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HOST PREFERENCE OF THE PARASITOID SPECIES *TRISSOLCUS SEMISTRIATUS* NEES (HYMENOPTERA: SCELIONIDAE) OBTAINED FROM DIFFERENT HOST EGGS

[1]Mahmut Islamoglu, [2]Serpil Kornosor

[1]Usak University, Faculty of Agriculture and Natural Sciences, Department of Plant Protection Usak Turkey

[2] Çukurova University, Faculty of Agriculture, Department of Plant Protection Balcalı Sarıçam Adana Turkey

ABSTRACT

Host preferences of the parasitoid species *Trissolcus semistriatus* Nees obtained from different eggs was studied under laboratory conditions. Eggs of *Eurygaster integriceps* (Put.), *Dolycoris baccarum* (L.), *Aelia rostrata* (Boh.) and, *Eurydema ornata* (L.) were offered to *T. semistriatus* According to the results of parasitized eggs, *E. integriceps* eggs were most preferred followed by *D. baccarum* eggs and then *A. rostrata* eggs. The least preference was detected on *E. ornatum* eggs. In stepwise multiple regression analysis, the independent variable was the parasitism rate; and the dependent variable was species *T. semistriatus*. The interaction between parasitism rate and host eggs species was significant. Significant correlation of eggs species (r = 0.538, r^2 = 2.90, n = 160, P = 0.000) was found, whereas there was insignificant correlation of *T. semistriatus* obtained from different eggs (r = 0.93, r^2 = 0.010, n = 160, P = 0.916).

Keywords: Host preference, parasitoid, *Trissolcus semistriatus,* Host eggs,

INTRODUCTION

The Sunn pest, *Eurygaster integriceps* Puton (Hemiptera: Scutelleridae), is the most harmful insect pest on wheat in Turkey. It exists in about 75% of wheat fields and its chemical control is carried out over an average of 1.2 million hectares every year. Sunn pest feeds on grains at their different stages of development. Overwintered adults of the Sunn pest attack the leaves and stems of young, succulent wheat and barley plants causing death prior to spike formation. It also feeds at the base of the spike during early growing period, resulting in greyish white spikes without kernels (called white spikes). Fourth and fifth nymph instars and new-generation adults of the Sunn pest feed on grains (Memişoğlu and Özer, 1992). Yield losses are estimated as 50–90% in

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wheat. In addition to direct yield reduction because of feeding, it excretes abundantly digestive secretions having proteolysis enzyme activations. These secretions are activated in case of suitability of temperature, moisture and a certain time. When flour is became dough by kneading with water, and suitable temperature and moisture are provided, enzymes became activated and degrade gluten proteins. Hence, dough softens and its elasticity decreases, so it is processed in hand and machine gets difficult. (Dizlek, H., 2017).

To suppress Sunn pest population to acceptable levels in Turkey, chemical control by areal application has been carried out from 1954 to 2004. This method had negative impact on human health and environment. Therefore, chemical control by ground equipment started in 2005.

The egg parasitoid, *Trissolcus semistriatus* Nees (Hymenoptera: Scelionidae), is an important natural enemy of the Sunn pest in Southern Turkey. The species of scelionid parasitoids have been used against Sunn pest in both inundative releases and classical biological control programs in Iran, Morocco and the former USSR (Laraichi and Voegele,´ 1975 and Shumakov, 1978). Mass rearing and inundative releases of the egg parasitoids attempts in Turkey started in 1990 and continued until 1997. Afterwards, new releasing studies started in 2001 and have continued up to the present (İslamoglu, 2012).

In this study, host preference of *T. semistriatus* towards different host eggs was studied under laboratory conditions. Obtained data will contribute prospectively for biological management studies of Sunn pest.

MATERIALS AND METHODS

1. Insect Hosts

E. integricep was obtained from infested wheat fields in provinces of Gaziantep, (36º 56’ N 37º 27’ E), *Dolycoris baccarum* (L.) was collected from overwintering individuals of Mountain Nemrut in Adıyaman (37º 58’ N 38º 48’ E). *Aelia rostrata* (Boh.) was obtained from overwintering individuals in province of Ereğli in Konya (37º 32’ N 34º 23’ E), and *Eurydema ornata* (L.) was collected from *Sinapsis arvensis* (L.) in district of Karaisalı in Adana (37 º 15 N; 35 º 03’ E). Adults were collected by hand picking and sweeping net and then transferred into an ice box to climatic rooms at the laboratory of Adana Plant Protection Research Institute. The pest species were placed in boxes containing different types of foods. *E. integricep*, *D. baccarum* and *A. rostrata* were fed on wheat plants; *E. ornatum* was fed on *S. arvensis*. All boxes were placed at 25±2°C, 65±10% relative humidity (RH) and a light: dark (L: D) of 14:10 hours for at least 48 hrs in the climatic rooms. Afterwards, the temperature was increased to 26±2 ºC. The boxes were

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provided daily by food. Insect eggs were collected daily and placed in an incubator at +4 ºC and then stored in jars in the fridge until they were used.

