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Implementation of Integrated Pest Control To Reduce Rhino Beetle (*Oryctes rhinoceros*) Attacks in Oil Palm Plantations

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ABSTRACT

Oryctes rhinoceros or Rhino beetle (*Coleoptera; Scarabidae*) is a major pest in oil palm plantations. This pest is very harmful, especially in replanting areas, and young plants cause up to 25 per cent of palm oil-related deaths. This study aims to evaluate the effectiveness of integrated pest management in suppressing the population and development of *O. rhinoceros*. The research was conducted at the Oil Palm Plantation, PT. Sumber Indah Perkasa, Penawartama, Tulangbawang Regency, Lampung Provincial for one year. The analysis used is a descriptive analysis involving the collection of data from a variety of control techniques. The results showed that the pest control techniques of *O. rhinoceros* lightrap, ferotrap, holetrap, nets, larval quotes and chemistry could suppress or decrease pest populations. The control with light traps is very efficient because it obtained the number of captures of imago beetles up to 246,224 in 1 year. The integrated pest control of *O. rhinoceros* successfully reduced the attack of beetles until it did not reach the economic threshold. It is hoped that implementing integrated *O. rhinoceros* pest control can be a reference for plantations.

Keywords: Palm oil, light trap , *Oryctes rhinoceros*, Integrated Pest Menagement

INTRODUCTION

Oryctes rhinoceros or Rhino beetle (Coleoptera: Scarabidae) hereinafter referred to as *O.rhinoceros*, is an important pest in oil palm plantation. This pest attack is very detrimental, especially in the replanting area that is currently being carried out on a large scale in Indonesia. *Oryctes. rhinoceros* causes serious damage to young oil palm trees. Apart from Indonesia, this pest is one of the longest-standing agricultural pests in Malaysia [1]. In Tunisia, the *O. rhinoceros* type Oryctes Agamemnon also attacks various palm plants and causes heavy damage. It can even cause fungal attacks [2]. Former replanting plants undergoing decay are the preferred place by O. rhinoceros for breeding grounds [3] [4]

O. rhinoceros attack 2.5-year-old oil palm plants by gnawing leaf sheaths and plant canopies and can cause death when attacking the growing point. This attack resulted in fresh fruit bunches decreasing by 69% in the first year. In addition, *O.*

rhinoceros can kill young plants by up to 25%. *O. rhinoceros* also attack the base of the unopened midrib. As a result of this pest attack, the process of photosynthesis is disturbed and will affect the growth and productivity of oil palm plants [5] [6]. Piles of empty bunches of oil palms or decaying woody plant remains become breeding grounds for *O. rhinoceros* larvae.

Several integrated control techniques can be carried out to overcome the pest problem, such as planting a legume cover crop, mechanically chopping the palm trunk and evenly spreading stems, the use of insecticides, the application of the fungus *Metarhizium anisoliae,* the manual citation of larvae, the manufacture of hole traps, the use of pheromones, and the use of light traps. This study aims to examine the effectiveness of integrating pest control *Oryctes rhinoeros* to suppress the development of the pest population in the field.

MATERIALS AND METHODS

This research was conducted at PT. Sumber Indah Perkasa, division 4, Penawartama District, Tulangbawang Regency, Lampung Province from 1 years. The research method used by descriptive analysis of data collection in the company, collection of monitoring data and data on some *O. rhinoceros* pest control applied in division 4. Observations were made in the field by taking data on pest control techniques such as lightrap, ferotrap, manual citation of larvae or imago, holetrap, the use of nets and chemical control using insecticides carbosulfate and cypermethrin.

RESULTS AND DISCUSSION

The results of the application of integrated pest control of *O. rhinoceros* in the 4th division:

Catch *O. rhinoceros* with Light trap

Lightrap control uses ultraviolet tubular lamp (TL) lamps. Ultraviolet colour lamps are used because ultraviolet light waves attract the attention of *O. rhinoceros* more than TL lamps which are white [7]. *O. rhinoceros* is a nocturnal insect, so it is nocturnal. Nocturnal insects tend to be attracted to light at night.

Table 1. The catch of imago *O. rhinoceros* with a light trap

Month (2020-2021)	Total Quotation (*Oryctes*)	Number of Lamps	Quote Day
April	30.813	53	25
May	58.232	53	23
June	32.853	53	25
July	21.205	53	26
August	21.694	53	24
September	24.590	53	26
October	19.616	53	26
November	7.897	53	25
December	7.768	53	25
January	5.613	53	24
February	5.451	53	23
March	5.377	53	26
April	5.115	53	25
Total	246.224		

From the data above, from April 2020 to April 2021, it can be seen that the highest citation results occurred in May 2020, namely 58,232 individuals.

