Growth of Palm Oil Seeds (Elaeis Guineensis Jacq.) on Solid Organic Fertilizer and Waste Tea Compost in Pre Nursery

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ABSTRACT

Increasing the area of oil palm plantation, Impact on the procurement of seeds in large quantities and quality. The aim of this research was to evaluate Growth of Palm Oil Seeds (Elaeis guineensis Jacq.) on Solid Organic Fertilizer and Waste Tea Compost in Pre Nursery. This research was conducted at Percut Sei Tuan, Deli Serdang, Medan, from March to May 2016. This research used Randomized Block Design Factorial with two factors. The first factor was organic fertilizers mashitam (B) were no fertilizer mashitam (B_0), B_1 (15 g / polybag), B_2 (30 g / polybag) and B_3 (45 g / polybag). The second factor was waste tea compost (M) with four factors were M_0 (no waste compost tea), M_1 (10 g / polybag), M_2 (20 g / polybag) and M_3 (30 g / polybag). The results indicated that growth of palm oil seed showed significant effect on Solid Organic Fertilizer and Waste Tea Compost in Pre Nursery variable such as leaf area 10 weeks after planting, crown wet weight, wet weight on bottom, dry weight on top and dry weight on bottom. Palm oil seed showed no significant effect on waste tea compost. Similarly the interaction of solid organic fertilizer and waste tea compost showed no significant effect. The information presented strongly suggests and confirms that the solid organic fertilizer can be fully harnessed for palm oil seed in pre nursery even for commercial purposes by and for farmers in order to increase crop production.

Keywords*: mashitam, tea compost, palm oil seed,solid organic.*

Introduction

Palm oil (*Elaeis guineensis* Jacq.) is one of the prima donna plantations that have a fairly bright development prospect. Indonesia has the largest palm oil area in the world, which is 34.18% of the world's palm oil (Fauzi *et al*., 2012). In 2012, the area of palm oil plantations in Indonesia reached ± 9,074,621 ha and total production ± 23,521,071 tons of FFB (fresh fruit bunches) (Direktorat Jenderal Perkebunan, 2012).

The increased demand for palm oil has led to increased production and expansion of oil palm plantations. The increase of palm oil area cultivation is required procurement of seeds in large quantities and quality. In an effort to cultivate palm oil, the first problem faced by the entrepreneur or farmer concerned is the provision of seeds. The quality of the seeds is crucial to the production of this type of commodity. Plant health during seedlings will affect growth and subsequent production after production in the field (Eva, 2007).

Plant growth and production can not be separated from the availability of nutrients in the form of fertilization, whether organic fertilizer or inorganic fertilizer. Provision of fertilizer in the nursery is one of the steps for the growth and production of plants that can ultimately increase production (Sutanto, 2002).

To encourage the groseedlings, it is necessary to fertilizers application either in the form of solid organic fertilizer or compost. The solid organic fertilizer used is mashitam, mashitam is one of the solid granular organic fertilizers made from a combination of several types of organic fertilizer (manure, green manure, compost, fish meal, bone meal and blood) with the content of HA (10%) , N (10%), P (10%), K (10%), Mg (10%), and some micro nutrients Mn, Zn, Cu, Fe. After applying this fertilizer will increase the activity of soil microorganisms such as bacteria and fungi, then decompose the fertilizer fertilizer into nutrients that are ready to be absorbed by plants. The advantages of this fertilizer, among others, to improve and maintain soil fertility conditions, improve soil ability to maintain soil moisture, has the nature of slow release so that the availability of nutrients is distributed evenly for a period of planting. The results of the study (Arnis and Husna, 2008) showed that giving of mashitam organic fertilizer with dose 500 kg / ha gave the best production for cabbage plant.

Artificial organic fertilizer used in this study was organic fertilizer compost tea dregs. The result indicated that the nutrient content contained in tea dregs was (N) 4.06%, (P2O5) 0.47%, (K2O) 1.77%, (C. Organic) 55.50%, and (C / N) 13.67%, (pH) 5.60, (moisture content) 91.51% useful for the formation or growth of plant vegetative parts, such as leaves, stems, and roots. (Widyati and Slamet, 2005) result showed that application of compost of tea dregs at a dose of 20 ton / ha gave the best result to growth and production of sweet corn (Zea mays L.).

