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GROWTH OF OIL PALM SEEDLINGS ON SEVERAL DOSES OF SUGARCANE BLOTONG AND SOIL TYPES

Sri Suryanti[1*)], Agung Firmanto[1)], Enny Rahayu[1)]
[1)]Faculty of Agriculture, Instiper Yogyakarta
Corresponding author: ntie@instiperjogja.ac.id

ABSTRACT

Blotong is sugar factory waste which can be used as organic fertilizer. Research on the effect of sugarcane doses for several types of soil was carried out with the aim of knowing the effect of blotong doses and soil types on the growth of oil palm seedlings in design*pre-nursery*. The research was conducted at the Stiper Agricultural Institute Research and Experimental Garden located in Maguwoharjo village, Depok District, Sleman Regency, DIY from March to June 2021. The experimental method used was a completely randomized design with two factors. The irst factor was the blotong dosage which consists of five levels, namely 0, 100, 200, 300 and 400 grams / polybag. The second factor was the type of soil which was divided into three levels, namely latosol, regosol and grumusol. The research data were analyzed using analysis of variance at a real level of 5% and if there were significant differences, it was continued with the Duncan Multiple Range Test. Observations were made on the parameters of seedling height, number of leaves, leaf area, fresh crown weight, shoot dry weight, root fresh weight, root dry weight, length of primary root, number of primary root, number of secondary root, number of tertiary root and root volume. The results showed that there was no significantly interaction between blotong and soil type on all observed parameters. The use of blotong at a dose of 300 g significantly increased seedling height and primary root length. The use of latosol soil as a seeding medium significantly increased seedling height and fresh shoot weight, while grumusol soil increased the number of secondary and tertiary roots.

Keywords : Blotong, soil type, oil palm seedlings

INTRODUCTION

The increasing expansion of oil palm land requires a large number of quality seeds. Quality seedlings largely determine success in planting in the field. A good seedbed medium and sufficient nutrients are needed to produce good seeds. Sometimes good seedbed media is limited in availability, so additional treatment is needed to get good seedbed media. A good planting medium is a planting medium that can prepare three fundamental desires for plants, namely water, nutrients, and oxygen that meet.

Regosol soil is a soil dominated by macro-porous sand so that soil aeration is good which supports the smooth process of root breathing in the soil, but the

strength to hold and provide water and nutrients is low so it is poor in organic matter. Latosol soil is a soil dominated by kaolinite loam that is not too attached and clay, moderate soil drainage, moderate soil aeration, the ability to provide water is quite high, the pH of the soil is acidic to slightly acidic, so that the chemical fertility of the soil is low to medium. Grumusol soil is a soil dominated by montmorylonite clay, which is a very fine, very sticky and clayey loam, poor drainage, poor soil aeration, high water retention, physical and chemical properties rather ugly to moderate. (Susanto 2005)

Blotong contains macro and micro nutrients that play an important role in plant growth. Application of blotong and improve the physical, chemical and chemical fertility of degraded soils (Juradi et al., 2020). Blotong can be used as a basic material for the production of compost used for minimize and reduce occurrence pollution as well as useful in perfecting the physical, biological and chemical properties of soil.

Disadvantages of regosol soil as a medium of planting have low soil aggregation because it is dominated by sand, which causes the ability of the soil to hold and provide nutrients and water is also low. Acidity in latosol soils causes high solubility of micrometallic nutrients so that the potential for high toxicity also causes phosphorus fixation. Grumusol soils are the base, the toxicity of the base and its high absorbency, its permeability is slow, and sensitive to erosion, and has a binder high water but low water supply ability. The weaknesses of the three types of soil can be overcome by providing organic matter, including sugarcane blotong, and being able to perfect the physical, chemical, biological properties of sand, clay soil and provide nutrients in seeds. The use of 0.75 kg/polybag blotong compost on ultisol soil can increase soil pH to 6.11, organic C by 4.27%, total N by 0.47%, Ca exchanged by 7.78 cmolc kg-1, Mg exchanged by 1.01 cmolc kg-1, K-exchanged by 0.36 cmolc kg-1, CEC by 31.94 cmolc.kg-1 and reduce Al levels (Septyani et al., 2020).

