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Productivity Of Palm Oil (*Elaeis guineensis* Jacq) In The Highlands In Simalungun District With Percentage Levels Of Bunch Rot Based On Planting Year

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ABSTRACT

The study was conducted to evaluate the percentage rate of bunch rot by planting year and the productivity of oil palm in the highlands. The research was conducted on the plant area yielded by survey method at Kebun Bah Birung Ulu Sidamanik Subdistrict Simalungun Regency. The study was conducted in August 2014 with a height of 648 - 1087 meters above sea level located on Longitude: 2o 52 '08.70' 'N - 99o 00' 14.96'' T and Latitude: 2o 46 '12.59' 'U-98o 56 ' 03.63 '' Q. This research was conducted by collecting data such as An Overview of Biru Ulu Garden of PTPN. IV, the production of fresh fruit bunches per block per year of planting: Actual production (tons/ha) for the 1996, 2004, 2005 and 2006 cropping periods and the number of staples per five years was also used in the determination of palm oil grade and attack percentage data bunch rot) and fruit parthenocarpy in Garden Bah Birung Ulu, PT Perkebunan Nusantara IV, Sidamanik Subdistrict, Simalungun Regency, North Sumatra Province. Research Results Show Oil palms at 4 - 9 years old are still attacked by rotting fruit, but the percentage of attacks tends to decrease with the age of oil palm plantations. The percentage of fruits shipped to the palm oil mill at 4 - 5 year olds is very low and tends to increase fruit rot and parthenocarpi attacks with increasing altitude of the plant site. bunch diseases commonly caused by Marasmius palmivorus also affect the low productivity of plants in the highlands.

Keywords*: Productivity, Attack Rate, Rotten Fruit, Elevation Place, Oil Palm*

1. INTRODUCTION

Oil palm (*Elaeis guineensis* Jacq.) is one of the plantation commodities which has an important role in economic activities in Indonesia. Palm oil is also one of Indonesia's export commodities which is quite important as a foreign exchange earner after oil and gas. Indonesia is the world's largest producer and exporter of palm oil. Commercially, the expansion of oil palm plantations in Indonesia in the highlands (altitude > 600 meters above sea level (m asl)) began in 1996 at the Bah Birung Ulu Plantation, North Sumatra.

Obstacles in increasing oil palm production include diseases such as anthracnose (Botryodiplodia sp., Melanconium sp., and Glomerella sp.), leaf spot disease (Culvularia sp., Helminthosporium sp., Cochliobolus sp., and Drechslera sp.), crown disease, leaf rust disease (Chepaleuros virescen), fruit bunch rot disease (Marasmius palmivorus) and stem base rot disease (Ganoderma boninense) (Susanto, 2002).

Bunch rot disease is found in all oil palm growing countries with different degrees of attack/loss, the greatest in Indonesia, namely in plantations in development areas where it can reach 25% (4 – 5 bunches/principal on young plants) . The cause of fruit bunch rot disease is the fungus Marasmius palmivorus, which is a common saprophytic fungus that lives on various kinds of dead materials/food waste. Its development depends on weather (humidity) and the availability of food sources (Pahan, 2008).

Bunch rot disease is usually found in plants aged 3 – 9 years but tends to increase in attack on plants with poor sanitation and/or poor (inadequate) pollination levels. Most fungal attacks increase in wet weather conditions, and high humidity, as well as constant humidity conditions in high density plantings will also increase the development of this disease (Turner and Gillbanks, 2003). Bunches that have not reached a certain size are cut regularly, even if the factory is not ready, bunches that are heavily attacked by fungi should not be sent to the factory because it will increase the levels of free fatty acids in the oil (Pahan, 2008). Virdiana et al. (2012) reported that planting oil palm seedlings at a distance of at least 2 m from the old planting hole when replanting can delay the process of disease infection through root contact and significantly reduce disease incidence rates up to 11 years after planting. Previously, Flood et al. (2005) have also reported that planting oil palm seedlings away from piles of stems and tubers when replanting can delay Ganoderma infection.

