GUANO FERTILISER APPLICATIONS TO IMPROVE GROWTH OF PALM OIL SEEDS (*Elaeis guineensis Jacq*) IN PRE-NURSERY

Muryanto [1] and Seprita Lidar [2]
[1, 2,] Faculty of Agriculture. Universitas Lancang Kuning
E-Mail: sepritaldr@unilak.ac.id

ABSTRACT

The study aims to determine and obtain the best effect of the dose of guano fertiliser on the growth of palm oil seedlings in pre-nursery conducted experimentally with a Completely Randomized Design (CRD) with five levels of treatment, four replications and three plants/plots with observational parameters that include seed height, stem diameter, number and area of leaves. Observation data were analysed statistically with variance and continued with Duncan test of 5% level. The application of guano fertiliser has a significant effect on plant height and leaf area, while the number of leaves and stem diameter has received no significant effect from the treatment. The 0.5 kg/polybag guano fertiliser treatment gave the best results to the growth of palm oil seedlings (*Elaeis guineensis Jacq*) in the pre-nursery.

***Keywords*:** seeds, palm oil, pre-nursery, guano fertiliser

ABSTRAK

Penelitian bertujuan untuk mengetahui pengaruh dan mendapatkan dosis pupuk guano yang terbaik terhadap pertumbuhan bibit kelapa sawit di *Pre Nursery* yang dilaksanakan secara eksperimen dengan Rancangan Acak Lengkap (RAL) dengan 5 taraf perlakuan, 4 ulangan dan 3 tanaman/plot dengan parameter pengamatan adalah tinggi bibit, diameter batang dan jumlah dan luas daun. Data hasil pengamatan dianalisa secara statistik dengan sidik ragam dan dilanjutkan dengan uji Duncan taraf 5%. Aplikasi pupuk guano berpengaruh nyata terhadap tinggi tanaman dan luas daun, sedangkan terhadap jumlah daun dan diameter batang berpengaruh tidak nyata. Perlakuan pupuk guano 0,5 kg/polibag memberi hasil terbaik terhadap pertumbuhan bibit kelapa sawit (*Elaeis guineensis* Jacq) di *pre-nursery*.

Kata kunci: bibit, kelapa sawit, *pre-nursery*, pupuk guano

Diterima : 11 January 2020. Disetujui: 6 Februari 2020

INTRODUCTION

Palm oil as a producer of the oil and kernel of palm coconuts is one of the prima donnas of plantation crops which is a source of non-oil and gas foreign exchange-earners for Indonesia. The bright prospect of the palm oil commodity in the world vegetable oil trade is encouraging the Indonesian government to spur the development of palm oil plantations so that the availability of high-quality seeds is needed.

In palm oil cultivation, its success cannot be separated from a series of nursery activities to produce quality palm oil seeds. Nurseries are the first step in determining the success of an agricultural business. Excellent and healthy seedling growth will be obtained if the optimal nursery treatment. Several factors affect the quality of palm oil seedlings, one of which is the planting media that will be used in nurseries. The planting media used are FMD soils which are relatively infertile due to nutrient-poor and contain low organic matter.

FMD soil has several main constraints, namely acid soil, low organic C content, low cation exchange capacity and low base saturation, high phosphate fixation and low water availability so that one of the characteristics of FMD soil is having a low CEC, so action is needed proper fertilisation to improve the physical, chemical and biological properties of the soil in the soil.

Organic fertiliser is a fertiliser that comes from the remains of plants or animals. The application of organic fertiliser is beneficial for maintaining sustainable soil fertility, including the physical, chemical and biological properties of the soil. Organic matter as an aggregate stabiliser also acts as a source of energy for most soil organisms.

Guano fertiliser is a fertiliser that originates from bat droppings and has long settled in the cave and has been mixed with soil and decomposing bacteria. This guano fertiliser contains nitrogen, phosphorus and potassium which are very good for supporting growth, stimulating roots, strengthening seedlings so that by giving guano fertiliser is expected to increase the growth of palm oil seedlings in pre-nursery.

