The Ist International Conference On Indigenous Knowledge For Sustainable Agriculture 2022
ISBN : 978-623-331-387-2

Effect of Liquid Organic Fertilizer Banana Peel on Vegetative Growth of Long Bean (*Vigna sinensis* L.) in Marginal Soils of North Kalimantan

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ABSTRACT

Long beans are one of the plants that grow all over the land in Indonesia, including North Kalimantan Province. The growth of long beans is not good because North Kalimantan is a marginal land. Low nutrient content makes long bean growth less than optimal. One way to increase the growth of long beans is to use liquid organic fertilizer of banana peels. Banana peel contains nutrients needed for the growth of long beans. This study aims to determine effect of liquid organic fertilizer banana peel on vegetative growth of long bean in marginal soils of North Kalimantan. The research was conducted in 2022 at the research garden of the University of Borneo Tarakan. This study used a non factorial randomized block design with 5 treatments and 5 replications. P(0) = Control, P(1) = 10 ml/plant, P(2) = 20 ml/plant, P(3) = 40 ml/plant and P(4) = 80 ml/plant. Research parameters is plant height, number of leaves and leaf width. The data analysis used is ANOVA, if there are data that are significantly different, then proceed with the DMRT test. The results showed that the 80 ml/plant liquid organic fertilizer banana peel treatment gave the best effect on plant height, number of leaves, and leaf width of long bean vegetative growth.

Keywords:

Banana peel, Liquid Organic Fertilizer, Long Bean, Vegetative Growth

INTRODUCTION

Long beans (*Vigna sinensis* L.) is a type of vegetable that is popular in Indonesia. In addition to its delicious taste, long beans also contain a variety of nutrients so they are very good for health and can fertilize the soil [1].

Production of long beans in Indonesia has decreased every year. Several regions in Indonesia, including in North Kalimantan, also have difficulties in cultivating long bean plants due to factors that do not support the growth of long bean plants [2]. Factors such as soil conditions in North Kalimantan with marginal soil categories that have limited nutrient content and extreme climatic conditions [3].

One of the efforts that can be used for the growth and production of long bean plants is to use liquid organic fertilizer from banana peels [4]. Liquid organic fertilizer from banana peels is a useful waste for plant growth because it contains macro elements such as nitrogen, phosphorus and potassium [5]. The largest nutrient content in the

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nutrient is phosphorus. Phosphorus has a function in the enlargement of plant cells so that the vegetative growth of plants will be good [6]. According [7] to giving of liquid organic fertilizer banana peels on *Brassica juncea*, the best treatment was giving 65 ml/plant on observations of plant height, number of leaves and plant weight of *Brassica juncea*. Strengthened by [8] the application of liquid organic fertilizer on *Ipomea reptans*, the best treatment was giving 60 ml/plant on observations of plant height, number of leaves and weight of *Ipomea reptans*.

Based on the results of previous studies, a research was conducted on the effect of liquid organic fertilizer on banana peels on the vegetative growth of long bean plants in marginal soils of North Kalimantan.

METHOD

The study was conducted March 2022 in the experimental garden of the University of Borneo Tarakan. The tools used are stationery, label paper, ruler, digital scale, hoe, measuring cup, camera, bucket, scissors, and machete. The materials used are long bean plant seeds, chicken manure, banana peel waste, and water. The study used a non-factorial Randomized Block Design (RAK) with 5 treatments and 5 replications. The treatment factor was the type of organic fertilizer consisting of P(0) = Control, P(1) = 10 g/plant, P(2) = 20 g/plant, P(3) = 40 g/plant and P(4) = 80 g/plant. Each plant treatment observed as many as 6 plants and the total plants were 150 plants

The research stages started from cleaning weeds in the research area then the soil was processed to form soil block using a hoe. The soil block were made of 25 soil block with a size of 1 m × 2 m each. The soil was given basic chicken manure fertilizer at a dose of 100 g/plant, then 3 seeds of long bean were added to each planting hole with a spacing of 40 cm × 50 cm. After the long bean plant was 14 DAP, one of the plants with the best growth was chosen to be used as the research sample plant. Watering is done when there is no rain and weeding is done once a week. Provision of organic fertilizer for banana peel was given when the plants were 14 DAP, 21 DAP, 28 DAP and 35 DAP according to the treatment dose.

