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Application of Liquid Organic Fertilizer (LOF) From Vegetable Waste and NPK on the Growth and Results of Corn (*Zea Mays* L.)

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ABSTRACT: Liquid Organic Fertilizer (LOF) and NPK fertilizer are fertilizers that are often used as additional nutrients in the soil to increase the productivity of agricultural products. This experiment aims to test the level of effectiveness and benefits of LOF on corn plants of the Paragon variety, and to provide a comparison between LOF and NPK fertilizer in the analysis of production and farming economics. This experiment was carried out from August to December 2022 at the Experimental Field of the Soil Fertility and Plant Nutrition Chemistry Laboratory, Department of Soil Science and Land Resources, Faculty of Agriculture, University of Padjadjaran Jatinangor, Sumedang Regency, West Java with an altitude of ± 750 meters above sea level . The experiment was carried out using the field trial method with a randomized block design (RBD) consisting of 6 treatments and repeated 4 times, namely 4 treatments with LOF doses, 1 treatment with recommended fertilizer and 1 control treatment. The results of the experiment showed that LOF treatment with NPK fertilizer had an effect on plant height, crown diameter, number of leaves, cob diameter, cob length, fresh and peeled cob weight, crop yield, and farm income. Based on the considerations of this experiment, LOF has met the requirements as a LOF that is suitable for use as a complementary nutrient supplement by combining single NPK fertilizers (Urea, Sp-36, and KCl). 1 treatment with recommended fertilizer and 1 control treatment. The results of the experiment showed that LOF treatment with NPK fertilizer had an effect on plant height, crown diameter, number of leaves, cob diameter, cob length, fresh and peeled cob weight, crop yield, and farm income. Based on the considerations of this experiment, LOF has met the requirements as a LOF that is suitable for use as a complementary nutrient supplement by combining single NPK fertilizers (Urea, Sp-36, and KCl). 1 treatment with recommended fertilizer and 1 control treatment. The results of the experiment showed that LOF treatment with NPK fertilizer had an effect on plant height, crown diameter, number of leaves, cob diameter, cob length, fresh and peeled cob weight, crop yield, and farm income. Based on the considerations of this experiment, LOF has met the requirements as a LOF that is suitable for use as a complementary nutrient supplement by combining single NPK fertilizers (Urea, Sp-36, and KCl).

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INTRODUCTION

Corn (*Zea mays* L.) is a cereal crop that plays an important role in global food security and economic development in many countries. The availability and productivity of maize has significant implications for food security and the country's economy. To get maximum corn yields, corn plants must not lack nutrients. Although the use of organic fertilizers N, P, K on plants can increase yields both quantitatively and qualitatively, the continuous use of inorganic fertilizers causes physical, chemical and biological unfavorable soil conditions where microorganisms do not get energy for their activities.

The use of fertilizers in agricultural production is increasing every year. Therefore, it is necessary to have rules and regulations regarding the requirements that must be met by producers in order to obtain the maximum benefit from the results of production activities for plant growth and support environmental sustainability. One of the current government regulations is the certification of fertilizers through the efficiency test stage.

The success of agricultural products through agricultural intensification efforts is inseparable from the contribution and role of production facilities, especially fertilizers. Plant cultivation can be optimized if plants are supplied with essential macro and micro nutrients. Therefore, proper fertilization based on the type, content and nature of the fertilizer used is very important.

Agricultural waste is a by-product of agriculture that is not utilized or thrown away so that it has no sale value like vegetable waste which can directly cause environmental pollution, sources disease, and interfering with environmental cleanliness. In addition to macro fertilizers, to meet the nutritional needs of corn plants, additional fertilizer is also needed to meet the nutritional needs of plants, namely LOF. LOF organic matter contains all the nutrients needed by plants. Therefore, the use of fertilizers in agricultural production is increasing from year to year, so it is necessary to regulate the conditions that must be met by fertilizers to achieve maximum benefits for plant growth and to ensure environmental sustainability. One of the government regulations related to fertilizer certification is the performance testing stage.

MATERIALS AND METHODS

This test was carried out from August to December 2022 at the Soil Fertility Chemistry Laboratory, Faculty of Agriculture, Padjadjaran University, Jatinangor. The materials used in this test were planting media in the form of mineral soil Inceptisols, corn seeds (Zea mays L.) of the Paragon variety, LOF, single inorganic fertilizer urea (45% N), SP-36 (36% P2O5), and KCL. (56% K2O).

The tools used in this study were hoes, sacks, plastic samples, label paper, treatment signs, tape measure, hammer, raffia rope, stationery, caliper, ruler, bucket, embrat, and laboratory equipment.

