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***THE EFFECT OF COCOPEAT AND RICE HUSK PLANTING MEDIA
HYDROPONICALLY ON THE GROWTH OF PALM OIL
IN PRE NURSERY***

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Abstract

Palm oil can produce high productivity which must be supported from several aspects, one of them is a good and correct nursery. Palm oil nursery is usually carried out conventionally, namely planting using soil media. Hydroponic research using cocopeat and rice husks planting media on the growth of palm oil seeds in pre nursery has never been carried out. The objective of this study was to determine the growth of palm oil seedlings using the hydroponic method. This research was conducted in the STIPAP Medan greenhouse. This research was conducted from April to July 2018. This research was a non-factorial RAK, which consisted of four treatments, namely M0 (top soil), M1 (Cocopeat), M2 (rice husks), M3 (combination). Height, stem, number of leaves, dry and wet weight of roots and plants, root length were observed. Then data analysis with ANOVA with the continued test of 5% Duncan was performed. The results of the effect of cocopeat and rice husk media was there was no a significant effect on the treatment parameters of seed height, number of leaves, dry and wet weight of roots and plants, and root length.

Keywords: Palm oil seedlings; Plant media; Hydroponics

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INTRODUCTION

Palm oil (*Elaeis guineensis*) is one of the plantation crops that contributes to the largest foreign exchange for Indonesia. For vegetable oil producers, palm oil is superior to its competitors, namely soybean, sunflower, Conola and so on.

In Indonesia, palm oil plantation area in 2017 was 12,307,677 Ha with CPO production of 35,359,384 tonnes, increased from production in 2016 (Indonesian Plantation Statistics, 2018).

According to Usman (2014) Nursery is an important thing in cultivating palm oil plants. The initial growth of seedlings is a critical period that determines the success of plants in achieving good growth in the nursery. One of the efforts that can be done during the initial seeding of the palm oil is by applying fertilizer.

The problem of palm oil found in Indonesia is quite complex, which can lead to low productivity. Palm oil nursery is the first step that can support the success of the plantation (Sartini *et al.*, 2018). The other determining factors in seed processing are influenced by the planting medium used. Laisan soil or so-called top soil is generally used which has higher fertility, according to the Palm oil Research Center, the thickness of the top soil is 10-30 cm which is commonly used in palm oil nursery. The planting media greatly affects the growth of the seeds to be planted, so it is necessary to

choose the right planting medium. Loose, fertile, light, cheap and easy to obtain are the characteristics of a good planting medium for nursery.

Rice husks and cocopeat are cheap agricultural waste products and easy to obtain (Novita *et al.*, 2012). The cocopeat is composed of lignesellulose compounds (complex lignin, cellulose, and hemicelluloses). Hermicellulose is hydrofibile (absorbs water easily) which results in an irregular structure and in dry hygroscopic cellulose (absorbs water well), hard, and brittle. The nature of cellulose is that it is not dissolved in water and is very easy to absorb water (Nisa & Widya, 2014; Chairunnisa *et al.*, 2019). Hydroponics is a method of planting without using soil, which is different from conventional methods that are often using soil.

Some organic waste has the potential for hydroponic liquid fertilizer, Based on Andriyeni *et al.*, (2017) the macro nutrient content of catfish culture wastewater has a pH of 7-8, C-organic 16.28 - 24.64%, and a C/N ratio of 1.71 - 12%.

Land availability is one of the limiting factors for the growth and production of palm oil. Its specific purpose is to test and to obtain information on the effect of various media for planting palm oil seedlings as well as the influence of the planting media on palm oil seeds with a hydroponic system. The target of this study

is expected to know the comparison of planting media in nursery by means of hydroponics. Contribution of this study is expected to increase knowledge for farmers and palm oil plantations about palm oil nursery by means of hydroponics.

MATERIALS AND METHODS

This study was conducted in the STIPAP Medan greenhouse. The study period was from April-July 2018. Non-factorial randomized block design (RBD) with treatment of M0 (top soil media), M1 (cocopeat), M2 (rice husk), M3 (cocopeat mixed with rice husks). Each sample/population was 3 times. The total of seedlings was 48 seeds. Sidik Analysis Variety of data was processed. The materials used were palm oil sprouts from PPKS DxP Langkat variety, polybags, cocopeat, rice husks, water, ABMix nutrition. The tools used were plastics, water pumps, hoses, TDS meters, pH meters, analytical scales, measuring cups, stationery.

Research Stages:

The plant material used the sprouts from Medan PPKS (DxP PPKS Langkat variety).

Polybag filling used ultisol soil, which dry it first. Then it was sieved to remove the remaining wood and roots, then fulfilled it in a poly bag so that no cavities occurred

and the level was left approximately 2cm. Likewise with cocopeat and rice husks, the poly bag was fulfilled so that there was no cavity then flushed it until really solid. Watering was done a day before planting sprouts, soil, cocopeat and rice husks in polybags until they are completely wet. Planting 1 sprout in each polybag in 2 cm deep from the planting surface. Adding nutrients after checking the concentration every day and for conventional media using urea fertilizer with a reference dose that has been determined by PPKS.