Parameters observed were plant height, number of leaves, and leaf width. Analysis of the data using the analysis of ANOVA with a level of 95% and if there is a significant difference, it will be continued with the Duncan Multiple Range Test (DMRT) with a confidence level of 5%.

RESULT AND DISCUSSION

Based on the ANOVA analysis, it was shown that the application of liquid organic fertilizer on banana peels was significantly different to the observed parameters of long bean plant height 14, 21,28 and 35 DAP, number of leaves of long bean plant 14, 21,28 and 35 DAP, and leaf width of long bean 14, 21,28 and 35 DAP. Completely in Table 1.

Table 1. Recapitulation of ANOVA Analysis Results Effect of Liquid Organic Fertilizer Banana Peel on Long Bean Plants

No	Parameters	F Test Result
1	Plant Height 14 DAP (cm)	*

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2	Plant Height 21 DAP (cm)	*
3	Plant Height 28 DAP (cm)	*
4	Plant Height 35 DAP (cm)	*
5	Number of Leaves 14 DAP (leaf)	*
6	Number of Leaves 14 DAP (leaf)	*
7	Number of Leaves 14 DAP (leaf)	*
8	Number of Leaves 14 DAP (leaf)	*
9	Leaf Width 14 DAP (cm)	*
10	Leaf Width 21 DAP (cm)	*
11	Leaf Width 14 DAP (cm)	*
12	Leaf Width 21 DAP (cm)	*

Note: ns = not significantly different; * = significantly different

Table 1 explains that the results of the ANOVA analysis on observations of plant height, leaf number, and leaf width will be further tested with the DMRT test, the results are listed in the table below.

Table 2. Average Plant Height (cm) of Long Bean on the Application of Liquid Organic Fertilizer Banana peel

Treatment	14 DAP	21 DAP	28 DAP	35 DAP
P0	13.97 a	1935 a	47.98 a	68.36 a
P1	15.41 a	22.99 a	56.96 b	81.37 b
P2	17.67 b	29.65 b	66.93 c	98.75 c
P3	19.49 c	34.43 bc	82.80 d	108.97 c
P4	21.94 d	39.34 c	94.69 e	129.47 d

Note : Numbers followed by the same letter were not significantly different in the 5% DMRT test.

Table 2. Showed that the effect of giving liquid organic fertilizer banana peels on plant height growth of Long beans with P4 treatment was the best treatment and significantly different from other treatments at observations of 14 DAP, 21 DAP, 28 DAP and 35 DAP.

Table 3. Average Number of Long Bean Leaves (Leaf) on the Application of Liquid Organic Fertilizer Banana peel

Treatment	14 DAP	21 DAP	28 DAP	35 DAP
P0	4.40 a	8.40 a	15.73 a	24.36 a
P1	5.45 b	9.67 a	18.03 ab	27.33 ab
P2	5.99 b	11.17 b	19.60 b	29.79 b
P3	7.26 c	12.17 bc	22.83 c	36.12 c
P4	7.75 c	13.59 c	26.23 d	41.49 d

Note : The numbers followed by the same letter were not significantly different in the 5% DMRT test.

Table 3. Showed that the effect of giving liquid organic fertilizer banana peels on the growth of number of leaves long beans with P4 treatment was the best treatment and significantly different from other treatments at observations of 14 DAP, 21 DAP, 28 DAP and 35 DAP.

Table 4. Average width of Long Bean Leaves (cm) on the Application of Liquid Organic Fertilizer Banana peel

Treatment	14 DAP	21 DAP	28 DAP	35 DAP
P0	2.57 a	3.87 a	4.80 a	5.28 a
P1	2.93 b	3.92 a	5.25 b	5.72 b
P2	2.97 b	4.51 b	5.53 b	6.05 c
P3	3.25 c	4.77 bc	5.94 c	6.26 c
P4	3.42 c	5.02 c	6.17 c	6.62 d

Note : Numbers followed by the same letter were not significantly different in the 5% DMRT test.

