JOURNAL OF
NATURAL SCIENCES AND MATHEMATICS RESEARCH

Available online at http://journal.walisongo.ac.id/index.php/jnsmr

Parasicity level of *Telenomus* sp. parasitoid against *Spodoptera frugiperda* J. E. Smith eggs in the laboratory

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Received: 9 October 2020,
Revised : 23 October 2020,
Accepted: 20 December 2020.

Abstracts

Telenomus sp. as a biological agent, can be used to control a new pest, namely *Spodoptera frugiperda* which attacks maize in Indonesia. The purpose of this study was to count the number of eggs of *S. frugiperda* parasitized by *Telenomus* sp. and to calculate the level of parasitization of the parasitoid *Telenomus* sp. against *S. frugiperda* in the laboratory. Research method that used in this research were searching for *S. frugiperda* caterpillars and preparation of *Telenomus* sp. The data analysis used in this research was inferential analysis. The results of this study were tested using the normality test, as well as the homogeneity test, and continued with the Kruskal Wallis test. The results showed that parasite level of parasitoid in tube I, tube II, tube III, and tube IV, namely 0%, 23.5%, 18.3%, 11.3%, and the calculation of sex ratio on *Telenomus* sp. were 2 females and 1 male were found. This study concludes that the number of parasitoids *Telenomus* sp. affects the level of egg parasitization.

Keywords: parasicity, parasitoid, *Spodoptera frugiperda, Telenomus* sp.

1. Introduction

Parasitoids are insects that live on or in the bodies of other animals. To be able to reach the adult phase, a parasitoid only needs one host. Thus, parasitoids are insects that live and feed on other living insects as hosts. Parasitoids are insects that live on or in the bodies of other animals. To be able to reach the adult phase, a parasitoid only needs one host. Thus, parasitoids are insects that live and feed on other living insects as hosts [1]. Parasitoids are one of the biological agents that are widely used in insect pest control programs. The host phase that is attacked is generally eggs and larvae, some parasitoids attack the pupa and very rarely attack the imago [2].

Taxonomically, 80% of the parasitoids are members of the order Hymenoptera [3]. Two families of this order that have potential as biocontrol agents are Ichneumonidae and Braconidae, especially as parasitoids of insect larvae of the orders Lepidoptera, Hemiptera, and Diptera. Efforts to use parasitoids as biocontrol agents in Indonesia in controlling biological pests have also been carried out, such as the utilization of *Trichogramma* sp., *Trichogrammatoidea* sp., and *Telenomus* sp. to control pests on corn plants which recently exploded in population, which is *S. frugiperda*. *S. frugiperda* J.E. Smith (Lepidoptera: Noctuidae) is a new pest in maize in Indonesia [4]. Therefore, there are no specific parasitoids that are ready to be used as biological agents and as controllers of S*. frugiperda.* So this research was conducted which aims to determine the level of effectiveness of the parasitoid *Telenomus* sp. in parasitizing the eggs of *S. frugiperda.*

2. Experiments Procedure

Preparation Stage

a. Tools and materials needed for research are prepared.
b. Searching for *S. frugiperda* caterpillars in corn fields, specifically in the Bantul area and bringing them to the laboratory to be reared until they turn into moths to get *S. frugiperda* eggs.
c. The *S. frugiperda* caterpillars obtained from the field were then reared first. Maintenance is done cup and given corn leaf feed. After two days, the cups are cleaned and the caterpillar feed is changed. After becoming a pupa, then transferred to a plastic jar. When the moths are fed, they are fed a 10% honey solution (honey:water = 1:9) which is absorbed into a lump of cotton and hung in a jar. The walls of the jar are covered with parchment paper as a place for moths to lay eggs. Every day the parchment paper containing the eggs is taken and stored.
d. *S. frugiperda* eggs were put into prepared test tubes, using 4 test tubes, each containing 50 eggs. Each test tube was repeated 3 times. So that the total eggs used are 600 eggs.