This test was carried out with the experimental method. The design used was a randomized block design (RBD), consisting of 6 treatments, namely 4 LOF dose treatments, 1 recommended fertilizer dose treatment, and 1 control treatment as a comparison. Each treatment was repeated 4 times so that the total number of replicate plots was 24 plots. The testing procedures carried out include:

Preparation of Planting Media

The experiment began with preparing the soil to be used, namely Inceptisol Jatinangor soil which was given minimum tillage treatment. Soil processing is done by turning it back and forth to a depth of 20 cm from the soil surface. Clean the land from weeds and other crop residues. Add basic fertilizer in the form of manure as much as 0.5 kg/planting hole. Make beds with a width of 200 cm while the length is 300 cm. The distance between plants is 75 cm x 25 cm with the number of planting holes is 24 holes/plot.

Planting and Fertilization

Provision of manure is given 2 weeks before planting time. Basic fertilization (SP-36 and KCl) is carried out when planting takes place while Urea fertilizer is given at 7 DAP and 14 DAP. Corn seeds are planted by digging at depth$\pm$3 cm, each hole planted 2 seeds. Seeds that have been inserted into the planting hole are immediately covered again with the planting medium.

Maintenance

Maintenance carried out in the field includes watering, replanting, thinning, weeding, and controlling pests and diseases.

Observation

The observations made were measuring plant height (cm), crown diameter (cm) and number of leaves (strands) observed every 2 week intervals.

Harvest

Harvesting is done when the plants have reached harvest age or when the plants enter the final generative phase, namely at 83 DAP. The criteria for plants that are fit for harvest are the full cob tips and the shiny yellow color of the seeds.

RESULTS AND DISCUSSION

Plant height

Observation of plant growth was carried out at 14 DAP until the maximum vegetative phase (56 DAP). The effect of fertilization on the appearance of the pupus (stands) was not clearly seen at observations 14 and 28 DAP, but the difference was only seen after the age of 42 DAP and 56 DAP (vegetative maximum). Corn plant height shows one of the characteristics of plant growth related to other growth factors and components. The average plant height growth at 14, 28, 42, and 56 DAP based on observational data can be seen in Table

Table 1. The Effect of LOF on the Height of Paragon Variety Corn Plants

Code	Treatment	Plant Height (cm)			
		14 DAP	28 DAP	42 DAP	56 DAP
A	Control	18.3 a	64.1 a	125.4a	157.1 a
B	1 NPK	20,3 a	69.7 a	163.6c	173.5b
C	¾ NPK + ½ LOF	18.5a	60.4 a	158.1c	175.4b
D	¾ NPK + 1 LOF	21,2 a	81.8 a	167.2c	182.7bc
E	¾ NPK + 1 ½ LOF	18.6 a	66.2 a	185.4 d	192.7c
F	1 NPK + 1 LOF	17,4 a	57.1 a	163.5c	182.2bc

Note: Numbers followed by the same letter are not significantly different based on the results of Duncan's multiple range test at the 5% level

The results of the analysis showed that the application of Liquid Organic Fertilizer and NPK did not significantly affect the average plant height at 14 DAP and 28 DAP. The effect of organic fertilizers and NPK from each treatment varied in response to plant height which resulted in growth that varied according to plant age or observation stages of each fertilization dose. At the age of 42 DAP treatment A (control), namely without fertilizer application, showed the lowest plant height growth compared to the application of LOF and NPK independently or in combination. This is because the availability of nutrients in the soil is limited, so it cannot meet the needs of plants for good growth. Treatment with single inorganic fertilizers and NPK can meet the needs of plants for good plant growth. Treatment A (control) when the plant was 56 DAP had the lowest plant height among the other treatments, namely 157.1 cm. E treatment (¾NPK + 1½ LOF) has the highest plant height of 192.7 cm.

Header Diameter

The growth of the Paragon variety of maize was significantly different in each treatment during the initial growth, which was 14 DAP. At the age of 28 DAP and 42 DAP showed that the effect of fertilizer application was not significantly different in each treatment. The application of various doses of liquid organic fertilizer and NPK had a significant effect on the diameter of the corn plant canopy aged 56 DAP when compared to the control treatment. The following data from observations of the effect of liquid organic fertilizer and NPK on canopy diameter can be seen in table 2.

Table 2. Effect of LOF application on Canopy Diameter of Paragon Variety Corn

Code	Treatment	Header Diameter(cm)			
		14 DAP	28 DAP	42 DAP	56 8DAP
A	Control	22.4 bc	70.6 a	133.2 a	161.8a
B	1 NPK	21.1 b	92.8 a	156.7a	175.2b
C	¾ NPK + ½ LOF	26.8c	72.4 a	142.6a	187.4 cdes
D	¾ NPK + 1 LOF	23.4 BC	74.5a	152.4a	193.4 de
E	¾ NPK + 1 ½ LOF	16.5a	63.7 a	157.2a	197.6 e
F	1 NPK + 1 LOF	21.8 b	78.7a	154.6a	185.7 cdes

Note: Numbers followed by the same letters are not significantly different based on the results of Duncan's multiple range test at the 5% level

Based on the data in table 2, it shows that the crown diameter increased with increasing age of the plants from 14 DAP to 56 DAP. Treatment A (control) at 56 DAP had the lowest crown diameter among other treatments, which was 161.8 cm, while treatment E (¾ NPK + 1 ½ LOF) gave high yields among other treatments, namely 197.6 cm. This is because in treatment A (control) no additional fertilizer was given, so that the nutrients needed by plants during growth are not available resulting in a slowdown in growth.

