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Increase in Kale Plant Production (Brassica Oleraceae Var. Acephala) with a Combination of Cow Manure and NPK Compound Fertilizer Treatment

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A B S T R A C T

Kale (Brassica oleraceae var. Acephala) is a type of vegetable that belongs to the cabbage family (Brassicaceae), which is a species with cabbage, cauliflower, broccoli, and others. This vegetable is quite famous among the public and is believed to have good enough prospects to be marketed and developed in Indonesian territory because kale has high economic value. The purpose of this study is to determine the effect of the interaction of the combination of cow manure and NPK compound fertilizer in increasing Kale plant production. The results showed that: 1). There was an interaction of the combination of cow manure (K) dose treatment and NPK compound fertilizer dose (N) on the observation variables of Wet Weight of Crops and Dry Soil of Kale Crops. 2). There was a binding of wet weight and dry weight of the crop produced by the combination of 40 Tons/Ha Cow Manure Dose and 500 Kg/Ha NPK Compound Fertilizer (K3N3) and was significantly different from other treatment combinations

INTRODUCTION

Kale (Brassica oleraceae var. Acephala) is a type of vegetable that belongs to the cabbage family (Brassicaceae), which is a species with cabbage, cauliflower, broccoli, and others. This vegetable is quite famous among the public and is believed to have good enough prospects to be marketed and developed in Indonesian territory because kale has high economic value

The production of vegetable commodities has increased slightly, especially the Kale plant. Although the Kale plant has been known to the public for a long time, the cultivation of the Kale plant is not good in results, there needs to be a way to cultivate to increase yields so that it can be consumed by the community, considering the many vitamin contents that are beneficial for the health of the body.

Efforts to increase Kale plant production can be done by providing Organic Fertilizer for Cowsheds and NPK Inorganic Fertilizer. Organic fertilizers have the ability to improve the physical, chemical, and biological properties of soil, in addition to being environmentally friendly. To complete the nutrients needed by plants so that they can grow better, it is necessary to add other fertilizers such as NPK compound fertilizer with N, P, and K contents, which are expected to be able to increase nutrients and plant yields well. By being given cow manure and NPK will spur the growth of Kale.

The purpose of this study is to determine the effect of the interaction of the combination of cow manure and NPK compound fertilizer in increasing Kale plant productioncarried out (Nainggolan, 2016).

LITERATURE REVIEW

Efforts to increase kale production can be made by fertilizing. Fertilization is one of the techniques that must be applied to get optimal production of a plant. One of them is using organic fertilizers with the right dosage so that they can improve growth, accelerate harvests, extend production life, and increase crop yield (Marliah, et al., 2012). Organic fertilizers function as growth regulators, and also contain more complete macro and micronutrients so that they can improve the physical, chemical, and biological properties of the soil. One type of organic fertilizer is Cow manure. Cow manure contains high fiber levels and the nutrient content in cow manure has a large enough benefit to meet plant nutrition so that plant growth will be more optimal. Cow dung contains nutrients in the form of Nitrogen (N) 28.1%, Phosphorus (P) 9.1%, and Potassium

(K) 20%, the content can help plant growth (Rosadi, et al., 2019). Inorganic fertilizers that can be used to meet the nutrient needs absorbed by plants are compound NPK fertilizers. Compound NPK is a mixed fertilizer that contains more than one type of plant nutrients (macro and micro), especially N, P, and K. The advantage of NPK fertilizer is that with one application of fertilizer, it can include several nutrients so it is more efficient when compared to a single fertilizer. NPK pearl is one of the compound fertilizers that contains 16% N, 16% P2O5, 16% K2O, 0.5% Mg, and 6% Ca. The use of NPK can provide convenience in field application can increase the content of nutrients needed in the soil and can be used directly by plants (Septianty, 2018)..

METHODOLOGY

This research was conducted in a greenhouse located in Sambi Village, Ringinrejo District, Kediri Regency. The topography in Sambi Village is relatively low, the air temperature in this area is 28^{o}C with an average rainfall rate of around 23.11 mm per day. This research was carried out from March to April 2024.

The Experimental Design uses an environmental design, namely a Complete Random Design (RAL) consisting of 2 factors and 3 replicates. The first factor is the dose of cow manure, the second factor is the application of NPK fertilizer. The first factor is the dose of cow manure which consists of 3 levels, namely: K1 = 20 tons/ha, K2 = 30 tons/ha, and K3 = 40 tons/hour. The second factor is the dose of NPK fertilizer which consists of 3 levels, namely: N1 = 300 kg/ha, N2 = 400 kg/ha, N3 = 500 kg/ha. From these two factors, 9 treatment combinations were obtained, namely: K1N1, K1N2, K1N3, K2N1, K2N2, K2N3, K3N1, K3N2, and K3N3,

The implementation of the research consisted of: Seed Preparation, Seeding, Preparation of Planting Media, Planting, Plant Maintenance (Embroidery, Plant Watering, Fertilization, Weeding, Pest and Disease Control), and Harvesting.

Observation variables: 1). Wet weight per plant (gr): Observation of wet weight per plant is carried out when the plant reaches the age of 55 hst, carried out after harvest, namely on sample plants by taking only the leaves and then the plants are weighed using a digital scale, 2). Dry weight per plant (gr): carried out after harvest when the plant is 55 hst, Dry weight observations per plant are carried out after the plants are in the oven for one day at 60^{o}C in the laboratory.

Data Analysis for Hypothesis Test using Test F with Analysis of Variance (ANOVA). To find out if there is an increase in results, a further comparative test is carried out if the average value of the results is less than 5, a BNT 5% comparison test is carried out, if the average value is more than 5, a DMR comparison test is carried out.