Materials and Methods

In order to study Growth of Palm Oil Seeds (Elaeis guineensis Jacq.) on Solid Organic Fertilizer and Waste Tea Compost in Pre Nursery an experiment was conducted in Jl. Pancing 1 pasar 3, Kecamatan Percut Sei Tuan, Kabupaten Deli Serdang. This research used Randomized Block Design Factorial with two factors. The first factor was organic fertilizers mashitam (B) were no fertilizer mashitam (B_0), B_1 (15 g / polybag), B_2 (30 g / polybag) and B_3 (45 g / polybag). The second factor was waste tea compost (M) with four factors were M_0 (no waste compost tea), M_1 (10 g / polybag), M_2 (20 g / polybag) and M_3 (30 g / polybag). If the effect of different treatments on the real variance,then tested further by Duncan's multiple range test.

Making Waste Tea Compost

Material : 6 kg of tea bag, 5 liter EM4, 1/2 kg of sugar, 2 liters of water

Tools: Drum, Wood stirrer, Blender

The tea bleach is blended until smooth, dissolve the sugar into the water and mix the EM-4 solution, then flush slowly - the pile of tea dregs in the inside. Cover the pile of tea pulp with the vat lid. During the composting process, the tea compost is stirred every 2 days.

vOn the 7th day the compost has matured, with the characteristics of the growth of white mushrooms and when it is held warm.

Land Preparation and Shade. Land location cleared of debris and weeds that can kompetition with plant. Shade made of bamboo poles and roof of palm stem.

Plant Media Preparation. Top soil (depth 0-30 cm). The soil used has a good texture and friable. Polibeg used was a small black polybag size 18 cm x 25 cm, capacity of 2 kg. Polibeg filled with soil top soil, at the time of filling the soil, polybags were rocked to compress the soil. Polibeg is filled with soil medium to a height of 1 cm from the lip of polybag and sprinkled with water until saturated before planting.
Application of Compost Tea. Application of tea dregs compost done 2 weeks before planting by mixing tea compost dregs with soil media in polibeg according to each treatment.
Seed Preparation. Before planting, first the ground watered, then make a hole. Plumula should be upward and the radicle down.
Application of Mashitam Organic Fertilizer. Mashitam solid organic fertilizers was given 2 weeks after planting and then at intervals of 2 to 10 weeks after planting. Fertilization was done in the morning after watering.

Results and Discussion

Growth Response of Palm Oil (*Elaeis guineensis* Jacq.) on Mashitam Organic Fertilizer

In these research, the response of palm oil seed to the application of mashitam organic fertilizer in pre nursery showed significant effects such as leaf area 10 WAP, gross weight top seed, gross weight bottom seed, dry weight of top seed, Dry weight of the bottom of the seedlings, whereas on the parameters of plant height and number of leaves showed no significant effects.

Table 1. Leaves of Palm Oil Seeds to Mashitam Fertilizer and Waste Tea Compost 10 WAP

mashitam organic fertilizer	Waste Tea Compost				
	T_0	T_1	T2	T_3	Average
	…… (cm^2)……				
P_0	10.97	12.94	12.63	12.78	12.33c
P_1	13.09	13.15	13.33	12.80	13.09b
P_2	14.65	13.42	12.64	13.08	13.45b
P_3	14.25	13.85	15.33	15.78	14.80a
Average	13.24	13.34	13.48	13.61	

Means values in followed by unequal letters on the same row are significantly different at 5% level using DMRT (Duncan Multiple Rentang Test).

The area of oil palm seedlings with the highest application of mashitam is in B3 treatment (14.80 cm^2) which is significantly different from the treatment of B0 (12.33 cm^2), B1 (13.09 cm^2) B2 (13.45 cm^2) (Table 1)

The Relationship of Leaf Area of Oil Palm Seedlings 10 MST to the mashitam can be seen in Figure 1.

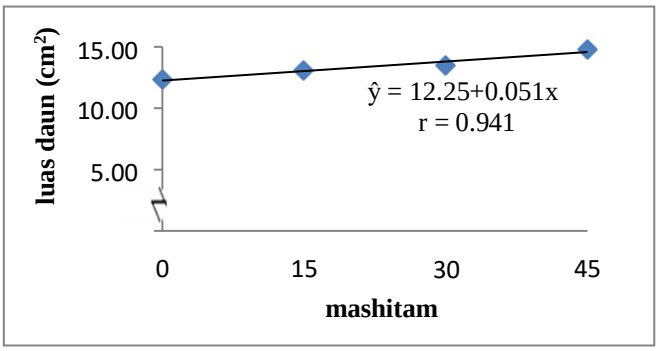

Figure 1. The Relationship of Leaves Area of Palm Oil Seedling to Mashitam 10 WAP

Based on Figure 1 it can be seen that the area of oil palm seedlings leaves a positive linear relationship with the equation ŷ = 12.25 + 0.051x with value r = 0.941.

