

Efficiency of Application of the Method of Solarization in Combating Gall Nematodes of Pomegranate Agroecosystem

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Abstract: *The article discusses the effectiveness of the method of solarization with the parasitic phytonematodes of pomegranate agroecosystems in the Surkhandarya region of Uzbekistan. The research results showed the effectiveness of the method of solarization is 99.5-99.6%.*

Keywords: Phytonematodes, pomegranate, pomegranate agroecosystems, root system, basal soil, solarization, gall nematodes

1. Introduction

Since the beginning of this century, in phytohelminthological science, great attention has been paid to the development of environmentally friendly and economically beneficial methods for combating phytoparasitic nematodes of agricultural crops. Solarization, unlike chemical, is almost harmless to humans, animals, plants and the environment [2,3]. This method was first developed and improved in 1978 in the former Soviet Union Sh.Kh.Khurramov. In many Central Asian and Transcaucasian republics, during the hot season, it was used and proved to be very effective and completely safe for the environment.

Solarization is the solar warming of the soil by covering it with plastic wrap and without film. In foreign countries, this method was used during the summer season, and it turned out to be the most effective in disinfecting the soil from various pathogens and pests of agroecosystem.

2. Material and Research Methods

Experiments to study the role of solarization were carried out in 2016 under field conditions on the shamkat farm "ZAMIN NAMUNA TERMIZ" in Termez district. The area of each option is 30 m². Control served as a plot of the same area.

Experience scheme

- 1) Solarization - 10 days
- 2) Solarization - 20 days
- 3) Control - plowed soil

Infection in each site by invasive larvae of gall nematodes was 1500-1700 l / 100 cm³ of soil. To do this, 6 soil samples of 100 cm³ in volume were taken from each plot at a depth of 25 cm. After mixing, a sample of 20 cm³ was taken from each sample and analyzed. Next, the number of larvae was meloydogin.

Each experimental area was plowed two times to a depth of 30-35 cm. The first plowing was carried out on June 25, and the second on July 10. After 15 days after plowing at a depth

of 40-50 cm, soil samples were taken, with a volume of 100 cm³. The number of larvae was counted. The data obtained are statistically processed using the analysis [1].

3. Results and Discussion of Research

In order to study the effectiveness of solarization in the fight against phytoparasitic nematodes (*Meloidogyne incognita*, *M. javanica*, *Pratylenchus pratensis*, *Ditylenchus dipsaci*, *Helicotylenchus erythrinae*, *H. dihystra*) in 2016 we carried out experiments in a natural environment with a natural scale, using a normal skin on the shamkat farm "ZAMIN NAMUNA TERMIZ" of Termez district of Surkhandarya region of Uzbekistan.

On pomegranate agroecosystems of the region, 17 phytoparasitic species are recorded, including two gall nematodes. This area is one of the hottest places in the republic. In the summer period (June-August), the air temperature in the shade reaches 50-55°C, and in the sun it reaches 65-75°C.

For the implementation of the task, this region is very successful.

The total effect of solarization depends on the ambient temperature, and not the duration of the solarization. Indicators of high temperatures are achieved in a very short period of time, due to the use of thick colorless and black films with greater radiation permeability than thin ones.

The effectiveness of solarization was studied in comparison with the area treated with the view and control.

The daily temperature was calculated as the average for 15 days. It should be noted that the increase in temperature during solarization, compared with the control, varied within 6-15°C at three depths of the soil. Soil temperature decreases with depth.

The maximum temperature in both areas (solarization and control) at a depth of 10 cm, respectively, was 56-45°, at a depth of 20 cm-47 and 39°C, at a depth of 30 cm-35 and 29°C.

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The number of invasive larvae of gall nematodes in the soil before and after treatments is presented in Table 1.

