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## The Effectiveness of Beneficial Plants in Oil Palm (*Elaeis guineensis* Jacq.) Area in Reducing the Attack Rate of Oil Palm Leaf-Eating Caterpillar (oplec) at PT. Socfindo Mata Pao Gardens.

*Efektivitas Beneficial Plant di Areal Tanaman Kelapa Sawit (*Elaeis guineensis* jacq.) Dalam Menurunkan Tingkat Serangan Hama Ulat Pemakan Daun Kelapa Sawit (oplec) Di PT. Socfindo Kebun Mata Pao*

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### ABSTRACT

*Efektivitas Tanaman Beneficial Plant Di Areal Tanaman Kelapa Sawit (*Elaeis guineensis* Jacq.) Dalam Penurunan Tingkat Serangan Hama Ulat Pemakan Daun Kelapa Sawit (UPDK) Di PT. Socfindo Kebun Mata Pao. Tujuan dari pengkajian ini adalah Untuk mengetahui efektivitas beneficial plant di areal tanaman kelapa sawit (*E. guineensis*) dalam menurunkan tingkat serangan hama Ulat Pemakan Daun Kelapa Sawit (UPDK) di PT Socfindo Kebun Mata Pao, dan untuk mengkaji faktor-faktor yang mempengaruhi tingkat serangan hama Ulat Pemakan Daun Kelapa Sawit (UPDKS) di PT Socfindo Kebun Mata Pao. Pengkajian ini dilaksanakan pada bulan November hingga Juni 2022. Metode pengumpulan data dilakukan dengan data primer dan sekunder. Hasil penelitian menunjukkan bahwa beneficial plant lebih efektif dalam penurunan tingkat serangan hama ulat pemakan daun kelapa sawit sesuai dengan SOP PT. Socfindo Kebun Mata Pao. Faktor-faktor yang mempengaruhi meningkatnya serangan hama UPDK adalah kondisi iklim dan fisiologis tanaman..*

**Keywords:** Beneficial Plant, Hama Pemakan Daun Kelapa Sawit (UPDK), Kelapa Sawit.

### ABSTRAK

The Effectiveness of Beneficial Plants in Oil Palm (*Elaeis guineensis* Jacq.) Areas in Reducing the Attack Rate of Oil Palm Leaf-Eating Caterpillars (OPLEC) At PT. Socfindo Pao Eye Gardens. The purpose of this study was to determine the effectiveness of beneficial plants in the oil palm plantation area (*Elaeis guineensis* Jacq.) in reducing the level of attack of the oil palm leaf-eating caterpillar (OPLEC) in PT Socfindo Kebun Mata Pao and to examine the factors that affect the level of Attack of the Palm Leaf Feeding Caterpillar (OPLEC) at PT Socfindo Kebun Mata Pao. This assessment was carried out from November to June 2022. The data collection method was carried out using primary and secondary data. The results showed that beneficial plants were more effective in reducing the attack rate of caterpillars that eat oil palm leaves by the SOP of PT. Socfindo Pao Eye Gardens. The factors that influence the increase in OPLEC pest attacks are climatic and physiological conditions.

**Keyword:** Beneficial Plant, Palm Leaf Eating Pest (OPLEC), Oil Palm.



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## 1. Introduction

Oil palm (*Elaeis guineensis* Jacq.) is one of the plantation crops that has a large role in improving the country's economy. Oil palm is an important industrial plant producing cooking oil, industrial oil, and fuel (biodiesel). In Indonesia, the spread is in the areas of Aceh, Sumatra, Kalimantan and Sulawesi. Palm oil is still a mainstay commodity as a source of foreign exchange from the non-oil and gas sector, this commodity has very good

prospects as a source of foreign exchange and taxes. In the process of product and processing, it is also able to create employment opportunities and at the same time improve people's welfare (Lubis et al, 2020).