At the same time, the results of the citations occurred at least in April 2021, namely as many as 5,115 individuals. The catch in May 2020 was the highest at 47 fish/lamp/day, while in April 2021, the lowest was 3 fish/lamp/day. Continuous control has the effect of reducing the population of *O. rhinoceros* in the field.

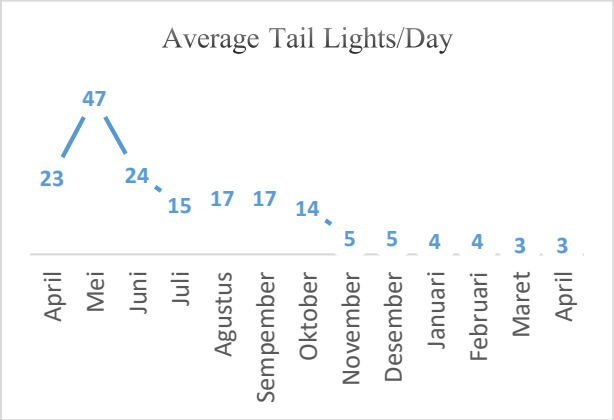

Fig 1. The capture of *O. rhinoceros* using light traps/Day

Insects are able to see ultraviolet radiation. Nocturnal insects are often attracted to light sources that emit large amounts of UV radiation, so they are used as traps to control various pests [7]. Light affects the behaviour and development of insects, otherwise known as phototaxis. Nocturnal insects are positively phototropic and are attracted to large amounts of artificial light. Most nocturnal insects are attracted to the ultraviolet light spectrum, ranging between 350 and 550 nm. However, the colour of the light has little effect on the catch of adult *O. rhinoceros* [8]

Imago catches with ferrotrap

Control of *O. rhinoceros* was also carried out using a ferrotrap. The first ferrotrap installation was carried out in April 2020 (Table 2). There was an increase in imago catches from the following month until August 2021, and then it gradually decreased (Figure 2).

Table 2. *O.rhinoceros* imago catches with ferrotrap

Month (2020-2021)	*Oryctes*	Number of Ferrotraps
April	702	20
May	1,066	20
June	1,222	32
July	1,012	32
August	1,737	32
September	1,696	32
October	1,220	32
November	770	32
December	519	32
January	329	32
February	277	32
March	235	32
April	219	32
Total	11.004	

The use of ferrotrap to capture *O. rhinoceros* imago is still widely practised in oil palm plantations. The use of ferrotrap is considered quite effective in controlling *O. rhinoceros*.

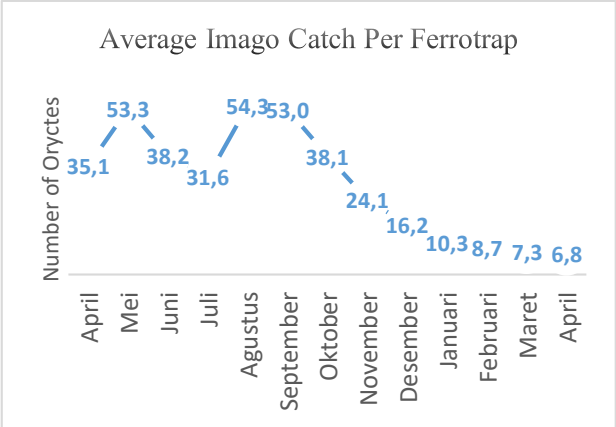

Fig 2. The average catch of imago *O. rhinoceros* per ferotrap

The use of mass traps with aggregate pheromones with the active ingredient ethyl 4-methyloctonoate is widely practised in plantation enterprises in Malaysia, especially in young plants after replanting [1]. The use of pheromones also monitors imago *O. rhinoceros* in the field.

Manual larva quote

Manual control of *O. rhinoceros* was also carried out by quoting larvae in empty studs or

weeds in dead poles. In early April 2020, control was carried out, and many larvae of *O. rhinoceros* were found but gradually decreased to 1,970 kg.

