The Biology of Black Ladybug (*Paraeucosmetus Pallicornis* Dallas): A New Pest on Rice in Southeast Sulawesi

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**ARTICLE INFO**

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<th>ABSTRACT</th>
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<td>Accepted 28 June 2015</td>
<td>Black ladybug, <em>Paraeucosmetus pallicornis</em> (Dallas) (Hemiptera: Lygaeidae) is considered as a new pest and new problem on rice that is widely dispersed in Southeast Sulawesi. This causes the rice grains tend to be bitter in taste, prone to be broken and unpalatable for human consumption. The objective of the research was to study the life cycle (biology) of black ladybugs. The experiment was conducted by collecting the insects and then cultured in the laboratory. Series of observation on their biological characteristics such as length, width and wing span were undertaken since the insects lay eggs, hatch, and becoming new insects. The results showed that male and female body length were 7.32 mm and 7.41 mm respectively. A female began to lay eggs on the third day with around 167.200 eggs with a hatchability of 61.56%. Eggs were laid randomly or 2 to 4 eggs per group. The eggs are milky white color and oval with 1.41 mm in length, 0.38 mm in width and egg stadium of 7.15 days. At nymphs stage there were five instars: the first instar was 4.40 days, the second 2.99 days, the third 2.60 days, the fourth 3.60 days and the fifth 3.20 days. The life cycle of female and male bugs were 49.80 and 68.60 days respectively. The findings on the life cycle of the black ladybugs will be useful information in designing an eco-friendly pest control strategy.</td>
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<td>black ladybug, life cycle,</td>
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<td>Paraeucosmetus pallicornis, rice</td>
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**INTRODUCTION**

Pest is one of the constraints in their quest to improve rice yields. Various types of pests that often constrain increasing rice production in Indonesia, especially in the Southeast Sulawesi including white paddy stem borer (*Scirpophaga innotata*) rice bug (*Leptocorisa acuta*), green leafhopper (*Nephotettix virescens*), white pests false (*Cnaphalocrosis medinalis*) and black ladybug (*Paraeucosmetus pallicornis*) (BPTPH Southeast Sulawesi, 2012). Black ladybug pests (BLB) are reported as a new pests that attack rice plant in North Sulawesi (Sembel, 1991). Further, Pelealu (1991) stated that there are insects *P. pallicornis* that attack rice plant in Toraut Bolaang Mongondow. Watung (1996) argues that found *Paraeucosmetus* sp. living and attacking rice plant and grasses Paspalum (*Paspalum conjugatum* Berg) in District Tumpaan Minahasa. In the rice-planting season in 1999/2000 BLB attack rice crops in South Sulawesi, after it reports the existence of BLB untracked until 2007. However, since 2008, returned to attack rice plant covering an area of 571 ha in District of Luwu, South Sulawesi (Patta et al., 2009). While in Southeast Sulawesi and deployment of BLB attack was first reported in 2010 (Southeast Sulawesi BPTPH, 2011). Some of researches suggested that black ladybug pest has been also found in East Kalimantan and East Nusa Tenggara (Wisbo, 2009; Rauf and Lanya, 2009; Selamet, 2012).

Black ladybug attack symptoms that are dark brown spots on the puncture marks around the ears are attacked, resulting in the rice becomes empty, if there is not harvested rice sold for black and bitter (Risnandi, 2011), Rosmana et al., (2014). Further Rosmana et al., (2014) reported the insect can carry a fungus that produces a toxic substance.

Suleha (2011) reported that the population density of pests in rice black ladybugs are highest at the age of 72 days after planting is 39.5 tails per 5 times the average swing while the lowest population at 30 days after planting i.e. 1.0 individuals per 5 swing time. The results of the study of Kaparanget al., (2012) the intensity of *P. pallicornis* in rice was found at an altitude of 0-300 m above sea level in the amount of 25.87% per clump, reaching a height of 300-600 of 24.12% per clump, and at a height > 600 meters above sea level reaches 23.77% per clump. This suggested that the status of the BLB as
a new pest has the potential of damaging high enough. In the concept of Integrated Pest Management (IPM), there are four elements of the underlying components of pest control, namely bioecology, natural control, threshold control, and pest population sampling techniques (Watson et al., 1976). The study of biology BLB with characteristics of the local ecosystem has not been done. Therefore, this study aimed to evaluate the biology of black ladybugs in Southeast Sulawesi.

