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COMBINED APPLICATION OF LOCAL ENTOMOPATHOGENIC NEMATODES AND BACTERIAL PREPARATIONS AGAINST *HYPONOMEUTA MALINELLUS* AND *ANTHONOMUS POMORUM*

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Abstract. Results of studies of entomopathogenic nematodes (*Steinernema disparica*, *S. gurgistana*) and bacterial preparations (*Bacillus thuringiensis*, *Gomelin*) against *Hyponomeuta malinellus* (Lepidoptera: Hyponomeutidae) and *Anthonomus pomorum* (Coleoptera: Curculionidae) are discussed in this work. Both laboratory and field experiments determined that the effectiveness of nematode suspension against pest insects considerably increases (from 25 to 30%) during their application in combination with bactpreparations.

Key words: Entomopathogenic Nematodes, *Hyponomeuta malinellus*, *Anthonomus pomorum*, *Bacillus thuringiensis*, *Gomelin*.

Introduction

Today great attention is paid to work out methods of biological control of forest and agricultural plant pests and to their application in practice. Recently in many countries of the world Entomopathogenic (EPN) nematodes (Steinernematidae, Heterorhabditidae, Mermitidae et al) are used as one of the means of biological control (Kaya, 1985; Ishibashi et al., 1991).

Effectiveness of nematodes against pest insects is high in laboratory experiments, but in field conditions is comparatively low (Gorgadze, 2000). High effectiveness of action of nematodes together with such entomopathogenic microorganisms as: *Bacillus thuringiensis* (Bt), *Entobacterin*, *Beauveria bassiana* et al., (Komionek, 1978; Koppehofer and Kaya, 1997; Schroer et al., 2005) is known.

Hyponomeuta malinellus (Lepidoptera: Hyponomeutidae) and *Anthonomus pomorum* (Coleoptera: Curculionidae) were used as objectives of the experiments. *H. malinellus* is monophagous and is considered as one of the most dangerous pests among garden pests. It mainly damages leaves of apple trees, also floral bract and green shoots. *A. pomorum* damages branches and buds of quince, apple and pear. It can reduce productivity from 60 to 80% (Batiashvili, 1959).

Our aim was to test EPN nematodes and bactpreparations against *H. malinellus* and *A. pomorum* in combination and separately.

Materials and methods

For lab experiments the adult insects and worms of *H. malinellus* and *A. pomorum* were collected in orchard of private sectors in Saguramo, Tsilkani and Thesami (Mtskheta region)

We used cellophane (2, 5 x 4) and umbrella to collect insects and gauze sacks for their transportation.

For the invasion of pest insects in the lab conditions, jars of 0, 5 L capacity were used. In each jar some apple leaves and certain number of insects was placed.

Steinernema gurgistana and *S. disparica* nematode suspension of equal titer (350 nem. in 1 ml water) were used separately and in combination with the bactpreparations (*Bacillus thuringiensis*, *Gomelin*) against pests placed in the jar.

Field experiments were carried out in orchards of private sectors, in the village Thesami. Nematode suspension of equal high concentration (titer-1000 nematodes in 1ml water) was used in all field experiments.

Together with nematodes, from bactpreparations only 0, 5% *B. thuringiensis* suspension was tested in experiments. Apple trees intensively inhibited with worms of the pest were chosen and were cultivated with suspension of different concentration. Hand apparatus of OBX-14 type was used for sprinkling.

Determination of nematode suspension titer and concentration of bactpreparations was carried out according to accepted methods (Veremchuk, 1986; Popov, 1963), but accounting of insect mortality was made according to Abbot formula (Abbot, 1925).

Results

Using *S. disparica* suspension separately (350 nem. in 1ml water) the mortality percentage of *H. malinellus* worms was 55, 7% on average (table 1.). By adding 0,3% *B. thuringiensis* (*Bt*) solution in the same dose of nematode suspension, the effectiveness of *H. malinellus* worms' mortality increases 86,5% on average, whereas the effectiveness of *Bt* separately on the pests mentioned above did not exceed 28,5%.

High effectiveness (80,8%) is also marked in case of using nematode *S. disparica* and *Gomelin* suspension combined (350 nem. in 1ml water +0,3% *Gomelin*), but when only 0,3% *Gomelin* was used in the test the mortality of *H. malinellus* worms was up to 32,3%.

Testing *S. gurgistana* together with the same bactpreparations (0, 3% *Bt* and 3% *Gomelin*) and with the same dose of nematodes (350 nem. in 1ml water) against *H. malinellus* the high results (88, 5%) were also obtained.

Action of marked combined preparations was found out rather effective also during their use against *A. pomorum*. Doses of preparations and sequence in the noted tests were the same as in tests carried out on *H. malinellus*. Using combined suspension (350 nem. of *S. disparica* in 1 ml water+0, 3% *Bt*) the mortality of *A. pomorum* was up to 91, 5%, and in combination with *Gomelin*– 83, 5%.

Within the period of combination of nematode *S. gurgistana* suspension with *Bt*, mortality of the *A. pomorum* was 94, 5%, and 92, 2% in combination with *Gomelin*.

As for field tests, using combined suspension (1000 nem. in 1ml water+0,5% *Bt*) in it, the high percentage of pest insects' mortality was also marked (see table 1), whereas the effectiveness of separate nematodes on pests didn't exceed 70,5% on average. In this case using 0, 5% *Bt* in combination with nematodes enhances pathogenic action of nematobacterial complex on pest insects and increases effectiveness on average 20, 5%.

Results of action of nematodes and bacterial preparations against pest insects

Table 1

Variants of the experiment	Mortality of pest in %	
	<i>H. malinellus</i>	<i>A. pomorum</i>
Lab. experiments		
<i>S. disparica</i>		
350 nem. in 1 ml water	55,7	57,3
350 nem. in 1 ml water+Bt(0,3%)	86,5	91,5
Bt (0,3%)	28,6	30,5
350 nem. in 1 ml water+Gomelin(0,3%)	80,8	83,5
Gomelin(0,3%)	32,3	25,5
<i>S. gurgistana</i>		
350 nem. in 1 ml water	59,1	60,8
350 nem. in 1 ml water+Bt(0,3%)	88,5	94,5
Bt (0,3%)	24,8	27,5
350 nem. in 1 ml water+Gomelin(0,3%)	85,5	92,2
Control (water)	2	1
Field experiments		
<i>S. disparica</i>		
1000 nem. in 1ml water	68,5	70,3
1000 nem. in 1ml water+Bt (0,5%)	85,7	89,6
Bt (0,5%)	19,3	17,7
<i>S. gurgistana</i>		
1000 nem. in 1ml water	70,9	73,6
1000 nem. in 1 ml water+Bt (0,5%)	88,5	91,4
Control (water)	0	2

Conclusion

From the results of carried out experiments we can conclude, that the effectiveness of nematode suspensions consider increases (from 25 to 30) in case of using them together in combination with bacterial preparations. Sepsis hastens in insect's body. This process causes death of the insect in short time and increases percent of mortality accordingly.

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