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Cocoa Seed Growth Response (Theobroma Cacao L.) In Nurseries Due to Mulch Giving And Some Watering Intervals

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ABSTRACT
Cocoa plant (Theobroma cacao L.) is one of Indonesia's export commodities in addition to rubber, tea, palm oil and others. With proper and regular mulch giving cocoa plants will have better growing power (Umboh, 2010). According to Umboh, (2010) mulch is an attempt to provide nutrients into the soil so that the physical, chemical and biological conditions of the soil are in accordance with the demands of plants. So the purpose of mulching is to provide nutrients in the soil to get good growth and increase soil productivity. In addition, mulch can also reduce the evaporation of water above the surface of the soil. This study uses Random Group Design (RAK), 3 repeats and the number of plots 12 plots per repeat, so that the total number of plots is 36 plots, while the factor to be tested consists of 2 factors: The first factor is the administration of mulch (B) consisting of 3 levels, namely, Mulch Factor B0, Without mulch, B1 rice husk mulch, B2 Mulch cane pulp While the second factor of water administration (W), water is given according to airy capacity (500 ml per polybag), consists of 4 levels, namely: Water Giving: W1 :1 day twice (1x2), W2 :1 day once (1x1), W3 : 2 days once (2x1) W4 :3 days (3x1) From the results of the study obtained results that the provision of mulch gives a real influence on the number of strands of leaves at the age of 9 weeks after planting and an unreal effect on plant height, leaf area, wet weight of roots and dry weight of roots. Watering treatment exerts an unreal influence on all observed parameters. While the interaction between mulch administration (B) and watering (W) exerts an unreal influence on all observed parameters.

Keywords : Cocoa, Mulch, Watering Intervals.

INTRODUCTION

Cocoa plant (Theobroma cacao L.) is one of Indonesia's export commodities in addition to rubber, tea, palm oil and others. In Indonesia, cocoa has been known since 1560, but has been an important commodity since 1951. Cocoa commodities play an important role in the national economy. As the third most important commodity after rubber and palm oil, cocoa is one of the main sources of income for farmers in 30 provinces that provide employment (Basri, et al. 2012). Cocoa which is one of the leading commodities of plantations in addition to acting as a source of farmers' income and the creation of farmers' jobs, also acts as a country's foreign exchange earner, encouraging the development of agribusiness and agroindustry, regional development and environmental conservation (Directorate General of Plantations, 2012).

Cocoa plants come from tropical rainforest areas in South America. In its home region, cocoa is a small plant at the bottom of the tropical rainforest and grows sheltered by large trees (Indonesian Coffee and Cocoa Research Center, 2010). Indonesia is currently ranked third as the world cocoa bean producer after Ivory Coast and Ghana by contributing foreign exchange of USD 1,053,446,947 (1.053 billion) from the export of cocoa beans and processed cocoa products (Invested General of Plantation, 2012). Cultivation techniques are one of the factors that will bring great benefits in achieving high production and good quality, while breeding is the beginning of efforts to achieve these goals. Proper and good breeding techniques will provide a great opportunity for plant success (Karmawati, et al, 2010). Good cocoa seedlings are the basic

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capital for farmers to benefit in the cocoa farming business. Cocoa is an annual crop that remains economical until the age of 37, so the mistake of choosing seedlings will cause losses in the long run. Therefore the selection of seedlings is a very important first step in cocoa cultivation (Indonesian Coffee and Cocoa Research Center, 2010).

To get good and healthy growth, also strived through the improvement of cultivation technology. Mulch is one of the important factors in determining the success of a cocoa plantation business. With proper and regular mulch giving cocoa plants will have better growing power (Umboh, 2010). According to Umboh, (2010) mulch is an attempt to provide nutrients into the soil so that the physical, chemical and biological conditions of the soil are in accordance with the demands of plants. So the purpose of mulching is to provide nutrients in the soil to get good growth and increase soil productivity. In addition, mulch can also reduce the evaporation of water above the surface of the soil. Watering given to cocoa seedlings is very decisive for its growth and development in the nursery. Improper watering will interfere with physiological processes that occur can result in inhibition of cocoa seed growth (Indonesian Coffee and Cocoa Research Center, 2010). With the provision of rice husk mulch and sugarcane dreg mulch (bagasse) is expected to reduce evaporation and can store water in polybags longer.

