IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 14, Issue 2 Ser. II (February 2021), PP 10-13
www.iosrjournals.org

Test of Various Kinds of Organic Fertilizers on The Growth and Yield of Cassava (Manihot esculenta Crantz.)

JM Sri Hardiatmi[1)], Endang Sri Sudalmi[1)], Efi Nikmatu Sholihah[1)]
[1](*Program Study of Agrotechnology, Faculty of Agriculture, Slamet Riyadi University, Indonesia)*

Abstract:
Background*: In Indonesia, cassava is the staple food after rice and maize. One way to increase the productivity of cassava is the use of fertilizers. Fertilization is an act of providing additional nutrients to the soil, either directly or indirectly, so that it can provide nutrients for plants. Fertilization is an important thing given to plants so that plants can grow and develop properly. Plant growth and development are strongly influenced by the availability of nutrients in the soil.*
Materials and Methods*: This research was conducted at the Experimental Garden of the Faculty of Agriculture, Slamet Riyadi University, Surakarta, which is located in Banjarsari Village, Banjarsari District, Surakarta. The research design used a completely randomized design (CRD) which consisted of a single factor, including various kinds of organic fertilizers with three levels of doses. Treatment with 3 repetitions, the treatment was the type and dose of organic fertilizer (MD) with 9 levels and the treatment without fertilizer as a control. Each treatment was repeated 3 times so that in total there were 30 research treatment units. The data analysis used was the ANOVA (Analysis of Variance) test. If there is a difference, it is continued with the Honest Real Difference Test (BNJ) at the 5% level to determine the influential and non-influential treatments.*
Results*: The results showed that the treatment of types and dosages of organic fertilizers significantly affected the growth and yield of cassava per plant. The most significant effect was observed in the parameters of shoot height, number of leaves, shoot dry weight, number of tubers, and tuber weight per plant. Treatment MD7 = vermicompost fertilizer dose of 720 g / polybag gave the highest yield on shoot dry weight of 378 grams, but the highest yield of tubers and tuber weight was achieved in the treatment of vermicompost fertilizer with a dose of 1.2 kg/polybag, which was 7.33 tubers weighing 2, 87 kg of cassava per plant.*
Conclusion: *The kinds and dosage of organic fertilizers affected the growth of cassava and a significant effect was shown in the use of vermicompost fertilizer.*
Key Word*: Kinds of Fertilizer, Dosage, Growth, Yield, Cassava.*

Date of Submission: 16-02-2021 Date of Acceptance: 02-03-2021

I. Introduction

Indonesia is facing a problem in the food situation which is the basic need of all people. Food insecurity events globally are caused by an imbalance between food supply and demand, which is an implication of an imbalance in population growth and increased agricultural productivity. Based on these facts, alternative foodstuffs that can substitute rice as a staple food are needed, which are increasingly difficult to develop due to limited irrigated land, which has been converted into industrial and residential land. Cassava is a plant that is familiar to people in Indonesia. This plant can grow in various places and conditions, both in areas with cold, moderate, and hot temperatures. Cassava can be used as a substitute for daily staple food. Even in certain areas, it is used as staple food such as rice. Cassava is a potential future food crop because it contains high enough carbohydrates so that it can be used as an alternative staple food [1].

In Indonesia, cassava is the staple food after rice and corn. Cassava and maize are several types of tropical plants that grow in Indonesia. Cassava products are usually used by the community as a staple food in certain areas in Indonesia. Common problems in cassava cultivation are low productivity and income [2]. From a technical point of view of production, an important cause of low yields of cassava at the farm level is the limited use of high yielding varieties and the use of fertilizers. Superior variety is a technology component that plays an important and strategic role because it is related to the potential results of broad unity, product quality that can be a reference for users, and information for farmers to adopt [3]. The elephant cassava variety is one of the superior varieties from East Kalimantan which can produce up to 40 kg per tree [4]. Elephant cassava can grow both in the lowlands and highlands, but cannot grow well in swampy areas or which are constantly being flooded. With normal growth, elephant cassava trees can reach a height of 4 to 5 meters.

One way to increase the productivity of cassava is the use of fertilizers. Fertilization is an act of providing additional nutrients to the soil, either directly or indirectly, so that it can provide nutrients for plants.

Fertilization is an important thing given to plants so that plants can grow and develop properly. Plant growth and development are strongly influenced by the availability of nutrients in the soil. Manure is an organic fertilizer made from animal manure that can increase soil fertility. According to [5] that the addition of organic matter (manure) will increase the total pore of the soil and will reduce the weight of the soil volume. In addition to improving soil physical fertility, manure also serves as a potential source of nutrients. Giving manure in addition to increasing the availability of nutrients, can also improve the physical properties of the soil. Seeing the importance of using organic fertilizers, it is necessary to research the effect of various kinds of organic fertilizers on the growth and yield of cassava plants.

