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ANALYSIS OF OIL PALM LEAF DAMAGE DUE TO ATTACKS OF THE RHORNY BEETLE (ORYCTES RHINOCEROS) IN THE PLANTING PHASE PRODUCTION AT PT. BINANGA KARYA

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Abstract

This study aims to analyze the intensity of rhinoceros beetle (Oryctes rhinoceros) attacks on oil palm leaf sheaths during the Mature Plant (TM) phase at PT. Binanga Karya. The rhinoceros beetle is a major pest of oil palm plants, reducing vegetative growth and potentially impacting crop productivity if not properly controlled. This study was conducted through a field survey using purposive sampling in mature plant blocks. Observed parameters included the number of infested plants, the number of leaf sheath holes, and the level of leaf sheath damage as an indicator of pest attack intensity. The data obtained were analyzed descriptively and quantitatively by calculating the percentage of attack intensity based on the ratio between the number of infested plants and the total sampled plant population. The results showed that rhinoceros beetle attack intensity was mild to moderate, with variations in the level of damage between plant blocks. The leaf sheath damage found generally consisted of bore holes and bite marks at the base of the sheath. Although the attack has not yet caused a significant decrease in production, the presence of this pest still requires vigilance because it has the potential to increase the level of damage if the population is not controlled. Therefore, appropriate and sustainable pest control efforts are needed to maintain plant health and the stability of palm oil production.

Keywords: Oil Palm, Rhinoceros Beetle, Attack Intensity, Leaf Sheath Damage And Productive Plants.

INTRODUCTION

Oil palm (Elaeis guineensis Jacq.) is a major plantation commodity in Indonesia, contributing significantly to the national economy through palm oil production reaching more than 40 million tons per year.(Ningrum, 2021)However, the productivity of this plant is often disrupted by pest attacks, one of which is the rhinoceros beetle (Oryctes rhinoceros L.), which is known as the main pest in the early growth phase.(Lestari, 2020)In the immature phase of the plant, leaf sheath damage caused by this beetle can inhibit vegetative growth, reduce photosynthesis, and potentially reduce long-term productivity. This study aims to analyze the mechanism of this damage in depth, focusing on the morphology and physiology of the affected leaf sheaths, to support more effective pest control strategies in oil palm plantations.(Wawan et al., 2019).

Oryctes rhinoceros, a Coleoptera species of the Scarabaeidae family, attacks oil palm leaf sheaths by boring into and feeding on young tissue, causing damage in the form of holes, tears, or drying of the sheaths. In the immature phase, oil palm plants are still developing their canopy and roots, so damage to the leaf sheaths can disrupt nutrient and energy allocation, resulting in stunted growth.(Arief et al., 2024)Recent studies have shown that these attacks are not only localized but can also spread through vectors such as wind or larval transmission, exacerbating the risk of epidemics in large-scale plantations (Siregar et al., 2020). This damage analysis is crucial for understanding severity based on variables such as attack intensity, plant age, and environmental conditions, which are often overlooked in conventional control practices.

The economic impact of this damage is substantial, with estimated production losses reaching 10-30% in several major palm oil-producing regions, such as Sumatra and Kalimantan. In the immature phase, leaf sheath damage can delay the transition to the productive phase, extending the planting period and increasing maintenance costs.(Magfira et al., 2022). In addition, the use of chemical insecticides for control often leads to problems of pest

resistance and negative environmental impacts, prompting the need for a more holistic analytical approach. This research is expected to provide empirical data for the development of more sustainable integrated control methods, such as the use of natural enemies or biotechnological techniques.(Arief et al., 2024). Several previous studies have explored aspects of Oryctes rhinoceros attacks, but their primary focus has been on the productive phase or biological control. For example, analysis of leaf sheath damage has been limited to visual measurements or simple damage indices, without integration with physiological parameters such as chlorophyll content or plant defense enzyme activity. Using current academic language, this study will adopt a multidisciplinary approach, including morphometric and biochemical analyses, to uncover damage patterns specific to the immature phase. This aligns with global research trends emphasizing predictive modeling for pest risk mitigation in tropical agriculture.(Efendi, 2020). Overall, this background emphasizes the urgency of analyzing oil palm leaf sheath damage caused by Oryctes rhinoceros as a basis for innovative, efficient and environmentally friendly pest control. By understanding the dynamics of damage during the early growth phase, this research contributes to the sustainability of the Indonesian palm oil industry, while also supporting sustainable development goals by reducing reliance on hazardous chemicals.(Fauzana, 2020)

RESEARCH METHODS

Location and Time of Research

This research was conducted on a mature oil palm plantation (TM) with a history of rhinoceros beetle (Oryctes rhinoceros) infestation. The research location was at PT. Binanga Karya. The location and research blocks were determined purposively, selecting blocks that had experienced or were currently experiencing rhinoceros beetle infestation. The research was conducted for three months, from October to December 2025. Research activities included preparation, field data collection, data processing, and data analysis.