METHODS

Place and Time

This research place was conducted at Jl. Pintu Air IV Kuala Bekala Padang Bulan Medan, with a height of ± 25 m above sea level. The study began from November 2020 to February 2021.

Materials and Tools

Materials used

- TSH (Trinidad Super Hybrid) cocoa sprouts are obtained from Aek Pancur Garden, Palm Oil Research Center (PPKS).
- Rice husk mulch and sugarcane dreg mulch (bagasse).
- Black polybag size 30 x 12 cm.
- Bamboo wood, slipped, palm leaf pellets, nails and wire.
- Sand, cow manure, top soil soil and burlap.

Tools used

- Hoes, machetes, chainsaws, hammers, and meters.
- Sied the soil, plastic buckets, plastic ropes, permanent sepidol.
- Fines, measuring cups, ruler, laptop, notebook, electric scales and stationery

Research Methods

This study used a Randomized Group Design consisting of 2 factors. The first factor is the administration of mulch (B) which consists of 3 levels, namely:

- Mulch Factor:
  B0: No mulch
  B1 : Rice husk mulch
  B2 : Sugarcane mulch
  While the second factor of water administration (W), water is given according to airy

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capacity (500 ml per polybag), consisting of 4 levels, namely:

- Giving Water:
  W1: 1 day twice (1x2)
  W2: Once a day (1x1)
  W3: Once every 2 days (2x1)
  W4: Once every 3 days (3x1)

The combination of 3 x 4 treatments = 12 treatments is:

B0W1	B0W2	B0W3	B0W4
B1W1	B1W2	B1W3	B1W4
B2W1	B2W2	B2W3	B2W4

Based on the combination of treatments, the number of repeats can be determined as follows:

(t-1) (r-1) ≥ 15
(12-1) (r-1) ≥ 15
11 (r-1) ≥ 15
11 r-11 ≥ 15
11 r ≥ 15 + 11
11 r ≥ 26
r ≥ 26/11
r ≥ 2.36 = 3 repeats

Based on the above description can be arranged treatment units as follows:

Number of repeats	= 3
Number of trial units	= 36
Number of seeds per plot	= 5
Number of samples per plot	= 3
Total number of seedlings	= 180
Total sample number	= 108
Distance between polybags	= 25 x 25 x 50 cm
Distance between plots	= 50 cm
Distance between repeats	= 100 cm
Trial plot size	= 60 x 60 cm

The linear model assumed for Group Random Design (RAK) is as follows:

Y_{ijk} = $\mu+\rho i+Bj+Wk+BWjk+\varepsilon ijk$
Y_{ijk} = The results of observations on k-i of the treatment of j-level mulch efforts and the gift of k-watering.
μ = Influence of the middle value.
ρi = Effect of the i-repeat.
Bj = Effect of j-level mulch.
Wk = Effect of k-level watering.
$BWjk$ = Effect of j-level mulch interaction and k-level watering.
εijk = Error b on the i^{th}, j^{th} mulch, k^{th} watering.

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Implementation of Research

Land Preparation

The land used for breeding is cleared from garbage, and grass, then razed. To avoid from puddles of rainwater, then around the area is made drainage ditches. The trial plot was made with a size of 60 x 60 cm, the treatment consisted of 3 repeats, the distance between the repeats 100 cm. In one repeat consists of 12 plots of treatment, the distance between plots is 50 cm.

Shade Making

The direction of shade faces East, east height 2 meters and west 1.5 meters. The roof is made from palm leaf smelter and the direction of the bed is North-South.

Soil Filling and Polybag Preparation

Polybags used in black that has a size of 30 x 12 cm, soil that has been mixed with sand and cow manure as a basic fertilizer with a ratio of 2: 1: 1. The prepared medium is then inserted little by little into the polybag until it reaches the top base of the polybag and then compacted then about the soil is solid, discarding the soil as deep as 2 cm from the base of the top of the polybag to put the rice husk mulch and sugarcane dreg mulch (bagasse). The polybag that has been ready to be filled is then arranged on top of the trial plot that has been provided in a perpendicular position.

Planting

Planting is carried out one week after filling the soil into the polybag. The seeds are planted upright, then the soil is covered with the mulch provided and gives a little gap so that cocoa seedlings can grow.