Table 3. Larvae quotes of *O. rhinoceros*

Month (2020-2021)	Total (Kg)	Total Power	The income per Labor (Kg)
April	11.455	866	13,23
May	7.059	572	12,34
June	8.775	856	10,25
July	14.755	1,172	12,59
August	12.901	1,048	12,31
September	10.074	1,067	9,44
October	6.449	677	9,53
November	1.699	170	9,99
December	272	24	11,33
January	2.082	174	11,97
February	3.250	220	14,77
March	1.882	153	12,30
April	1.970	163	12,08
TOTAL	81.621	1758	

The development of *O. rhinoceros* larvae is influenced by the availability of organic waste materials, especially the presence of leaf litter because it contains substances needed by the larvae to develop. However, temperature and humidity are more influential for the pupa stage [9]

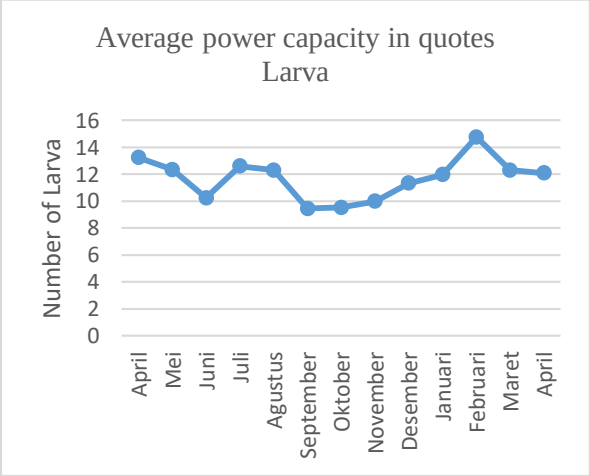

Fig. 3. Average power capacity in quoting larvae of *O. rhinoceros*

O. rhinoceros eggs and larvae are usually laid on the ground or in places rich in organic matter, such as empty stud, litter,r or garbage. The application of oil palm empty fruit bunches in oil palm cultivation which functions as mulch and soil compost can improve the physical and biological properties of the soil but actually increase the population of *O. rhinoceros* [10]. Extracting the larvae of *O. rhinoceros* is quite effective in suppressing the larval population. However, adequate human resources is required.

Control technique with Holetrap

Control using holetrap or trap holes is intended to trap O.rhinoceros larvae to collect in one place. This technique is quite effective in reducing the larval population, especially efficiently in finding larvae in the soil or empty studs. The catch of *O. rhinoceros* larvae can be seen in table 4 below.

Table 4. Catch of *O. rhinoceros* larvae with hole trap

Month 2020-2021	Larva Yield (kg)	Number of holetrap points
July	8,75	16
August	25,70	16
November	18,91	16
December	28,00	16
March	18,24	16
April	14,85	16
Total	114,45	

The use of hole traps is intended to facilitate the collection of larvae or pupae in oil palm blocks. Usually, a hole trap is made by filling the trap hole with organic materials such as empty grass, leaf litter, straw, cow dung and so on. Coconut cut powder media with cow dung media is preferable to wood powder media with cow dung [11]. For replanting gardens, chopping or chipping former oil palm trunks is recommended to suppress the development of *O. rhinoceros* larvae in the field.

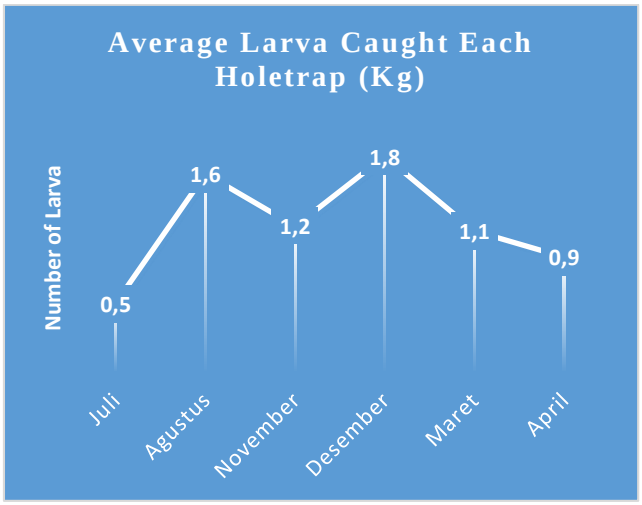

Fig. 4. Average Larvae Caught Each Holetrap (kg)

Places such as waste compost piles, wood waste, livestock manure piles, haystacks, stumps or dead coconut trees will be used as active nests as breeding grounds for eggs to pupae of O. rhinoceros. The use of Oryctes Nudivirus that infects the midgut of insects in Fiji can reduce the population of these insects [12]. This hole trap will be more effective when combined with applying a biological control agent in the form of the fungus Metarhizium anisopliae in trap hole. Metarhizium anisopliae is an entomopathogenic fungus that has the potential to control O. rhinoceros. Larvae infected with this fungus can die from the second to the twelfth day. The use of a hole trap, when combined with a dose of 4 grams of mushrooms with 100 grams of manure, will produce the best mortality [13].

