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EFFECT OF PLANTING MEDIA COMPOSITION AND PROVISION OF VEGETABLE WASTE LIQUID ORGANIC FERTILIZER ON THE GROWTH OF PALM PALM SEEDLINGS (*Elaeis guineensis* Jacq) IN THE MAIN NURSERY

Ety Rosa Setyawati¹, Dian Pratama Putra² Muhammad Rinaldy³

^{1,2} Lecturer at the Yogyakarta STIPER Agricultural Institute, Indonesia.

³ Student at the Yogyakarta STIPER Agricultural Institute, Indonesia.

* Corresponding author's e-mail: etyrosasetyawati@gmail.com

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ABSTRACT

The research was carried out at KP2 of the STIPER Agricultural Institute which is located in Maguwoharjo, Depok, Sleman, DIY. Research was prepared with a completely randomized plan consisting of 2 factors. First factor is composition of the planting medium with 3 acres, namely: M1 = top soil + cocopeat (1:1) M2 = top soil + husk charcoal (1:1) and M3 = top soil + cocopeat + husk charcoal (1:1:1), Second factor is LOF vegetable waste which consists of 4 areas, namely: P0 = without LOF of vegetable waste (control) P1 = 50 ml/plant P2 = 80 ml/plant P3 = 100 ml/liter of fertilizer treatment combination 3 x 4 = 12 with 4 replications to obtain 48 plants. Observational data were analyzed using analysis of variance and continued with Duncan's Multiple Range Test at a level of 5%. There was an interaction between the planting medium and the LOF of vegetable waste on the fresh weight of the shoot and the fresh weight of the roots. The best is top soil + husk charcoal with LOF vegetable waste 100ml/plant. In the planting media treatment top soil + charcoal husk is the best. LOF vegetable waste is given 50 ml/plant and so on until 100 ml/plant has good growth.

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Keywords:

Claves; Main nursery, organic fertilizer, growing media.

1. Introduction

Seeding is the stage of oil palm cultivation after obtaining planting material in the form of oil palm sprouts. The seedling stage will determine plant growth in the field. One thing that determines this is the planting medium used. The composition of the planting media can be made so that the media can provide sufficient nutrients and water for plants.

There are four functions of planting media to support good plant growth, namely as a place for nutrients, able to hold water available to plants, able to exchange air

between roots and the atmosphere above the media and must be able to support plant growth. A good plant media must have the requirements as a place for plants to stand, have the ability to bind water and supply the nutrients needed by plants, be able to control excess water and have good air circulation, be able to retain moisture around plant roots and not easily rot or become brittle (Mulyani et al., 2018).

Several types of materials that can be used as planting media include top soil, husk charcoal, cocopeat and many others. Each of these organic materials has benefits and advantages so that they can be used in efforts to improve the quality of seeds. Top Soil is the soil that is in the top layer of the soil with a depth of around 5 cm to 30 cm below the surface of the soil. This layer is the most fertile layer, because it contains a lot of organic material. Therefore, this layer is the optimum part for plant life (Mulyani et al., 2018).

Cocopeat, which comes from coconut fiber, is an alternative planting medium that can be used to cultivate various types of plants, especially for hydroponic growing systems. In cultivating plants, not only soil can be used as a planting medium, but cocopeat can also be used. This planting medium has qualities that are no less than soil. Cocopeat has the property of easily absorbing and storing water (Kuntardina et al., 2022). Cocopeat has a good level of aeration so it easily absorbs nutrients and oxygen (Atikah et al., 2023).

Rice husk charcoal is a waste from rice plants and can be used as a planting medium because it can maintain the humidity of the planting medium. This organic material becomes a sterile planting medium but the rice husks are only used for one season. Another advantage of this media is that it can improve the physical properties of the soil (Aryani et al., 2021).

