

Use of Palm Oil Medium (*Elaeis guineensis* Jacq) in Pre-Nursery Solid Application

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ABSTRACT

The objective of the research is to determine the impact of solid application on the growth of oil palm seedlings and to identify the optimal dosage for promoting their growth in the main nursery. From June to October of 2022, the research was carried out at the Islamic University of Indragiri's Agriculture Faculty's experimental farm. The investigation was conducted using a completely randomised design (CRD) with six treatments: no solid, 150 g/polybag, 200 g/polybag solid, 250 g/polybag solid, 300 g/polybag solid and 350 g/polybag solid used. Each treatment was replicated three times. The collected data were subjected to a 5% level Duncan Multiple Range Test after being statistically analysed using analysis of variance. The findings demonstrated a strong relationship between solid application in oil palm medium and the height of the seeds, the number of leaves, the diameter of the hump, and the dry weight of the oil palm seedlings. The optimal dosage for promoting oil palm seedling growth in pre-nursery is 300 grammes per polybag, applied in a solid form.

Keywords: Palm Oil, solid, pre nursery

INTRODUCTION

At present, oil palm (*Elaeis guineensis* Jacq.) remains the predominant agricultural product in the plantation industry of Indonesia, with Riau Province being no exception. The oil palm plantation area experiences annual growth. Its existence is dominated by smallholder oil palm plantations, which account for 51% of the total oil palm plantations in Riau and produce a staggering 7,000,000 tonnes annually. According to data provided by the Riau Provincial Plantation Office in 2022, the rejuvenation stage commenced on an

area of 10,247 hectares in 2022. If there are 136 plants in one hectare, then a total of 1,393,592 plants would be required to replace the injured ones. Adequate care must be taken during the seedling stage in order to fulfil these requirements.

As the initial stage in the entire sequence of oil palm cultivation operations, seeding requires careful consideration of both quality and quantity. Superior-characteristic genotypes of progenitors are utilised to acquire oil palm seeds of superior quality. Preserving seedlings, which includes

fertilisation, is an additional factor that contributes to their high quality, alongside possessing superior qualities.

[1] asserts that fertilisation is an essential practice in order to maintain healthy seedlings in the primary nursery. Organic and inorganic fertilisers constitute the two categories of fertilisers. Agricultural yields can be increased through the use of inorganic fertilisers; however, this effect must be balanced with that of organic fertilisers. According to [2], organic fertilisers are crucial for enhancing the physical, chemical, and biological fertility of the soil. One of the organic fertilizers that can be used is the utilization of palm oil mill waste. In general, waste from palm oil mills consists of three forms, namely solid, liquid and gas.

As with solid waste, empty janjang ash, and empty palm bundles (TKS) are all types of Palm Oil Processing (PKS) mill byproducts that can be utilised to enhance the quality of oil palm seeds. Solid by-products of the conversion of fresh fruit clusters (FFB) into crude palm oil (CPO) in palm oil mills constitute solid waste. The number of enterprises in Riau Province is a clear indication of the robust availability of solid resources. There are a total of 160 Palm Oil mills in Riau, as of the latest

data in 2022. Detrimental palm oil mill residue can be put to good use due to the nutrient and organic matter content of solids, which enables their application as nutrient enhancers in plants [3].

Based on the analysis findings, solid substances comprise 81.56% dry matter. Among this, 9.98% are crude fibre, 7.12% are crude protein, 0.03% are calcium, and 0.003% are phosphorus. The energy content per 100 g is 154 cal [4]. Solid contents of N = 3.52%, P = 1.97%, K = 0.33%, and Mg = 0.49% were determined through sample analysis in a number of expansive plantations located in Sumatra. Since 2020, Palm Oil Research Centre data indicates. According to the findings of [5], [6] study, the incorporation of solid compost into planting media significantly impacts various plant characteristics of oil palm in pre-nursery, including seedling height, stem diameter, leaf count, total leaf area, fresh weight, and dried weight. When combined with 50% Ultisol top soil, solid decomposition is most effectively utilised as planting medium.

Determining the optimal dose for oil palm seedlings (*Elaeis guineensis* Jacq.) in pre-nursery and determining the impact of solid nutrition on their development are the objectives of this research.

MATERIALS AND METHODS

Experimental Garden, Faculty of Agriculture, Indragiri Islamic University, Tempuling District, Indragiri Hilir, is where research has been conducted on polybags. From June to October of 2022, a four-month period, the study was carried out.

