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Intensity of Some Diseases Main Features of Cocoa Plants (*Theobroma Cacao*, L.) in Sebapo Village, Mestong District

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Abstract: Cocoa is one of the plantation commodities that has a relatively high economic value among other plantation crops and plays an important role as a source of foreign exchange for the country through exports and driving the regional economy, especially in rural areas. To increase cocoa production in Sebapo Village, Mestong District, it is necessary to know the condition of the cocoa plants affected by disease, the percentage and intensity of the disease, and how often they are affected. This information is useful for implementing disease control techniques in cocoa plants. This study aims to find out about the main diseases that attack cocoa plants, such as Fruit Rot Disease, Stem Cancer Disease, and Disease. Vascular Streak Dieback (VSD) and what is the percentage and intensity of attacks of these diseases. The study was conducted using a simple random sampling method. Plant samples were taken randomly from smallholder cocoa plantations. Data were then collected by counting all healthy and diseased plants to determine the percentage and intensity of diseased plants. Samples of diseased cocoa plants were identified at the Unbari Basic Laboratory. The results of the study show that fruit rot disease caused by fungus *Phytophthora palmivora* in Sebapo village the percentage of attack was 33.33% and the intensity of attack was 14.57%, stem cancer disease caused by *Phytophthora palmivora* fungus the percentage of attack was 26.66% and the intensity of attack was 12.96%, Vascular Streak Dieback (VSD) disease the percentage of attack was 15% and the intensity of attack was 09.66%.

Keywords: Intensity of Disease Attacks, Fruit Rot Disease, Stem Cancer Disease, VSD Disease

INTRODUCTION

Cocoa (*Theobroma cacao* L.) belongs to the kingdom: Plantae, Division: Magnoliophyta, Class: Magnoliopsida, Order: Malvales, Family: Malvaceae, Genus: *Theobroma*, Species: *Theobroma cacao*. L. The cocoa plant consists of two type Which differentiated from the color of the beans. Cocoa with white beans is included in the Criollo group, while purple beans are included in the Forastero group (Susanto, 2010).

Cocoa is a plantation commodity with relatively high economic value among other plantation crops and plays a significant role as a source of foreign exchange through exports and as a catalyst for regional economies, particularly in rural areas. Therefore, since 1980, the government has prioritized developing cocoa as a leading commodity (Pratiwi, Hutabarat, Nabila, Hevinosa, & Mauli, 2024) and (Susanto, 2010).

Indonesia is currently the third largest cocoa producer after Ghana and Ivory Coast. Indonesia's cocoa plantations cover 1,774,303.97 hectares (2014), with a production of 777,500 tons, of which approximately 90 % is cultivated by smallholder farmers. Sulawesi is Indonesia's largest cocoa-producing region, accounting for 60% of Indonesia's cocoa production, contributing to national production of up to 500 million tons. Sumatra ranks second, with an area of nearly 300,000 hectares and contributing to production of up to 150,000 tons (Directorate General of Plantations, 2015).

According to the Jambi Province Central Bureau of Statistics 2021, the area of cocoa plants in Sebapo village, Mestong subdistrict is 1021 ha with a production of 376 tons. One of the causes of low cocoa production is disease. Disease often causes significant losses to cocoa plants, with annual losses reaching millions of rupiah per hectare. Fungi are the most common causes of disease in cocoa plants. Bacteria and viruses are rare and do not cause significant damage (Semangun, 2000).

Literature Review

Pod rot is the most important disease in cocoa cultivation in Indonesia today (Brugman et al., 2026). In fact, it is the most important disease in most cocoa-producing countries and causes significant losses (Agrios, 1999). Pod rot is the most important disease in cocoa cultivation in Indonesia today. In fact, it is the most important disease in most cocoa-producing countries and causes significant losses (Agrios, 1999).

Fruit rot symptoms can appear at various ages. The color of the fruit changes, generally starting at the tip or near the stem, and quickly spreading throughout the fruit (Naeem et al., 2023). Eventually, the fruit turns black. A powdery coating forms on the surface of the diseased, blackened fruit, consisting of secondary fungi that produce numerous spores (Semangun, 2000).

