

Relationship Of Micro Climate To Attack Intensity Of Cocoa Fruit Borer (*Conopomorpha Cramerella*) At Gedong Tataan Sub-District

Dimas Prakoswo Widiyani¹, Rendi Setiawan², Wiwik Indrawati³, Kresna Shifa Usodri⁴,
Hamdani⁵, Abdul Aziz⁶, Ersan⁷, Dewi Riniarti⁸
{dimaspw2@polinela.ac.id¹, wiwik@polinela.ac.id³, kresna@polinela.ac.id⁴,
hamdanikajik@polinela.ac.id⁵}

Politeknik Negeri Lampung, Lampung, Indonesia^{1,2,3,4,5,6,7,8}.

Abstract. Gedong Tataan District has very good prospects with cocoa redevelopment. However, with the increasing age of the plants and the many pests and diseases that attack cocoa plants, some farmers are reluctant to maintain their gardens and switch to other agricultural commodities or even look for other jobs in order to survive [1]. In addition to the factors above, there are also many factors that cause the degradation of cocoa commodities in Pesawaran Regency, including land suitability and climate problems that are no longer suitable. This research was conducted from April to August 2023 in the Pesawaran cocoa plantation area, more precisely located in Sungai Langka Village and Wiyono Village, Gedong Tataan District, Kab. offer. This study used a survey method by taking some sample in the area belonging to the people of Sungai Langka and Wiyono Village. Sampling points are based on land conditions and microclimatic conditions in the area. The results of observations on the percentage of attack by the cocoa pod borer is analyzed by ANOVA test, analysis of variance with a level of 5%. If the data of research are significantly different, it was continued with the Least Significant Difference (LSD) test with a level of 5%. To know the relationship between agroclimate elements and cocoa pod borer (CPB) attacks, multiple linear regression tests were performed. The results and that have been carried out, there are different levels of CPB pest attacks in each area, both in Sungai Rare Village and Wiyono Village. Furthermore, the regression analysis that has been carried out shows that the influence of microelements does not have a significant on the level of CPB attack.

Keywords: cocoa, climate, CPB pests.

1 Introduction

Gedong Tataan District has very good prospects with cocoa redevelopment. However, with the increasing age of the plants and the many pests and diseases that attack cocoa plants, some farmers are reluctant to maintain their gardens and switch to other agricultural commodities or even look for other jobs in order to survive. In addition to the factors above, there are also many factors that cause the degradation of cocoa commodities in Pesawaran Regency, including land suitability and climate problems that are no longer suitable.

The growth and development of a plant is influenced by internal and external factors, internal factors are influenced by genetics and external factors are influenced by environmental factors [2]. One of these environmental factors is climate, climate in general not only affects plants, but plants can also influence climate conditions [3]. Climatic elements support and play an

important role in crop production, and the physical, chemical, and biological properties of soil are directly related to crop productivity, in this case cocoa. Therefore, land suitability also plays an important role in rejuvenating cocoa plants in Pesawaran Regency in order to get the expected results.

Cocoa production is currently not optimal, this is inseparable from several cocoa crop problems in Pesawaran district, such as attacks by Plant Pest Organisms (OPT) such as CPB Cocoa Fruit Borer pests. CPB is an insect whose larvae burrow into the fruit affecting the normal development of the cocoa pod and bean. CPB is an insect pest of cocoa that causes the most damage to fruit, where the cocoa pods that are attacked will ripen young, the seeds are flat and stick to one another. As a result of CPB pest attacks, the seeds are very difficult to collect, the seeds are not perfect and can no longer be used. CPB pests have considerable destructive power and can reduce yields by up to 50-80% [4].

Base [5] stated that cocoa pod borer can reduce production by up to 80% and damage beans by up to 82%. Symptoms of CPB attack cause the cocoa pods to have a slightly orange or pale white color, the fruit becomes heavier. This happens because of the appearance of mucus and dirt on the flesh of the fruit and damage to the seeds on the fruit. The cocoa pod borer attacks all stages of the fruit, namely young fruit, ripe fruit and ripe fruit.

