STUDY ON THE USE OF ANORGANIC FERTILIZER FOR IMPROVING CASSAVA (*Manihot esculenta*) PRODUCTIVITY IN AGROFORESTRY SYSTEM AT GUNUNG WALAT EDUCATION FOREST

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Abstract

Previous study showed that agroforestry site in Gunung Walat had soils that were not so fertile and comprise areas that were covered and those not covered with tree crown. Cassava is the most plant planted by the farmer under the Aghatis trees. The Cassava productivity up to now be not satisfied due to no fertilizer input was carried out.

The objective of this study was to learn the effectiveness of an organic fertilizer in increasing the growth of Cassava in Gunung Walat. Four different level dosages were used as follow : Control, Dosage 1 Urea 7.5 g + SP 36 2.5 g + KCL 5 g , Dosage 2 Urea 15 g + SP 36 5 g + KCL 10 g, Dosage 3 Urea 22.5 g + SP 36 7.5 g + KCL 15 g. Research results showed that the use of fertilizer could significantly increase height of the plant, the number of the Tuber and the weight of the Tuber as compare to the control .

Key words: agroforestry, productivity, anorganic fertilizer

Introduction

Gunung Walat is an educational forest managed by Faculty of Forestry Bogor Agricultural University. Since past ten years ago Agroforesty was developed in order to maximize the land productivity. In addition, Gunung Walat Education Forest was surrounded by village with majority habitat populations were poor farmer. In line with Poverty alleviation programmed, various plants were selected as Agroforestry plant. *Cassava (Manihot esculenta)* is one of the plant that have been planted by the

farmer at Agroforestry site. The reason of choice of this plant was due to its easy for growing and there is no problem in term of product marketing so it's economically important for increasing farmer income.

Now days the farmer processes the cassava by own self to different kind of product like Cassava chips, tapioca and other product. Consequently they need many raw material for continuation the product. Unfortunately the productivity of Cassava were very low due to the Agroforestry site in Gunung Walat had soils not so fertile as shown in previous study. The application of an organic fertilizer should be attempted in order to increase the productivity of the plants.

The objective of this study was to learn the effectiveness of an organic fertilizer in increasing the growth Cassava productivity in Gunung Walat Educational Forest.

Materials and Methods

Study site

Gunung Walat Educational Forests lies geographically between south latitudes of 6° 53' 35" and 6°55' 10", and between east longitudes of 106° 67' 50" and 106°51' 30", with an annual mean temperature range of 22 ^{0}C – 30 ^{0}Cand annual rain fall range of 1600 – 4400 mm. The soils are Latosol red yellow, followed by Latosol brown and Podsolic red yellow which are low in organic matter content and nutrient availability.

Preparation of study site and Planting

The areas of 0.25 ha were cleared by removing the grass and shrub. The clearance of the site was done manually. The areas then divided by four each 625 m^2. The Cassava cutting around 30 cm long was then planted with the spacing of 50 cm x 50 cm.

Experimental design

Random Complete Design was used for this experiment. One week after planting, the plant was then fertilized by different level dosages as following : Control, Dosage 1 Urea 7.5 g + SP 36 2.5 g + KCL 5 g , Dosage 2 Urea 15 g + SP 36 5 g + KCL 10 g, Dosage 3 Urea 22.5 g + SP 36 7.5 g + KCL 15 g, Plant height, tuber number and tuber weight was

recorded after 6 months of planting. For statistical analysis purpose, 15 replicate was taken randomly per treatment and recorded. The data obtained were subjected to Analysis of Variance and Duncan range test.

Results

Plant Height, Tuber number and height

The plant height, tuber numbers and its weight 6 months after planting were recorded and statistical analyzed. Results of Analysis of Variance showed that there were significantly difference between treatments in terms of all variables recorded **(Table 1).**

Table 1 Plant height, number of tuber and tuber weight of Cassava after 6 month of planting

Treatments	N	Height (cm) Average	Tuber Number/plant in Average	Tuber Weight/Plant in Average (g)	% of increase compared to control		
					Height	Tuber Number/ plant	Tuber Weight/ Plant
Control	15	161,46a*	1,5a	94a			
Dosage 1	15	203,3b	3.53b	202,86b	25,9	135,3	115,53
Dosage 2	15	226,5b	3,87b	269,73c	40,28	158	186,95
Dosage 3	15	249,8c	4,2	316,13d	54,71	180	236,31

