Original Research Article

"EFFECT OF DIFFERENT RATES OF LIQUID TRICHODERMA ON GROWTH ENHANCEMENT OF TISSUE CULTUREDABACA SEEDLINGS"

ABSTRACT

The study was conducted in Brgy. Tiguman, Digos City, Davao Del Sur. It aimed to evaluate the effect of different rates of liquid Trichoderma on the growth enhancement of tissue-cultured abaca seedlings. Liquid Trichoderma was taken at Davao Del Sur State College (DSSC). The study was conducted from April 4, 2022, to May 3, 2022.

The study was carried out in completely randomized design experiments. The treatment was replicated four (4) times with 5 samples per replicate. The following were the treatment: T_0-control, T_1- 50 ml of L, T_2- 40 ml of LT, T_3-30 ml of LT, T_4- 20 ml of LT, and T_5-10ml of LT.

Different rates of Liquid Trichoderma have no significant difference in plant height and pseudo stem girth. Also, the morphological characteristics of plants, such as leaf count, leaf area (length & width), and the number of primary roots of Abaca seedlings.

Liquid Trichoderma has the potential in enhancing the growth of plants. Especially the shoot length and root length of Abaca seedlings. The different rates of Liquid Trichoderma that are suited for Abaca seedlings were 30ml. Liquid Trichoderma is recommended for growth enhancement. In addition, it is recommended to increase the duration of the study to observe the excellent results of Liquid Trichoderma in the seedling stage.

Keywords: Liquid Trichoderma; Growth; Tissue-cultured; Morphological; Enhancement

INTRODUCTION

Abaca is a Philippines-native perennial plant. It is one of the Philippines' primary revenue sources because it exports 80 percent to 85 percent of its fiber (Manila hemp) to the global market. As the incidence of Abaca viral diseases increased in the mid-1970s, the production and supply of abaca fiber became uncertain. The apex of the Abaca mosaic is a bunchy Abaca. The impact of these abaca diseases on fiber production and yield quality is significant (Dev, P., 2012).

Trichoderma spp. is widely used in industrial and agricultural processes because it can produce secondary enzymes and metabolites (Jiang, X., Geng, A., He, N., & Li, Q., 2011). This research has the potential to increase the economic benefits of liquid Trichoderma for abaca production, particularly for our beloved Filipino farmers. Trichoderma can combine multiple benefits into a single product, such as the control of

multiple plant diseases, the enhancement of plant growth, and the provision of a clean environment for sustainable agriculture (Al-Ani, L. K. T., 2018)). Humans, wildlife, and other beneficial organisms are unaffected by this biological control agent.

Verbal communication from Dr. Juan P. Agudera, who developed liquid Trichoderma and is a professor at Davao Del Sur State College, revealed that Liquid Trichoderma could control Fusarium wilt disease, bacterial wilt disease, Compost Fungus Activator (CFA) and root extender, and that liquid Trichoderma was a growth enhancer and highly effective in controlling tomato wilt (Ralstonia solanacea). This research can help improve the growth performance of tissue-cultured abaca seedlings by using Liquid Trichoderma. Furthermore, the study was designed to aid in the long-term development of farm

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Methodology

Research Locale

The site of the study was located at Barangay Tiguman, Digos City, Davao del Sur. Start on April 4, 2022, and end on May 3, 2022. A double-layer net surrounded the research area to provide a more or less uniform planting environment during the entire growing period until the end of the study.what is the temperature and humidity?

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Figure 1. Location Map of the Research Study

Materials of the Research Study

The following materials were used in the study: 240 meri-plant (40 each treatment), Polyethylene plastic bag (6"x8"x0.003mm), one bag (50kgs) Vermicompost purchase at Lao far, (25kgs) carbonized rice hull, (25kgs) coco coir, Liquid Trichoderma, a sprinkler can measuring cup, graduated cylinder, ruler, Vernier Caliper, record boo

Experiment Design

The study was conducted using the Completely Randomized Design (CRD). There were six treatments replicated four times with 5 sample plants per replicate. The treatment used in this study were the following:

T_0- Control (Natural water)
T_1- 50ml of Liquid Trichoderma/1L of water
T_2- 40ml of Liquid Trichoderma/1L of water
T_3-30ml of Liquid Trichoderma /1L of water
T_4- 20ml of Liquid Trichoderma/1L of water
T_5- 10ml of Liquid Trichoderma/1L of water