Based on Direktorat Jendral Perkebunan 2018, The area of oil palm (*Elaeis guineensis* Jacq.) plantations in Indonesia in 2018 reached 14,326,350 Ha. Sumatra Island has the largest oil palm plantation area compared to other islands in Indonesia. The total area of oil palm plantations on the island of Sumatra in 2018 reached 8,047,920 Ha where the four provinces on the island of Sumatra are included in the area with the largest area of oil palm plantations in Indonesia, namely the provinces of Riau, Sumatra Utara, Sumatra Selatan, Jambi and Kalimantan island being the island with the largest area 5,588,075 Ha (Dirjenbun, 2018).

PT. Socfin Indonesia (Socfindo) is part of the Socfin Group and is a leading oil palm and rubber plantation company operating in North Sumatra and Aceh Provinces and headquartered in Medan, North Sumatra, Indonesia. One of the gardens at PT. Socfindo is the Matapao plantation, consisting of 3 divisions where each division has an area of division I 700.97 ha, division II 782.82 ha, and division III 683.41 ha. The area of the 2020 Mata Pao statement is 2,167.18 Ha. Division I is the division with the second largest area. PT. Socfindo Kebun Mata Pao Division I some obstacles are some obstacles that are the main problem and have not been resolved to date, namely caterpillar and bag pest attacks on immature plantings as well as on mature plants. The attacks of bagworms and fire worms reach a high level of around 50%. The high attack caused a decrease in palm oil production. Efforts to overcome these pests are carried out by chemical and biological control.

PT. Socfindo Kebun Mata Pao uses biological control techniques using the natural predator *Sycanus* sp. And planting beneficial plants as well as hosts for these natural predators. Based on data from the Oil Palm Research Center (2018) an important problem in oil palm plantations is the attack of leaf-eating caterpillars that attack both during immature plantations and mature plantations. The decline in the amount of palm oil production due to pest attacks reached 40% or around 6.4 tons/ha.

Efforts to overcome these pests and diseases are carried out using chemical control and biological control. However, pest control using chemicals has an impact on environmental pollution so biological control is developed to control pests biologically, namely by using natural enemies of the pests themselves. The use of natural enemies in the field can be used by conserving natural enemies. In addition, there is a way to increase the population of natural enemies, namely by breeding (mass-rearing) natural enemies. This program was formed to make efficient use of synthetic chemical insecticides which have many negative impacts. One of the pests that greatly affect the productivity of oil palm plants is the fire caterpillar pest and the bagworm caterpillar that eats oil palm leaves (Mukhopadhyay dan Sarker, 2019).

Efforts to control oil palm leaf-eating caterpillar pests are used by natural enemies, namely *Sycanus* sp, so it is necessary to develop host plants for these predators. The host plant of *Sycanus* sp is a beneficial plant which consists of several kinds of plants, namely *Cassia cobanensis*, *Antigonon leptopus*, *Turnera*, and *Cuphea hyssopifolia*. These plants are believed to provide a good shelter for *sycanus*. Short, high reproductive capacity and ability to lay eggs on oil palm leaves, allowing both nymphs and imago to live in the canopy of oil palm leaves and actively prey on fire caterpillars and bagworms (Simangunsong, 2018).

## 2. Materials And Methods

This research was carried out from November 2021 – June 2022 at PT. Socfindo Unit Kebun Matapao Division I. The tools used in this research are cameras, laptops, and other writing instruments. The material used in the study is the block map of beneficial plant planting, the area of the beneficial plant, and the area not planted with beneficial plants in Division I. The research method is basically a scientific way to obtain data with specific purposes and uses. This study uses a quantitative descriptive method. Descriptive study is a method that functions to describe or give an overview of the object under study through data or samples that have been collected as they are, without conducting analysis and making generally accepted conclusions.

