Preference Spodoptera litura (Lepidoptera : Noctuidae) on Leguminose, oil palm of peat land and mineral

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Abstract. S. litura is one of a new pest in oil palm plantation with high population and caused damage on Immature plants I, immature plants II, immature plants III in PT. HSJ Negeri Lama Plantation. This research aimed to know preferences and development of S. litura on leguminose, oil palm of peat land, and mineral. The experiment was conducted from start June 2017 until December 2017 at PT. HSJ Negeri Lama Plantation and at the Laboratory of Agricultural Product Technology University North Sumatra. Preferences test used completely randomized design method (CRD) non factorial with five replications. The method of the research were choice and no choice treatment by using variety of Topaz oil palm.

1. Introduction

Oil palm production needs to rise sharply with increasing world demand for CPO, as happened the last few years [9]. Oil palm cultivation can not be separated from the problems of crop pests. Pests are a major problem in oil palm plantations are Setora niteus (Lepidoptera: Limacodidae), Metisa plana (Lepidoptera: Psychidae) and Dasychira inclusa (Lepidoptera: Lymantriidae) [15]. Ased on data from PT. Hari Sawit Jaya, S. litura have attacked oil palm plantations on peat land PT. HSJ Negeri Lama Plantation. The number of trees stricken during the period of January to October 2014 is 33, 634, 274, 496, 281, 121, 314, 915, 453, 1686 trees. This makes S. litura special attention from the plantation because it has never been found in previous oil palm. S. litura attacked the leguminose in the plantation area and attacked the new oil palm planted until the immature plant III.

Looking at the thickness of the leaves between the oil palm leaves on the ground of the peat soils with thicker and mineral leaves than the palm oil leaves on the peat soil (immature), it is possible that the percentage of coarse and lignin fibers contained in the leaves in large quantities can be a factor of occurrence of antifeedant. This is the same with Syahputra (2005) who reported that fiber and lignin were thought to affect the rate of larval consumption, thus stopped eating and began to choose other feeds that contained less crude fiber and lignin. In addition, the high water content of oil palm leaves from peat soil is very influential on the selection of feed. This research is expected to contribute the basic relationship of S. litura with oil palm crops and damage caused by S. litura. It can be used as a basis for proper management and timing for the control of S. litura in the field. It is important to know the dietary preferences related to nutrients in palm oil leaves related to primary compounds.
2. Materials and Methods

This research is finish in PT. Hari Sawit Jaya Negeri Lama and laboratory of Agricultural Products Technology USU. This research was carried out from June to December 2017. The materials used are leguminose, oil palm plantation from media mineral soil, oil palm leaves from peat soil and S. litura larvae. The tools used are hoe, gembor, soil, isolative, plastic container, label paper, stationery, HVS paper, eraser, ruler, microscope, sliding wheel, organdy fabric.

Research on the development of feeding preferences of S. litura using Randomized Complete Design (RAL) non factorial. The implementation of the research started from the preparation of test crops of palm trees and palm trees of 10-month topaz varieties of mineral soil media, while the palm oil plant of peat soil media using peat soil and mineral soil with 80: 20% ratio was reproduced in polybags. Preference test by two method that is method of choice and method not choice. The optionless method includes 10 larvae which are satisfied for 1 day on one plant placed on the surface which is enclosed using organdy fabric using a bamboo frame measuring 1 x 1.3 x 1 m. While the method without choice by placing 30 instar larvae III on plants in a circular stacking then larvae placed in the middle of the plant in one cage and the reset 5 times.

The first variable, preferences were measured by counting the number of crawling S. litura in all three test plants over a period of 2, 4, 6, 8, 10, 12, 24, 36, 48, 60 and 72 hours after discharge. The second observational variable, hunger test was observed the behavior of S. litura and reported descriptively and in table form. The third observation variable, the intensity of the attack is calculated by the following formula:

\[ I = \frac{\sum_{i=1}^{Z} (n_i \times v_i)}{Z \times N} \times 100\% \]

\( I \): Intensity of plant damage attack (%)
\( n_i \): The number of parts of the plant with an example of the scale of damage to -i
\( v_i \): Value of the damage scale of the i-th example
\( N \): Number of plants or parts of plants observed
\( Z \): The highest damage scale value.

