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FIELD TESTING OF BIOLOGICALLY ACTIVE SUBSTANCES ON THE ENTOMOPHAGOUS *TRICHOGRAMMA EVANESCENS* WESTW

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INTRODUCTION

Ensuring an appropriate quality of the environment and its protection, as a necessity for survival and progress, is a major issue of social evolution. The main objectives are the adoption of solutions to reduce pollution and increase the overall quality of the environment (Istrate Ana-Maria, Gontariu I., 2020, Gontariu, I., 2018).

In the context of modern concepts of integrated plant protection, biotechnical methods of pest control, such as kairomones, are substances with attractant action that stimulate organisms to find sources of food. The concept of integrated control represents a way of regulating and controlling pests based on technological, ecological, and economic elements.

Kairomones improve their capacity for their role in shaping reproductive behavior, but further studies have discovered other extremely interesting aspects. These substances, released by one sex (often the female) in very small quantities, transmit an extremely important informational message for survival and perpetuation of the species, and can be used for the destruction of other species. Kairomones are messenger substances for the transfer of information between different species, which benefits the receiving organism.

Kairomones enhance the recipient's capacity and, in this sense, differ from an alomon (which is opposite: beneficial to the producer and harmful to the recipient). Initially, research aimed to study sexual pheromones (especially) from a fundamental perspective for their role in shaping reproductive behavior, but further studies have discovered other extremely interesting aspects. These substances, released by one sex (often the female) in very small quantities, transmit an extremely important informational message for survival and perpetuation of the species, and can be used for the destruction of other species.

The role of kairomones in the biological control of pests in agricultural crops has been described by authors (Ramasamy Kanagaraj, Murali-Baskaran, Kailash Chander Sharma). The impact of plant phenolics as semiochemicals on the performance of *Trichogramma chilonis* Ishii has been described by authors (Pathipati Usha Rani, Pratyusha Sambangi, Kurra Sandhyarani).

Authors (Fatouros Nina, Marcel Dicke, Roland Mumm, 2008) conducted research using kairomones.

To compensate for the limited flight capacity and to gain access to freshly deposited host eggs of egg parasitoids, several strategies have been developed such as the use of kairomones. The kairomonal effect of certain saturated hydrocarbons on egg parasitoids, *Trichogramma brasiliensis* (Ashmead) and *T. exiguum, T. pintoi,* was studied by (Paul A., Singh S., Singh A.K., Pathipati, 2017).

Annual crop losses due to pests range from 15-80%. The use of the entomophagous *Trichogramma* spp. in plant protection is linked to its quality for mass rearing and field application. The research goal for 2022 is to estimate the effect of biologically active substances with kairomonal properties on the behavior of the entomophagous *Trichogramma evanescens* Westw.

MATERIALS AND METHODS

Field research was conducted on soybean crops at the Institute of Genetics, Physiology, and Plant Protection in Chisinau, Moldova, with the aim of testing the effectiveness of *Trichogramma* evanescens Westw. in the presence of kairomones.

Alcohol extract and eggs of the Angoumois grain moth (*Sitotroga cerealella* Ol) were used as the source of kairomones (SBA). The action of the fractions extracted from moth scales on the searching capacity of *T. evanescens* W, which is an active component for enhancing the quality of the entomophage and reducing the density of harmful insects, was evaluated. In the 2022 experiments, the kairomone with optimal properties obtained in 2020 using the "Optimclas" program and following Box 3 Plan was used.

The formula for determining the amount of water required to dilute the alcohol to the necessary strength is as follows: $X = P * (N/M-1)$. X is the amount of water needed to dilute the ethyl alcohol to the necessary strength; P is the amount of ethyl alcohol for dilution in each variant; N is 96% - the initial strength of ethyl alcohol; M is 30% - the required strength of ethyl alcohol.

RESULTS AND DISCUSSIONS

Field research was conducted to test *Trichogramma* evanescens Westw. on soybean crops in the presence of Biologically Active Substances (BAS) using 4m2 plots, with each variant being tested in 3 replicates.

