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Concentration of Soaking Coconut Water and the Use of Kinds of Clon Entres toward the Growth of Bud Shoots of Cocoa (*Theobroma cacao* L)

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Abstract.The purpose of this research is to find out the influence of concentration of soaking coconut water and the use of kinds of clon entres toward the growth of bud shoots cocoa. This research was conducted on October 2019 until January 2020 at Lapang (Saung) Laboratory, Polytechnic of Jember. This research used Complete Random Design Factorial. Concentration of soaking coconut water was determined as first factor with 4 levels: 0% ; 25% ; 50% ; and 75%. While the use of kinds of clon entres was determined as second factor with 3 levels: Sulawesi Clon 1; Sulawesi Clon 2; and MCC Clon 2. There were 12 treatments combination and 3 repetitions. Further, the researcher conducted a 5% of DMRT (Duncan Multiple Range Test) follow-up test. The result shows that concentration of soaking coconut water did not give significantly different treatment on all parameters. The use of MCC Clon Entres 2 gave significantly different result toward leaf area and shoot length parameters.

1. Introduction

Cocoa (Theobroma cacao L.) is a plantation crop that has an important role for the national economy, especially as a source of income and foreign exchange. An increase in cocoa production every year in Jember Regency, East Java, needs to be balanced with more, fast and quality seeds. Grafting the shoots is one way of vegetative propagation of cocoa seedlings. The choice of the use of scion or scion must use superior clones of cocoa. One of the growth regulators (ZPT) that can help the growth of cocoa so that the proportion of growth is higher and the transfer of ready-to-plant seedlings is faster is the natural growth regulating agent (ZPT) of coconut water. This study aims to see the effect of its effect on the air concentration of coconut and the use of clone types of scion on the grafting of cocoa shoots..

2. Research Method

This research was conducted from October 2019 to January 2020 at the Field Laboratory (Saung), Jember State Polytechnic. This study used a Factorial Completely Randomized Design (CRD) with the first factor being Coconut Water Immersion Concentration and the second factor was the use of various types of Entres clones, there were 12 treatment combinations and 3 replications. The concentration factor

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of Coconut Water Immersion consists of 4 levels, namely 0%, 25%, 50% and 75%. The use of factors for different types of entry clones consists of 3 levels, namely Sulawesi 1, Sulawesi 2 and MCC 2.

2.1. Tools and Materials

The tools needed in this research are meter, gembor, measuring cup / liter, razor / cutter, knife, container, scissors, stationery.

The materials needed in this study were 5 months old ICCRI 06H rootstock cocoa seedlings in polybags, Sulawesi clone 1 top stem entres, Sulawesi clone 2 and MCC 02 clone 5 months old with 2 segments, water, 3 month old young coconut water (coconut inside), plastic straps, plastic covers, observation books.

2.2. Research methods

This study was compiled using a completely randomized design (CRD) factorial with 12 treatments, including:

- The concentration of coconut water immersion consists of 4 levels, namely:
  A1: 0%, A2: 25%, A3: 50%, A4: 75%
- The use of various Entres Clones consists of 3 levels, namely:
  K1: Sulawesi 1, K2: Sulawesi 2, K3: MCC 02

There were 12 treatment combinations with each treatment consisting of 3 replications in order to obtain 36 experimental units. Each unit consists of 5 polybags so that a total of 180 polybags

Combination treatment of Coconut Water Immersion Concentration and Use of Types of Entres Clones is presented in table 3.1 as follows:

Concentration of Coconut Water	**Klon Entres**		
	K1	K2	K3
A1	A1K1	A1K2	A1K3
A2	A2K1	A2K2	A2K3
A3	A3K1	A3K2	A3K3
A4	A4K1	AK2	A4K3

1. A1K1 = 0% Coconut water + Sulawesi 1
2. A1K2 = 0% Coconut water + Sulawesi 2
3. A1K3 = 0% Coconut water + MCC 2
4. A2K1 = 25% Coconut water + Sulawesi 1
5. A2K2 = 25% Coconut water + Sulawesi 2
6. A2K3 = 25% Coconut water + MCC 2
7. A3K1 = 50% Coconut water + Sulawesi 1
8. A3K2 = 50% Coconut water + Sulawesi 2
9. A3K3 = 50% Coconut water + MCC 2
10. A4K1 = 75% Coconut water + Sulawesi 1
11. A4K2 = 75% Coconut water + Sulawesi 2
12. A4K3 = 75% Coconut water + MCC 2