Several types of fungi attack oil palm plants, one of which is bunch rot disease caused by the fungus Marasmius palmivorus which attacks the fruit that is ready to be produced (Palm Plant Research Institute, 2010). Apart from diseases caused by macroscopic fungi, there are also several types of microscopic fungi that can attack the fruit of oil palm plants, including fruit rot disease caused by the Phytoptora palmivora fungus which attacks oil palm fruit ready for production. According to the research results of Domingues et al., (2012), anthracnose disease in oil palm plantations south of Lake Maracaibo, Venezuela is caused by the Colleotrichum fungus which attacks mature oil palm plants. This fungus causes fruit to rot and fall.

Generally in the highlands the growth and development of oil palm plants is quite good and jagur, problems with plant density (density), etiolation and bunch rot disease are quite often found in the field. Excessive vegetative growth of plants and problems with plant density cause plant canopies to cover each other (overlapping) and have an impact on low plant productivity. Bunch rot disease, which is generally caused by Marasmius palmivorus, also affects low plant

productivity in the highlands (Simangunsong et al., 2005).

2. MATERIALS AND METHODS

Research was carried out in areas of productive cropswith survey methodsat Bah Birung Ulu Gardens, Sidamanik District, Simalungun Regency. The research was conducted in August 2014 with an altitude of 648 – 1087 m above sea level located at Longitude: 2o 52' 08.70'' N – 99o 00' 14.96'' E and Latitude: 2o 46' 12.59''N- 98o 56' 03.63''E. This research was carried out by collecting data such as an overview of PTPN's Bah Birung Ulu Gardens. IV, production of fresh fruit bunches per block per planting year:

Figure 1. Map of research locations

Realized production (tons/ha) for the planting years 1996, 2004, 2005 and 2006 and the number of bunches per principal for the last five years were also used in determining the class of oil palm plants and data on the percentage of attack (bunch rot) and parthenocarpic fruit at the Bah Birung Ulu Plantation, PT Perkebunan Nusantara IV, Kec. Sidamanik, Kab. Simalungun, North Sumatra Province.

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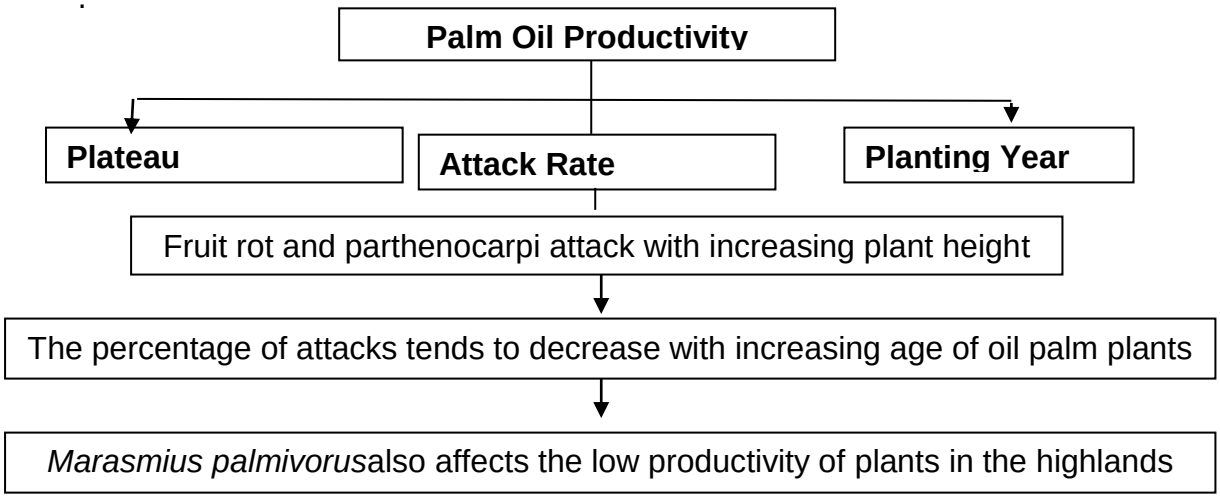