MATERIALS AND METHODS

Place and Time of Studies:
This research was conducted in the laboratory of Plant Pests and Diseases Science Faculty of Agriculture, University of Halu Oleo from March to June 2014.

Insect Rearing:
Test insects were obtained by collecting adult insects from the field and then cultured in the laboratory. Test insects reared in rice plants that had been prepared beforehand. Rice plants containing the test insects were given a wooden cage size 60 cm × 60 cm × 80 cm. Age uniformity obtained by separation of egg, then the egg is placed in a cage of size 15 cm × 20 cm. The top of the cage covered with tricot fabric. Nymphs were transferred to a cage outside the insects that had been prepared and contains grains. While eggs are also transferred to the other cage and maintained until it becomes a nymph and imago. Imago produced is used as a second-generation test insects.

Biology P. pallicornis:
Eggs Stage Stadium eggs were observed since the eggs laid by adult female insects until the eggs hatch. The new eggs laid on rice plants were taken and placed in a test tube diameter of 2 cm × 12 cm.

Nymphs Stage Nymph stage observed since hatching egg to nymph, observations were made every day of the 10 tail nymph.

Adult Stage An adult stage observed since formed to adult insects died. Adult male and female insects were placed in pairs with sex ratio 1: 1 in a test tube diameter of 2 cm × 12 cm which already contains grains. Rice grains used as feed test insects were given each morning.

Observations:
The shape, color, length, width and longer egg stage. Data were collected for 10 eggs. Body length, head width, color and duration of each stage of each instar. Observations were made every day on the 10 tail nymph. The length of the body, the length of the antenna, wing span. Data were collected for 20 tails of adult insects. Pre-oviposition, oviposition period, number of eggs laid and hatched either did not hatch. Pre-oviposition recorded since the female imago copulation until the first egg laid. Egg laying period recorded since the laying of the first egg until the last egg laid by the female adult.

Data Analysis:
Data observation of life cycle, long each stage, the length and width, described by calculating the average value and standard deviation using Excel.

RESULTS AND DISCUSSIONS

Egg stage:
Eggs are laid one at random or in groups of two to five adjoining the grain. White eggs, milk and elliptic and easily separated or fall when touched. Toward hatching eggs turn red brick (Figure 1). The average value of the length, width, and duration of the egg stage is presented in Table 1.

![Fig. 1: P. pallicornis Eggs are laid one by one at random and group (a and b). Newly laid eggs (c), before the eggs hatch (d) (EZ4HD Leica microscope (8x))](image)

| Table 1: The average length, width and duration of egg stage. |
|---|---|
| No. | Observed |
| 1. | Length | 1.14 ± 0.05 (mm) |
| 2. | Width | 0.37 ± 0.03 (mm) |
| 3. | Stage of eggs | 7.15 ± 0.67 (days) |

The data inTable 1. shows that the small-sized eggs and day old egg stage 7.15. For comparison is used Leptocorisa acuta Thunberg, who have behavior and symptoms that are similar to the BLB.
According Pracaya (2010), *L. acuta* eggs are round and flat, blackish brown. Laid eggs lined up, in one or two lines, totaling 12-16 eggs grain. Long period of eggs 57 days.

**Nymphs stage:** Instar nymphs of the body is red and their heads are black. Instar nymphs of two to five black body slightly golden brown (Figure 2).

**Table 2:** The average length of the body, the width of head, and the duration of each nymphs-instar stages.

<table>
<thead>
<tr>
<th>Num.</th>
<th>Observed</th>
<th>The length of body (mm)</th>
<th>The Width of head (mm)</th>
<th>The duration of instar (day)</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Instar-1</td>
<td>1.19 ± 0.18</td>
<td>0.28 ± 0.03</td>
<td>4.40 ± 0.84</td>
</tr>
<tr>
<td>2.</td>
<td>Instar-2</td>
<td>1.95 ± 0.24</td>
<td>0.39 ± 0.02</td>
<td>2.90 ± 0.56</td>
</tr>
<tr>
<td>3.</td>
<td>Instar-3</td>
<td>0.50</td>
<td>0.61 ± 0.07</td>
<td>2.60 ± 0.51</td>
</tr>
<tr>
<td>4.</td>
<td>Instar-4</td>
<td>4.12 ± 0.27</td>
<td>0.76 ± 0.06</td>
<td>3.60 ± 0.51</td>
</tr>
<tr>
<td>5.</td>
<td>Instar-5</td>
<td>6.02 ± 0.62</td>
<td>0.87 ± 0.04</td>
<td>5.20 ± 0.42</td>
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<tr>
<td>6.</td>
<td>Period Total</td>
<td></td>
<td></td>
<td>118.70 ± 1.16</td>
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**Fig. 2:** Nymphs *P. pallicornis* with various stage Instar 1 (a) not microscope, Instar 1-5 (b,c,d, e dan f) (microscope Leica EZ4HD (8x))