Stem canker is caused by the fungus *Phytophthora palmivora*. The pathogen, which causes fruit rot, can attack stems and branches. It is a wound that has clear boundaries on the skin, surrounded by callus tissue that is often open, so that the wood is visible from the outside (Rosmiati, Sembiring, Rahim, Pudjaningsih, & Hutabarat, 2022).

VSD, also known as dieback, is a major cocoa disease found in Southeast Sulawesi, East Kalimantan, Halmahera, West Java, and several other locations (Parawansa et al., 2022). The disease increases in areas with high humidity and rainfall (Zhang et al., 2024). The disease attacks both mature and young shoots that have not yet formed joints (stem junctions) (Djoko Widodo, 1988).

Symptoms of VSD disease attack are; a) The plant shoots die because the distribution of nutrients and water to the plant shoots stops as a continuation of the damage to the vascular tissue under the cocoa shoots, b) The tips and bases of the branches still have leaves, but between them there are no more leaves, so it looks like they are toothless, c) Yellow Green Spots on the leaves appear on the second and third leaves of the cocoa plant shoots which within a few days later the leaves fall off, d) If the base of the leaf stalk is cut thinly transversely, three dark brown spots will appear. This is a clear typical symptom of VSD attacks on cocoa (Semangun, 2000). Based on this, research will be conducted on the intensity of several major diseases that attack cocoa plants in Betung Village, Kumpeh Ilir District (Pudjaningsih et al., 2023).

METHOD

This research was conducted in Sebapo Village, Mestong District, Muaro Jambi Regency, and Batanghari University Laboratory for approximately 6 months, starting from March to August 2024. Determination of observation areas in the field was carried out using the Simple Random Sampling method. Plant sampling was conducted randomly on smallholder cocoa plantations. After that, the condition of the cocoa plants was assessed and directly observed the fruiting plants. Data was then collected by counting all the fruit, both healthy and diseased, observing the stems of the cocoa plants affected by canker disease, and observing the parts of the cocoa

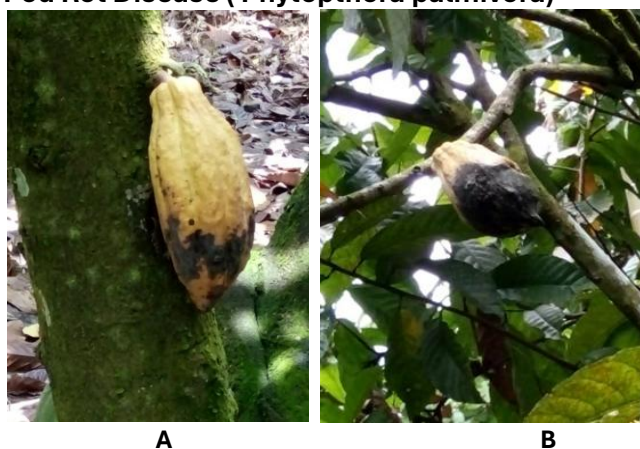
plants affected by VSD to obtain the percentage and intensity of the disease attacks (Debnath et al., 2023).

Cocoa plants observed were those showing symptoms of *Phytophthora palmivora* fungal attack. Symptoms of fruit rot disease include the appearance of black spots on the outer skin of the fruit (Yzquierdo-Alvarez et al., 2026). These black spots will spread until they cover the entire skin. Rotten fruit should be removed, wrapped in damp newspaper, placed in a plastic bag, and then transported to the laboratory and stored in a refrigerator until identification. Observations made in the field on cocoa plants were by observing the symptoms of fruit rot, stem cancer and Vascular Streak Dieback (VSD) on the sample plants and calculating the percentage and intensity of disease attacks (Baruah et al., 2022).

RESULTS AND DISCUSSION

The results of macroscopic observations of diseases attacking cocoa plants in Betung Village, Kumpeh Ilir District, Muaro Jambi Regency are shown in the following image:

Symptoms of Cocoa Pod Rot Disease (*Phytophthora palmivora*)



**Figure 1. A. Symptoms of Cocoa Pod Rot on the Lower Stem of the Cocoa Plant
B. Symptoms of Cocoa Pod Rot on Cocoa Plant Branches**

Symptoms of fruit rot disease include black spots on the outer skin of the fruit. These black spots will spread to cover the entire skin if left untreated. Symptoms appear on fruit of various ages, from young to near-ripe. The fruit color changes to a blackish brown, starting at the tip or near the stem. The fruit eventually turns black and is often covered in a white secondary fungus. The fungal infection that causes the disease extends to the seeds (Abadi, 2005).