Sugiyono (2018), Quantitative approach is defined as a research method based on the philosophy of positivism, used to examine certain populations or samples, sampling techniques are generally carried out randomly, data collection uses research instruments, data analysis is quantitative/statistical to test established hypotheses. The formula for the independent sample t-test is as follows :

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

### 2.1. Assessment Implementation

- Observations on areas planted with beneficial plants and areas without beneficial plants.
- OPLEC pest attack data for 2018-2021 was processed using an independent sample t test and further studies were carried out.
- Palm oil production data is presented in the form of a description accompanied by tables and graphs.
- Data on the factors that affect the level of attack by the oil palm leaf-eating caterpillar (OPLEC) are presented in the form of a description

The description of the area of the study location is as follows:

Table 1. The area of the study in PT Socfindo Mata Pao

Planting Year	Areas with Beneficial Plants (Ha)		Areas without Beneficial Plants (Ha)	
	Block	Large (Ha)	Block	Large (Ha)
2010	2	55,94	1	36,68
2010	5	36,65	14	35,47
2007	6	32,78	4	56,45
2017	7	19,96	12	45,69
2008	16	47,32	17	47,13
Total area		192,65		221,42

Source: PT. Socfindo Kebun Mata Pao

Data collection is primary and secondary data. Primary data is obtained through direct observation in the field in the form of data on attack rates of oil palm leaf-eating caterpillars (OPLEC), interview data on factors that influence OPLEC pest attack rates, and oil palm production data. . Secondary data was obtained from various sources, books, journals, scientific articles and from PT Socfindo Mata Pao as supporting data for researchers.

- Observation, namely the method of collecting data by observing in the field by observing and recording all the information and data needed in this study.
- Literature study, namely by looking at the relevance and suitability of what is needed to support an assessment by looking at previous studies.
- Documentation, namely by relying on documents as a source of supporting data for the study.

### 3. Results And Discussion

Oil palm plants are classified as strong plants. Even so, this plant is also not immune from attacks by the oil palm leaf-eating caterpillar (OPLEC), both the less harmful and the more dangerous. Oil palm plants can be attacked by various pests of oil palm leaf-eating caterpillars (OPLEC) from the nursery to the plantation. (Hartanto, 2019).

Preliminary activities were carried out to determine the effectiveness of the beneficial plant at PT. Socfindo Kebun Mata Pao, namely by carrying out census activities in the plantation areas planted with beneficial plants and those not planted with beneficial plants by comparing the two areas using independent samples t-tests to obtain a significance value of the level of OPLEC pest attack. For the beneficial plant types in PT. Socfindo Mata Pao Gardens are *Turnera*, *A. leptopus*, and *C. cobanensis* with distribution in several blocks as study locations, namely, biological controlling used beneficial plants, multiplication is carried out to increase the number of beneficial plants and reduce the level of attack by OPLEC pests. The following is a beneficial plant propagation in PT. Socfindo Mata Pao Garden:

Table 2. Beneficial Plant Area in PT. Socfindo Mata Pao

PlantingYear	Block	Areas with beneficial plant (Ha)	Block	Areas without beneficial plants (Ha)
2010	2	0,64	1	0,64
2010	5	0,60	14	0,60
2007	6	0,60	4	0,60
2017	7	1,12	12	1,12
2008	16	0,76	17	0,76
<b>Total</b>			<b>4,44</b>	

Source: PT. Socfindo Kebun Mata Pao

Table 3. Propagation Beneficial Plant in PT. Socfindo Mata Pao

Type Benefit Plant	Propagation Techniques
<i>Cassia cobanensis</i>	Using cuttings and seeds. Propagation by cuttings is done by cutting new stems that have hardened and have at least 3 segments cut 15-20 cm long. Planting is done by inserting 1 segment into the baby bag soil. Planting with seeds is done directly in the cleared field. The seeds are mixed with sand in a ratio of 1:5 (one part seeds to 5 parts sand). The area to be planted is made of an array, the seed mixture is sown in the array and then covered with soil to a depth of about 2 cm. The number of cuttings per babybag is 1-2 cuttings until they are 1-2 months old. Planting in the field with a distance of 1 meter.
<i>Antigonon leptopus</i>	Propagation using cuttings and seeds is done by cutting 2-3 tendrils and then planting them in baby bags measuring 15 x 22 cm until they are 2-3 months old. Planting in the field with a distance of 1 meter between plants and a 1.5 meter high bamboo or wooden pole or a wooden cube- like box with a side length of 1.5 meters without any cover on each side. Treatment in nurseries and the field with manual weed control.
<i>Turnera</i>	This type of plant, multiplication uses cuttings. This is done by cutting a branch that has 2 segments and flowers, then implanting it in a 15 x 22 cm baby bag. Plants that are ready to be transferred to the field after 2-3 months are planted at a distance of 1 meter. Apart from maintenance, beneficial plant cultivation is also monitored.