Experimental Layout

T_0R_1	T_3R_1	T_1R_4	T_2R_3
T_2R_1	T_5R_4	T_4R_2	T_0R_4
T_3R_3	T_4R_3	T_0R_3	T_3R_2
T_5R_3	T_1R_3	T_4R_1	T_2R_2
T_5R_2	T_0R_2	T_3R_4	T_1R_2
T_1R_1	T_5R_1	T_2R_4	T_4R_4

Table 1. Completely Randomized Design (CRD) Experimental Layout for the Study Entitled "Effect of Different Rates of Liquid Trichoderma to Growth Enhancement of Tissue-cultured Abaca Seedlings."

Procurement of Materials

The Liquid Trichoderma (L.T.) was purchased at Davao del Sur State College (DSSC). Vermicompost, coco coir, and carbonized rice hull were available at Lao Farm Bansalan, Davao del Sur. Two Hundred forty pieces of meri-plant tissue-cultured Abaca seedlings were purchased in Davao City. The Polyethylene plastic bag (6" x8" x0.003 mm), a sprinkler can measure cup, graduated cylinder, ruler, Vernier Caliper, record book, and cutting tools were purchased in Digos City public market.

Preparation of Treatments

The concentrations of Liquid Trichoderma were prepared based on weight per liter. This was expressed in millimeter concentration of Liquid Trichoderma (L.T.) per liter of natural water. The 50ml, 40ml, 30ml, 20ml, and 10ml of Liquid Trichoderma were prepared.

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Application of Treatments and Control

Abaca was watered every 8: 00 in the morning and 5: 00 in the afternoon with natural water. Every three days, plants were sprayed with their respective treatments (T_0, T_1, T_2, T_3, T_4, and T_5), all with the same amount and at the same time. One liter of the solution was sprayed on 20 plants/Treatment. Each plant was composted with 50ml per plant.

Table 2. Treatment, Application, Schedule, and Method of Application.

Treatment	Application	Schedule of application	Method of Application
T_0,T_1,T_2,T_3,T_4,T_5	Natural Water and Liquid Trichoderma	April 4,7,10,13,16,19,22,25, 28 and May 1,2022	foliar

Care and Maintenance

It was sprinkled every 8:00 in the morning and 5:00 in the afternoon with a bucket. If there is enough rain, no watering takes place. Any weeds noticed growing in the experimental area, particularly inside the polyethylene bag, were immediately removed to minimize underground growth competition.

Potting Media Preparation and Bagging Procedure

The materials were laid on a flat and cemented surface for thorough mixing for even distribution in the potting medium. Bagging was done by filling the perforated plastic bags with at least 500g of mixed potting medium. Filled bags were arranged in the nursery according to the prescribed layout. Potted media were water at least one-fourth liter of each bag with natural water before planting.

Transplanting of Meri-plants in Media-filled Pots

Every pot was planted with a meri plant. The transplanted plants were acclimatized for one week in a hardening zone. Another week has been scheduled so that seedlings are stable before applying the recommended fertilizing treatments.

Data Gathering Procedure

Initial data on plant height and pseudo stem girth were gathered two weeks after transplanting and before the first application of Liquid Trichoderma (L.T.). Succeeding data collection started a week after every three days of application on Liquid Trichoderma (L.T.). After every three days of application to the Liquid Trichoderma, the succeeding collection was done for all parameters that need weekly data collection. The following data will be gathered:

1. Plant Height (cm). This was measured every week by a ruler. Measurement was located from the mounting peg. Installed 1 cm above the soil surface to the base of the junction or the bottom of "V" of the last fully-opened leaf. The mounted peg was set to provide a uniform guide in measuring the height since soil media is not a stable guide.
2. Pseudo stem girth (mm). A caliper was used as a measuring device, and the measurement area on the pseudostem was located on the tip of the installed guide peg. Data was collected every week.
3. Morphological Characteristic
   3.1 Leaf Count per Plant. All functional leaves were counted on termination day.
   3.2 Leaf Area per Plant. The scheduled collection was done on termination day. The leaf length was measured from the tip to the base of the middle lamina. The width was calculated from the broadest part of the lamina. The area was established by multiplying the length with the width.
   3.3 Shoot Length. was measured on termination day. Measurement started from the base where the guide peg was mounted to the point where the last leaf emerged.
   3.5 Number of Primary Roots: Counting of primary roots at termination day.
   3.6 Root Length. All primary roots from every sample were measured from the base of the pseudo stem. The average was computed by dividing the root length by the number of measured roots. This was gathered on the termination day.

