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Original Paper

Response of Vermicompost and Urea Combination Fertilizer Doses on the Growth and Yield of Scallion Plants (*Allium fistulosum* L.)

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***Abstract* — Leeks (*Allium fistulosum* L.) are short-lived horticultural crops and have great commercial potential. The productivity of leeks in Indonesia, especially in the East Java region, is experiencing fluctuations, this is due to the problem of decreasing soil fertility. The use of inorganic fertilizers is one of the causes of decreasing soil fertility where the use of inorganic fertilizers in Indonesia reached 105.22 kg/ha, being the highest use compared to several countries in Southeast Asia. Therefore, we offer a solution to this problem, namely by combining the use of inorganic fertilizer with organic fertilizer (urea fertilizer and vermicompost fertilizer). Vermicompost fertilizer has advantages compared to other compost fertilizers in terms of complete content starting from microorganisms, growth hormones, and nutrients. The aim of this research was to determine the interaction of applying urea fertilizer and vermicompost on the growth and yield of leek plants (*Allium fistulosum* L). The research was conducted at the Green House using a Completely Randomized Design (CRD) with 2 factors, each of which had 3 levels and was repeated 3 times to obtain 27 plant units. The first factor was a vermicompost dose of 0 g/polybag, 75 g/polybag, and 150 g/polybag, while the second factor was a urea dose of 0 g/polybag, 1 g/polybag, and 2 g/polybag. The experimental results showed that the best dose for the combined interaction of vermicompost and urea fertilizer treatment was 75 g/polybag vermicompost and 2 g/polybag urea to increase the number of leaves and height of leek plants.**

***Keywords*— Scallions, Vermicompost, Urea**

I. INTRODUCTION

Horticultural commodities such as fruit and vegetable plants contain lots of vitamins and fiber which are good for body health [1]. Vegetable commodities have prospects for farmers because vegetable consumption in Indonesia is increasing in line with the population so that these commodities are able to generate real profits for farmers. One of the vegetable commodities that is widely cultivated is spring onions. The productivity of leek plants in Indonesia, especially the East Java region, has fluctuated, namely in 2017 it was 11.32 tonnes/ha, in 2018 it was 10.30, in 2019 it was 11.28 tonnes/ha, in 2020 it was 7.49 tons/ha, in 2021 it will be 10.07 tons/ha, and in 2022 it will be 11.84 tons/ha [2]. The tendency for leek plant productivity to fluctuate from year to year is due to a decrease in land area and production, this indicates that there is a problem in leek cultivation activities, namely external factors in the form of soil conditions as the main factor for plants to grow. Soil conditions with low nutrient content indicate a decline in soil fertility. One of the problems of declining soil fertility is caused by excessive use of inorganic fertilizers, where data on fertilizer use in several countries in Southeast Asia, namely Malaysia 95.40 kg/ha, Thailand 51.15 kg/ha, Indonesia 105.22 kg/ha, Philippines 90.33 kg/ha [22], So it can be concluded that Indonesia has the highest usage. The impact of using inorganic fertilizers is that it causes soil damage, environmental pollution, increases chemical residues in the soil, and reduces soil productivity [9]. Cultivating leek plants by relying on inorganic fertilizers needs to be balanced with the use of organic fertilizers to increase soil fertility and enrich organic matter. The combination of urea fertilizer and vermicompost can be a recommendation for fertilizing leek cultivation. Vermicompost has advantages compared to other composts because it contains microorganisms in the form of: Azotobacter; Rhizobium; phosphate-solubilizing bacteria (PSB); Nitrobacter, growth hormone in the form of: Gibberellins; Auxin; and Cytokinin, macro and micro nutrient content such as: N, P, K, Ca, Mg, Zn, Cu, Bo, Mn, Al, Na, and Fe [27]. Consideration of using inorganic fertilizer in the form of urea fertilizer, namely the dominant N nutrient in it, is able to optimize the growth of the leaves of the leek plant so that it will increase the yield of this commodity. It is hoped that organic fertilizer combined with inorganic fertilizer will be able to reduce the use of inorganic fertilizer considering the negative impact of these fertilizer residues on both the environment and human health. This research was designed with the aim of determining the interaction effect of applying a combination of vermicompost and urea fertilizer on the growth and yield of leek plants.

II. MATERIALS AND METHODS

A. Time and Place of Research

Research on "Response of Vermicompost and Urea Combination Fertilizer Doses on the Growth and Yield of Scallion Plants (Allium fistulosum L.)" was conducted at the Green House in Kembangsri Village, Ngoro District, Mojokerto Regency, East Java starting from 15 July to 30 September 2023.

B. Tools and Materials

The tools used during the research were hoes, shovels, boxes, analytical scales, sprayers, scissors, buckets, writing tools, documentation tools and other supporting tools. The materials used during the research were Lumbricus rubellus earthworms, chicken manure, vegetable waste, urea fertilizer, leek plant seeds, 30 x 30 cm polybags, and other supporting tools.

C. Research design

The experiment was carried out factorially using the basic pattern of a Completely Randomized Design (CRD) with 2 factors, each of which had 3 levels and was repeated 3 times to obtain 27 plant units. The first factor is the vermicompost dosage of 0 g/polybag (V_0), 75 g/polybag (V_1), and 150 g/polybag (V_2). The second factor is the urea dosage of 0 g/polybag (N_0), 1 g/polybag (N_1), and 2 g/polybag (N_2).