*Numbers followed by the same letter in the same rows are not significantly different

Plant Height

The plant height recorded after 6 months of planting were shown in **Figure 1.**

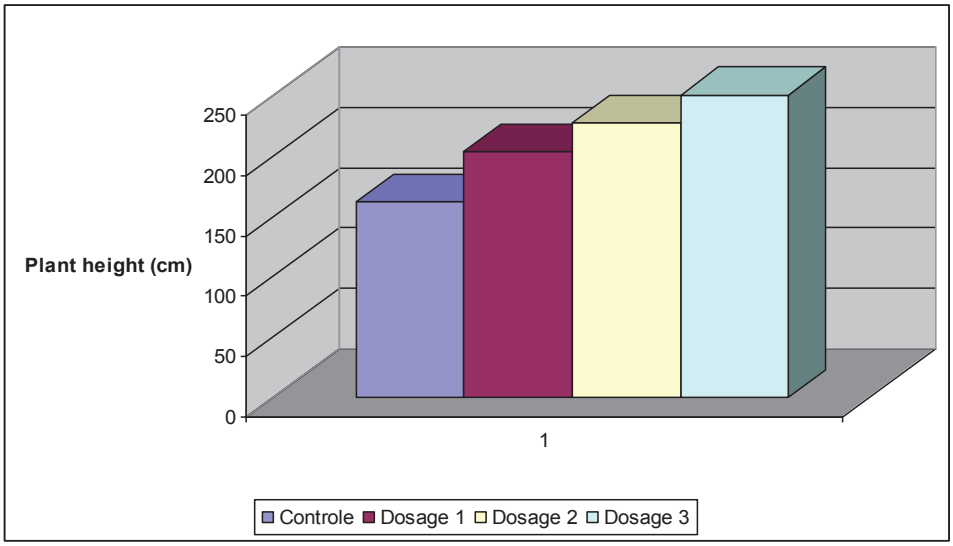

Figure 1 Effects of fertilizers dosages to the plant height after 6 months of planting

Based on the statistical analysis there were significance different to the plant height. The treatments by dosage 1, 2 and 3 could increase plant height by 25.9 %, 40.28 % and 57.71 % respectively.

Tuber number

The average of tuber number per plant after 6 month of planting was presented in **Figure 2.**

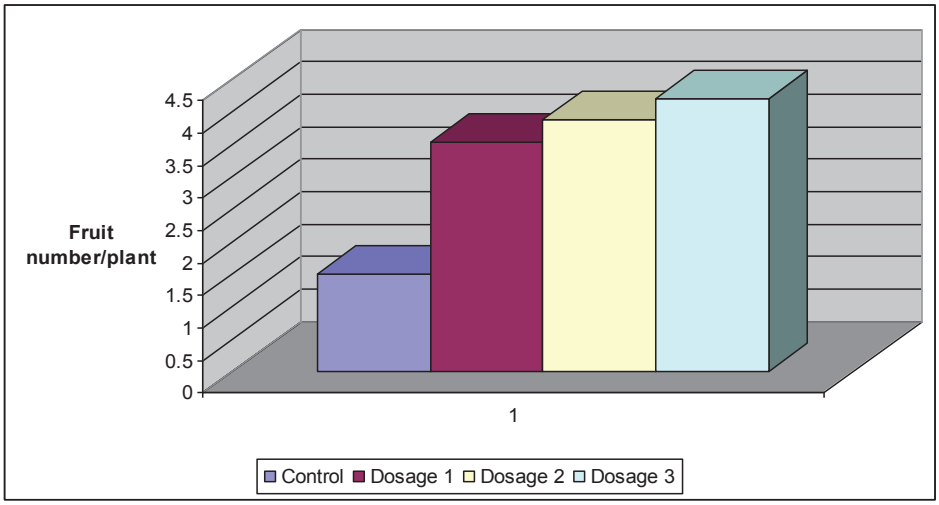

Figure 2 Effects of fertilizer dosages to the tuber number after 6 month of planting

Average tuber number at 6 month after planting for treatments of control, dosage 1, dosages 2, dosage 3 were consecutively 1.5, 3.53, 3.8, and 4.2. Statistical analysis showed the significant different among the treatment. There were significantly increase the tuber number per plant as compare to the control that the treatment by dosage 3 gave the best result with increased by 180 % as compared to the control. The number of tuber per plant is presented in **Figure 3**.

