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Increasing Productivity Long Bean Plant (*Vigna Sinensis* L) With Organic Vermicompost Fertilizer

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ABSTRACT

Long beans are classified as seasonal plants that can begin to be harvested approximately 6-9 weeks after planting and then periodically until approximately 3 months after planting, then the plants experience aging which results in low flower and fruit production. The harvest can be in the form of young pods which contain lots of vitamins A, B and C; medium for the production of mature seeds containing protein, fat and carbohydrates. The productivity achieved by farmers is still much lower when compared to the potential yield of long beans which can reach 20-25 tons/ha of fresh pods. The purpose of the study was to determine the increase in the productivity of long bean plants through the application of organic vermicompost fertilizer. The results of the study provide the following conclusions: There was a significant effect on the treatment of vermicompost on all observed variables, namely plant length, number of leaves, number of fruit (pods) per plant, and fresh weight of fruit (pods) per plant; and giving vermicompost as much as 1.50 kg per plant (treatment K6) gave a better average effect than other treatments at the end of the observation on the variables of plant length, number of leaves, and number of fruit (pods) per plant, although it was not significantly different by giving vermicompost as much as 1.25 kg per plant and 1 kg per plant on the variable total fresh weight of fruit (pods) per plant studied.

Keywords: Long Beans, Vermicompost, Plant, Organic.

1. INTRODUCTION

Long bean (*Vigna sinensis* L.) is one of the plants commonly cultivated by farmers in Indonesia, either in monoculture or intercropping. Long bean plants are a class of annual plants that are easy to cultivate because they can grow in both highlands and lowlands. This plant has very good prospects both in foreign markets and especially in the local market. Considering the habit of people who always consume long beans in various forms, both leaves, young pods and old seeds. The main factor that is very influential in the cultivation of long beans is the fertility of the soil and water, where water must be sufficient in its growth.

Legumes are sensitive to high soil acidity. Soil that is too acidic with a pH below 5.5 can cause stunted growth because it is poisoned by aluminum which is dissolved in the soil. To overcome this, it is necessary to giving lime liming the land planted with long beans. Before planting the land is processed first with the aim of stopping weeds, improving drainage and soil aeration (Jati et al., 2018).

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Long bean plants have long been cultivated in Indonesia to support family needs. Even in some places long beans are the main source of the family's economy. Therefore, efforts to increase the productivity of long beans need to be continued. The productivity of long beans at the farm level is very low at 2-3 tons/ha. This productivity is much lower when compared to the potential yield of long beans which can reach 20-25 tons/ha of fresh pods (Raksun et al., 2021).

Efforts to increase the productivity of long beans can be done through the provision of fertilizers, both organic and inorganic fertilizers. The application of organic fertilizers can improve the physical, chemical and biological properties of the soil and improve the quality of vegetables. The use of appropriate organic fertilizers, especially organic vermicompost, is expected to overcome the lack of availability of nutrients in the soil.

Kascing organic fertilizer is a plus organic fertilizer, because it contains macro and micro nutrients and growth hormones that are ready to be absorbed by plants and are useful for plant growth and production (Mulat, 2003).

Worms are earthworm droppings or feces. Other terms for vermicompost are casting or casting and Vermicast or Vermicompost. Kascing contains complete nutrients, both macro and micro nutrients that are useful for plant growth (Nisak et al., 2017). Besides that, vermicompost contains many microbes and plant growth-stimulating hormones such as giberilin 2.75%, cytokinin 1.05% and auxin 3.08%. The large number of microbes and their high activity can accelerate mineralization or the release of nutrients from worm droppings into forms that are available to plants. Besides that, vermicompost contains a high cation exchange capacity (CEC). Cation exchange capacity is the ability of the soil to give or receive cations, nutrients or plant nutrients. The soil CEC is lower than the vermicompost CEC, giving a tendency for vermicompost to add nutrients to the soil or vermicompost can increase soil fertility (Nurhuda et al., 2021).

Kascing or vermicompost is earthworm droppings. Kascing fertilizer contains complete nutrients, both macro and micro elements that are useful for plant growth. The chemical composition of Eisenia foetida vermicompost includes nitrogen (N) 0.63%, phosphorus (P) 0.35%, potassium (K) 0.20%, calcium (Ca) 0.23%, magnesium (Mg) 0.26% , sodium (Na) 0.07%, copper (Cu) 17.58%, zinc (Zn) 0.007%, manganium (Mn) 0.003%, iron (Fe) 0.79%, boron (B) 0.21% , molybdenum (Mo) 14.48%, CEC 35.80 meg/100mg, water storage capacity 41.23 and humic acid 13.88% (Prihatiningsih, 2008).

