Studii şi Cercetări	Mai 2020	Biologie	29/2	13-16	Universitatea"Vasile Alecsandri" din Bacău

PRODUCTION OF THE LABORATORY HOST CEREAL MOTH (*SITOTROGA CEREALELLA* OL.) ON DIFFERENT CEREAL SUBSTRATES FOR THE *TRICHOGRAMMA* ENTOMOPHAGUS' REARING

Lidia Gavrilita

Key words*: T. evanescens, T. pintoi, substrates, barley, wheat, maize, triticale, S. cerealella.*

INTRODUCTION

Particular interests in plant protection present the biological methods with the *Trichogramma* entomophage, which parasitizes various species of pests and is widely used in integrated plant protection. According to the data of the author Lenteren, (2000), this entomophage is launched annually, in the world, on a total area of 45 million hectares of agricultural crops for pests' control. According to the information of author Knutson (2001), *Trichogramma* is the most used entomophage in the world, being launched annually in agricultural crops and forests in 30 countries.

The "Biotop" company in Europe, produces and sells the *Trichogramma* entomophage, used to combat lepidopteron pests. *Trichogramma* is produced for the use of farmers in biological protection in the control of *Ostrinia nubilalis* at corn and *Tuta absoluta* at tomatoes and is used annually on an area of over 100.000 ha in France, Germany, Switzerland and the Czech Republic, (Frandon, 2012).

Among the biotic factors, an important role in enhancing the quality *Trichogramma* is the choice of the host to be used for production. The parasites hatched from the eggs of the moth complex–cabbage white, are more prolific and have a longer lifespan than from eggs of cereal moth (*Sitotroga cerealella Ol.*). The size of the host eggs has a particular influence on the formation of the correlation between females and males in Ihneumonids (*Ichneumonidae*). As insects accumulate energy resources in the larval stage, the choice of laboratory host (*S. cerealella*) is an essential moment in *Trichogramma* production.

Continuous rearing of *Trichogramma* on eggs of cereal moth, a reduction of the entomophage in its size, the same as the reduction of Prolificacy and the search capacity for females is observed. In order to increase the vitality of the laboratory populations, it is recommended to renew annually the maternal culture by collecting the Lepidoptera nags parasitized by *Trichogramma* in nature. However, the *S. cerealella* laboratory host is widely used in the production of entomophage, because it is easily reared on substrates of different cereals and is less expensive than other hosts.

The purpose of the research was: to determine the optimal cereal substrate for the production of the laboratory host *S. cerealella*, consecutively used for the entomophage *Trichogramma* production.

In order to reach the purpose, the percentage of substrate infestation has been determined including, the biological indices of *T. pintoi* and *T. evanescens* raised on eggs of cereal moth from different cereal substrates.

MATERIALS AND METHODS

During the period 2010-2011, a series of experiments were set for the production of cereal moth eggs (S. cerealella) on different substrates such as: barley, wheat, corn and triticale.

The barley, wheat, maize and tritical substrates of 5 kg (5 reps) were sterilized in autoclave at 95-97°C to destroy cereal pests–*Habracytus cerealella* Ashm, *Pediculaides ventricosus* etc. Substrates in each variant after sterilization were dried then infested with cereal moth (*Sitotroga cerealella*) at a ratio of 1 kg cereals /1 gram of moth eggs, then all the steps in the technology of obtaining moth eggs of cereals described by the authors Абашкин, Воротынцева, Гринберг/ Abashkin, Vorotyntseva, Greenberg (1979) were followed.

The experiments were applied in four variants, each variant per substrate, in five repetitions. In the first variant, barley grains were used as substrate, in the second variant wheat grains were used, in the third variant–maize beans, in the fourth variant–triticale beans respectively. In the control variant, the substrates were not treated thermally.

Then the cereal substrates were poured separately into containers. During the development of the moth on substrates, the climatic conditions of development were maintained and controlled: temperature 24-25°C, humidity 80-85%. Infested substrates were poured into boxes after 30-32 days of moth development. When the flight of the first butterflies began, they were collected then placed in collectors, which were kept in special containers for

egg slaying. The moth eggs obtained from each substrate were collected separately, then stuck in cylinders with the volume of one liter and set for *Trichogramma* parasitation.