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The statistical model RAL (Completely Randomized Design) factorial used ie :

$$Yijk = \mu + \alpha i + \beta j + (\alpha\beta)ij + \varepsilon ijk$$

Information :

Yijk: the value of the k-observation that obtained the combination of the treatment of the jth immersion concentration of coconut water and the treatment of the use of the i-th entres clone

μ: common mean

αi: the effect of the treatment of the i th immersion concentration of coconut water

βj: the effect of using the j-th type of entres clone

(αβ) ij: the effect of the combination of i-th and j-treatments

εijk: experimental error of the i-th and j-th treatments in the k-th experimental unit

The data obtained were analyzed using analysis of variance (ANOVA). If there is a significant difference, continue with the DMRT (Duncan Multipe Range Test) further test with a level of 5%.

3. Results and Discussion

Table 4.1 Recapitulation of Various Concentrations of Coconut Water Immersion and Use of Types of Entres Clones on the Growth of Cocoa Shoots (Theobroma cacao L.)

Observation Parameters	Factor A	Factor K	Factor A*K	KK (%)
Shoot diameter 13 MSS (cm)	NS	NS	NS	21
Number of Leaves 13 MSS (helai)	NS	NS	NS	25
Leaf area 13 MSS (cm^2)	NS	**	NS	26
Number of shoots13 MSS	NS	NS	NS	21
Shoot length 13 MSS (cm)	NS	**	NS	22

Description: MSS: Week After Connecting; (A): Coconut Water Concentration; (K): Entres clone; (*): Real Different; (**): Very Real Different; (NS): Not Real Different

3.1. Live Percentage

Observation of the percentage of live shoot grafting of cocoa seedlings was carried out when the seedlings were 2 MSS (Week After Connection) by counting the number of live shoot grafting seeds. The grafting seedlings of cocoa are said to be successful if the scion or scion is still green and does not rot. The results of the observation of the percentage of live grafting of cocoa seedlings at the age of 2 MSS can be seen in table 4.2, there is 1 dead grafting seedling, namely A4K1 seedlings in replication 1.

Table 4.2 Percentage of Life Gathering Cocoa Shoots 2 MSS

No.	Treatment	∑ Connect Pucuk	∑ Connect the Top of Life	∑ Connect the Dead Top	Percentage
1.	A1K1	15	14	1	93,33%
2.	A1K2	15	15	0	100%
3.	A1K3	15	15	0	100%
4.	A2K1	15	15	0	100%
5.	A2K2	15	15	0	100%
6.	A2K3	15	15	0	100%
7.	A3K1	15	15	0	100%
8.	A3K2	15	15	0	100%
9.	A3K3	15	15	0	100%
10.	A4K1	15	15	0	100%
11.	A4K2	15	15	0	100%
12.	A4K3	15	15	0	100%

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Percentage of survival is one indicator of the success of shoot grafting propagation of cocoa seedlings. From table 4.2, it can be seen that the results of the live grafting percentage of cocoa shoots aged 2 MSS showed that the percentage of live shoot grafting had a high success rate, namely 93.33% - 100%.

Treatment of coconut water immersion resulted in a survival rate of more than 90% of cacao shoot grafting. This is thought to be due to the content of the hormones auxin, cytokinins and gibberellins found in coconut water which can help the growth and grafting of cocoa shoots, resulting in a high percentage of life.

The use of clones of scion also gave a high percentage of live grafting of cocoa shoots, which was more than 90%. This is thought to be due to genetic factors in the cocoa clones that provide minerals and the performance of the cells in the plant for connection growth.

3.2. Shoot Diameter

Observation data on shoot diameter at 13 MSS are presented in appendix 3. The next data was analyzed for ANOVA variance which is shown in table 4.3.

