrence of root-knot nematodes and vegetation damage in these areas were relatively high. Wild plants, such as black nightshade, amaranth, growing in agrocenoses, were not affected by nematodes. As a result of the study of the susceptibility of agricultural plants and wild plants growing around such agricultural plants, root susceptibility of these plants to root-knot nematodes to a varying degree was found. In the affected root, it was found that the external morphological structure of the root changed under the influence of a nematode, that is, galls are formed. In the most affected plants, the

leaves dried out, the drying process began at the base of the stem, and in some cases, drying was observed in crops. It turned out that young seedlings died without the appearance of galls. It was observed that with an increase in the number of invasive nematode larvae in plant roots, the disease develops and causes serious morphological disturbances of the roots (Fig. 1).

Certain species of nematodes of the genus Meloidogine and characteristics of plant resistance are expressed in the number of nematode eggs laid on the root of the plant and in a decrease in the number of eggs in the root and the intensity of root-knot formation in the root [7]. The size of the galls formed at the root of the plant depends on the type of parasite, its specific condition, the resistance of plants to diseases, nutritional conditions and a number of other factors.

Fig. 1. Roots affected by root-knot nematodes: A-root of the cucumber (in the field); B - the root of the cucumber (in greenhouse conditions); Pumpkin C-root (in the field); D-is the root of the pattison (in the field).

The size of galls depends on the thickness of the tissue of the root of the plant and the structural features of the root system, as well as on the pathways of penetration of the larva [5, 7]. For example, the northern root-knot nematode produces mainly small bulges in tomato, dill, radish, cabbage and other plants, and in some cases the roots can become very large. The cotton root-knot nematode produces significantly larger and several conjugated galls in the roots of affected plants, while the roots of corn and other crops form small galls. Peanut and Javanese nematodes produce a number of large galls [7]. In our study, it was noted that in the studied territories, root root-knot nematodes caused different sizes of galls in different plant roots under the influence of species. It has been observed that nematodes Javanese and peanut produce a large number of galls. Under the influence of peanut nematodes, it was found that large galls formed on the roots of tomatoes of the "TEMP" varieties, on the area and roots of tomatoes affected by the nematode (Fig. 2).

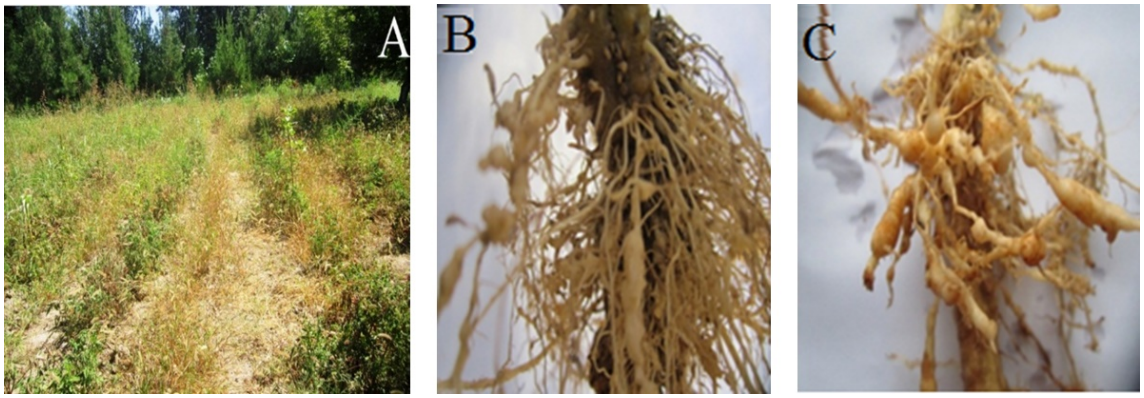

Fig. 2. A-Field of a tomato affected by a peanut root-knot nematode - Meloidogyne arenaria Chitwood, 1949 (Botanical Garden of NUUz); B, C-roots of the affected tomato.

It was noted that a number of large interconnected galls formed on the roots of plants affected by M. incognita. However, under the influence of this species, a slight protrusion was found on the roots of corn and other grains. Large galls were found in the roots of host plants under the influence of M. acrita species. The formation of small galls was observed under the influence of M. hapla on plant roots, such as tomato, dill, cabbage and radish. We explain that the different structure and different size of the galls formed on the roots of plants due to nematodes depends on the type of nematodes and their host plants.