II. Material And Methods

This research was conducted at the Experimental Garden of the Faculty of Agriculture, Slamet Riyadi University, Surakarta, which is located in Banjarsari Village, Banjarsari District, Surakarta. The research design used a completely randomized design (CRD) which consisted of a single factor, including various kinds of organic fertilizers with three levels of doses. Treatment with 3 repetitions, the treatment was the type and dose of organic fertilizer (MD) with 9 levels and the treatment without fertilizer as a control.

Study Design: completely randomized design (CRD) which consisted of a single factor

Study Location: This research was conducted at the Experimental Garden of the Faculty of Agriculture, Slamet Riyadi University, Surakarta, which is located in Banjarsari Village, Banjarsari District, Surakarta.

Study Duration: March 2020 to November 2020.

Sample size: 50 Plants of Cassava.

Procedure methodology

The design of this study used a completely randomized design (CRD) which consisted of a single factor, including a variety of organic fertilizers with three levels of doses. Treatment with 3 repetitions, the treatments were the kinds and dosage of organic fertilizer (MD) with 9 levels and the treatment without fertilizer as a control:

MD0 = Without fertilizer (control)
MD1 = Manure dosage of 720g / polybag
MD2 = manure dosage of 960g / polybag
MD3 = Manure dosage of 1.2 kg / polybag
MD4 = green fertilizer dosage of 720g / polybag
MD5 = green fertilizer dosage of 960g / polybag
MD6 = green fertilizer dosage of of 1.2 kg / polybag
MD7 = vermicompost fertilizer dosage of 720 g / polybag
MD8 = vermicompost fertilizer dosage of 960 g / polybag
MD9 = vermicompost fertilizer dosage of 1.2 kg / polybag.

Observation parameters

1. bud Height
2. The number of leaves per plant
3. The number of buds per Plant
4. Shoot Weight per Plant
5. The number of Roots per Plant
6. The number of Tubers per Plant
7. Tuber weight per plant (kg)

Statistical analysis

Each treatment was repeated 3 times so that in total there were 30 research treatment units. The data analysis used was the ANOVA (Analysis of Variance) test. If there is a difference, it is continued with the Honestly Real Difference Test (BNJ) at the 5% level to determine the influential and non-influential treatments.

III. Result

Effect of various kinds of organic fertilizers on the growth of cassava plants

Table no 1 Shows the treatment of vermicompost fertilizer at a dose of 1.2 kg (MD9) with an average buds height of 167.67 cm was significantly different when compared to the treatment of green manure with a dose of 1.2 kg/polybags (MD6) with an average buds height of 69.27 cm. The highest buds height was shown as 167.67 cm and the lowest was at 69.27 cm. The results of the analysis of the variety of the number of leaves showed that there was a significant difference in the treatment of organic fertilizers on the number of leaves per plant. Vermicompost Fertilizer Dose of 720g / Polybag (MD7) with an average number of leaves per plant of 72 leaves, there is a very significant difference when compared to the treatment of Green Fertilizer Dose of 1.2 kg / Polybag (MD6) with an average number of leaves per plant 26 leaves. The results of the analysis of the variety

of weight of dried buds showed that the average treatment with the heaviest weight of dried buds was the vermicompost fertilizer treatment with a dose of 720g / Polybag (MD7) with an average weight of dried buds of 378 grams and the least dry weight of buds was at Treatment of Green Fertilizer Dose of 1.2 kg (MD6) with an average of 12 grams.

Table no 1: Effect of various kinds of organic fertilizers on the growth of cassava plants

Treatment		High Average Buds (cm)	Average Number of Leaves (blade)	Tuber weight per plant (kg)
MD0	Without fertilizer (control)	149,3 a	51,3 ab	113 abc
MD1	Manure dosage of 720g / polybag	76,9 a	32,3 ab	16,5 a
MD2	Manure dosage of 960g / polybag	102,1 a	49 ab	139 bc
MD3	Manure dosage of 1.2 kg / polybag	134,3 a	44 ab	151 bc
MD4	Green fertilizer dosage of 720g / polybag	125 a	38,67 ab	52,78 ab
MD5	Green fertilizer dosage of 960g / polybag	120 a	34,67 ab	31,4 a
MD6	Green fertilizer dosage of 1.2 kg / polybag	69,27 a	26 a	12 a
MD7	Vermicompost fertilizer of 720g / polybag	141 a	72 b	378 c
MD8	Vermicompost fertilizer 960g / polybag	166,3 b	62,3 b	177,9 c
MD9	Vermicompost fertilizer of 1.2 kg / polybag	167,67 b	45,3 ab	172,5 c

Note: Mean numbers followed by the same letter mean not significantly different in the 5% level significant difference test.