Tools and materials

The tools and materials used in this study were adapted to the needs of observing rhinoceros beetle (Oryctes rhinoceros) attacks in the field. The tools used included stationery and observation sheets for data recording, a Global Positioning System (GPS) to determine the coordinates of sample plants, a digital camera as a means of visual documentation of leaf sheath damage, a machete or egrek to open the sheath if necessary, a meter or measuring stick to assist in measuring plant parts, a form for recording the number of drill holes and the level of sheath damage, and a laptop used in the data processing and analysis process. The research materials consisted of oil palm plants in the Mature Plant (TM) phase, oil palm leaf sheaths attacked and not attacked by rhinoceros beetles, and fresh fruit bunch (FFB) production data as supporting data if further analysis is carried out.

Research methods

This study used a field survey method with direct observation of sample trees. This method aimed to determine the extent of rhinoceros beetle infestation and to analyze the form and extent of damage to oil palm leaf sheaths caused by this pest during the mature plant phase. Data obtained from these observations were then analyzed descriptively and quantitatively to describe the condition of leaf sheath damage and its relationship to plant condition.

Fig 1. Condition of leaf sheath damage

Population and Sample

The population in this study was all oil palm plants in the Mature Plant (TM) phase found in PT. Binanga Karya's plantation blocks. The research sample was determined using a purposive sampling method, namely by

selecting sample plants in plantation blocks with a history of rhinoceros beetle attacks. The number of sample plants was determined based on the plant population in each block using the Slovin formula or based on applicable regulations at the plantation. Each sample plant was observed based on predetermined parameters.

Observation Variables and Parameters

The variables observed in this study consisted of primary and secondary variables. The primary variables included the level of rhinoceros beetle infestation and the level of damage to oil palm leaf sheaths. Observation parameters for each sample plant included:

Oryctes Attack
Oryctes Attack Intensity
Types and forms of leaf sheath damage

Fig 2. Condition of oil palm leaf sheaths

Data collection technique

Data collection was conducted through direct field observations of sample plants. Each plant was observed for leaf sheath condition by recording the number of dent holes, the type of sheath damage, the number of productive sheaths, and the condition of the plant's shoots. Visual documentation using a digital camera was also conducted to support the observation data. Fresh fruit bunch (FFB) production data was obtained from plantation records as secondary data, if used in the analysis.

Data Analysis Techniques

Observation data was analyzed descriptively and quantitatively. The rhinoceros beetle infestation level was calculated based on the percentage of affected plants using the following formula:

$$\text{Intensitas Serangan (\%)} = \frac{\text{Jumlah pokok terserang}}{\text{Jumlah total pokok}} \times 100$$

The level of leaf sheath damage is analyzed based on the number of drill holes and the severity of the damage, which is then classified into light, moderate, and heavy categories.

RESULTS AND DISCUSSION

Results

Recapitulation of Oryctes Attack Data on Block 6

Based on the research results, data on oryctes attacks in block 6 of PT. Binanga Karya were obtained, which are presented in Table 1.

Detection Location Block 6	Old Oryctes (pkk)	New Oryctes (tail)	Damage Description
Dead End Rain House	11	0	Broken leaf stalk/sengkleh
Ngadimen Dead End	7	0	Broken leaf stalk/sengkleh
Dead End House Rain & Tree 5	6	0	Broken leaf stalk/sengkleh
Dead End Cemetery	5	0	Broken leaf stalk/sengkleh
Dead End Mail	8	0	Broken leaf stalk/sengkleh
New Dead End	9	0	Broken leaf stalk/sengkleh
Block 6	7	0	Broken leaf stalk/sengkleh

Based on the results of observations of rhinoceros beetle attacks in Block 6, it was found that all detection locations showed old oryctes attacks, which were characterized by damage in the form of broken leaf sheaths or shingles. The number of old oryctes attacks varied between locations, with the highest number found at the Buntu Rumah Hujan location of 11 trees, while the lowest number was found at the Buntu Kuburan location of 5 trees. The variation in the number of attacks indicates that the level of leaf sheath damage is uneven and is influenced by the microhabitat conditions at each observation location. During the entire observation period, no new oryctes infestations were observed, as indicated by the absence of active beetles or new boring holes in the plant shoots. This indicates that the rhinoceros beetle infestation in Block 6 is residual, or a remnant of a previous attack, while new infestations are relatively rare. This is likely related to previous control efforts and the reduction in organic matter sources that support rhinoceros beetle development, thus suppressing the potential for new infestations.