The result of single factor application of mashitam fertilizer with highest dose 45g/polybag showed significant effect on growth of palm oil seedling such as leaf area at the age of 10 WAP, it is because mashitam fertilizer contains high nitrogen (N) 10 %, Therefore the application of mashitam fertilizer with high concentration can stimulate the plant growth, especially in the leaf. Nyakpa, *et al*. (1998), the process of leaf formation can not be separated from the role of nutrients such as nitrogen contained in medium planting and available for plants. These nutrients play a role in the formation of new cells and the main components of organic compounds in plants.

The application of mashitam organic fertilizer showed significant effect on crown wet weight (Table 2).

Table 2. Crown Wet Weight of Mashitam Organic Fertilizer and Tea Compost.

Mashitam Organic Fertilizer	Tea Compost				
	T0	T_1	T_2	T_3	Average
	……(g)……				
P_0	3.69	4.23	3.75	4.12	3.95c
P_1	4.24	4.14	4.63	4.34	4.34b
P_2	4.40	4.12	4.63	4.52	4.42b
P_3	4.66	4.75	4.73	5.02	4.79a
Average	4.25	4.31	4.44	4.50	

Means values in followed by unequal letters on the same row are significantly different at 5% level using DMRT (Duncan Multiple Rentang Test).

The crown wet weight showed that the highest application of mashitam was found in B_3 (4.79 g) which showed significant effect on B_0 (3.95 g) then followed B_1 (4.34 g) and B2 (4.42 g).

crown wet weight on organic fertilizer mashitam can be seen in Figure 2.

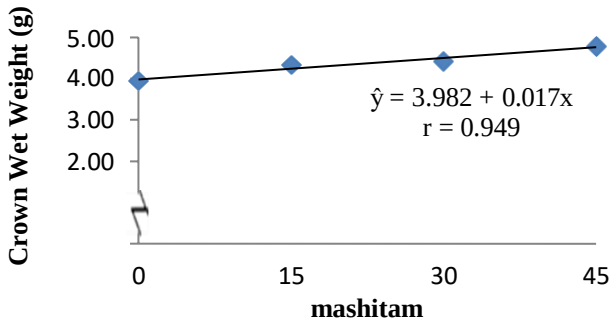

Figure 2. Relation of Crown Wet Weight on Mashitam Organic Fertilizer.

Based on Figure 2, it can be seen that the crown wet weight of the palm oil formed a positive linear relationship with the equation ŷ = 3.982 + 0.017x with the value r = 0.949. Based on the equation it can be seen that the wet weight of the crown has increased at every dose of mashitam fertilizer was given 45 g / polybag obtained the highest crown wet weight, while at the given of 0 g / polybag showed the lowest crown wet weight.

From the result of single factor application of mashitam fertilizer showed significant effect on crown wet weight. Increasing the yield of crown wet weight can achieve optimal results, because the plants get the nutrients from each treatment in accordance with the needs of plants so that the increase in the number and size of cells can reach optimum and allow for an increase in optimal plant water content as well. Harjadi (1989), the xylem from (woody stem functions for upward movement (header) of N-organic. This fact is thought to be the cause of the increased crown wet weight and crown dry weight which is not followed by increased root wet weight and root dry weight. The application of mashitam organic fertilizer showed significant effect on root wet weight (Table 3).

Table 3. Root Wet Weight on Mashitam Organic Fertilizer and Tea Tea Compost.

Mashitam Organic Fertilizer	Tea compost				
	M_0	M_1	M_2	M_3	Average
	……(g)…..……				
B_0	0.60	0.61	0.67	0.69	0.64c
B_1	0.73	0.67	0.72	0.66	0.70b
B_2	0.67	0.71	0.77	0.70	0.71b
B_3	0.79	0.82	0.86	0.99	0.87a
Average	.70	0.70	0.76	0.76	

Means values in followed by unequal letters on the same row are significantly different at 5% level using DMRT (Duncan Multiple Rentang Test).

The root wet weight of seedlings showed the highest application of mashitam organic fertilizer found in B_3 treatment (0.87 g) which was significantly different from the treatment of B_0 (0.64 g), B_1 (0.70 g) and B_2 (0.71 g).