Seedling Maintenance

Polybags filled with sprouts are arranged regularly on flat soil, then carried out the maintenance of seedlings in the form of:

Watering

The frequency of seedling watering is carried out in accordance with the treatment and capacity of the room that has been determined, namely 500 ml per polybag:

W1: 1 day twice (1x2)
W2: Once a day (1x1)
W3: Once every 2 days (2x1)
W4: Once every 3 days (3x1)

By using a dose of 500 ml per polybag in the morning at 08:00 to 09:00 WIB and in the afternoon at 16:00 to 17:00 WIB and the watering implementation once a day, once every two days and once every three days in the morning at 08:00 to 09:00 WIB. For the treatment of watering W1 = (one day twice), given a lot of water, which is 250 ml for the morning and 250 ml for day dysore.

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Weeding

Weeding is done by removing weeds that grow inside the polybag or outside the polybag. This is done once a week depending on the growth of the weed.

Embroidery

Embroidery is carried out up to the age limit of one week after planting, and the plant as a substitute must be the same age.

Observation Parameters

Plant height (cm)

The height of the plant is measured from the neck of the root to the point of growing. Measurements are made after the seedlings are 4 weeks old after planting and in addition to observations with a time of once a week. To avoid errors in subsequent measurements, each sample plant is made a measurement limit and given a patok ajir to facilitate the next measurement.

Number of leaves (strands)

Observation of the number of leaves is done by calculating the entire number of leaves formed since the plant is 4 weeks old, with an observation time of 1 week. Where the leaves that count are the leaves that have been perfect (not the flus leaves).

Leaf area (cm^2)

Leaf area is obtained by measuring the leaves in the nursery using the formula (Dartius, 2005):

$\text{Log } Y = - 0.495 + 1.904 \log X$

Where: Y = Leaf area (cm2)

X = Leaf length (cm)

Measurements were taken at the time the plant was 9 weeks old after planting (at the end of the study).

Wet weight of roots (g)

Wet weight of roots was obtained in plants aged 9 weeks after planting (at the end of the study). By tearing the polybag then breaking the soil slowly, separating the soil attached to the root, then cutting the boundary between the stem and the root, washing the roots thoroughly then the roots are hardened and the roots weighed.

Dry weight of roots (g)

Sample that has been weighed wet weight of the root is then put in the envelope and then dioven for 24 hours with a temperature of 105ºC so that it gets the dry weight of the root, after which it is weighted dry weight.

RESULTS AND DISCUSSION

Results

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Plant Height (cm)

The results of statistical analysis showed that the administration of mulch (B) watering (W) and its interactions had no noticeable effect on plant height. For more details, you can see in Table 1.

Table 1. Average Height of Cocoa Plants (cm) in Mulch Treatment (B) and Watering (W) Age 9 Weeks After Planting.

Treatment	W_1	W_2	W_3	W_4	Average
B_0	20.30	19.30	20.07	19.67	19,84
B_1	18.10	22.30	19.63	20.63	20.17
B_2	20.17	18.87	20.20	19.20	19.61
Average	19.52	20.16	19.97	19.83	

Description: The number followed by the same notation is not real at the α = 5%

From Table 1 it can be seen that on mulch treatment (B) on treatment B1 shows the highest plant height (20.17 cm) and on treatment B2 shows the lowest plant height (19.61 cm). Watering treatment (W) on W2 treatment (20.16 cm) indicates the highest average plant height and at W1 treatment (19.52 cm) shows the average height of the lowest plant. The combination of B1W2 indicates the highest plant height (22.30 cm) and the B1W1 combination shows the lowest plant height (18.10 cm).

Number of leaves (strands)

The results of the analysis showed that the administration of mulch had a real effect on the number of leaves at 9 weeks after planting. Watering treatment and interaction between mulch giving and watering have no real effect on the number of leaves. For more details, you can see in Table 2.

Table 2. Average Number of Cacao Plant Leaves (Strands) in Mulch Treatment (B) and Watering (W) Age 9 Weeks After Planting.