As a result of determining the range, the distribution of some species of nematodes of the genus Meloidogyne showed that root nematodes were not evenly distributed in the region. In the lowland areas of the oasis - Akkurgan, Tashkent, Angren, Yangiyul, Urtachirchik, Pskent, Buka and Bekabad districts, M. javanica, M. arenaria, M. incognita, M. acrita, M. hapla. In the mountainous and foothill areas - Bostanlyk, Parkent, Akhangaran, Almalyk, M. hapla is widespread. Among the studied plants, the greatest damage from nematodes was observed in vegetables and melons. Parasites are especially damaged in sandy soils, in meadows and in pre-sown areas of tomatoes, cucumbers, eggplant and potatoes.

Root knot nematodes are polyphages; they parasitize on vegetable and melons, fruits, industrial and ornamental plants, as well as on tree roots [19].

Root-knot nematodes of the genus Meloidogyne Goeldi, 1982 are considered dangerous pathogens parasitizing on cultivated and wild plants. For more than 4000 species of root-knot nematodes, related to this genus of vegetables and melons, cereals and legumes, industrial plants, berries and ornamental plants in open and closed soils are host plants. [16] It was revealed that there are 82 family plants, including 31 types of crops and 51 species of wild plants - was first registered as a host plant.

While studying the distribution of root knot nematodes in agricultural crops and their harm, we simultaneously studied wild plants in irrigation canals, which are invasive foci of parasites. As a result of studies in the conditions of the Tashkent oasis, we compiled a list of host plants of root knot nematodes: according to the list, 82 host plants belonging to 24 families were identified, including 31 of them are

agricultural plants, and 51 species consist of wild plant species. 31 plant species were first registered as host plants of root knot nematodes.

The Javanese root-knot nematode, M. javanica, is found in 49 plant species, 7 of which are new host plants in Uzbekistan. Peanut root-knot nematode - M. arenaria is found in 49 plant species, 17 of which are new host plants in Uzbekistan. Southern root-knot nematode - M. incognita is found in 34 plant species, 7 of which are new host plants in Uzbekistan. Cotton root-knot nematode - M. acrita was found in 20 plant species; in Uzbekistan, a new host of this species was not detected. Northern root-knot nematode - M. hapla is found in 50 plant species, and in Uzbekistan 16 plant species are new host plants of nematodes (Fig. 3).

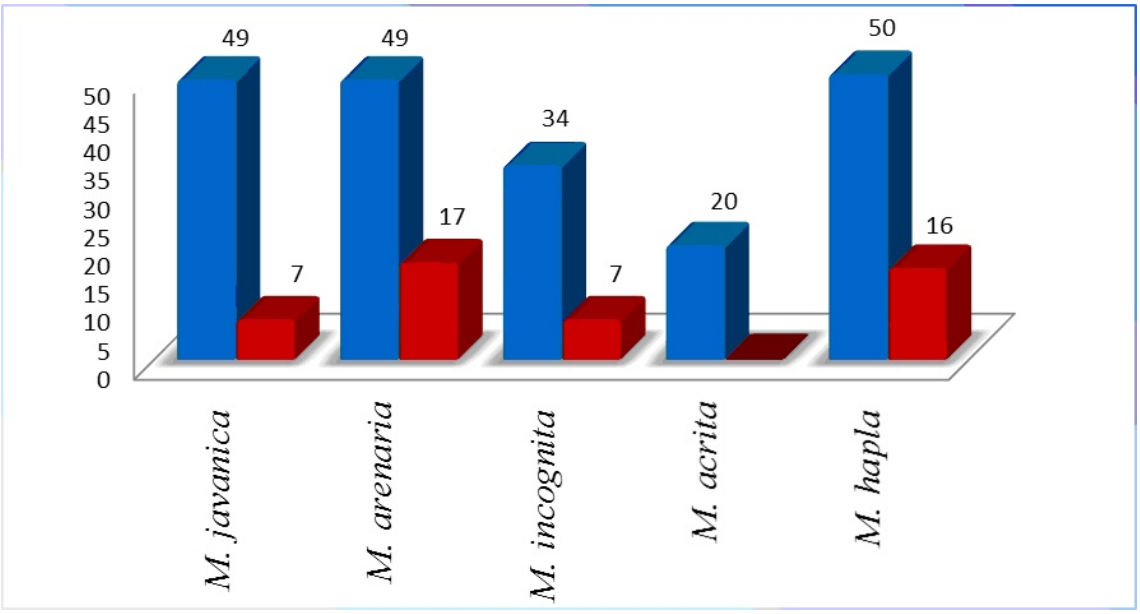

Fig. 3. Host plants of root root-knot nematodes: 1-column - plants in which nematodes are found; 2 column: the number of nematode host plants found in Uzbekistan for the first time.