Figure 1. Flow diagram of research implementation

3. **RESULTS AND DISCUSSION**

Productivity of oil palm plants

Table 1. Productivity of oil palm plants based on age per year plant

Year Plant	Height (m above sea level)	Age	Tot. TBS (kg)	Tot. bunch Total	TBS (kg)/ Bunches	TBS (ton)/ha	Bunch/ Tree
1996	600-800	12	274930.77	12837.77	21.42	16.14	5.93
		13	288334.23	13137.96	21.95	16.92	6.21
		14	328714.23	13653.15	24.08	19.29	6.52
		15	348843.46	12734.08	27.39	20.47	6.79
		16	351232.31	12613.92	27.84	20.61	6.72
		17	298405.38	9939.62	30.02	17.51	5.30
		Average	**315076.73**	**12486.08**	**25.45**	**18.49**	**6.24**
2004	700-750	4	170186.00	21225.00	8.02	9.35	11.20
		5	295310.00	40374.60	7.31	16.23	21.30
		6	379240.00	31592.20	12.00	20.84	16.66
		7	421100.00	28559.40	14.74	23.14	15.19
		8	392626.00	25548.80	15.37	21.57	13.59
		9	376720.00	20920.60	18.01	20.70	11.13
		Average	**339197.00**	**28036.77**	**12.58**	**18.64**	**14.84**
2005	650-900	3	27059.83	4161.89	6.50	1.60	2.34
		4	244716.90	41107.40	5.95	14.51	22.73
		5	296094.58	31614.60	9.37	17.56	17.53
		6	324272.16	24840.68	13.05	19.23	14.19
		7	299501.96	21027.56	14.24	17.76	12.00
		8	296018.14	17202.04	17.21	17.55	9.75
		Average	**247943.93**	**23325.69**	**11.05**	**14.70**	**13.09**
2006	750-850	3	8303.67	2575.67	3.22	1.04	3.04
		4	118755.33	13401.67	8.86	14.84	15.82
		5	115150.00	14697.33	7.83	14.39	18.23
		6	141520.00	15158.67	9.34	17.69	18.80
		7	130120.00	10849.67	11.99	16.27	11.03
		Average	**102769.80**	**11336.60**	**8.25**	**12.85**	**13.38**
2022	900-1100	4	3217.06	334.41	9.62	0.25	0.24
		5	40104.71	5596.18	7.17	3.08	4.08
		Average	**21660.88**	**20219.56**	**8.39**	**1.67**	**2.16**

(Source: Processed from LM76 production data from Bah Birung Ulu Unit Office, 2022)

Results Table 1. In the 2008 planting year, the oil palm plantation area in the Bah Birung Hulu plantation was 900 - 1100 m above sea level with very low productivity and late maturity of the harvest. According to (Simagunsong et al., 2005; Siregar et al., 2006) this is due to the minimum air temperature of less than 18oC which may still fluctuate in December and January which can disrupt the metabolic process, development of oil palm flowers and fruit. caused by low air temperature stress. The result of low air temperature stress can be analogous to "drought stress", namely: increased abortion, bunch failure / bunch rot, fluctuating and relatively low productivity and longer development of flowers into fruit (8-9 months) (Simagunsong et al. al., 2005; Siregar et al., 2006).

From the data in Table 1, it can be seen that oil palm plants aged 4 - 9 years are still attacked by fruit rot, but the percentage level of attack tends to decrease with increasing age of the oil palm plants. The percentage of fruit sent to palm oil mills at a plant age of 4 - 5 years is very low and tends to increase in fruit rot and parthenocarpi attacks with increasing height of the plant. According to Turner and Gillbanks (2003), bunch rot disease is usually found in plants aged 3 - 9 years but tends to increase in attack on plants with poor sanitation and/or poor (inadequate) pollination levels. Most fungal attacks increase in wet weather conditions, and high humidity, as well as constant humidity conditions in high density plantings will also increase the development of this fruit rot disease. The percentage of attacks can reach 97.75% reducing the production of fresh fruit bunches sent to palm oil mills. This is in accordance with the statement of Simangunsong et al (2005) who said that bunch rot disease which is generally caused by Marasmius palmivorus also affects the low productivity of plants in the highlands. This is also supported by the opinion of Fenty (2012) In general, disease attacks on oil palm fruit are caused by fungi that attack plants aged 3-9 years because at that age oil palm plants are ready to be produced.

