

## Level Attack of Caterpillar on Oil Palm (*Elaeis guineensis* Jacq.) Plantations in Dharmasraya District, West Sumatera Province

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### ABSTRACT

Caterpillars are insects that eat oil palm leaves. As a herbivore, its presence and feeding activity will be affected by the growth phase of the host plant. This study compares the percentage and intensity of caterpillar attacks at immature oil palm plantations and mature oil palm plantations in Dharmasraya Regency. The research was conducted in July-September 2022, and the location was determined using a purposive sampling method. The research was conducted in two immature oil palm plantations (Nagari Silago and Timpeh) and two mature areas (Nagari Sitiung and Muaro polite). Determination of sample plants was carried out diagonally and taken  $\pm 10\%$  of the total population of palms. The caterpillars found during the research in the oil palm plantations of Dharmasraya Regency consisted of 2 species, namely *Setora nitens* and *Setothosea asigna*. At the four study locations, the average percentage of infected plants, infected midribs, and attack intensity were 43.47, 40.71, and 19.86 %. Immature oil palm plants have a higher rate of caterpillar attacks than mature ones.

**Keywords:** caterpillars attacks; oil palm plantation; pest

### INTRODUCTION

Oil palm (*Elaeis guineensis* Jacq.) is an industrial plant producing essential human life needs. The products produced include cooking, industrial, and even vehicle fuel (biodiesel). Oil palm plantations generate substantial profits for farmers. With these promising prospects, so much land is used for oil palm plantations.

Dharmasraya Regency is an area that is passionate about developing oil palm plantations. This can be seen in the area of oil palm, which reaches 43.72% of the total area of plantation crops. Palm oil production is the highest (75%) compared to the total production of all plantation crops in Dharmasraya (BPS, 2022). Various problems were found in efforts to increase palm oil production, including the presence of herbivorous insects or what is commonly termed pests.

Herbivorous insects or pests are one of the factors that need attention in oil palm cultivation. Pests are animals that can disturb and cause losses to farmers who grow oil palm. Both direct and indirect losses. The existence of pests in oil palm plantations needs to be appropriately controlled so that productivity does not decrease significantly. Said to be a pest can cause losses, but in theory, pest control must be based on the economic threshold of pest populations in oil palm plants (Maruli & Pardamean, 2017). Some of them are caterpillars that eat palm leaves.

Pests that attack oil palm plants are grouped based on the part they attack. Among them are shoot and leaf-eating pests, bunches, stems, and roots (Riady et al., 2020). including fire caterpillars. Caterpillars belong to the

Lepidoptera Order, Family Limacodidae. These pests are the most common eater of oil palm leaves and cause significant losses in oil palm plantations.

The caterpillars commonly found are *Setothosea asigna*, *Setora nitens*, *Darna trima*, *Darna diducta*, and *Darna bradleyi*. While the rare species are *Thosea vetusta*, *Birthosea bisura*, *Susica malayana*, and *Birhamula chara* (Susanto et al., 2012). In general, all types of caterpillars can significantly reduce palm oil production.

Caterpillars damage oil palm plants by eating palm leaves, generally starting from the lower leaves to the young leaves. This pest attack can cause defoliation, reducing the production of fresh fruit bunches by 40 – 60% (Pahan, 2008). Syahputra (2013) also said that a caterpillar could consume 300-500 cm<sup>2</sup> of leaves in a day. In heavy attacks, the caterpillars can eat all the leaves of the oil palm plant until only the sticks remain.

Caterpillars were found attacking oil palm plants starting from the nursery phase, immature plantations, and mature plantations. However, as herbivores, the presence and feeding activity of caterpillars will undoubtedly be influenced by the growth phase of the host plant. Therefore, as supporting information for the design of pest management in oil palm, information is needed about the level of attack by caterpillars on oil palm plants that have not yet matured and have matured. Information about the level of attack of caterpillars that attack oil palm is one aspect that needs attention in supporting oil palm plantation development programs. Information on the level of this attack is also needed to know how to control or countermeasures that can be carried out effectively and efficiently.



## MATERIAL AND METHOD

This research was conducted in four Dharmasraya Regency, West Sumatra Province sub-districts. Padang Laweh and Timpeh sub-districts represent immature oil palm areas, and the Padang Laweh and Sitiung sub-districts represent mature oil palm areas. This research was conducted in July-September 2022.