Source: PT. Socfindo Kebun Mata Pao

Table 4. The results of the study of the average OPLEC attack rate in PT Socfindo Mata Pao

Year	Significance Value	Average attack rate (tail)	
		With Beneficial Plant	Without Beneficial Plant
2018	0,033	14,2	25,3
2019	0,006	13,9	22,8
2020	0,024	12,8	20,2
2021	0,044	11,9	16,2

Based on Table 4 shows that in 2018 the significance value was  $0.033 < 0.05$ . In 2019 the significance value is  $0.006 < 0.05$ . In 2020 the significance value is  $0.024 < 0.05$ . Furthermore, in 2021 the significance value is  $0.044 < 0.05$ . Shows that there is a difference in the average attack rate in areas planted with beneficial plants and areas without beneficial plants.

The analysis carried out proved that the existence of a beneficial plant was able to influence the level

of attack by the oil palm leaf-eating caterpillar (OPLEC). This statement is supported by the opinion (Prabawati, 2017) that pest control by utilizing beneficial plants planted around oil palm plantations is useful as a pest trap and encourages ecosystem stability so that the level of pest attack can be suppressed and is in balance.

There are several types of beneficial plants planted at the study site, namely *Turnera* (eight o'clock flower), *A. leptopus* (bride's tear flower), and *C. cobanensis*. This beneficial plant functions as a host for natural enemies, namely a place to get food, and a place to live and reproduce. Flowering plants provide a necessary food source for the growth and development of natural predators.

### 3.1. Reducing the Attack Rate of Palm Leaf Eating Caterpillars

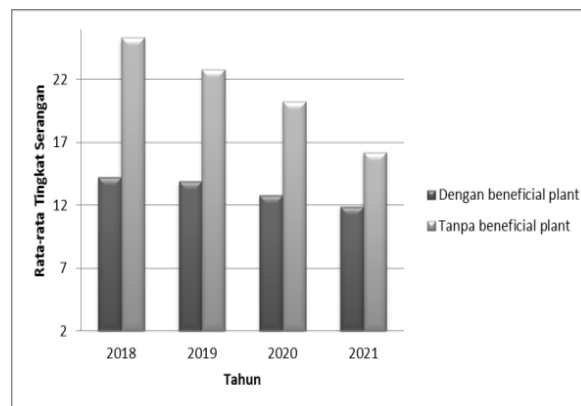


Figure 1. Graph of Average Attack Rate

Based on the graph, it can be seen that the highest average attack rate was found in areas planted with beneficial plants, which occurred in 2018 reaching 14.2 individuals. Continue to experience a decrease in the average attack rate in 2019, namely 13.9 individuals. In 2020 the average attack rate was 12.8 individuals. And in 2021 there will also be a decrease in attack rates with an average of 11.9 individuals.

Tabel 5. Attack Rate of Caterpillars in PT Socfindo Kebun Mata Pao

Scale	Attack Rate (tail/block)	Criteria
1	0-25	Light
2	26-39	Currently
3	>40	Heavy

Source: SOP PT. Socfindo Kebun Mata Pao

Based on SOP PT. Socfindo Kebun Mata Pao with an average attack level of oil palm leaf-eating caterpillars, namely bag caterpillars and fire caterpillars, which are included in the mild category. Therefore the use of beneficial plants as hosts for natural predators is effective in reducing the level of OPLEC pest attacks. However, the company's policy continues to carry out controls to prevent the explosion of the oil palm leaf-eating caterpillar (OPLEC). In addition to biological control PT. Socfindo Kebun Mata Pao, especially division I, carries out control using the HPS (High Power Sprayer), Fogging, and TI (Trunk Injection) methods with provisions for poison dosage, water dosage and processing according to the level of attack and company SOP.