Symptoms of Cocoa Stem Cancer

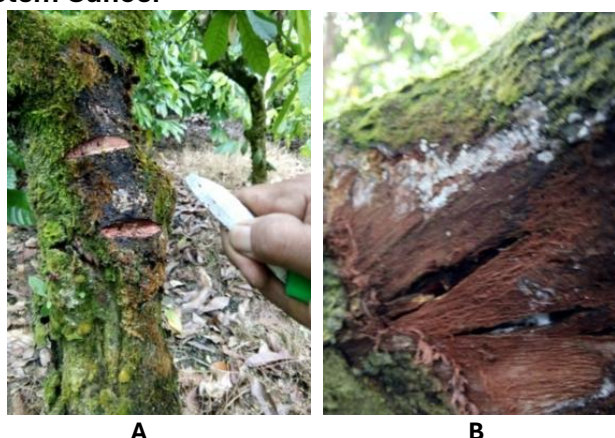


Figure 2. a. Symptoms of Cocoa Stem Cancer before scraping b. Symptoms of Cocoa Stem Cancer after erosion

The disease is easily recognized by the symptoms of blackish swelling of the trunk or branches. This area will rot and exude a reddish, rust-like fluid. If the rotting layer is scraped or cleaned, a reddish-purple layer will appear (Semangun, 2000).

Symptoms of Vascular Streak Dieback (VSD)

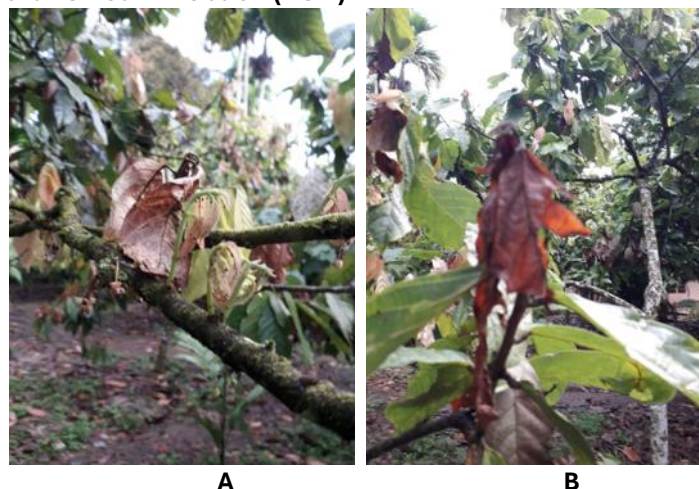


Figure 3. a . Symptoms of Vascular Streak Dieback (VSD) on Wilted and Dead Leaf Shoots. b. Symptoms of Vascular Streak Dieback (VSD) on Blackish Brown Leaf Tips, Wilting and Death

Symptoms of Vascular Streak Dieback (VSD) include new shoots wilting and eventually dying. Furthermore, the shoots of the plant turn blackish-brown, wilt, and die (Agrios, 1999).

According to Semangun (2000) , another symptom of Vascular Streak Dieback (VSD) is a characteristic yellowing of the leaves in the second or third flush behind the growing point . These leaves develop small, sharply demarcated green spots scattered across a yellow background. Affected leaves will fall off a few days after turning yellow.

The results of observations on the percentage of cocoa plant disease attacks can be seen in Table 1, as below.

Table 1. Number and percentage of diseases attacking cocoa plants in Sebapo Village, Mestong District

No	Types of Disease	Symptom	Number and Percentage of Plants Affected by Disease		
			P ₁	P ₂	P ₃
1	Fruit Rot	Black spots on the outer skin of the fruit . The fruit turns blackish brown, starting at the tip or near the stem. The fruit eventually turns black and is often covered in a secondary white fungus.	9 trees 45 %	7 trees 35 %	4 trees 20 %
2	Stem Cancer	black spots. These black spots appear rotting and wet, and ooze a reddish, rust-like fluid.	7 trees 35 %	5 trees 25%	4 trees 20%
3	Vascular Streak Dieback	New shoots will wilt and eventually die. Furthermore, the tops of the plants will turn blackish brown, wilt, and die .	3 trees 15%	4 trees 20 %	2 trees 10 %

P1, P2 and P3 are sampling locations.