Determination of research locations using a survey method with the determination of plants by purposive sampling. The locations used as samples were two immature oil palm plantations and two mature oil palm plantations, each area of  $\pm 10$  Ha. Determination of sample plants is done diagonally and by taking 10% of the sample plants at each research location.

Measuring the level of attack by caterpillars was seen by calculating the percentage of affected plants and the intensity of the attack on the sample plants' young and old leaf midribs. Measurement of the level of attack was carried out by looking at the percentage of damage that occurred to the 7th frond (young leaves), 16th frond (old leaf), and 19th frond (old leaf) for plants aged four years and for plants aged two years with similar observations and also carried out only that the difference is on the 17th frond (old leaf) (Lubis, 2021).

The percentage of infected plants and the percentage of damage to the oil palm fronds attacked by caterpillars were calculated using the Tulung formula (2000). The following formula determines the intensity of the attack by caterpillars, and the criteria for the Attack Intensity Category can be seen in Table 1.

$$P = \frac{n}{N} \times 100\%$$

Information:

P = percentage of infected plants/ fronds

N = number of infected plants/ fronds

N = total number of plants/ fronds observed

$$I = I = \frac{n_i \cdot V_i}{N \cdot V} \times 100\%$$

Information;

I = attack intensity (%)

$n_i$  = number of scores

$V_i$  = attack Score Value

N = number of plant midribs observed

V = highest score

## RESULTS AND DISCUSSION

### Species of caterpillars found and symptoms of their attacks

The caterpillars found during the research in the oil palm plantations of Dharmasraya Regency consisted of 2 species, namely *Setora nitens* and *Setothosea asigna* (Figure 1). The body of *S. nitens* larvae is shaped like a beam and is elongated, and has protrusions that have coarse hair on several parts of the body (Figure 1a). Another unique feature is a longitudinal line on the dorsal side of *S. nitens* which is purplish-blue. The larvae of *S. nitens* are slightly yellowish-green in color and usually turn slightly reddish when they become pupae. The morphology of the caterpillar found follows that obtained by Lubis et al. (2021). *S. nitens* attack the leaves of oil palm plants from the tip of the leaf to the base of the leaf. The larvae of *S. nitens* eat the oil palm leaves until they leave the upper epidermis of the leaves and leave only the sticks (Figure 2).

*S. asigna* is found in fewer cases than *S. nitens*. This could be due to *S. nitens* having a shorter life cycle and very high egg production, the ability to live without competition, high adaptability, and a higher population. In addition, its ability to reproduce is also excellent. Following what Susanto (2010) conveyed, the short life cycle of a species will have the potential to have a high population.

Caterpillar attacks can cause oil palm plants to lose leaves (defoliation), affecting production decline. The young larvae usually live in clusters around the egg-laying sites, then scrape the leaves starting from the lower surface of the palm fronds. In addition, symptoms of fire caterpillar attacks are also marked by traces of egg shells that have hatched and abandoned cocoons.

According to Satriawan (2011), caterpillars like old oil palm leaves, but when the old leaves are used up, the caterpillars also eat young leaves. Leaf loss reaching 100% in mature oil palm plantations can have a direct impact on reducing palm production by up to 70% in one attack and 93% if there is a repeat attack in the same year (Pahan, 2008). This confirms that caterpillar attacks have a severe impact on oil palm production.

### Percentage and intensity of caterpillar attack on oil palm plantations

The level of attack was measured in four sub-districts in Dharmasraya Regency. The sub-districts of Sembilan koto and Timpeh represent immature oil palm plantations, while the sub-districts of Sitiung and Padang Laweh represent mature plantations. Immature palms are 2-3 years old, and mature palms are > five years old. The percentage and intensity of caterpillar attacks in Dharmasraya District can be seen in Table 2.

