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Symptom Analysis and Assessment of the Incidence of Bud Rot on Tenga Tall Variety in South Minahasa District

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Abstract : One of the stages in the development of coconut bud rot disease is the symptoms of the disease. Analysis of the symptoms of this disease is needed so that the assessment of the incidence of the disease is not mistaken. The aims of this study were to: (1) analyze the symptoms of bud rot disease, and (2) calculate the incidence of bud rot disease. Analysis of the symptoms of bud rot disease by observing the symptoms of disease on the shoots, and splitting vertically starting from the growing point to see and smell the symptoms of rot at the growing point and its surroundings. Bud rot diseased trees were sampled using purposive sampling method at coconut production centers in South MinahasaDistrict. Analysis of disease symptoms showed that the coconut was actually attacked by *Phytophthora palmivora*. The incidence of bud rot disease in Villages BoyongAtas (11.76%), Pakuweru (7.89%), and Tawaang (6.89%)was higher than in other villages.
Keywords : *Phytophthora palmivora*, Coconut bud rot, disease incidence.

1. Introduction

Coconut (*Cocos nucifera* L.) is a plantation crop that plays an important role both socially and economically for human life, especially for the economy in North Sulawesi Province. Coconut is a plantation crop, and in the process of cultivation it is still relatively simple, and managed from generation to generation.

Copra production now, it is difficult to meet the needs of these factories because the age of coconut trees in North Sulawesi is above 60 years on average, so production is getting lower. Previous coconut rejuvenation efforts did not go according to plan and were attacked by plant-disturbing organisms. The main organism as a barrier to coconut production in North Sulawesi is *P. palmivora* pests and diseases, the cause of coconut bud rot[1,2].

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In South Minahasa there are still hundreds of thousands of coconut cultivars that are susceptible to *P. palmivora* attack, especially hybrid coconut (cultivar PB 121) and Nias Yellow Dwarf. Apart from these factors, the population density of *Oryctesr hynoceros*, a coconut shoot pest, is still quite high. This beetle most likely acted as a carrier of *P. palmivora*[3]. Cultivars of susceptible coconut trees that have been attacked by *P. palmivora* are a source of infection for deep coconut varieties that are more resistant to this pathogen attack.

Monitoring of a plant disease must be done regularly with relatively short time intervals, for example every week. This activity includes calculating the incidence of bud rot disease. Data on the incidence of this disease is useful in determining disease control strategies. The objectives of this research are; (1) analyzing the symptoms of coconut bud rot, and (2) calculating the incidence of bud rot disease in Tengatall variety.

2. Experimental

Determination of research locations based on coconut production centers in South Minahasa District. Then survey the location and determine the sampling location for calculating the incidence of disease.

Survey of coconut bud rot disease was carried out in Tenga, Amurang and Tatapaan Subdistricts. For each subdistrict, three villages were selected by purposive sampling, and the criteria for the garden as a sample were one ha in size on company plantations or people's plantations.

Observation of bud rot disease symptoms was carried out by observing the symptoms of *P. palmivora* attack on the leaves on the shoots, and splitting vertically from the growing point to about 40 cm downwards to see the rotten tissue at the growing point and its surroundings. The measurement of the incidence of coconut bud rot disease was carried out based on the following formula:

$$\mathrm{DI} = \frac{\mathrm{a}}{\mathrm{b}} \mathrm{x}\ 100\ \%$$

$DI_{=}$ Disease insidence

$a_{=}$ Number of infected plant

$b_{=}$ Total number of plant in the garden

3. Results and Discussion

a. Symptoms of Bud Rot Disease

Bud rot disease caused by *P. palmivora* can be distinguished from bud rot due to lightning strikes, *Oryctes* attack, or leaf rot disease, stem bleeding, root disease (wilt), lethal yellowing, fusarium wilt, bacterial bud rot, and others. The typical symptom is leaf wilting followed by drying of the leaves at the shoots starting on the unopened leaves and nearby leaves (Figure 1). This symptom will be more clearly seen with the occurrence of tissue decay on the underside of the petiole of the affected leaves, and emit a foul smell. The continuation of the coconut growing point will be attacked and eventually the plant will die (Figure 2).

This bud rot symptom is described in more detail by[4] that early symptoms in young or mature trees are wilting, discoloration, and death of young leaves. Spear leaves that have not yet stretched also die early in the development of the disease. Dead fronds bend abnormally but remain attached to the stem for several weeks. According to[5] that at the point of growing it becomes foul-smelling due to a secondary infection by bacteria.

Figure 1. Typical symptoms of coconut bud rot disease

Figure 2. Growing point of rotting coconut

b. Incidence of Bud Rot Disease

The incidence of disease in several villages in Tenga, Amurang and Tatapaan Subdistricts is presented in Table 1. Information from Table 1 is that the incidence of coconut bud rot in the villages of Boyong Atas (11.76%), Pakuweru (7.89%), and Tawaang (6.89%) was higher than in other villages because coconut plantations were adjacent to plantations planted with cultivars of nias yellow dwarf coconut and hybrid coconut PB 121. These coconut cultivars were susceptible to attack by *P. palmivora* (Figures 3 and 4).

