

# USE OF DISCRIMINATION DOSE METHOD TO INVESTIGATE THE RESISTANCE OF CEREAL APHIDS IN THE REGION OF KARNOBAT, BULGARIA

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**ABSTRACT:** *The investigation was carried out during 2006 at cereal plants and Institute of agriculture – Karnobat, Bulgaria. The resistance of cereal aphids was examined under controlled laboratory conditions. The testing was done with approved and double insecticide dose by the method of bathing. Several insecticides were applied to cereal aphids aged individuals: Actara 25 WG (Tiametoksam), Lannate 90 WP (Methomyl), Mospilan 20 SP (Acetamiprid), Pirimor 50 VG (Pirimicarb), Nurelle D (Cypermethrin+ Chlorpiriphosethyl), Vaztac 10 EK (Alphamethrin), Bi 58 (Dimethoate), Regent 800 VG (Fipronyl).*

**Key words:** Cereal aphids , Resistance, Susceptibility, Insecticides

## INTRODUCTION

In years with good climatic conditions, leaf aphids on cereal plants multiply in large numbers and cause enormous damages on crops, and reduce the production of the grain. They damage, sucking in plant sap and as a result whitish spots appear and later whiter. That causes stress on plants and disturbs their normal growth. In dry years whole plants die. During their eating some kinds of aphids inject toxins in cereal plants and spread virus diseases also (Bakardjieva, N., Stoev, A., 2006, Gospodinov, G., Mitov, N., 1971, Grigorov, S., 1980, Kovachevski, I., Markov, M., Yankulova, M., Trifonov, D., Stoyanov, D., Kacharmazov, V., 1999, Krasteva, H., Lubomirova, A., 2003). The most spread and the most economically important virus disease on cereal plants in the world is *Barley Yellow Dwarf Virus* (BYDV) (Kovachevski, I., Markov, M., Yankulova, M., Trifonov, D., Stoyanov, D., Kacharmazov, V., 1999). It spreads persistently with different kinds of leaf aphids. In Bulgaria on cereal crops are spread mostly leaf aphids from kinds *Rhopalosiphum padi*, *Rhopalosiphum maidis*, *Schizaphis graminum* and *Sitobion avenae*. They harm to wheat, barley, oats, rye and other cultural and wide wheat grass (Kovachevski, I., Markov, M., Yankulova, M., Trifonov, D., Stoyanov, D., Kacharmazov, V., 1999, Krasteva, H., Lubomirova, A., 2003).

To prevent losses coming from multiplication in large numbers of leaf aphids is necessary to begin a chemical war with them. Because this measure on the cereal plants is expensive an effective preparation which leaf aphids are not resistant has to be chosen.

**The purpose** of the study is to find the reaction of the population of the aphids on cereal plants in the area of the town of Karnobat to 8 different insecticides.

## MATERIALS AND METHODS

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The study has been carried out in controlled laboratory conditions in the Institute of agriculture – Karnobat in 2006. Wingless female aphids have been collected from the cereal plants in the area of the town of Karnobat and have been transferred on cereal plants put in glass cylinders and covered on top with cheesecloth in the laboratory of entomology in the Institute. 8 insecticides from different groups have been tested with the dipping method (Rashev, S., 2006) on the wingless aphids of the fourth the most spread kinds of leaf aphids on the cereal plants in the area of Karnobat - *Rhopalosiphum padi*, *Rhopalosiphum maidis*, *Schizaphis graminum* and *Sitobion avenae*. The preparations - Actara 25 WG (Tiametoksam), Lannate 90 WP (Methomyl), Mospilan 20 SP (Acetamiprid), Pirimore 50 VG (Pirimicarb), Nurelle D (Cypermethrin+ Chlorpiriphosethyl), Vaztac 10 EK (Alphamethrin), Bi 58 (Dimethoate), Regent 800 VG (Fipronyl) have been used. Each preparation has been used in two concentrations – approved and doubled. The biotest included 4 repetitions on 25 adult wingless females from every kind and for every concentration.

The cereal plants have been dipped in solutions from both concentrations for the period of 10 second, after that they have been left to dry on filter paper for 2 hours. The aphids have been put on mill screen and have been dipped in the same solutions for 5 seconds after that they have been transferred on the treated cereal plants on Petri dish covered with cheesecloth. Death-rate has been reported after 24 hours. The effectiveness of the insecticides have been calculated with the formula of Henderson – Tiltan (Harizanov, A., Harizanova, V., 1998).

The given population has been accepted as resistant when doubled at the beginning recommended dose caused death – rate less than 95 %.

## RESULTS AND DISCUSSION

Table1. Resistance of *Rhopalosiphum maydis* to insecticides

Insecticides	Actively matter	Dose: Approved, Doubled	Advance density	24h After treatment	
				Density	Efficiency
Actara 25 WG	Tiametoksam	80 g/ha	20	0	100
		160 g/ha	20	0	100
Lannate 90 WP	Methomyl	0.03 %	20	1	95
		0.06 %	20	0	100
Mospilan 20SP	Acetamiprid	0,0125 %	20	2	90
		0,0250 %	20	0.5	97.5
Pirimore50 VG	Pirimicarb	0.1 %	20	4	80
		0.2 %	20	1	95
Nurelle D	Cypermethrin+ Chlorpiriphosethyl	0.05 %	20	0	100
		0.1 %	20	0	100
Vaztac 10 EK	Alphamethrin	0.02 %	20	1.5	92.5
		0.04 %	20	0	100
Bi 58	Dimethoate	0.05%	20	0	100
		0.1 %	20	0	100
Regent 800 VG	Fipronyl	0.0035 %	20	0.5	97.5
		0.007 %	20	0	100
Check			20	20	-

