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Response Of Liquid Organic Fertilizer Eco Enzyme (Ee) On Growth And Production Of Shallot (*Allium ascalonicum*. L)

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ABSTRACT

Shallots are horticultural products that have high economic value. For obtaining quality shallots, there is an optimal cultivation action. One way that can be done to increase productivity is through fertilization. Organic fertilizers derived from household waste such as vegetable and fruit waste can manufacture liquid organic fertilizers whose final results are called eco-enzymes (EE). Eco enzymes can provide nutrients and improve physical attributes, soil's chemical and biological properties, and product quality. The purpose of the study was to determine the response of the eco-enzyme liquid organic fertilizer application to shallot plant growth and production and determine the appropriate application dose for the growth and production of shallots. The method used in this study used a non-factorial randomized block design (RAK) method. The dose of EE LOF application consists of 6 levels, namely E1 = 0.5 ml/L water, E2 = 0.75 ml/L water, E3 = 1 ml/L water, E4 = 1.25 ml/L water, E5 = 1.5 ml/L water, E6 = 1.75 ml/L water. Analysis of the data used the mathematical model of Analysis of Variety Prints, and further tests were carried out using the Honestly Significant Difference Test (HSD) at 5% and 1% levels. The results showed a very significant effect on the parameters of root length and significantly affected the number of leaves at a dose of 1.75 ml/L of water.
Keywords: *Shallots, Dosage, Eco Enzymes, LOF*

I.INTRODUCTION

Shallot is a horticultural plant that has an essential role. Shallot has been cultivated intensively by farmers for years by Indonesian farmers. This plant has high economic value in any market because shallot constitutes food ingredients mixed with other ingredients. Based on the data obtained in 2017, Indonesia has shallots production centers in several regions such as Brebes, Wates, Tegal, Cirebon, Kuningan, East Lombok, and Samosir (Aldila *et al.*, 2017). According to Aryanta (2019), the composition of nutrition contents contained in shallot is 16.80 grams of carbohydrate, 3.2 grams of fiber, 2.5 grams of protein, 31.2 milligrams of vitamin C, 0.20 milligrams of vitamin B1, 1.235 milligrams of vitamin B6, and 9 IU of vitamin A, of which overall is measured per 100 grams.

Based on the data from the Central Bureau of Statistics (2020) that in 2019, Indonesian shallot production was as much as 1.580.247 tons/year. Meanwhile, the data of shallot production is increasing by 1,815,445 tons/year. It indicates intensive efforts of agricultural businesspeople in shallot cultivation. To meet people's demand annually in consuming horticultural products, especially shallots, farmers can make various efforts to increase shallots production from year to year. One of the efforts that can be done in shallot cultivation activity is by utilizing organic fertilizer. This attempt aligns with Novianto's (2020) opinion that organic fertilizer contributes to nutrient composition in small amounts for plants compared to the utilization of inorganic fertilizer. However, organic fertilizer must be used continuously with an interval usage and its application. Liquid organic fertilizer made of household waste fermentation such as vegetables and fruits leftovers can be transformed into material for making liquid organic fertilizer in the form of Eco Enzyme (EE) liquid organic fertilizer.

Chandra (2020) states that the eco enzyme was introduced by Rosuko, the founder of Thailand's Organic Farming Association. The Eco Enzyme results from the fermentation process of household organic waste such as fruit pulp, rind, vegetables, sugar (brown sugar, palm sugar, or cane sugar), and water. Its color is dark brown, and its fermentation aroma is sour solid, and sweet. However, although it is environmentally friendly, the eco enzyme is not for consumption. Eco enzyme can be a multi-purpose liquid, and its application includes household, agriculture, and farms. Eco enzyme is produced by certain microbes, such as organic acid, single-cell protein, antibiotic, and biopolymer. The content of organic acid has a significant role in rectifying physical attributes, soil chemicals, and microbe for plants contributes as fertilizer for soil which can provide nutrients substance and growth regulatory metabolites for plants, protecting the roots from the attack of pests and diseases and stimulating the roots system to grow ideally. The recommendation to use eco enzyme for agriculture as organic fertilizer with dosage application by 1 ml/liter of water can be applied to plants or soil. Susanti's (2021) research reveals that spraying eco enzyme affects height growth and dry weight of the Lettuce plant (Lactuca sativa L.) cultivated using hydroponic. Azhar *et al.'s* (2021) research results convey that applying eco enzyme affects glutinous corn plant's yields. Meanwhile, Syahputra's (2021) research result on the application of eco enzyme provides a result, e.g., the eco enzyme of Chinese Cabbage and orange peel significantly effect on plant's Height in the 3rd, 4th, 5th, 6th, and 7th WAP, wet canopy weight, wet tuber weight, and tuber dry weight were higher than the pineapple peel eco enzyme treatment. Based on the analysis result of nutrient and microorganism content contained in eco enzyme organic fertilizer, the writer is interested in conducting a study in a precise manner by testing different dosing applied to shallot plants. Consequently, the correct dosage will increase the production quality and quantity as expected. The correct dosage can be recommended to business entrepreneurs of shallot cultivation.