Percentage of fruit rot and parthenocarpy diseases based on planting year, altitude per year

The results of Table 2 show that oil palm plants aged 4 - 9 years are still attacked by fruit rot, but the percentage level of attack tends to decrease with increasing age of the oil palm plants. Percentage of fruit sent to palm oil mills in.

Table 2. Percentage of fruit rot and parthenocarpy based on planting year, altitude, 2012

Plant Age	Height of Place (masl)	Number of Losses			Number of Tanadans	% Case			Number of Bunches	
		Maras Minu	Parthe no Carpi	Amou nt	Harvested until Dec	Maras Mirus	Parthen o Carpi	Amo unt	Sent until Dec to PKS	% Cas e
					2012 observations					
8	>700-750	13,546.0 0	-	13,546	141,290	9.59	-	9.59	127,744	90.41
7	650-700	1,554.75	495	1,802	24,390	6	2.26	7.36	22,588.00	92.64
	>700-750	728.63	764.33	1,263. 67	20,955.60	4.04	3	6.15	19,691.93	93.85
	>750-800	633.74	4,391.4 1	4,527. 17	26,139.83	2.6	12.52	13.5 4	21,612.67	86.46
	>800-900	1,238.93	1,796	2,260	23,529	4.79	7.85	9.4	21,269.10	90.6
6	>800-850	592	531	1,123	46,599	1.27	1.14	2.41	45,476	98
4	>900-1000	3,333	1,243	4,576	6,848	53	22	75	2,272	25
	>1000-1050	4,615	1,434.1 7	6,049. 33	6,377.67	72.76	23.24	96	493	6
	>1050-1100	2,312	717.43	3,029. 00	3,046.29	76.42	23.26	99.6 8	121	2.25

(Source: Processed from LM76 production data from Bah Birung Ulu Unit Office, 2013)

Table 3. Percentage of fruit rot and parthenocarpy based on planting year, altitude, 2013

Plant Age	Height of Place (masl)	Number of Losses			Number of Tanadans	% Case			Number of Bunches	
		Maras Minu	Parthen o Carpi	Amo unt	Harvested until Dec	Maras Mirus	Parthen o Carpi	Amo unt	Sent until Dec to PKS	% Case
	2013 observations									
9	>700-750	6,789	-	6,789	111,372	6.08	-	6.08	104.603	93.92
8	650-700	10,983	1,053	12,036	222,630	4.93	0.47	5.41	210,594	94.59
	>700-750	21,495	2,606	24,101	502,953	4.27	0.52	4.79	478,852	95.21
	>750-800	12,639	15,780	28,419	474,282	2.66	3.33	5.99	445,863	94.01
	>800-900	25,711	7,654	33,365	567,813	4.53	1.35	5.88	534,448	94.12
7	>800-850	818	176	994	29,794	2.75	0.59	3.34	28,800	97
5	>900-1000	10,714 .00	5,518.00	16,232.00	46,389.00	23.1	11.9	34.99	30,157.0 0	65.01
	>1000-1050	32,325	14,269	46,594	81,760.00	39.54	17.45	56.99	35,166.0 0	43.01
	>1050-1100	33,591	12,819	46,410	76,222	44.07	16.82	60.89	29,812	39.11

Plant age of 4 – 5 years is very low and tends to increase in fruit rot and parthenocarpi attacks with increasing plant height. According to Turner and Gillbanks (2003), bunch rot disease is usually found in plants aged 3 - 9 years but tends to increase in attack on plants with poor sanitation and/or poor (inadequate) pollination levels. Most fungal attacks increase in wet weather conditions, and high humidity, as well as constant humidity conditions in high density plantings will also increase the development of this fruit rot disease. The percentage of attacks can reach 97.75% reducing the production of fresh fruit bunches sent to palm oil mills. This is in accordance with the statement of Simangunsong et al (2005) who said that bunch rot disease which is generally caused by Marasmius palmivorus also affects the low productivity of plants in the highlands.

4. CONCLUSION

From the survey results, it was found that oil palm plants aged 4 - 9 years were still attacked by fruit rot, but the percentage level of attack tended to decrease with increasing age of the oil palm plants. The percentage of fruit sent to palm oil mills at a plant age of 4 - 5 years is very low and tends to increase in fruit rot and parthenocarpi attacks with increasing height of the plant. The percentage level of attacks tends to decrease with increasing age of oil palm plants.