Therefore, this study aims to determine the effect and get the dose of guano fertiliser which gives the best effect on the growth of palm oil seedlings (*Elaeis guineensis Jacq*) in the pre-nursery.

METHOD

This research was conducted in the experimental garden of the Faculty of Agriculture, Lancang Kuning University, Jl. Yos Sudarso Km 8 Rumbai with a height of 16 meters above sea level, flat topography and red-yellow podzolic soil type (FMD).

Complete Randomized Design (CRD), consisting of 5 treatments and 4 replications, with G_0 treatment (without the use of guano fertiliser), G_1 (giving guano fertiliser 0.25 kg/polybag), G_2 (giving guano fertiliser 0.50 kg/polybag), G_3 (0.75 kg/polybag guano fertiliser), G_4 (1.0 kg/polybag guano fertiliser). Then the data are analysed with variance and followed by DNMRT at the level of 5%.

Growing media is topsoil mixed with cow manure with a ratio of 4:1. Shade made as high as 2 m covered the entire research plot. Palm oil sprouts are chosen uniformly, namely plumula length 1 cm and radicles 2 cm and planted with plumula facing upward and radicle downwards, then watering is done. Guano fertiliser is given only once, that is mixed with the planting media according to the treatment dose.

Plant maintenance is carried out such as fertilizing urea 2 g/l given at the time of a month after planting, with intervals of 2 weeks. Watering the seeds 2 times a day, i.e. morning and evening with the same volume. Pest and disease control is done using Decis 2,5, EC with a concentration of 1 cc/l and Dithane M-45 with a concentration of 1 g/l. Spraying is done 2 weeks after planting at intervals of 2 weeks Observed parameters measured were: seedling height (cm), number of leaves (strands), stem diameter (mm) and leaf area (cm^2).

RESULTS AND DISCUSSION

The application of guano fertiliser has a significant effect on plant height and leaf area of palm oil seedlings, the average yield and Duncan's test can be seen in **Table 1** and **Table 4**, while the parameters on the number of leaves and stem diameter giving guano fertiliser have no significant effect (**Table 2** and **Table 4**).

The application of guano fertiliser can increase the height of palm oil seedlings, the higher the dose of guano fertiliser applied, the higher the palm oil seedling. Duncan further test results stated that the application of guano fertiliser in the treatment of G_4 (1.0 kg/polybag) gave the highest average (29.35 cm) but was not significantly different from G_1 (0.25 kg/polybag), G_2 (0.5 kg/polybag) and G_3 (1.5 kg/polybag), while the lowest in G_0 (without administration) is 20.85 cm.

Results of variance showed that the application of guano fertiliser had no significant effect on the number of leaves of palm oil seedlings, for the average number of leaves of palm oil seedlings is presented in **Table 2**.

Table 2 shows that all treatment levels had no significant effect on the number of leaves. In the mean number of G_4 (1.0 kg/polybag) gave the highest yield of 5.88 strands, the lowest G_0 treatment (without treatment) was 5.00 strands.

The results of the variance table showed that the application of guano fertiliser had no significant effect on the stem diameter of palm oil seedlings, for the average stem diameter of the plants presented in **Table 3**. it shows that all treatment levels had no significant effect on stem diameter. In the mean number of G_4 (1.0 kg/polybag) gave the highest yield of 1.93 cm, the lowest G_0 treatment (without treatment) of 1.04 cm.