Based on the literature review derived, the writer has conducted research entitled "Response of Liquid Organic Fertilizer Eco Enzyme (EE) on Growth And Production of Shallot (Allium ascalonicum. L)". This research aims to determine the shallot plant's yield and growth by applying various eco enzyme liquid organic fertilizer dosing.

2. RESEARCH METHOD

This research has been conducted in Experimental Garden, Faculty of Agriculture, Musi Rawas University, Lubuklinggau City, with an altitude of 129 meters above sea level. This research was conducted for four months, from March until June 2021. The materials employed in this study were Solok Shallot varieties, Eco Enzyme (EE) liquid organic fertilizer, cow dung manure, and 5 Kg size polybag. While the tools used were a hoe, watering can, and a digital scale.

This research implements randomized block design (RAK) arranged in a non-factorial manner with six levels of treatments of eco enzyme dose by 50 ml/liter of water, 0.75 ml/liter of water, 1.00 ml/liter of water, 1.25 ml/liter of water, 1.50 ml/liter of water, and 1.75 ml/liter of water and also every treatment unit were repeated as much as four times, thus, there were 25 units of treatments. In this research, the experimental parameters were plant Height, leaves quantity, tuber total weight per plant, tuber weight per seed, tuber quantity per plant, and roots length. The data analysis was carried out using a mathematical model and the analysis of variance (ANOVA) to determine the effect of treatments and observe each treatment's effect. Subsequently, the Honestly Significant Different (HSD) test was applied to observe the difference between treatments on a 5% and 1% significance level (Paiman, 2015).

As for the stages in this research, it can be seen in the following flow diagram:

