The Characteristics of Acacia mangium Stands at Site 23 B, RPH Maribaya, BKPH Parung Panjang, KPH Bogor which is attacked by pests and diseases

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Abstract. RPH Maribaya, BKH Parung Panjang, KPH Bogor is an Industrial Forest Plantation dominated by A. mangium stands. The characteristics of A. mangium stands is done by calculating the frequency and intensity of pest and disease attacks on A. mangium stands. The method used in this research is referring to the Criteria and Score for Plant Pests / Diseases [1]. The research was conducted on 85 sample trees in 7 plots in the Plot 23b of the RPH Maribaya by Simple Random Sampling. The results of this research indicate that the highest attack frequency on A. mangium is in plot 4 is 80%, and the lowest is in plot 7 which is 0%. The highest attack intensity is found in plot 4 that is 50% and the lowest is in plot 7 which is 0%. The percentage of attack frequency ranges from 20% - 80% (low category) with an average percentage of attack frequency of 41%. The percentage of attack intensity ranged from 20% - 50% (mild category) with an average percentage of attack intensity of 23%. The pests found in A. mangium stands are sac caterpillars (Pteroma plagiophleps), and the larva of white grub (Lepidiota stigma).

1. Introduction
Perum Perhutani (BUMN) is a State-Owned Enterprise that manages forests specifically in Java. It plays an important role in ensuring the conservation of forest areas in order to support the carrying capacity of the social and economic development of the community; one of which in the Forest Management Unit (KPH), Bogor, West Java. KPH Bogor is a forest management unit that is included in the Regional Division of West Java and Banten with a total forest area of 49,337.06 hectares. The management of these forest areas in the KPH Bogor is carried out by 5 BKPH (Forest Stake Unit Section) and 16 RPH (Forest Stakeholder Resort). One of the BKPH operates under the auspices of the KPH Bogor is BKPH Parung Panjang which is located in the villages of Gintung Cilejet and Jagabaya, Parung Panjang District, Bogor Regency, West Java, and is bordered by the Banten Province. BKPH Parung Panjang has 3 RPH (Forest Pemangkuan Resort) areas including the Maribaya RPH, Tenjo RPH, and Jagabaya RPH [2]. BKPH Parung Panjang has a forest area of 5,342.90 hectares with a relatively flat topography and manages plantations dominated by Acacia mangium. forestry plant; it is planted for land rehabilitation and HTI (Industrial Plantation Forest) development. Timber products from A. mangium have a high economic value for the use of pulp, paper and carpentry wood. A. mangium plantations in the forest area of BKPH Parung Panjang use the monoculture method. Monoculture planting of forests can cause plants to be quite susceptible to damaging pests and diseases. Some examples of the types of pests that attack...
acacia plants include the bag caterpillars (*Pteroma plangiophelps*), grasshoppers (*Valanga nigricornis*), branch borer (*Xylosabdrus* sp), and stem weevil (*Xystrocera globosa*) [3]. This causes a lessening in which the characteristics of stand conditions wind up affecting the quantity, quality, sale value, and crop production of the asset. Based on the data from Perum Perhutani, *A. mangium* regarding wood production from 2014 to 2018, it has been reported that *A. mangium* plantations in BKPH Panurung Panjang had a significant decline in wood productivity in 2015 by staggering 88%.

To overcome this problem, a study was done to find out the information about the characteristics of *A. mangium* stands that are attacked by pests and diseases for better efforts to manage *A. mangium* plantations. The purpose of this study is to determine the frequency and intensity of the attacks on *A. mangium* stands. This determine the types of pest and disease attacks against *A. mangium* stands in the BKPH Parung Panjang forest area with their symptoms, and forms of control.

2. Materials, Tools, and Methods
2.1. Materials
Pest or disease samples, pest and disease reference books, tally sheets, notebooks, and infraboards.

2.2. Tools
Measuring tapes, stationeries, roll meters, GPS essentials.

2.3. System Random Sampling
Field data collection was carried out in the *A. mangium* forest area BKPH Parung Panjang, Maribaya RPH plot 23 b by taking an IS (Intensity of Sampling) sample of 1% consisting of 7 plots producing 20 mx 20 m.

2.4. Method of Criteria and Scores of Plant Pests / Diseases
Observe *A. mangium* stands in each plot that experiences symptoms of pests / diseases and healthy ones. Observations were made by determining the value of pest and disease attack scores based on the symptoms of the attacks and the criteria as in Figure 1.

