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The Effect of Watering Frequency on Several Types of Oil Palm (Elais guineensis Jacq.) Great Bunches Superior Seeds 'Yangambi' in Main Nursery Ages of 4 to 7 Months

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ABSTRACT

The effect of watering frequency on several types of oil palm great bunches superior seeds in main nursery ages of 4 to 7 months was held from September 2017 to November 2017 on Jl. Cempaka, Gang Cempaka Sari, Tanjung Sari, Medan Selayang. The research design used was Factorial Completely Randomized Design with two factors, the first factor was the watering frequency, consisting of; morning (1 time) and morning and evening (2 times). The second factor was several types of great bunches superior oil palm seeds (Elaeis quineensis Jacq.), consisting of; Yangambi, PPKS 239 and PPKS 718. The observation parameters were plant height, number of leaves, stem diameter, total leaf area and number of leaflets. The results showed that the watering frequency treatment and several types of large-bunches oil palm varieties had no significant effect on the growth of oil palm seedlings.

Keywords: watering frequency, growth of oil palm seedlings, varieties.

INTRODUCTION

Oil palm (Elaeis guineensis Jacq) is one of the plantation crops that has an important role for the plantation subsector. Oil palm development provides benefits in increasing the income of farmers and communities, processing raw materials that create domestic added value, exports Crude Palm Oil (CPO) to generate foreign exchange, and provides employment opportunities for more than 2 million workers in various subsystems. This indicated that the market opportunity of oil palm is very good hence oil palm production has very good prospects to be developed in Indonesia (Syahbana, 2007).

In 2004, the value of Indonesia's CPO exports to the world amounted to USD 1.06 billion or 1.74% of Indonesia's total exports and continued to experience significant growth in 2012 to USD 8.42 billion or 4.43% of Indonesia's total exports. The export value of Indonesia's PKO to the world in 2004 amounted to USD 385 million or 0.53% of the total exports of Indonesian products and continued to experience an increase until 2011 its export value became USD 1.64 billion or 0.80% of total Indonesian exports (UN Comtrade, 2012).

The flow of investment in oil palm plantations opens opportunities for nursery businesses. In 2006 and 2007, the Indonesian oil palm nursery industry was unable to meet the demand for oil palm sprouts seeds due to the continued increase in demand. According to the present in Indonesia there are eight producers of sprouts and oil palm seeds which are officially recognized by the Indonesian government. The producers of sprouts and seeds are; Medan Oil Palm Research Institute (PPKS/IOPRI), Socfindo Ltd, London Sumatera (Lonsum) Ltd, Tunggal Yunus Estate Ltd, Dami Mas Ltd, Bina Sawit Makmur Ltd, Tania Selatan Ltd, and Bakti Tani Nusantara Ltd (Directorate of seed and production facilities, 2007).

The continuous expansion of oil palm plantations has resulted in reduced land supply. This brings consequences to the need for agronomic technology innovation to anticipate

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the negative impacts of environmental conditions that are not ideal for oil palm. Abiotic environmental conditions on marginal land are predicted to occur more frequently with high intensity due to the phenomenon of global climate change. The phenomenon of global climate change which is suspected to be found on marginal land in the future is extreme climate, especially drought. If this is not addressed in the development of oil palm commodities it clearly has a negative effect on growth, development and productivity. Agronomic technology innovation to anticipate the negative effects of drought was using superior oil palm planting material (hybrid). The use of oil palm hybrids that have the potential was to withstand drought stress (Issukindarsyah, 2013).

In general, an area has different environmental conditions for genotypes. Genotypic responses to environmental factors are usually seen in the phenotypic appearance of the plants and one of them can be seen from its growth (Darliah et al., 2001).

Each type of oil palm has different advantages to the environment and planting treatment. Tenera oil palm plant has a broad ability on the used planting media compared to the types of Dura and Psifera. For sustainable plantations, planting material is an absolute requirement for success. Genetic potential and planting characters that have competitive advantages are reflected in the description of plant varieties (Mangunsoekarjo and Semangun, 2008).

Yangambi's derivative oil palm varieties are African oil palm populations which are widely used as superior seed pisifera elders. PPKS oil palm varieties which produced from this population are: D x Yangambi, DxP PPKS 239, DxP PPKS 718, in general, this population has advantages on relatively large bunches. Generally Yangambi has a high oil and mesocarp content, much higher than other populations (Suprianto, 2016).