Table 4.3 Scanning Analysis of Variety of Shoots Diameter 13 MSS (cm)

SK	db	JK	KT	F Hit	Notasi	F 0.05	F 0.01
treatmentn	11	0,050	0,005	1,062	NS	2,216	3,094
Factor A	3	0,008	0,003	0,601	NS	3,009	4,718
Factor K	2	0,027	0,014	3,184	NS	3,403	5,614
A x K	6	0,015	0,003	0,586	NS	2,508	3,667
Gallat	24	0,103	0,004				
Total	35	0,154					

Observation of shoot diameter of cacao shoot graft (Theobroma cacao L) was carried out at 5 MSS (Week After Connection), 7 MSS, 9 MSS, 11 MSS and 13 MSS. Based on the analysis of variance in Table 4.3, the treatment of coconut water immersion concentration (A), the treatment of using types of scion clones (K), and the interaction between the concentration of immersion in coconut water and the use of various types of clones of scion (A * K) showed no significant differences in shoot diameter at cacao shoot grafting seedlings (NS). The results of the observation of the concentration of coconut water immersion on the diameter of the shoot graft of cocoa can be seen in Figure 4.1

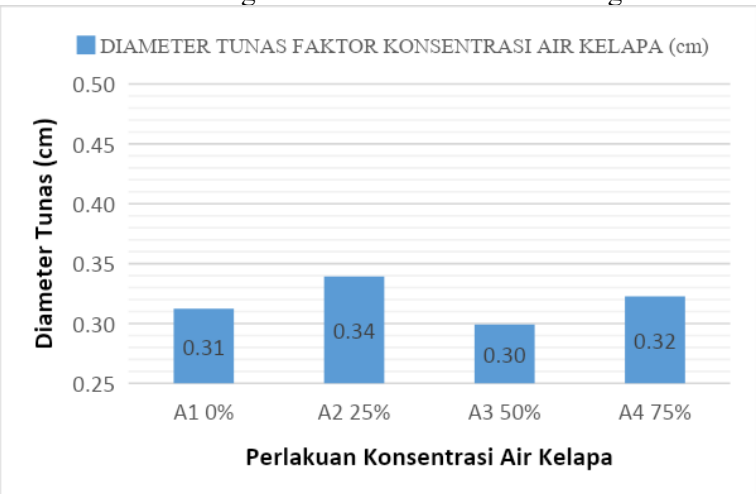

Figure 4.1 Graph of Average Effect of Coconut Water Immersion Concentration on Shoot Diameter (cm)

ISBN : 978-623-96220-1-5

Based on Figure 4.1 above, the control treatment (A1) produces an average shoot diameter of 0.31 cm, while for the treatment of 25% coconut water immersion concentration (A2) results in a shoot diameter of 0.34 cm, 0.30 cm for the concentration of 50 immersion in coconut water. % (A3), and 0.32 cm for the concentration of coconut water immersion 75% (A4). Putri et al (2016) stated that coconut water contains growth regulators such as phytohormones auxin and gibberellin, auxin hormones combined with the hormone gibberellin can help trigger the growth of vessel tissue and cell division in the vessel cambium so as to support stem diameter growth. In this study, the results of immersion in coconut water showed no significant difference (NS) to all concentrations used in the shoot diameter parameter. This is presumably because the concentration of coconut water immersion used has not been able to help the growth of shoot diameter grafting cocoa shoots. The use of immersion concentration in coconut water is closely related to the absorption of phytohormones contained in coconut water for the growth of shoot diameter of cacao shoots. This is supported by the statement of Nurman et al (2017) that giving coconut water to plants in the right concentration can increase the endogenous content of plants which can help accelerate the growth and development of plant organs.

The results of observations on the use of clones of scent clones on shoot diameter of cacao shoots can be seen in Figure 4.2

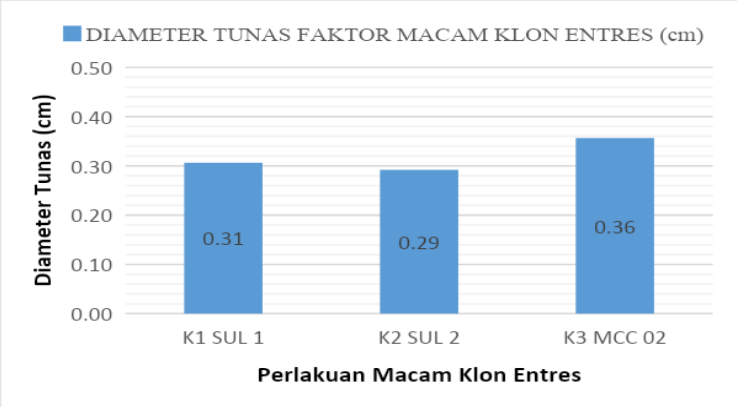

Figure 4.2 Graph of Average Effect of Use of Different Types of Entres Clones on Shoot Diameter (cm)

