

Testing Various Doses of Liquid Organic Fertilizer (LOF) on the Growth of Scallion (*Allium fistulosum* L.)

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ABSTRACT

Scallion is one type of vegetable plant that is widely used as a flavouring or seasoning for dishes and other vegetable mixtures in several types of cuisine in Indonesia. For this reason, one of the efforts that can be made to increase the production of scallions in meeting the consumption needs of the community is by means of technical cultivation through the application of liquid organic fertiliser (LOF). The purpose of this study was to analyse the need for the right dose of LOF for scallions. This study used a non-factorial Randomised Group Design method by testing 6 treatment of LOF dose, namely: J1 = 1 ml/L water, J2 = 1.5 ml/L, J3 = 2 ml/L, J4 = 2.5 ml/L, J5 = 3 ml/L and J6 = 3.5 ml/L. Each treatment was repeated as many as 4 replications. The results from analysis of variance (ANOVA) showed that doses of LOF affected very significantly on the parameters of root length, root weight, wet stalk weight, and fresh shoot yield with the LOF dose of 1.5 ml/L water (J2) giving the best results.

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1. INTRODUCTION

Scallions or green onions (*Allium fistulosum* L.) is a leaf vegetable plant with sort harvesting age, which is consumed by the young leaves. Scallions can be cultivated either in the lowlands or highlands, but preferably in the highlands with an altitude between 900 -1700 m above sea level (masl). The nutrition value in every 100 g of scallions are calories of 29.0 kcal; proteins 0 g; fat 1.8 g; carbohydrates 0.4 g; 6.0 g fiber; ash 0.9 g; calcium 0.5 mg; phosphorus 35.0 mg; iron 38.0 mg; vitamin A 3.20 SI; thiamin 910.0 SI; riboflavin 0.08 mg; niacin 0.09 mg; vitamin C 0.60 mg; and nicotinamide 48.0 mg (Qibtiyah & Astuti, 2016). In Indonesia, scallions are one type of leaf vegetable plant which is used as a flavoring agent or seasoning and can be used as an ingredient in the treatment of various diseases.

Based on data from the statistic agency (BPS, 2022) green onion or scallion production from 2020 and 2021 has increased. In 2020, scallion production in Indonesia was 579,748 ton, while in 2021 it was 627,853 ton. Likewise, in the South Sumatra Province, the production of scallions in 2020 was 2,835 ton, and increased to 3,099 ton in 2021. There

was an increase in production, but this production still cannot meet the needs of public consumption every year, given the increasing public understanding of the nutritional value contained in food to support health. For this reason, efforts must be made to increase scallion production, among others by improving the technical cultivation of plants, such as the implementation of organic liquid fertilizer (OLF).

Based on observation by [Dewi *et al.* \(2022\)](#), the application of organic liquid fertilizer with a concentration of 20% provides the best growth and production for scallion plants. This is supported by the opinion of [Febriantami & Nusyirwan \(2017\)](#) explaining that giving Jimmy Hantu liquid organic fertilizer at a dose of 3 ml/L of water had a real effect on the weight of the long beans. In line with the opinion of [Suhendra *et al.* \(2019\)](#) explained that the application of Jimmy Hantu organic liquid fertilizer at a dose of 3 ml/L of water had a considerable effects on the parameters of plant length, number of fruits, production per plant, and production per plot in cucumber plants. In addition, according to [Zulia *et al.* \(2017\)](#), giving a concentration of 3 ml/L of Hantu organic fertilizer water can increase the variables observed plant height and stem diameter of cucumber.

