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Kajian Pengaruh Dosis Pupuk Majemuk Npk Terhadap Pertumbuhan Dan Hasil Tanaman Kunyit (Curcuma Zedoaria)

Study The Effect Fertilizer Of Dosage Npk Compound Growth And Yield Turmeric (Curcuma Zedoaria)

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Abstract: *Turmeric (Curcuma zedoaria) is one of rhizome herbal plant (phytopharmaca) from genus of Zingiberaceae. Rhizome is used to precursor of traditional medicine. This resarch was conducted in Jatirejoyoso, Kepanjen subdistrct, Malang Town, above sea level in 5 months. Since January up to Mey 2015. The objective of this research to determine the optimum dosage so that get maximum growth and yield both quantity and quality. The hypothesis is the optimum dosage is among seven level of NPK dosage that researched. The tools was used are polybag with diameter 30 cm, SPAD meter, spectrophotometer, vessel, analitic balance, measurement, hoe , watering can, and camera. The materials was used are seed of Java Turmeric 10 kg plant medium that silt loam texture per polybag and Urea fertilizer with 5 level (0, 50, 100, 150, 200 kg ha^{1} tahun^{-1}). This research was designed by randomized block design. The data showed that the seven level of nitrogen is significant influence the growth and yield*

Keyword : *Turmeric. Compound Fertilizer, NPK.*

I. Introduction

Turmeric (Curcuma zedoaria) is a rhizomatous herbal plant (phytopharmaca) from genus of Zingiberaceae. The rhizome is widely used as an ingredient in traditional medicine. Dried rhizomes in several medicinal forms are easily found in pharmacies (Widaryanto, 2008). Turmeric is one of the national superior herbal medicines that has many uses as quality herbal medicine ingredients which shows some potential for further development (Deptan, 2007). Turmeric, fresh or dried, has been clinically proven showing antioxidant activity, anti hepatotoxic, antihypertensive effect, increasing bile secretion, diluting cholesterol, stimulating milk secretion (galactagoge), anti bacterial, reducing liver and biliary disorders, as tonic for post- birth mother, food coloring and fabrics, as well as cosmetic ingredients. Turmeric has chemical composition of 10% curcumin, 1-5% bisdemethoxycurcumin and other beneficial substances such essential oils that consists of sesquiterpene ketones, turmeron, 60% tumeon, 25% zingiberen, felandren, sabinen, borneol and sineil. Turmeric also contain as much as 1-3% fat, 3% carbohydrates, 30% Protein, 8% starch, 45-55% vitamin C, and mineral salts, namely iron, phosphorus, and calcium. Increasing the available nutrients can be done through fertilization. Fertilization is conducted to fulfil plant requirement for compound nutrients (NPK) which are the most macro nutrients absorbed by the plant rhizomes (Kandiannan, 1996). This is due to the fact that those compound nutrients are the components of important organic substances in the plant (proteins, enzymes, vitamin B complex, hormones, nucleic acids, and chlorophyll). The provision of nutrient compound (NPK) for the plant will encourage the growth of organs related to photosynthesis. It should not be lack or excessive because it will lead to a decrease in crop production. Current constraint for turmeric cultivation includes its status as a secondary crop (side crop) whereof farmers rarely cultivated the plant intensively and the cultivation practice itself is not in accordance with the GAP (Good Agriculture Practice), especially in terms of fertilization. Turmuric production is the lowest (7.79%) if compared to that of other important herbaceous rhizomes (Director General of Horticulture, 2010). Therefore, research is needed to obtain the recommendations of optimum dosage provision for compound nutrients that allowing maximum growth and yield in both quantity and quality so as to meet production targets.

II. Materials And Method

Research was conducted at the Jatirejoyoso in District of Kepanjen Malang Region at the altitude of 300 m above sea level. Soil nutrient analysis was done at the Laboratory of Chemistry and Soil Physics Faculty of Agriculture Brawijaya University. Plant tissue analysis was carried out in the Laboratory of Plant Physiology, Faculty of Agriculture Brawijaya University. The experiment was conducted from January to May 2012 on a 6.15m x 10m field. Several tools used were 30cm-polybags, SPAD meter spectrophotometer, analytical balance, tape measure, hoes, drill, watering can and camera. Materials used are turmeric, dusty loam textured planting medium, NPK compound fertilizer. This study was designed using a simple randomized block design (RBD) consisting of 5 levels of treatment dose. Observations by crop harvesting were done at the age of 4 and 5 months after planting.

The number of plants taken was 3 plants. Doses used for compound fertilizer (NPK) were 0, 50, 100, 150, 200 kg ha-1.

III. Result And Discussion

Results of analysis of variance showed that the levels of NPK fertilizer significantly influenced the length of turmeric plants in all age observations. The average of turmeric plant growth parameters are presented in Table 1

Table 1. Average of Turmeric growth parameters 16 weeks after planting (wap) .

