Application of Drip Irrigation on Various Planting Media and Cow Urine in the Main Media of Preliminary Oil Palm Nursery

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Abstract. The objective of this study was to determine the effect of drip irrigation and biological organic fertilizer treatment on oil palm growth. This study used a randomized complete block design with 3 replications. This research consisted of three experiments, namely drip irrigation, planting media composition, and cow urine dose on the growth of oil palm seedlings. There are three levels of drip irrigation, namely 30 minutes, 60 minutes and 90 minutes. Experiments on the type of planting media consisted of two types, namely M1 (ultisol soil + husk charcoal + fern fertilizer) and M2 (ultisol soil + empty bunches + goat manure). The cow urine experiment consisted of three levels, namely 100 ml, 150 ml, 300 ml. The results showed that giving water for 30 minutes gave the best results on stem circumference, plant height increase, plant dry weight increase, plant wet weight increase in oil palm seedlings. M1 media (ultisol soil + husk charcoal + fern fertilizer) had a significant effect on the increase in plant height, wet weight and dry weight of oil palm seedlings. Treatment of 150 ml cow urine liquid fertilizer is sufficient for the needs of oil palm seedlings with a response that is not different from 200 ml of cow urine.

1. Introduction

Oil palm (*Elaeis guineensis* Jacq.) is one of the plantation crops that has an important role in the plantation sub-sector. The development of oil palm provides benefits in increasing the income of farmers and the community, such as by providing raw material for the processing industry that creates added value in the domestic market, Crude Palm Oil (CPO) exports to generate foreign exchange, as well as providing employment opportunities for more than 2 million workers in various fields [1].

Oil palm production is strongly influenced by the quality of the seeds used. Therefore, nursery is the first step in the whole series of oil palm cultivation activities. Through this nursery stage, it is hoped that they can produce good and quality seedlings, so that in the end the seeds will be able to grow well in the field [2].
One of the advances in oil palm nurseries is the improvement of nursery techniques and the development of superior seeds that produce higher and earlier yields, so that farmers do not wait too long for plants to produce, as well as better production and quality. Basically there are two nursery systems: single stage and double stage. The single-stage nursery system is basically the same as double-stage nursery, except it does not go through preliminary nursery first. The increasing demand for oil palm causes production and expansion of oil palm planted areas to increase. With the increasing area of oil palm cultivation, it is necessary to procure large quantities of high-quality seeds. Nurseries are a determining factor for the success of oil palm cultivation. In oil palm nurseries, there is a "double stage" nursery. The preliminary nursery is carried out for three months and requires shade. Preliminary nurseries aim to get plants that grow uniformly when transferred to the main nursery. The main nursery is done to prepare the plants to be strong enough before being transplanting to the field [3].

Ultisol is soil that is commonly found in swampland and has a low nutrient content and pH but can still be used for the cultivation process, namely by adding or mixing other planting media that has high nutrient content such as empty bunches, husk charcoal, cocopeat, fern roots, and manure [4]. The planting medium is the most important component in planting crops because it is the material in which plants grow and develop. The purpose of this study was to determine the effect of drip irrigation, media composition, and cow urine dose on the growth of oil palm seedlings. The use of liquid organic fertilizer from urine metabolized by livestock provides benefits such as helping plant grow, because the high content of N and K contains growth hormones for plants and are easily absorbed by plants [5].

2. Methods
The research used oil palm seedlings in the pre-nursery and kept them for two months in the nursery. This study used a randomized block design and consisted of several experiments. The first experiment used the duration in watering using drip irrigation, divided into three duration levels: 30 minutes, 60 minutes, 90 minutes. The second experiment was to test two types of media for oil palm nurseries, namely M1 (ultisol soil + husk charcoal + fern fertilizer) and M2 (ultisol soil + empty bunches + and goat manure). The study used a dose of cow urine, divided into three levels, namely 100, 150 and 300 ml. Factors observed were the plant height increase, leaf number increase, palm weevil diameter, plant dry weight and plant wet weight. Data analysis used analysis of variance (F test) at α level of 5%. If the F test is significant, a further test is carried out by Duncan's Multiple Range Test (DMRT). Data were analyzed using analysis of variance (F test) at the level of α 5%. If the treatment had a significant effect, it then would proceed with the Duncan Multiple Range Test (DMRT). Data analysis was performed using STAR 2.0.1 software.