Control technique with Orycnet trap

Control of *O. rhinoceros* has also been tried using a net wrapped around the growing point of the oil palm. The purpose of using Orycnet is to prevent attacks at growing points. The nets wrapped around the growing point of the young oil palm will prevent *O. rhinoceros* from reaching the growing point.

Table 5. Catches of *O. rhinoceros* with orycnet

Month (2020-2021)	*Oryctes*	Number of net points
October	2,644	14
November	1,970	16
December	1,913	16
January	1,287	18
February	1,330	18
March	1,465	18
April	1,253	18
Total	11,862	

The use of nets also causes the insects to become entangled and unable to move, making catching easier. The catch of *O. rhinoceros* at each point of the net can be seen in Figure 5 below.

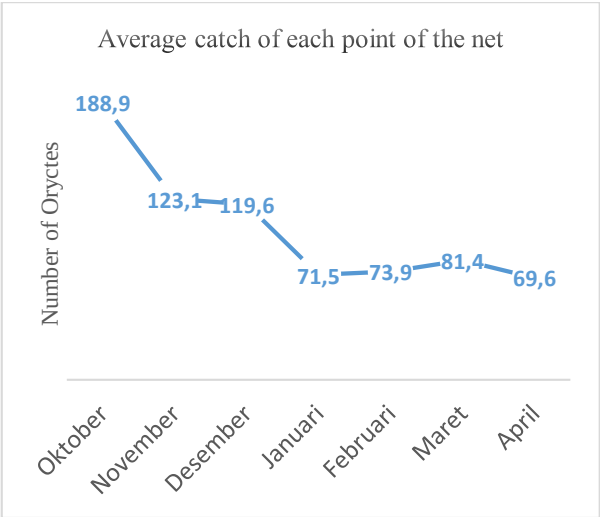

Fig. 5. Average Catch of Each Point of the Net

Using nets wrapped around the base of the growing point can reduce the intensity of damage to oil palms. For eight months, the use of an orycnet trap reduced the catch of *O. rhinoceros* imago in the field (Figure 5). Insects will be trapped in the net, so they cannot reach the growing point. The use of orycnet traps with pheromones is quite effective in reducing the attack rate of *O.*

rhinoceros than the use of nets combined with insecticides [14]

Census Attacks *O. rhinoceros*

The census of *O. rhinoceros* attacks was carried out by counting the number of affected trees (new attacks). Attacks of *O. rhinoceros* are usually marked by holes and palm fibres resulting from *O. rhinoceros* activity which will enter the growing point of the palm tree. A comprehensive census is carried out on all trees. After conducting a census of the principal, it turned out that there was a decrease in new attacks, which gradually decreased, as shown in Figure 6 below.

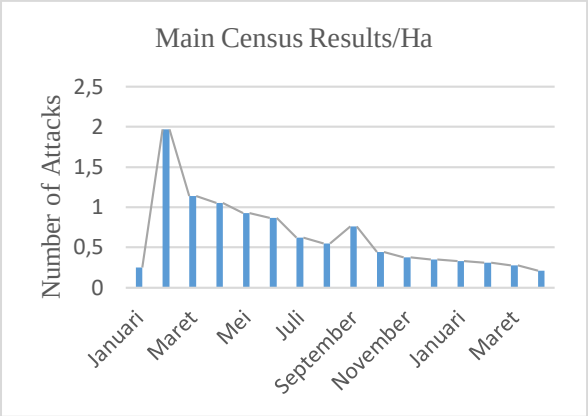

Fig. 6. Main Census Results/Ha

Based on the census conducted to detect *O. rhinoceros* attacks during 2020-2021, it can be seen that there is a decrease in *O. rhinoceros* attacks. The implementation of integrated and sustainable pest control of *O. rhinoceros* has been shown to reduce the new attack of the beetle.

CONCLUSION

From the results of the studies that have been carried out, it can be concluded that the integrated and sustainable pest control of *O. rhinoceros* can reduce the attack of *O. rhinoceros* below the economic threshold. Control using lightrap provides the most catches and is effective in controlling these pests in the field.

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