DOI :https://doi.org/10.36378/juatika.v6i2.3748
JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL. 6 NO. 2 May 2024
eissn 2656-1727
pissn 2684-785X
Hal : 683 – 689

Effect of Water Application and Zeba Products on The Growth of Palm Oil Plants (*Elaeis guineensis* Jacq) on Main Nursery

Egi Syahputra, Asmanizar*, Rahmad Setia Budi, Noverina Chaniago
Universitas Islam Sumatera Utara
Jl. Sisingamangaraja No.Kelurahan, Teladan Bar., Kec. Medan Kota, Kota Medan, Sumatera Utara 20217, Indonesia
*Email : asmanizar_az@fp.uisu.ac.id

ABSTRACT

The requirement of water for plants absolutely must be realized hence, it is necessary to make efforts in order to plants can still provide their water needs even though the availability of water for watering is less or even not available continuously. This study was conducted to evaluate the effect of water application and zeba products on the growth of oil palm seedlings in the main nursery. The study arranged as a randomized completely block design (RCBD) with 5 treatments: without Zeba with 2 times watering; without Zeba with 1 time watering; Zeba 10 g/polybag with 1 time watering; Zeba 20 g/polybag with 1 time watering and Zeba 20 g + Rock Phosphate 75 g with 1 time watering. Watering is carried out in accordance with the treatment at the time from 07.00-09.00 WIB in the morning and 16.00-18.00 WIB in the afternoon using a paddle with a volume of 2 liters of water. There were three replications for each treatment. Variables observed plant height, stem diameter, leaf number, leaf color, soil pH values. The results showed that Zeba application affects the height of oil palm seedlings in the main nursery, stem diameter, soil pH and leaf color, but does not affect the number of leaves. Twenty grams of zeba on soil showed the similar response of stem diameter, soil pH and leaf green color with 20 g zeba + Rock Phosphate fertilizer. Zeba application can save water use in the main nursery of oil palm plants.

Keywords: Drought, *Elaeis guineensis*, Zeba, Main Nursery, Time Watering

1. INTRODUCTION

Oil palm is a plantation commodity that has an important role in advancing the economy and agriculture in Indonesia. The utilization of palm oil products can be used as food and various other industrial raw materials. The development and growth of plants, such as the oil palm, are mainly dependent on components that are not only hereditary but also natural and climatic in nature (Darmawan et al., 2021).

Water is the main requirement for plants because it is needed in physiological processes. The role of water in oil palm plants is as a solvent of various organic molecular compounds (nutrients) from the soil into plants, nutrient elements transportation, maintaining cell turgidity including cell enlargement and opening stomata. If the availability of water in watering is lacking for oil palm plants, it will cause plant photosynthesis to be disrupted due to a reduction in the formation and expansion of leaves which will have an impact on the seedling growth. The continuously sufficient groundwater accessible, oil palm plants have a great chance of developing to their full potential (Dwiyana et al., 2015).

In oil palm cultivation, the planters often encounter the limited availability of water during nursery. The oil palm nursery process is the most decisive starting point in oil palm growth and production, therefore good handling is required so that the required oil palm seedlings can be provided both in quality and quantity seedlings available (Martha et al., 2015).

The requirement of water for plants absolutely must be realized hence, it is necessary to make efforts in order to plants can still provide their water needs even though the availability of water for watering is less or even not available continuously. Planting media that used in nurseries is sought to be able to store water longer for the plants through the addition of organic fertilizers that plays a role in increasing the water-holding capacity of the soil (Aryanti et al., 2018).

It is difficult to forecast the weather in the months when there should be high-intensity rain, but there is a drought because of the influence of the climate anomaly. Temperature and weather anomalies that have become more frequent in recent years are tangible manifestations of very serious climate change in every region of the world (Johnson et al., 2022; Zhang et al., 2022). The addition of media to the soil is necessary because it can help retain water so that it can save water use and plants grow better. According to Sri Suryanti et al. (2023) the provision of 200 grams of biochar with watering every 2 days on pre-nursery oil palm seedling was not significantly different from the control treatment (watering every day). This happens because the addition of 200 grams of biochar/polybag causes the soil to have a large ability to retain water.