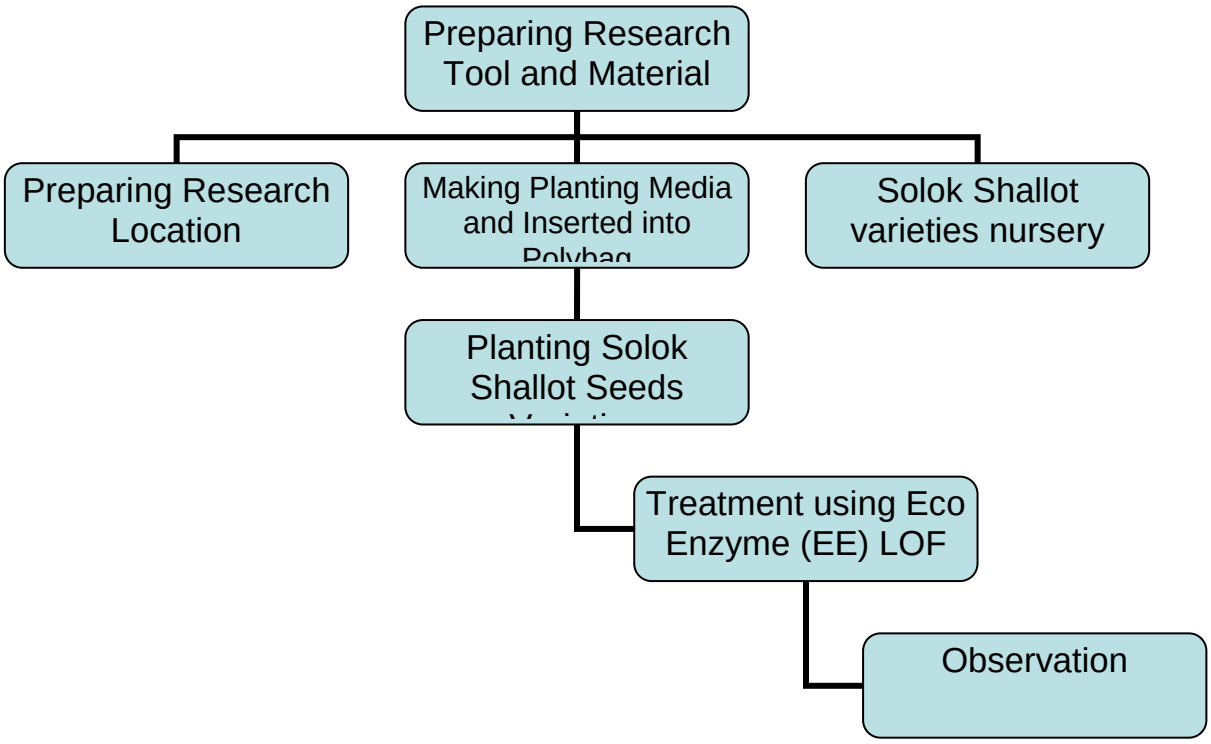

Figure 01. Research Flow Diagram

3. RESULT AND DISCUSSION

The results of the analysis of variance in the response of Eco Enzyme (EE) Liquid Organic Fertilizer treatment to the Shallots' (*Allium ascalonicum*. L) Growth and Production is displayed in the following table 1:

Table 1. The results of the analysis of variance in the response of Eco Enzyme (EE) Liquid Organic Fertilizer treatment to the Shallots' (*Allium ascalonicum*. L) Growth and Production on the observed parameters

No	Parameter	F-hit	KK (%)
1.	Plant's Height (cm)	0,78 ^{tn}	13,11
2.	Leaves Quantity (sheet)	3,14 *	6,96
3.	Total Tuber Weight per plant (g)	0,35 ^{tn}	20,05
4.	Tuber Weight Per Seed (g)	1,19 ^{tn}	18,68
5.	Tuber Seed quantity per plant (piece)	1,37 ^{tn}	19,90
6.	Roots length (cm)	8,51 **	15,05

Remark: * = Significant Effect ** = Very Significant Effect
tn = Not Significant Effect KK = Coefficient of Diversity

The analysis of variance in Table 1 shows that eco enzyme treatment on shallots' production and growth generates a very significant response on the roots length parameter and a significant response on the leaves quantity parameter. This yield was assumed that the content of eco enzyme (EE) liquid organic fertilizer and various kinds of acid produced from the fermentation process could stimulate plant growth and flourishment; one of them can fasten the growth of the rooting system and the cell membrane of the leaves. This yield is supported by Nasution's (2020) statement; organic acid can stimulate and increase the roots' growth and increase plant membrane permeability. Additionally, organic acid also helps microorganism activity above the soil, producing growth hormones. According to Rochyani *et al.* (2020), the final result of organic waste materials fermentation produces nitrate content which can be utilized as organic fertilizer for plants.

Moreover, acetic acid content and enzyme in this liquid organic fertilizer EE has the merit in shoot germination growth, maintaining soil balance, and eliminating and preventing virus and pathogen bacteria that can inhibit plant's growth, especially in plant's roots and leaves. This finding is also strengthened by Vika *et al.'s* (2020) research result, that the final result of vegetables and fruit waste fermentation, the residue suspended at the bottom, is the rest of the vegetables and fruit. The liquid extract of the fermentation process result can be utilized as organic fertilizer of NO3 (nitrate) and CO3 (Carbon Trioxides) needed by the soil as nutrient and acetate acid, which can suppress the emergence of pathogen microorganisms. The nitrate contained in eco enzyme liquid organic fertilizer is a nitrogen source that is valuable as an N nutrient element source required by the plant during the plants' growth and flourishment phase. Parallel with Praman and Heriko's (2020) opinion, the nutrient Nitrogen element contained in liquid organic fertilizer contributes to increasing plant growth, producing chlorophyll, increasing protein level, and fastening leaves growth. This statement is supported by Lumbanraja's (2021) research result stating that implementing eco enzyme can also significantly affect the soil's pH, Soil P-availability, plant's height growth, roots length, wet canopy weight, and canopy dry weight on mustard plants. Research by Liu *et al*. (2020) covey that the application of eco

enzyme liquid marked with plant's Height, stem diameter, broader leaves wide and greener color of the plants without eco enzyme fertilizer, in addition, according to Firmansyah *et al.* (2017), the availability of nitrogen for plants can effect on protein formation and as a part of chlorophyll formation to the leaves. Moreover, the eco enzyme's nitrogen can help provide nucleic acids and bio enzymes. Meanwhile, according to Maula *et al.* (2020), propionate acid content in eco enzyme effectively suppresses and prevents pathogen microbes in the plants.