Dosis NPK	Panjang Tanaman	Jumlah Daun	Luas Daun	Klorfil a	Klorofil b	Klorofil Total
M_1 (0 kg N ha^{-1})	76,14 a	5,83	458,50 a	0,45 a	0,25 a	0,70 a
M_2 (50 kg N ha^{-1})	75,75 b	7,58	543,75 ab	0,74 b	0,36 ab	1,09 ab
M_3 (100 kg N ha^{-1})	87,61 bc	8,25	554,91b	0,97 c	0,44 bc	1,41 bc
M_4 (150 kg N ha^{-1})	78,42 bc	8,08	559,12b	1,09 cd	0,49 bcd	1,57 bcd
M_5 (200 kg N ha^{-1})	89,23 bc	7,78	597,58b	1,18 d	0,53 cd	1,70 cd
BNT 5 %	10,215	tn	96,321	0,42	0,16	0,58
KK (%)	6,600	14,505	11,606	23,07	19,24	21,89

Remark: Values followed by the same letter are not significantly different at P= .05 LSD level

Based on Table 1, applying 200 kg NPK ha-1 could produce higher values of plant length than any other treatments in every observation age. Results of analysis of Variance showed that the levels of NPK fertilizer had no significant effect on the number of leaves At all ages of observations though it increased as the age increased. The average numbers of leaves of turmeric plants are presented in Table 1. The result analysis also showed that the level of compound NPK fertilizer influenced the leaf area significantly at various ages of observations. The average values of leaf area are

Presented in Table 1 which indicating that giving 200 kg NPK ha-1 produced higher leaf area than other treatments at any age observations. Applying 200 kg NPK ha-1 increased leaf area to 47.44% more than treatment without fertilizer when observed on 16 wap. Provision of 200 kg NPK ha-1 on 16 wap was significantly different from both treatments without fertilizer and provision of 100-150 kg NPK ha-1, but not significantly different from the provision of 200 kg NPK ha-1 at the age of 4 wap. Treatment of 200 kg NPK ha-1 was significantly different from those without fertilizer and provision of 50-150 kg NPK ha-1, but not significantly different from the application of 150 and 200 kg NPK ha-1 at the age of 8 wap. of analysis of variance showed that the levels of NPK fertilizer had a significant effect on total leaf chlorophyll of turmeric in various age observations. The average values of turmeric leaf total chlorophyll are presented in Table 1.

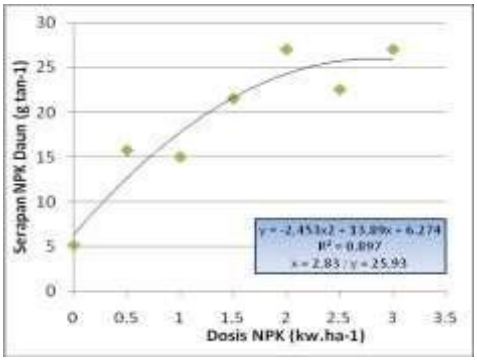

Figure (1). Relationship between leaf absorption at different doses of NPK and doses of NPK at the age of 16 wap.

Stover weight of turmeric

Table 2. Average rhizome fresh weight and dry weight and stover weight on different doses of NPK at different age of observations (wap).

Dosis NPK	Rimpang Basah	Rimpang Kering*	Brangkasan Basah Total	Brangkasan Kering Total*
M_1 (0 kg N ha^{-1})	49,64 a	8.82 a	132,45 a	17,37 a
M_2 (50 kg N ha^{-1})	102,20 ab	15.93b	243,11 ab	39,49 b
M_3 (100 kg N ha^{-1})	105,45 abc	17.40b	276,68 b	33,00 b
M_4 (150 kg N ha^{-1})	126,40 bc	18.67 b	280,55 bc	36,44 b
M_5 (200 kg N ha^{-1})	125,50 bc	17.47b	315,80 bc	39,98 b
BNT 5 %	47,50		80,18	
KK (%)	28,340	9,572	18,835	6,620

Remark: Values followed by the same letter are not significantly different at P= .05 LSD level. * = data analyzed after transformed to Log (x)

Results of analysis of variance showed that the levels of NPK fertilizer had a significant effect on weight of turmeric stover at various ages of observation.The average values of stover fresh and dry weight in each treatment are presented in Table 2. Based on Table 2, application of 200 kg NPK ha - 1 gave higher results on fresh and dry total weight of stover than other treatments. Application of 200 kg NPK ha - 1 resulted in fresh and dry total weight of stover that were significantly different from treatment without fertilizer and treatment with dose of 50-100 kg ha - 1 NPK; those results were not significantly different from the administration of 150-200 kg NPK ha - 1.