Research on suitable planting media to be used as a mixture of media for nurseries, especially in agriculture, has been carried out, especially on oil palm plants. The aim is to create a way to more effectively utilize watering water in oil palm nurseries in the main nursery. One of the technologies that can be done to improve the growth of oil palm seedlings is by providing substances that can regulate the supply of nutrients and maintain the availability of water in accordance with plant needs. Zeba is a corn starch-based super sponge designed to help plants meet their nutritional needs. Zeba can absorb water and nutrients 400 times its weight and will release it slowly so that water and nutrients are always available around plant roots. Zeba is an environmentally friendly product that is safe for plants, and can increase soil fertility. The soil resulting from the application of zeba will be looser than soil that is not coated with zeba (Anonimuous, 2024, https://www.upl-ltd.com/id/).

Seedling is an important thing in oil palm cultivation. The early growth of seedlings is a critical period that greatly determines the success of plants in achieving good growth in the nursery. One of the efforts that can be made during the nursery of oil palm plants is by applying basic fertilizers (Setyamidjaja, 2006). The application of rock phosphate fertilizer is thought to increase the availability of sufficient phosphorus elements, where these elements play a role in helping to form carbohydrates and proteins, strengthen plant tissues, and increase plant resistance to drought. The enlargement of stem diameter is influenced by the availability of the element potassium (Zafata & Roy, 2004). The influence of some hydrogels of Zeba on the aromatic and medicinal plants stimulating water retention capacity near seeds or roots, reducing the risk of water loss by leaching or evaporation, increasing soil permeability, reducing soil degradation and implicitly increasing quantitative and qualitative productivity (Chiorescu et al., 2017).

The purpose of this research was to evaluate the effect of water application and zeba products on the growth of oil palm seedlings in the main nursery.

2. MATERIAL AND METHODS

The research was conducted at PT Abdi Budi Mulia Plantation, Labuhan Batu Selatan Regency (1°57'48.5"N 100°16'14.9"E), North Sumatra Province from September 2023 to January 2024. Treatments were carried out in the main nursery area. Polybags were filled with top soil planting media mixed with organic matter in a ratio of 3: 1 which had been loosened and cleaned, then put into polybags sized 35 x 40 cm and then added Zeba according to the treatment. The research was arranged as a Randomized Block Design with the treatment was application of zeba and number application of watering, namely: without Zeba with 2 times watering; without Zeba with 1 time watering; Zeba 10 g/polybag with 1 time watering; Zeba 20 g/polybag with 1 time watering and Zeba 20 g + Rock Phosphate 75 g with 1 time watering. Planting of main nursery oil palm seedlings is done by transferring seedlings (variety Verdant V-80) from the pre-nursery to main nursery polybags that have contained soil, organic matter and Zeba, then the seedlings are inserted into the planting holes as many as 1 seedling per polybag. After that, it is covered with soil and levelled.

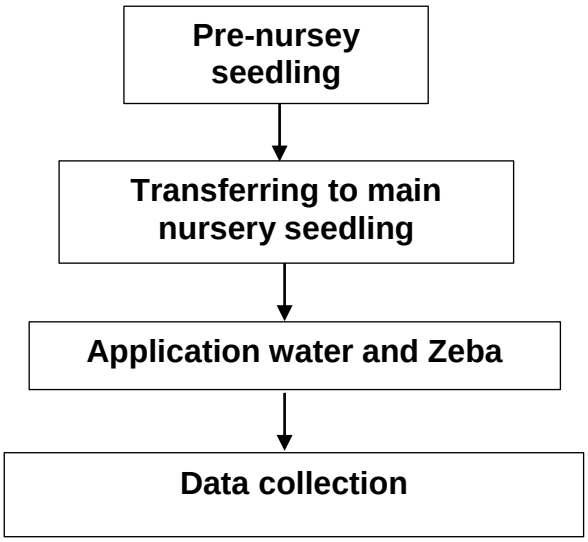

Figure 1. Research flow diagram

Watering is carried out in accordance with the treatment at the time from 07.00-09.00 WIB in the morning and 16.00-18.00 WIB in the afternoon using a paddle with a volume of 2 liters of water. There were three replications for each

treatment. Data collected were plant height, stem diameter, leaf number, leaf color, soil pH values. The data were analyzed by one way ANOVA. Means were separated using DMR Test at P=0.05 when the ANOVA was significant. All analysis were run on the IBM SPSS Statistics 26.