Apart from using good planting media to get high quality oil palm seeds is by fertilizing. Liquid organic fertilizer (LOF) is a fertilizer material that can be used in maintaining oil palm seedlings. The ingredients for making LOF can come from various organic materials. On the other hand, in everyday life we find by-products of human activities in the form of waste. Vegetable waste is the most common waste from human activities and is an important problem in maintaining environmental cleanliness. Utilizing vegetable waste as material for making LOF is an activity that can simultaneously overcome problems that exist in the human environment (R. Gunawan et al., 2022).

2. Materials and Methods

Place and Time of research. research was conducted at KP2 Kalikuning, Maguwoharjo, Sleman, DIY. Research was conducted from April - July 2023.

Tools and materials. Tools used : hoe, machete, bucket, gembor, spade, soil sieve, wood, bamboo, ruler, stationery, polybag, digital scale and oven. The materials used

in this research were: LOF vegetable waste, burnt husks, cocopeat, top soil , 3 month old oil palm seeds.

Research design. Research was prepared with a completely randomized plan consisting of 2 factors. The first factor consists of 3 levels: M 1 = top soil + cocopeat (1:1) M 2 = top soil + husk charcoal (1:1) and M 3 = top soil + cocopeat + husk charcoal (1:1:1), Second factor is LOF vegetable waste which consists of 4 areas, namely: P0 = without LOF of vegetable waste (control) P 1 = 50 ml / plant P 2 = 80 ml / plant P 3 = 100 ml / liter of air treatment combination $3 \times 4 = 12$ with 4 replications to obtain 48 plants.

Preparation of planting medium. The soil used is topsoil, then sieved to make it into fine granules and the soil is clean of rubbish or wild plant remains. Then the sifted soil is put into a polybag. There are several compositions that need to be carried out according to the treatment, namely top soil and cocopeat in a ratio of 1: 1, top soil and husk charcoal in a 1: 1 ratio and top soil, husk charcoal and cocopeat in a ratio of 1: 1: 1 combined in a volume to medium ratio. planting that is evenly composed.

Making vegetable waste LOF. The process of making liquid organic fertilizer is carried out anaerobically. The materials needed to make vegetable waste LOF are water, EM4, vegetable waste and brown sugar. The steps in creating a LOF are: 1) Cut/chop organic vegetable waste materials that will be used as raw materials. Put it in a barrel and add water, the composition is: 3 parts organic vegetable waste, 1 part brown sugar, and 10 parts water. 2) Dissolve EM4 and brown sugar in water then add the solution to the barrel containing organic waste vegetable materials that have been cut into pieces. Close the LOF tightly and leave it for 1.5 months.

3. Results and Discussion

The results of variance analysis showed that there was a real interaction between the composition of the planting media and the LOF of vegetable waste on the fresh weight of the shoot and the fresh weight of the roots. This means that these two factors work together to provide good parameters for fresh shoot weight and root fresh weight for the growth of oil palm seedlings in the main nursery.

Table 1. Effect of the combination of planting media and LOF of vegetable waste on shoot fresh weight and root fresh weight.

Growing media	LOF vegetable waste	Observation parameters	
		Fresh weight of shoots (g)	fresh weight of roots (g)
Top soil + cocopeat (1:1)	Control	30.84cd	13.08e
	50 ml/plant	36.03bcd	19.58bcd
	80 ml/plant	27.78d	17.95bcd

	100 ml/plant	39.63abc	17.23cde
	Control	33.88bcd	18.61bcd
top soil + husk charcoal (1:1)	50 ml/plant	44.07ab	16.56cde
	80 ml/plant	39.03abc	20.83abc
	100 ml/plant	46.76a	25.11a
	Control	36.79abcd	15.03de
top soil + cocopeat + husk charcoal (1:1:1)	50 ml/plant	30.29cd	19.33bcd
	80 ml/plant	41.80ab	16.82cde
	100 ml/plant	37.49abcd	22.42ab

Note: Number followed by the same letter in the column indicates there is no significant difference based on Duncan at the 5% level.