TABLE I. TREATMENT COMBINATIONS

	V_0	**V_1**	**V_2**
N_0	V_0N_0	V_1N_0	V_2N_0
N_1	V_0N_1	V_1N_1	V_2N_1
N_2	V_0N_2	V_1N_2	V_2N_2

TABLE II. RESEARCH PLAN

V_2N_2	V_0N_2	V_2N_2
V_0N_1	V_0N_1	V_0N_2
V_2N_0	V_2N_1	V_1N_2
V_2N_1	V_0N_0	V_0N_1
V_1N_0	V_1N_2	V_1N_0
V_2N_0	V_2N_1	V_1N_0
V_0N_2	V_2N_2	V_0N_0
V_1N_1	V_1N_1	V_2N_0
V_1N_2	V_1N_1	V_0N_0

D. Research Procedures

The steps taken during the research were (1) Making vermicompost in general was made in three stages, namely multiplying organic material in the form of chicken manure then multiplying Lumbricus luberus worms, the composting process (2) Analysis of nutrient content was carried out in the Soil Laboratory of the Soil Science Study Program Faculty of Agriculture, University of Jember (3) Selection of spring onion seeds with the criteria that the parent is easy to give birth to, strong stems, large and thick leaves (4) Planting 1 spring onion seedling in each polybag using a spacing of 20 cm x 20 cm (5) Maintenance starting from watering twice a day, weeding weeds, fertilizing according to the prescribed dose, and controlling pests (6) Harvesting with the criteria that the plant has reached 2.5 months of age after transplanting. (7) Plant observations include plant height, leaf length, number of leaves, number of tillers, plant fresh weight and plant dry weight.

E. Data Analysis

The data obtained from the experimental results were further tested using analysis of variance. If the results of the analysis of variance show significantly different results, then a further test is carried out using Duncan's multiple range test at the 5% level.

III. RESULTS AND DISCUSSION

A. Result

- Vermicompost Analysis Results

The results of the chemical analysis of vermicompost are presented in table III in the form of N, P, K, C-Organic, and pH nutrient analysis. The results of the analysis carried out at the Soil Laboratory, Soil Science Study Program, Faculty of Agriculture, Jember University show that the nutrient N is 2.58%, P is 0.12%, K is 0.46%, C-Organic is 25, 18%, pH of 6.7 and obtained a C:N ratio of 10:1. Referring to PERMENTAN REGULATION N0. 261/KPTS/SR.310/M/4/2019 explains that the minimum requirements for N, P, K content in solid organic fertilizer are 2%, minimum C-Organic is 15%, pH is 4-9, and C/N ratio of ≤ 25, then vermicompost does not meet all the minimum requirements for solid organic fertilizer quality standards, but still has the opportunity to be used as fertilizer for leek plants considering that the N content has been met which can increase plant leaf production.

TABLE III. RESULTS OF VERMICOMPOST ANALYSIS

Sample	**Result of Analysis**				
Vermicompost	**C-Organic**	**N Total**	**P_2O_5**	**K_2O**	**pH**
	25,18 %	2,58 %	0,12 %	0,46 %	6,7

Description: Based on the results of Soil Laboratory analysis, Soil Science Study Program, Faculty of Agriculture, University of Jember

- Variety Analysis Results

Analysis of the various effects of administering vermicompost and urea fertilizer doses on all observation variables is presented in table IV. Based on the results of the analysis of variance in table IV, it shows that the interaction of the treatment dose of Vermicompost (V) and dose of Urea (N) had a significantly different effect on the research variables in the form of plant height and number of leaves but had an insignificant different effect on the variables of leaf length, number of tillers, fresh weight, and dry weight of the plant. The main effect of Vermicompost dose (V) had a significantly different effect on the variables of plant height, number of leaves, leaf length and fresh weight of the plant, but had a non-significant different effect on the variables of number of tillers and dry weight of the plant. The main effect of Urea (N) dose had a significantly different effect on the variables number of leaves, leaf length and fresh weight of the plant, but had an

insignificant different effect on the research variables in the form of plant height, number of tillers and dry weight of the plant.

TABLE IV. SUMMARY OF F-CALCULATED VALUES OF ALL OBSERVATION VARIABLES

No	Research Variable	F-Count		
		Vermicompost (V)	Urea (N)	Vermicompost x Urea (VxN)
1.	Height of Plant	3,71 *	1,80 ns	2,99 *
2.	Leaf Amount	3,76 *	5,21 *	3,79 *
3.	Leaf Length	3,61 *	4,48 *	2,04 ns
4.	Number of tillers	1,08 ns	1,08 ns	2,71 ns
5.	Plant Fresh Weight	3,67 *	4,16 *	2,92 ns
6.	Plant Dry Weight	1,52 ns	2,39 ns	1,22 ns

Description: ns: Not real different, *: Really different, **: Very real different

- The Interaction Effect of Dosing Vermicompost and Urea on the Growth and Yield of Scallion Plants

The results of the analysis of variance in Table IV show that the interaction effect of providing vermicompost and urea has a significantly different effect on the variables of plant height and number of leaves. Average value test results using the Duncan 5% test

(1) Plant Height (cm)

TABLE V. EFFECT OF INTERACTIONS ON PLANT HEIGHT

Vermikompos (V)	Urea (N)		
	N_0 (0 g/polybag)	N_1 (1 g/polybag)	N_2 (2 g/polybag)
V_0 (0 g/polybag)	58,33 a	55,00 a	57,33 a
	A	A	AB
V_1 (75 g/polybag)	53,67 b	54,67 b	58,67 a
	B	A	A
V_2 (150 g/polybag)	52,67 a	55,67 a	54,00 a
	B	A	B

Note: Numbers followed by the same letter are not significantly different in Duncan's 5% multiple range test. Capital letters (vertical) indicate the simple effect of the Vermicompost dosage factor (V) at the same treatment level of Urea dosage (N). Lowercase (horizontal) letters indicate the effect of a simple dose of Urea (N) at the same treatment level of Vermicompost (V) dose.

The results of Duncan's multiple distance test in table V of the simple effect of the vermicompost dosage factor at the same urea dosage level of 0 g/polybag (N_0) show that the highest plant height resulted from the combination of treatment with a vermicompost dosage of 0 g/polybag with a urea dosage of 0 g/polybag (V_0 N_0) of 58.33 cm. The combination treatment with a vermicompost dose of 0 g/polybag with a urea dose of 0 g/polybag (V_0 N_0) is significantly different from the treatment combination of 75 g/polybag with a urea dose of 0 g/polybag (V_1 N_0), and the treatment combination of 150 g/polybag with a urea dose 0 g/polybag (V_2 N_0), so that in the same treatment (N_0) to obtain the best plant height it is best to use a combination treatment with a vermicompost dose of 0 g/polybag and a urea dose of 0 g/polybag (V_0 N_0).