![Figure 1. Method of Criteria and Scores of Plant Pests / Diseases (Mardji [1])](image)
2.5. Frequency of Attacks
The frequency of attacks (FS) is determined by comparing the number of plants attacked by pests / diseases with the total number of trees observed, and expressed in percent (%) with the following formula:
\[ F = \frac{Y}{X} \times 100\% \]
Information:
F: Frequency of attack
Y: Number of trees attacked
X: Number of trees observed

Assessment of attack rates based on the percentage of plants attacked [4] Table 1.

| Percentage % | Attack Level Classification |
|--------------|-----------------------------|
| <10%         | Very Low                    |
| 10 – 50%     | Low                         |
| 51 – 75 %    | Medium                      |
| >75%         | High                        |

2.6. The Intensity of Attacks (IS)
The Intensity of Attacks (IS) is calculated using the formula [1] :
\[ IS = \frac{X_1Y_1 + X_2Y_2 + X_3Y_3 + X_4Y_4}{XY} \times 100\% \]
Information:
IS = The Intensity of Attacks
X = number of trees observed
Y = number of score criteria (4)
X1 = number of trees that are lightly attacked (score 1)
X2 = moderate number of trees (score 2)
X3 = number of trees that are heavily attacked (score 3)
X4 = number of dead trees (score 4)
Y1 = Value 1 with mild attacked criteria
Y2 = Value 2 with moderate criteria
Y3 = Value 3 with severe criteria
Y4 = Value 4 with dead criteria or no signs of life

The assessment of stand conditions is based on the percentage values of the intensity of attacks can be seen in Table 2.

| The Intensity of Attacks (IS) % | Stand Condition               |
|---------------------------------|-------------------------------|
| 0 - 1                           | Healthy (S)                   |
| >1 - 25                         | Lightly damaged (RR)          |
| >25 – 50                        | Moderately damaged (RS)       |
| >50 – 75                        | Heavily damaged (RB)          |
| >75 – 100                       | Very heavily damaged or dead (RT) |
2.7. Determine Type of Pest or Disease
Determination of the kind of pests and plant diseases is done through observing macroscopic symptoms. Pests and diseases are identified by comparing the morphological characteristics of insects or diseases that are found with the identification book of pests and diseases of forestry plants along with existing literature on pests and diseases in *Acacia mangium* plants.

2.8. Determine The Pest / Diseases Control
Determine the techniques of controlling and preventing the types of pests or diseases that are found correctly and methods of maintaining plants from various sources of literature and books.

3. Result and discussion

3.1. The Assessment of Criteria and Scores of *Acacia mangium* Pests / Diseases
Based on the results of data collection in the field through the criteria assessment method and the score of pests / diseases of plants, the results obtained were the results of observations of pests and diseases in *A. mangium* based on the level of criteria for each damage in Figure 2.

![Figure 2. The Results of Assessment Criteria and Scores *Acacia mangium* Pests / Diseases](image)

Based on Figure 2., *A. mangium* stands in each of the 7 plots, have several different criteria and characteristics of stands. From the total of 85 *A. mangium* trees, we got a total of 55 healthy trees, 16 lightly damaged trees, and 14 dead trees. The unhealthiest *A. mangium* plants are in plot 4 with the criteria of light damage of 4 trees and 4 trees of death. The healthiest *A. mangium* plants are in plot 7 with the criteria that all trees are entirely healthy. From several *A. mangium* stands, some symptoms of pest attack are found through the signs of damage. Some signs of damage are leaves with holes and yellowing Figure 3. The leaf symptoms plants that are perforated by leaf-eating pests, caused by bag caterpillars. This pest replaces the top of the leaves, so the bite marks are dried and then created a hollow. Other symptoms of pest attacks found are root damage, dry, blackened and decaying stems Figure 4. The root neck area is peeled off, caused by root-eating pests or stems. These pests are generally attracted to unhealthy or diseased trees.
Figure 3. *A. mangium* leaves which have holes and change color

Figure 4. Rotating *A. mangium* stems

3.2. Attack Frequency (FS) and Attack Intensity (IS) of *Acacia mangium*

Based on the calculation results from the assessment criteria and the score of pests and diseases of *A. mangium* plants, the percentage of attack frequency (FS) was obtained in Figure 5. and the percentage of attack intensity (IS) in Figure 5.