The value of a defective leaf score on the beans is as follows:
0 = No damage
1 = <25% of damaged leaves
2 = 25 - <50% of the leaves are damaged
3 = 50- <75% of the leaves are damaged
4 = <75% of damaged leaves

The value of damaged leaf scores on oil palm plants is as follows:
1 = 1-20% The stem is damaged
2 = 21-40% The fragment is damaged
3 = 41-60% The stem is damaged
4 = 61-80% The fragment is damaged
5 = 81-100% The break is damaged

The calculation of the intensity of the attack is done 1 week after instar larvae II is infected in the plant. Observations were made until the larvae entered the pretend phase at 1-week intervals.
3. Results and Discussion

Table 1. Number of *S. litura* creep 72 hours after discharge

| Treatment      | 2   | 4   | 6   | 8   | 10  | 12  | 24  | 36  | 48  | 60  | 72  | Average |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|
| Gambut         | 3.79| 4.01| 4.15| 3.69| 4.33| 3.57| 3.73| 3.73| 4.82| 3.94|     |         |
| Mineral        | 4.59| 4.05| 4.15| 3.43| 4.23| 3.40| 3.50| 3.50| 4.43| 3.67|     |         |
| Kacangan       | 4.99| 4.72| 4.85| 5.03| a   | a   | a   | a   | a   | a   | a   | 3.52    |

Different letters in the same column differ significantly at the 5% level (after the data is transformed with $\text{arc sin } \sqrt{x}$).

The observation of preference of *S. litura* on the treatment of oil palm plantation from peat soil, minerals and leguminose up to 6 hours after infestation (haa) showed no significant difference. This is possible because the insects take time for early adaptation to the plant as a potential host. The selection of suitable individual plants to be hosted by insects is a complex process.

In addition, the release time of *S. litura* done in the morning causes the imago to be more active than during the day. *S. litura* is instantly creeping on plants but *S. litura* does not all feed on the plants it comes to. At the observation of 8 haa, the movement of *S. litura* began to attack the plants and spread to get the youngest leaves. There is a difference of preferences at 8 haa between the leguminose and the oil palm. On the observation of 8 haa in leguminose showed a tangible result. The occurrence of a difference of 8 haa is possible because *S. litura* responsive to time changes. *S. litura* in the afternoon and evening is more active than during the day. In daylight *S. litura* naturally rests in dark or sun-protected places.

There are difference of preference at 12 haa and 60 haa that is the amount of *S. litura* increased both in peanut and palm oil plant of peat and mineral media. This preference difference is related to time change. *S. litura* is more active at night. Some insects eat plants at night to avoid allelochemical activation. An example of a lady has a pattern of bimodal activity, which is to search for food early in the night and immediately take shelter at dawn. Adaptation to light and dark light (observation in the compound eyes of insects) is also under the control of the circadian rhythm (Lazzari & Insausti, 2008).

Table 2. Test of hungry *S. litura* no choice

| Types of Plants          | Behaviour |
|--------------------------|-----------|
| Leguminose               | Eat a lot and can complete the life cycle. The larvae are larger and longer. Larvae cannibalism occurs when the leaves begin to run out. The ability of *S. litura* eat beans is high enough above 90%. |
| Oil palm of peat soil media | Eat a lot and can complete the life cycle. Larval state is smaller than peas. Cannibalism during the larval less because of loose peat soil facilitates the larvae into the ground to take cover and peat water content in the leaves was higher than palm nuts and leaves mineral soil. |
| Oil palm media minerals  | Less eating, can complete the life cycle. Cannibalism at the time of the larvae. |
3.1. Intensity Attack

The results of observation of intensity attack of *S. litura* with method not choice is shown in table 3.

| Treatment | 3 haa | 6 haa | 9 haa | 12 haa | 15 haa | 18 haa | 21 haa | 24 haa |
|-----------|-------|-------|-------|--------|--------|--------|--------|--------|
| T1        | 15.86b| 18.42b| 28.82b| 33.72b | 40.34b | 51.97c | 54.65c | 59.54b |
| T2        | 12.54b| 15.35b| 23.73b| 25.35b | 27.77b | 30.83b | 33.16b | 37.81b |
| T3        | 51.00a| 57.75a| 67.07a| 71.46a | 77.37a | 79.39a | 84.65a | 89.27a |