Effect of various kinds of organic fertilizers on the yield of cassava plants

Table no 2 Shows treatment of vermicompost fertilizer 720 g / polybag (MD7), vermicompost fertilizer 960 g / polybag (MD8), and vermicompost fertilizer 1.2 kg/polybag (MD9) resulted in the number of tubers of 7.33, 6.00, and 7.33. This result was not significantly different from the treatment without fertilizer (MD0), manure dose of 720 g / polybag (MD1), manure 1.2 kg/polybags (MD3), green manure 720 g / polybag (MD4), and green manure 960 g / polybags (MD5) which produced 5.33 fruit, 5.00 fruit, 4.67 fruit, 4.67 fruit, 6.67 fruit. The treatment of organic fertilizers on the number of tubers was significantly different in the treatment of manure 960 g / polybag (MD2) and 1.2 kg of green manure (MD6) which produced 4.00 and 2.67 fruits. Treatment of organic fertilizers at a dose of 720g (MD1) manure, 960g (MD2) manure, and 1.2kg (MD3) manure, will increase tuber weight, respectively 1.14 kg, 1.37 kg, and 1.43 kg However, these results were not significantly different when compared to green manure with a dose of 720g (MD4) and green manure with a dose of 960g (MD5) which yielded 0.85kg and 1.59kg, respectively. The increase in new tuber weight was evident in the treatment of vermicompost fertilizer with a dose of 960g (MD8) which produced 2.56 kg and vermicompost fertilizer with a dose of 1.2 kg (MD9) which produced 2.87 kg. The vermicompost fertilizer 960g per polybag (MD8) and 1.2 kg vermicompost fertilizer per polybag (MD9) increased the tuber weight, respectively 2.56 kg and 2.87 kg, this is different when compared to vermicompost fertilizer 720g / polybag (MD7) and very different compared to green manure 1.2 kg (MD6), namely 1.6 kg and 0.3 kg.

Table no 2: Effect of various kinds of organic fertilizers on the growth of cassava plants

Treatment		The number of Tubers per Plant	Average Number of Leaves (blade)
MD0	Without fertilizer (control)	5,33c	1,40b
MD1	Manure dosage of 720g / polybag	5,00c	1,14b
MD2	Manure dosage of 960g / polybag	4,00b	1,36b
MD3	Manure dosage of 1.2 kg / polybag	4,67c	1,43b
MD4	Green fertilizer dosage of 720g / polybag	4,67c	0,85b
MD5	Green fertilizer dosage of 960g / polybag	6,67c	1,59b
MD6	Green fertilizer dosage of 1.2 kg / polybag	2,67a	0,31a
MD7	Vermicompost fertilizer of 720g / polybag	7,33c	1,60b
MD8	Vermicompost fertilizer 960g / polybag	6,00c	2,56c
MD9	Vermicompost fertilizer of 1.2 kg / polybag	7,33c	2,87c

Note: Mean numbers followed by the same letter mean not significantly different in the 5% level significant difference test.

IV. Discussion

The more buds that grow on the plant stem, the higher the plant will be. The more buds that grow, the competition for foodstuffs is higher and it hinders plant growth [6]. If only one bud grows, the growth is maximized because carbohydrate reserves only support the growth of a bud [7]. Leaves are the main plant organ where photosynthesis is used by plants in their growth and development. Nitrogen functions as the most important part of amino acids, nucleic acids, and chlorophyll, increasing plant protein content and accelerating vegetative growth, thereby increasing the number of leaves to grow. Nutrients contained in organic fertilizers are needed for the formation or growth of the vegetative parts of plants [8].

Bud dry weight can be used as an indicator of plant growth. This dry weight reflects the accumulation of organic compounds that plants have successfully synthesized from organic compounds. Observation of growth through dry weight was better than observation through wet weight. Because of the wet weight, the figures obtained are too fluctuating. According to [8] the fresh weight of a plant is influenced by the water content and photosynthate content in the cells and tissue of the plant so that if the photosynthate formed increases, the fresh weight of the plant will also increase. The dry weight reflects nutritional status because plant dry matter depends on photosynthesis and respiration. According to [9] greater production of photosynthate allows the formation of all larger plant organs (such as shoots, stems, and roots) which then produce greater dry matter.

The significant increase in the number of tubers mentioned above is thought to be due to the treatment. The dosage of vermicompost fertilizer 1,2.kg (MD9) can meet the needs of plants will be various elements needed to support the increase in the number of tubers. This is in accordance with the opinion of [10] that the application of vermicompost in the field improves soil quality by increasing microbial activity and microbial biomass which are key in the nutrient cycle and production of growth regulators. Vermicompost has many advantages when compared to other organic fertilizers because vermicompost is rich in essential macro and micronutrients and contains plant growth hormones such as auxins, gibberellins, and cytokines which are absolutely needed for maximum plant growth [11]. The results of this study indicate that there is a positive correlation between tuber weight and the number of tubers planted. As a result of the different types of organic fertilizers and fertilizer doses, this was followed by an increase in tuber weight per plant.