Figure 5. The Percentage of Attack Intensity Value (IS) of *A. mangium* in each plot

Figure 6. The Percentage of Attack Intensity Value (IS) of *A. mangium* for each plot
The biggest attack frequency is plot 4 with a total percentage of attack frequency is 80% and the lowest is plot 7 which is 0% figure 5. The frequency of attack rates of > 75% is included in the high category [4]. The greatest intensity of pest and disease attacks is plot 4 which is 50% and the lowest is plot 7 at 0% figure 6. The attack intensity by 50% is included in the category of the moderately damaged [5]. Plot 4 has the highest frequency of attack and intensity because it has high tree cover, the spacing plant is not visible, and moreover there are several types of vegetation other than *A. mangium*, which will become a weed for *A. mangium*. Plot 7 has an overall topography of *A. mangium* plants, the spacing of plant is still regular, and no weeds grow around *A. mangium* plants [6]. Weeds act as an alternative host for pests and diseases, because weeds have a high competition with staple plants to get growing space, absorb water, nutrients, and sunlight. This causes physiological disorders for *A. mangium* and it is easily attacked by pests or diseases [3]. Based on figure 5, and figure 6., the percentage of attack frequency obtained between 20% - 80% is included in the low category with an average percentage of attack frequency of 41% ] and intensity of attacks between 20% - 50% included is in the mild category with an average percentage of attack intensity of 23%. The development of pest and pathogen populations are dynamic in accordance with environmental conditions that affect the activity of host pests and diseases [7].

The average value of the frequency and intensity in plot 7 have a value of 0%. This due to the fact that on plot 7 is beside the RPH Maribaya Office as shown in figure 7, therefore plantation managers can easily handle and maintain the plants with a variety of easily accessible facilities.

**Figure 7.** RPH Maribaya Office House is located next to the Plot 7

### 3.3. Types of Pests *A. mangium* Found

#### 3.3.1. Sac Caterpillar (*Pteroma plagiophleps*)

*Pteroma plagiophleps* (Lepidoptera: Pyschidae), is a leaf pest that generally damages *A. mangium* plants [3]. The *A. mangium* forest area in BKPH Parung Panjang RPH Maribaya, Bogor Regency, West Java, obtained the results that leaf damaging pests found on *A. mangium* plants were *Pteroma plagiophleps* sacs shown in figure 8, [6]. A type of sac caterpillar that is generally causes a large attack on *A. mangium*, namely *Pteroma plagiophleps* [3]. The spread areas of this pest are Sri Lanka, Bangladesh, India, and Southeast Asia, especially in several regions in Indonesia [8]. This pest has several host plants, including *Paraserianthes falcatoria, Acacia mangium, A. auliculiformis, Rhizophora spp., Eucalyptus spp., Pinus merkusii, Hevea brasiliensis, Shorea spp., Palmae spp. , and others* [9] . *Pteroma plagiophleps* has several characteristics that are always live in cone-shaped bags, 16 mm long sacs, brown, made of several leaf substrate host glued together by silk producing by larvae, and these pests hang on branches or leaves [10]. Female pests do not have wings, while the males have small wings [3]. The chronological attack of *Pteroma plagiophleps* pests on plant leaves are at first pests eat young leaves, especially at the bottom of the leaves and result in hollow and dry leaves. These pests cause a damage to the plants in the lower epidermal layer and leaf mesophyll tissue leaving the upper epidermal tissue then the rest of the upper epidermis dries as the leaves will grow back [10]. This pest has a life cycle that starts with an egg phase that lasts for 10 days, larvae phase that lasts 49-62 days, and pupae phase that lasts for 14 days. Adult
pests live around 4 days. The total development period for male pests is 2 months and female pests are 2.5 months [11].

3.3.2. White Grub (Lepidiota stigma)
This pest is classified as the super family Scarabaeoidea (Lamellicornia), and the order Coleoptera. This pest has local names in general in Central Java and East Java called gayas, in West Java called kuuk and in the Tapanuli area called guridap. Some types of pests that generally attack the firewall plants are Leucopholis rorida F., H. helleri Bsnk., Lepidiota stigma F., and H. constricta Bur. Some types of plants that have repaired attacks are teak, Paraserianthes falcataria, Altingia excelsa, Anthocephalus cadamba, and pine [12]. In the A. mangium forest area in BKPH Panung Panjang RPH Maribaya, Bogor Regency, West Java, obtained the results of data found in A. mangium plants need uret type Lepidiota stigma. L. stigma belongs to the super family of Scarabaeoidea, a pest that has a large size and fat. L. stigma pest found in the A. Mangium BKPH Panung Panjang Forest Area has a size of 5 cm and a relatively fat body that can be seen in figure 9. L. stigma has special features by this pest at the time published move on the ground level. This pest has a grayish brown body and is covered by yellow or yellowish white scales (if the scales are detached, then the pest's body is shiny brown) and a fat body.
The body length of *L. stigma* differs depending on the sex of the pest, but in adult urets the length can reach 7.5 cm. The length of the female uret is around 4.3 - 5.3 cm and the width is 2.2 - 2.7 cm. Meanwhile, the length of the male uret is around 4.2 - 5.3 cm and the width is 2.0 - 2.6 cm. *L. stigma* has white patches on the tip of the elytranya measuring ± 1.5 mm consisting of tiny micro scales. This pest is very deadly to plants and very detrimental to the quality of Industrial Forest Plants because it has symptoms of an attack that at first the leaves will wilt, turn yellow, and dry, then followed by drying and rotting of the stems, and the plant will die quickly and will be seen in a period of 2 months after the beetle's flight. If the roots of the plant are examined, then uret bite marks will be seen on the roots of the branches that are still young and some urets that multiply [13].