Treatment	W_1	W_2	W_3	W_4	Average	
B_0	8.77	9.97	9.40	10.10	9.56	b
B_1	10.53	9.50	11.73	11.30	10.77	a
B_2	9.10	9.50	10.53	9.87	9.75	ab
Average	9.47	9.66	10.55	10.42		

Description: The number followed by the same notation is not real at the α = 5%

From Table 2 it can be seen that the B1 treatment shows the most number of leaves (10.77 strands) and differs markedly from B0 (9.56 strands) but differs not markedly from the treatment of B2 (9.75 strands). Between the treatment of B2 and B0 different is not real. Watering treatment (W) in W3 treatment (10.55 strands) shows the average number of plant leaves and in W1 treatment (9.47 strands) shows an average number of plant leaves is small. The B1W3 combination shows the largest number of plant leaves (11.73 strands) and the B0W1 combination shows a small number of plant leaves (8.77 strands).

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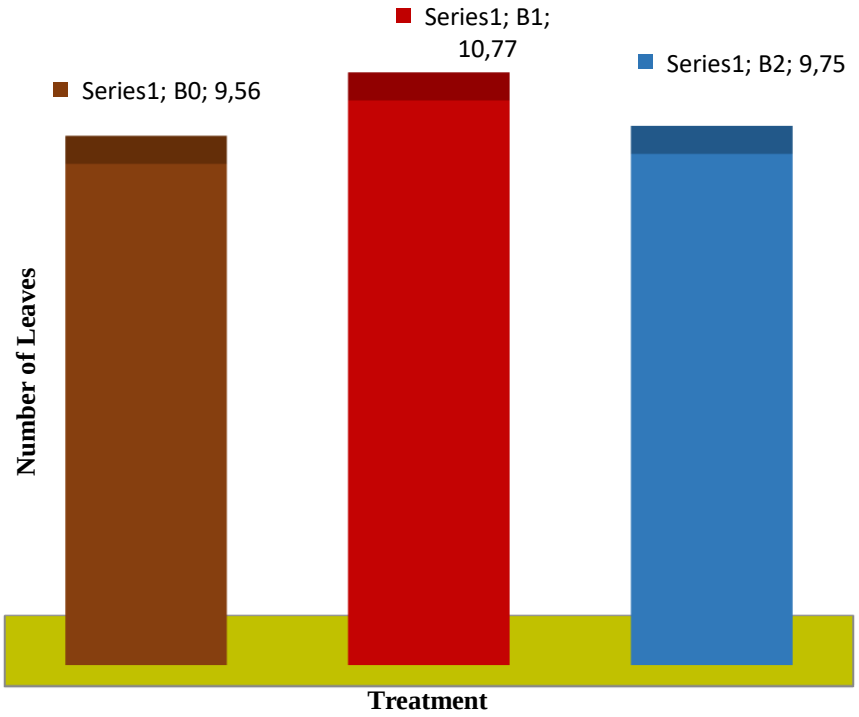

Figure 1. Graph of Number of Leaves Against Mulch Treatment

Leaf Area (cm2)

The results of statistical analysis showed that the administration of mulch (B) watering (W) and its interactions had an unreal effect on the area of the leaves. For more details, you can see in Table 3.

Table 3. Average Area of Cocoa Plant Leaves (cm2) on Mulch Treatment (B) and Watering (W) Age 9 Weeks After Planting.

Treatment	W_1	W_2	W_3	W_4	Average
B_0	72.95	79.23	88.17	83.22	80.89
B_1	91.07	70.92	90.84	72.73	81.39
B_2	71.78	80.78	83.51	94.68	82.69
Average	78.60	76.98	87.51	83.54	

Description: The number followed by the same notation is not real at the $\alpha = 5\%$

From Table 3 it can be seen that the administration of mulch on the B2 treatment shows the widest leaf area (82.69 cm2) and on B0 shows the smallest leaf area (80.89 cm2). Watering treatment (W) in W3 treatment (87.51 cm2) shows the average area of the widest plant leaves and the W2 treatment (76.98 cm2) shows the average leaf area of the smallest plant. The B2W4 combination shows the widest plant leaf area (94.68 cm2) and the B1W2 combination shows the smallest plant leaf area (70.92 cm2).

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Heavy Wet Root (g)

The results of statistical analysis showed that the administration of mulch (B) watering (W) and its interactions had an unreal effect on the wet weight of the roots. For more details, you can see table 4.

Table 4. Average Wet Weight of Cocoa Plant Roots (g) on Mulch Treatment (B) and Watering (W) Age 9 Weeks After Planting.