Variant I. Four plants in each corner of the plots were treated with a 30% concentration of *Sitotroga cerealella* Ol. kairomones extract for 5 minutes. The search capacity of *T. evanescens* was determined as a result of the influence of (biologically active substances) with kairomonal properties of *Sitotroga cerealella* Ol. at the egg stage. After the treated plants dried labels with 24-hour-old *Sitotroga cerealella* Ol. eggs were fixed on them, and three releases of *T. evanescens* were made in the middle of the plots on June 14, June 22, and June 28, 2022.

The parasitization period in the field lasted three days, after which the labels were collected, placed in a thermostat for development, and the number of parasitized moth eggs that were exposed was recorded after six days. The results are presented in Table 1.

Variant II. Four plants in the middle of the plots were treated with a 30% concentration of *Sitotroga cerealella* Ol. kairomones extract for 5 minutes, and *T. evanescens* was released in the corners of the plots. Labels with 24-hour-old *Sitotroga cerealella* Ol. eggs were fixed on the treated plants, and three releases of *T. evanescens* were made after treating the plants and fixing fresh moth eggs before each release.

In Control I, the plants in the plots were not treated with kairomones, but *T. evanescens* was released in the center of the plots. In Control II, the plants in the plots were not treated with kairomones, but labels with moth eggs were fixed in the corners of the plots to be parasitized.

In the first variant after three releases (14.06, 22.06, 28.06.22), where *T. evanescens* was released in the center of the plots, eggs of the cereal moth were fixed in the corners, with four plants treated with pheromone in each corner, the percentage of parasitism of the exposed eggs of the cereal moth in the field varied from 18.43-31.0.

In the second variant after three releases (14.06, 22.06, 28.06.22), *T. evanescens* was released in the corners of the plots, and eggs of the cereal moth were fixed in the center on plants previously treated with pheromone, the percentage of parasitism of the eggs of the cereal moth varied from 11.65-27.50.

In the control, plants in the plots were not treated with pheromone, but *T. evanescens* was released in the center of the plot (C1), where cards with moth eggs were fixed. The percentage of parasitism of the eggs of the cereal moth varied from 6.10-14.50 in the corners of the plots (C2), and the percentage of parasitism of the eggs of the cereal moth varied from 7.10-11.10.

The experimental field in the soybean crop, where *T. evanescens* was applied in the presence of koiromones, is presented in Fig. 1, 2, 3, 4.

Table 1. The parasitization percentage (search capacity) of *T. evanescens* in the presence of kairomones in soybean fields, Chisinau, 2022

The options are:	**Data**	**Number of parasitized eggs**	**Parasitism percentage**
	First launch 14.06.22		
Variant I	14.06.22	2416	20.13±3.2
Variant II	14.06.22	2278	19.0±3.1
Control I-var.	14.06.22	1254	10.45±3.0
Control II-var.	14.06.22	1216	10.13±2.8
	Second launch 22.06.22		
Variant I	22.06.22	3716	31.0±3.5
Variant II	22.06.22	2553	21.27±3.2
Control I-var.	22.06.22	1741	14.50±2.1
Control II-var.	22.06.22	1332	11.10±2.0
	Third launch 28.06. 22		
Variant I	28.06. 22	2212	18.43±2.4
Variant II	28.06. 22	1398	11.65±2.1
Control I-var.	28.06. 22	750	6.25±1.8
Control II-var.	28.06. 22	853	7.10±1.9
DEM	(Td=1,9-4,3>1.96=To.o5)		

Figure 1. The experimental field in soybean crop, where *Trichogramma evanescens* was applied in capsules in the presence of kairomones, 2022

Figure 2. Experimental field in soybean culture, where *Trichogramma evanescens* was applied in capsules in the center of the plot, 2022