Sugarcane blotong stores high nutrients, which are useful for plant development, mainly percentages C and P. Blotong has a large content of soil pollinating material such as Nitrogen, Phosphat (P2O5), Calcium (CaO), humus and others, then blotong can be converted into organic fertilizer, used to fertilize and improve soil structure as in arid soils (Taufik, dkk, 2013). Sugar cane blotong also known as "filter press mud" is a great material. Used as an organic fertilizer material, it can increase soil fertility by improving soil texture, which is determined by the physical properties of the soil, such as increasing the binding power of water, reducing the rate of nutrient leaching, and improving soil drainage, as well as reducing the use of phosphate fertilizers such as SP36 and NPK (Asril et al., 2023).

Blotong compost is useful for a source of nutrients that can be useful for plants, in addition to improving the physical, chemical and biological properties of the soil. The utilization of blotong waste not only saves costs by reducing the need for inorganic fertilizers, but also contributes to the zero-waste sector. It was found that the use of sugarcane and bamboo shoots at doses of sugarcane 160 g and 14 ml bamboo shoots have a significant influence on the growth of oil palm seedlings in pre nursery (Pratomo et al., 2018). These two things also have real implications on the height of oil palm seedlings at the age of 9 weeks post-planting and 10 weeks

post-planting. The application of 1500 grams of blotong compost per plant with optimum watering can markedly increase the height of seedlings, number of leaves, stem diameter and fresh weight of oil palm seedlings in the main nursery. This happens because blotong compost contains 32.38% C-organic, 1.51% N, 5.63% P2O5, and 0.26% K2O (Ariyanti et al., 2018). Different results are shown by studies conducted by (Sigit et al., 2020) shows that the application of sugarcane liquid waste has not had an optimal influence on all parameters in oil palm nurseries in the main nursery. The best growth of seedlings is shown in control. Therefore, it is necessary to conduct research on the growth of oil palm seedlings at several doses of sugarcane blotong and soil type.

METHOD

The tools used in the study were digital scales, gauges, polybags and ovens. The materials used were oil palm sprouts of Simalungun variety from PPKS Medan, sugarcane blotong, and regosol soil types taken in Maguwoharjo Village, latosol and grumusol soil in Pathuk Village, Gunung Kidul Regency. This research was carried out at KP2 Stiper Agricultural Institute located in Maguwoharjo village, Depok District, Sleman Regency, DIY with an altitude of 118 meters above sea level. This study was conducted from March to June 2021.This study was a factorial experiment with a Completely Randomized Design (RAL) consisting of two factors. The first factor was the dose of sugarcane blotong which consists of 5 levels, namely 0, 100, 200, 300 and 400 grams / polybag. The second factor was the type of soil consisting of 3 levels, namely latosol, regosol and grumusol. The observations were analyzed with a *5%* analysis of variance. To determine the difference between treatments, DMRT (Duncan's Multiple Range Test) was used at a real level of 5% and correlation analysis. Observation parameters include seedling height, number of leaves, leaf area, fresh weight of shoot, dry weight of shoot, fresh weight of root, dry weight of root, primary root length, number of primary roots, number of secondary roots, number of tertiary roots and root volume.

RESULTS OF DISCUSSION

The results of the analysis showed that between the dose of sugarcane blotong and soil type there was no significant interaction with all seedling growth parameters (Table 1). The results of the analysis showed that at a dose of sugarcane blotong 300g had a significant effect on seedling height and primary root length. The results of this study are in line with research conducted by (Sari et al., 2019) that the application of 500 grams of blotong compost markedly increased the height of oil palm seedlings, dry weight of the shoot and dry weight of the root of oil palm seedlings in the main nursery. Sugarcane blotong has nutrient content water (32%), pH H_20 (6.54%), C-Organic (9.93%), N-kjeldahl (1.01%), NH_4 (0.5%), N-NO_3 (0.11%), N-Total (1.13%), C/N Ratio (8.76%), P_2O_5 (1.05%), K_2O Total (0.16 ppm), Fe (10308.67 ppm), Mn (759.597 ppm), Cu (50.75 ppm), and Zn (90.68 ppm) (Supari et al., 2013).

Table 1. The effect of sugarcane blotong dose on the growth of oil palm seedlings in pre-nursery.