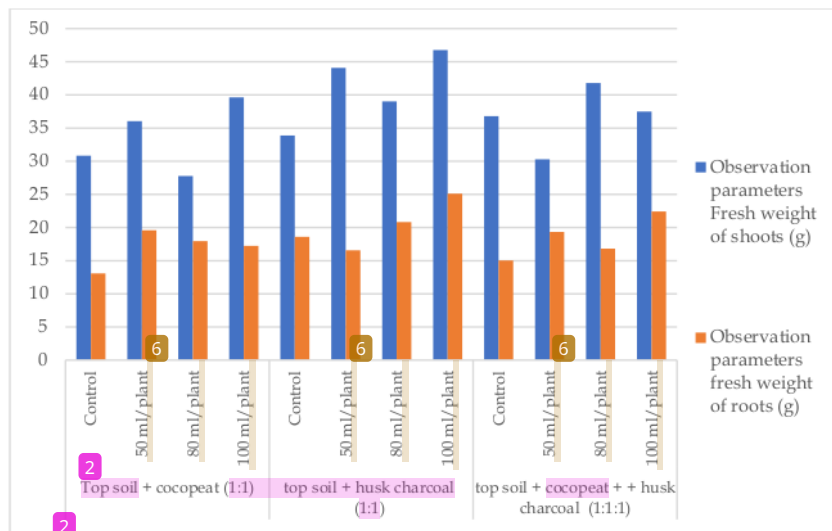


Figure 1. Effect of planting media composition and LOF of vegetable waste.

Table 1 shows that the combination of top soil + husk charcoal with vegetable waste LOF of 100ml/plant has the best effect on shoot fresh weight. It is suspected that planting media with added husk charcoal can improve the physical properties of the planting media so that it can maintain soil moisture, because if husk charcoal is added to the soil it will be able to bind water and increase the organic content in the planting media, then it will be released into the soil pores to be absorbed by plants and encourage the growth of oil palm canopy. According to Ainiah et al., (2019) that rice husk charcoal media contains a lot of organic material, can absorb water, has large pores and can accelerate plant growth. Lestari et al., (2015) stated that the nitrogen nutrient (N) in liquid organic fertilizer stimulates plant growth, because nitrogen forms amino acids into protein. The proteins formed are used to form plant growth

hormones. This is what makes the combination of top soil + husk charcoal with LOF vegetable waste 100ml/plant the best.

The fresh root weight in Table 1 shows that the combination of top soil + husk charcoal with 100ml vegetable waste LOF/plant gives the best effect. It is suspected that the microorganisms and nutrients contained in vegetable waste LOF can help the development of plant roots. According to Tengku et al., (2021) that when microbes grow well around the root cap, the plant, through root function, will be able to absorb the available nutrients optimally. The amount of nitrogen absorbed will also increase. Nutrient absorption will be more optimal if it is supported by good rooting and a good number of active roots. According to Irawan & Kafiari, (2015) use of organic rice husk charcoal is thought to have crumb properties so that oxygen, water, nutrients and roots can easily enter the soil and can bind water. This is important for the roots of plant seeds because the planting medium in which plants grow is closely related to root growth.

It is thought that adding organic material to the planting media and providing vegetable waste LOF can work together to improve the quality of the planting media, where the microorganisms in the vegetable waste LOF can help fertilize the planting media and help decompose the organic material in the planting media. According to Saragih et al., (2019) The organic material in the planting media will be broken down by microorganisms so that in this case a high population of microorganisms also requires plant nutrients for plants and their reproduction. According to B. Gunawan et al., (2021) the cellulosic microorganisms found in the process of making LOF are microorganisms that produce cellulose enzymes which will speed up the composting process of organic materials.

Table 2. Effect of plant media composition on growth of main nursery *Elaeis guineensis* Jacq seedlings.