3. Results and discussion
3.1 Experiment 1. Effect of drip irrigation duration on oil palm seedling growth.
The duration of drip irrigation was significant for the increase in height, weevil width, dry weight and wet weight of plants. Giving drip irrigation for 30 minutes resulted in a better response than giving drip irrigation for 90 minutes. Giving drip irrigation for 90 minutes inhibited the growth of plants with height gain, weevil width, dry weight and plant wet weight having lower values than that of giving drip irrigation for 30 minutes. The availability of nutrients that can be absorbed by plants by providing sufficient water by plants is one of the factors that affect plant growth, which will increase cell enlargement which affects the diameter of the ‘plants’ weevils [6]. Water is used by plants for cell division and enlargement which is manifested in increase in plant height, enlargement of diameter, leaf multiplication and root growth. The condition where the soil water content is above field capacity curbed plant growth due to inhibition of root development caused by a lack of oxygen in the soil [7].
Table 1. Increased observation results from various parameters in drip irrigation

| Parameter | Drop Irrigation (minute) |
|-----------|--------------------------|
|           | 30           | 60           | 90           |
| PHI       | 27.67 a       | 24.10 ab     | 22.19 b      |
| LNI       | 7.89 a        | 7.67 a       | 7.22 a       |
| WD        | 19.05 a       | 18.16 b      | 16.93 c      |
| CWW       | 461.97 a      | 414.43 ab    | 371.47 b     |
| CDW       | 160.53 a      | 140.13 ab    | 117.30 b     |

Note: PHI: Plant height increase, LNI: leaves number increase, WD: weevil diameter, CWW: crown wet weight, CDW: crown dry weight, the numbers followed by the same letter in the same column show no significant difference using the test DMRT α 5%.

3.2 Experiment 2. Effect of media composition on oil palm seedling growth
The composition of the planting medium had a significant effect on the parameters of plant height, wet weight, and dry weight of oil palm seedlings. Table 2 shows M1 treatment resulted in significant difference from M2 treatment in producing wet weight of oil palm seedlings. This is thought to be related to the physical properties of the plant media in supporting the growth of oil palm seedlings. M1 media with a composition consisting of husk charcoal and fertilizer was thought to increase the porosity and permeability of the planting medium. Husk charcoal media will increase soil porosity and support root growth better than M2 [8]. The role of organic matter is very important in increasing the ability of soil to retain water [9]. By increasing the ability of the soil to hold water, plant roots will more easily absorb nutrients to support the growth of oil palm seedlings.

Table 2. The increase in the results of the observation of various parameters on the provision of planting media.

| Parameter | Media       |
|-----------|-------------|
|           | M1         | M2         |
| PHI       | 29.67 a    | 23.30 b    |
| LNI       | 8.00 a     | 7.89 a     |
| WD        | 18.27 a    | 18.26 a    |
| CWW       | 460.67 a   | 381.90 b   |
| CDW       | 152.12 a   | 125.12 b   |

Note: PHI: Plant height increase, LNI: leaves number increase, WD: weevil diameter, CWW: crown wet weight, CDW: crown dry weight, the numbers followed by the same letter in the same column show no significant difference using the test DMRT α 5%.

3.3 Experiment 3. Effect of cow urine dose on oil palm seedling growth.
Giving cow urine with a concentration of 150 ml visibly increased plant height compared to giving 100 ml, although it was not significantly different from giving 200 ml. Treatment of 200 ml of cow urine increased the plant's wet weight compared to that of 100 ml of urine, although it was not significantly different from that of giving 150 ml treatment. This shows that the provision of 150 ml of liquid organic fertilizer from cow urine already met the nutrient needs of oil palm seeds. Increasing the concentration of fertilizer to a certain extent will increase plant growth, because plants have a limit of nutrient absorption according to plant growth [10]. Application of fertilizer with a concentration exceeding the optimum concentration will reduce plant growth and production [11]. Plant wet weight is influenced by the absorption process of water and nutrient by the plant. The absorption of water and nutrients by plants depends on the water and nutrient reserves absorbed and the ability to absorb them [12].
Table 3. Increase in the results of observations of various parameters in cow urine administration.

| Parameter | U1 (100 ml) | U2 (150 ml) | U3 (200 ml) |
|-----------|-------------|-------------|-------------|
| PHI       | 19.72 b     | 25.14 a     | 24.66 a     |
| LNI       | 7.10 a      | 7.78 a      | 7.82 a      |
| WD        | 16.70 a     | 17.99 a     | 17.53 a     |
| CWW       | 329.88 b    | 383.67 ab   | 418.67 a    |
| CDW       | 101.89 a    | 134.01 a    | 134.11 a    |

Note: PHI: Plant height increase, LNI: leaves number increase, WD: weevil diameter, CWW: crown wet weight, CDW: crown dry weight, the numbers followed by the same letter in the same column show no significant difference using the test DMRT at 5%.

4. Conclusion

Giving drip irrigation for 30 minutes showed better results than giving drip irrigation for 60 and 90 minutes. Using composition of M2 media (ultisol planting medium + husk charcoal + fern fertilizer) increased plant height, wet weight and dry weight of the plant. The application of 150 ml cow urine liquid fertilizer is sufficient for the needs of oil palm seeds with no significant difference in plant response from the application of 200 ml cow urine.

5. Acknowledgment

The first author thanked Yayasan Amanah Pelalawan (YAP) and Sekolah Tinggi Teknologi Pelalawan (STT Pelalawan) for funding the research.

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