Table 1. Caterpillar attack intensity category criteria

Score	percentage	Attack criteria
0	0	healthy
1	0-25	light
2	25-50	medium
3	50-90	serious
4	>90	very serious



Figure 1. Species of caterpillars found. a) *Setora nitens*, b) *Sethosea asigna*



Figure 2. Symptoms of caterpillar attack on oil palm plants

Table 2. Percentage and intensity of caterpillar attacks in Dharmasraya District

oil palm phase	Location (Nagari)	Coordinate	Elevation	Infected plants (%)	Infected midrib (%)	Attack intensity (%)
Immature plants	Silago	0° 59' 31,76" S, 101° 25' 37,23" E	114	<b>75,24</b>	<b>68,11</b>	<b>33,71</b>
	Timpeh	0° 52' 12,15" S, 101° 33' 17,35" E	125	71,82	55,75	27,92
Mature plants	Muaro Sopan	1° 02' 25,43" S, 101° 47' 17,45" E	100	12,58	18,52	7,66
	Sitiung	1° 01' 33,01" S, 101° 38' 27,98" E	98	14,24	20,44	10,14
<b>Average</b>				<b>43,47</b>	<b>40,71</b>	<b>19,86</b>

Immature oil palm plants have a higher rate of caterpillar attacks than mature ones. This is based on data on the percentage of infected plants, the percentage of infected fronds, and the intensity of fire caterpillar attacks in Dharmasraya Regency. The results of this study explain that caterpillars attack immature and mature oil palm leaves. The difference in the attack level can be caused by differences in the components of the undergrowth in the two plant phases. Sahari et al. (2020) also reported that caterpillars are more common in oil palm plants that are under three years old.

In addition, the difference in attack levels of caterpillars on immature and mature plants can also be caused by differences in abiotic conditions in the two phases. This is in line with what was conveyed by (Agustina, 2021) that the level of attack by caterpillar pests in the Bah Birung Ulu garden is strongly influenced by altitude and air temperature. The higher the air temperature, the easier it is for caterpillars to breed, whereas the lower the temperature, the more difficult it is for caterpillars to breed.

According to Maruli and Pardamean (2017), attacks by caterpillars that eat oil palm leaves can occur due to disruption of the natural balance on agricultural land. This is due to inappropriate cultivation methods, such as blanket spraying of weeds, non-selective chemicals, and weather conditions, such as prolonged dry seasons.

This result is also supported by previous research. Lukmana & Elafia (2017) also said that caterpillars are among the most common pests in oil palm plantations. The questionnaire results showed that 96.6% of respondents stated that caterpillars that eat palm leave pests mostly attacked immature oil palm plantations.

The relatively high intensity of caterpillar pest attacks in the Timpeh and Sitiung sub-districts is thought to be influenced by environmental conditions. At the optimum temperature, which is between 25 - 35° C, the ability of insects to produce large offspring and death before the age limit is few. Temperature affects fertility and egg production, growth, and distribution of insects. Seasonal factors also affect plant conditions, which during field observations are at the end of the dry season and the beginning of the rainy season. High rainfall with low-temperature conditions. Tends to increase humidity. (Ikhsan, 2022; Purba et al, 2015).

In low plantation ecosystems, these conditions can inhibit the development of insect pests because they can negatively affect pest metabolism. In addition, the availability of nutrients and water can also reduce plant resistance to pest attacks. Lack of nutrients and water during the dry season can reduce plant resistance to pest attacks. Other information states that leaf-eating caterpillar attacks occur when plants are experiencing stress as a result of low nutrition. (Personal, 2010).

The mild-moderate level of caterpillar attack provides control techniques that can be applied to oil palm plantations. For mild attack levels, it is necessary to prioritize an integrated pest management system (IPM). Some ways can be applied trapping plants, light traps, and natural enemies. Natural enemies of caterpillars include predators *Eochantecona furcellata*, *Sycanus leucomesus*, and

parasitoids *Brachimeria lasus*, *Spinaria spinator*, *Apanteles aluella*, *Chlorocryptus purpuratus*, *Fornicia ceylonica*, *Systropus roepkei*, *Dolichogenidae metesae*, and *Chaetexorista javana* (Simajuntak et al., 2011).

## CONCLUSION

The caterpillars found during the research on oil palm plantations in Dharmasraya Regency consisted of 2 species: *Setora nitens* and *Setothosea asigna*. Immature oil palm plantations have a higher attack rate by caterpillars than mature ones. The average percentage of infected plants, infected midribs, and attack intensity at the four study locations was 43.47, 40.71, and 19.86 %.

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