These chemical elements are readily absorbed by plants and are very useful for their growth and production. In addition, vermicompost contains microbes and plant growth-stimulating hormones. The large number of microbes and their high activity can accelerate the release of

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nutrients from worm droppings into forms that are available to plants. The purpose of this study was to determine the increase in the productivity of long beans (*Vigna sinensis* L.) with the application of vermicompost fertilizer.

2. RESEARCH METHOD

Analysis of this research data used a Randomized Block Design (RBD) with 7 (seven) treatments of giving organic vermicompost fertilizer, each treatment repeated 3 times, including: a). K_0= 0 kg vermicompost/plant; b). K_1= 0.25 kg vermicompost/plant; c). K_2 = 0.50 kg vermicompost/plant; d). K_3 = 0.75 kg vermicompost/plant; e). K_4 = 1.0 kg vermicompost/plant; f). K_5 = 1.25 kg vermicompost/plant; g). K_6 = 1.50 kg vermicompost/plant. The tool used to calculate RBD with the help of excel. The weight of the planting media in polybags was 9 kg after adding vermicompost for each treatment and mixed well with the soil. To determine the effect of treatment used analysis of variance with the F test, and to determine the difference between each treatment used the BNT test (Least Significant Difference) with a level of 5% (Yitrosumarto, 1991). The research variables observed included: plant length, number of leaves, number of fruit (pods) per plant, fresh weight of fruit (pods) per plant.

3. RESULTS AND DISCUSSION

Plant Length

The results of statistical analysis showed that the dose of vermicompost fertilizer had a significant effect on plant length at various ages of observation 14, 28, 42, 56 and 70 days after planting as shown in Figure 1.

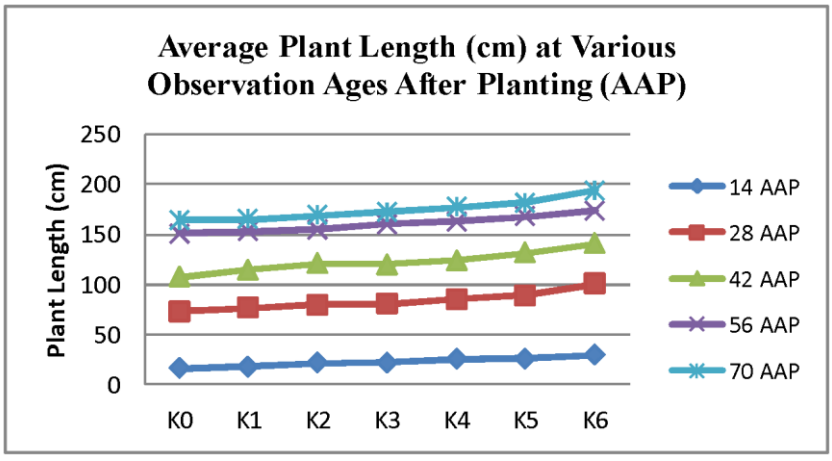

Figure1. Graph of Plant Length Average Value (cm) Due to Treatment of Vermicompost Fertilizer at Various Ages Observation.

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At the last observation 70 days after planting, the highest plant length value was achieved by K6 treatment of 193.667 cm which was significantly different from other treatments. While the treatments K0, K1 and K2 did not have a significant effect on the value of plant length at the end of the observation.

Number of Leaves

The results of statistical analysis showed that the dose of vermicompost fertilizer had a significant effect on the variable number of leaves, as shown in Figure 2.

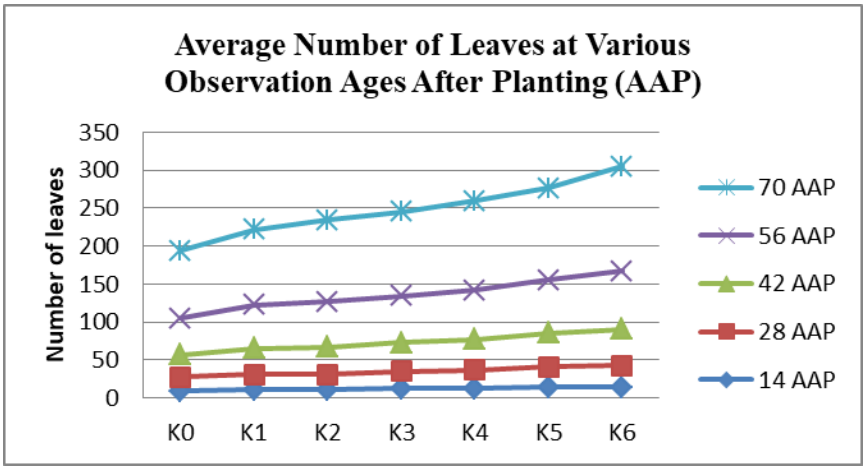

Figure 2. Graph of the Average Number of Leaves Due to Treatment of Vermicompost Fertilizer at Various Ages of Observation.