The research utilised oil palm seedlings that were produced through a cross between D and P. The following materials were utilised: topsoil or inceptisol soil, topas from Asian Agri, hydrous polybags containing 1 kg of soil, NPK Mutiara, solid fertiliser, fungicide Dithane M-45, and insecticide Decis 2.5 EC.

This research employed hoes, tarpaulins, sieves, gauges, paranets, callipers, drills, digital

scales, furnaces, cameras, books, and stationery as instruments. Utilising a Completely Randomised Design (RAL) with six treatments, this study was carried out experimentally. By repeating each treatment three times, a total of 18 experimental units were acquired. Thus, a total of 36 polybags are produced, with two polybags of plant seeds in each experimental unit. The treatment options are as follows: S0: No solid feeding (control), S1: 150 g of solid food per polybag, S2: 200 g of solid food per polybag, S3: 250 g of solid food per polybag, S4: 300 g of solid food per polybag, and S5: 350 g of solid food per polybag.

RESULTS AND DISCUSSION

1. Increase in Seedling Height, Weevil Diameter, and Leaf Count

Multiple observational data points, including weevil diameter, seedling height, and leaf count, are significantly impacted by the

application of solids to oil palm seed media, according to analyses. Additional test results including the mean height growth, leaf count, and weevil diameter can be observed in Table 1.

Table 1. Application of solid fertiliser to oil palm seedlings results in an average increase in height, leaf count, and weevil diameter.

Treatment	Growth		
	Plant height cm	Number of leaves leaf	Hump diameter cm
Control	14d	2c	0,71c
S1	15c	2,6bc	0,88c
S2	15.6c	2,9bc	0,91b
S3	17.4c	3,41b	1,05b
S4	18.4b	3,83a	1,27a
S5	20.01a	4,01a	1,39a

The numbers in the column for each parameter followed by unequal lowercase letters are markedly different According to Duncan's double distance test of 5%)

The treatment with the highest increase in height (20.01 cm) among oil palm seedlings was the solid dose treatment of 350 g/polybag, as shown in Table 1. This increase was significantly greater than that of the other treatments. This is believed to be due to the ample availability of nutrients in a solid 350 g per polybag, which promotes plant growth. The solid analysis results indicate that the sample includes 3.52% nitrogen (N), 1.97% phosphorus (P), 0.33% potassium (K), and 0.49% magnesium (Mg) [7], [8]. The growth of plants is affected by the presence of nitrogen fertilisers in the soil. Nitrogen is a vital nutrient essential for the vegetative growth of plants. Nitrogen fertilisers contribute to the acceleration of photosynthesis, which in turn promotes plant growth by increasing plant height.

According to [1], [9], [10], nitrogen is involved in the formation of chlorophyll cells, which are essential for photosynthesis and provide the necessary energy for cellular division, expansion, and elongation.

According to Table 1, a moderate increase in height is observed with increasing solid doses; however, solid applications at doses of 250

g/polybag, 300 g/polybag, and 150 g/polybag indicate that the claims of high yields for various seedlings are not supported.

Presumably, the dose contains an equivalent quantity of nutrients, as no discernible variations in effect are observed. The increase in plant height is strongly correlated with macronutrients, specifically nitrogen, phosphorus, and potassium.

[11], [12] state that the introduction of nitrogen nutrients can promote vegetative growth, specifically in the development of stems, leaves, and branches. These organs and tissues comprise amino acids, proteins, and cell protoplasm, all of which have the ability to stimulate the growth of the plant in height.

Since the number of leaves is proportional to the height of the seedlings, significant variations in seedling height also lead to substantial differences in leaf count among regimens. This phenomenon occurs due to the fact that both the height and quantity of foliage occur during the vegetative phase, which is significantly impacted by nitrogen inputs. The highest seedling height and leaf count were observed with a solid application

dose of 350 g/polybag, whereas the minimum seedling height and leaf count were observed with an application without treatment.

This phenomenon is believed to be attributed to the N and P nutrients supplied in sufficient quantities in the 350 g/polybag treatment. The N and P elements present in the medium facilitate cell division and enlargement, thereby expediting the maturation of juvenile leaves to their ideal shape. [1], [9], [13] posits that the quantity and configuration of leaves are influenced by the availability of N and P elements. Accelerates the process of juvenile leaves attaining their ideal form by facilitating cell division and enlargement. This is consistent with [1] assertion that the shape and quantity of leaves are influenced by the availability of N and P elements.