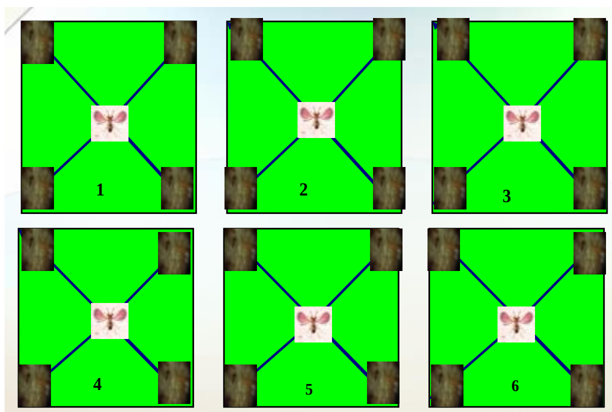

Figure 3. Plan of the experimental field with release of *Trichogramma evanescens* in the presence of Biologically Active Substances with kairomonal properties. 1.2.3. – Fields with releases of *Trichogramma evanescens* (in the middle) in the presence of Biologically Active Substances with kairomonal properties 4.5.6. – Fields with releases with *Trichogramma evanescens* in the absence of Biologically Active Substances (Witness)

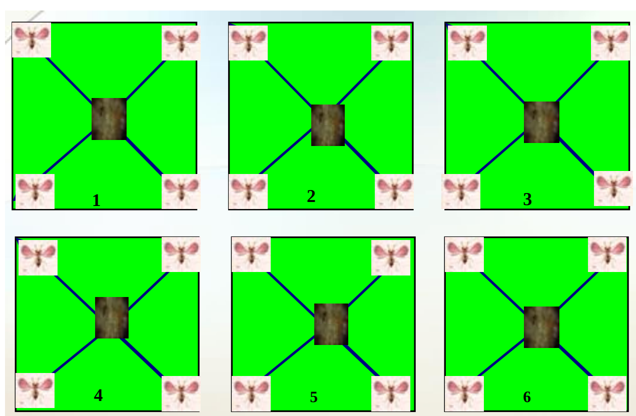

Figure 4. Plan of the experimental field with releases of *Trichogramma evanescens* in the presence of kairomones 1.2.3. – Field with releases of *Trichogramma evanescens* (in the corners) in the presence of Biologically Active Substances with kairomonal properties. 4.5.6. – The fields with releases with *Trichogramma evanescens* in the absence of Biologically Active Substances with kairomonal properties (Control)

CONCLUSIONS

Testing in field conditions of the Active Biological Substances for marking the ethology of the entomophage *Trichogramma evanescens* Westw. was carried out in 2 variants:

In the first variant, where *T. evanescens* was launched in the center of the plot, 4 plants were treated with the extract of cereal moth kairomones (optimal variant) with a concentration of 30%, exposure time of 5 minutes, and the percentage of parasitization of cereal moth eggs exposed in the field varied from 18.43-31.0.

In the second variant, where *T. evanescens* was launched in the corners of the plots, 4 plants in the middle of the plots were treated with the extract of cereal moth kairomones, and the percentage of parasitization of cereal moth eggs varied from 11.65-27.50.

In the control group, the plants in the plots were not treated with kairomones, but *T. evanescens* was launched in the center of the plot (M1), where cardboard cards with moth eggs were fixed, and the percentage of parasitization of cereal moth eggs in the corners of the plots (M2) varied from 6.10-14.50, while the percentage of parasitization of cereal moth eggs varied from 7.10-11.10.

ABSTRACT

Field testing of Biologically Active Substances on the behavior of the entomophagous *Trichogramma evanescens* Westw. was conducted in two variants: In the first variant, where *T. evanescens* was released in the center of the plot, four plants were treated with a 30% concentration of kairomones extract of the cereal moth (optimal variant) for 5 minutes in the corners of the plot, and the percentage of cereal moth eggs parasitized varied from 18.43 to 31.0. In the second variant, where *T. evanescens* was released in the corners of the plot, four plants were treated with the kairomones extract of the cereal moth in the middle of the plot, and the percentage of cereal moth eggs parasitized varied from 11.65 to 27.50. In the control plot, plants were not treated with kairomones, but *T. evanescens* was released in the center of the plot (C1), where cards with moth eggs were fixed. The percentage of cereal moth eggs parasitized varied from 6.10 to 14.50 in the corners of the plot (C2), and the percentage of cereal moth eggs parasitized varied from 7.10 to 11.10.

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