In the treatment of the dose of vermicompost fertilizer on the number of leaves, the value increased until the observation was 70 days after planting and the highest number of leaves was achieved in the K6 treatment, which was 137.833 which was significantly different from other treatments at all ages of observation.

Based on the results of research on vegetative growth variables, namely plant length and number of leaves, it was shown that the treatment with vermicompost fertilizer gave a significant difference compared to no vermicompost treatment (control); Provision of vermicompost fertilizer is able to provide nutrients, both macro and micro elements needed for plant vegetative growth, It was proven that giving 1.50 kg of vermicompost per plant (K6 treatment) gave better results than other treatments (K1, K2, K3, K4, and K5) at all ages of observation.

According to Ismoyo et al., (2013) stated that nitrogen is one of the most important nutrients in the vegetative growth process of plants which includes the growth of roots, stems and leaves. In this phase, the plant first remodels food reserves (carbohydrates) from seed chips into initial growth energy, then after leafy plants are able to carry out the photosynthesis process,

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carbohydrates will be formed as bioenergy for plant development. The results of research from BPTP Bali *et al*., (2014) that the use of vermicompost fertilizer resulted in the appearance of plants that were fresh, soft and the colors were better, brighter and shiny. The number of leaves affects the fresh weight of the plant canopy.

Kascing contains complete nutrients, both macro and micro nutrients that are useful for plant growth. Where these chemical elements are absorbed by plants and are very useful for their growth and production. Besides that, vermicompost contains many microbes and plant growth-stimulating hormones such as giberilin 2.75%, cytokinin 1.05% and auxin 3.08%. The large number of microbes and their high activity can accelerate mineralization or the release of nutrients from worm droppings into forms that are available to plants (Nurhuda et al., 2021).

Number of Fruits (pods) per Plant

The results of statistical analysis showed that the dose of vermicompost fertilizer had a significant effect on the number of fruits per plant at the age of observation 63 days and 70 days after planting, but at the age of observation 77 days after planting did not give a significant effect. significant; while the observation of the total number of fruit variables that reflect the overall productivity of the number of fruits turned out to have a significant effect, as shown in Figure 3.

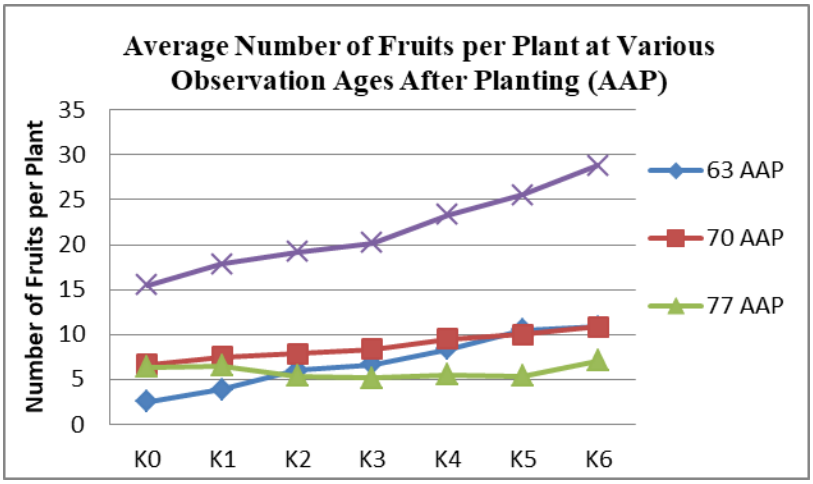

Figure 3. Graph of the Average Number of Fruits Due to Treatment of Vermicompost Fertilizer at Various Ages of Observation.

In Figure 3, it can be seen that the K5 and K6 treatments at the age of 63 days and 70 days after planting showed insignificant differences, then there was a tendency to decrease the number of fruits produced after the harvest period of 70 days; but cumulatively the dose of vermicompost fertilizer had a significant effect on the total number of fruits from the three harvest periods, the

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highest total number of fruits was achieved by K6 treatment, which was 28,833 compared to other treatments.