Statistical Analysis

Data were analyzed using the analysis of variance (ANOVA) in Completely Randomized Design (CRD). Least Significant Difference (LSD) was used in comparing treatment means. The IBM Statistical Package for the Social Sciences (SPSS) 26 software was used to analyze the data

RESULTS AND DISCUSSION

The effect of different rates of Liquid Trichoderma on growth enhancement of tissue cultured Abaca seedlings in terms of the plant height, pseudo stem girth, leaf count per plant, leaf area per plant, shoot length, number of primary roots, and root length are discussed in this chapter. Cultured tissue plantlets are produced in the laboratories and transferred to nurseries for hardening for three months (Abaca Sustainability Manual, (2016).

Effect of Different Rates of Liquid Trichoderma on Growth Enhancement of Tissue Cultured Abaca Seedlings

Plant Height

Figure2, shows the week one collection of Liquid Trichoderma in terms of plant height. Treatment two (40 ml of Liquid Trichoderma) and Treatment Three (30 ml of Liquid Trichoderma) has the same highest mean with a value of 11.4 while treatment four (20 ml of Liquid Trichoderma) with a mean value of 8.72 is the lowest.

Based on Analysis of Variance week one of observation in plant height is not significant which means the Liquid Trichoderma and natural water (T0) have not affected the growth of plant height of Abaca seedlings.

Figure 2. Showing the Mean of Plant Height on Week 1 Collection with different Rates of Liquid Trichoderma

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Figure 3, shows a week two collection on plant height. Treatment three (30 ml of Liquid Trichoderma) has the highest mean with a value of 14.755 while treatment one (50 ml of Liquid Trichoderma) with a value of 12.40 is the lowest among the six treatments.

Based on the result of the Analysis of Variance the p-value is 0.170 and the f-value is 1.1771 which indicates no statistically significant difference. After two weeks of the collection seems that Liquid Trichoderma and natural water have no potential to enhance the growth of abaca seedlings in terms of plant height of Abaca seedlings.

Figure 3. Showing the Mean of Plant Height on Week 2 Collection with different Rates of Liquid Trichoderma

Figure 4, shows the different levels of Liquid Trichoderma in the third week of collections. Based on the results, treatment two (40 ml of Liquid Trichoderma) has the highest with a mean value of 24.8 while treatment zero (Control) has the lowest with a mean value of 21.575.

Based on the results of the Analysis of Variance, the p-value is 0.333 and the F-value is 1.237 which means not significant. The third week of applying Liquid Trichoderma and pure water can't affect the growth of abaca seedlings in terms of plant height.

Figure 4. Showing the Mean of Plant Height on Week 3 Collection with different Rates of Liquid Trichoderma

Figure 5, shows the different levels of Liquid Trichoderma in the fourth week of collections. Based on the results, treatment five (10 ml of Liquid Trichoderma) has the highest with a mean value of 34.1 while treatment zero (Control) has the lowest with a mean value of 28.75.

Based on the results of the Analysis of Variance, the p-value is 0.411 and the F-value is 1.067 which indicates there is no statistically significant difference. Thus, we could not reject the null hypothesis. The fourth week of applying Liquid Trichoderma and natural water (T0) can't affect the height of abaca seedlings. The observation of Liquid Trichoderma is better than pure water and has the potential in increasing Plant height.According to Bande, M., Asio, V., Sauerborn, J., & Romheld, V. (2016), Plant height and diameter continued to decrease after two months of planting. This is due to a delay in new root development and water uptake efficiency. A similar pattern in the physiological responses of bananas at various stages of development. According to their study After 1 and 2 months of growth, the results show an average increase of 116 cm and 123 cm in plant height, respectively. This translates to a 17-centimeter increase in the first month and a 7-centimeter gain the following month.

Figure 5. Showing the Mean of Plant Height on Week 4 Collection with different Rates of Liquid Trichoderma

Pseudo Stem Girth

Figure 6, shows a week one collection on Pseudo stem. Treatment two (40ml of Liquid Trichoderma) has the highest mean with a value of 18.31 while treatment zero (Control) with a mean value of 15.3 is the lowest among the six treatments.