The Yangambi variety is a variety that needs a lot of water. This superior variety has been certified for its superiority, the availability of sufficient water will make the growth of Yangambi superior types will experience good growth in morphologically and physiologically. The role of water is the biggest thing needed by Yangambi varieties and also the full intensity of light to grow optimally (Siregar, 2016).

The availability of water is one of the main limiting factors for the growth and production of oil palm plants. In the vegetative phase, lack of water availability can cause damage to plant tissue, while in the generative phase can reduce oil palm crop production due to inhibition of flower formation, increasing number of male flowers, disturbed fertilization, declining young fruit, small fruit shape, and low fruit oil yield (Hidayat, 2013).

Watering too often resulted in dense soil nutrient decreasing rapidly and can cause the soil to lack in oxygen if watering is carried out in large quantities. This was in line with the opinion that watering too often can have a bad effect on the soil, poor leaching and aeration (Hardjadi, 2001).

Seedlings tending consists of watering, weeding, fertilizing, controlling plant disease pests, and seedlings selection. In the nursery, watering is usually done twice a day, namely in the morning and evening. Morning watering starts at 07.00 WIB until 11.00 WIB while afternoon watering starts at 16.00 WIB (Dwiyana et. Al., 2015)

MATERIALS AND METHOD

This research was conducted at Jalan Cempaka, Gang Cempaka Sari, Tanjung Sari, Medan with an altitude of ± 32 meters above sea level. This research was conducted from September to November.

The material used in this research was Yangambi large-bunches oil palm seedlings at 4 months old, consisting of; DxP Yangambi varieties, DxP PPKS 239, DxP PPKS 718 as objects of observation, topsoil, fungicides,

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sugar plastics, and other materials that support the research.

The tools used in this research were hoes, meters, rulers, hoops, sprayers, scales, digital calipers, stationery to record observation data, bamboo, white plastic, nails, wire and other supporting tools.

This research used Factorial Randomized Group Design with the following treatment; Factor 1: Watering frequency (F) with 2 levels, namely; F1 = 1 time (Morning), F2 = 2 times (Morning and Evening). Factor 2: Yangambi large-bunches oil palm superior variety seedlings with 3 varieties, namely; V1 = DxP Yangambi, V2 = DxP 239 PPKS and V3 = DxP PPKS 718.

The research began with the preparation of the nursery area, the land was prepared in flat and open land and also was strategic and safe. The area used was cleaned from weeds and the rest of plant roots. Experimental plots with a size of 150 x 100 cm were made with spacing between 50 cm and a distance between plots of 30 cm.

The shade making preparation was to avoid rainwater hence the watering frequency treatment carried out remains the in same frequency. The shade was made using 2.5 m bamboo poles with a shade roof made of transparent plastic.

Seedlings purchased at the beginning of nursery were at 4 months old. Seedlings come from nurseries in the village of Aek Pancur, Tanjung Morawa District, Sumatera Utara, purchased by a pickup truck. The seedlings were selected in order to make the plant material homogeneous. Polybags were placed and arranged according to the layout of the research land and labeled according to the treatment.

Watering was carried out according to each treatment. Each watering of seedlings required 2 liters/day/polybag according to the Oil Palm Research Institute (IOPRI / PPKS) instructions.

Fertilization was done once a week using basic fertilizer of NPK Mg as much as 2.5 grams/polybag by means of an array. Weeding was done manually by removing weeds in polybags and experimental fields. Weeding was done twice a week and adjusted to the conditions of the planting and land media. Pest and disease control using a decisive insecticide and a fungicide score of 250 EC, adjusted to the conditions of the plants on the experimental site. The observation variables were plant height, stem diameter, total leaf area, number of leaves, number of leaflets.

RESULTS AND DISCUSSION

Total Leaf Area

The treatment of watering frequency had no significant effect on the total leaf area in the 12th week of observation, while in the superior variety of oil palm seedlings with large leaves Yangambi also had no significant effect on the 12th week of observation and interaction of both had no significant effect on the total leaf area parameters.

Based on Table 3, it was known that the treatment of F2 watering frequency (morning and evening) resulted in the largest increasing delta of the plant growth, which was 2115.75cm^2 which was not significantly different from F1 treatment (morning), which was 2019.97cm^2 at 12 weeks. Whereas in oil palm varieties large-bunches Yangambi produced the largest average plant delta increase namely in Yangambi (V1) of 2135.46cm2 which was not significantly different from PPKS 718 (V3) of 2064.05cm2 and the lowest average was in PPKS 239 (V2) of 2004,06 cm2 at 12th weeks and the interaction between the two treatment had no significant effect.

