

Effect Of Phosphate Fertilizer Application And Cow Manure On The Growth And Yield Of Edamame (*Glycine Max L. Merril*)

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Abstract: Limited P availability in the soil is caused by the low solubility and absorption of P components, particularly in soils with low organic matter content. The purpose of this study is to investigate how phosphate fertilizer and cow dung fertilizer affect the yields of edamame crops. Between July and October of 2024, this study was carried out in Kaliurang Village, Jember, which is 146 meters above sea level and has an average temperature of 24 to 32 degrees Celsius (8o09'29.2"S 113o44'21.0"E). A Factorial RAK with two factors and three replications was used to design this experiment. There were three levels of phosphate fertilizer treatments: 1.7 g/plant, 2 g/plant, and 2.3 g/plant. Three levels of cow dung fertilizer treatment are available: 2 kg/plot, 4 kg/plot, and 6 kg/plot. Variables of observation, namely 2 kg/plot, 4 kg/plot, and 6 kg/plot. Observation variables included plant height, number of fertile nodes, number of pods per sample, pod weight per sample, and dry biomass weight. The results showed that the treatment interaction of 2,3 g phosphate fertilizer/plant and 6 kg cow dung fertilizer/plot had a significantly different effect in the dry biomass weight variable per sample (18,13 g). This is suspected to increase the availability of P in the root media, as the absorption of P by organic fertilizers also increases. Treatment of 2,3 g/plant of phosphate fertilizer had a significantly different effect on pod weight per sample (50,70 g). This is suspected to increase the availability of P in the root media, as the absorption of P by organic fertilizers also increases.

Keywords: Edamame, Phosphate fertilizer, Cow manure.

1. Introduction

Edamame is Jember's leading commodity. It was recorded that in 2019 edamame exports from Indonesia amounted to 6,790.7 tons. Of the total exports, 4,528.82 tons came from Jember (Ministry of Agriculture, 2019). The United States requested the export of edamame as much as 7,000 tons/year and Japan 100,000 tons/year to Indonesia. Meanwhile, Indonesia is only able to meet 3% of Japan's market needs, so that 97% of Japan's market needs are met by China and Taiwan (Setiawati et al., 2017). Based on this data, farmers need efforts to optimize edamame cultivation in order to get increased yields with the best quality that is able to meet export quality standards.

A common thing that is often done by the community, especially in agriculture, is to provide nutrients into the soil through the application of organic fertilizers. In line with the opinion of Surya (2019) that the effort that needs to be made for appropriate management is to add organic matter through fertilization to the soil. Another factor in

increasing the yield of soybean edamame is by adding nutrients needed by the plant according to the recommended dosage for each type of plant. The nutrient phosphate (SP36) is very useful for stimulating new roots from young plant seeds.

Element P in soil is very low availability. At pH the acid is bound by the elements Fe and Al while at the pH the base is bound by the elements Ca and Mg. The low solubility of the element P and its giraffe results in the limited availability of P in the soil. In addition, the availability of P in the soil has low organic matter. This is due to the leaching process. With the addition of organic matter, namely cow manure, it can increase P absorption at the roots so that production can increase. Based on the above background, it is necessary to conduct research on the effect of the application of phosphate fertilizer and cow manure fertilizer on the growth and yield of edamame plants.

2. Materials and Methods

The tools needed in this study include: stationery, roll meter, digital scale, kenco, bamboo, timba, knapsack sprayer, scissors, hoe, sickle, gembor, raffia rope, sack, and camera. The materials needed in this study are: edamame seeds of the Biomax – 1 variety, straw mulch, label boards, phosphate fertilizer (SP36), cow manure, Urea fertilizer 150 kg/ha, KCL fertilizer 50 kg/ha, and Phonska fertilizer 100 kg/ha.

The research design used was a Factorial Group Random Design (RAKF), the factors used were phosphate fertilizer (F) 3 levels and cow manure fertilizer (S) 3 levels, with 9 treatment combinations and 3 repeats so that 27 experimental units were obtained. The number of repetitions is determined using the formula $(t-1)(r-1) \geq 15$ with the following treatment:

1. The first factor is that the dosage of Phosphate Fertilizer (SP36) consists of 3 levels:
F1 : 250 kg/ha or 1.7 g/plant
F2 : 300 kg/ha or 2 g/plant
F3 : 350 kg/ha or 2.3 g/plant
2. The second factor is that the dosage of Cow Manure Fertilizer consists of 3 levels:
S1 : 10 tons/ha or 2 kg/plot
S2 : 20 tons/ha or 4 kg/plot
S3 : 30 tons/ha or 6 kg/plot

3. Results and Discussion

No	Observation Variables	F Count		
		F x S	F	S
1.	Plant Height 14 Days after planting	0,57 ^{ns}	0,97 ^{ns}	0,82 ^{ns}
2.	Plant Height 21 Days after planting	0,39 ^{ns}	0,48 ^{ns}	0,45 ^{ns}
3.	Plant Height 28 Days after planting	0,44 ^{ns}	1,02 ^{ns}	0,18 ^{ns}
4.	Number of Fertile Books	0,46 ^{ns}	1,58 ^{ns}	0,71 ^{ns}
5.	Number of pods per sample	0,83 ^{ns}	1,94 ^{ns}	0,30 ^{ns}
6.	Pod Weight Per Sample	1,02 ^{ns}	3,70*	0,27 ^{ns}
7.	Dry Biomass Weight Per Sample	4,74*	1,92 ^{ns}	2,28 ^{ns}

In the observation variable of pod weight per sample, the results were significantly different in the treatment of phosphate fertilizer so that DMRT was further tested at the level of 5%. It is suspected that during the application of nutrient P, the nutrient decomposes quickly and makes it easier for the roots to absorb the available nutrient P. The application of phosphorus fertilizer is needed by plants because it is a macronutrient fertilizer. The nutrient content of phosphorus plays a very important role in stimulating root growth and development and can accelerate fertilization in plants. This is in

accordance with the opinion (Anwar, 2016) that the application of phosphate elements to plants will be able to produce more pods and increase the percentage of flower growth into fruits and seeds.

In the variable observation of dry biomass weight, the results were significantly different in the treatment combination, so DMRT was further tested at a level of 5%. This is due to the efficiency of nutrients that support each other. Phosphate fertilizer provides phosphorus (P) which is an essential nutrient for plants to support root growth, flower formation, and pod or seed filling. Meanwhile, cow manure is not only a source of macronutrients such as nitrogen, potassium, and phosphorus, but also increases the activity of soil microorganisms which helps phosphorus be more available to plants. This is in line with the statement of Manasikana (2019), the lack of optimal plant growth is suspected that the nutrients needed are not adequately met, especially the N nutrients.

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