V. Conclusion

Based on the research results it can be concluded as follows:

1. Treatment of the effect of the type and dose of organic fertilizers on growth had a significant effect on the parameters of shoot height. The effect is very significant, there are parameters of the number of leaves per plant, dry weight of shoots per plant, number of tubers per plant, and weight of tubers planted .
2. The treatment of vermicompost fertilizer at a dose of 720g / polybag (MD7) gave the best results on shoot dry weight , namely 378 grams, but the highest yield of tuber count and tuber weight per plant was achieved at a dose of 1.2 kg / polybag (MD9) fertilizer treatment which was several 7.33 tubers , weighing 2.87 kg of cassava. This is indicate that there is a positive correlation between tuber weight and the number of tubers planted. As a result of the different types of organic fertilizers and fertilizer doses, this was followed by an increase in tuber weight per plant.

References

[1] A. Y. Savitri, Ardian, and E. Yuliadi, "ENGARUH BERBAGAI PERLAKUAN STEK TERHADAP PERTUMBUHAN AKAR PADA UBI KAYU (Manihot esculenta Crantz)," *Inov. dan PEMBANGUNAN-JURNAL KELITBANGAN*, vol. 2, no. 3, pp. 85–95, 2013.

[2] Amarullah, "TEKNOLOGI BUDIDAYA SINGKONG GAJAH (Manihot esculenta Crantz)," *AgroUPY*, vol. VI, no. 2, pp. 35–44, 2015.

[3] Amarullah, Indradewa, Yudono, and Sunarminto, "Evaluasi Kualitas dan Hasil Tiga Varietas Ubi Kayu," in *Prosiding Seminar Hasil Penelitian Tanaman Aneka Kacang dan Umbi*, 2016, vol. 4, pp. 500–507.

[4] Ristono and Amarullah, *Singkong Gajah Berjuang*, Cetakan II. Balikpapan: Petrogas Press, 2011.

[5] S. W. Atmojo, "Kesuburan Tanah Dan Upaya Pengelolaannya," Universitas Sebelas Maret, 2003.

[6] Y. E. Prasetyawati, C. Wibowo, and S. W. Budi, "PENGARUH KEBERADAAN AKAR ADVENTIF DAN MEDIA TANAM TERHADAP PERTUMBUHAN STEK CABANG BAMBU BETUNG (Dendrocalamus asper Schult Backer ex Heyne)," *Silvikultur Trop. - J. Trop. Silvic. Sci. Technol.*, vol. 9, no. 02, pp. 109–115, 2019.

[7] Y. K. Simangunsong, Indriyanto, and A. Bintoro, "RESPON SETEK CABANG BAMBU KUNING (Bambusa vulgaris) TERHADAP PEMBERIAN AIA (THE," *J. Sylva Lestari*, vol. 2, no. 1, pp. 95–100, 2014.

[8] I. N. I. B. Nata, I. P. Dharma, and I. K. A. Wijaya, "Pengaruh Pemberian Berbagai Macam Pupuk terhadap Pertumbuhan dan Hasil Tanaman Gumitir (Tagetes erecta L.)," *J. Agroekoteknologi Trop.*, vol. 9, no. 2, pp. 115–124, 2020.

[9] A. Wulandari, N. W., Heddy, S., dan Suryanto, "Penggunaan Bobot Umbi Bibit Pada Peningkatan Hasil Tanaman Kentang (Solanum tuberosum L.) G3 Dan G4 Varietas Granola," *J. Produksi Tanam.*, vol. 2, no. 1, pp. 65–72, 2014.

[10] Suparno, B. Prasetya, A. Talkah, and Soemarno, "Aplikasi Vermikompos Pada Budidaya Organik Tanaman Ubijalar (Ipomoea batatas L .)," *Indones. Green Technol. J.*, vol. 2, no. 1, pp. 37–44, 2013.

[11] C. N. Herlina, Syafruddin, and Zaitun, "Efektivitas Dosis Vermikompos dan Jenis Mikoriza Terhadap Pertumbuhan Dan Hasil Tanaman Kedelai (Glycine max L. Merril) Pada Tanah Ultisol Jantho," *Ef. Dosis Vermikompos dan Jenis Mikoriza Terhadap Pertumbuhan Dan Has. Tanam. Kedelai (Glycine max L. Merril) Pada Tanah Ultisol Jantho*, vol. 11, no. 1, pp. 1–9, 2016.