In contrast to the observed increase in the number of leaves on oil palm seedlings at a dose of 350 g/polybag, the application of a solid dose of 300 g/polybag did not produce the same results. This discrepancy can be attributed to the fact that the nitrogen content in the solid, which the plants assimilated, was adequate to initiate the growth of new leaves. The outcomes were found to be substantially different from those obtained without solid application, but they differed insignificantly from those obtained with dosing applications of 150 g/polybag and 200 g/polybag.

This is due to the fact that each genotype of oil palm plant has almost the same number of leaves due to genetic variables determining leaf number. As per [14] assertion, the quantity of leaves on oil palm plants is an inherent genetic characteristic that is also contingent upon the plant's age.

Table 2. Average dry weight of oil palm seedlings (g) with solid application at 3 months of age

Dose solid (g/polybag)	Dry weight (g)
S0	12,88c
S1	27,04c
S2	30,24b
S3	37,82b
S4	39,78b
S5	55,49a

The numbers in the column for each parameter followed by unequal lowercase letters are markedly different According to Duncan's double distance test of 5%)

Under consistent temperature and light intensity conditions, the rate of leaf formation (i.e., the number of leaves produced per unit time) remains relatively stable. According to [15], nitrogen is the primary nutrient that has the greatest impact on the growth and development of leaves. Insufficient nitrogen in plants hampers the production of chlorophyll, protein, and new cells, leading to the inability to develop organs like leaves.

The diameter is smallest at a dose of 0 g/polybag and does not differ significantly from a dose of 150 g/polybag; it is then followed by a dose of 200 g/polybag and does not differ significantly from a dose of 250 g/polybag; and it reaches a relatively good diameter at a dose of 300 g/polybag and does not differ significantly from a dose of 350 g/polybag, as shown in Table 1. The absorption of nutrients from substances by plant roots is hypothesised to occur through the formation of weevils.

Numbrance, phosphorus, and potassium, which are plant nutrients, exert an influence on the enlargement of oil palm weevils. Element K is the nutrient responsible for increasing the diameter of the oil palm weevil. Potassium, as stated by [15], functions to expedite the development of meristem tissue.

2. Dry weight of seedlings

It is evident, from the outcomes of numerous analyses of observations, that solid application significantly affects the dry weight of oil palm seedlings. Table 2 displays further test results regarding dry weight observations.

As shown in Table 2, the maximum dry weight of seedlings was produced by applying solid doses of 350 g/polybag; this treatment was strikingly distinct from the others. Efficient utilisation of nitrogen (N), phosphorus (P), and potassium (K) nutrients in plants can enhance chlorophyll production. Dry weight is influenced by photosynthetic activity in the production of assimilate, as stated by [16], when chlorophyll levels are increased. The determination of dried weight in seedlings is contingent upon several factors, including the seedling's height, leaf count, and weevil diameter. The augmentation in dry mass is directly correlated with the quantity of leaves as it governs the amplification in photosynthetic products. The utilisation of solid doses of 300 g/polybag in Table 2 yielded distinct outcomes compared to the other treatments. An augmentation in plant height, leaf count, and weevil diameter leads to a corresponding rise in the dry weight of the plant. The administration of a solid substance at a dosage of 0 grammes per polybag results in the lowest dry weight of seedlings. This pertains to preceding factors such as the augmentation of plant height, the diameter of weevils, and the count of leaves exhibiting limited

growth, resulting in a correspondingly low dry weight. This is attributed to the successful synthesis of organic compounds being judged to be low. Dry weight serves as a reliable indicator of plant growth and development as it represents the accumulation of organic components that plants have effectively synthesised. Dry weight refers to the proportion of solid stuff in plant tissue that is not water.

The dry weight of plants serves as an indicator of their nutritional status and determines their growth and development, thus establishing a close relationship between nutrient availability and plant development [17]. The accumulation of assimilates through the process of photosynthesis, according to [18], is the method by which plants generate dried weight. An escalation in the dosage administered to the treatment will result in a corresponding augmentation in the plant's dry weight. Nutrient content in plants is determined by weighing plant dry matter and expressing the result in parts per million (ppm) or percent, as stated by [19]. Plant dry matter refers to the residual plant material remaining after the removal of all the water it contains.

CONCLUSION

Increasing the height, number of leaves, diameter of weevils, and dry weight of oil palm seeds in response to different solid quantities of seed media vary considerably. When compared to

other treatments, solid at a dose of 300 g per polybag produces the greatest increase in seedling height, leaf count, and weevil diameter..

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