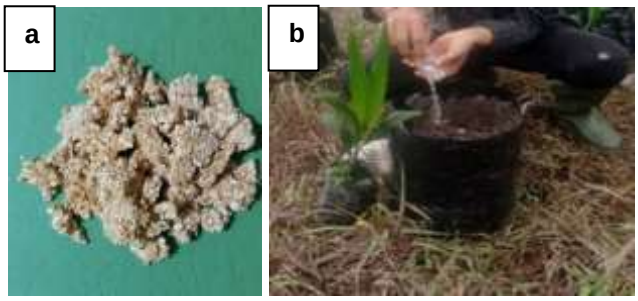

Figure 2. a. Zeba; b. Zeba application

3. RESULT AND DISCUSSION

Plant height, stem diameter, leaf number at 60 DAT (Days After Treatments) as response of treatment can be seen in Table 1.

Table 1. Response of application water and Zeba at 60 DAT on main nursery seedling

Treaments	Plant height (cm) ± SEM	Stem diameter (cm) ± SEM	Leaf number ± SEM
Without Zeba with 2 times watering	46.40±0.31 cd	21.30±0.55 d	7.30±0.26
Without Zeba with 1 time watering	46.10±0.36 d	20.40±0.46 c	7.10±0.29
Zeba 10 g/polybag with 1 time watering	46.70±0.45 bc	22.50±0.25 b	7.40±0.23
Zeba 20 g/polybag with 1 time watering	47.00±0.49 b	23.50±0.52 a	7.60±0.21
Zeba 20 g + Rock Phosphate 75 g with 1 time watering	48.00±0.82 a	23.00±0.21 ab	7.80±0.12

Note: Letters followed by the similar letter in column indicates no significant difference at the 5% level according to the DMRT test. DAT = Day After Treatment; SEM = Standart Error of Mean.

There were significant effect application water and zeba treatment on plant height and stem diameter of *E. guineensis* main nursery seedling at 60 DAT. Meanwhile, there was no significant effect application water and zeba treatment on leaf number. The treatment with zeba showed higher plant growth compared to the treatment without zeba. Meanwhile, plants without zeba that were watered twice or once showed the similar plant height response. The application of zeba to the soil in the main nursery showed significantly different plant height growth with no zeba application. Likewise, the addition of 75 g Rock Phospahate fertilizer showed a height that was significantly different from plants without Rock Phospahate fertilizer.

The measurement of stem diameter showed that plants with 2 times watering showed a significantly larger stem diameter compared to 1 watering. Likewise, plants given zeba showed a diameter that was significantly greater than without zeba. Meanwhile, the stem diameter of oil palm seedlings with 20 g of zeba showed a significant difference in stem diameter compared to 10 g of zeba.

This indicates that zeba material has the ability to retain water availability for palm seedlings so that it can be optimally utilized for stem diameter growth. Different doses of zeba also affect its ability to retain water as evidenced by more zeba producing a larger stem diameter. Meanwhile, the addition of 75 g Rock phosphate fertilizer to oil palm seedlings with 20 g zeba did not show significantly different growth from oil palm seedlings with 10 or 20 g zeba.

Diameter of oil palm seedlings physiologically functions as a tissue that plays a role in the translocation of nutrients from roots to leaves and also as

a store of food reserves. In the vegetative phase, photosynthate will be translocated to the roots, stems and leaves. The occurrence of increased photosynthesis in the vegetative phase causes cell division resulting in the addition of plant organs such as stem diameter. The size of the stem diameter is related to the availability of water and nutrients needed by plants, including accelerating metabolic processes that occur in the plant body. Drought (Water deficit) caused decrease in absorption and translocation of mineral nutrients, protein denaturation and loss of enzyme activities (Kumari et al., 2022).

Observations on the number of leaves showed no effect of treatment on the number of leaves. The average number up to 7 leaves. This is because the number of leaves on oil palm plants is more determined by genetic factors.

According to (Salgotra & Chauhan, 2023) genetic factors also determine the number of leaves formed, therefore it is very important in breeding to use quality seedlings.

Observations on soil pH and leaf color data can be seen in Table 2. The results showed that there was an effect of treatment on the pH of the soil where the main nursery grew at 30 and 60 days after transferring pre-nursery to main nursery plants. There was an increase in soil pH from 30 DAT to 60 DAT in the treatment of 10 and 20 g zeba application. The treatment of zeba application of 20 g with 1 time watering was able to provide nutrients, retain nutrients and water and was able to increase pH in less fertile soil and reduce the rate of CO_2 emission and accumulate carbon in large enough quantities because zeba was able to last long in the soil.