Table 1. Incidence of coconut bud rot disease in several villages in the Subdistricts of Tenga, Amurang and Tatapaan (South Minahasa District)

Subdistricts	Villages	Garden to:	No. Bud Rot diseased trees	No. healthy trees	Total No. trees	Bud Rot Diseases Incidence (%)
	Boyong Atas	1	12	90	102	11,76
Tenga	Tawaang	2	6	81	87	6,89
	Pakuweru	3	7	84	91	7,69
	Elusan	1	2	95	97	2,06
Amurang	Kapitu	2	4	77	81	4,98
	Rumoong Bawah	3	3	93	96	3,12
	Popareng	1	2	90	92	2,17
Tatapaan	Paslaten	2	4	85	89	4,49
	Bajo	3	2	81	84	2,38

According to Lolong (pers. comm. 2010) the source of *P. palmivora* inoculum was spread from infected coconut trees to healthy coconut trees in the vicinity by means of insects. The mass of spores in the stem end of fruit is white like a crust so that it easily attaches to insects or other animals that pass on it, and spreads it[4].

Mycelium, chlamydospores of *P. palmivora* can be spread passively when planting infected plants, scattering of soil, gravel, and dead plant material in agricultural activities; or attached to agricultural implements, shoes, or motor vehicle tires[6].*P. palmivora* can also do active dispersal by zoospore. Zoospores have been collected from surface runoff and flooded areas of infected coconut plantations.Zoospores are driven by two flagella located at both ends of the spore[5,7].

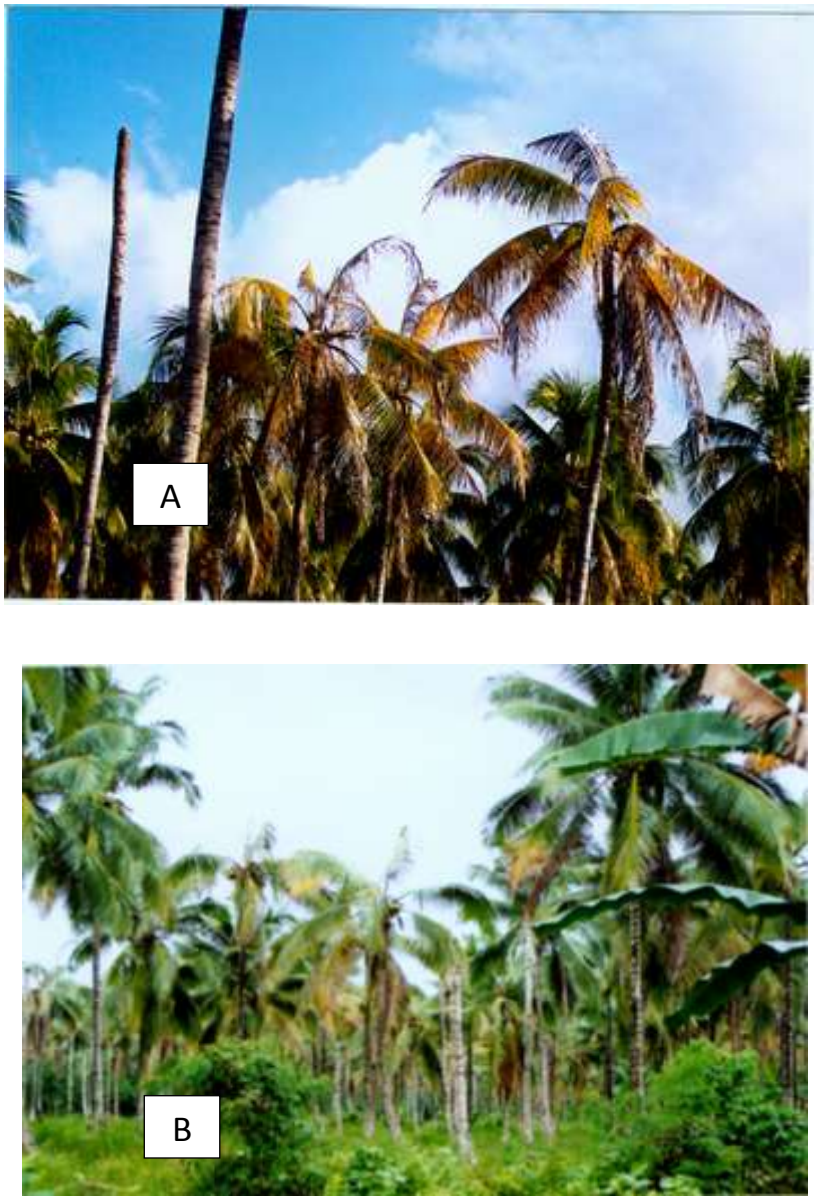

Figure 3.Coconut cultivars with bud rot disease. A. Niasyellow dwarf. B. Hybrid coconut PB 121

Data on the incidence of bud rot disease (Table 1) has epidemiological importance because in 2005, the incidence of bud rot disease in tenga tall variety was only 1%[8]. So, in 2014 there has been an increase in the incidence of bud rot disease by about 11 times.The increase in *P. palmivora* attack on tenga tall variety could occur because in the evolutionary process, this pathogen may already have genes that produce non-specific elicitors so that the R1 gene-coded receptor found no elicitor, so there was no resistance reaction[9]. Furthermore[10]stated that *P. palmivora* can overcome pattern-triggered immunity (PTI) by secreting effectors to block PTI responses. So, it is these effectors that trigger coconut susceptibility.

4. Conclusions

1. Symptoms of bud rot disease in Tenga tall variety were actually caused by *P. palmivora*.

2. The incidence of bud rot disease in Boyong Atas Village (11.76%), Pakuweru (7.89%), and Tawaang (6.89%) was higher than in other villages.

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