The results of Duncan's multiple distance test in table V of the simple effect of the vermicompost dosage factor at the same urea dosage level of 1 g/polybag (N_1) show that the highest plant height resulted from the combination treatment of a vermicompost dosage of 150 g/polybag with a urea dosage of 1 g/polybag (V_2 N_1) of 55.67 cm. The treatment combination with a vermicompost dose of 150 g/polybag with a urea dose of 1 g/polybag (V_2N_1) was not significantly different from the treatment combination (V_0N_1) and the treatment combination (V_1N_1), so that the same treatment (N_1) obtained the best plant height. It is best to use a combination treatment with a vermicompost dose of 0 g/polybag and a urea dose of 1 g/polybag (V_0N_1).

The results of Duncan's multiple distance test in table V of the simple effect of the vermicompost dosage factor at the same urea dosage level of 2 g/polybag (N_2) show that the highest plant height resulted from the combination of treatment with a vermicompost dosage of 75 g/polybag and a urea dosage of 2 g/polybag (V_1N_2) of 58.67 cm. The treatment combination with a vermicompost dose of 75 gr/polybag and a urea dose of 2 g/polybag (V_1N_2) was not significantly different from the treatment combination (V_0N_2), but was significantly different from the treatment combination (V_2N_2), so that the treatment (N_2) was the same for To obtain the best plant height, it is best to use a combination treatment with a vermicompost dose of 75 g/polybag and a urea dose of 2 g/polybag (V_1N_2).

The results of Duncan's multiple distance test in table V of the simple effect of the urea dose factor (N) at the same vermicompost dose level of 0 g/polybag (V_0) show that the highest plant height resulted from the combination treatment of a vermicompost dose of 0 g/polybag with a urea dose of 0 g/ polybag (V_0N_0) of 58.33 cm. The treatment combination with a vermicompost dose of 0 g/polybag and a urea dose of 0 g/polybag (V_0N_0) was not significantly different from the treatment combination (V_0N_1) and the treatment combination (V_0N_2), so that the same treatment (V_0) obtained the best plant height. It is best to use a combination treatment with a vermicompost dose of 0 g/polybag and a urea dose of 0 g/polybag (V_0N_0).

The results of Duncan's multiple distance test in table V of the simple effect of the urea dose factor (N) at the same vermicompost dose level of 75 g/polybag (V_1) show that the highest plant height resulted from the combination treatment of a vermicompost dose of 75 g/polybag with a urea dose of 2 g/ polybag (V_1N_2) of 58.67 cm. The treatment combination with a vermicompost dose of 75 g/polybag with a urea dose of 2 g/polybag (V_1N_2) is significantly different from the treatment combination (V_1N_1) and the treatment combination (V_1N_0), so that using the same treatment (V_1) to obtain the best plant height is best using a combination treatment with a vermicompost dose of 75 g/polybag and a urea dose of 2 g/polybag (V_1N_2).

The results of Duncan's multiple distance test in the simple effect of the urea dose factor (N) at the same vermicompost dose level of 150 g/polybag (V_2) shows that the highest plant height resulted from the combination treatment of a vermicompost dose of 150 g/polybag and a urea dose of 1 g/polybag (V_2N_1) of 55.67 cm. The combination treatment with a vermicompost dose of 150 g/polybag and a urea dose of 1 g/polybag (V_2N_1) was not significantly different from the treatment combination of 150 g/polybag and 0 g/polybag

(V_2N_0) and the treatment combination of 150 g/polybag and 2 g/polybag (V_2N_2), so that in the same treatment (N_2) to obtain the best plant height it is best to use a combination treatment with a vermicompost dose of 150 g/polybag and a urea dose of 0 g/polybag (V_2N_0).

(2) Number of Leaves (pieces)

TABLE VI. EFFECT OF INTERACTIONS ON THE NUMBER OF LEAVES

Vermicompost (V)	Urea (N)		
	N_0 (0g/polybag)	N_1 (1g/polybag)	N_2 (2g/polybag)
V_0 (0g/polybag)	10,67 a	8,33 a	9,00 a
	A	A	B
V_1 (75g/polybag)	8,67 b	10,00 b	15,00 a
	B	A	A
V_2 (150g/polybag)	8,67 a	8,33 a	10,33 a
	B	A	B

Note: Numbers followed by the same letter are not significantly different in Duncan's 5% multiple range test. Capital letters (vertical) indicate the simple effect of the Vermicompost dosage factor (V) at the same treatment level of Urea dosage (N). Lowercase (horizontal) letters indicate the effect of a simple dose of Urea (N) at the same treatment level of Vermicompost (V) dose.

The results of Duncan's multiple distance test in table VI of the simple effect of the vermicompost dosage factor (V) at the same urea dosage level of 0 g/polybag (N_0) show that the highest number of leaves was produced from the combination of treatment with a vermicompost dosage of 0 g/polybag with a urea dosage of 0 g/polybag. polybag (V_0N_0) of 10.67 pieces. The treatment combination with a vermicompost dose of 0 g/polybag with a urea dose of 0 g/polybag (V_0N_0) is significantly different from the treatment combination (V_1N_0) and the treatment combination (V_2N_0), so that in the same treatment (N_0) it is best to obtain the best number of leaves. using a combination treatment with a vermicompost dose of 0 g/polybag and a urea dose of 0 g/polybag (V_0N_0).

The results of Duncan's multiple distance test in table VI of the simple effect of the vermicompost dosage factor (V) at the same urea dosage level of 1 g/polybag (N_1) show that the highest number of leaves was produced from the combination of treatment with a vermicompost dosage of 75 g/polybag with a urea dosage of 1 g/ polybag (V_1N_1) of 10.00 pieces. The treatment combination with a vermicompost dose of 75 g/polybag with a urea dose of 1 g/polybag (V_1N_1) was not significantly different from the treatment combination (V_0N_1) and the treatment combination (V_2N_1), so that the same treatment (N_1) obtained the best number of leaves. It is best to use a combination treatment with a vermicompost dose of 0 g/polybag and a urea dose of 1 g/polybag (V_0N_1).