One of the technical efforts of plant cultivation that can increase agricultural production through meeting the nutritional needs of plants is by applying fertilization, which is a technical part of the five farming activities. In plant fertilization activities, the fertilizer that can be applied is liquid organic fertilizer (POC). According to [Novianto *et al.* \(2020\)](#) organic liquid fertilizer is a fertilizer that can supply the nutritional needs of plants, namely the nutrients nitrogen, phosphorus and potassium which are absorbed by plants, to support plant growth and development. Liquid fertilizer is more easily absorbed by plants, because the nutrients in it have decomposed. The advantage of liquid fertilizer is that the nutrient content varies, namely it contains macro and micro nutrients, in the absorption process it is faster because it has dissolved ([Febrianna *et al.* \(2018\)](#)). Furthermore, according to [Novianto & Bahri \(2023\)](#), organic liquid fertilizer can add nutrients to plants. Apart from that, according to [Hendarto *et al.* \(2021\)](#) provide information on the use of organic liquid fertilizer produces products that are more useful. The aim of the study was to get the right LOF dosage application to increase the production of scallions.

2. MATERIALS AND METHODS

This research was carried out at the Experimental Station of the Faculty of Agriculture, Musi Rawas University, Lubuk Linggau City with an altitude of 118 meters above sea level (masl). The study was conducted from April to July 2022. The materials used included green onion or scallion seeds (Fragrant variety), Jimmy Hantu liquid organic fertilizer (LOF), cow manure, soil and polybags (5 kg soil-capacity). While the tools used include hoes, tape measure, rain bucket (gembor), and digital scales.

The method and implementation of this research included: clearing the research area, preparing the planting material for the of scallion seeds, planting media in the form of humus soil which was cleaned of dirt, crushed lumpy soil then put the soil in polybags and application of cow manure with ratio 2:1. The seeds were cleaned first and soaked in fungicide for 2 min, then the seeds were planted 1 seed per polybag (the green onion seeds were selected with uniform size). Weeding was done by removing weeds that grow in the polybag, watering was done in the morning and LOF application was carried out on the plants at 14 day after planting (DAP), 28 DAP, and 35 DAP.

Non-factorial Randomized Block Design (RBD) method was adopted in this study by grouping various doses of LOF, with testing of 6 dose treatment levels, namely: J1 = 1

ml/L water, J2 = 1.5 ml/L, J3 = 2 ml/L, J4 = 2.5 ml/L, J5 = 3 ml/L and J6 = 3.5 ml/L. Each treatment contained 3 polybag samples, repeated 4 times so that there were 24 experimental units and 72 samples. Figure 1 showed a scheme of the experiment lay out.

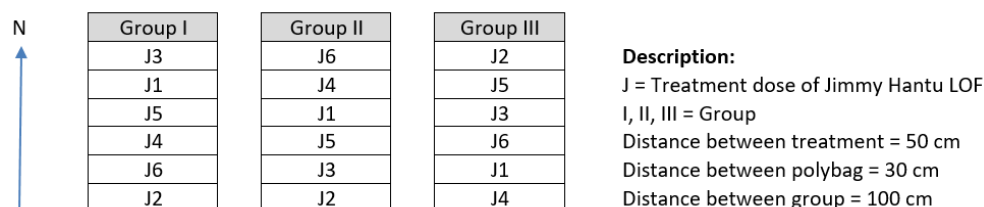


Figure 1. Lay out of the experiment

Data collection for all parameters observed at the end of the study included plant height by measuring the height of the plant from the base of the stem to the tip of the highest leaf, the number of leaves by counting all the leaves of each plant, the length of green leaves was measured from the border of the green leaf to the highest green leaf, the length of the white leaf was measured from the stem base to the the tallest leaf tip, root length was measured from the root base to the root tip, weight of the root by cutting the base of the stem, fresh weight of the crown by weighing the consumable green leaf, weight of fresh stover (root and old leaf weight), and harvest index. All data obtained was then analyzed using a mathematical model and analysis of variance (ANOVA) followed by the Honest Significant Difference (HSD) test to determine differences in each treatment at a significant level of 5% and 1% (Paiman, 2015).