Seen from Figure 4.2 above shows that the treatment using the type of scent clone Sulawesi 1 (K1) had a shoot diameter of 0.31 cm, Sulawesi scion 2 (K2) clone produced shoot diameter of 0.29 cm and 0.36 cm for shoot diameter of MCC 02 clones. (K3). In general, the results of all treatments using these types of entrees clones were not significantly different (NS). This condition is presumably because the growth in shoot diameter is influenced by genetic factors of the clones used. Genetic factors for cocoa clones, which are annual crops, cause growth in shoot diameter that takes a long time. This is supported by Irvandi et al (2017) who state that annual crops such as cacao plants take a long time to grow horizontally, so increasing the diameter of the shoots in cocoa plants requires a long time to grow.

3.3. Number of Leaves

Observation data on the number of leaves aged 13 MSS are presented in appendix 3. The next data was analyzed for ANOVA variance which is shown in table 4.4.

Table 4.4 Analysis of the Variety of Parameters Number of leaves 13 MSS (strands)

SK	db	JK	KT	F Hit	Notasi	F 0.05	F 0.01
treatmentn	11	33,21	3,02	1,69	NS	2,22	3,09
Factor A	3	13,93	4,64	2,59	NS	3,01	4,72
Factor K	2	3,93	1,97	1,10	NS	3,40	5,61

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A x K	6	15,35	2,56	1,43	NS	2,51	3,67
Gallat	24	42,96	1,79				
Total	35	76,17					

Observation of the number of leaves of cacao shoot grafting (Theobroma cacao L) was carried out at 5 MSS (Week After Connection), 7 MSS, 9 MSS, 11 MSS and 13 MSS. Based on the analysis of variance in Table 4.4, the treatment of coconut water immersion concentration (A), the treatment of using types of scion clones (K), and the interaction between the concentration of immersion in coconut water and the use of various types of clones of scion (A * K) showed no significant differences in the number of leaves. on cacao shoot grafting seedlings (NS). The results of the observation of the concentration of coconut water immersion on the number of leaf grafting cacao shoots can be seen in Figure 4.3

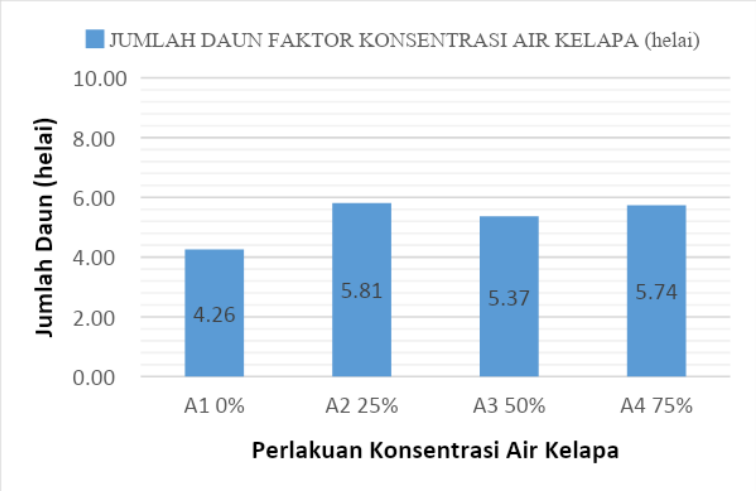

Figure 4.3 Graph of Average Effect of Coconut Water Immersion Concentration on Number of Leaves (strands)

Judging from Figure 4.3 above, the treatment of 0% coconut water immersion concentration (A1) produces an average number of leaves 4.26 leaves, while for the treatment of coconut water immersion concentration of 25% (A2) results in the number of leaves 5.81, 5.37 leaves for coconut water immersion concentration of 50% (A3), and 5.74 leaves for coconut water immersion concentration of 75% (A4). The results of immersion in coconut water showed no significant difference in the parameters of the number of leaves grafting cocoa shoots (NS). This is presumably because the use of coconut water has not helped to increase the number of leaves on the shoot graft of cocoa but can help as an inhibitor in leaf shedding, so that coconut water functions to maintain the number of leaves that grow on the shoot grafts of cocoa. In accordance with the statement of Putri et al (2016) which states that coconut water contains the auxin hormone which functions as an inhibitor of leaf decay or shedding. Auxins can react in plants to produce inhibitors that function as inhibitors of the formation of ethylene, which causes loss of various plant organs.