The results of Duncan's multiple distance test in table VI of the simple effect of the vermicompost dose factor (V) at the same urea dose level of 2 g/polybag (N_2) show that the highest number of leaves was produced from the combination treatment of a vermicompost dose of 75 g/polybag and a urea dose of 2 g/ polybag (V_1N_2) of 15.00 pieces. The treatment combination with a vermicompost dose of 75 g/polybag and a urea dose of 2 g/polybag (V_1N_2) is significantly different from the treatment combination (V_0N_2) and the treatment combination (V_2N_2), so that in the same treatment (N_2) it is best to obtain the best number of leaves. using a combination treatment with a vermicompost dose of 75 g/polybag and a urea dose of 2 g/polybag (V_1N_2).

The results of Duncan's multiple distance test in table VI of the simple effect of the urea dose factor (N) at the same vermicompost dose level of 0 g/polybag (V_0) show that the highest number of leaves was produced from the combination treatment of a vermicompost dose of 0 g/polybag with a urea dose of 0 g/ polybag (V_0N_0) of 10.67 pieces. The treatment combination with a vermicompost dose of 0 g/polybag with a urea dose of 0 g/polybag (V_0N_0) was not significantly different from the treatment combination (V_0N_1) and the treatment combination (V_0N_2), so that the same treatment (V_0) obtained the best number of leaves. It is best to use a combination treatment with a vermicompost dose of 0 g/polybag and a urea dose of 0 g/polybag (V_0N_0). The results of Duncan's multiple distance test in table VI of the simple effect of the urea dose factor (N) at the same vermicompost dose level of 75 g/polybag (V_1) show that the highest number of leaves was produced from the combination treatment of a vermicompost dose of 75 g/polybag with a urea dose of 2 g/ polybag (V_1N_2) of 15.00 pieces. The treatment combination with a vermicompost dose of 75 g/polybag with a urea dose of 2 g/polybag (V_1N_2) is significantly different from the treatment combination (V1N0) and the treatment combination (V_1N_1), so that in the same treatment (V_1) it is best to obtain the best number of leaves. using a combination treatment with a vermicompost dose of 75 g/polybag and a urea dose of 2 g/polybag (V_1N_2).

The results of Duncan's multiple distance test in table VI of the simple effect of the urea dose factor (N) at the same vermicompost dose level of 150 g/polybag (V_2) show that the highest number of leaves was produced from the combination treatment of a vermicompost dose of 150 g/polybag and a urea dose of 2 g/ polybag (V_2N_2) of 10.33 pieces. The treatment combination with a vermicompost dose of 150 g/polybag and a urea dose of 2 g/polybag (V_2N_2) was not significantly different from the treatment combination (V_2N_0) and the treatment combination (V_2N_1), so that the same treatment (V_2) obtained the best number of leaves. It is best to use a combination treatment with a vermicompost dose of 150 g/polybag and a urea dose of 0 g/polybag (V_2N_0).

- The Main Effect of Vermicompost Dosage Factors on the Growth and Yield of Scallion Plants

The results of the analysis of variance in table IV show that the effect of giving vermikompo had a significantly different effect on the variables of leaf length and plant fresh weight. Average value test results using the Duncan 5% test.

(1) Leaf Length (cm)

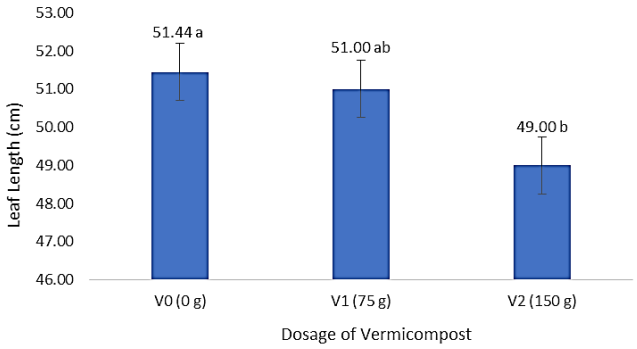

Fig 1. Effect of Vermicompost Dosage on Leaf Length

The results of the Duncan 5% multiple distance test in Fig. 1 show that the main effect of the vermicompost dosage factor (V) shows that the treatment with a vermicompost dosage of 0 g/polybag (V_0) produces the highest leaf length, namely 51.44 cm. The treatment with a vermicompost dose of 0 g/polybag (V_0) is not significantly different from the treatment with a vermicompost fertilizer dose of 75 g/polybag (V_1) but is significantly different from the treatment with a vermicompost fertilizer dose of 150 g/polybag (V_2), so to obtain the best leaf length it is best to use the treatment Vermicompost dosage 0 g/polybag (V_0)

(2) Plant Fresh Weight (g)

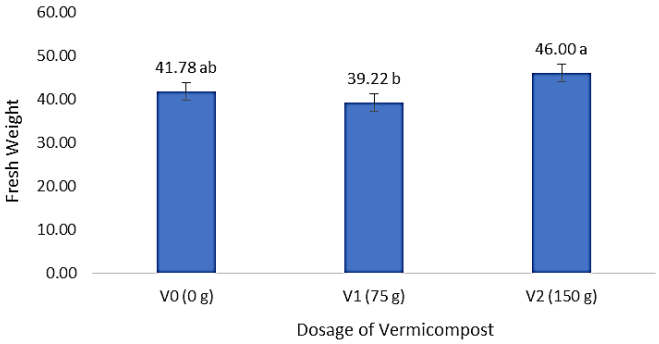

Fig. 2. Effect of Vermicompost Dosage on Plant Fresh Weight

Duncan's 5% multiple distance test results in Fig. The 2 main influences of the vermicompost dosage factor (V) show that the treatment with a vermicompost dosage of 150 g/polybag (V_2) produces the highest fresh plant weight, namely 46.00 grams. The treatment with a vermicompost dose of 150 g/polybag (V_2) is not significantly different from the treatment with a vermicompost dose of 0 g/polybag (V_0) but is significantly different from the treatment with a vermicompost dose of 75 g/polybag (V_1), so to obtain fresh plant weight it is best to use the vermicompost dose treatment. 150 g/polybag (V_2). The average fresh weight of plants with the best treatment is 55.33 g so it can be converted into plant productivity calculations, as follows:

$$\text{Number of Plants } (m^2) = \frac{\text{Area}}{\text{Planting Distance}} \quad (1)$$

$$\frac{1\text{ m}}{0{,}2\text{ m}} \times \frac{1\text{ m}}{0{,}2\text{ m}} = \frac{1\text{ m}^2}{0{,}04\text{ m}^2} \text{ x 1 plant} = 25 \text{ plants}$$

$$25 \text{ plants/m}^2 \text{ x } 10.000 \text{ m}^2\text{/ha} = 250.000 \text{ plants/ha} \quad (2)$$

$$\text{Plants Productivity} = 250.000 \text{ plant/ha x } 53{,}33 \text{ g/plant} \quad (3)$$

$$= (25 \text{ x } 10^4 \text{ ha}) \text{ x } (53{,}33 \text{ x } 10^{-6} \text{ ton})$$

$$= (25 \text{ ha}) \text{ x } (53{,}33 \text{ x } 10^{-2} \text{ ton})$$

$$= 1.333{,}25 \text{ x } 10^{-2} \text{ ton/ha}$$

$$= 13{,}33 \text{ ton/ha}$$

- The Main Influence of Urea Dosage Factors on the Growth and Yield of Scallion Plants

The results of the analysis of variance in Table IV show that the interaction effect of giving urea has a significantly different effect on the leaf length and plant fresh weight variables. Average value test results using the Duncan 5% test

(1) Leaf Length (cm)

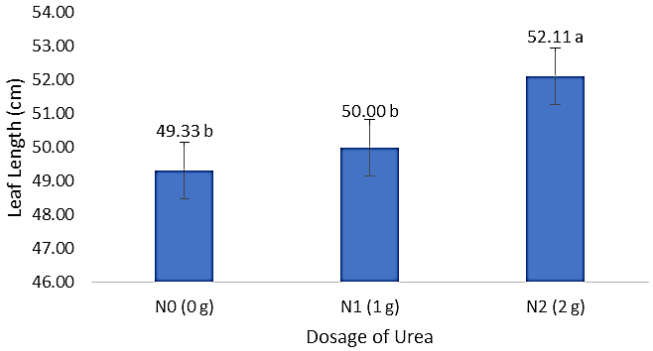

Fig. 3. Effect of Urea Dosage on Leaf Length

The results of the Duncan 5% multiple distance test in (Fig. 4.5) the main effect of the urea dose factor (N) shows that the treatment with a urea dose of 2 g/polybag (N_2) produces the highest leaf length, namely 52.11 cm. The treatment with a urea dose of 2 g/polybag (N_2) is significantly different from the treatment with a urea dose of 0 g/polybag (N_0) and the treatment with a urea dose of 1 g/polybag (N_1), so to obtain the best leaf length it is best to use a 2 g urea dose treatment/polybag (N_2).

(2) Plant Fresh Weight (g)

The results of the Duncan 5% multiple distance test in (Fig. 4) the main influence of the urea dose factor (N) shows that the vermicompost dose treatment (N_0) produces the highest fresh weight, namely 45.67 grams. The treatment with a urea dose of 0 g/polybag (N_0) is not significantly different from the treatment with a urea dose of 2 g/polybag (N_2), but is significantly different from the treatment with a urea dose of 1 g/polybag (N_1), so to obtain the best plant fresh weight it is best to use the treatment urea dosage 0 g/polybag (N_0).

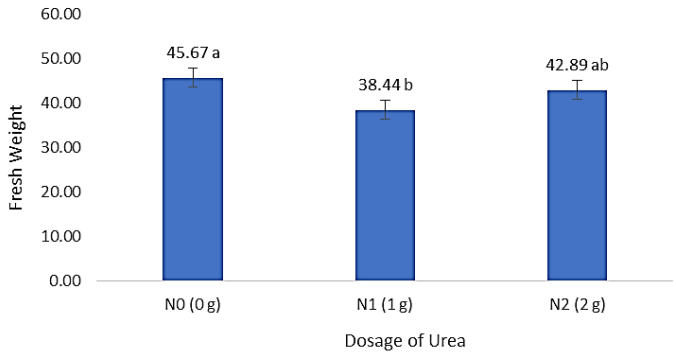

Fig. 4. Effect of Urea Dosage on Plant Fresh Weight

B. Discussion

- The Interaction Effect of Dosing Vermicompost and Urea on the Growth and Yield of Scallion Plants

Based on the analysis of variance in table 4.2, it showed that the interaction between vermicompost dose treatment and urea dose treatment on the growth and yield of leek plants *(Allium fistulosum* L.) The combination of 75 g/polybag vermicompost dose treatment and 2 g/polybag urea dose (V_1N_2) for obtain the best plant height and number of leaves. The occurrence of this interaction is due to the combination of treatment of 75 g/polybag and urea dose of 2 g/polybag (V_1N_2) which can be said to be sufficient to encourage the growth of leek plants such as plant height and number of leaves, this is in accordance with the statement [12] that vermicompost encourages growth and development in vegetable plants and can increase seed germination, stem height and number of leaves. The nutrient element that has the most influence on leaf growth and development is the N element, where the role of the N element in urea fertilizer is to stimulate growth such as increasing plant cell volume such as plant height and leaf development [8].

The combination of vermicompost and urea dosage treatment had an influence on the variable number of leaves. Providing this combination fertilizer can increase the growth of leek plants by improving the physical soil, namely increasing soil porosity, as well as improving soil chemistry, namely by fulfilling the nitrogen nutrient requirements needed by plants. Improving soil structure can make it easier for plant roots to absorb nutrients and water, thereby helping the vegetative development of leek plants [7]. The addition of urea in the vegetative phase of plants provides mineral N nutrients more quickly and at higher levels compared to organic fertilizer because the fertilizer needs to go through a decomposition and mineralization process first to produce mineral N that is ready to be absorbed by plants [16]. Providing organic fertilizer such as vermicompost can improve soil fertility status [24], this is in accordance with the statement [20] that soil fertility is closely related to high CEC because the nutrient elements are in the soil absorption complex so that these nutrients are not easily washed away by water. , the higher the organic matter, the more crumbly the soil texture, the higher the CEC of the soil.