RESULTS

Wet Weight of Planting

Based on the results of the variegated analysis (Table 1), the variable of observation of the wet weight of the crop showed that there was an interaction between the combination treatment of cow manure (K) and NPK compound fertilizer (N) at the age of 55 hst and showed an increase in the wet weight yield of the crop.

Table 1. Fingerprint Table of Rta-Average Wet Weight of Planting

SK	Db	JK	KT	Fhit	Ftabel 5%	Ftabel 1%
Group	2	245,702	122,851	10,407 **	3,36	6,23
Combination of Treatments	8	1461,913	182,739	15,481 **	2,59	3,89
K	2	870,630	435,315	36,878 **	3,36	6,23
N	2	423,456	211,728	17,937 **	3,36	6,23
KN	4	167,827	41,957	3,554 *	3,01	4,77
Error	16	188,867	11,804			
Total	26	1896,482				

Remarks: Ns Have No Effect, * Real Influence, ** Very Real Influence

Table 2. Average Wet Weight of Planting Effect of Cow Manure (K) and NPK Compound Fertilizer (N) at the Time of Harvest Age 55 HST with DMRT Comparative Test of 5%

Combination of Treatments	Average Dry Weight of Crops At the time of harvest age 55 hst (gram)	
K1N1	58,58	a
K1N2	62,28	ab
K1N3	65,87	BC
K2N1	63,67	abc
K2N2	66,22	c
K2N3	67,38	c
K3N1	65,99	bC
K3N2	77,10	d
K3N3	83,88	e

Remarks: Numbers Accompanied by the Same Letter on the Same Column Show no Significant Difference in Results on the 5% DMRT Test

Dry Weight of Planting

Based on the results of the variegated analysis (Table 3), the variable of observation of dry weight of Kale plants showed an interaction between the combination treatment of cow manure (K) and NPK compound fertilizer (N) at the age of 55 hst and showed a significant increase in dry weight of the crop.

Table 3. Fingerprint Table of Rta-Average Wet Weight of Planting

SK	Db	JK	KT	Fhit	Ftabel 5%	Ftabel 1%
Group	2	11,053	5,527	11,933 **	3,36	6,23
Combination of Treatments	8	57,953	7,244	15,642 **	2,59	3,89
K	2	31,324	15,662	33,819 **	3,36	6,23
N	2	20,086	10,043	21,685 **	3,36	6,23
KN	4	6,543	1,636	3,532 *	3,01	4,77
Error	16	7,410	0,463			
Total	26	76,416				

Remarks: Ns Have No Effect, * Real Influence, ** Very Real Influence

Table 4. Average Dry Weight of Crops Affected by Cow Manure (K) and NPK Compound Fertilizer (N) at the Time of Harvest at the Age of 55 HST with a DMRT Comparative Test of 5%

Combination of Treatments	Average Dry Weight of Crops At the time of harvest age 55 hst (gram)
K1N1	11,72 a
K1N2	12,46 ab
K1N3	13,72 b
K2N1	12,73 ab
K2N2	13,24 b
K2N3	13,48 b
K3N1	13,20 b
K3N2	15,42 c
K3N3	16,78 d

Remarks: Numbers Accompanied by the Same Letter on the Same Column Show no Significant Difference in Results on the 5% DMRT Test

DISCUSSION

Table 2 shows that the average wet weight of Kale crop planting is highest produced by the combination of 40 Tons/Ha Cow Manure Dose and 500 Kg/Ha NPK Compound Fertilizer (K3N3) and is significantly different from other treatment combinations, the result is 83.88 grams per crop or 20.97 Tons/Ha. The wet-weight yield of the K3N3 combination treatment showed an increase in the production of weight of kale crops, This is because cow manure can increase fertility and soil structure, especially in the root area of Kale plants, thereby affecting the absorption of macronutrients provided through fertilization with NPK compound fertilizer. Nitrogen plays an important role for plants in the translocation of photosynthetic results in the form of carbohydrates and water to all plants so it affects the plant growth process (Pangestu et al., 2020). The nutrients N, P, and K contained in cow manure and NPK compound fertilizer applied to the planting medium can be optimally absorbed by plant roots, thus affecting the wet weight produced by plants. Table 4 shows that the average dry weight of Kale crops is highest produced by the combination of 40 Tons/Ha Cow Manure Dose and 500 Kg/Ha NPK Compound Fertilizer (K3N3) and is significantly different from other treatment combinations, the result is 16.78 grams per crop. The combination treatment of K3N3 showed that it could increase the dry-weight production of kale crops.

The dry weight of the crop is an indicator of plant growth which is the result of plant photosynthesis. The photosynthesis process that occurs in the leaves produces photosynthetics which are then translocated to plant parts, namely stems, roots, and leaves. The number of leaves of the Kale plant is one of the indicators of plant growth. The growth of the number of leaves is a form of cell division and enlargement process from plant photosynthesis. The results of the photosynth in Kale plants are used for the growth of various plant organs, one of which is increasing the number of leaves. The combination of cow manure and NPK compound fertilizer had a real effect on the variable of observing the dry weight of Kale crop planting

CONCLUSIONS

Based on the results of the research on the Increasing Production of Kale Plants (Brassica oleraceae var. Acephala) with a combination of Cow Manure and NPK Compound Fertilizer treatment can be concluded that:

1. There was an interaction of the combination of cow manure (K) dose treatment and NPK compound fertilizer dose (N) on the observation variables of Wet Weight of Crops and Dry Soil of Kale Crops.
2. There was a binding of wet weight and dry weight of the crop produced by the combination of 40 Tons/Ha Cow Manure Dose and 500 Kg/Ha NPK Compound Fertilizer (K3N3) and was significantly different from other treatment combinations.

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