Description: Different letters in the same column differ significantly at the 5% level (after the data is transformed with arcsin $\sqrt{x}$)

Table 3 and based on the analysis of variance intensity attacks (Appendix 18), indicate that the pulses significantly affect the intensity of *S. litura*. The intensity attack on the leguminose (T3), tend to be significantly different high and further trials compared treatment based on mineral oil palm trees and the peat since the first observations up to the end (24 haa). While in the processing oil from peat soil media (T1) and oil palm plantations mineral soil media (T2), the highest intensity attacks on media treatment of oil palm plantations, peat soils (T1) with a value (59.54%).

There is a difference in the intensity attack on the plant being tested, indicating a difference in nutrient content (primary compound) on the leaves. High intensity attack on leguminose due to high fat and carbohydrate. Carbohydrates are a source of energy for every metabolism in the body while fat is a backup energy.

Fat is the most important form of energy reserves in the body as well as an essential source of nutrients for insects fitofag. In the Noctuidae larvae, glucose as a monosaccharide molecular form of carbohydrates absorbed through the digestive process will have an increase in blood concentration within 15 minutes after eating. Furthermore, glucose is stored as glycogen in the body fat insect cutin of the cuticle or the connective tissue and the basement membrane of the insect body (Chapman, 1998).

In addition to the fiber content of leguminose are also low, low fiber content affects the rate of consumption of larvae of *S. litura* choose the leguminose. This result is similar to the research (Wali, 2014) who reported that the high protein, fat and carbohydrate content did not affect the consumption of larvae if the fiber content was also high. High fiber levels become antifeedent in insects so choose plants with low fiber content. These results are in line with the research (Wali, 2014) The higher the ash content becomes toxic and antifeedent to insects.

The results of the analysis of the ash content of proximate test showed that the ash content in palm leaves and peat soil media with high mineral values can be seen in Table 6. The ash content in the proximate analysis does not provide nutritional value is important because the ash does not undergo combustion so that does not produce energy. The amount of ash in feedstuffs is only important to determine the calculation BETA-N. The value of ADF on the leaves represents the content of lignin and cellulose of plant cell walls. Lignin is a component of cell walls that is difficult to digest by bacteria, so that with lower lignin levels the bacteria will more easily degrade the food substances contained in cell contents (McDonald et al., 1988).

The highest intensity of next subscriber is on palm oil plant of peat soil media. Suspected differences in nutrients in plants, especially protein and high water content in plants. Protein is the major nutrient needed by the phytophag insects, and it is most often a limiting nutrient for optimal growth of insects. Protein is also one of the important substances that the body needs to grow and repair damaged tissue. In addition, protein also affects overall food quality, in this case related to the balance of essential amino acids available in proteins (Chapman, 1998).

The need for water for the body's metabolic processes depends on the water content contained in the leaf (feed in consumption). This is in line with Purnomo et al. (2008) who reported that a high water content in a feed was positively correlated with host selection for phytophag.
The phytophagous insects have evolved primarily about the mechanisms to overcome the obstacles that the host plant has. Activities on behavior, biochemistry and physiology are governed through sensory input. In addition, their natural physiological feedback mechanisms and environmental factors enable them to adapt to changing situations. One side of the plant must defend itself, but the herbivore insects need food for its survival. So the insects must find a way to overcome the defense of plants in various situations, conditions, space and time. Environmental adaptability is needed by insects to overcome obstacles that are plant defenses eg obstacles to allelochemical, plant and ecological contents. This situation means that insects must be able to break the defense of plants, both chemical and physical defense to survive.

4. Conclusion
The average preferences of S. litura to the three crops in the consecutive test were leguminose (4.40 animals / plants), oil palm plantations of peat soil media (3.62 animals / plants), palm oil plant of mineral soil media (3, 52kor / plant). Based on the intensity of the attack, the highest S. litura attack was 89.27%, palm oil of peat soil media 59.54%, then the palm oil plant of mineral soil media was 37.81%.

Acknowledgement
Thank you I said to the father and mother of the lecturer who has guided me in the completion of my research and, I say to PT. HSJ The old state garden that has helped me in this research process.

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