Based on the result of the Analysis of Variance the p-value is 0.126 and F-value is 2.008 which means there is no significance in the first week of collection in terms of Pseudo Stem and seems that Liquid Trichoderma and natural water have not affected the pseudo stem of abaca seedlings.

Figure 6. Showing the Mean of Pseudo Stem Girth on Week 1 Collection with different Rates of Liquid Trichoderma

Figure 7, shows the second week of collections. Based on the results, treatment two (40 ml of Liquid Trichoderma) has the highest mean value of 21.5 while treatment one (50 ml of Liquid Trichoderma) is the lowest mean value of 12.

In the results of the Analysis of Variance, the p-value is 0.343 and the F-value is 1.212 which indicates not significant. The second week of applying Liquid Trichoderma and natural water can't affect the growth of abaca seedlings in terms of Pseudo stem.

Figure 7. Showing the Mean of Pseudo Stem Girth on Week 2 Collection with different Rates of Liquid Trichoderma

Figure 8, shows the third week of collections on Pseudo Stem. Treatment two (40 ml of Liquid Trichoderma) has the highest mean with a value of 27.125 while treatment zero (Control) with a value of 24.625 is the lowest among the six treatments.

Based on the result of the Analysis of Variance the p-value is 0.508 and the F-value is 0.890 which means there is no significance in the third week of collection in terms of Pseudo Stem and seems that Liquid Trichoderma and natural water has no potential to increase the size of the pseudo stem of abaca seedlings within 30 days.

Figure 8. Showing the Mean of Pseudo Stem Girth on Week 3 Collection with different Rates of Liquid Trichoderma

Figure 9, shows the fourth week of collections. Based on the results, treatment four (20 ml of Liquid Trichoderma) has the highest mean value of 35 while treatment zero (control) has the lowest mean value of 30.

Based on the results of the Analysis of Variance, the p-value is 0.532 and the F-value is 0.852 which means not significant. Thus, we could not reject the null hypothesis. The fourth week of applying Liquid Trichoderma and natural water can't affect the growth of abaca seedlings in terms of Pseudo stem. According to Bande, M., Asio, V., Sauerborn, J., & Romheld, V. (2016), Instead of developing the pseudo stem girt, it decreased to an average of 2.1 cm per month because of several factors.According to krishnamoorthy & Harif (2017), The pseudo stem girth was increased proportionally to give the plant the strength to withstand the weight of the bunch. The largest pseudostem circumference was 76 cm.

Figure 9. Showing the Mean of Pseudo Stem Girth on Week 4 Collection with different Rates of Liquid Trichoderma

Leaf Count

Figure 10, shows the Average leaf count of applying Liquid Trichoderma. Treatment four (40 ml of Liquid Trichoderma) has the highest mean value of 35.75 while treatment (Control) has a mean value of 31.25 is the lowest among the six treatments.

Based on the result of the Analysis of Variance the p-value is 0.217 and the F-value is 1.576 which represents there is no statistically significant difference (p-0.05). Thus, we could not reject the null hypothesis. The results indicate that Liquid Trichoderma and Natural water has no potential in increasing the Number of leaves within 30 days of observation. According to Bande, M. M., Asio, V. B., Sauerborn, J., & Römheld, V. (2016), there is a statistically significant difference (p0.05) in the total number of functional leaves between blocks. From the first to the sixth month after planting, the number of functional leaves increased, then decreased after seven months.

Figure 10. Showing the Mean of Leaf Count with different Rates of Liquid Trichoderma

Leaf Area

Figure 11, shows the effect of Liquid Trichoderma in terms of Leaf Area. Treatment five (10 ml of Liquid Trichoderma) has the highest mean with a value of 37394 while treatment zero (Control) has a value of 24955.5 is the lowest among the six treatments.