Observation Parameters	Growing media		
	Top soil + cocopeat	Top soil + husk charcoal	Top soil + cocopeat + husk charcoal
Plant Height Growth (cm)	10.22b	13.95a	12.68a
Number of leaves (pieces)	7.44b	8.06a	7.81ab
Bar diameter (mm)	20.18a	20.06a	21.04a
fresh weight of crown (g)	33.57b	40.94a	36.59ab
crown dry weight (g)	9.84a	12.37a	10.87a
Root fresh weight (g)	16.96b	20.28a	18.4ab
root dry weight (g)	6.25a	7.21a	6.39a

root length (cm) 43.63a 48.63a 49.13a

Note: Number followed by same letter in column indicates there is no significant difference based on Duncan at the 5% level.

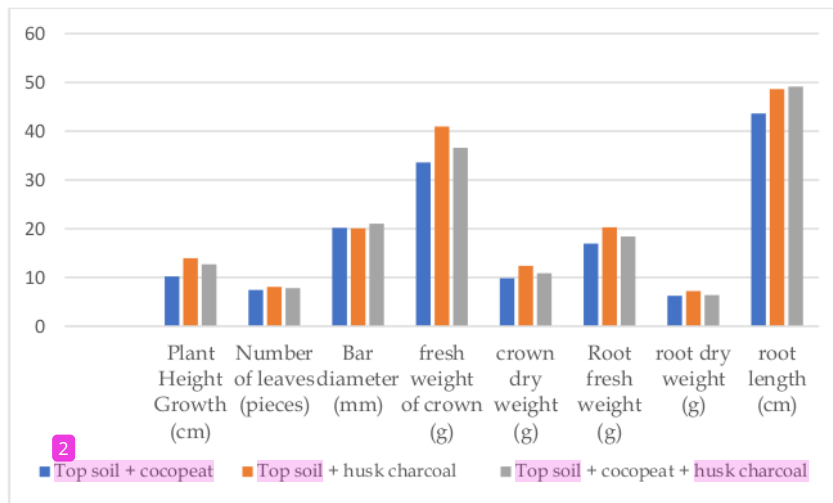


Figure 2. Effect of planting media composition on growth of main nursery oil palm seedlings.

In Table 2, the treatment of planting media composition made a significant difference in the growth of plant height, fresh weight of the crown, number of leaves, and fresh weight of the roots. For the four parameters above, best planting medium is top soil plus husk charcoal. It is suspected that planting medium that is added with rice husk charcoal contains the nutrient N. The nutrient elements contained are macro nutrients where the N element is used for plant growth, especially in the vegetative phase. The availability of nitrogen nutrients contained in husk charcoal is necessary for the formation or vegetative growth of plants such as leaves, crowns and roots. According to Dewi Agustini et al., (2014) Availability of the elements N, P, and K greatly influences the photosynthesis process. The elements N, P, and K are essential elements that have an important role for plants. Results of nutrient content analysis show that planting media added with rice husk charcoal has a higher percentage of N elements. According to Ginandjar et al., (2019) husk charcoal can provide porosity in soil pore spaces which can be occupied by water and air. According to Koyama et al., (2016) SiO₂ content in charcoal husks uptake of silicon by plants increases photosynthesis by suppressing excessive transpiration and improving the light interception structure in growing plants.

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addition of organic material in the planting medium is thought to act as an adhesive between particles in the soil to become soil aggregates, so that organic material is important in its formation and the addition of organic material can increase the population of microorganisms in the soil. According Panda et al., (2021) Soil with organic matter added to it can increase the nutrient content in the soil, bind water, and act as an energy provider for microorganisms in the planting medium.

In table 2, the planting media provides significant differences in plant height, number of leaves, fresh weight crown, and fresh weight roots. The treatment with top soil + cocopeat planting media composition obtained the lowest growth results. According to Asroh et al., (2020) Planting media mixed with cocopeat has micro pores which are able to bind more water, causing the planting media to become saturated with water. This condition becomes an obstacle to gas exchange in the planting medium, the macro pore space which should be filled with oxygen is also filled with water, this makes the roots experience obstacles in respiration. According to Irawan & Kafiar, (2015) there is tannin contained in coconut fiber powder, tannin is a mechanical barrier compound in the absorption of nutrients.