2. *Trissolcus semistriatus*

When the temperature reached around 13ºC in early spring *T. semistriatus* culture was established, by collecting the scelionid parasitoids from newly planted wheat fields or from the plants around those wheat fields at Adana Provinces, Karaisalı district of Kuzgun village (37º 08' N 35º 05' E) using a sweeping net. The parasitoid adults were transferred to the laboratory in plastic bags and then were separated as species. The parasitoids were placed in cotton-plugged glass tubes and streaked inside with a diluted honey (10% distilled water) as a food source. *T. semistriatus* was kept in an incubator at 26±1 °C, 65±10% RH and L: D 14:10 hrs. When enough numbers of *E. integriceps, A. rostrata, D. baccarum, E. ornatum* eggs were offered to parasitoid, parasitized eggs of each host species were kept seperately in an incubator at 18ºC in glass tubes.

3. Host Preference of *T. semistriatus*

Host preference of *T. semistriatus* to the eggs obtained from different host eggs, (*E. integriceps, A. rostrata, D. baccarum, E. ornatum*) was studied. Each of host eggs (25 eggs) was placed in Petri dishes in which 90 degrees between each mass egg. Before the Petri dish was closed, a female individual had placed into Petri dish. After 150 minutes on 16 hours light conditions and 26 °C temperature, parasitoids were removed from Petri dishes (Pluke ve Leibee, 2006). Eggs in Petri dishes were collected and kept at the incubator at 26 °C with humidity of 65% until hatching. Parasitized eggs were counted and recorded. Experiment was set to 10 repetitions for each host.

4. Statistical analysis

Data were tested using analysis of variance (one-way ANOVA). Statistical differences were separated by using the Tukey test (P= 0.05). The correlation among the measured variables was evaluated using Pearson correlation and multiple regression analysis to identify factors that might affect host preference.

RESULTS AND DISCUSSION

Data of parasitism rates *T. semistriatus*, which obtained from eggs of *E. integriceps*, are shown in Figure1.

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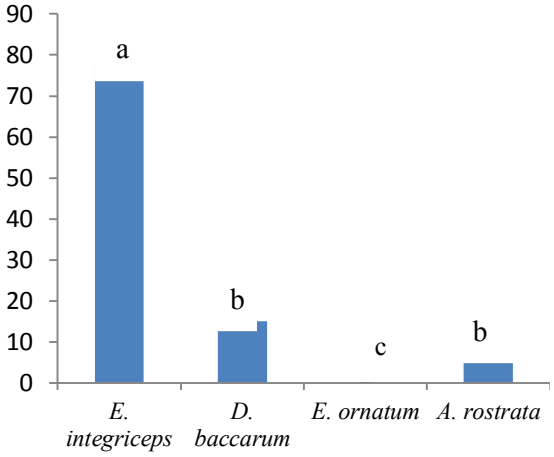

Figure 1. Host preference of *T. semistriatus* obtained from *E. integriceps* egss

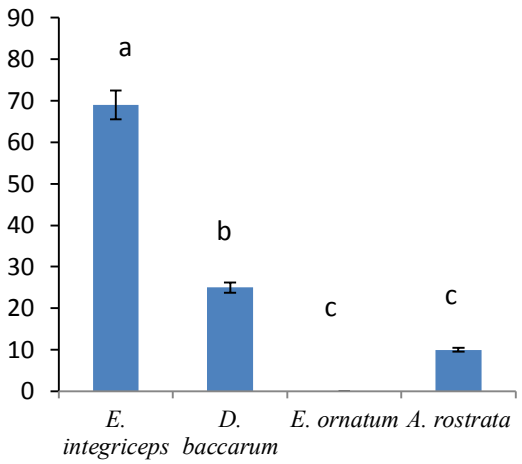

Figure 2. Host preference of *T. semistriatus* obtained from *D. baccarum* egss

The highest parasitism (78% (117 eggs)) rate was recorded on *E. integriceps* eggs. Parasitism rates of *D. baccarum* and *E. ornatum* eggs were (15% (23 eggs)) and (7% (10 eggs)), respectively, while *E. ornatum* showed no parasitism. Parasitism rates of *T. semistriatus* obtained from *E. integriceps* eggs was subjected to statistical evaluation. And this difference statistically to be significant ($F_{3,36}$=11.640 P= 0.000) was found and at the statistical grouping, while *E. integriceps* egg was located in one group other eggs was located in different group.