### 3.4. Plagiophelps pteroma Control
The form of pest control of *P. plagiophelps* pests can be done by adjusting plant spacing. Plant spacing in monoculture forests that are generally used are size 2.5 x 2.5 m, 3 x 1 m, 2 x 3 m, and 3 x 3 m [14]. In addition, there are several other forms of control, among others, by installing light traps, and using vegetable insecticides in the form of mahogany rind (200gr / L), mahogany seed extraction (150gr / L), and squeezed yam tubers (125gr / L). Among some of the effective insecticides is the squeeze of tuber juice. The yam tuber extract had a significant effect on the mortality of sac caterpillars [15]. The higher the concentration of yam tuber extract, the higher the larva mortality rate. At the highest concentration, yam tuber extract produced larval mortality of 97.78%. Apart from using plant-based insecticides, eradication of bag worms can be carried out by using chemical systemic insecticides using Trichlorfos (95% WP 15 g) insecticide sprayed onto leaves [16]. In addition to the use of pesticides, bag caterpillars can be controlled using biopesticides with *Beauveria bassiana* fungi, because these fungi are pathogenic to bag caterpillars [17].

### 3.5. Lepidiota stigma Control
The *L. stigma* control is done through this white grub larva collection during active larva strikes at the time of 5-9 months of plant life. The eradication of *L. stigma* chemistry is done by using an insecticide mixed with soil in the form of a solution, granules, and dust. Mixing of insecticides with soil is done before or during the planting process so that eradication of white grub can run effectively before the emergence of plants damaged by white grub attack. The type of insecticide that is effective for eradicate white grub is 3G Carbofuran [12]. uret pests with 3G carbofuran insecticide was declared effective at a dose of 10 grams per planting hole, can reduce percent white grub attack from 70% to 10% [18].

### 3.6. Plant Maintenance and Treatments
In addition to eradicating pests, maintaining and treating plants intensively. This needs to be done to reduce and prevent pest and disease attacks on *A. mangium* plants. To carry out plant maintenance, the first step is weeding [19]. Weeding is the disposal / prunning of disturbing vegetation to avoid competition for nutrients, water and light. Weeding activities are carried out in the first year until the canopy closes or reaches a certain size, so that the plant can suppress the growth of weeds, so that the growth of weeds which are nests for pests will be controlled. Some things that are done in the weeding process are as follows control of weeds on the surface of the soil which is a host for pests, including control of grass, herbs and shrubs that directly compete with new crops in the first year of planting, and cleanup and disposal of disturbing plants by removing weeds on the surface. After weeding, other maintenance activities which become the main aspects in the success of planting good quality plants are through the fertilization process. In general, the fertilization process is carried out when there is a lack of nutrients caused by these plants growing in critical land, poor nutrient cycles, washing by rain water on plants that grow in areas of high rainfall, plants that grow in areas of rainfall low, and lack of mycorrhizae for soil fertility. Fertilization is carried out in plantations, generally done at some time after planting the first three months until the closing of the canopy, at the beginning of thinning, and 3 - 10 years before the rotation of logging is done. After that there is a trimming process that is done by cutting branches still alive in order to improve the quality of wood products at the end of the cycle. In general, wood pruning is...
carried out in industrial plantations whose wood will be produced for veneers, construction wood and pole wood to free it from the eyes and defects in the wood so that the wood produced has good quality. After the wood trimming process is done, there is one other process of activity that is needed in supporting plant maintenance, namely thinning activities. Thinning is the activity of reducing the number of trees in a stand which is carried out several years during the cycle and starts several years after the plant canopy is closed.

Conclusion
The highest frequency of attacks is plot 4 with a total percentage of attack frequency of 80% (high category) and the lowest is plot 7 which is 0% (healthy category). The greatest intensity of pest and disease attacks is plot 4, which is 50% (moderate damage category) and the lowest is plot 7, which is 0% (healthy category). The average percentage of attack frequency of all plots was 41% (low category). The average percentage of attack intensity was 23% (mild damage category). Some of the symptoms of pests found in *A. mangium* are hollow leaves caused by *Pteroma plagiophleps* (small pocket caterpillars), and damage to roots, stems that dry out, blacken, and rot caused by stigma *Lepidiota stigma*. No symptoms were found in *A. mangium*.

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