The combination of vermicompost and urea dosage treatment had an influence on plant height variables. Providing this combination fertilizer has its own role, where vermicompost plays a role in increasing plant growth rate and urea as a nutrient addition. Vermicompost contains growth hormones such as auxin, gibberellins and cytokinins which play a role in plant height growth [14]. Endogenous cytokinin hormones, either directly or indirectly, can regulate hormone production to trigger growth and shoot formation which can influence leaf growth, as well as gibberellin hormones which can support root cell division and plant stem elongation. The combination of providing vermicompost and inorganic fertilizer can increase growth and yield, intake of several nutrients N, P, K and increase plant height by around 50% [11].

The application of a combination fertilizer between vermicompost and urea is considered very useful in providing the nutrients needed by plants, however for several variables the results obtained are not significantly different, it is thought to be due to several factors which are divided into 2, namely internal and external factors. Internal factors that can influence the growth results of leek plants are in accordance with the statement [3] that although short-term effects from the application of vermicompost have been observed, these effects cannot always be detected, whereas long-term and regular applications can increase biomass and microbial diversity in the soil. External factors that influence different results are not significant due to the interaction of several variables, namely environmental conditions such as lighting obtained by plants that is less than optimal. When plants are unable to form enough assimilate resulting from the photosynthesis process for the plant, competition will occur between the generative and vegetative organs of the plant [23]. The assimilate that is translocated to vegetative organs is different from the generative organs, the amount of assimilate produced by plants can be seen in several parts of the plant such as the length of the leaves [17].

- The Main Effect of Vermicompost Dosage Factors on the Growth and Yield of Scallion Plants

Based on the analysis of variance in table 4.2, the main effect of vermicompost dosage (V) shows significantly different results on the variables of plant height, leaf length, number of leaves and fresh weight. Giving a vermicompost dose of 0 g/polybag (V_0) was the best treatment for the leaf length variable and giving a vermicompost dose of 150 g/polybag (V_2) was the best treatment for the plant fresh weight variable. The test results for macro nutrient content in vermicompost showed that the N nutrient content was 2.58%, P nutrient content was 0.12%, K nutrient content was 0.46%, C-Organic was 25.18% and the C content was obtained. :N ratio of 10:1, and pH level of 6.7. Referring to PERMENTAN REGULATION N0. 261/KPTS/SR.310/M/4/2019 as a minimum requirement for nutrient content in vermicompost does not fully meet the minimum requirements for solid organic fertilizer quality standards but the amount of Nitrogen and pH nutrients have met the minimum requirements for nutrient content in solid organic fertilizer where Nitrogen nutrient content with pH conditions close to normal indicates an abundance of nutrients that can help trigger leaf production from leek plant commodities, referring to the statement [10] that the application of vermicompost or vermicompost fertilizer directly increases plant production through the availability of macro nutrients for plants such as N, P, and K and can indirectly improve soil quality by improving soil structure and stimulating microbial activity.

Treatment with a vermicompost dose of 150 g/polybag (V_2) can increase the variable fresh weight of plants due to sufficient organic material and the ease with which roots can absorb nutrients in the soil. An increase in plant fresh weight is due to sufficient organic material where plant roots can easily absorb the organic material used to accelerate the growth of plant organs such as roots, stems, shoots and leaves [25]. The organs of the leek plant, such as stems and leaves, grow well, supported by the role of plant roots which actively absorb plant nutrients so that they can indirectly influence the fresh weight of the plant after being calculated during the harvesting process. The best treatment in the form of (V_2) influences the increase in productivity of leek plants converted on 1 hectare of land where the results from the production conversion divided by the land area get a yield of 13 tons/ha, 2 digits higher than leek productivity in 2022 of 11.84 tons/ha. Ha.

Treatment with a vermicompost dose of 0 g/polybag (V_0) can increase leaf length variables, this is thought to be influenced by the factor of excess N nutrient content from vermicompost fertilizer which causes a decrease in photosynthesis, this is in accordance with the statement [29] that the intensity of photosynthesis can increase along with increasing the N nutrient, but a higher increase in this nutrient can reduce photosynthetic efficiency as can too high a dose of vermicompost. Excess N can also acidify the soil reaction or lower the soil pH, thereby harming plants because plant roots will lift other nutrients compared to the N nutrient.

The variables of number of tillers and dry weight of plants showed that the results were not significantly different, which means there was no effect on the application of vermicompost fertilizer, this was thought to be due to the main pest attack, namely armyworms (Spodoptera exigua). S. exigu is one type of fall armyworm that causes losses in the cultivation of spring onions and shallots where a density of 3-5 S. exigua larvae in a plant cluster causes losses of 32-42% respectively, apart from S. exigua attacks in the vegetative phase. resulting in yield losses of 57-100% [21]. Several factors cause S.exigua pest attacks on leek plants, namely internal and external factors. The internal factors that influence it are that the spread can decrease due to the nature of the parent which is not resistant to pest attacks and the nature of the leek plant itself which is favored by the pest S.exigua. S. exigua adults prefer to lay their eggs on plants with soft and smooth morphology such as onions, mustard greens, cabbage, etc. compared to grasses and legumes [28]. Environmental factors that support S.exigua pest attacks are abundance of food and weather. S.exigua pest attacks are higher in the dry season compared to the rainy season because the S.exigua population will be washed away by rainwater, besides that pest activity will decrease during the rainy season [18].