The average value of the body length, head width, and length for each stage instar nymphs is presented in Table 2.

**Fig. 3:** Adult *P. pallicornis* (a) Male (b) Female.
Data Table 2 shows that the new body nymphs out of the eggs reach a size of 1.19 mm, and the nymphs are the longest found in the 5th instar, reaching 6.02 mm in size. Old nymph stage is 18.70 days. This is different to those reported by Pelealu (1991) that long development of nymphs average of 30 days while the results of this study the average length of the nymph stage is 18.70 days. Nymph stage is less than 20 days to provide information that the weakest stage of quite short. It is therefore time to consider appropriate controls

Adult Stage:

Nymph and adult same shape. Adult is dominated by black and slightly golden brown (Figure 3). Adult active in the morning and evening. Adult female body size somewhat larger than the male adult. Adult females when seen ventral abdominal bulge and there is a white line a little brighter than the male. The antenna consists of four sections. Prominent compound eyes, front femur is rather large compared to the two pairs of hind legs. In general, lay eggs at night. These results are accordance with those reported by Rauf and Lanya (2009), Patihong (2011), Chandra and Kushwaha (2014).

The average value of the body length, body width, length of the antenna and a wing span of adults of males and females is presented in Table 3.

<table>
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<th>Table 3: The average length and width of the body, the length of antennae, and the male and female wing stretch (mm)</th>
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<tr>
<td>Observed</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>1. Body length</td>
</tr>
<tr>
<td>2. Body width</td>
</tr>
<tr>
<td>3. Antenna length</td>
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<tr>
<td>4. Wing Range</td>
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The data in Table 3 shows that the size of the adults of females tend to be longer and larger than that of male adults. Adults of the old stage which includes the pre laying, egg laying period, a period of adults of female, male adults of period, and the number of eggs laid by female adults of tail and hatchability of eggs. The average duration of the adult stage, the number of eggs produced and hatchability of eggs is presented in Table 4.

<table>
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<th>Table 4: The average duration of the adult stage, the number of eggs produced, and hatchability of eggs</th>
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<td>No.</td>
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</tr>
<tr>
<td>1. Pre-laying</td>
</tr>
<tr>
<td>2. Laying</td>
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<td>3. Females adults of period</td>
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<tr>
<td>4. Males adults of period</td>
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<tr>
<td>5. The number of eggs by adults</td>
</tr>
<tr>
<td>6. The Number of eggs hatched</td>
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<td>7. Hatchability of eggs</td>
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The data in Table 4, show that the average pre-laying period of 2.50 days, spawning period at an average of 19.40 days, and after the nesting female adult, adult male died but still live up to an average of 40.60 days. The number of eggs by female adult and hatchability of eggs 167.20 grains reached 64.15%. The life cycle of female and male BLB were 49.80 and 68.60 days. This result is new information about the ability to lay eggs and hatchability of eggs BLB.

Based on the results of the research life cycle of the female BLB average 49.80 days 68.60 days while the males. This is in contrast to reviews those reported by Rauf and Lanya (2009), the life cycle of 45 days and the female insects males to 38 days, (Gerardo and Taubodong, 2013) BLB period from egg to adult 35 to 39 days may be due to rearing using bean while on this study use the grains, while according Patihong (2011) BLB adult stage lasts 6-21 days.

Conclusion and recommendation:

The biology of BLB was succesfully study under laboratory condition. The life cycle of female and male BLB were 49.80 and 68.60 days. P. pallicornis laid eggs one by one at random or in groups of two to five adjoining. Newly laid egg-shaped oval creamy white and red brick hatch ahead. The nymphs consists of five instar. The first instar red and two to five brownish black to resemble adults of. Imago females laid eggs at night. It is recommended to study more on host range of black ladybug.

REFERENCES