Fresh Weight of Fruit (pods) per Plant

The results of statistical analysis showed that the dose of vermicompost fertilizer had a significant effect on the fresh weight of fruit per plant at the age of observation 63 days and 70 days after planting, but observations on the total fresh weight variable of fruit reflect total number of the three previous observations of fresh fruit weight turned out to have a significant effect, as shown in Figure 4.

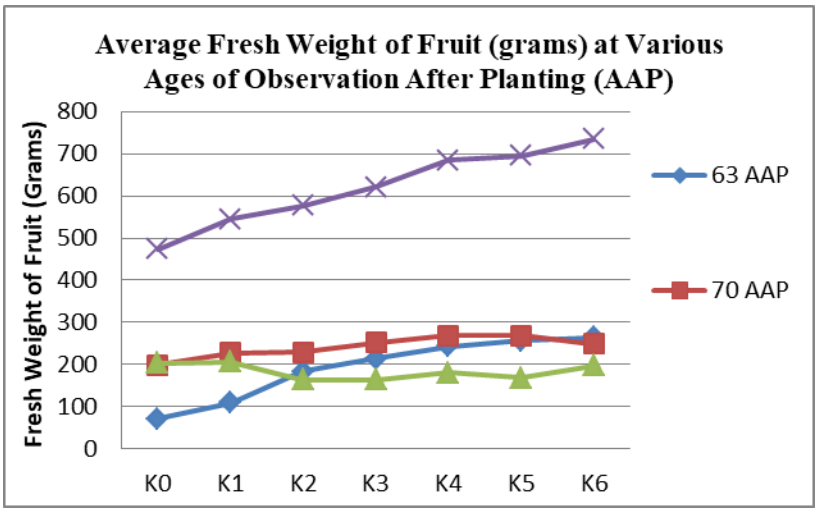

Figure 4. Graph of Average Fruit Weight (grams) Due to Treatment of Vermicompost Fertilizer at Various Ages of Observation.

Figure 4 also shows a tendency to decrease the value of fresh fruit weight after the harvest period of 70 days after planting; but cumulatively the dose of vermicompost fertilizer had a significant effect on the total fresh weight of fruit, where it was shown that the highest total value of fresh fruit weight at the end of the observation (77 days after planting) was achieved by K6 treatment, which was 733,867 grams compared to other treatments, although not significantly different from the K5 and K4 treatments, respectively 694,467 grams and 684,267 grams.

Therefore on the generative variable, the treatment with vermicompost also gave effect a significant difference compared to no vermicompost (control); and it was proven that giving 1.50 kg of vermicompost per plant (K6 treatment) showed better results than other treatments (K1, K2, K3, K4, K5) on plant generative variables, especially the total fresh weight of fruit (pods) per plant. plants of 733,867 grams which showed no significant difference with K5 and K4 treatments, respectively 694,467 grams and 684,267 grams at the age of observation 77 days after planting.

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Syahri's research, (2019) showed that there was a significant effect of vermicompost fertilizer application on plant height, flowering age, harvest age, number of pods per plant, pod weight per plant and root volume.

Earthworms with the help of enzymes contained in their digestive organs play a role in converting insoluble nutrients into soluble forms that plants need. These nutrients are contained in vermicompost, so it can be absorbed by plant roots to be carried to all parts of the plant. Vermicompost contains plant growth hormones that can stimulate the growth of plant roots in the soil, spur the sprouting of new branches on tree trunks and branches, and stimulate leaf growth. Vermicompost can also prevent soil loss due to runoff. In the process of vermicompost formation, when the soil enters the digestive tract of the worms, the worms will also secrete a compound, namely Ca-humate. With the presence of these compounds, the soil particles are bound into a single unit (aggregate) which will be excreted in the form of vermicompost. These aggregates have the ability to bind water and soil nutrients (Syahri, 2019). Furthermore, the process of decomposition of organic matter in addition to producing CO^2 and water also produces amides, amino acids and some nitrogen reacts with lignin and resistant compounds generally to form soil humus. Where the properties of humus include: colloidal, has a large surface, water absorption capacity of 80-90% of its weight, so that more water can be utilized by plants (Astuti, 2005).

Utilization of organic fertilizers or known as natural agriculture is carried out to reduce dependence on the use of inorganic fertilizers as well as to overcome the negative impacts caused by the use of inorganic fertilizers which have a high risk of physical soil; and one of the most widely used organic fertilizers is vermicompost. Worms are earthworm droppings or feces (Simanungkalit et al., 2006).