Figure 3 Tuber number per plant (A) Control (B) Fertilization

Tuber Weight

The average of tuber weight per plant after 6 month of planting was presented in **Figure 4.**

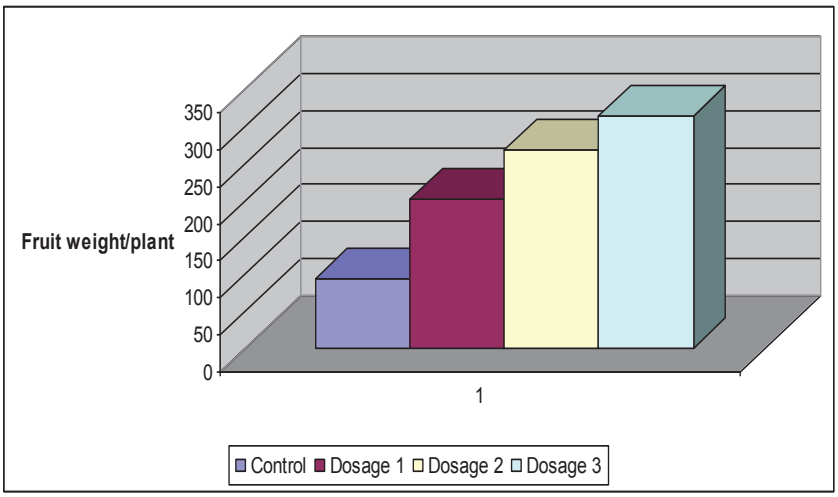

Figure 4 Effects of fertilizer dosages to the tuber weight after 6 month of planting

The increasing fertilizer dosage consecutively increasing the weight of the tuber produced per plant and significantly different to the control. The dosage 1, 2 and 3 could increase the tuber weight by 115. 53 %; 186. 95 % and 236. 31 % respectively.

Discussion

As shown in Table 1, the fertilization could increasing the plant height, tuber number and tuber weight. Increasing fertilizer dosage by 2 and 3 times could increase the tuber weight by 186.95 % and 236.31 % respectively, this data indicate that the nutrient of N, P and K in the site may improved by fertilization. According to Etherington, (1976) plants require sixteen essential elements and the absence of any one of these will cause failure. Three of the elements, C,H, and O which are the constituent of the structural and primary energy storage compounds, are not usually described as nutrients (). The remaining thirteen elements are subdivided into the macronutrients, N,P,K,S,Ca and Mg which are required in comparatively large amounts, and the micronutrients, Cu, Zn, B, Cl, Mo, Mn and Fe which are required in smaller amounts.

Among essential elements N, P and K are required in more large quantity than the other due to not only their physiological function in the plant but also the availability in the soil is limited, therefore, it's important to give fertilizers to the plant. Physiologically the function of Nitrogen in the plant is its presence in the structure of the protein structure and is found in such important molecule as purines, pyrimidines, porphyrins and coenzyme, which are all very important to the cell division and enlargements (Devlin and Witham, 1983). Phosphorus is present in the soil in two general form, organic and inorganic. According to present-day knowledge, plants do not absorb organic phosphorous. The availability of inorganic P is dependent on the pH of the soil solution. In acid soil, in organic P will be fixed by other element and become not available. The soil pH in this experiment is 5, it may be the not all the fertilizer added can be absorbed by the plant.

The spacing used in this experiment is 50 cm x 50 cm it means that there are 20.000 plant per ha. In assumption that the effective area planted by 16.000 plant per ha, the Cassava production without fertilization equal to 1,504 kg per ha, while by fertilization dosage 1, 2 and 3 could produced 3, 245,76 kg, 4,315,68 kg and 5,058,08 kg/ha respectively.

Normally the farmer would harvest the Cassava after 12 months of planting, its means that the Cassava production treated by fertilizer dosage 1, 2 and 3 would contribute twice.

Conclusion

Results of this research conclude the following: (1) The fertilizer dosages significantly different increased plant height, tuber number per plant and tuber weight. (2). The dosage 1 and 2 and 3 significantly different as compare to the control and give contribution for increasing tuber weight by 115,53 %, 186,95 % and 236,31 % respectively after 6 month of planting. (3) The production per ha indicate that the dosage 1, 2 and 3 contribute 3, 245,76 kg, 4,315,68 kg and 5,058,08 kg, while the control just contribute 1,504 kg per ha.

References

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