Oryctes Attack Intensity Calculation

$$\text{Intensitas Serangan (\%)} = \frac{\text{Jumlah pokok terserang}}{\text{Jumlah total pokok}} \times 100$$

$$= \frac{53}{3575} \times 100$$

$$= 1.48\%$$

Based on observations in Block 6, with a total population of 3,575 oil palm trees, the rhinoceros beetle infestation intensity was 1.48%. This intensity value was calculated from a total of 53 trees showing symptoms of old oryctes infestation, such as broken fronds or scallops. No new oryctes infestations were found during the observation period. This relatively low infestation intensity indicates that the rhinoceros beetle infestation level in the study area is relatively light and has not spread widely across the observation block. The low intensity of these pest attacks indicates that the rhinoceros beetle population in Block 6 is below the control threshold, thus not causing significant pressure on the growth of mature oil palm plants. The absence of new attacks during the observations also supports the suspicion that the attacks are residual from previous infestations and do not indicate an increase in the pest population. Given these conditions, pest management efforts in the research area are more directed at ongoing monitoring and recovery of plants that have experienced frond damage, to prevent new attacks in the future.

Discussion

Observations showed that the rhinoceros beetle infestations in Block 6 were all classified as old infestations, characterized by leaf sheath damage in the form of breaks or dents. The absence of new infestations during the observation period indicates that pest activity in the area has ceased. This reflects that the infestation phase had

occurred previously and did not develop further during the study. Variations in the number of Oryctes lama infestations between observation locations, with the highest values in Buntu Rumah Hujan and the lowest in Buntu Kuburan, indicate uneven levels of leaf sheath damage. This difference is thought to be influenced by microhabitat conditions, such as environmental humidity, organic matter availability, and garden sanitation conditions at each location. Areas with more humid conditions and abundant organic matter are generally more likely to support rhinoceros beetle development. The absence of new oryctes infestations during the entire observation period is a positive indication of the pest control status in Block 6. The absence of active beetles or new boring holes in the plant shoots indicates that the rhinoceros beetle life cycle was not actively ongoing at the time of the study. This suggests that the pest population was at a low level and showed no signs of new infestations.

One factor suspected to contribute to the low rate of new infestations is previous control efforts, whether mechanical, cultural, or chemical. Garden sanitation practices such as cleaning up organic matter, stump management, and proper frond pruning can reduce the rhinoceros beetle's breeding grounds, thus reducing the likelihood of new infestations. Based on the attack intensity calculation, the value was 1.48% of the total population of 3,575 oil palm trees. This value is considered low and indicates a light pest infestation level. A low attack intensity indicates that the majority of the plants are healthy and only a small portion have suffered damage from previous attacks. The low intensity of attacks also indicates that the rhinoceros beetle population in the study area is below the economic control threshold. Under these conditions, the pest infestation has not significantly impacted the vegetative growth of the plants or the potential for fresh fruit bunch production during the mature phase. This is consistent with the absence of any signs of severe damage to the plant shoots.

Another factor contributing to the low intensity of attacks is the age of the plants, which have entered the mature phase. At this stage, oil palm plants generally have stronger stems and fronds than younger plants, making them relatively more tolerant to rhinoceros beetle attacks. Furthermore, a well-developed root system and crown allow the plants to recover more quickly from frond damage. Considering the observation results and low attack intensity, the pest management strategy in Block 6 should focus on routine monitoring and preventative measures. Optimal recovery of plants with damaged fronds is essential to maintain canopy balance and support photosynthesis. Continuous preventative measures are expected to reduce the potential for new attacks and maintain the health of oil palm plants.

CONCLUSION

Based on the research results, it can be concluded that rhinoceros beetle (Oryctes rhinoceros) attacks on oil palm plants in the Mature Plant phase in Block 6 of PT. Binanga Karya were entirely old attacks characterized by broken leaf sheaths or shingles, with no new attacks found during the observation period. Of the total population of 3,575 trees, 53 trees experienced damage with an attack intensity of 1.48%, which is classified as a light attack category and is below the control threshold. This condition indicates that the pest population is relatively under control and does not put significant pressure on plant growth, so that pest management efforts are more directed at continuous monitoring and recovery of plants that have experienced damage to prevent new attacks in the future.

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