The results of the observations on the use of scion clones on the number of leaf grafts of cocoa shoots can be seen in Figure 4.4

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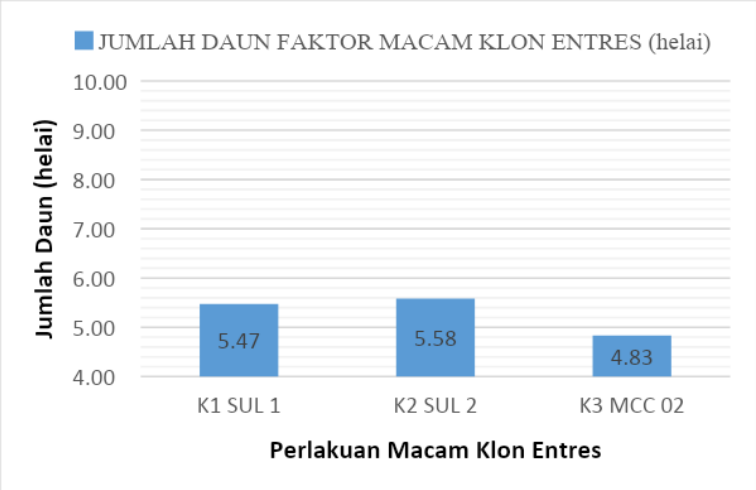

Figure 4.4 Graph of Average Effect of the Use of Types of Entres Clones on the Number of Leaves (strands)

Based on Figure 4.4, it can be seen that the treatment of using the type of scent clone Sulawesi 1 (K1) resulted in an average number of leaves of 5.47 leaves, Sulawesi 2 (K2) scion clone resulted in an average number of leaves of 5.58 and MCC 02 (K3) clones resulted in the average number of leaves was 4.83 leaves. The treatment of using different types of clones of entres was not significantly different for all types of clones of entres used in the number of leaves (NS) parameter. This condition is thought to be because the growth in the number of leaves can be influenced by the combination factor between scion and rootstock clones, resulting in a metabolic process. Excessive metabolic processes in new plants can be the cause of the low number of leaves growing because the seedlings are still in a state of adjustment after being wounded for shoot grafting. This is in accordance with the statement of Anita Sari et al (2012), namely the low number of leaves formed is caused by the metabolic process in the seeds that occurs continuously as long as the seeds cannot produce their own food reserves.

3.4. Shoot Length

Observation data on the length of shoots at 13 MSS are presented in appendix 3. The next data was analyzed for ANOVA variance which are listed in table 4.8.

Table 4.8 Analysis of the Variety of Parameters for Shoots Length 13 MSS (cm)

SK	db	JK	KT	F Hit	Notasi	F 0.05	F 0.01
treatment	11	119,86	10,90	3,20	**	2,22	3,09
Factor A	3	23,87	7,96	2,34	NS	3,01	4,72
Factor K	2	56,52	28,26	8,31	**	3,40	5,61
A x K	6	39,47	6,58	1,93	NS	2,51	3,67
Gallat	24	81,60	3,40				
Total	35	201,46					

Observation of shoot length of cacao shoot graft (Theobroma cacao L) was carried out at 5 MSS (Week After Connecting), 7 MSS, 9 MSS, 11 MSS and 13 MSS. Based on the analysis of variance in Table 4.8, the treatment of coconut water immersion concentration (A), as well as the interaction between the immersion concentration of coconut water and the use of various types of clones of entres (A * K) showed insignificant differences in leaf length in cacao shoot grafting seeds (NS). However, in the treatment the use of different types of clone entres (K) showed a very significant difference. The

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results of the observation of the concentration of coconut water immersion on the length of the grafting shoots of cocoa can be seen in Figure 4.8