REFERENCES

Ariska, E., Harahap, F. S., Dalimunthe, B. A., & Septyani, I. A. P. (2022). Pelatihan pemanfaatan tandan kosong kelapa sawit (TKKS) untuk dijadikan pupuk organik di Desa Tebing Tinggi Pangkatan. *E-Dimas: Jurnal Pengabdian kepada Masyarakat*, *13*(1), 201-208.

Domingues, G, Sari, M, Mauricio, M, Henry, P, 2012, 'Characterization and Genetic Variability Of Colleotrichum gloeosponioides sensu lato in Oil Palm (Elaeis guineensis Jacq.) en Venezuela' Plant pathol, Vol. 37, no. 2.http://www.scielo.br/scielo.php?pid=S198256762012000200003&script=sci_abstract

Fenty, F, 2012, Study of fruit rot on oil palm in East Aceh Regency. Agricultural Technician Center. Banda Aceh. pkpp.ristek.go.id /_assets/upload /feval/ X_305_ Presentation_Evaluation1. Pdf.

Ferdiansyah, W. Y., Harahap, F. S., Walida, H., & Septiyani, I. A. P. (2023). Soil Erodibility Prediction On Oil Palm Land In Ujung Bandar Village, South Rantau District,

Labuhanbatu Regency. *Biofarm: Jurnal Ilmiah Pertanian*, *19*(2), 369-378.

Flood J, Keenan L, Wayne S, Hasan Y. 2005. Studies on oil palm trunks as sources of infection in the field. Mycopathologia. 159(1):101–107. DOI:http://dx.doi.org/10.1007/s11046-004-4430-8.

Harahap, F. S., Purba, J., & Rauf, A. (2021). Hubungan curah hujan dengan pola ketersediaan air tanah terhadap produksi kelapa sawit (Elaeis guineensis Jacq) di dataran tinggi. *Agrikultura*, *32*(1), 37-42.

Mangoensoekarjo, S., and Semangun, H., 2008. Coconut Agribusiness Management Palm. Gadjah Mada University Press, Yogyakarta. Pg 73-97, 202-206.

Pahan, I . 2008 . Complete Guide to Palm Oil (Agribusiness Management from Upstream to Downstream). Self-Help Spreader, Jakarta.

Palm Crop Research Institute, 2010. Development of Plant Disease Fungi. Poor.http://balitka.litbang.pertanian.go.id/sdm_profesional=ir-emy-sulistyowati-m-agr-phd

Rahmawaty, R., Frastika, S., Rauf, A., Batubara, R., & Harahap, F. S. (2020). Land suitability assessment for Lansium domesticum cultivation on agroforestry land using matching method and geographic information system. *Biodiversitas Journal of Biological Diversity*, *21*(8).

Simangunsong G., Hidayat TC, Siregar HH, 2005. Coconut Production Trends Palm Oil in the Highlands (The Case of Bah Birung Ulu Gardens, Sumatra North). PPKS News, Vol. 13 (3) Pages: 1 – 6.

Siregar, HH, Darlan NH, Pangaribuan Y., 2006. The Role of Climate Science in Present andFuture for Palm Oil Planting. Central News Palm Oil Research. Vol. 14(2) pp: 21-29.

Susanto A. 2002. Study of Biological Control of Ganoderma boninense Pat. Causes of Oil Palm Stem Rot Disease [dissertation]. Bogor Agricultural Institute. Bogor.

Turner P. D and Gillbanks RA, 2003. Oil Palm Cultivation and Management (second edition). The incorporated society ofplanters PO Box 10262, 50708 Kuala Lumpur, Malaysia. Pages: 23 – 24, 660 – 661

Virdiana I, Flood J, Sitepu B, Hasan Y, Aditya R, Nelson S. 2012. Integrated disease management to reduce future Ganodermainfection during oil palm replanting. Planters. 88(1305):383–393.

Walida, H., Harahap, F. S., Ritongah, Z., Yani, P., & Yana, R. F. (2020). Evaluasi status hara bahan organik terhadap sifat kimia tanah di lahan miring kelapa sawit. *Ziraa'ah Majalah Ilmiah Pertanian*, *45*(3), 234-240.