Table 3. Effect of vegetable waste LOF on growth parameters of *Elaeis guineensis* Jacq seedlings in main nursery.

Observation Parameters	LOF vegetable waste			
	control	50 ml/plant	80 ml/plant	100 ml/plant
Plant Height Growth (cm)	10.99p	11.94p	12.58p	13.62p
Number of leaves (pieces)	7.50p	7.83p	7.83p	7.92p
Bar diameter (mm)	18.83q	20.96p	21.14p	20.77p
fresh weight of crown (g)	33.84q	36.8pq	36.21pq	41.29p
crown dry weight (g)	9.59p	11.26p	11.04p	12.22p
Root fresh weight (g)	15.57r	18.49q	18.53q	21.59p
root dry weight (g)	5.43p	6.49p	6.93p	7.62p
root length (cm)	44.33p	47.92p	46.83p	49.42p

Note: Number followed by same letter in column indicates there is no significant difference based on Duncan at the 5% level.

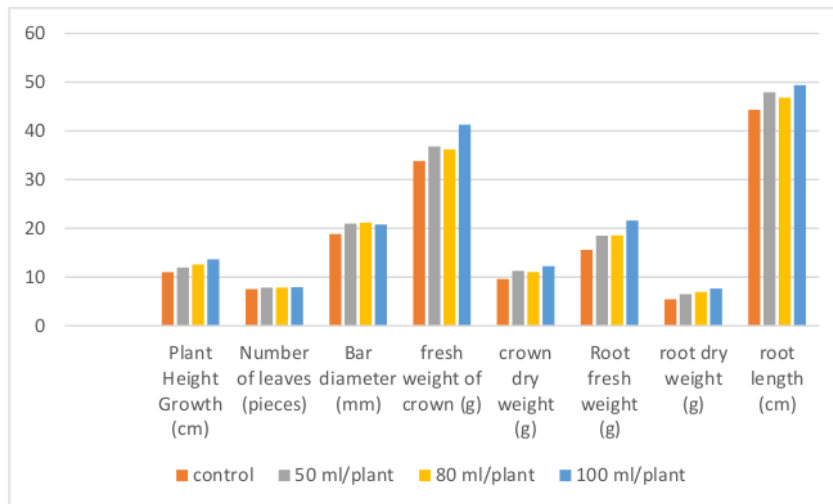


Figure 3. Effect of vegetable waste LOF on growth parameters of *Elaeis guineensis* Jacq seedlings in main nursery.

Table 3, giving LOF vegetable waste has a real influence on the parameters of stem diameter, fresh weight shoot and fresh weight roots. Giving vegetable waste LOF of 50 ml/plant and then up to 100 ml/plant showed better growth compared treatment without vegetable waste LOF (control). It is suspected that the ability of liquid organic fertilizer can be easily absorbed by plants. According to Santosa et al., (2023) The ability of liquid organic fertilizer to provide sufficient macro and micro nutrients, especially the nutrients N, P and K, is very important because it acts as an essential element and component of protein and chlorophyll which has an important role in increasing plant growth.

Apart from providing macro and micro nutrients, liquid organic fertilizer also has microorganisms that can help improve the physical properties of soil. According B. Gunawan et al., (2021) organic fertilizer looks for environmental products that contain various beneficial microorganisms that can improve and maintain Soil fertility, apart from that, can suppress growth of disease bacteria so that the stems, roots and leaves of plants can grow well. Muthu et al., (2023) that organic liquid fertilizer provides important nutrients for plants and microorganisms that help decompose organic matter. According to Arliani et al., (2023) the nitrogen contained in liquid organic fertilizer can improve the growth of the apical meristem.

4. Conclusion

1. There was an interaction between the planting medium and the LOF of vegetable waste on the fresh weight of the shoot and the fresh weight of the roots. Best is top soil and husk charcoal with LOF vegetable waste 100ml/plant.
2. In the planting media treatment top soil and rice husk charcoal is the best.
3. LOF vegetable waste is given 50 ml/plant and so on until 100 ml/plant has good growth.

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