The application of 1 watering with the provision of 20 g zeba produces the highest pH value, it might cause the application of 1 watering with the provision of 20 g zeba can act as a soil improver aimed at stabilizing soil aggregates and increasing pH in the soil. According to Dariah et al. (2015), a good soil improver is a soil improver that can change the hydrophobic and hydrophilic properties of the soil due to pollution and erosion to change the soil's capacity to hold water, and improve the soil's ability to hold nutrients so that water and nutrients are not easily lost and plants can still utilize them.According to Sulistyo et al. (2010), the optimal soil acidity for oil palm is 5.0-6.0, but it is still tolerant of adapting to pH<5.0. In this study, the soil pH range in the zeba treatment was 5.2-5.9. Zeba also has physical presence within the soil profile. Because its starch based formula it attracts individual soil particles to its surfaces, and upon drying will hold then in what is known as aggregates, these aggregates are just what is required in many of our soils today. Zeba is capable of interacting with soil nutirents, with a high exchange capacity, increasing the soils ability to exchange nutrients within the soil environment (Anonimuous, 2024, https://www.upl-ltd.com/id/).

Observations on the color of the leaves of oil palm seedlings in the main nursery showed that there was a significant effect of treatment on leaf color. The largest leaf color value is in the treatment of watering 1 time watering with 20 g zeba + 75 g Rock Phosphate (6.30), not significantly different from the application of watering 1 time watering with 20 g zeba (6.10) but significantly different from the application of watering 1 time watering with 10 g zeba (6.00), the application of watering 2 times watering without giving zeba (3.20) and the application of watering 1 time watering without giving zeba (3.20).

The treatment of giving zeba 20 g + Rock Phosphate 70 g and 1 time watering is able to meet the needs of nutrients and water needs, Manuhuttu *et al*. (2014) said that the more the amount of chlorophyll, the more rainy the color of the leaves, this can be influenced by the water content and the content of nutrients

in the cells of plant tissue, the provision of soil conditioners to the soil will increase the water holding capacity so that there is a difference in concentration to the cell wall, plant growth is spurred by the availability of sufficient nutrients and results in an increase in the amount of chlorophyll.

Table 2. Response of application water and Zeba soil pH and leaf color on main nursery seedling

Treaments	Soil pH		Leaf color ± SEM
	30 DAT± SEM	60 DAT± SEM	
Without Zeba with 2 times watering	5.00±0.00 c	4.67±0.27 c	3.20±0.23 c
Without Zeba with 1 time watering	5.00±0.06 c	4.77±0.12 c	3.20±0.20 c
Zeba 10 g/polybag with 1 time watering	5.00±0.06 c	5.37±0.23 b	6.00±0.25 b
Zeba 20 g/polybag with 1 time watering	5.10±0.06 b	5.93±0.29 a	6.10±0.30 ab
Zeba 20 g + Rock Phosphate 75 g with 1 time watering	5.50±0.06 a	5.50±0.46 a	6.30±0.31 a

Note: Letters followed by the similar letter in column indicates no significant difference at the 5% level according to the DMRT test. DAT = Day After Treatment; SEM = Standart Error of Mean.

4. CONCLUSION

Zeba application affects the height of oil palm seedlings in the main nursery, stem diameter, soil pH and leaf color, but does not affect the number of leaves. Zeba added with Rock Phosphate Fertilizer shows the highest plant growth significantly different from other treatments. Zeba application can save water use in the main nursery of oil palm plants. Zeba application can save fertilizer use, 20 g zeba on soil showed the similar response of stem diameter, soil pH and leaf green color with 20 g zeba + Rock Phosphate fertilizer.

ACKNOWLEDGEMENT

For the carrying out of this research, high appreciation is expressed to: 1) Dr.Ir. Askif Pasaribu, M.P. Regional Apac Technology Deveploment Lead-Herbicide & Adjuvant at UPL for the support of facilities provided for this research. 2) PT. Abdi Budi Mulia Kabupaten Labuhan Batu Selatan Provinsi Sumatera Utara for field and facilities provided.

REFERENCES

Anonymous. (2024). Zeba corn starch. UPL. https://www.upl-ltd.com/id/

Ariyanti, M., Rosniawaty, S., & Utami, H. A. (2018). The growth response of oil palm (*Elaeis guineensis* Jacq.) toward the application of several dosages of filter cake compost accompanied with the different interval time of watering in main nursery. *Jurnal Kultivasi, 17*(3), 723-733.