Attacks on young fruit are characterized by the appearance of large yellow spots on the skin of the affected fruit. If the fruit showing these symptoms splits, the skin of the fruit and the entry point for the larvae and the seed canal (placenta) where the larvae take food appear brown due to larvae attack. While the flesh is still white. In heavy attacks, the inside of the fruit is brown-black. Based on the results of interviews with farmers in Peunaron District, CPB pests that attack cocoa plants in smallholder plantations in Peunaron District, East Aceh Regency are the main pests causing a decrease in cocoa bean production. This is because the cocoa pod borer larvae that attack the cocoa pods cause damage to the cocoa beans which have high economic value so that this pest attack is quite detrimental [6].

2 Research Methods

This research was conducted from April to August 2023 in the Pesawaran cocoa plantation area, more precisely located in Sungai Langka Village and Wiyono Village, Gedong Tataan District. This study used a survey method by taking some sample in the area belonging to the people of Sungai Langka and Wiyono Village. Sampling points are based on land conditions and microclimatic conditions in the area. Which are classified in each village into 3 areas in the 2 villages are as follows:

1. *Sungai Langka 1*
2. *Sungai Langka 2*
3. *Sungai Langka 3*
4. *Wiyono 1*
5. *Wiyono 2*
6. *Wiyono 3*

The data taken is primary data from the results of sample points both in terms of climate including temperature, humidity, light intensity. Microclimate data collection from each sub-garden area was repeated 3 times. The climate observation variables are temperature, humidity, solar radiation and rainfall. The results of observations on the percentage of attack by the cocoa

pod borer were analyzed using the ANOVA test, analysis of variance with a level of 5%. If the results are significantly different, that was continued by the Least Significant Difference (LSD) test by level of 5%. Meanwhile, to calculate the relationship between climate and cocoa pod borer, a regression test was carried out as follows:

Regression:
$$Y_i = a + (b_1x_1) + (b_2x_2) + e_i \quad (1)$$

Information:

- Y_i : Dependent variable
- F : Constant
- X_i : Independent variable
- b : Regression coefficient
- E_i : Disturbance variable

3 Result and Discussion

3.1 Climate condition

Microclimate correlations were carried out after all microclimate data had been collected. The results of the microclimate correlation in Sungai Langka Village and Wiyono Village, Pesawaran Regency this is shown in table 1.

Table 1. Recapitulation of the correlation analysis of air temperature, air humidity, and light intensity

	Temperature (°C)	Humidity (%)	Light intensity (lux)
Temperature (°C)	1		
Humidity (%)	-0,06262173	1	
Light intensity (lux)	-0,128663025	0,699711828	1

The observations of the correlation analysis of air temperature, air humidity, and light intensity, it shows that if light rises, the air temperature around the plants drops, and humidity and light intensity are positively correlated, if light intensity increases, the air humidity around the plants also increases. The following results are contrary to the opinion of [7] which states that if the light rises, it will increase the temperature and decrease the humidity. This can happen because the branches of the shade trees, and the branches of the cocoa plant itself are rarely pruned which results in thick leaves around the cocoa plantations, and the cocoa gardens which are rarely cleaned of litter, making the cocoa plantations have cool air and the soil is always wet except in long summer season.

3.2 CPB pest attack

Based on the analysis of variance that was carried out in several sample gardens in the Gedong Tataan area, Sungai Rarang and Wiyono villages, there was a significant CPB attack. this is shown in table 2.

Table 2. CPB pest attack levels

Plot	CPB pest attack levels	
	Value	notation

Sungai Langka 1	28,2	b
Sungai Langka 2	56,73	d
Sungai Langka 3	49,03	c
Wiyono 1	19,06	a
Wiyono 2	80,83	e
Wiyono 3	79,86	e
LSD (5%)	5,49	
DC (%)	14,13	

Based on table 2, it shows the percentage or level of CPB attack in various gardens in Gedong Tataan. The highest level of attack was in the Wiyono 2 and Wiyono 3 plantations, while the lowest attack was in the Sungai Rarang 1 garden area. Almost all of the cocoa plantations in area II were attacked by CPB pests and became the main pest for cocoa farmers in the area. Cocoa Pod Borer Pest attack all phases of the fruit, namely young fruit, mature fruit and ripe fruit. Symptoms of attack on young fruit are marked by the appearance of large yellow spots on the skin of the affected fruit. If fruits showing these symptoms are split, the skin of the fruit and the entry point for the larvae and the seed canal (placenta) where the larvae take food appear brown due to larvae attack. While the fruit flesh is still white. In heavy attacks the inside of the fruit is blackish brown [8]

Regression results of air temperature, humidity, light intensity and rainfall on the level of CPB attack.

