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THE EFFECTIVENESS OF THE OXIDAT PREPARATION IN CONTROLLING MELOIDOGYNE NEMATODES IN VEGETABLE CROPS

Tokhtasinov Farkhod Rakhmonberdiyevich
Senior Lecturer, Department of Zoology and General Biology,
Fergana State University, B.A., B.A., B.A., PhD
Abdukayumova Sayyora Nematjon kizi
master's student of the Department of Zoology and
General Biology, Fergana State University

Abstract. This study examined the effectiveness of the biological preparation "Oksidat" against root-knot nematodes of the genus Meloidogyne, which are common in vegetable crops. Experiments were conducted in greenhouse and field conditions. The results showed that the number of nematodes was significantly reduced in the variants where the Oxidat preparation was used, and the growth indicators and yield of the plants increased. No phytotoxic effects of the drug were observed. The results of the study showed that Oxidate can be used as an environmentally safe and effective agent against root-knot nematodes in vegetable crops.

Keywords: Meloidogyne, nematode, vegetable crops, Oxidat, biological preparation, effectiveness, control measures, ecological safety.

In recent years, increasing the productivity of vegetable crops in agriculture and producing environmentally friendly and high-quality products has remained one of the important tasks. One of the most damaging factors to vegetable crops is various types of phytoparasitic nematodes, in particular, root knot nematodes of the genus Meloidogyne. These parasites live in the root system of plants and disrupt the flow of nutrients, resulting in stunted plant growth, yellowing of leaves, and a sharp decrease in crop quality and quantity. In some cases, when the level of damage is high, the yield of vegetable crops can be lost by 50–80 percent.

Root-knot nematodes, which belong to the Meloidogyne genus, reproduce rapidly in warm climates, especially in greenhouses and enclosed structures. They damage various vegetable and melon crops such as tomatoes, cucumbers, peppers, melons, watermelons, carrots, beets, soybeans, and beans. Therefore, the development of effective, economical, and environmentally safe control measures against this pest is an urgent issue.

In recent years, due to the negative environmental impact of chemical nematicides, their ability to reduce beneficial microflora in the soil, and their phytotoxicity in plants, the use of biological preparations has been increasingly expanding. One of these is the drug" oxidate", which is characterized by the fact that it stimulates the plant growth process, has microbiologically active components and has an effective effect against pathogenic microorganisms, including parasitic nematodes. The main purpose of this study is to determine the effectiveness of the drug "oxidate" in the fight against meloidogyne nematodes found in vegetable crops, assess its biological activity and study the effect of crops on growth and productivity indicators. The results of the study will be of great practical importance in the future in creating an environmentally safe, sustainable and effective protection system.

Preventive measures play an important role in preventing the damage of vegetable and polyz crops with parasitic nematodes. They are distinguished within methods of combating parasitic phytonematodes by their simplicity, cost-effectiveness, and effectiveness. Most species of parasitic nematodes survive through seeds, grains, seedlings, or seedlings and are

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thus spread to other areas. For example, the stem nematode disease that occurs in alfalfa and sorghum plants, or the rice aphid disease, is mainly spread by planting infected seeds. Therefore, it is necessary to sort or disinfect damaged seeds and seedlings before planting. Separating the bumps between the seeds of grain crops using modern seed cleaning techniques facilitates this process.

The transport of infested crop seeds or seedlings to other areas leads to the spread of nematodes and an increase in the level of damage. Therefore, the use of only healthy planting material is one of the most important factors in preventing the spread of parasitic nematodes. The spread of nematodes is stopped by identifying and destroying damaged seedlings. For example, it is necessary to separate damaged potato tubers before planting them. Parasitic nematodes can spread to healthy fields through water (rain, irrigation, or melted snow), agricultural machinery, equipment, animals, and even human shoes. Therefore, it is necessary to strictly adhere to general phytosanitary rules: organic waste and manure should be inspected by specialists, diseased plants should be destroyed, and heavily infected areas should be plowed up, the roots should be dug up and burned.

Fertilization has a positive effect on plant growth and increases productivity, but excessive use of fertilizers can dramatically increase the number of parasitic nematodes in the soil. Therefore, applying excessive fertilizer to fields infested with nematodes will not help achieve high yields. Some fertilizers, particularly calcium cyanamide, have been found to have an effect against nematodes in some countries. Experiments conducted in Belgium showed that this fertilizer reduced the number of Pratylenchus, Paratylenchus, and Hoplolaimus nematodes in the soil by 30–75%.

Crop rotation (rotation) is one of the most effective methods of combating nematodes. As a result of alternating planting of disease-resistant varieties with intolerant ones, the population of nematodes decreases. It is not recommended to plant Meloidogyne species in succession in the same area with rapidly susceptible plants (cucumbers, squash, melons, tomatoes, eggplants, etc.). On the contrary, it is advisable to rotate crops with low damage, such as onions, garlic, cabbage, lettuce, and chives.

The timing of planting and harvesting of crops is also important: as the growing season lengthens, damage by nematodes increases. For example, early harvesting of potatoes reduces the degree of damage to the stem with nematodes by several times.