Table 1. Average Height of Palm oil Seed Crops Due to Provision of Guano

Guano Fertiliser Treatment	Average Plant Height (cm)
G_0 = none given	21,35 a
G_1 = given 0,25 kg/polybag	26,72 ab
G_2 = given 0,50 kg/polybag	28,67 b
G_3 = given 0,75 kg/polybag	29,26 b
G_4 = given 1,00 kg/polybag	29,35 b

Numbers followed by the same letters in different columns are not real. According to DNMRT 5%

Table 2. Average Number of Palm Oil Seed Leaves Due to Giving of Guano

Guano Fertiliser Treatment	Average Number of Leaves (sheet)
G_0 = none given	5,00
G_1 = given 0,25 kg/polybag	5,50
G_2 = given 0,50 kg/polybag	5,63
G_3 = given 0,75 kg/polybag	5,75
G_4 = given 1,00 kg/polybag	5,88

Table 3. Average Stem Diameter of Palm Oil Seedling Due to Giving of Guano

Guano Fertiliser Treatment	Average Stem Diameter (cm)
G_0 = none given	1,04
G_1 = given 0,25 kg/polybag	1,13
G_2 = given 0,50 kg/polybag	1,82
G_3 = given 0,75 kg/polybag	1,88
G_4 = given 1,00 kg/polybag	1,93

Table 4. Average Diameter of Palm Oil Seedling Stems Due to Giving of Guano

Guano Fertiliser Treatment	Average Leaf Area (cm^2)
G_0 = none given	34,33 a
G_1 = given 0,25 kg/polybag	45,36 b
G_2 = given 0,50 kg/polybag	52,89 c
G_3 = given 0,75 kg/polybag	57,32 c
G_4 = given 1,00 kg/polybag	60,08 c

Numbers followed by the same letters in different columns are not real. According to DNMRT 5%

The application of guano fertiliser can increase the leaf area of a palm oil seedling, the higher the dose of the guano fertiliser applied, the wider the palm leaf seedling area. Duncan's further test results stated that the application of guano fertiliser in the treatment of G_4 (1.0 kg/polybag) gave the widest mean (34.33 cm^2), although it was not significantly different from G_2 (0.5 kg/polybag) and G_3 (0, 75 kg/polybag), while the lowest in G_0 (without administration) was 34.33 cm^2. Based on the variance of the application of guano fertiliser significantly affected the height and area of the leaves, while the parameters of the number of leaves and stem diameter had no significant effect.

The growth of palm oil seedlings in the N_0 treatment (without the use of guano fertiliser) was lower than the other treatments, this was allegedly due to the lack of nutrients in the planting media of palm seedlings, so that it was not sufficient to grow and develop palm oil seedlings and finally its growth was low compared to palm oil seedlings that were given Guano fertiliser. The soil used as a medium is Ultisol which is a soil that contains low organic matter, N, P, K and soil pH, so this is what makes the growth rate of palm oil seedlings low. Without applying guano fertiliser the number of nutrients absorbed by plants is limited, it is only available in the media, so there is no significant effect on the growth of palm oil seedlings.

This is in accordance with the opinion of the assembly (2004) the availability of essential nutrients that are less than the amount needed will be disturbed metabolism, because plant growth has a positive correlation with nutrient availability so that in plant cultivation nutrient availability becomes a very decisive factor.

Nutrients are very instrumental in increasing plant growth. Sutedjo (2002) incomplete macro and micronutrients can cause obstacles to the growth and development of plants. Fertilisation is something that can increase the growth of palm oil seedlings, as well as the guano fertiliser in this study that can increase the growth of palm oil seedlings.

Seedlings treated with guano fertiliser have an increase in their growth as seen in the parameters of seedling height, the number of leaves, stem diameter and leaf area. It is apparent that the higher the dose of given guano fertiliser, the better the growth. Guano fertiliser is a fertiliser derived from bat droppings and has long settled in the cave and has been mixed with soil and decomposing bacteria, so that it contains phosphorus and potassium which is very good for supporting growth, stimulating roots, strengthening seedlings.

Moreover, Mengel and Kirby (2010) and Sufardi (2012) guano fertiliser contains 19% phosphorus in the form of P_2O_5 which is in the plant as a constituent of ATP compounds needed in the process of photosynthesis for carbohydrate formation. Furthermore, Suwarno and Idris (2007) guano fertiliser can increase pH, CEC and available N, P and K levels.