Treatment	W_1	W_2	W_3	W_4	Average
B_0	0.55	0.71	0.54	0.61	0.60
B_1	0.67	0.63	0.62	0.78	0.68
B_2	0.67	0.59	0.50	0.66	0.61
Average	0.63	0.64	0.55	0.68	

Description: The number followed by the same notation is not real at the α = 5%

From Table 4 it can be seen that the administration of mulch on the B1 treatment indicates the wet weight of the heaviest roots (0.68 g) and on B0 indicates the wet weight of the lightest roots (0.60 g). Watering treatment (W) in W4 treatment (0.68 g) indicates the average wet weight of the heaviest roots and at the W3 treatment (0.55 g) indicates the average wet weight of the lightest roots. The combination of B1W4 indicates the wet weight of the heaviest plant roots (0.78 g) and the combination of B2W3 indicates the wet weight of the lightest plant roots (0.50 g).

Weight Dry Root (g)

The results of statistical analysis showed that the administration of mulch (B) watering (W) and its interactions had an unreal effect on the dry weight of the roots. For more details, you can see in Table 5.

Table 5. Average Dry Weight Of Cocoa Plant Roots (g) in Mulch Treatment (B) and Watering (W) Age 9 Weeks After Planting.

Treatment	W_1	W_2	W_3	W_4	Average
B_0	0.29	0.32	0.25	0.32	0.30
B_1	0.34	0.32	0.33	0.37	0.34
B_2	0.31	0.35	0.27	0.34	0.32
Average	0.31	0.33	0.29	0.34	

Description: The number followed by the same notation is not real at the α = 5%

From Table 4 it can be seen that mulch administration on treatment B1 indicates the heaviest dry weight of the roots (0.34 g) and B0 indicates the dry weight of the lightest roots (0.30 g). Watering treatment (W) in W4 treatment (0.34 g) indicates the average dry weight of the heaviest roots and W3 treatment (0.29 g) indicates the average dry weight of the distest root. The combination of B1W4 indicates the dry weight of the heaviest plant roots (0.37 g) and the combination of B0W3 indicates the dry weight of the roots of the youngest plant roots (0.25 g).

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Table 6. Summary of the Influence of Mulch (B) and Watering (W) and Its Interaction With The Average Growth (Seedling) of Cocoa Plants Aged 9 Weeks After Planting.

Treatment	Parameter				
	Plant Height (cm)	Number of Leaves (Strands)	Leaf Area (cm^2)	Wet Weight Root (g)	Dry Root Weight (g)
Mulch Giving (B)					
B_0	19.84	9.56 b	80.89	0.60	0.30
B_1	20.17	10.77 a	81.39	0.68	0.34
B_2	19.61	9.75 ab	82.69	0.61	0.32
Watering (W)					
W_1	19.52	9.47	78.60	0.63	0.31
W_2	20.16	9.66	79.98	0.64	0.33
W_3	19.97	10.55	87.51	0.55	0.29
W_4	19.83	10.42	83.54	0.68	0.34
Combination					
B_0W_1	20.30	8.77	72.95	0.55	0.29
B_0W_2	19.30	9.97	79.23	0.71	0.32
B_0W_3	20.07	9.40	88.17	0.54	0.25
B_0W_4	19.67	10.10	83.22	0.61	0.32
B_1W_1	18.10	10.53	91.07	0.67	0.34
B_1W_2	22.30	9.50	70.92	0.63	0.32
B_1W_3	19.63	11.73	90.84	0.62	0.33
B_1W_4	20.63	11.30	72.73	0.78	0.37
B_2W_1	20.17	9.10	71.78	0.67	0.31
B_2W_2	18.87	9.50	80.78	0.59	0.35
B_2W_3	20.20	10.53	83.51	0.50	0.27
B_2W_4	19.20	9.87	94.68	0.66	0.34

Discussion

Effect of mulch treatment on the growth of cocoa plants (Theobroma cacao L) in polybags

From the results of the study it is known that the administration of mulch has a noticeable influence on the number of leaves at 9 weeks of age after planting and has no noticeable effect on plant height, leaf area, wet weight of roots and dry weight of roots. In plants that are mulched there is an increase in growth also due to the supply of nutrients fulfilled for plant growth. This is in accordance with the opinion of Koryati (2011) which states that in soils that are not given mulch there is a tendency to decrease soil organic matter and vice versa in soils that are given mulch the content of organic matter is quite good and tends to increase. Furthermore, mulch can reduce evaporation over a long period of time and because it can add soil organic matter, the ability to hold water increases.