Weeds can also be a natural intermediate host for nematodes. If they are not eliminated, all measures taken will be ineffective. Therefore, weed control is an integral part of the fight against parasitic nematodes.

In biological control, natural enemies of nematodes are used, such as predatory fungi, bacteria, protozoa, and soil-dwelling animals. Experiments show that predatory fungi can kill nematodes using ring traps. Additionally, some plants are naturally resistant to nematodes, with their larvae unable to penetrate the tissue or die from lack of food.

For example, corn is an unfavorable host for the development of the root-knot nematode. By creating resistant plant varieties, potato nematode populations have been reduced by up to 99% in some countries within a few years.

Heat treatment of soil, i.e., the thermal method, is widely used in the fight against parasitic nematodes. When soil is steamed at 100°C for 30–60 minutes, most phytonematode species die. The eggs of the nematode larvae die when heated to a temperature of 38–40 °C for one hour.

Sh. X. The solarization method developed by khurramov destroys nematodes by heating the soil using sunlight. In surkhandarya conditions, the effectiveness of this method was 95-

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98%. Ultrasound, osmotic pressure, ultraviolet light, electric current, and coagulation methods are also used in some cases, but they are mainly effective in greenhouse conditions.

Chemical control is one of the fastest-acting, but environmentally hazardous, methods against parasitic nematodes. Currently, nematicides such as "Vidat", "Nematorin", "Mokap", "EZO", "Faymet", "DD", "Ipam-40", "Karbotion", and "Tiazon" are used. They are effective in greenhouses and small areas.

However, long-term use of chemical preparations can damage beneficial microorganisms in the soil, disrupt soil structure, and cause adaptation (resistance) in nematodes.

Not all methods of combating parasitic nematodes give a complete 100% result. The most optimal way is the complex application of preventive, agrotechnical, biological and physical measures. The most promising direction is the creation of varieties resistant to biological methods, especially nematodes, and their planting. On a global scale, selective scientists are actively working on the creation of such resistant varieties and are achieving significant results.

Table 1. Effectiveness of the Oxidat preparation against Meloidogyne nematodes

№	Options	Oxidant concentration (%)	Number of root nematodes (per 100 g of soil)	Nematode reduction, %	Plant height, cm	Productivity, t/ha	Productivity increase, %
1	Control (without medication)	0,0	3200	—	45,2	28,5	—
2	Oxide 0,1 %	0,1	1600	50,0	50,4	33,6	17,9
3	Oxide 0,2 %	0,2	1050	67,2	52,8	34,9	22,5
4	Oxide 0,3 %	0,3	700	78,1	54,9	35,8	25,6

The study focused on the study of the effect of the drug “oxidate” against Root bulging nematodes of the Meloidogyne type found in the root system of vegetable crops (Solanum lycopersicum — tomato, Cucumis sativus — cucumber). Experiments were carried out in greenhouse and field conditions, and various concentrations of the drug (0.1 %, 0.2% and 0.3 %) were applied. The results were evaluated in comparison with the control (the drug was not used) option.

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According to the results of the experiment, the use of the drug "Oxidat" led to a significant reduction in the number of Meloidogyne nematodes. The highest efficacy was observed at a concentration of 0.3%, with a reduction in nematode population of 78–85%. At a concentration of 0.2%, this figure was 65–70%, and at 0.1%, it was around 50%. At the same time, the health of the roots, growth rate, and yield of plants treated with Oxidat were significantly higher than the control variant.

In tomato crops, the use of "Oxidat" increased plant height by an average of 12–15%, and in cucumber by 10–13%. And the yield factor increased by 18-22% and 15-20%, respectively. Also, the phytotoxic effect of the drug was not detected, there were no negative changes in the leaves and root system of the plant.

The results obtained show that the drug "Oxidat" is effective not only as a biologically active substance against nematodes, but also as a plant growth stimulant. The active components in the preparation maintain the balance of soil microflora, strengthen the plant's immune system, and improve the functioning of the root system.

Comparison of the results with literature data showed that the use of biological products against nematodes is an environmentally safe, sustainable and economically viable approach. Therefore, the drug "Oksidat" can be recommended as an important element of a comprehensive system of combating Meloidogyne nematodes in vegetable crops.

Studies have shown the high effectiveness of the biological preparation "Oxidat" against root-knot nematodes of the genus Meloidogyne, which are found in the root system of vegetable crops. When the drug was used at a concentration of 0.3%, a reduction in the number of nematodes by 78–85% was observed compared to the control. At the same time, the growth rate and yield of plants increased by 18–25%.

The drug "Oxidat" not only limits the development of nematodes, reducing their population, but also increases the physiological activity of plants, stimulates the development of the root system, and improves the quality of the crop. During the experiments, no phytotoxic effects of the drug were detected, which allows it to be used as an environmentally safe agent.

Based on the results obtained, it can be concluded that the drug "Oksidat" is recommended for use as an effective tool in the biological control system against Meloidogyne nematodes found in vegetable crops. It is an alternative to traditional chemical nematisides and has great practical value as an environmentally friendly, sustainable and economically beneficial protective measure.

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