RESULTS OF THE RESEARCHES

Estimating the percentage of infestation and the biological indices of *T. pintoi* and *T. evanescens* grown on eggs of cereal moth from different substrates, it was determined: the percentage of infested grains and the percentage of parasitation of *S. cerealella* by *Trichogramma* obtained from each substrate. From each substrate, 5000 grains were analyzed in each variant, to determine the percentage of infestation. To determine the percentage of parasites, 5 grams of moth eggs were used, from each substrate (5 repetitions).

Analyzing the obtained results, can be determined that in the variant with thermal processing the quantity of grains infested in the substrate of barley, wheat, maize and triticale ranged from 81.0% to 85.2%. The number of parasitized eggs by *T. evanescens* ranged from 81.0 - 83.0% and by *T. pintoi* on variants ranged from 82.5-86.4%. In the control, where the substrates were not processed, these indices varied respectively, the quantity of grains infested from 72.0 to 74.5%. The amount of parasitized eggs by *T. evanescens* ranged from 70-74.0%, of *T. pintoi* ranged from 71.8 to 75.2%.

Comparing the infestation values between variants–substrates (barley, wheat, maize, triticale) thermally processed and non-processed ($t_{d=1.90-2.60>.0.05=1.96}$) the difference is not significant in all cases.

Comparing the parasitation values of *T. evanescens* and *T. pintoi* eggs between variants (from thermally processed and un processed substrates, the difference is not significant through the cases ($t_{d=1.87-2.35>1.96=0.05}$). The mathematical processing was done according to the methodology described by the author's Менчер, Земшман, (1986).

It can be said that both the percentage of infestation and the percentage of parasitation in variants with thermal processing is higher than in the control. In the variants with thermal processing, the amount of eggs obtained on the substrates of barley, wheat, maize and triticale from 1 kg was higher (7-8 grams were collected). In the control, where the substrates were not processed thermally this index varied respectively 6.0-6.5gr. This means that from 100 kg of cereal substrate 700-800 grams and 600-650 grams of eggs respectively can be obtained on variants. The results are presented in table 1, figure 1.

The results of the biological indices of *Trichogramma spp*. grown on cereal moth eggs on the barley substrate, the most preferred, are presented in Table 2.

Biological indices of *T. evanescens* grown on moth eggs on barley substrate are as follows: for *T. evanescens*: prolificity - 21.60 eggs / female, hatching of individuals (females and males) - 80.5%, hatching of females - 53.5%, the static quality criterion - 9.30.

Biological indices of *T. pintoi* grown on moth eggs on the barley substrate are: prolificity - 22.4 eggs / female, number of individuals (male and female hatching) - 80.5%, female hatching - 54.0%, criterion static quality - 9.8.

Table 1. Percentage of infestation of different substrates with *S. cerealella* and percentage of parasitation By *T. pintoi* and *T. evanescens*, 2010

Conditions	Variants	Cereal substrate	The quantity of eggs obtained from 1kg substrate, (grams)	Percentage of infested grains	The percentage of parasitized eggs of *T. evanescens*	The percentage of parasitized eggs of *T. pintoi*
1.Thermlly treated	1	barley	8.0±0.7	852±2.6	83.0±2.3	86.4±3.1
	2	wheat	7.5±0.4	81.7±2.9	82.0±2.1	84.5±2.7
	3	corn	7.5±0.9	80.4±1.8	80.0±3.1	82.5±3.3
	4	triticale	7.0±0.5	81.0±2.5	81.0±2.6	82.5±3.5
	Average		7.5±0.6	82.0±2.8	81.5±2.2	84.0±2.9
2.Control non treated	1	barley	6.5±0.4	74.5±2.6	74.0±2.0	75.2±2.6
	2	wheat	6.0±0.3	730±2.2	72.0±2.1	73.5±2.8
	3	corn	6.5±0.2	71.0±2.0	72.0±2.8	72,2±2.4
	4	triticale	6.0±0.3	72.0±1.6	70.0±2.2	71.8±2.6
	Average		625±0.2	72.6±2.0	72.0±2.2	73.2±2.7
		$t_{d=1.86-2.35>1.96=0.05.}$				