Observation parameters	Dose of sugar cane blotong				
	0 g	**100 g**	**200 g**	**300 g**	**400 g**
Seedling height (cm)	20,32 b	20,76 ab	22,22 ab	23,33 a	21,68 ab
Number of leaves	3,44 a	3,67 a	3,56 a	3,66 a	3,44 a
Volume of roots (ml)	1,56 a	1,66 a	1,89 a	2,22 a	1,56 a
Leaf area (cm^2)	120,93 a	124,98 a	124,35 a	132,79 a	124,19 a
Fresh weight of shoot (g)	2,97 a	3,09 a	3,65 a	3,72 a	3,38 a
Dry weight of shoot (g)	0,60 a	0,62 a	0,72 a	0,73 a	0,66 a
Fresh weight of roots (g)	2,83a	2,88a	3,00a	3,63a	3,58a
Dry weight of root (g)	0,36a	0,34a	0,34a	0,38a	0,41a
Primary root length (cm)	18,24 ab	16,54 b	18,48 ab	21,08 a	16,28 b
Number of primary roots	2,67 a	2,78 a	2,67 a	2,78 a	2,56 a
Number of secondary roots	30,67 a	43,44 a	37,00 a	35,56 a	37,89 a
Number of tertiary roots	66,89 a	85,67 a	76,44 a	81,22 a	80,11 a

Description: the average number in a row followed by the same letter shows that there is no difference in this based on DMRT at the level of 5%

The high P content in blotong and loose soil with blotong causes the roots to develop better. Increasing root length has a positive effect on water and nutrient absorption so that the height of oil palm seedlings increases. The results of the correlation analysis between seedling height and root length showed a positive correlation (r = 0.399). This indicates a close relationship between root length increases seedling height. Sugar cane blotong can improve physical, soil chemistry and biology properties. This benefit is not possessed by inorganic fertilizers. Inorganic fertilizers only act as nutrient suppliers, while sugarcane blotong can serve as a source of nutrients and soil improvers due to the results of organic matter decomposition. Organic fertilizers can increase cation exchange capacity (KPK), increase the storage capacity of water and nutrients, and increase the activity of microorganisms, especially beneficial microorganisms in the soil.

The results of the analysis showed that giving a dose of sugarcane blotong higher than 400 grams decreased the height of seedlings and the length of the roots of oil palm seedlings in pre nursery (Figure 1). At a dose of 400 grams can cause high levels of moisture which will reduce aeration in the soil so that the process of root respiration in the soil decreases. Low root respiration will reduce ATP production which acts as an energy source in the process of active nutrient absorption, so that reduces the capacity of the roots to absorb nutrients and results in lower growth of seedlings. These results are different from the results of research conducted by (Putra et al., 2015) The increase in blotong compost ratings was followed by an increase in crop growth.

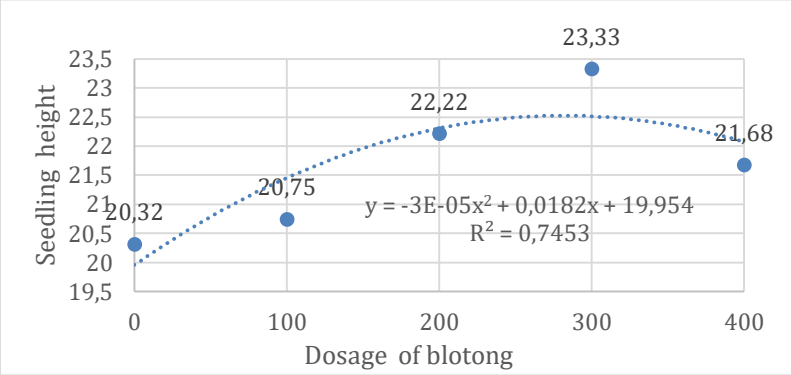

Figure 1. Graph of the Relationship between Dosage of Blotong and Seedling Height

The results of polymonial regression analysis (Figure 1) showed that the height of oil palm seedlings in pre nursery at doses 300 grams had better growth compared to other doses and at higher doses experienced a decrease in seedling height. Giving sugarcane blotong with a dose of 300 grams has a better effect than the dose of 0 grams on the height of oil palm seedlings pre nursery. These results are in line with the results of research conducted by (Pratomo et al., 2018) which showed that the dose of blotong 300 grams gives better results than the use of sugar cane blotong at a dose of 160 grams. This happens because the higher the dose of sugarcane blotong will make the soil become more loose and the availability of nutrients N, P and K increases so that it will increase the height of seedlings and the length of plant roots.