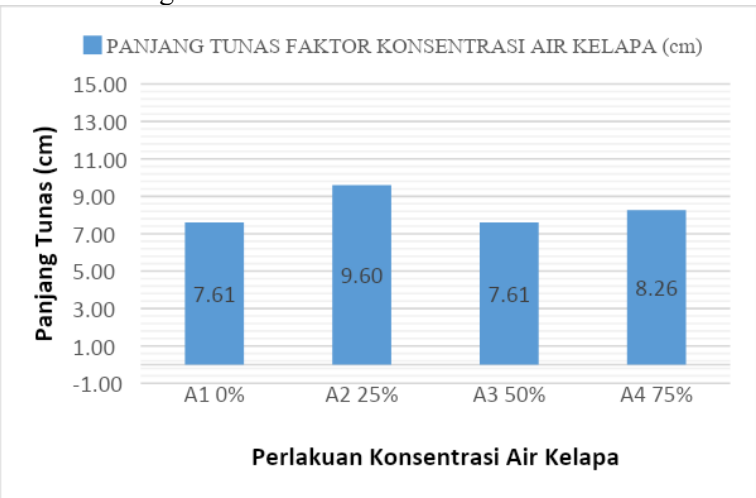

Figure 4.8 Graph of Average Effect of Coconut Water Immersion Concentrations on Shoot Length (cm)

Judging from Figure 4.8 above, the treatment of 0% coconut water immersion concentration (A1) resulted in an average shoot length of 7.61 cm, while for treatment of 25% coconut water immersion concentration (A2) resulted in shoot lengths of 9.60 cm, 7.61 cm for coconut water immersion concentration of 50% (A3), and 8.26 cm for coconut water immersion concentration of 75% (A4). The results of all treatment concentrations of immersion in coconut water showed no significant difference (NS) in shoot length parameters. It is suspected that the immersion concentration of coconut water is still low so that it has not been able to stimulate the growth of scion in the long parameter of grafting cocoa shoots. Coconut water immersion treatment will have an effect if you use the right concentration. Thamrin et al (2019) state that giving ZPT at excessive concentrations will disrupt cell functions in plants and inhibit growth, on the other hand, giving ZPT at too low concentrations causes ZPT administration to not appear in plant growth.

The results of the 5% DMRT test for the treatment of the use of the scent clone on the variable length of cacao shoot grafts are presented in Table 4.9 below.

Table 4.9 DMRT Advanced Test 5% Use of Different Types of Entres (K) Clones to the Average Length of Shoots of 13 MSS (cm)

Kind of Clone Entres	Average Shoot Length (cm)
K1	6,82 a
K2	7,84 a
K3	9,88 b

Note: the numbers followed by letters that are not the same are significantly different in the DMRT follow-up test 5%

Based on Table 4.9 above, it shows that the treatment of using the type of scion clone (K) gave very significantly different results on the length of the shoot graft of the cacao shoots. This condition is thought to be due to the genetic influence of using cocoa clone. The choice of using scent clones is also influenced by the nutritional and hormonal content of the scent. This is supported by the statement of Anita Sari et al. (2012) that shoot growth in plants is influenced by the ability of plant cells to carry out

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elongation or extension. Shoot elongation in plants is caused by the performance of the auxin hormone which functions in stem growth and is assisted by cytokinin hormones. The collaboration between the low auxin hormone content and the high cytokinin hormone will be very appropriate for shoot growth in buds. In this study, the use of MCC 02 (K3) scion clones gave the longest average shoot length of 9.88 cm and was very significantly different from the use of the scent clone in Sulawesi 1 (K1) and Sulawesi 2 (K2).

4. Conclution

Based on the results of research on the concentration of coconut water immersion and the use of various types of entres clones on the growth of cacao shoots (Theobroma cacao L), it can be concluded as follows:

- The immersion concentration of coconut water was not significantly different on the grafting growth of cocoa (Theobroma cacao L)
- The use of MCC 02 scion clones was very significantly different in the growth of leaf area and shoot length of cacao shoots (Theobroma cacao L).
- The combination of immersion concentration in coconut water and the use of different types of clones of scent was not significantly different on the grafting growth of cocoa (Theobroma cacao L)

Suggestion

From the results of these studies, it is necessary to carry out further research by reducing the interval of coconut water concentration used to determine the proper immersion concentration of coconut water for the growth of shoot grafts.

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