Table 2. Result of Honestly Significant Difference (HSD) test and Data tabulation in the response of Eco Enzyme (EE) Liquid Organic Fertilizer Treatment on Shallot's (*Allium ascalonicum*. L) Growth and Production respond

No	Observed Variable	Dosage Treatment of Eco Enzyme LOF						HSD
		E1	E2	E3	E4	E5	E6	5%
1.	Plant's Height (cm)	36,75	37,50	40,00	38,25	38,25	45,00	-
2.	Leaves Quantity (sheet)	15,00 A	16,75 a	16,25 a	17,00 a	15,50 a	17,75 ab	2,90
3.	Total Tuber Weight per plant (g)	16,25	17,88	17,38	17,50	18,38	19,39	-
4.	Tuber Weight Per Seed (g)	2,94	3,00	3,13	3,63	3,38	3,75	-
5.	Tuber Seed quantity per plant (piece)	6,00	6,25	6,13	6,25	7,00	8,00	-
6.	Roots length (cm)	4,00 A	6,50 ab	5,25 a	5,00 a	4,75 a	7,25 b	1,59

Remark: The result of the HSD test with the same letters on the same line shows no significant effect on the 5% test level

The result of HSD and tabulation data in the above Table 2 is that Eco Enzyme (EE) treatment on 5% HSD test level indicate significant response to the leaves quantity parameter and roots length, E6 treatment with the dose of 1,75 ml/liter of water makes the best result on every variable observed and also shows the positive response in the length of the roots and leaves quantity. It is alleged that the correct dose will increase the plant's growth and quality. The application of liquid organic fertilizer can be aimed at plants or soil. The more frequent and interval of application to plants can help the availability of nutrients for plants. It aligns with Lingga and Marsono's opinion in Nuryani *et al.* (2019), fertilizer treatment must be exact conforming to the concentration which has been tested; too much fertilizer will cause plant poisoning that inhibits plant's growth and flourishment. Organic fertilization contributes to mobilizing or bridging nutrient elements inside the soil to form ion particles that are easy to absorb by the roots. During vegetative growth, plants need nutrient conduct metabolism processes. The nitrogen content in eco enzyme in the form of NO_3 or nitrate is an organic nitrogen source, which can encourage cell division and form the cell. As a result, it forms plants' organs such as better leaves, roots, and stems, and these organs can help expedite the photosynthesis process. It aligns with Bahrun *et al*. (2014) claims that the function of nitrogen nutrients is the constituent of amino acid, protein, chlorophyll, nucleate, and coenzyme acid. Nitrogen nutrient is an essential nutrient for the plant which its function in the plant is irreplaceable with other nutrients. If a plant lacks this nutrient,

the plant will likely die, or the growth or the flourishment is inhibited. Vama and Cherekar's (2020) research result shows that the eco enzyme also contains various secondary metabolites such as flavonoid, quinone, saponin, alkaloid, and cardio-glycoside. Rasit et al. (2019) also support this result, and their research result shows eco enzyme content produced from the fermentation in the form of the enzyme is acidic and contains a biocatalytic enzyme (protease, amylase, and lipase). Meanwhile, carbon trioxide or CO_3 contained in the eco enzyme is the source of C-organic material for soil fertility, significantly to help stabilize the soil. This statement was proven with the significant response on roots growth length parameter. Parallel to Sihombing *et al.* (2019), organic fertilizer treatment to the soil can increase C organic in the soil to increase Cation Exchange Capacity (KTK) and increase soil's pH, all of which is soil's chemical properties. Rochyani. *et al.* (2020) reveal that solvent in eco enzyme generates organic substances from fruit and vegetable waste or solid organic waste and molasses, encouraging high TDS factors in eco enzyme liquid.

4. CONCLUSION

Based on the research result conducted recently, it can be concluded that the dosage of 1,75 ml/L of water is highly significant can increase the effect of roots length parameter and the significant effect on leaves quantity parameter.

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