• The Main Influence of Urea Dosage Factors on the Growth and Yield of Scallion Plants

Based on the analysis of variance in table 4.2, the main effect of urea dose (N) shows significantly different results for the variables number of leaves, leaf length and fresh weight, but shows no significant different results for the variables plant height, number of tillers and dry weight. Giving a urea dose of 2 g/polybag (N_2) was the best treatment for the leaf length variable and giving a urea dose of 0 g/polybag (N_0) was the best treatment for the plant fresh weight variable. Providing the right dose of urea fertilizer can encourage the growth of leek plants, characterized by the effect on leaf length and fresh weight. The nitrogen contained in urea becomes plant metabolites either directly through root uptake or nitrate after urea degradation by soil microbes. According to the N nutrient, it plays an active role in the formation of shoots, the development of plant stems and leaves which will later influence the fresh weight of the plant [15], this is in accordance with the statement [4] that when all parts of the plant grow optimally, especially the leaves play an active role in the process. photosynthesis to produce photosynthesis which is stored for plant organs so that it can increase the fresh weight of the plant. The urea fertilizer dose of 0 g/polybag has a significant effect on fresh weight, this is thought to occur because excess N nutrients can reduce plant growth which indirectly also causes a decrease in plant fresh weight. N nutrients based only on urea can cause a decrease in plant growth, apart from that it can be influenced by less efficient distribution of nitrogen when the storage concentration of nitrogen elements and amino acids, especially glutamine or asparagine, increases, making the amino acid concentration higher, causing plant depression. High amounts of amino acids indicate an abundance of nitrogen nutrients in plants, resulting in the cessation of further absorption and distribution of nitrogen in plants [26].

The variables number of tillers and dry weight had no significant different effects due to the influence of environmental factors. Drought stress caused by long droughts causes a decrease in chlorophyll and assimilate content as food reserves for plant growth [30]. Dry weight is the accumulation of food reserves or can also be called the accumulation of photosynthate resulting from photosynthesis carried out by plants. Dry weight is a balance between carbon dioxide intake (photosynthesis) and expenditure (respiration). If respiration is greater than photosynthesis, the dry weight of the plant will decrease and vice versa [5]. The second factor is infection with dieback disease caused by the fungus Phytopthora sp. Symptoms of infection with this disease can be seen during the research, namely that it is characterized by small, curved inward, white spots with a purplish (gray) center, the spots develop like reddish rings surrounded by yellow which as the day goes on can expand at the bottom and top of the spots. [6]. The internal factor that causes dieback disease in leek plants is due to the inherited characteristics of the parents, although the leek plant seeds have been selected before planting, but still no one knows for certain the nature of the genes and hormones in them [1]. The control carried out is spraying the Nativo trademarked fungicide at a dose of 1 gram per 1 liter with a frequency of administration of once every 5 days. For their growth and development, plants need a given amount of a certain nutrient in a specified form at the right periods. Higher yields can only be achieved by utilizing crop nutrients, of which both macro and micronutrient roles are critical [30].

IV. CONCLUSION

The interaction between the treatment of vermicompost dosage and urea dosage had a significant effect on the variables of plant height and number of leaves with the best dosage combination, namely 75 g/polybag vermicompost and 2 g/polybag urea. The vermicompost dosage treatment had a significant effect on leaf length and plant weight variables with

the best dosage being 150 g/vermicompost polybag. The urea dose treatment had a significant effect on leaf length and plant fresh weight variables with the best dose being 2 g/urea polybag. Therefore, researchers suggest carrying out further research related to giving lower doses of combined fertilizer and carrying out soil analysis first to determine the nutrient content in the planting media so as to minimize the occurrence of excess nutrients.

REFERENCE

[1] Anggreini, A. Y., A. Raksun, and I. G. Mertha, "The Effect of Vermicompost and NPK Fertilizer on the Growth of Green House Mustrad (*Brassica Juncea* L.)", edisi ke-2, vol. 22. Jornal Biologi Tropis: 2022, hlm. 525-533.

[2] Badan Pusat Statistika Jawa Timur. 2023. *Statistika Hortikultura Provinsi Jawa Timur 2022*. Jakarta Pusat: Badan Pusat Statistika (https://jatim.bps.go.id/publication/2023/11/23/c1e4944d2094b78886059b73/statistik-hortikultura-provinsi-jawa-timur-2022.html).

[3] Denesh R., V. Srinivasan, S. Hamza, and A. Manjusha, "Short-tern Incorporation of Organic Manures and Biofertilizers Influences Biochemical and Microbial Characteristics of Soil under an Annual Crop (Turmeric *Curcuma longa* L.)", edisi ke-12, vol. 101. Bioresource Technology, 2021, hlm. 4697-4702.

[4] Feri. S, dan A. Handriatni, "Pengaruh Konsentrasi Pupuk Cair Limbah Tahu dan Pemotongan Bibit Anakan yang Berbeda terhadap Pertumbuhan dan Produksi Bawang Daun (*Allium fistulosum* L.)", edisi ke-2, vol. 17. Biofarm: Jurnal Ilmiah Pertanian, 2021, hlm. 76-81.

[5] Gardner, F. P., R. B. Pearce, and R. L. Mitchell, *Fisiologi Tanaman*. Jararta: PT. Gramedia, 2007.

[6] Gunaeni, N., "Pengendalian hama dan Penyakit secara Fisik dan Mekanik pada Produksi Bawang Daun (*Allium fistulosum* L.)", edisi ke-1, vol.19. Journal Agrin, 2015, hlm. 37-51.

[7] Januwari, M., S. Sudiatso, dan S.W. Andriani, "Pengaruh Dosis Pupuk Kandang dan Tingkat Populasi terhadap Pertumbuhan dan Produksi Pegagan (*Centella asiatica* L.) dibawah Tegakan Kelapa (*Cocos nucifera* L.)", edisi ke-2, vol. 1. Journal Bahan Alam Indonesia, 2002, hlm. 49-57.

[8] Lakitan, B., Dasar-Dasar Fisiologi Tumbuhan. Jakarta: PT. Raja Grafindo Persada, 2011

[9] Manuhuttu, A. P., H. Rehatta, dan J. J. G. Kailola, "Pengaruh Konsentrasi Pupuk Hayati BioBoost terhadap Peningkatan Produksi Tanaman Selada (*Lactuca sativa* L.)", edisi ke-1, vol. 3. Agrologia, 2014, hlm. 18-27.