To determine parasitisim rate of *T. semistriatus*, which obtained from *D. baccarum* eggs, were submitted to *E. integriceps, D. baccarum, A. rostrata* and *E. ornatum* of eggs. Parasitism rate are presented at Fig. (2). *E. integriceps D. baccarum* and *A. rostrata* eggs parasitism rate was detected to be 69, 25 and 6%, respectively (Figure 2). Number of parasitized eggs was 111, 41 and 10 eggs, respectively. No parasitism was determined in *E. ornatum* eggs. At the statistical evaluation, numbers of parasitism among *E. integriceps*, *D. baccarum E. orantum* and were *A. rostrata* significantly ($F_{3,36}$= 4.524 P= 0.009).

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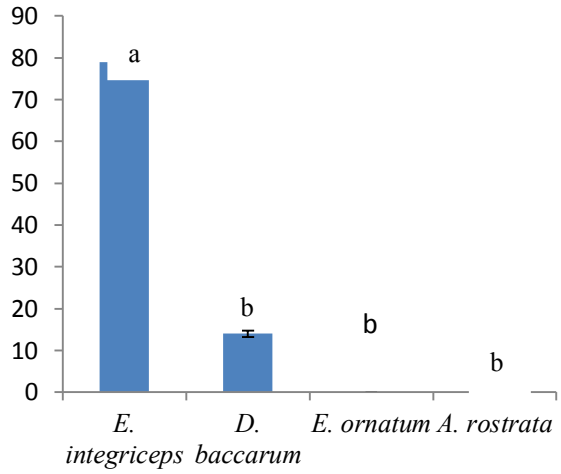

Figure 3. Host preference of *T. semistriatus* obtained from *E. ornatum* egss

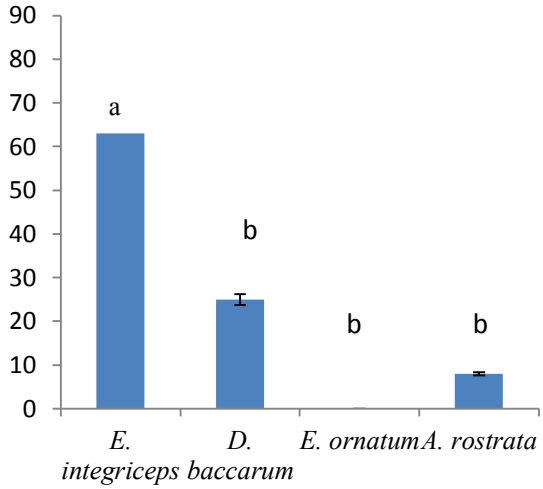

Figure 4. Host preference of *T. semistriatus* obtained from *A.rostrata* egss

E. integriceps, D. baccarum, E. ornatum and *A. rostrata* of eggs were submitted to *T. semistriatus,* which obtained from eggs of *E. ornatum*. The obtained data are shown in Figure 3., While 79% of *E. integriceps*, 25% of *D. baccarum* and 6% of *A. rostrata* eggs were parasitized by *T. semistriatus*, none of *E. ornatum* eggs was parasitized by *T. semistriatus*. At the statistical evaluation, numbers of parasitism among *E. integriceps*, *D. baccarum A. rostrata* and *E. orantum* were found different and this difference statistically to be significant was found ($F_{3,36}$=12.211 P= 0.000). At the statistical grouping *E. integriceps* egg was located in one group, *D. baccarum A. rostrata* and *E. orantum* eggs was located in different group.

E. ıntegriceps, D. baccarum, E. ornatum and *A. rostrata* eggs were offered *T. semistriatus,* obtained from eggs of *A. rostrata*. Data of parasitism rates are shown in Figure 4. When Fig. 4 were examined, while the highest parasitism of all eggs with 67% (102 eggs) was determined in *E. integriceps* eggs. Parasitisim rate of *D. baccarum* and *A. rostrata* eggs were detected 25% (37 eggs) and 8% (12 eggs) respectively. Eggs of *E. ornatum* were not determined.

In the group of *E. integriceps, D. baccarum, A. rostrata* ve *E. ornatum* parasitism rates were determined to be different. And this difference was detected statically significant ($F_{3,36}$=6.350 P= 0.001). and at the statistical grouping while *E. integriceps* egg was located in one group *D. baccarum, E. ornatum* and *A. rostrata* eggs was located in different group.