There is a trophic connection between the plant and the parasite, and this connection was formed in the evolutionary process. The identification of the interaction of each pathogen with the environment is important for understanding the evolution of the parasite and the formation of the phytocomplex, as well as developing strategic and tactical methods of plant protection [11]. The "host-parasite" system between nematodes and plants is an integral system, firstly, the struggle process leading to the reformation of the relationship through mutual adaptation between the parasite and the host, and secondly, the adaptation of organisms to their habitats [13]. The relationship between the host and the parasite, the parasite-host system is complex and very diverse and developed in parallel in different taxonomic groups during evolution. The transition to parasitism often occurs in unique environmental conditions, accompanied by the appearance of specialized organs adapted to the new habitat, and the disappearance of a number of organs [4]. It is noteworthy that some agricultural

plants are associated with certain types of parasitic nematodes. The development of environmental and other plant protection methods requires a detailed study of host plant relationships and host-parasite relationships. One of the most promising ways to protect crops from phytohelminths is to plant resistant plant varieties. Planting resistant plant varieties will prevent the formation of strong foci of infection. Currently, breeders around the world are conducting scientific research on the creation of plant-resistant varieties of agricultural plants and the development of plant varieties resistant to parasitic nematodes. As a result, the population density of parasitic nematodes can be significantly reduced by growing resistant plant varieties in the affected fields. The development of larvae that have introduced into the root system of a stable plant variety impedes the normal development of larvae, which leads to a significant decrease in the number of phytohelminths in the soil. Of course, in the fight against phytohelminths of agricultural crops, relatively low-infected or resistant, regionalized and promising varieties are selected. There is information about specific species of nematodes of the genus Meloidogyne and specificity of resistance of some plants [3, 7, 9, 14, 22].

Evaluation of the level and distribution of root root-knot nematodes in crops and identification of nematode plants is important in the development of measures to combat these pathogens and gives good results. It is necessary to remove plants affected by melodinous nematodes during the growing season, and to remove them from weeds and weeds in and around agrocenoses. Determination of the density of invasive larvae of root-knot nematodes in soils around the root system of plants and the intensity of damage to the root system by them depends on the norm and duration of irrigation. Long and plentiful irrigation along long furrows stimulates the exit of nematode larvae from the egg and the active penetration into the root system of the plant. In sandy soils, it was possible to significantly reduce the impact of parasitic nematodes by conducting a small amount of frequent irrigation on soils [16]. To reduce the number of invasive larvae in the nematode, it is advisable to initiate crop rotation during agrocenoses, replacing plants that are heavily infected with nematodes, such as tomatoes and eggplant, with uninfected or poorly grown plants after 2-3 years. In soils infected with melodinous nematodes, it is recommended crop rotation, such as maize, alfalfa and wheat resistant to meloidoginosis.

4 Conclusions

In the roots of cultivated and wild plants of the Tashkent oasis, a distribution of five species of nematodes - Meloidogyne javanica, M. arenaria, M. incognita, M. acrita, M. hapla. It was noted that all species found on the plains are common in vegetables and melons, and Meloidogyne hapla in vegetables in the mountains and foothills. Losses from nematodes in vegetable and gourds were high among agricultural plants.

As a result of studies of the distribution of root-knot nematodes in agricultural plants, their harm, and their host plants in the conditions of the Tashkent oasis, host plants of root root-knot nematodes were identified: 82 host plants belonging to 24 families were identified, including 31 of them are agricultural plants, 51 species

consists of wild plant species. Melodyginous nematodes were found in 82 species of culture and wild plants from 24 families, 31 of which were first registered in Uzbekistan as host plants of nematodes.

Due to widespread damage to Meloidogyne nematodes, which can cause serious damage to crops, preventive and agrotechnical measures have been developed and recommended to combat these parasites.

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