3. RESULTS AND DISCUSSION

Test results of analysis of variance data on testing various doses of the Jimmy Hantu LOF on the growth of green onions (*Allium fistulosum* L.) are presented in Table 1.

Table 1. Results of ANOVA on the effect of OLF doses to the growth of scallions (*Allium fistulosum* L.)

No.	Parameter	F-calc	CV (%)
1.	Plant height (cm)	1,73 ^{tn}	24,05
2.	Number of leaves (helai)	0,49 ^{tn}	12,72
3.	Length of green leaves (cm)	1,11 ^{tn}	18,89
4.	Length of white leaves (cm)	2,10 ^{tn}	22,03
5.	Root length (cm)	13,29 ^{**}	19,81
6.	Root weight (g)	5,24 ^{**}	22,93
7.	Weight of fresh stover (g)	13,86 ^{**}	19,69
8.	Weight of fresh shoot (g)	13,40 ^{**}	20,74
9.	Hasvest index	1,03 ^{tn}	5,79

Note: ** = highly significant; tn = not significant; CV = Coefficient of variance

Results of the review ANOVA analysis in Table 1 retrieved that the grouping results of testing various doses of LOF on the growth of green onions (*Allium fistulosum* L.) had a very significant effect on the parameters of root length, root weight, fresh stover weight and fresh crown weight. It is suspected that the doses and nutrients contained in LOF can increase the production of scallion plants. According to the leaflet, the

Jimmy Hantu liquid fertilizer contains complete macro and micro nutrients such as N, P, K, Na, Mg, Cu, Fe, Mn, and Zn. It also contains the hormones GA3 98.37 ppm, DA5 107.13 ppm, GA7 131.46 ppm, Auxin IAA 156.35 ppm, Cytokinin Kinetin 128.04 ppm, and Cytokinin Swatin 106.45 ppm (Pupuk Jimmy Hantu, 2023). This is supported by the opinion of [Djatkiko et al. \(2015\)](#) stated that the complete content of LOF includes macro and micro nutrients, growth regulators, and probiotic microorganisms, resulting in liquid organic fertilizer absorbed by plants being able to increase plant growth and yield. The similar thing was conveyed by [Pramita et al. \(2019\)](#), good plant growth and development can be achieved if the nutrients required for the growth and development of plant are available in balanced and optimum concentrations, and is supported by environmental factors. Additionally, if nutrients are provided to plants in the proper circumstances, the outcomes of their metabolism will produce hormones, enzymes, carbohydrates and proteins, allowing for rapid growth, elongation, and cell division. The hormones contained in liquid organic fertilizers can affect growth and development, plant differentiation.

The results of the ANOVA analysis in table 1 show that testing the dose of liquid organic fertilizer on the growth of green onions (*Allium fistulosum* L.) had no significant effect on the parameters of plant height, number of leaves, length of green leaves, length of white leaves, and harvest index. It is suspected that the role of internal factors in the activity of cell division and elongation in plants is relatively non-uniform. According to [Lakitan \(1996\)](#) and [Parman \(2007\)](#), the internal factors that affect plant growth are the rate and quantity of photosynthesis supplied from the plant canopy. Furthermore, the anticlinal and periclinal division and enlargement of meristematic cells at the tip of the stem, although the speed is not the same. This is supported by [Setyanti et al. \(2013\)](#) stating that internal factors or genetic factors are one of the limiting factors for plant growth and development which include species differences, influence of leaf age, and affect the rate of photosynthetic translocation. This is in accordance with the understanding [Manullang et al. \(2014\)](#) that there is no significant difference in the effect of the POC concentration because the plant's nutrient needs can still be met by the planting medium.

Furthermore, results of the review ANOVA analysis showed that testing various doses of LOF on scallion plants obtained the right dose to increase the production of plant fresh stover weight and fresh shoot weight. It is suspected that the need for nutrients is appropriate in their absorption by plants. According to [Rahmi et al. \(2017\)](#), optimum and balanced availability of nutrients greatly affects plant growth. Meanwhile, [Widyowanti et al. \(2019\)](#) stated that the growth and development of crop yields is determined by several factors, namely the type, dosage and application of liquid organic fertilizer.