Physiologically, mulch provides an average of plant growth better than without mulch, this is because the provision of mulch can improve the physical, biological and chemical

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properties of the soil. The effect of mulching can also maintain soil moisture and can reduce the rate of soil evaporation and have a fairly good absorption of water, so that the availability of water in the soil is fulfilled and where it can help increase the absorption of nutrients by plants (Anggi, 2010). This is in line with Umboh's statement (2010) that rice husks have advantages, among others, are sources of nutrients, have a fairly good aerase and have a light mass so that it is good enough to be used as a planting medium.

Rice husks have hygroscopic properties, low type weight and neutral color. Rice husks are an excellent insulating material because chaff is difficult to burn and can prevent moisture. Some studies have found that burned rice husks will produce a certain amount of silica, for this reason rice husks provide excellent thermal insulation (Coniwanti et al. 2011). Sugarcane pulp (bagasse) is a solid waste that comes from the squeeze of sugarcane stems to be taken niranya. This waste contains a lot of fiber and cork. This sugar cane pulp has a fresh aroma and is easily dried so that it does not cause a foul odor. Sugarcane pulp (bagasse) can be mandated as mulch or formulated with blotong and ash as sugarcane compost. (Anwar, 2015). According to Hayati, et al (2010) the use of rice husk mulch is better, this is because rice husk mulch has the property of retaining higher soil moisture than sugarcane dregs because rice husks have a smaller texture and can be spread evenly covering the surface of the soil, thus the temperature of the soil and the availability of water for plants can be met so that plants can grow and develop perfectly.

Effect of watering treatment on the growth of cocoa plants (Theobroma cacao L) in polybags

From the results of this study it is known that watering exerts an unreal influence on all observed parameters. The unreal effect of watering treatment is thought to be because water is still available to plants obtained from soil-contained water and air moisture. This is in line with Setiono's statement (2010) in addition to the availability of nutrients, plant growth concerns fertility influenced by factors such as water and climate. The basic necessities for the living fertility of plants are certain elements (nutrients, water, air, light, and temperature). Root growth is affected by the high level of low soil temperature in the rooting area, as well as the availability of air in the soil affects the breathing of some of the roots of the plant. Below ground level, soil pores contain water and air with varying amounts. When rainwater falls to the surface of the soil, the water continues to move downward through the aeration zone and partially fills the pores of the soil and lives in the pores held by the grains of the soil.

According to Fahrudin (2009) lack of water or excess water in cocoa plant nurseries causes vegetative growth such as plant height decreased compared to plant growth under optimum conditions. Excess water will interfere with chemical balance in plants that result in physiological processes running abnormally. Excess water causes the pores of the soil there is no oxygen while the plant needs oxygen for breathing, if this condition continues then plant growth is hampered, plants become thin, production is low, quality drops, The amount of groundwater that is useful for plants has certain limits. Such a lack of water and excess water can cause difficulties. Excess water itself is not toxic, but lacks air in inundated soil that causes damage (Harjadi, 2011).

The effect of the treatment of mulch and watering interactions on the growth of cocoa plants (Theobroma cacao L) in polybags

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From the results of this study it turns out that the treatment of the interaction between mulch administration (B) and watering (W) has an unreal influence on all parameters observed. This is allegedly because each treatment is mulch and water works individually so that it does not affect the growth of cocoa seedlings or mulch given is not able to affect the absence of water preparations for plants, because of the functioning of groundwater content and air humidity conditions.

CONCLUSION

Based on the results of the research conducted can be concluded as follows:

1. Mulch administration shows a noticeable effect on the number of leaf strands at 9 weeks of age and has no noticeable effect on plant height, leaf area, wet weight of roots and dry weight of roots. The largest number of leaves is at the B1 level (10.77 strands) and the lowest is at the B0 (9.56 strands) level without mulch.
2. Watering exerts an unreal influence on all observed parameters of plant height, number of leaves, leaf area, wet weight of roots and dry weight of roots. The largest number of leaves is at the W3 level (10.55 strands) and the lowest is at the W1 level (9.47 strands).
3. The interaction of mulch treatment and watering exerts an unreal influence on all observed parameters of plant height, number of leaves, leaf area, wet weight of roots and dry weight of roots.