The available nutrients are vital in increasing plant height growth. According to Winarso (2005), if the nutrients in the soil are sufficiently available following the needs of the plant, the plants can be utilised for their growth. The increase in plant growth is caused by the macronutrient content found in guano fertiliser which has been able to provide the nutrients needed by plants. The availability of nutrients that can be absorbed by plants is one of the factors that affect plant growth which will increase cell enlargement. Dalimunthe, Ardian and Khoiri (2012) stated that Phosphorus functions to accelerate the development of roots, plays a role in the process of respiration, thus encouraging the growth rate of plants including stem twists.

Furthermore, Riza and Giska (2017) found that the application of guano fertiliser can increase the nutrients of N, P and K media, thereby increasing plant growth. According to Surtinah (2010), N element acts as a stimulant of vegetative growth mainly in the growth of roots, stems, and leaves. Besides nitrogen also plays an important role in the formation of chlorophyll which is very useful in the process of photosynthesis. Nutrient P helps accelerate root development and germination can increase the efficiency of water use, increase resistance to disease which can ultimately improve plant quality.

Furthermore, nutrient K plays a role in the formation of protein and carbohydrate, strengthens plant growth so that leaves do not fall easily and as a source of strength for plants in the face of drought and disease.

The results of variance showed that the use of guano fertiliser had no significant effect on the number of leaves. It is suspected that plant genetic factors are more dominant in influencing leaf growth. This statement is supported by Pahan (2012) who states that one of the factors that influence the growth and development of plants throughout their lives is innate factors, namely factors related to plant genetics. This factor is absolute and has existed since embryo formation in seeds. In addition, the number of leaves of each individual commodity is not too different. In fact, genetic traits where palm oil seeds form 1-2 strands each month strongly influences the number of leaves (Reksa, 2007).

This research also found that the treatments between G_2, G_3, and G_4 have no significant effect on each other on the parameters of the area of palm seedling leaves. This is presumably due to the content of phosphorus and calcium from guano fertiliser. Phosphorus elements contained in guano fertiliser can encourage the growth of the roots of palm oil seeds, phosphorus is part of the cell nucleus, which is very important in cell division and the development of meristem tissue. The development of a sound root system can encourage the development of plant canopy parts.

The roots absorb nutrients from the soil and are transported to the plant canopy through the xylem vessels used for photosynthesis (Lingga, 2010). While the element of calcium contained in guano fertiliser can increase the pH in the soil, thereby making the soil fertile. Calcium in the soil has a role in reducing the level of soil acidity, and calcium is the main constituent in the formation of the middle lamella of the cell wall, which can strengthen the growth of palm oil seedlings.

The best growth of palm oil seedlings was in the G4 treatment (20 g/polybag), which gave the highest yield on plant height, the number of leaves, stem diameter, and leaf area. It is suspected that the administration of guano at a dose of 20 g/polybag is sufficient to meet the needs of the plant in its infancy to increase the best growth. Suwandi and Chan (1982) further state that organic material can be used to increase plant metabolism, where the absorption of nutrients derived from fertiliser s will be more effective because of the increased carrying capacity of the soil due to the addition of organic matter in the soil. Thus, plant growth will be better so that it can increase plant growth. This is in line with the results of Mukhtaruddin, Sufardi, and Anhar's research (2015), who found that the application of guano fertiliser significantly affected palm oil seedlings in pre-nursery on subsoil soil media with the best dosage of 15 g/polybag.

CONCLUSION AND SUGGESTION

Conclusion

The application of guano fertiliser has a significant effect on plant height and leaf area, whereas the number of leaves and stem diameter had received no significant effect. The 0.5 kg/polybag of guano fertiliser treatment gave the best results to the growth of palm oil seedlings (*Elaeis guineensis Jacq*) in the pre-nursery.

Suggestion

Based on the results of this research, it is recommended to use 0.5 kg/polybag of guano fertiliser for palm oil in pre-nursery.