The correlation between dry weight of roots and dry weight of shoot showed a positive correlation (r = 0.87). This showed a close relationship between the dry weight of the roots and the dry weight of shoot. The dry weight of shoot and the dry weight of the roots are the main indicators in plant growth. With increased root growth, the ability of plants to absorb water and nutrients will increase so that the process of photosynthesis and photosynthetes are manifested in plant development.

According to (Rachman et al., 2019) in general, the characteristics of the physical properties of the soil greatly affect its ability to supply water available to plants. The results of the analysis revealed that latosol soil has a better influence than regosol soil and does not differ from grumusol soil on the parameters of seedling height, fresh weight of shoot, dry weight of shoot, fresh weight of roots and dry weight of of roots in pre nursery. Latosol soil is dominated by kaolinite clay, which is clay that is not too attached and clay, so that air circulation in the soil is still good enough which is needed for the smooth process of root respiration in the soil. In addition, latosol soil has the ability to provide high enough water needed by seedlings to carry out metabolic processes in plants. Meanwhile, according to the results of the study (Kurniawan et al., 2023) that regosol soil has a better physical structure compared to other types of soil in supporting rooting, but has several problems such as low ability to absorb and store water.

Table 2. The effect of soil type on the growth of oil palm seedlings in *pre-nursery*.

Parameter	Soil type		
	Latosol	**Regosol**	**Grumusol**
Seedling height (cm)	23,00 p	20,70 q	21,29 pq
Number of leaves	3,60 p	3,47 p	3,60 p
Volume of roots (ml)	1,80 pq	1,47 q	2,07 p
Leaf area (cm^2)	135,33 p	120,37 p	120,64 p
Fresh weight of shoot (g)	3,71 p	2,96 q	3,42 pq
Dry weight of shoot (g)	0,75 p	0,58 q	0,67 pq
Fresh weight of roots(g)	3,01p	3,13p	3,41p
Dry weight of roots (g)	0,43p	0,32q	0,36pq
Primary root length (cm)	18,59 p	16,53 p	19,25 p
Number of primary roots	2,80 p	2,47 p	2,80 p
Number of secondary roots	32,40 q	30,67 q	47,66 p
Number of tertiary roots	73,00 q	63,67 q	97,53 p

Description: the average number in a row followed by the same letter shows that there is no difference in this based on DMRT at the level of 5%

The results of the analysis (table 2) showed that regosol soil had the same effect as latosol and grumusol soil on the number of leaves, leaf area, primary root length, and number of primary root. Sand fraction dominates regosol soils, drainage and soil aeration (air circulation in the soil) is very good which allows smooth process of root breathing in the soil. Regosol soil is porous and roots penetrate easily, thus accelerating root growth. Although the ability to store water is limited, the provision of water through regular watering every day is able to provide enough water for good seedling growth. According to (Ulama & Bakri, 2022) physical properties in the form of moisture content, total pore space are positively correlated with the value of oil palm root distribution.

The results of the analysis (table 2) showed that grumusol soil has a strong influence on the parameters of the number of secondary roots and the number of tertiary roots and exerts a different influence from latosol soil on root volume. This is likely due to grumusol soil which has a high type surface area and many nutrients that stimulate the growth of secondary roots and tertiary roots. Grumusol soil is a soil dominated by monmorilonite clay which has the property of expanding when wet and shrivelling when dry, very sticky and very clay. This clay is very finely dominated by micropores, so although the ability to hold water is high, the ability to provide water for plants is very low. In research that Sutanto (2005) revealed that clays in vertisol or grumusol are montmorilonite clays that expand and shrivel. This land has large water-holding capacity, but relatively little water is available for plant growth. According to (Anaba et al., 2020) choosing the right type of soil for oil palm seedlings is the key to successful oil palm nurseries. Soil texture greatly affects the survival of oil palm seedlings, especially during drought stress.

CONCLUSION

The results of the analysis showed that there was no combination between sugarcane blotong dose and soil type in increasing the growth of oil palm seedlings in the *pre-nursery*. Feeding sugarcane blotong at a dosage of 300 g markedly increases seedling height and root length. Giving sugarcane blotong dose of 300g at optimal seedling height and root length. Latosol soil markedly increases seedling height, fresh weight of shoot, dry weight of shoot, fresh weight of root, and oil palm seedling weight in *pre nursery.* While grumusol soil increases the number of secondary and tertiary roots.

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