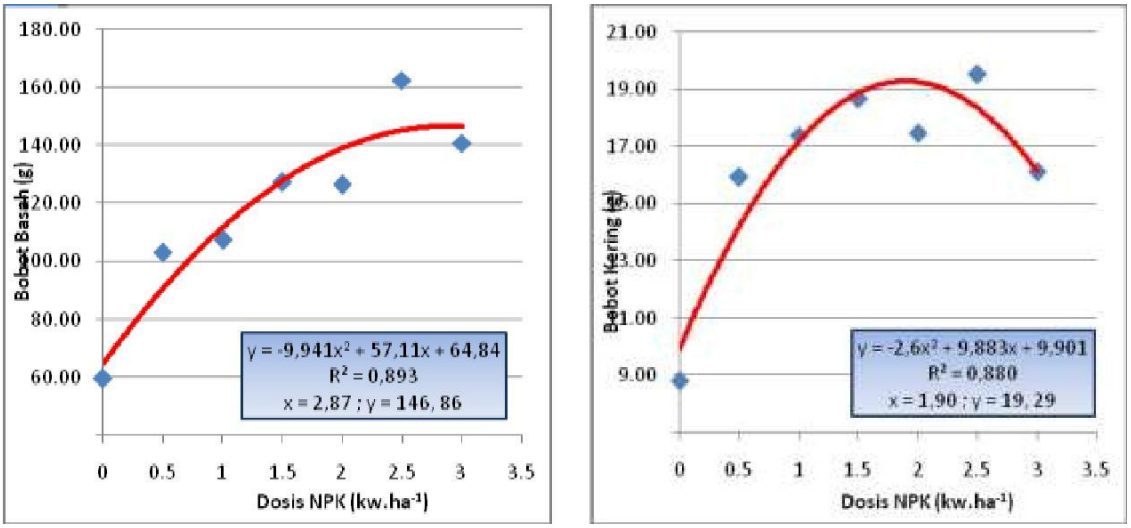

Figure (2). Relationship between application of different doses of NPK and fresh turmeric stover weight on 16 wap. (3) Relationship between application of different doses of NPK and dry turmeric stover weight on 16 wap.

Application of several doses of NPK (0-200 kg NPK ha - 1) had significant effect on the components of growth including the length of plants, leaf area and chlorophyll content of leaves and yield components, hence, it requires the optimum dose to obtain maximum growth and yield.

NPK requirement for increasing plant length is high in the beginning stage that then become lower when it reaches the age of 16 wap. Turmeric plants efficiently absorb a dose of 150 kg NPK ha - 1 at the age of 6-8 wap, but when entering the age of 10-16 wap, the absorption decreased to 100 kg NPK ha - 1 (Table 1). This happens because the NPK absorption is the highest at the beginning of growth. When the vegetative period ends, the absorption of nutrients will be reduced. This is consistent with the statement of Kandiananan et al (1996) that high demand of nitrogen takes place during the vegetative growth period. Increased nitrogen levels had a significant effect on the length of turmeric plant (Akamine et al . , 2007; Haque , 2007). Plant length is closely related to the development of leaf area which indicates that the length of the plant supports the development of leaf area. NPK application will encourage the growth of organs associated with photosynthesis which is the leaves.

Plant that gets sufficient supply of NPK will form broad leaves with high chlorophyll content, so that the plant is able to produce sufficient amounts of carbohydrates to promote vegetative growth. NPK application showed significant effect on leaf area. NPK nutrients can be absorbed efficiently at a dose of 200 kg NPK ha - 1 so that the leaf area increased at the age of observation 8-10 wap. As with the length of the plant, at the age of 12 wap NPK requirement declined which also happened on the age of 14 -16 wap that indicated NPK requirement decreased to 50 kg NPK ha - 1 (Table 3). Thus, if the plant length is high then the plant leaf area would also high. For determine the optimum dose to achieve maximum leaf area.

Increasing the number of leaves will influence leaf area. Although until age up to 16 wap, Number of leaves increased, they began senescence after that period. According to Ferry et al. (2009) in tissue culture research of temulawak (Javanese ginger) on medium with paclobutrasol, the results showed that The number of leaves did not differ up to 7 months. It is because the number of leaves of temulawak that is largely determined by genetic traits and little influenced by the environment. The maximum leaf area can affect the content of chlorophyll a, b and chlorophyll total on turmeric leaves because the close relationship between the broad leaves with those chlorophyll.

Measurement on the relative content of chlorophyll can be done to find out NPK contained in the plant (Francies and Piekielek , 2000). At the age of 6-14 wap, chlorophyll content continued to increase and then decreased at the age of 16 wap because chlorophyll was used for photosynthesis. In early stage of leaf development, photosynthetic ability increases but then begins to fall. The senescence leaves turn yellow and lost the ability to photosynthesize because of an overhaul of chlorophyll and loss of function of chloroplasts (Lakitan , 1993). Thus, at the age of 16 wap old leaves start yellowing due to senescence.

IV. Conclusion And Recommendation

Conclusion:

1. Application of a dose of NPK gives significant effect on the growth and yield of Turmeric
2. Rhizome maximum results on the weight of fresh and dry weight of the rhizomes were generated by optimum dose of 200 kg NPK ha – 1 which increased the fresh weight and dry weight to 154.70 % and 78.07% respectively compare to those of treatment without fertilizer
3. Application of NPK compound fertilizer has no significant effect on the production of starch though there is close relationship between the fresh weight of rhizomes with starch production

Suggestion :

1. In order to obtain maximum results of turmeric rhizome, the addition of NPK Compound fertilizers can be done .
2. Planting turmeric should be done at the beginning of the rainy season to get maximum growth
3. Further research needs to be done to know the influence of application of NPK compound fertilizer on the growth of turmeric plants

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