REFERENCE

Edy Usman, Meriyanto, dan Haris. 2013. Respons Pertumbuhan Bibit Kelapa Sawit (*Elaeis guineensis Jacq*) Di *Pre Nursery* Akibat Pemberian Pupuk Melalui Daun. Jur.Agroekotek 6 (1) : 41 – 47

Fitriatin, A. Yuniarti., T. Turmuktini., dan F. K. Ruswandi. 2014. The Effect of Phosphate Solubilizing Microbe Producing Growth Regulators on Soil Phosphate, Growth and Yield of Maize and Fertiliser Efficiency on Ultisol. Eurasian J. of Soil Sci. Indonesia. Vol. 10 (5) Hal:101-107.

Lestari Dan Azwin. 2014. Pengujian Pupuk Tulang Ayam Sebagai Bahan Ameliorasi Terhadap Pertumbuhan Tanaman Sorghum Dan Sifat-Sifat Kimia Tanah Podzolik Merah Kuning Pekanbaru. Jurnal Ilmu Pertanian Vol II (2).

Lubis, R. E., dan A. Widanarko. 2011. Buku Pintar Kelapa Sawit. Agromedia Pustaka. Jakarta. 296 hlm.

Mengel, K dan E.A. Kirkby, 2010. Principles of Plant Nutrision. Inter. Potash Inst. 864 p.

Mukhtaruddin, Sufardi, & Anhar, Ashabul 2015. Penggunaan guano dan pupuk NPK Mutiara untuk memperbaiki kualitas media subsoil dan pertumbuhan bibit kelapa sawit (*Elaeis guineensis Jacq*.). Jurnal Floratek Vol. 10(2); 19-33.

Mulyani, A. Rachman, dan A. Dairah. 2010. Penyebaran Lahan Masam, Potensi dan Ketersediaannya Untuk Pengembangan Pertanian. dalam Prosiding Simposium Nasional Pendayagunaan Tanah Masam. Pusat Penelitian dan Pengembangan Tanah dan Agroklimat. Bogor. Hal: 23-34

Pahan. 2015. Panduan Teknis Budidaya Kelapa Sawit untuk Praktisi Kebun. Penebar Swadaya. Jakarta. 116 hlm.

Rasantika, M.S. 2009. Guano Kotoran Burung Yang Menyuburkan. Kompas Gramedia. 9 Juli 2009. Jakarta.

Riza, S., Giska. O. 2017. Aplikasi Pupuk Guano Dalam Meningkatkan Unsur hara N, P, K dan Pertumbuhan Tanaman Kedelai Pada Media Tanam Tailing Tambang Emas. Prosiding Seminar Nasional Fak. Pertanian UMJ "Pertanian dan Tanaman Herbal Berkelanjutan di Indonesia".

Sastrosayono, S., 2008. Budidaya Kelapa Sawit. Edisi Kedua Belas. Agromedia Pustaka. Jakarta. 66 hal.

Sufardi, 2012. Pengantar Nutrisi Tanaman. Syiah Kuala University Press, Banda Aceh

Suwarno dan K. Idris. 2007. Potensi dan Kemungkinan Penggunaan Guano Secara Langsung Sebagai Pupuk Di Indonesia. Jurnal Tanah dan Lingkungan Vol.9 (1); 37-43.

Sylvia Madusari Prasetyo Yuan Wiarno. 2016. Analisis Sistem Penggunaan Tray Pada Pembibitan Awal Kelapa Sawit (*Pre Nursery*). Sarawak Plantatiom Agriculture Development Sdn. Bhd. Malaysia.

Tengku A. J., Asil B., dan Syukri. 2013. Respon Pertumbuhan Dan produksi Sawi (*Brassica juncea* L) Terhadap Pemberian Urine kelinci dan Pupuk Guano

Tutik Nugrahini. 2013. Pengaruh Pemberian Pupuk Guano Terhadap Pertumbuhan dan Hasil Tanaman Selada Pada Dua Metode Vertikultur. Jurnal Dinamika Pertanian Vol. 28 (3); 211 - 216.