Chiorescu, E., Clinciuradu, A. R., Chiorescu, D., Teliban, G. C., & Robu, T. (2017). Research on the influence of hydrogels Zeba SP and Terracottem on the development of some aromatic plant species. *Research Journal of Agricultural Science, 49*(4).

Dariah, A., Sutono, S., Nurida, N. L., Hartatik, W., & Pratiwi, E. (2015). Pembenah tanah untuk meningkatkan produktivitas lahan pertanian. *Jurnal Sumberdaya Lahan, 9*(2), 67-84. http://ejurnal.litbang.pertanian.go.id/index.php/jsl/article/view/6571

Darmawan, S., Carolita, I., Agustan, Dirgahayu, D., Suyadini, W., Hernawati, R., & Wiratmoko, D. (2021). *Model fenologi kelapa sawit berbasis pengindraan jauh* (I. Carolita & D. Dirgahayu, Eds.; 1st ed.). ITENAS.

Harjadi, S., & Yahya, S. (1996). *Fisiologi stress lingkungan*. PAU Bioteknologi IPB. https://opac.lib.itenas.ac.id/index.php?p=show_detail&id=14207

Dwiyana, S., Sampoerna, R., & Ardian. (2015). Waktu dan volume pemberian air pada bibit kelapa sawit (*Elaeis guineensis* Jacq.) di main nursery. *Fakultas Pertanian Universitas Riau*, Pekan Baru.

Johnson, J. V., Exton, D. A., Jaimie, |, Dick, T. A., Oakley, J., Jompa, J., & Pincheira-Donoso, D. (2022). The relative influence of sea surface temperature anomalies on the benthic composition of an Indo-Pacific and Caribbean coral reef over the last decade. *Ecology and Evolution, 12*(9). https://doi.org/10.1002/ECE3.9263

Kumari, V. V., Banerjee, P., Verma, V. C., Sukumaran, S., Chandran, M. A. S., Gopinath, K. A., Venkatesh, G., Yadav, S. K., Singh, V. K., & Awasthi, N. K. (2022). Plant nutrition: An effective way to alleviate abiotic stress in agricultural crops. *International Journal of Molecular Sciences, 23*(15), 8519. https://doi.org/10.3390/ijms23158519

Manuhuttu, A. P., Rehatta, H., & Kailola, J. J. G. (2014). Pengaruh konsentrasi pupuk hayati Bioboost terhadap peningkatan produksi tanaman selada (*Lactuca sativa* L.). *Agrologia, 3*(1), 18-27. https://doi.org/10.30598/a.v3i1.256

Martha, H., Ardian, M., & Amrul, K. (2015). Penggunaan bahan penyimpan air dan volume pemberian air terhadap pertumbuhan bibit kelapa sawit (*Elaeis guineensis* Jacq.) di main nursery. *JOM Faperta, 2*(2).

Salgotra, R. K., & Chauhan, B. S. (2023). Genetic diversity, conservation, and utilization of plant genetic resources. *Genes, 14*, 174. https://doi.org/10.3390/genes14010174

Setyamidjaja, D. (2006). *Budidaya kelapa sawit*. Kanisius.

Sri Suryanti, Wibowo, A., & Hartati, R. M. (2023). Applying biochar and oil palm seeds' resistance to drought stress. *Jurnal Agronomi Tanaman Tropika, 5*(2), 425-431. https://doi.org/10.36378/juatika.v5i2.3143

Sulistyo, D. H., Purba, B. A., Siahaan, D., Efendi, J., & Sidik, A. (2010). *Budidaya kelapa sawit*. PT. Balai Pustaka dan Pusat Penelitian Kelapa Sawit.

Zafata, F., & Roy, R. N. (2004). *Use of phosphate rocks for sustainable agriculture*. Food and Agriculture Organization of the United Nations. https://www.fao.org/4/y5053e/y5053e00.htm#Contents

Zhang, X., Hao, Z., Singh, V. P., Zhang, Y., Feng, S., Xu, Y., & Hao, F. (2022). Drought propagation under global warming: Characteristics, approaches, processes, and controlling factors. *Science of The Total Environment, 838*, 56021. https://doi.org/10.1016/J.SCITOTENV.2022.156021