Table 3. Multiple linear regression analysis

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	2347,769	6369,211	0,369	0,775
Temperature (°C)	-127,249	233,700	-0,544	0,683
Humidity (%)	1777,273	1961,611	0,906	0,531
Light intensity (lux)	0,650	0,799	0,814	0,565
Rainfall(mm)	-0,810	0,901	-0,899	0,534
R ²	0,652			

The data from the regression analysis at table 9, it could be obtained that the level of attack by the Cocoa Fruit Borer in Sungai Langka and Wiyono Village from several samples has obtained several climate elements that have no significant effect. This is indicated by the temperature factor with a P-value of $0.685 \geq 0.05$, air humidity with a P-value of $0.531 \geq 0.05$, light intensity with a P-value of $0.565 \geq 0.05$ and rainfall with a P-value of $0.534 \geq 0.05$.

Then to find out the ANOVA or F test, the results are listed in Table 4 as follows:

Table 4. Anova test

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	2145,346	536,337	0,469	0,782
Residual	1	1144,315	1144,315		
Total	5	3289,661			

Table 11 shows that the calculated F value is 0.469 with a significance level of 0.782, while the 5% F table alpha is 2.68. Because $F_{count} < F_{table}$ and a significance level of $0.782 > 0.05$ indicates that air temperature, humidity, light and rainfall are not significant to CPB attacks. In this study, information was obtained from data analysis and various sources in the field in Sungai Langka Village and Wiyono Village, that the conditions in the field showed CPB pest attacks were not directly influenced by the microclimate of plants, but were indicated to be influenced by the treatment carried out by the owner farmer. cocoa farms, and the age of the cocoa plants themselves. The results of study, it was found that cocoa aged under 15 years had better productivity when compared to cocoa aged more than 15 years [9]. In Sungai Langka Village and Wiyono Village, the average age of the cocoa plants is 20 years. I got this information directly from several farmers who have cocoa gardens in Sungai Langka Village and Wiyono Village.

Based on observations that have been made, the highest CPB pest attack rate is in cocoa plantations in Sungai Langka 2, with an average CPB pest attack rate of 80.83%, this is because the plants in the Sungai Langka 2 garden have a relatively old age. i.e. 21 years which makes the fruit susceptible to CPB pests and has never been treated at all, for example: branches of cacao plants and shade plants that have never been pruned, no sanitation has been carried out, too many intercropping plants, no weed control has been carried out, and no pest and disease control is carried out, this results in high levels of CPB pest attacks on gardens. This also results in conditions that are not ideal for cocoa plantations in the region. According to [10] states that to obtain optimal crop yields, several aspects need to be considered, both soil, climate and good cultivation factors so that plants can develop and grow well.

The lowest CPB pest attack was found in the Sungai Langka 1 cocoa garden, with an average attack rate of CPB pests of 19.06%, this was because the cocoa plants in the Sungai Langka 1 cocoa garden were still at a productive age of 14 years and routine maintenance was carried out. by the owner, for example: regular pruning, sanitation, weed control, and pest and disease control, this is an effort to reduce the level of Cocoa Pod Borer pest attacks on cocoa plants in the garden.

4 Conclusions

The conclusion of the research are:

- a. Level of attack by the Cocoa Pod Borer (*Conopomorpha cramerella*) in Sungai Langka village and at Wiyono village varies according to the condition of the cocoa farm.
- b. In Gedong District, the plant microclimate (rainfall, light intensity, air humidity, and

air temperature) did not significantly influence the level of attack by the cocoa pod borer.

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