Table2. Resistance of *Schizaphis graminum* to insecticides

Insecticides	Actively matter	Dose: Approved, Doubled	Advance density	24h After treatment	
				Density	Efficiency
Actara 25 WG	Tiametoksam	80 g/ha	20	0	100
		160 g/ha	20	0	100
Lannate90WP	Methomyl	0.03 %	20	0	100
		0.06 %	20	0	100
Mospilan20SP	Acetamiprid	0,0125 %	20	1.5	92.5
		0,0250 %	20	0	100
Pirimore50VG	Pirimicarb	0.1 %	20	1	95
		0.2 %	20	0	100
Nurelle D	Cypermethrin+ Chlorpiriphosethyl	0.05 %	20	0	100
		0.1 %	20	0	100
Vaztac 10 EK	Alphamethrin	0.02 %	20	1	95
		0.04 %	20	0	100
Bi 58	Dimethoate	0.05 %	20	0	100
		0.1 %	20	0	100
Regent800VG	Fipronyl	0.0035 %	20	0	100
		0.007 %	20	0	100
Check			20	20	-

Table3. Resistance of *Sitobion avenae* to insecticides

Insecticides	Actively matter	Dose: Approved, Doubled	Advance density	24h After treatment	
				Density	Efficiency
Actara 25 WG	Tiametoksam	80 g/ha	20	0	100
		160 g/ha	20	0	100
Lannate 90 WP	Methomyl	0.03 %	20	0	100
		0.06 %	20	0	100
Mospilan20SP	Acetamiprid	0,0125 %	20	1	95
		0,0250 %	20	0	100
Pirimore50VG	Pirimicarb	0.1 %	20	4	80
		0.2 %	20	1	95
Nurelle D	Cypermethrin+ Chlorpiriphosethyl	0.05 %	20	0	100
		0.1 %	20	0	100
Vaztac 10 EK	Alphamethrin	0.02 %	20	1	95
		0.04 %	20	0	100
Bi 58	Dimethoate	0.05 %	20	0	100
		0.1 %	20	0	100
Regent 800 VG	Fipronyl	0.0035 %	20	1	95
		0.007 %	20	0	100
Check			20	20	-

Table4. Resistance of *Rhopalosiphum padi* to insecticides

Insecticides	Actively matter	Dose: Approved, Doubled	Advance density	24h After treatment	
				Density	Efficiency
Actara 25 WG	Tiametoksam	80 g/ha	20	0	100
		160 g/ha	20	0	100
Lannate90WP	Methomyl	0.03 %	20	2	90
		0.06 %	20	0	100
Mospilan20SP	Acetamiprid	0.0125 %	20	4	80
		0.0250 %	20	1.5	92.5
Pirimore50VG	Pirimicarb	0.1 %	20	1.5	92.5
		0.2 %	20	1	95
Nurelle D	Cypermethrin+ Chlorpiriphosethyl	0.05 %	20	0	100
		0.1 %	20	0	100
Vaztac 10 EK	Alphamethrin	0.02 %	20	2	90
		0.04 %	20	0	100
Bi 58	Dimethoate	0.05 %	20	0	100
		0.1%	20	0	100
Regent800VG	Fipronyl	0.0035 %	20	0	100
		0.007 %	20	0	100
Check			20	20	-

From the **table 1, 2** and **3** is seen that the leaf aphids - *Rhopalosiphum maidis*, *Schizaphis graminum* and *Sitobion avenae* are sensitive to all tested insecticides. *Rhopalosiphum padi* shows very low stability to Mospilan 20 SP – **table 4**. Most likely the sensibility of aphids is due to minimum use of the insecticides in the area. Except for the insecticide - Mospilan 20 SP, towards which *Rhopalosiphum padi* shows very low stability, additional prerequisite for which is the presence of wax coating on body of the aphids.

### CONCLUSION

In the area of the town of Karnobat aphids *Rhopalosiphum maidis*, *Schizaphis graminum* and *Sitobion avenae* have high sensibility to insecticides: Actara 25 WG (Tiametoksam), Lannate 90 WP (Methomyl), Mospilan 20 SP (Acetamiprid), Pirimore 50 VG (Pirimicarb), Nurelle D (Cypermethrin+ Chlorpiriphosethyl), Vaztac 10 EK (Alphamethrin), Bi 58 (Dimethoate), Regent 800 VG (Fipronyl). The population of *Rhopalosiphum padi* shows very low stability to Mospilan 20 SP.

When endangered of highly attack by leaf aphids, with a purpose to prevent losses of yields of cereal plants, against all kinds insecticides Actara 25 WG (Tiametoksam), Lannate 90 WP (Methomyl), Pirimore 50 VG (Pirimicarb), Nurelle D (Cypermethrin+ Chlorpiriphosethyl), Vaztac 10 EK (Alphamethrin), Bi 58 (Dimethoate), Regent 800 VG (Fipronyl) could be used in the approved concentrations.

In dominant populations of the kinds *Rhopalosiphum maidis*, *Schizaphis graminum* and *Sitobion avenae* could be used Mospilan 20 SP (Acetamiprid) too in approved concentration to fight against them.

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