Table 1: The effect of soil solarization through plastic film on the number of larvae of *Meloidogyne* sp. (2016 experience)

Options	Date of soil sampling						Efficiency, ** %
	10.06	20.07	20.08	20.09	20.10	20.11	
Vidat	1850*	478	205	52	11	8	99,5
Solarization (black film)	1770*	390	178	48	13	6	99,6
Control (without processing)	1930*	1910	1950	1990	2070	2290	-

* - the initial number of larvae of gall nematodes

** - the efficiency is calculated according to the number of larvae in the soil.

The results of analyzes of soil samples taken on October 20 showed that the larvae of gall nematodes at the site with solarization were found in single specimens. Gall nematodes *Meloidogyne* spp. marked at the end of the experience. In the control plot, the number of larvae of gall nematodes was greater than at the beginning of the experiments (Table 1).

From the data of table 1 it can be seen that galls were not found on the roots of plant seedlings dug from the site treated with the species, the roots had a completely healthy appearance. On the root system of pomegranate seedlings from the site subjected to solarization in late October, isolated small galls appeared. In November, their number did not exceed two per plant. The plants had a healthy appearance and did not differ from the plants from the plot treated with the species.

Solarization has provided soil disinfection from gall nematodes and obtaining healthy pomegranate seedlings of the susceptible variety Cossacks anor, a plant that had good growth and development compared to control. The effectiveness of the method of solarization of the soil using a black plastic film is shown in Table No. 1.

While the pomegranate seedlings of the control plot were noticeably lagging behind in growth and development, their roots were covered with galls and had a dark brown shade.

Significant differences in the development of pomegranate plants in the experimental plots and in control began to be observed from September 25. On the plot treated by the vidat, the plants were completely healthy and developed well until the end of their growing season. At the site where solarization was carried out, the development of the plants was good until the end of October, and since November there was some lag in growth.

According to the results of the experiment, it was established that the infection with gall nematodes of pomegranate seedlings (Cossacks Anor variety) decreased to economically insignificant sizes, the height of plant seedlings reached 1.2 meters compared to the control (0.65-0.74 cm length).

To compare the results of the fight against gall nematodes using the method of solarization in the conditions of film

coatings and on non-film open areas, we additionally conducted a field experiment on a 0.2 ha site. The area is not irrigated. On July 25, the first deep plowing was performed with a turn of the reservoir, and on August 15 and 25 (the second and third) - to a depth of 30 cm. The average air temperature during the experiment was + 50°C. The second half of the site served as a control and did not plow.

From the data in the table it can be seen that after the first plowing, the number of larvae of gall nematodes decreased by more than 4 times, after the second - more than 12 times and after the third - isolated larvae were recorded in the soil (Table 2.).

Thus, the temperature at the experimental site where solarization was carried out at different depths of the soil was 10–18 ° C higher than in the control. An increase in temperature suppressed the number of juvenile larvae *Meloidogyne* in the soil and led to a significant decrease in their numbers, almost to the complete disinfection of the soil.

The results obtained during the treatment with vidata confirm the effectiveness of this nematicide preparation in the fight against parasitic fitonematodes, in particular of the genus *Meloidogyne*.

Table 2: The effect of solarization on the number of larvae of gall nematodes per 100 cm³ of soil (without film variant)

Options	Periods of larvae accounting meloydogin				Efficiency, ** %
	Before plowing	After the first till age	After the second till age	After the third till age	
Solarization	1780*	450	125	8	99,5
Control	1780*	1978	2185	2398	-

* - the initial number of larvae of gall nematodes

** - the efficiency is calculated according to the number of larvae in the soil.

4. Conclusions

The results of our research confirmed the possibility of using solarization in the fight against gall nematodes (*Meloidogyne* spp.).

This method is particularly promising in our country, characterized by high solar radiation and temperature. This method of struggle can be successfully combined with agrotechnical methods by additional plowing of pomegranate plantations and used as organizational and preventive measures.

It should be noted that with respect to gall nematodes, one of the most harmful types of parasitic plant nematodes, the mentioned method has proved to be effective, as well as chemical (vidat).

The data we obtained allow us to conclude that the solarization method is cheap, environmentally friendly and very promising anti-modemantic measure for its introduction into production in many dysfunctional horticultural nurseries and other farms in relation to gall nematodes in the Central Asian Republics, and in particular Uzbekistan.

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