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The Influence of Cocopeat Plant Media and Manure on the Growth of Ketapang (*Terminalia cattapa* L.) in Telaga Cemara Beach Forest, Holmafen Village, Muara Tor District, Sarmi Regency

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Abstract: Planting media with a certain composition and different treatments influence the growth of a plant. This research was carried out for 5 months from December 2022 -May 2023 with the aim of research to find out the right composition for planting *T. catappa* plants in the rehabilitation process of the Telaga Cemara beach forest in Holmafen Village, Muara Tor District, Sarmi Regency. The composition of the growing media used in this study was manure, cocopeat, and soil. The research design used was Completely Randomized Design (CRD). There are three variables used in this study, namely the independent variable (combination of Cocopeat manure and soil), dependent variable (type of tree planted), and control variable (soil without treatment). The results showed that there was an effect of treatment on the Ketapang plant which showed significant results on the five parameters tested, NL (T2K3), LL (T2K1), LW (T2K1), PH (T2K1), NB (T2K1). Based on the results of linear regression, the correct composition was obtained, namely the composition of 32.5% cocopeat, manure 17.5%, and land 50%.

Keywords: Ketapang; Media composition; Sarmi regency

Introduction

Coastal forests are an important component in maintaining the balance of ecosystems in conservation areas (Gunawan et al., 2022). The function of the coastal forest is to absorb natural phenomena caused by abrasion, storms, and waves and as a buffer for the life of marine and other coastal biota (Wibisono, 2005). Holmafen is a village in Sarmi Regency which has a coastal forest area that used to be an area covered with various coastal vegetation. This area continues to experience degradation due to both natural and human factors.

Exploitation activities and illegal logging by residents to meet household needs (Bösch, 2021), especially firewood, have had an impact on decreasing the quality and quantity of coastal forests and significant changes in the coastline (Rudianto et al., 2020). It is necessary to carry out coastal forest rehabilitation activities to reduce the damage (Rifdan et al., 2023). One type of vegetation that can be used for beach rehabilitation is the ketapang plant (*Terminalia catappa*) (Darwati et al., 2022). This type can withstand high salt levels and can function to reduce abrasion and windbreaks (Purwantaraet al., 2019).

Apart from the ketapang plant which has excellent ecological functions for coastal ecosystems, several

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species such as *Callophylum inophylum* and *Casuarina equisetifolia* Linn (Xu et al., 2022). Can be categorized as species that have excellent functions in protecting coastal areas (Roemantyo et al., 2012). Ecologically, the condition of the Telaga Cemara beach forest in the village of Holmafen is dominated or inhabited by sand along the area. In addition to the long stretch of sand, this area is also dominated by coastal vegetation such as Coconut trees, Shrimp pine, Ketapang, and Bintangor. However, rehabilitation efforts need to be continuously encouraged by both the community and the government (Bullock & Bunce, 2020). The success of rehabilitation activities needs to be supported by local resources but also innovation and good methods (Rani et al., 2023).

Thus, the rehabilitation phase needs to be well planned, innovation, methods and the right design are the key to the success of rehabilitation activities (Dragin-Jensen et al., 2022). Coconut coir (cocopeat) and manure are plant media that are thought to be very suitable for testing in the rehabilitation of the Telaga Cemara coastal forest by developing *T. catappa* plants (Aprianto et al., 2023). Cocopeat is a planting medium derived from coconut coir and has the advantage of being free from soil-borne pathogens and weeds and can store water 6 times (Cahyaningsih, 2018; Suryawan, 2014). Besides having a good ability to store water (Stocker et al., 2023). cocopeat is very good when combined with organic and inorganic fertilizers as a planting medium to increase the number of leaves of a plant (Yusriani & Pardi, 2022).

According to Suryawan (2014) and Kuntardina et al. (2022) the highwater storage properties of cocopeat have a positive effect on seed viability. Nyamplung (*C. inophyllum*) viability on cocopeat media reached 80% while on the soil it was only 60% in the third month. Rehabilitation of the Telaga Cemara Holmafen coastal forest is very important to determine the status of Telaga Cemara as a Nature Tourism Area because this area will then have ecological, economic, tourism, educational, and research benefits. This study aimed to determine the effective composition for planting *T. catappa* in the process of rehabilitation of the Telaga Cemara beach forest in Holmafen Village, Muara Tor District, Sarmi Regency.

Method

Study Site

This research was conducted for 5 months, from December 2022–May 2023 in the coastal forest of Holmafen Village, Muara Tor District, Sarmi Regency.