Root wet weight on mashitam organic fertilizer can be seen in Figure 3.

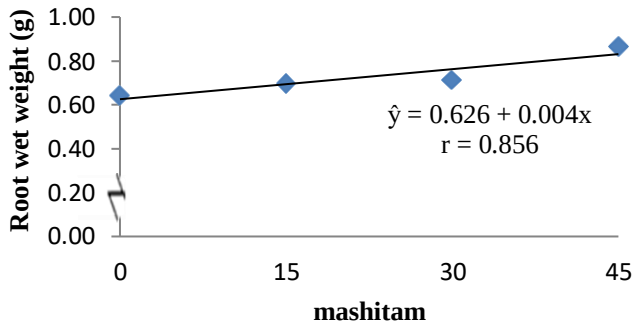

Figure 3. Root Wet Weight on Mashitam Organic Fertilizer

Based on figure 3, it can be seen that the root wet weight was a positive linear on the equation ŷ = 0.626 + 0.004x with r = 0.856. Based on the equation it can be seen that the weight of the roots increased in each dose of mashitam organic fertilizer that was given 45 g / polybag obtained the highest root wet weight, but while given 0 g / polybag showed the lowest on root wet weight.

From the result of single factor on mashitam organic fertilizer, the highest dose 45g / polybag showed significant effect. The increase of root wet weight result can achieve optimal result, because the plants got the nutrients from each treatment in accordance with the required plants so that the increase in the number and size of the cell can reach optimum and allow for an increase in optimal plant water content as well. According to Gardner *et. al*. (1985) in Abdul R.A and Crishpen D.L (2011) the wet weight of the plant is generally highly fluctuating, depending on the state of the plant moisture.

The application of mashitam organic fertilizer showed significant effect on canopy dry weight (Table 4).

Table 4. Canopy Dry Weight on Mashitam Organic Fertilizer and Tea Compost.

Mashitam Organic Fertilizer	Tea Compost				
	M_0	M_1	M_2	M_3	Average
	……(g)……				
B_0	0.42	0.42	0.47	0.48	0.45b
B_1	0.50	0.50	0.49	0.50	0.50a
B_2	0.52	0.54	0.50	0.51	0.52a
B_3	0.53	0.53	0.53	0.58	0.54a
Average	0.49	0.50	0.50	0.52	

Means values in followed by unequal letters on the same row are significantly different at 5% level using DMRT (Duncan Multiple Rentang Test).

Application of mashitam organic fertilizer showed significant effect on canopy dry weight, the highest was found in B3 (0.54 g) which was no significantly different with B1 (0.50 g) and B2 (0.52 g) and significantly different with B0 (0.45 g).

The relationship of canopy dry weight on mashitam organic fertilizer can be seen in Figure 4.

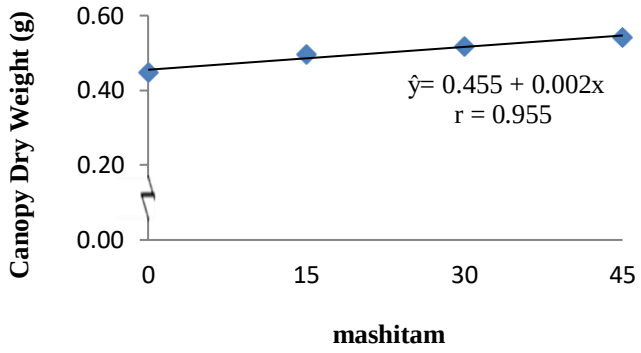

Figure 4. Canopy Dry Weight on Mashitam Organic Fertilizer

Based on figure 4, it can be seen that the dry weight of the canopy forms a positive linear relationship with the equation ŷ = 0.455 + 0.002x with r = 0.955. Based on the equation it can be seen that the dry weight of the canopy has increased in each dose of mashitam that is by giving 45 g / polybag obtained the highest dry weight of the crown, whereas at 0 g / polybag showed the lowest canopy dry weight.

From the result of single factor application of mashitam fertilizer gave a real response on canopy dry weight. The increase in dry weight of crowns is due to the growing growth of oil palm seedlings. Increased growth of oil palm seedlings will increase the weight of wet and dry weight of the plant, the growth of good palm oil seedlings can not be separated from the provision of adequate nutrients, so that the growth of plants to be optimal. Anas (1978), the dry weight produced by a plant is highly dependent on leaf development. The process of photosynthesis is an important factor in the growth of plants where high leaves can receive high sunlight, thus causing photosynthesis results to increase, which then photosynthesis compounds are circulated throughout the plant organs that require and cause dry plant material to be high. While on application of compost of tea dregs did not give a real response on dry weight parameters of bottom of plant.