Parasitoid preparation of Telenomus sp.

a. *Telenomus sp.* was put into a test tube that already contains *S. frugiperda* eggs. The transfer of parasitoids was carried out by means of a test tube containing *Telenomus* sp. at the bottom it was covered with a black cloth to make it look dark inside, then connected to a reaction tube that already contained *S. frugiperda* eggs.
b. The number of *Telenomus* sp. counted when leaving and entering the test tube which already contained *S. frugiperda* eggs.
c. Calculations were performed on each tube. *Telenomus* sp. was not inserted in Tube 1 (control). tube 2 is inserted *Telenomus* sp. as many as 15, tube 3 was inserted *Telenomus* sp. as many as 10, and the fourth tube was inserted as many as 5 *Telenomus* sp. Each tube treatment was repeated 3 times.
d. After the calculation is complete, the top wall of the test tube is smeared with honey, as a food source for *Telenomus* sp., then covered with a cloth and tied with a rubber band.
e. The test tubes are stored in a tube rack and stored in a low light cabinet at a temperature of 25 ^{0}C.
f. Checks were carried out every day on the conditions of temperature and honey, and whether there are eggs that have been parasitized. Eggs that have been parasitized are marked by turning black.
g. Observations were made by removing the parasitized eggs into the petridish, the number of parasitized and non-parasitic eggs was counted.
h. Eggs that are not parasitized are allowed to hatch into larvae and will then be reared until they become moths.
i. Observations and calculations of participation rates were carried out using a microscope and optilab

Data Analysis

The data analysis used in this research is by using inferential analysis. The results of this study were tested using the normality test, followed by the homogeneity test, and continued with the Kruskal Wallis test. Data analysis to determine the percentage of S. frugiperda eggs parasitized by parasitoids was calculated using the formula according to Ratna [5]:

$$PTS\ (\%) = \frac{N1}{N2} \times 100\% \qquad (1)$$

Where N1 is Total number of parasitized eggs, N2 is Total number of eggs used, and PTS is *Spodoptera* egg percentage.

3. Result and Discussion

Number of Eggs of Spodoptera frugiperda parasitized by Telenomus sp.

Based on Table 2, the number of eggs of *S. frugiperda* parasitized by *Telenomus* sp. the highest in tube II as many as 141 eggs. The number of eggs of *S. frugiperda* parasitized by *Telenomus* sp. the lowest is IV tube as many as 68 eggs.

Table 2. Number of eggs of *S. frugiperda* parasitized by *Telenomus sp*.

Tube	Treatments				Total	Average
	1	2	3	4		
I (Control)	0	0	0	0	0	0
II (Parasitoid 15)	3	7	4	7	41	35.25
III (Parasitoid 10)	9	7	9	5	10	27.5
IV (Parasitoid 5)	2	5	8	3	8	17

The results showed that there were differences in parasitized eggs between tubes I, II, III, and IV. According to Buchori *et al*. [6], the more parasitoids *Telenomus* sp. If released, the eggs of the genus Spodoptera as a host will be more and more parasitized and the high level of parasitization will reduce the percentage of survival of the eggs of the host.

According to Situmorang et al. [7], the factor between the number of parasitoids and the number of hosts affects the level of parasitation, the higher the parasitoid population, the higher the level of parasitation, but if the population of pests (hosts) is higher, the level of parasitization will decrease. This is in accordance with the opinion of Hasriyanty [8], which states that parasitization will increase in parasitoid conditions and a balanced number of hosts and vice versa. According to Memeroh [9], the food factor is the main element that is very decisive for the survival and development of every organism. Parasitoids can choose their host and choose a place to lay their eggs so that they can live and develop properly [10]. The results of research from Buchori et al. (2008), showed that the number of *Spodoptera exigua* Hübner eggs trapped by *T. remus* was 68 parasitized eggs, this was because the number of *S. exigua* eggs produced was not the same. However, when observed from the percentage of *S. exigua* eggs that died, it was seen that the percentage of *S. exigua* eggs parasitized at the two stages did not differ. However, in this treatment the effectiveness of *T. remus* in controlling the population of *S. exigua* could not be seen directly. Based on this, a model was made to see the ability of *T. remus* in reducing the population of *S. exigua* with the assumption that the number of eggs laid was the same as in the initial population (control). This model showed that when *T. remus* parasitized *S. exigua* eggs up to 48%, *T. remus* was able to suppress *S. exigua* populations up to 50%.