Morning watering treatments tend to produce greater plant growth on parameters of stem diameter, number of leaves and number of leaflets, while the morning and evening watering treatments tend to produce greater plant growth on parameters of plant height and total leaf area. This was allegedly because the

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availability of sufficient water at watering in the morning has fulfilled the water needs of the plants. Watering that was not excessive will spur the growth of oil palm seedlings because water functions as the main compound forming the protoplasm and increasing cell turgor pressure. This was in accordance with the opinion of Salisbury & Ross (1997) that the availability of sufficient water to meet water needs.

Statistical analysis showed that the influence of large-bunches oil palm varieties showed insignificant differences. However, the varieties of Yangambi oil palm seedlings (V1) tend to produce the largest plants in the parameters of stem diameter, total leaf area, number of leaves, number of leaflets, while the varieties of PPKS 239 (V2) tend to produce the largest plants, namely plant height parameters and the lowest wass the PPKS 718 (V3) variety. It was alleged that the Yangambi variety which had existed since long ago had the superiority of genetic traits derived from the origin of the previous cross hence the Yangambi variety proved to have better quality compared to other varieties. This was supported by the opinion of PPKS/IOPRI (2010) which stated that Yangambi is one of the first generations of DxP crossing results, in several oil palm varieties produced by PPKS in the 1980 period which have a high potential for CPO and KPO production and greater bunch weight.

The effect of oil palm varieties that have large-bunches had no significant effect on all observed parameters. This was suspected because in the environment area at the research time, experienced a rise in temperature due to the use of plastic shade. This can be seen from the maximum temperature data which showed an increase in temperature hence the plant undergoes excessive transpiration, which resulted in the closure of the stomata in the leaves due to self-protection actions carried out by plants due to lack of water which aims to maintain their lives. This was supported by the opinion of Sinaga (2009) who said that if evapotranspiration and transpiration increase, it will cause a loss of large amounts of water which affects cell membranes in the process of cell division. Water loss in plant tissue will affect all metabolic processes hence it can reduce plant growth.

Water can work as a hydraulic system and can cause turgor on the cell wall because it puts pressure on plant cells. And this was inseparable from the genetic characteristics of each large-bunches oil palm variety that had different responses to the water requirements given in the nursery phase. This genetic difference caused each variety to have special characteristics that were different from each other hence it would show diversity.

This was consistent with the literature of Darliah et. al., (2001) which said that varieties are defined as groups of plants of a particular species or species of plants that have certain characteristics such as the shape of growth, leaves, flowers, and seeds that can be distinguished from other kinds and species. Differences in characteristics of each plant were caused by derivatives of elders and the results of genetic crosses between elders.

Table 1. Delta of total leaf area increase in the watering frequency and oil palm varieties ‘Yangambi’ treatment at the 12th week.

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Week/s	Watering Frequency	Varieties			Average
		V1	V2	V3	
1	F1 (Morning)		292,25	331,15	301,04
	F2 (Morning and Evening)	326,78	342,21	329,60	332,86
	Average	303,24	317,23	330,38	316,95
12	F1 (Morning)	2079,74	1912,37	2067,79	2019,97
	F2 (Morning and Evening)	2191,18	2095,76	2060,32	2115,75
	Average	2135,46	2004,06	2064,05	2067,86

Table 2. Delta of stem diameter increase in the watering frequency and oil palm varieties of Yangambi treatment at week 2 - week 12.

Weeks	Watering Frequency	Varieties			Average
		V1	V2	V3	
2	F1 (Morning)	1,61bc	1,67abc	1,35c	1,54b
	F2 (Morning and Evening)	1,56bc	1,84ab	2,04a	1,81a
	Average	1,59	1,75	1,70	1,68
4	F1 (Morning)	2,01	1,69	1,49	1,73
	F2 (Morning and Evening)	1,67	1,41	1,81	1,63
	Average	1,84	1,55	1,65	1,68
6	F1 (Morning)	1,19	1,58	1,63	1,47
	F2 (Morning and Evening)	1,68	1,58	1,63	1,63
	Average	1,43	1,58	1,63	1,55
8	F1 (Morning)	1,19	1,58	1,63	1,47
	F2 (Morning and Evening)	1,68	1,58	1,63	1,63
	Average	1,43	1,58	1,63	1,55
10	F1 (Morning)	1,52	1,37	1,39	1,43
	F2 (Morning and Evening)	1,57	1,57	1,60	1,58
	Average	1,54	1,47	1,50	1,50
12	F1 (Morning)	1,99	1,79	1,71	1,83
	F2 (Morning and Evening)	1,64	1,29	1,54	1,49
	Average	1,81	1,54	1,62	1,66

Note: The numbers followed by the same letter showed no significant difference according to Duncan's Multiple Range Test at the level of α = 5%.