### 3.2. The Role of Beneficial Plants on Palm Oil Production

Table 6. Results of the Study of Production Data 2018-2021 in PT Socfindo Kebun Mata Pao

Year	Average Production (tons)	
	With Beneficial Plant	Without Beneficial Plant
2018	52,6	55,6
2019	51,9	50,5

2020	64,4	73,6
2021	61,6	71,8

Source: PT. Socfindo Kebun Mata Pao

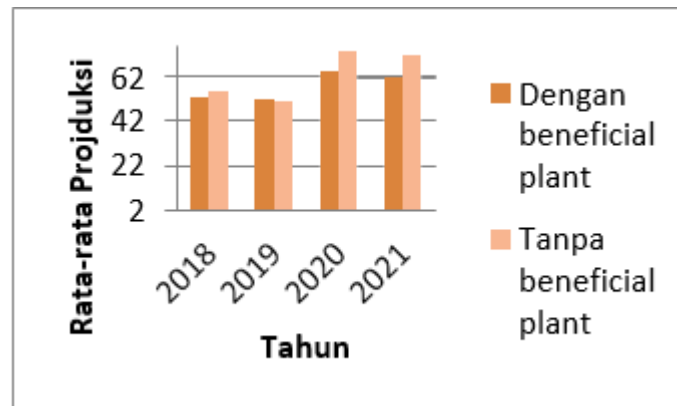


Figure 2. Graph of Average Production Data 2018-2021

Beneficial plants do not have a direct effect on increasing the production of oil palm plants. However, beneficial plants affect reducing the level of pest attacks through natural predators that prey on bagworms and caterpillars. Beneficial plants are nectar-producing plants that are developed as a food source for predators which are natural enemies for oil palm plant pests. This natural enemy is expected to counterbalance ecosystems damaged by attacks by caterpillars that eat oil palm leaves (Simangunsong, 2019). In line with this opinion, beneficial plants do not directly affect the production of oil palm plants. PT. Socfindo Kebun Mata Pao in increasing its production certainly knows several factors that influence it according to the company's SOP.

#### Factors Affecting the Level of Attack by Palm Leaf-Eating Caterpillars (OPLEC)

##### a. Climatic Conditions

Climate is an important cause of changes in pest populations in ecosystems. Insects as cold-blooded (poikilothermal) animals are physiologically unable to regulate their body temperature so their lives will be greatly influenced by weather conditions and the climate in which they live or their habitat (Ardi, 2019). The climatic conditions are influenced by several aspects, namely rainfall, air humidity, and air temperature.

Rainfall also has a major effect on insect ecology, especially on insect growth and activity. Weather and climate directly affect the rate of growth and death of insect species, under favorable conditions high development rates and low mortality.

##### b. Physiological Conditions

Derived from the word physiology which is defined as a branch of biology that studies the functioning of living systems. In this study, it was carried out by identifying the causes of increased attacks by caterpillars that eat palm leaves. OPLEC pest control methods at PT. Socfindo Kebun Mata Pao apart from biological control, also carries out chemical control, namely using pesticide poisons to kill OPLEC pests through HPS (High Power Sprayer), TI (Trunk Injection), and Fogging methods. Control with this method is considered quite effective but causes other problems to arise.

#### 4. Conclusion

In the study conducted, the attack rate of OPLEC pests continued to occur from 2018 to 2021, which showed that beneficial plants were more effective in reducing the attack rate of oil palm leaf-eating caterpillars by with the SOP of PT. Socfindo Mata Pao Gardens. The factors that affect the level of attack by OPLEC pests are climatic conditions and physiological conditions.

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