Parasitization level of Telenomus sp. against the eggs of Spodoptera frugiperda

The results showed that the percentage level of eggs parasitized by the parasitoid *Telenomus* sp. the highest was in tube II with a percentage of 23.5% while the lowest was in tube IV which was only 11.3%. The results of this study indicate that the level of parasitization of this pest eggs by *Telenomus* sp. in various treatments ranging from 0 - 23.50%.

According to Sari et al. [11] the parasitoid rate of *Telenomus remus* Nixon against *S. frugiperda* eggs was 69.40% with 50 *Spodoptera frugiperda* eggs and 35 *Telenomus remus* Nixon parasitoids. The mechanism of the two species is by injecting antennae into the eggs of *Spodoptera frugiperda* so that the eggs are parasitized, and an important factor for the development of every living thing including parasitoids that require adequate nutrition. The complexity of the nutritional content that is available in sufficient and good will support the development of parasitoids. Pabbage and Tandiabang [12], suggest that the disturbances that occur can be caused by several factors including the limited space for the parasitoid to move in the test tube and the location between the egg groups of the host is close to each other so that the host is not parasitized at all.

According to Jones et al. [13], variations in parasitoid behavior such as attack time and host emergence are influenced by the underlying population dynamics. Parasitoids that are under threat of death by various factors are high in the midst of host density will prefer a short time. Parasitoids that have a low threat prioritize the effectiveness and efficiency of growth and self-development among host densities. According to Hasriyanti (2008), the Parasitoid *Telenomus* sp. known to be able to estimate the availability of nutrients in host eggs for the availability of offspring growth, meanwhile it is known that host egg size is an important criterion used by female parasitoids (*Telenomus* sp.) during the process of receiving host eggs including how many eggs to lay.

Pabbage and Tandiabang [12], reported that the disturbance was caused by several factors, including the limited space for movement of the parasitoid in the test tube and the location of the host egg groups close to each other so that the host was not parasitized at all. Host eggs that are not parasitized can become 1-instar larvae and may become rotten eggs or eggs that do not develop into parasitoids. In addition, the factors that influence the level of parasitation, namely the younger parasitoid parent will produce more offspring and slowly decrease with increasing age. Parasitioid survival rate decreased with increasing age of host eggs at oviposition.

Processing of data on the level of parasitization of *S. frugiperda* eggs was carried out using inferential analysis using the Kruskal Wallis test. The test results from Kruskal Wallis found that the Asymp.sig value was $0.006 < 0.05$, so it could be concluded that there were differences between treatments. According to Junaedi [14], the percentage results of parasitization of *Telenomus* sp. in the white rice stem borer (*Scirpophaga innotata*) eggs as much as 8.75% of the total eggs. Other studies stated *Telenomus remus* prefers to parasitize for 24 – 48 hours and *S. frugiperda* eggs are more than 72 hours old. Parasitoids will examine the eggs using their antennae to distinguish whether the eggs are suitable for oviposition which makes the parasitoid quality lower when there is a decrease in the nutritional content of the eggs. These changes cause the characteristic level of parasitization in host eggs to decrease [15].

4. Conclusion

The conclusion of this study was that the number of eggs of *Spodoptera frugiperda* parasitized by Telenomus sp. in the laboratory in tube I (control) as many as 0 items, tube II (141 items), tube III (110 items) and tube IV (68 items). and the parasitization level of the parasitoid *Telenomus* sp. against *Spodoptera frugiperda* eggs in the laboratory, namely in tube 1 as much as 0%, tube II (23.5%), tube III (18.3%) and tube IV (11.3%).

Acknowledgment

The author wishes to thank Laboratory of Ecology and Systematics, Universitas Ahmad Dahlan.

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