Observation and Indicator

Height of plant was measured from the base of the stem (palm bole) to the tip of the highest leaf using a tape measure. Measurements were done at the age of 4 weeks to 12 weeks of seedlings in once a week. Counting the total number of leaves that had been opened completely. Measurements were done at the age of 4 weeks to 12 weeks of seedlings in once a week.

The root wet weight data were collected by separating the roots from the top of the plant on the basis of the midrib (bole) by using a sharp knife. Observation was done at the end of the observation. Root dry weight data were collected from all parts of the roots that had been separated from the plant crown and then put them in the oven until a constant

weight was obtained. Observation was done at the end of the observation.

Weighing all parts of the plant was done at the end of the study so that the wet weight was obtained. Putting all parts of the plant at the end of the observation in the oven until the constant weight was obtained. The root length observation was carried out at the end of the observation by measuring the entire root from the weevil (bole) to the root tip.

RESULTS AND DISCUSSION

Based on the research data, it was found that the parameters of the height of the seedlings in the treatment started 28 days (4 weeks) after planting to 84 days (12 weeks) it was found that the largest

average height observation was in the M0 treatment, namely 23.25 cm. While the smallest average height was found in M2 treatment, namely 22.29 cm (Table 1. Plant Height). Rice husks and cocopeat were cheap agricultural waste products and easy to obtain (Novita *et al.*, 2012).

Based on the variance, it showed that the treatment of the planting medium had no significant effect: seedling height at the 4th to 12th observation weeks after planting. The height growth of palm oil seedlings at M0, namely the soil medium, showed the highest number, namely 31.35 cm. On M1, the highest number was 31.30 cm. M2 shows the highest figure at 30.23 cm. The M3 shows the highest number at 31.58 cm.

Table 1. Seed Height (cm)

Seed Age	M0	M1	M2	M3
4 MST	14.92	13.98	13.44	13.62
5 MST	17.00	15.93	15.45	15.66
6 MST	19.52	18.34	17.82	18.93
7 MST	21.39	20.37	20.58	20.89
8 MST	22.66	22.54	22.04	22.40
9 MST	25.79	25.25	25.58	25.73
10 MST	27.57	27.81	27.38	28.31
11 MST	29.09	28.75	28.08	29.14
12 MST	31.35	31.30	30.23	31.58
Total	209.28	204.26	200.58	206.26
Average	23.25	22.70	22.29	22.92

The parameters of measured plant height indicated that the cocopeat media in palm oil seedlings was able to store water for the needs of palm oil plants so that it could maintain the humidity of the

cocopeat planting media. Since in the cocopeat there are chemical compounds, namely legnin, cellulose, and hemicellulose which have long and strong fibers so they can absorb water. It is in accordance with

the opinion of (Dixit & Preeti, 2012; Vidianto *et al.*, 2013) lignocellulosic fibers are hydrophilic and able to absorb moisture so that the needs of water are fulfilled and have an effect on the plants. Result of Variance prints is in table 2. Number of leaves showed that the influence of the planting medium had an effect but not significant on the parameter of the increasing number of leaves of palm oil seedlings. The highest total leaves growth of all treatments was M1, namely 4.17. While the lowest was M2 with 3.92 strands. Although it did not show a significant difference at the 5% level, the treatment of the growing medium tended

to produce a greater number of leaves (strands) than the soil medium. Utami (2015) stated that the increasing in plant height can support the increasing in the number of leaves as the plant ages.

It is suspected that the cocopeat media could help the planting media to hold the water content which was much needed by palm oil. The need for adequate water for plants was very important. If groundwater was lacking for plants, the photosynthesis process was not optimal, transportation would be hampered, which would have an impact on vegetative growth and productivity. Here is the number of leaves counted (table 2).

Table 2 Number of Leaves (Strands)

Age of seeds	M0	M1	M2	M3
4 MST	0.67	0.83	0.92	1.00
5 MST	1.33	1.50	1.50	1.50
6 MST	1.67	1.83	1.67	1.83
7 MST	2.00	2.08	2.08	2.08
8 MST	2.33	2.83	2.75	2.92
9 MST	2.92	3.00	3.00	3.00
10 MST	3.08	3.17	3.00	3.08
11 MST	3.67	4.00	3.58	3.50
12 MST	4.00	4.17	3.92	4.00
Total	21.67	23.42	22.42	22.92
Average	2.41	2.60	2.49	2.55

Results in Table 3. Bobot Basah Akar Dapat. can in each of the planting media treatments at 12 MST (weeks after planting), it can be seen that the highest

root wet weight is 2.49 g, and the lowest root wet weight measurement is M2 around 2.15 g.