Table 4. Showed that the effect of giving liquid organic fertilizer banana peels on the growth of leaf width of long beans with P4 treatment was the best treatment and significantly different from other treatments at observations of 14 DAP, 21 DAP, 28 DAP and 35 DAP.

Banana peel liquid organic fertilizer contains nutrients such as nitrogen, phosphorus and potassium which are needed by plants for plant growth, especially vegetative growth.

Parameters of plant height are strongly influenced by metabolic processes in the plant body. In carrying out their metabolic activities, plants need nutrients that can be obtained from fertilization. The increase in plant height is an

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indicator of plant growth and development that determines the productivity of a plant.

Long bean plant growth with the highest value in plant height was obtained at treatment P4 (80 g/plant). This is due to the availability of good nutrients compared to other treatments. Long bean plant height growth is assisted by phosphorus and calcium contained in banana peels. Phosphorus plays a role in helping the development of young roots, where fertile plant roots can strengthen the establishment of plants and can increase the absorption of nutrients needed by plants while Calcium has an influence on upper plant growth and bud formation and is needed in cell elongation, synthesis and division cell [9].

The growth of long bean plant height with the lowest value in the P0 treatment (Control). This is due to a lack of nutrients for the growth of long bean plant height, thus causing the long bean plant to be less good. According to [10] the opinion that plant growth and production will be high if there are nutrients in the soil in a balanced amount and the growth rate will decrease if the necessary nutrients are not available.

Application of banana peel fertilizer in P4 treatment (80 g/plant) was better for long bean plants on long bean plants which gave an effect on increasing photosynthetic activity used by plants as a source of energy for plants. Increased photosynthetic activity will produce energy, so that plants grow taller accompanied by plant leaf growth [11]. Leaves are the first organ for photosynthesis in plants. The growth of long bean leaves was triggered by the application of banana peel fertilizer [12]. Banana peel contains magnesium which plays an important role in the formation of chlorophyll for photosynthesis. One of the factors that determine the rate of photosynthesis is the opening of stomata so that air flow or exchange takes place properly [13]. The movement of opening and closing of stomata is caused by water balance. Banana peel contains an element of sodium which is easy to absorb water and holds water so strongly that the plant is resistant to drought [14].

The growth of the number of leaves of long bean plants with the lowest value in the P0 treatment (control). This is due to a lack of nutrients for the growth of the number of long bean leaves, causing the growth of the number of leaves of the long bean plant to be less good.

Long bean plants with the highest value in leaf width were obtained at treatment P4 (80 g/plant). This is because the nutrients in banana peels needed for leaf width growth are used in appropriate amounts and can stimulate the growth of long bean plants. The increase in leaf width growth was caused by cell enlargement and division [15]. Plant growth and development is also influenced by external factors such as nutrients, temperature, humidity, light, water pH and internal factors such as genetics, enzymes and hormones. The role of each nutrient in plant growth includes the process of cell division and enlargement [16]. Where besides Phosphorus and Calcium in banana peels contained N, K, Mg, and others [17].

According to [18] argues that nitrogen plays a role in stimulating growth such as stems,

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branches, leaves, and roots and is very important in the formation of protein, fat and other compounds. In addition, nitrogen also plays a role in the formation of green leaves which are very useful in the process of photosynthesis. Potassium plays a role in helping the formation of proteins and carbohydrates, potassium also functions in strengthening the plant body so that leaves, flowers, fruit do not fall easily and are a source of strength for plants in dealing with drought and disease. Magnesium plays a role in water absorption, so cells divide and enlarge.

Leaf width growth of long bean plants with the lowest value in the P0 treatment (control). This is due to a lack of nutrients for the growth of long bean leaf width, causing the growth of long bean leaf width to be less good.

CONCLUSION

Effect of liquid organic fertilizer on banana peels had a significantly different effect on all parameters observed for long beans, namely plant height, leaf width and leaf area at plant ages of 14 DAP, 21 DAP, 28 DAP and 35 DAP. P4 treatment is the best treatment when compared to other treatments.

ACKNOWLEDGMENTS

Acknowledgments are given to students who helped in collecting research data and to Faculty of Agriculture University of Borneo Tarakan in providing funds so that this research can be used as a research journal.

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