Stem Diameter

Based on Table 2, it was known that the treatment of F1 watering frequency (morning) resulted in the largest delta in increasing plant growth, which was 1.83 cm which was not significantly different from F2 treatment

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(morning and evening) which was 1.49 cm at week 11. Whereas in large-bunches oil palm varieties 'Yangambi' produced the largest average delta increase in plants on Yangambi (V1) varieties with 1.84 mm which was not significantly different from PPKS 718 (V3) of 1.65 mm and the lowest average was 239 (V2) PPKS amounting to 1.55mm at week 3 and the interaction between them had no significant effect.

Susila's (2006) research stated that the watering volume of 250 ml 4 or 5 times a day according to the schedule gave the best results on plants.

Statistical analysis showed that the influence of large-bunches oil palm varieties showed insignificant differences. However, the varieties of oil palm seedlings 'Yangambi' (V1) varieties tend to produce the largest plants in the parameters of stem diameter, total leaf area, number of leaves, number of leaflets, while the varieties of PPKS 239 (V2) tend to produce the largest plants namely in plant height parameters and the lowest was the PPKS 718 (V3) variety.

It was suspected that the Yangambi variety that had existed since long ago had the superiority of genetic traits derived from the origin of its previous crossing hence the Yangambi variety was proven to have better quality compared to other varieties. This was supported by the opinion of PPKS / IOPRI (2010) which stated that Yangambi is one of the first generations of DxP crossing results, in several oil palm varieties produced by PPKS in the 1980 period which have a high potential for CPO and KPO production and greater bunch weight.

Number of Leaflets

Based on Table 3, it was known that the treatment of F1 watering frequency (morning) This was inseparable from the genetic characteristics of each large-bunches of oil palm variety that had different responses to the water requirements given in the nursery phase. This genetic difference causes each variety to resulted in the highest delta increase in plant growth, in the number of leaflets, which was 35.54 strands which were not significantly different from F2 treatment (morning and evening) i.e. 34.38 strands in the 12th week. In large-bunched oil palm varieties the highest delta yield of the average number of leaves in Yangambi variety (V1) was 38.69 strands which were not significantly different from PPKS 239 (V2) of 33.50 strands and the lowest average was PPKS 718 (V3) of 32.69 strands in the 12th week of observations and the interactions of both treatment had no significant effect.

Statistical analysis showed that the interaction of watering frequency and superior varieties of oil palm seedlings was not significantly affected, but the growth of oil palm seedlings measured at one-time watering and Yangambi (V1) showed better combinations. This was presumably because at one-time watering the availability of water was sufficient for the plants hence it was very helpful in the process of cell extension and division. This was supported by the literature of Mangoensoekarjo and Semangun (2008) which stated that water functions as the formation of protoplasm and as a compound that can regulate the mechanism of movement to open and close the stomata in plants. Water can work as a hydraulic system and can cause turgor on the cell wall because it puts pressure on plant cells. The effect of watering frequency once and twice a day showed positive linear growth. But one-time watering tends to show greater results than twice a day. It was suspected that the planting media is in a field capacity hence it did not affect the plant growth.

have special characteristics that were different from each other hence it will show diversity. This was consistent with the literature of Darliah et. al., (2001) which said that varieties are defined as groups of plants of a particular

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species of plants that have certain characteristics such as the shape of growth, leaves, flowers, and seeds that can be distinguished from other species

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Table 3. Delta of the increase in the number of leaflets in the treatment of the watering frequency and oil palm varieties of Yangambi at 12 weeks.

Weeks	Watering Frequency	Variety			Average
		V1	V2	V3	
12	F1 (Morning)	41,00	33,25	32,38	35,54
	F2 (Morning and Evening)	36,38	33,75	33,00	34,38
	Average	38,69	33,50	32,69	34,96

CONCLUSION

The growth of large-bunched oil palm seedlings (Yangambi) namely DxP Yangambi, DxP PPKS 239 and DxP PPKS 718 at Main Nursery aged 4 to 7 months, watering was done once, namely in the morning. The growth of large-bunches oil palm seedlings (Yangambi) namely DXP Yangambi, DxP PPKS 239 and DxP PPKS 718 at the Main Nursery aged 4 to 7 months, not significantly difference.

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