Tools and Materials

The tools used in this research included a soil drill, tape measure, plastic bags, polybags, books, stationery, and Garmin GPS. The ingredients are cocopeat, manure, soil, and Ketapang (*T. catappa*) seedlings.

Research Type

This type of research is an experiment. A special feature of experimental research is that there are experiments by giving various treatments to objects (Irfan, 2014).

Experimental Implementation
Media Preparation

The first activity was preparing the planting medium which was treated in the form of P0 (soil) as a control, P1 (10% manure + 15% cocopeat + 75% soil), P2 (25% manure + 25% cocopeat + 50% soil) and P3 (25% manure + 50% cocopeat + 25% soil). The treated planting media was put in polybags with a size of P = 30 cm and L = 15 cm. The next activity was to prepare the seeds of the Ketapang plant (*T. catappa*) with an estimated age of the same plant which were obtained from the environment around the Holmafen beach and the nearest location which has a similar habitat. Then the seeds of the Ketapang plant (*T. catappa*) were planted in the prepared media. After planting, the three types of plants that have been planted are watered little by little. The next step is to place the nursery in a location or place that has been arranged with good shade.

Maintenance

Maintenance activities include replanting, weeding, and controlling pests or fungi using a solution of sugar and salt. Watering was done every day during the study period (Iqbal et al., 2020).

Research Observations

Growth observations were carried out on all types of plants in polybags for each experimental unit for 7 weeks. the parameters observed and recorded, i.e. number of leaves (NL), leaf length (LL), leaf width (LW), plant height (PH), number of branches (NB), and life presentation (LP). The indicator percentage of life includes 3 categories, i.e., healthy, less energetic, and dead. The research design used was Completely Randomized Design (CRD). There are three variables used in this study, namely independent variables (a combination of Cocopeat manure and soil), dependent variable (type of tree to be planted), and control variable (soil = no treatment).

Data Analysis

This study used a completely randomized design (CRD). The parameters measured were the Number of Leaves (NL), Leaf Length (LL), Leaf Width (LW), Plant Height (PH), and Number of Branches (NB). One-way ANOVA was used to see the average similarity of the

median distribution of data from each treatment (homogeneity of variance). Linear regression is used to determine the prediction of the composition of the planting medium which is more effective than the treatment being tested. All test data were analyzed using PAST (Paleontological Statistics) software version 4.09 (Hammer, 2009).

Result and Discussion

The results of observations on ketapang plants to see the average measurement in seven weeks obtained the highest number of leaves (NL) in composition P2, the highest leaf length (LL) in composition P2, the highest leaf width (LW) in composition P1, plant height (PH) the highest in composition P2, the highest number of branches (NB) in composition P2. Measurement of each parameter experienced an increase in size occurring at weeks 5, 6, and 7 (Figure 1).

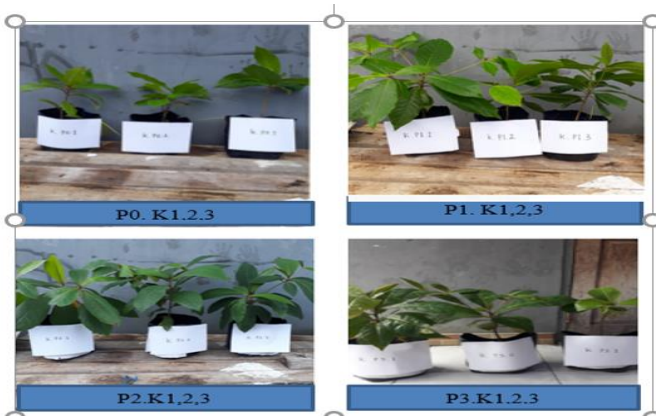

Figure 1. Conditions of ketapang plants for treatments P0, P1, P2, and P3 from the first - seventh week

Table 1 shows that the average measurement of the effect of the media on the growth of Ketapang plants showed significant results for the five parameters during the seven weeks of observation. The NL parameter was more significant in the P2 treatment with media composition (25%MR+25%CP+50%SL) with the highest mean and standard deviation (SD) values, namely in K3 (11.1 ± 1.95). Meanwhile, for the LW parameter, P2 was treated better with media composition (25%MR+25% CP+50%SL) having the highest mean and standard deviation (SD) values, namely K1 (27.6 ± 7.001). The LW parameter was more dominant in the P2 treatment with the media composition (25%MR+25%CP+50%SL) having the highest mean and standard deviation (SD) values, namely K1 (10.5 ± 1.66). In addition, for the PH parameter, P2 was treated with composition (25%MR+25%CP+50%SL), where the highest mean and standard deviation values were K1 (29.3 ± 0.68). Meanwhile for the NB parameter, treating P2 with media composition (25%MR+25%CP+50%SL) showed good results, where it achieved the highest mean and standard deviation (SD) values at K1 (1.14 ± 1.77).