Based on Table 1 , the types of diseases found in all the observed fields were three diseases, namely fruit rot , stem cancer and vascular streak dieback . Fruit rot disease caused by the fungus *Phytophthora palmivora* on land P 1 there is 9 (45 %) plants were attacked by disease, on land P 2 There were 7 (35 %) plants infected with the disease and in the P3 plot there

were 4 plants (20%) infected with the disease. Meanwhile, stem cancer disease caused by the fungus *Phytophthora palmivora* was also found in three locations, namely in the P1 plot there were 7 (35%) plants infected with the disease, in the P2 plot there were 5 (25%) plants infected and in the P3 plot there were 4 (20%) plants infected. Vascular Streak Dieback (VSD) disease was found in the P1 plot 3 (15%) plants infected, in the P2 plot 4 (20%) plants infected and in the P3 plot there were 2 (10%) plants infected.

Table 2. Intensity of attacks of fruit rot, stem cancer and VSD in Sebapo village, Mestong sub-district

Name of Disease	Attack intensity (%)			Total	Average
	P1	P2	P3		
Fruit Rot	12.90	17.18	14.64	43.72	14.57
Stem Cancer	12.00	15.00	11.89	38.89	12.96
VSD	9.00	11.00	9.00	29.00	09.66

Based on the data in Table 2, it shows that the intensity of fruit rot disease attacks caused by fungi *Phytophthora palmivora* in Sebapo village was 14.57%, the intensity of stem cancer disease caused by the fungus *Phytophthora palmivora* was 12.96% and the intensity of Vascular Streak Dieback (VSD) disease was 09.66%. From the results of these observations, there were attacks by several diseases that attacked cocoa plants in Sebapo village. This was caused by poorly maintained plantation conditions such as land cleanliness, planting distance and lack of control over diseases that attack cocoa plants. Microscopic observation of the pathogenic fungi that cause disease can be seen in Figure 4.

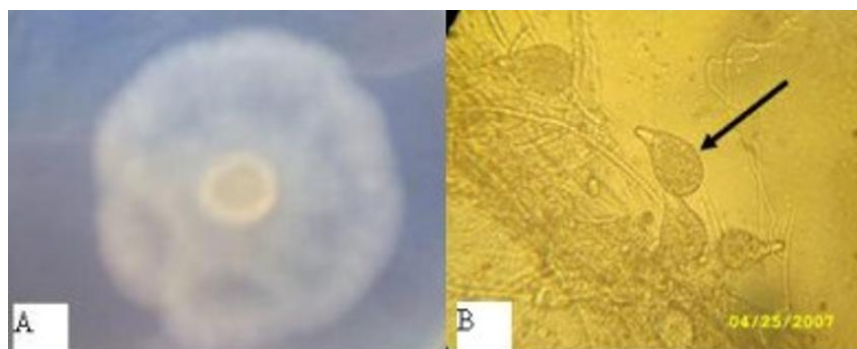


Figure 4. *Phytophthora Palmivora*, a. Fungal Colony and b. Sporangium (Arrow)

Fruit rot and stem canker are caused by the fungus *Phytophthora palmivora*. The fungus forms a pear-shaped sporangium. Sporangia can germinate directly or form migratory spores that can swim. The fungus can form resistant structures called chlamydospores and sexual spores called oospores (Semangun, 2000).



Figure 5. *Oncobasidium theobromae*

Vascular Streak Dieback (VSD) is caused by the fungus *Oncobasidium theobromae*. The fungus forms pear-shaped sporangia. Sporangia can germinate directly or form migratory spores that can swim. The fungus can form resistant structures called chlamydospores and sexual spores called oospores (Semangun, 2000).

CONCLUSION

From research conducted in Sebapo Village, Mestong District, Muaro Jambi Regency, it was concluded that the fruit rot disease was caused by fungi. *Phytophthora palmivora* in Sebapo village the percentage of attack was 33.33% and the intensity of attack was 14.57%, stem cancer disease caused by *Phytophthora palmivora* fungus the percentage of attack was 26.66 and the intensity of attack was 12.96%, Vascular Streak Dieback (VSD) disease the percentage of attack was 15% and the intensity of attack was 09.66%.

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