The Analysis of Variance on Leaf Area with different levels of Liquid Trichoderma and natural water. Based on the results, the p-value is 0.219 and the F-value is 1.569 which means there is no statistically significant difference (0.05). Thus, we could not reject the null hypothesis. The results indicate that Liquid Trichoderma and natural water has no potential in increasing the Leaf Area of Abaca Seedlings within 30 days. According to Bande, M. M., Asio, V. B., Sauerborn, J., & Römheld, V. (2016), The slight decrease in cumulative leaf area is due to the decline in the number of functional leaves which is due to the combined effect of nutrient deficiency,

Figure 11. Showing the Mean of Leaf Area with different Rates of Liquid Trichoderma

Shoot Length

Figure 12, shows the Average Shoot length with different levels of Liquid Trichoderma. Treatment three (30 ml of Liquid Trichoderma) has the highest mean with a value of 561.75 while treatment zero (Control) has a mean value of 369 is the lowest among the six treatments.

The analysis of variance revealed that the p-value is 0.018 and F-value is 3.695 representing that the results are statistically significant differences (p0.05). Thus, it was successfully rejected the null hypothesis. It demonstrates that liquid Trichoderma can lengthen the shoot length of tissue cultured abaca seedlings, and indicates that has the potential to increase within 30 days. According to Yedidia, I., Srivastva, A. K., Kapulnik, Y., & Chet, I. (2001), The growth rate of shoot length and dry weight of the whole plant in the Trichoderma treated plants were 1.6 and 1.5 times, respectively, the rate of the noninoculated control plants, from 7 to 28 days post-emergence. According to Shekhany, H., (2017). The Peat moss medium produced the highest values for shoot diameter, shoot length, shoot dry weight, and fresh root weight (2.52 mm, 248.42 mm, 2.23 g, and 0.83 g, respectively).

Figure 12. Showing the Mean of Shoot Length with different Rates of Liquid Trichoderma

Number of Primary Roots

Figure 13, shows the average number of primary roots with different levels of Liquid Trichoderma. Treatment four (20 ml of Liquid Trichoderma) with a value of 30 is the highest number of primary roots while treatment five (10 ml of Liquid Trichoderma) with a value of 25 is the lowest.

The Analysis of Variance showed that the P-value is 0.148 and F-value is 1.878 which means the number of primary roots with different levels of Liquid Trichoderma was not statistically significant. Thus, we could not reject the null hypothesis. It indicates that pure water and Liquid Trichoderma have no potential in increasing the number of primary roots within 30 days. According to Lo, C. T., & Lin, C. Y. (2002) that only 2.8 percent of the Trichoderma strains evaluated in the study promoted the growth of primary and lateral roots as compared to untreated plants, implying that only around 3.6 percent of the strains tested could enhance the number of lateral roots.

Figure 13. Showing the Mean Number of Primary Roots with different Rates of LiquidTrichoderma

Root Length

Figure 14, shows the average Root Length with different levels of Liquid Trichoderma. Treatment three (30 ml of Liquid Trichoderma) with a value of 2433 was the highest Root length while treatment zero (Control) with a value of 1065.5 is the lowest. All treatments with Liquid Trichoderma are better than pure water (T0).

Based on the Analysis of Variance that the p-value is 0.001 is less than 0.05 and the F-value is 7.062 indicating that the results are a statistically significant difference and it was successfully rejected the null hypothesis. It demonstrates that liquid Trichoderma can boost and lengthen the Root length of tissue cultured abaca seedlings within 30 days.

According to Mahato, S., Bhuju, S., & Shrestha, J. (2018), Trichoderma showed increased root and shoot growth in a pot experiment. The stronger root system leads to improved uptake of water, minerals, and nutrients when the root surface area responds to nutrient limitation circumstances.

Figure 14. Showing the Mean of Root Length with different Rates of Liquid Trichoderma

Correlation Between Treatment and the Parameters

Table 3, shows the correlation between treatment and the parameters. The Pseudo stem girt, leaf area, shoot length, and root length have a perfect Pearson correlation at the 0.01 level. It indicates that Liquid Trichoderma has the potential to enhance the growth of Abaca seedlings. The leaf count has a Pearson correlation significant at the 0.05 level which indicates the relationship of Liquid Trichoderma. The plant height and the number of primary roots have a very weak Pearson correlation at the level of 0.01 and 0.05 in 2-tailed. It represents that Liquid Trichoderma between plant height and the number of primary roots has no potential in terms of enhancing the growth of Abaca seedlings.