Giving vermicompost as the right way to fertilize the soil because it contains a number of macro and micro elements as well as soil microbes and growth hormones, has been proven to provide benefits for increasing the growth and production of long bean plants, namely being able to increase the fresh weight of fruit (pods) per plant by 86%. and total fresh weight of fruit (pods) per plant by 55% compared to no vermicompost.

4. CONCLUSION

Based on the research, several conclusions can be drawn as follows: There was a significant effect on the treatment of vermicompost on all observed variables, namely plant length, number of leaves, number of fruit (pods) per plant, and fresh weight of fruit (pods) per plant; and giving vermicompost as much as 1.50 kg per plant (treatment K6) gave a better average effect than

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other treatments at the end of the observation on the variables of plant length, number of leaves, and number of fruit (pods) per plant, although it was not significantly different by giving vermicompost as much as 1.25 kg per plant and 1 kg per plant on the variable total fresh weight of fruit (pods) per plant studied..

REFERENCES

Astuti, A. (2005). Aktivitas proses dekomposisi berbagai bahan organik dengan aktivator alami dan buatan. *Jurnal Ilmu Pertanian*, *13*(2), 92–104.

Bali, B., Kariada, I. K., & Bali, B. (2014). *KAJIAN ADOPSI PENERAPAN TEKNOLOGI PUPUK ORGANIK KASCING DI DAERAH SENTRA PRODUKSI SAYURAN KABUPATEN TABANAN*.

Ismoyo, L., Sumarno, S., & Sudadi, S. (2013). Pengaruh Dosis Kompos Azolla dan Kalium Organik terhadap Ketersediaan Kalium dan Hasil Kacang Tanah pada Alfisol. *Sains Tanah-Journal of Soil Science and Agroclimatology*, *10*(2), 123–132.

Jati, B. P., Hastuti, P. B., & Rusmarini, U. K. (2018). Pengaruh pemberian pupuk kandang dan dosis pupuk P terhadap pertumbuhan dan produksi tanaman kacang panjang (Vigna sinensis L.). *Jurnal Agromast*, *3*(1).

Nurhuda, M., Inti, M., Nurhidayat, E., Anggraini, D. J., Hidayat, N., Rokim, A. M., azharry Rohmadan, A. R., Nurmaliatik, N., Nurwito, N., & Setyaningsih, I. R. (2021). KAJIAN STRUKTUR TANAH RIZOSFER TANAMAN KACANG HIJAU DENGAN PERLAKUAN PUPUK KANDANG DAN KASCING. *Jurnal Pertanian Agros*, *23*(1), 35–43.

Prihatiningsih, N. L. (2008). *Pengaruh kascing dan pupuk anorganik terhadap serapan k dan hasil tanaman jagung manis (zea mays saccharata sturt) pada tanah alfisol Jumantono*.

Raksun, A., Ilhamdi, M. L., Merta, I. W., & Mertha, I. G. (2021). Vegetative Growth of Green Eggplant Due to Treatment of Vermicompost and NPK Fertilizer. *Jurnal Biologi Tropis*, *21*(3), 917–925.

Nisak, F., Pratiwi, Y. I., & Ali, M. (2017). The Influence of Immersion Duration and Organic Growing Organics on Sugar Cane (Saccharum omcinarum L) Growth and Yield. *AGRICULTURAL SCIENCE*, *1*(1), 11–26.

Nurhuda, M., Inti, M., Nurhidayat, E., Anggraini, D. J., Hidayat, N., Rokim, A. M., azharry Rohmadan, A. R., Nurmaliatik, N., Nurwito, N., & Setyaningsih, I. R. (2021). KAJIAN STRUKTUR TANAH RIZOSFER TANAMAN KACANG HIJAU DENGAN PERLAKUAN PUPUK KANDANG DAN KASCING. *Jurnal Pertanian*

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Agros, *23*(1), 35–43.

Simanungkalit, R. D. M., Suriadikarta, D. A., Saraswati, R., Setyorini, D., & Hartatik, W. (2006). *Pupuk organik dan pupuk hayati*. Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian.

Syahri, M. (2019). *Pengaruh Pemberian Pupuk Kascing Dan Herbafarm Terhadap Pertumbuhan Dan Produksi Tanaman Kacang Panjang Renek (Vigna Unguiculata Var. Sesquepedalis)*. Universitas Islam Riau.

Yitnosumarto, S. 1993. Percobaan Perancangan, Analisis dan Interpretasinya. Gramedia Pustaka Utama. Jakarta.

DOI : https://doi.org/10.55173/agriscience.v6i1.78