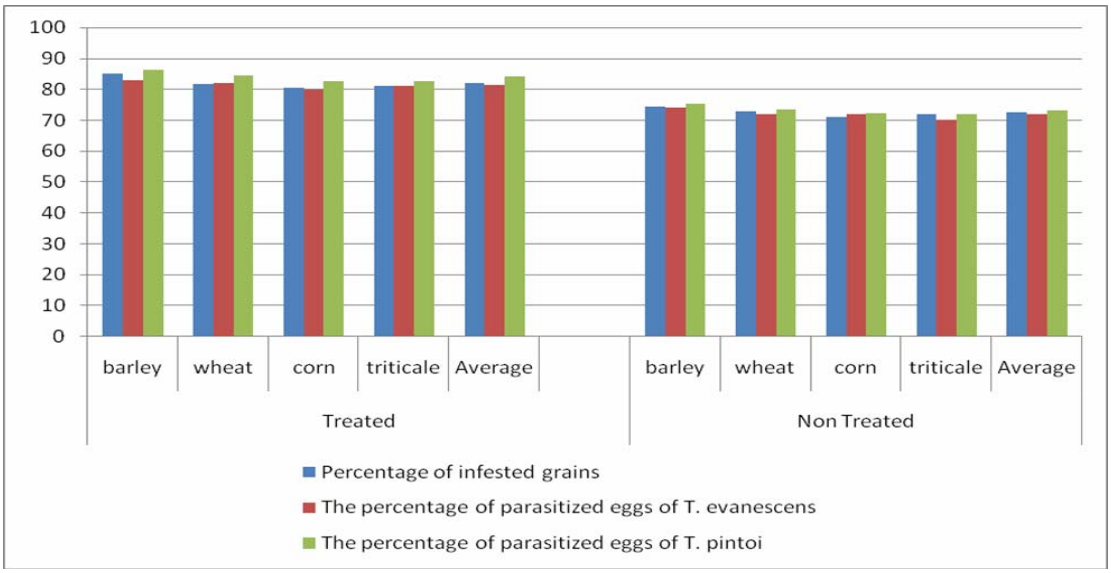

Fig. 1. The percentage of infestation of different substrates with *S. cerealella* and the percentage of parasitation of *T. pintoi* and *T. evanescens*, 2010.

Table 2. Biological indices of *Trichogramma spp.* grown on *S. cerealella* eggs obtained from barley substrate

Nr. crt.	Variants	Prolificity, eggs/female, P	The exclusion of individuals (females and males), %, a_1	The hatching of females, %,a_2	The static quality criterion, Y_1
1.	*T. evanescens* grown on *S. cerealella* eggs on barley substrate	21.60	80.5	53.5	9.3±0.7
2.	*T. pintoi* grown on *S. cerealella* eggs on barley substrate	22.4	80.5	54.0	9.8±1.0

CONCLUSIONS

1. In the variants with thermal processing, the quantity of eggs obtained on the substrates of barley, wheat, maize and triticale from 1 kg 7-8 grams were collected, in control, where the substrates were not processed this index varied respectively 6.0-6.5 grams.
2. The percentage of infestation of the substrates with *S. cerealella* and the percentage of parasitation eggs of *T. pintoi* and *T. evanescens*, in the variants with thermal processing is higher, than in the control.
3. The values of the barley infestation percentage and the parasitic percentage of *T. pintoi* and *T. evanescens* obtained on eggs of the barley substrate is slightly higher than on wheat, maize and triticale.

ABSTRACT

In the variants with thermal processing, the quantity of eggs obtained on the substrates of barley, wheat, maize and triticale from 1 kg 7-8 grams were collected, in control, where the substrates were not processed this index varied respectively 6.0-6.5 grams. The percentage of infestation of the substrates with *S. cerealella* Ol. and the percentage of parasitation eggs of *T. pintoi* Voeg. and *T. evanescens Westw.*, in the variants with thermal processing is higher, than in the control. The values of the barley infestation percentage and the parasitic percentage of *T. pintoi* and *T. evanescens* obtained on eggs of the barley substrate is slightly higher than on wheat, maize and triticale.

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AUTHOR'S ADDRESS

GAVRILITA LIDIA - Institute of Genetics, Physiology and Plant Protection, Pădurii Str., 20, Chişinău, Republic of Moldova, e-mail: lidia_gavrilita@yahoo.com.