Table 3. Correlation Between Treatment and the Parameters

Correlations

		PLANT HEIGHT	Pseudo Stem_Girth	Leaf Count	Leaf_Area	ShootLength	Number of Primary Roots	Root_Length
PLANT_HEIGHT	Pearson Correlation	1	.442*	.506*	.728**	.650**	.178	.701**
	Sig. (2-tailed)		.031	.012	.000	.001	.406	.000
	N	24	24	24	24	24	24	24
Pseudo_Stem_Girth	Pearson Correlation	.442*	1	.498*	.416*	.274	-.060	.482*
	Sig. (2-tailed)	.031		.013	.043	.195	.782	.017
	N	24	24	24	24	24	24	24
Leaf_Count	Pearson Correlation	.506*	.498*	1	.286	.377	.264	.392
	Sig. (2-tailed)	.012	.013		.176	.069	.213	.058
	N	24	24	24	24	24	24	24
Leaf_Area	Pearson Correlation	.728**	.416*	.286	1	.569**	-.014	.668**
	Sig. (2-tailed)	.000	.043	.176		.004	.949	.000
	N	24	24	24	24	24	24	24
Shoot_Length	Pearson Correlation	.650**	.274	.377	.569**	1	.048	.784**
	Sig. (2-tailed)	.001	.195	.069	.004		.824	.000
	N	24	24	24	24	24	24	24
Number_of_Primary_Roots	Pearson Correlation	.178	-.060	.264	-.014	.048	1	.082
	Sig. (2-tailed)	.406	.782	.213	.949	.824		.704
	N	24	24	24	24	24	24	24
Root_Length	Pearson Correlation	.701**	.482*	.392	.668**	.784**	.082	1
	Sig. (2-tailed)	.000	.017	.058	.000	.000	.704	
	N	24	24	24	24	24	24	24

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

SUMMARY

The study was conducted to evaluate the effect of different rates of liquid Trichoderma on the growth enhancement of tissue cultured abaca seedlings. The study was carried out in a completely randomized design experiment. There were six treatments replicated four (4) times with 5 five samples per replicate. The following treatments were T_0- control, T_1- 50 ml of L.T., T_2- 40 ml of L.T., T_3- 30 ml of L.T., T_4- 40 ml of L.T., and T_5- 10 ml of L.T. The abaca seedling was monitored for 30 days before applying liquid Trichoderma, and the initial data on plant height and pseudo stem girth was collected for the basis. The data collection of plant height and pseudo stem are collected every week. The application of liquid Trichoderma was every three days. The various effects of liquid Trichoderma were not observed in the first week of abaca seedlings. The control and Liquid Trichoderma appear to have different effects in the secondweek. The leaves of abaca seedlings treated with Liquid Trichoderma were healthier than the natural water. In the third-week observation of T_0 (control or natural water), there was an insect found on the tissue-cultured Abaca Seedlings.

Based on the results, Plant Height has the highest mean in treatment five (10 ml of Liquid Trichoderma) with a value of 34.1. Pseudo stem girth has the larger in treatment four (20 ml of Liquid Trichoderma). Leaf Count has the highest mean in treatment four (20 ml of Liquid Trichoderma) with a value of 35.75. Leaf Area has the highest mean in treatment five (10 ml of Liquid Trichoderma) with a value of 37394. Shoot Length has the highest mean in treatment three (30 ml of Liquid Trichoderma) with a value of 561.75. The number of primary roots has the highest mean in treatment four (20 ml of Liquid Trichoderma) with a value of 30, and Root Length has the highest mean in treatment three (30 ml of Liquid Trichoderma) with a value of 2433.

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CONCLUSION

Based on the results of the study, Plant height, Pseudo stem girth, Leaf count, Leaf area and the number of primary roots of Abaca seedlings with the application of Liquid Trichoderma are not statistically significant we could not reject the null hypotheses based on the Analysis of Variance. The Shoot length and Root length with Liquid Trichoderma revealed a statistically significant difference and have enough evidence to reject the null hypotheses. The Liquid Trichoderma has a positive result than natural water. The different rates of Liquid Trichoderma that are suited for Abaca seedlings are the rate of 30 ml.

RECOMMENDATION

Based on the results, T3 (30 ml of L.T.) for shoot length and T3 (30 ml of L.T.) for root length are the most effective treatments, although T2 (40 ml of L.T.), T4 (20 ml of L.T.), and T5 (10ml of L.T) also produce better results too. Liquid Trichoderma is recommended for growth enhancement. In addition, it is recommended to increase the duration of the study to observe the excellent results of Liquid Trichoderma in the seedlings.

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