Suggestion

From the results of the above research, further research is needed on other producing plants. So that knowing the influence of rice husk mulch, sugarcane mulch and watering influence can be known more clearly.

REFERENCES

Anggi. 2010. Mulsa. http://anggi-arga.blogspot.co.id/2010/03/mulsa.html. Diakses 12 Februari 2016

Anwar. 2015. Ampas Tebu. http://dokumen.tips/documents/jurnal-ampas-tebu.html. Diakses 18 Oktober 2016

Basri, A., S, Mulato., C, Ismayadi. 2012. Panen dan Pasca Panen Kakao. Departemen Pertanian

Coniwanti, Pamilia., Srikandhy, Rasmiah., dan Apriliyanni. 2011. Pengaruh Proses Pengeringan, Normalitas HCl, dan Temperatur Pembakaran Pada Pembuatan Silika Dari Sekam Padi. Jurnal Teknik Kimia No. 1 Vol. 15

Dartius. 2005 Analisis Pertumbuhan Tanaman Universitas Sumatra Utara.

Direktorat Jenderal Perkebunan. 2012. Pedoman Teknis Perluasan Tanaman Kakao Tahun 2012. Kementrian Pertanian. Jakarta

Direktorat Jenderal Perkebunan. 2012. Volume dan Nilai Ekspor, Impor Indonesia.http://ditjenbun.deptan.go.id/cigraph/index.php/viewstat/exportimport/1-Kakao. Diakses 12 Februari 2016

Fahrudin, Fuat. 2009. Budidaya Caisim (Brassica Juncea L.) Menggunakan Ekstrak Teh Dan Pupuk Kascing. Skripsi. Fakultas Pertanian: UNS.

Harjadi, SS. 2011. Pengantar Agronomi. Gramedia. Jakarta

International Journal of Economic, Technology and Social Sciences
e-ISSN 2775-2976
International Journal of Economic, Technology and Social Sciences
url: https://jurnal.ceredindonesia.or.id/index.php/injects
Volume 2 Number 1 page 339 - 350

Hayati, E., A. Halim Ahmad, dan Cut Taisir Rahman. 2010. Respon Jagung Manis (*Zea mays, Sacharata* Shout) Terhadap Penggunaan Mulsa dan Pupuk Organik. Jurnal Agrista Vol. 14 No. 1

Hipoci. 2014. Bagase (Ampas Tebu). http://hipoci.blogspot.co.id/2014/10/bagase-ampas-tebu.html. Diakses 06 November 2016

Karmawati, E., Zainal, M., M. Syakir., S. Joni Munarso., I Ketut, A., dan Rubiyono. 2010. Budidaya dan Pasca Panen Kakao. Pusat Penelitian dan Pengembangan Perkebunan. IPB. Bogor

Koryati, T. 2011. Pengaruh Penggunaan Mulsa dan Pemupukan Urea Terhadap Pertumbuhan dan Prduksi Cabai Merah (*Capsicum annum* L.). Jurnal Penelitian Bidang Ilmu Pertanian Volume 2 Nomor 1

Muljana, W. 2010. Bercocok Tanam Coklat. Penerbit Aneka Ilmu. Semarang

Pusat Penelitian Kopi dan Kakao Indonesia. 2010. Buku Pintar Budidaya Kakao. Agromedia Pustaka. Jakarta.

Setiono. 2010. Hubungan Air Tanaman. http://setiono774.blogspot.co.id/ 2010/11/hubungan-air-tanaman.html. Diakses 17 Oktober 2016

Siregar, T. H. S., Slamet R., dan Laeli N. 2011. Budidaya Cokelat. Penebar Swadaya. Jakarta

Umboh A.H. 2010. Petunjuk Penggunaan Mulsa. Penebar Swadaya. Jakarta

Virgine, Okar. 2014. Rasio C/N Dan Perannya Pada Proses Pengomposan Bahan Organik. http://eprints.undip.ac.id/44533/4/BAB_II.pdf. Diakses 06 November 2016