Observation results displayed in Table 2 completed with HSD test results. The data shows that giving LOF at a dose of 1.5 ml/L of water (J2) gave the best results and a positive response to plant production in parameter i of wet stover weight and fresh shoot weight. It is suspected that the low dose given is appropriate for plants and is more effective in absorbing nutrients, in order to increase plant growth and development, so as to increase growth. According to [Marpaung \(2017\)](#) the application of liquid organic fertilizer must pay attention to the concentration or dosage that will be applied to plants. This supports the opinion of [Yartiwi & Siagian \(2017\)](#) stating that the application of POC to each plant with a different concentration will affect the size of the nutrient content in the fertilizer, but it is not certain that the larger the dose applied will further increase plant growth. [Azyyati et al. \(2016\)](#) stated that the exact dose applied can affect the continuity of plant growth and development.

Table 2. Results from HSD test on the effect of LOF doses to the growth of scallions (*Allium fistulosum* L.)

Parameter	LOF Dose Treatments						HSD	
	J1	J2	J3	J4	J5	J6	5%	1%
Plant height (cm)	49.30	40.81	38.00	40.13	29.75	41.75	-	-
Number of leaves (strand)	6.63	8.00	7.00	8.00	9.00	9.00	-	-
Length of green leaves (cm)	42.25	36.25	33.25	34.50	32.25	37.00	-	-
Length of white leaves (cm)	6.94	4.88	4.94	5.56	5.00	4.63	-	-
Root length (cm)	21.25bB	12.25aA	9.50aA	11.75aA	8.75aA	11.38aA	4.79	6.07
Root weight (g)	2.86bB	2.44bAB	2.36abA	1.83aA	1.61aA	1.44aA	0.93	1.18
Weight of fresh stover (g)	31.33bB	44.31cC	35.36bB	22.72aA	19.60aA	17.28aA	10.84	13.75
Weight of fresh shoot (g)	28.47aAB	41.87bB	33.00aAB	20.89aA	17.99aA	15.84aA	10.58	13.41
Harvest index	0.90	0.94	0.94	0.92	0.87	0.92	-	-

Note: Numbers followed by the same letters in the same row show no significant effect based on the HSD test at the 5% (a) & 1% (A) level.

The results of the research are presented in Table 2 in terms of analysis of variance and tabulated data showing that giving POC with a concentration of 3.5 ml/L water (J6) gave the lowest results and a negative response to the parameters of root weight, fresh stover weight and fresh shoot weight. This is presumably the dose given exceeds the dose needed by the plant, so that it can cause inhibition of plant growth and development. According to [Azyyati et al. \(2016\)](#) stated that if the dose of fertilizer is given low, it shows no effect on plant growth and development, while doses that exceed plant needs can disrupt nutrient balance and can poison plant roots. This supports the opinion of [Manullang et al. \(2014\)](#) that the application of fertilizer doses given is not appropriate, it will result in no carrying capacity and effectiveness of fertilizer on plant growth and development. Meanwhile, according to [Munawar \(2011\)](#) explained that the application of excessive doses of fertilizer, can inhibit the quantity of crop yields. In addition, according to [Endriani & Lidar \(2021\)](#) stated that giving high concentrations will decrease growth, and is not good for plant development, because the higher the concentration given, then nutrients are absorbed in plants becomes saturated so that the process of growth and development of plant organs will be hampered

4. CONCLUSION

The result of observation analysis concluded that testing various doses of liquid organic fertilizer on the growth of scallions or green onions (*Allium fistulosum* L.) showed that LOF with a concentration of 1.5 ml/L water (J2) had the best and positive effect on the production parameters of wet stover weight and fresh shoot weight.

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