[10] Mahmud, M., R. Abdullah, and J. S. Yaacob, "Effect of Vermicompost on Growth. Plant Nutrient Uptake and Bioactivity of Ex Vitro Pineapple (*Ananas comosus* var MD2)", edisi ke-1333, vol. 10. Agronomy , 2020, hlm. 1-22.

[11] Muhammad N., BM, Maina, KM. Aljameel, SA. Maigandi, and S. Buhari, "Nutrient Intake and Digestibility of Uda Rams Fed Levels of *Parkia biglobosa* (*African locust bean*) Yellow Fruit Pulp", edisi ke-5, vol. 6. Internasional Journal of Livestock Research, 2016, hlm. 33-42.

[12] Olle, M., "Review: Vermicompost, It's Importance and Benefit in Agriculture", edisi ke-1, vol. 2. Journal of Agricultural Science, 2019, hlm. 93-98.

[13] Persyaratan Menteri Pertanian No.261/KPTS/SR.310/M/4/2019 Tentang Persyaratan Teknis Minimal Pupuk Organik, Pupuk Hayati, dan Pembenahan Tanah.

[14] Pertiwi, I., dan Ardian, "Pemberian Pupuk Vermikompos pada Bibit Kopi Robusta (*Coffea canephora* Pierre)", edisi ke-1, vol. 3. JOM Faperta, 2016, hlm. 1-8.

[15] Prasetyo, R., "Pemanfaatan berbagai Sumber Pupuk Kandang sebagai Sumber N dalam Budidaya cabai Merah (*Capsicum annum* L.) di Tanah Berpasir", edisi ke-2, vol. 2. Plant Tropika Journal of AgroScience , 2014, hlm. 125-132.

[16] Ramadhan, R. H., M. Roviq, dan M. D. Maghfoer, "Pengaruh Sumber Pupuk Nitrogen dan Waktu Pemberian Urea pada Pertumbuhan dan Hasil Tanaman Jagung Manis (*Zea mays* Sturt. var. *saccharata*)", edisi ke-1, vol. 4. Journal Produksi Tanaman, 2016, hlm. 8-15.

[17] Rustikawati, R., M. Simarmata, E. Turmudi, dan C. Herison, "Penentuan Kadar Garam Kultur Hara untuk Seleksi Toleransi Salinitas pada Padi Lokal Bengkulu", edisi ke-2, vol. 17. Journal Akta Agrosia, 2014, hlm. 101-107.

[18] Sari, Y. Mayang, S. Prastowo, and T. Haryadi, "Uji Ketertarikan Ngengat *Spodoptera exigua* Hubn. Terhadap Perangkap lampu warna pada pertanaman bawang merah (*Allium ascalonicum* L.)", edisi ke-1, vol. 10. Agrivor: Jurnal Agroteknologi, 2017, hlm. 1-6.

[19] Sudaryono, "Tingkat Kesuburan Tanah Ultisol pada Lahan Pertambangan BatuBara Sangatta, Kalimantan Timur", edisi ke-3, vol. 10. Jurnal Teknik Lingkungan, 2009, hlm. 337-346.

[20] Sutarya, "Hama Ulat *Spedoptera exigua* pada Bawang Merah dan Strategi Pengendaliannya", edisi ke-2, vol. 15. J. Litbang, 1996, hlm. 41-46.

[21] Suwahyono, U., Panduan Penggunaan Pupuk Organik. Jakarta: Penebar Swadaya, 2017.

[22] Umarie, I., W. Widarti, I. Wijaya, dan H. Hasbi, "Pengaruh Warna Naungan Plastik dan Dosis Pupuk Organik Kompos terhadap Pertumbuhan Bawang Merah (*Allium ascalonicum* L.)", edisi ke-2, vol. 16. Journal Agroqua, 2018, hlm. 129-131.

[23] Utami, K., E.I. R. Sari, Z. Muktamar, dan Y. H. Bertham, "Akselerasi hasil Penelitian dan Optimasi Tata Ruang Agraria untuk Mewujudkan Pertanian Berkelanjutan", edisi ke-1, vol. 7. Seminar dalam Rangka Dies Natalis, 2023, hlm. 465-473.

[24] Uwumarongie, E. G. B. B., "Vegetative Growth Performance of Oil Palm (*Elaeis guineensis*) Seedling in Response to Inorganic and Organic Fertilizer", edisi ke-1, vol. 2. J. Agric. Sci Greener, hlm. 26-30.

[25] Witte, K. P., "Ureas Metabolism in Plant", edisi ke-1, vol. 180. Journal Plant Science, 2011, hlm. 431-438.

[26] Yuliarti, N., 1001 Cara Menghasilkan Pupuk Organik. Yogyakarta: Lily Publisher, 2009.

[27] Zheng X. L., X. P. Cong., X. P. Wang, and C. L. Lei., "A Review of Geographic Distribution, Overwintering and Migration in *Spodoptera exigua* Hubner (Lepidoptera: Noctuidae)", edisi ke-3, vol. 13. J. Entomol Res. Soc, 2011, hlm. 39-48.

[28] Zuo, Y., J. Zhang, R. Zhao, H. Dai, and Z. Zhangy, "Application of vermicompost Improves Strawberry Growth and Quality Through Increased Photosynthesis Rate, Free Radical Scavenging and Soil Enzymatic Activity", edisi ke-1, vol. 233. Journal Scientia Horticulturae, 2018, hlm. 132-140.

[29] Zou, J., W. Hu, D. A. Loka, J. L. Snider, H. Zhu, Y. Li, Y. Wang, and Z. Zhou, "Carbon Assimilation and Distribution in Cotton Photosynthetic Organs is a Limiting Factor Affecting Boll Weight Formation under Drought", edisi ke-1, vol. 13. Frontiers in Plant Science, 2022, hlm. 1-16.

[30] M. A. Wedajo, S. Kidanu, and A. Reggasa, "Effect of Compound (NPSB) Fertilizer Type on Yield and Nutrient use Efficiency of Maize (Zea mays L.) at Beko Village in Yeki District, Southwest Ethiopia," *Int. J. Food, Agric. Nat. Resour.*, vol. 4, no. 2, pp. 40–45, 2023, doi: 10.46676/ij-fanres.v4i2.130.