The application of mashitam organic fertilizer showed significant effect on root dry weight (Table 5).

Table 5. Root Dry Weight on Mashitam Organic Fertilizer and Tea Compost.

Mashitam Organic Fertilizer	Tea Compost				
	M_0	M_1	M_2	M_3	Average
	……(g)……				
B_0	0.10	0.12	0.11	0.12	0.11c
B_1	0.12	0.14	0.15	0.14	0.14b
B_2	0.13	0.15	0.14	0.14	0.14b
B_3	0.16	0.15	0.16	0.17	0.16a
Average	0.13	0.14	0.14	0.14	

Means values in followed by unequal letters on the same row are significantly different at 5% level using DMRT (Duncan Multiple Rentang Test).

The application of mashitam on root dry weight was found on B3 (0.16 g) as the highest, followed by B0 (0.11 g), B1 (0.14 g) and B2 (0.14 g) (Figure 5).

The relationship of root dry weight on mashitam organic fertilizer can be seen in Figure 5.

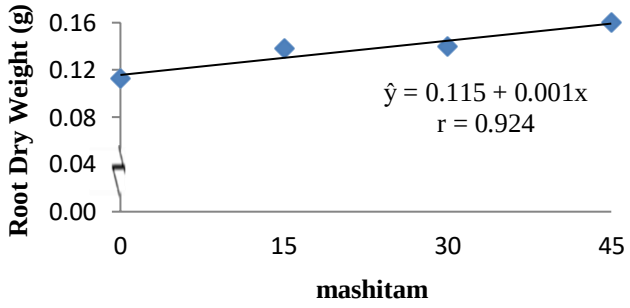

Figure 5. Root Dry Weight on Mashitam Organic Fertilizer

Based on figure 5, it can be seen that the dry weight of roots form a positive linear relationship with the equation y = 0.115 + 0.001x with the value r = 0.924. Based on the equation it can be seen that the root dry weight increased in each dosage of mashitam organic fertilizer that is by giving 45 g / polybag obtained the highest dry root weight, whereas at 0 g / polybag showed the lowest dry root weight result.

From the result of single factor application of mashitam fertilizer give a real response on root dry weight. Increase in root dry weight results due to increased growth of oil palm seedlings. Increased growth of oil palm seedlings will increase the weight of wet and dry weight of the plant, the growth of good palm oil seedlings can not be separated from adequate nutrient supply, so that the growth of plants to be optimal. Fatimah and Budi (2008) say that the high growth of plants, stems and the number of good leaves will produce better total dry weight of plants. The total dry weight of the plant is the result of a balance between carbon dioxide uptake and oxygen excretion is manifestly demonstrated on the wet weight of the plant, as well as the photosynthetic rate that affects the dry weight of the plant where the higher the rate of photosynthesis increases as well as the dry weight of the plant. While on application of single factor of compost of tea dregs does not significantly influence on dry weight parameter of bottom of seedlings.

Growth Response of Palm Oil (*Elaeis guineensis* Jacq.) on Tea Compost

Based on the results (ANOVA) with (RAK) shows that the growth of palm oil seedlings in pre nursery on tea compost showed significant effect on all parameters observed.

Growth Response of Palm Oil (*Elaeis guineensis* Jacq.) on Mashitam Organic Fertilizer and Tea Compost

Based on the results of the variance can be seen that the combination of mashitam organic fertilizer and tea compost showed no significant effect on all parameters observed.

Conclusions

1. Palm Oil seedlings showed significant effect on organic fertilizer mashitam such as leaf area, canopy wet weight, root wet weight, canopy dry weight, root dry weight. The highest growth was at a dose of 45g / polybag with each of 9.44 cm2, 5.02 g, 2.97 g, 0.58 g, 0.17 g.

2. Palm oil seedlings showed no significant effect on tea compost in all parameters observed.

3. Palm oil seedlings showed no interaction on mashitam organic fertilizer and tea compost on all parameters observed.

Suggestion

Need further research by increasing the dose of its use to see a better response on mashitam organic fertilizer and tea compost on growth of palm oil seedlings.

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