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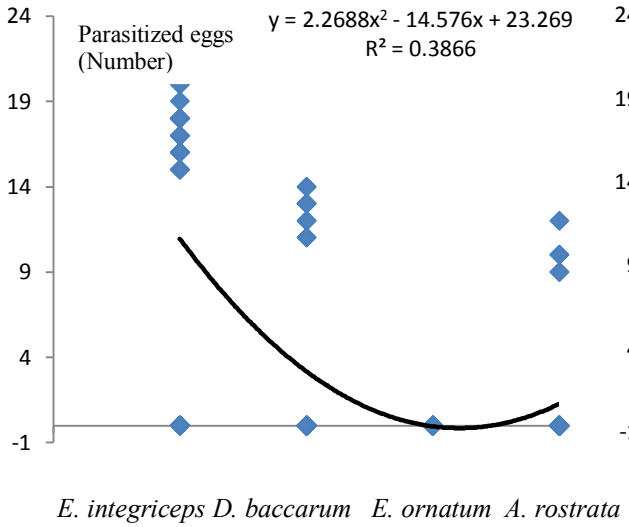

Figure 5. Host preference of *T. semistriatus*

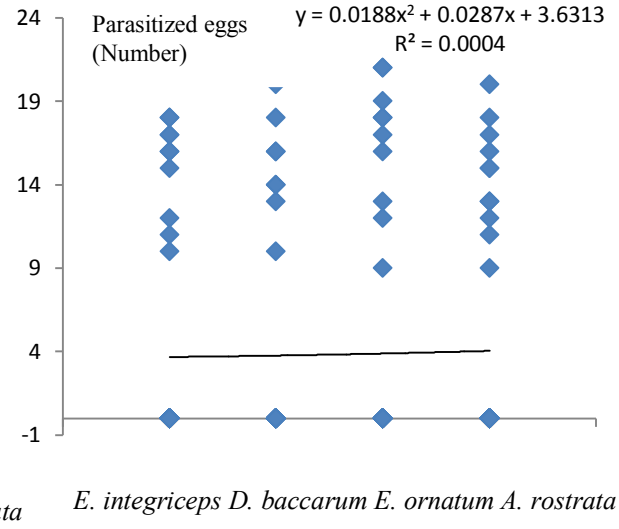

Figure 6. Parasitism rate *T. semistriatus* which obtained from eggs and eggs

In stepwise multiple regression analysis, the independent variable were the parasitism rate; and the dependent variables were *T. semistriatus* which obtained from different host eggs. The interaction between parasitism rate and eggs species was determined significant in the statistically evaluation. There were significant correlations of eggs species ($r = 0.538$, $r^2 = 2.90$, $n = 160$, $P = 0.000$) (Figure 5) whereas there was insignificant correlation of *T. semistriatus* which obtained from eggs of host eggs ($r = 0.93$, $r^2 = 0.010$, $n = 160$, $P = 0.916$) (Figure 6).

When we evaluate preference of *T. semistriatus,* obtained from different host, was determined to have no effect on parasitism. But It was determined to have a significant effect on the parasitism different types of eggs. The most parasitism rate were detected in the *E. integriceps* eggs. Parasitism rate of *D. baccarum* eggs less than parasitism rate of *E. integriceps* eggs, Similarly, parasitism rate of *A. rostrata* eggs less than parasitism rate of *E. integriceps* and *D.baccarum* eggs. But, in the experiment, the lowest parasitism rate was determined on *E. ornatum* eggs.

It has been encountered a study that preference of *T. semistriatus* which obtained from different host eggs But, Kıvan and Kılıc (2002) reported that, *E. integriceps*, *D. baccarum Graphosoma lineatum* (L.) *Carpocoris pudicus* (Poda) and *Holcostethus vernalis* (Fab.) were parasited of different rate by *T. semistriatus* and parasitism rate were detected 88%, 83.6%, 94.8%, 87.3% and 88.0% respectively. While in *E. ornatum* eggs parasitism rate was detected to be 24%, No parasitism rate was detected in *Nezera viridula* (L.) eggs. In the study made by Gözüaçık and atc,, declaration was done that, *T. semistriatus* preferred the most of the eggs of *E. integriceps*

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and then *D. baccarum*, *H. vernalis*, *E. ornata* ve *P. lituratus* were detected most preference respectively. In another study, *E. integriceps* was the most preferred species, followed by *D. baccarum*. They also emphasized that taking environmental precautions to maintain natural populations of these species, *H. vernalis*, *E. ornata* and *P. lituratus* would be in favor of sustaining bio-control of Sunn pest (Gözüaçık and Yiğit, 2012).

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