The influence of plant media gave significant results on parameters such as NL, LW, LL, PH, and NB. Based on the results of the average measurement, the effect of the planting medium was very significant on P2 treatment with media composition (25% MR + 25% CP + 50% SL). These results indicate that the planting medium has a significant influence on the parameters. Twenty-five percent (25%) of manure is a planting medium that has a good contribution to the five parameters (Kranz et al., 2020). This is in line with the opinion of Nurhidayat et al. (2020) that goat manure influences plant height and number of leaves. The effect of NL and PH is thought to be influenced by the content of macro and micronutrients in the fertilizer. According to Hartati et al. (2022), the application of goat manure had a significant effect on plant height (PH), number of leaves (NL), leaf width (LW), and leaf length (LL) or leaf area. The nutrient content in goat manure consists of 2.10% N, 0.66% P2O5, 1.97% K2O, 1.64% Ca, 0.60% Mg, 233 ppm Mn, and 90.8 ppm Zn (Samekto, 2006). Apart from being needed for the growth of stems and branches, P and K nutrients also function to produce many leaves (Sucipto, 2010).

Table 1. Comparison of Parameters between Individuals (Repetitions) of Ketapang (K1, K2, K3) with Different

Treatment	Repetition	Parameter				
		NL	LL	LW	PH	NB
P0 (Control)	K1	7.42±1.61	15.4±1.68	5.78±0.20	20.8±1.64	0
	K2	6±1.15	13.7±1.87	4.98±0.79	19.7±0.82	0
	K3	2.85±1.21	13.3±3.12	7.22±1.15	21.6±3.70	0
P1(10%PK+15%CP+75%Th)	K1	7.71±0.75	26.6±4.53	10.08±1.40	25.5±2.12	0.85±1.46
	K2	7.14±1.95	18.3±2.74	8.08±1.36	21.8±1.82	0.42±0.78
	K3	9±0.57	18.5±1.66	7.5±1.49	22.4±2.10	0.57±0.78
P2(25%PK+25%CP+50%Th)	K1	10±2.16	27.6±7.001	10.5±1.66	29.3±0.68	1.14±1.77
	K2	11.1±2.03	21.2±3.51	9.68±0.96	26.5±3.42	1±1.82
	K3	11.1±1.95	17.5±3.62	7.12±1.07	23.1±1.36	0.57±0.78
P3(25%PK+50%CP+25%Th)	K1	9.42±2.07	22.7±4.6	9.51±1.88	23.5±1.37	0.42±0.78
	K2	9.42±1.71	18.4±4.10	9.1±2.50	22.9±1.64	0.71±1.11
	K3	3.28±1.11	14.6±0.03	6.37±0.16	25.6±1.56	0

The effect of composition on each treatment shows a high average value for each parameter (Fredriksson & Oliveira, 2019), which can be assumed to be a process of adaptation of plants to growing media and improvement of the root system with different compositions. Table 1 shows a comparison of the average number and standard deviation of individual samples (repeats) of ketapang measured weekly once a week for seven weeks of observation.

The results of one-way ANOVA (several sample tests) analysis on the number of leaves, leaf length, leaf width, plant height, and number of branches for everyone with different treatments showed no significant difference between the median sample treatments and the composition of the growing media. different in each individual ketapang K1, K2, K3 (Figure 2). Based on the results of the one-way ANOVA analysis (several sample tests) there is no significant difference between the median samples (normal probability), so there is no need for further tests.