Table 3. Wet Root Weight (gr)

Treatment level	Root wet weight (gr)
M0	2.49
M1	2.40
M2	2.15
M3	2.24

Wet weight of roots after dismantling scales in grams. Genetic traits, soil without any drying process first. Then the conditions, or the growing medium of the weighing was carried out using analytical plant would show the system.

Table 4. Root Dry Weight (gr)

Treatment level	Root dry weight (gr)
M0	0.65
M1	0.46
M2	0.51
M3	0.47

It can be seen that the root dry weight Stunted root elongation was then in each planting medium treatment at 12 followed by secondary growth, namely root MST showed that the highest root dry expansion caused by the activity of the weight was 0.65 gr. The dry weight of the lateral meristem, namely the formation of the roots, after unloading, weigh the wet the cambium. The widening of the roots weight first, then do the oven. Weighing is caused the root diameter increase which in carried out using analytical scales in grams. turn affects the dry weight of the roots.

Table 5. Seed Wet Weight (gr)

Treatment level	Plant wet weight
M0	10.00
M1	9.00
M2	9.00
M3	9.00

It showed that the wet weight of palm element N for plants was to stimulate the oil seedlings at 12 WAP, namely at the time growth of plant height, especially on stems of unloading the plants, the M0 planting and leaves, thereby increasing the wet medium showed the highest number, weight of the plant.

which was 10.00 gr and in the treatment of Research by (Frasetya *et al.*, 2018) cocopeat, roasted rice husk and cocopeat, showed that the EC treatment of 1.7 mS/cm the lowest was 9.00 gr. The role of the and 2.4 mS/cm produced the highest plant

fresh weight of 79.32 mS/cm. It can be seen from the increasing in plant height and root volume, which will increase the wet weight of palm oil plants.

Table 6. Seed Dry Weight (gr)

Treatment level	Seed dry weight
M0	1.80
M1	1.80
M2	2.90
M3	2.30

According to (Rahmadhani *et al.*, 2020), root biomass is strongly influenced by root volume and number of roots. The greater the number of roots is, the greater the root volume and biomass is. It shows that the dry weight of palm oil seedlings at 12 WAP, which is at the time of unloading the plants, the M2 planting medium shows the highest number was 2.90 gr and in the treatment of M0 planting media and M1 planting media, the lowest was 1.80 gr. The dry weight of the seeds formed reflects the amount of photosynthesis as a result of photosynthesis. Since dry weight is very dependent on the rate of photosynthesis.

Table 7. Root Length (cm)

Treatment Level	Root Length
M0	35.80
M1	27.50
M2	47.70
M3	38.60

Whereas the root length of palm oil seedlings at 12 weeks after planting, namely at the time of unloading the plants, the M2 planting medium showed the highest number, 47.70cm and the lowest M1 planting medium, 27.50 cm. The root length parameter showed that the growing media on rice husks at 12 WAP observations the highest number is 47.70 cm. Since rice husks have a lot of hollow or porous forms (Crumb), good drainage and water. This is based on Taufiqullah's opinion (2017) that plant roots will be easy to get through the form of porous soil, so that the roots will develop properly. The crumbly soil structure will make it easier for the roots to pass through, so that the plant growth was higher and had longer roots.

According to (Delaide *et al.*, 2016) fish feces waste contains microorganisms and a high content of dissolved organic matter which plays an important role in supporting the crown and roots, especially

root volume. So it is possible that cocopeat and rice husk have microorganisms that are useful for affecting the length of the roots of palm oil seedlings.

Farida *et al.*, (2017) stated that for hydroponic tds (ppm) 900 - 1,400, solution pH of 6.5 - 6.9. It is in accordance with the research we conducted where the pH was not more than 7 and not too low than 6 and the maximum results.

According to Syarif (2013) the element of Phosphorus (P) has functions to transport metabolic energy in plants, to stimulate flowering and fertilization, to stimulate root growth, to stimulate ordered seeds, to stimulates plant cell division and enlarges cell tissue. The plants that lack P elements has some characteristics : reduced fruit/seeds, stunted, purplish or reddish leaves (less healthy).

According to (Siregar *et al.*, 2015) the elements in the solution could be absorbed by plants, their availability was largely determined by pH. Some elements had a certain pH value range, N was at at pH 5.5 - 7.5 while K at pH 5.5 - 10 while micro elements were relatively available at low pH. The availability of essential elements in relation to pH means that to carry out field experiments it is recommended that they be carried out in areas with a pH of approximately 7.

CONCLUSION

From the research results, it can be concluded that the use of cocopeat planting media had no significant effect on all observations, but the best number of leaves was on cocopeat media. The use of rice husk media did not significantly affect the overall parameters observed, but the dry weight and root length were better for rice husk media. In all observations, cocopeat media mixed with rice husks had no significant effect. The cocopeat media mixed with rice husk was the best for plant height parameters.

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