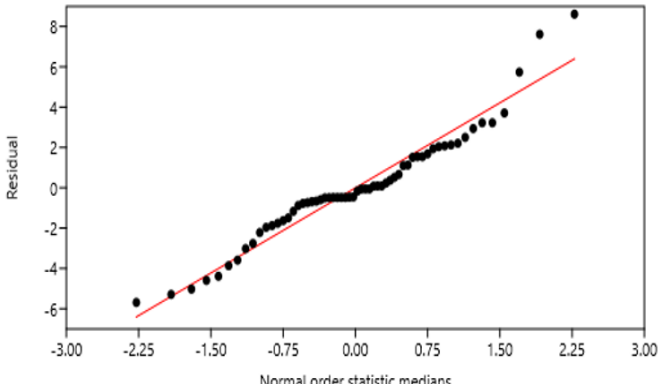

Figure 2. ANOVA test results on ketapang plants

Administration of different compositions or doses for each treatment (Darwati et al. 2022). In line with this study, the application of manure had a significant effect on height, diameter, total wet weight, leaf length, total dry weight, and root length, but was not significantly different from the increase in the number of leaves and the number of branches (Darwati et al. 2022).

The addition of manure with the right composition will add good nitrogen elements for the vegetative growth of plants such as plant height, number of leaves, and leaf area. The N content of goat manure is 0.55%, while the P and K nutrient content is 0.31% and 0.15%, respectively (Roidah, 2013). The results of this test were obtained from the average composition which was more significantly added and divided by the number of treatments which was more significant from the results of the regression analysis, namely 32.5% cocopeat, 17.5% manure, and 50% soil which could increase the growth of ketapang plants.

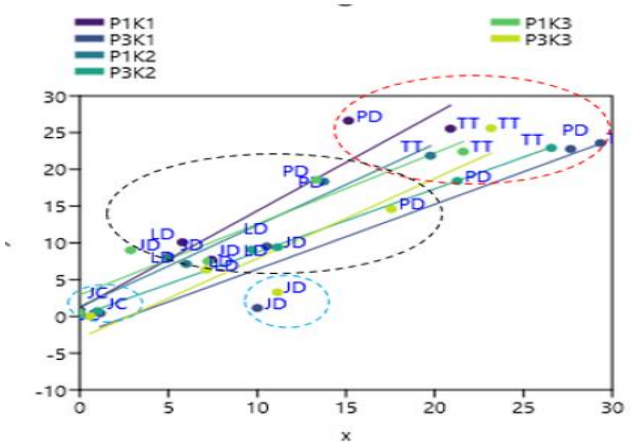

Figure 3. The plot of the linear regression model on ketapang plants showed significant differences between the parameters in each treatment with different compositions (- - - Category 1=45%; - - - Category 2=40%; - - - Category 3=15%; x=parameter average value; y=treatment average value)

Based on the test results, it was found that the percentage of survival in the ketapang plants tested on different media compositions was 99% alive and 1% dead. The results of the study by Hasriani et al. (2013) regarding the study of coconut coir powder as a planting medium showed a significant effect on the growth of sengon plants. Research by Susilawati (2007) also showed that a mixture of coconut coir powder, soil, and compost in a ratio of 3:2:1 in paper flower plants (Zinnia elegans) had a lot of root fibers compared to other treatments. Cocopeat media has micro-pores that can absorb greater water movement, resulting in higher water availability. At certain times, these conditions cause gas exchange in the media to experience obstacles because the media is saturated with water. This happens because the macro pore space which should be filled with air is also filled with water so that the roots experience obstacles in breathing. Therefore, the air in the media will decrease so that it can inhibit plant growth (Risnawati, 2016).

Conclusion

This research was conducted in an experiment with the application of cocopeat growing media, manure, and soil with 3 treatments of different planting media compositions on ketapang plants. It was found that the treatment composition of the planting media was effective and increased the growth, development, and survival rate of ketapang plants, namely the composition of 17.5% PK + 32.5% CP + 50% Th.

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Author Contributions

Conceptualization, Isobela Kornelia Felle, Alfred Alfonso Antoh, Edoward Krisson Raunsay, Maik N R Akobiarek, Leonard Elisa Aisoi, and David Reinhard Jesajas; methodology, Isobela Kornelia Felle; validation, Alfred Alfonso Antoh, and Edoward Krisson Raunsay; formal analysis, Maik N R Akobiarek; investigation, Leonard Elisa Aisoi, and Leonard Elisa Aisoi; resources, David Reinhard Jesajas and Isobela Kornelia Felle; data curation, Alfred Alfonso Antoh; writing-original draft preparation, Edoward Krisson Raunsay, and Maik N R Akobiarek; writing-review and editing, Leonard Elisa Aisoi; visualization, David Reinhard Jesajas, and Isobela Kornelia Felle; supervision, Alfred Alfonso Antoh; project administration, Edoward Krisson Raunsay; funding acquisition, Maik N R Akobiarek, and Leonard Elisa Aisoi. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The author declares no conflict of interest.

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