Number of Leaves

The increase in the number of leaves is related to the absorption of nutrients by plant roots. In this case, roots play an important role because roots act as nutrient absorbers, transferring elements from roots to stems, leaves or fruit (Rosmarkam and Yuwono, 2002). The number of corn plant leaves every week based on observational data can be seen in table 3.

Table 3. The effect of LOF application on the number of leaves of the Paragon variety corn plants

Code	Treatment	Number of Leaves			
		14 DAP	28 DAP	42 DAP	56 DAP
A	Control	4,2 ab	8,4 a	10,2a	10.3 a
B	1 NPK	4.5 ab	9,4a	11.3 b	11.7 b
C	¾ NPK + ½ LOF	4.5 ab	8,6 a	11.4 b	11.4 b
D	¾ NPK + 1 LOF	4,6 ab	8,7a	11,2b	11,2b
E	¾ NPK + 1 ½ LOF	4,1 a	8,8a	11.5 ab	11.8 b
F	1 NPK + 1 LOF	4,4 ab	8,6 a	10.8 ab	11.5 b

Note: Numbers followed by the same letter are not significantly different based on the results of Duncan's multiple range test at the 5% level

At the age of 14 DAP the plants have not been able to optimally absorb nutrients in the soil due to the growth of roots that have not yet developed and are actively absorbing nutrients. In the observations of 28 DAP to 56 DAP the application of single LOF and NPK gave a significant effect on the number of leaves parameter compared to treatment A (control). Based on the data in the table, it shows that treatment A (control) has the lowest number of leaves among the other treatments, namely having 10.3 leaves at 56 DAP. While the treatment using LOF and single NPK fertilizer gave results that were not significantly different, namely 11 leaves starting from treatment B (1 NPK) to treatment F (1 NPK + 1 LOF).

Yield Component

Corn plants grown under the same growing conditions but with different treatments showed different yield components. The yield components observed were: diameter of cobs/plant (mm), length of cobs/plant (cm), fresh cobs/plant (g), and weight of peeled cobs/plant (g), and cob/slot weight. Observational data on the yield components of the Paragon variety of corn can be seen in table 4.

Table 4.The Effect of Giving LOF on Yield Components of Paragon Corn Varieties

Code	Treatment	Diameter	Length cob	Weight cob
A	Control	42.3 a	15,7a	0.34a
B	1 NPK	54.3 bc	18.6 bc	0.43 b
C	¾ NPK + ½ LOF	55.9 bc	19.1 bc	0.46 b
D	¾ NPK + 1 LOF	58.8 bc	19.5 bc	0.51 bc
E	¾ NPK + 1 ½ LOF	57.4c	19.9c	0.55c
F	1 NPK + 1 LOF	56.3 bc	19.3 bc	0.47 bc

Note: Numbers followed by the same letter are not significantly different based on the results of Duncan's multiple range test at the 5% level

Based on the results obtained in the treatment of LOF doses combined with a single NPK fertilizer, it had an effect on fresh cob weight and peeled cob weight where the treatment with the highest result was E treatment.(¾ NPK + 1 ½ LOF). This can be caused by the treatment of inorganic fertilizers, the nutrients N, P, and K are available in optimal and balanced quantities so as to provide a balance of macronutrients for plants. Sutedjo (2002) and Iskandar (2003) stated that plants will not give maximum results if the nutrients provided are not available.

Plant Quality

Based on visual observations during testing and observed parameter data, plant growth was quite good in terms of the yield potential of the Paragon Variety corn produced, namely the yield was still above its potential yield. Plants that were given inorganic fertilizers had better stands in terms of leaf green, plant height, number of leaves and crown diameter compared to the treatment without inorganic fertilizers (control). Treatment without fertilization as a control gave different results, namely the leaves of the corn plants turned a slightly yellowish color.

CONCLUSIONS AND IMPLICATIONS

Based onLOF effectiveness testing results"Blaze Nature"on maize (Zea mays L.) Paragon variety can be summarized as follows:

1. The LOF treatment in this study had a significant effect on increasing the growth and yield of the Paragon variety of maize. Treatment E (¾ dose of NPK + 1 ½) dose of LOF was the best treatment in increasing the growth and yield of the Paragon variety corn.
2. LOF used in this study meet the LOF requirements that are suitable for use as a supplement or complementary complement to the nutrient content combined with standard NPK fertilizers (Urea, SP-36, and KCl) which are commonly used for food crops.

REFERENCES

1. Agricultural Research and Development Agency. 2005. Technical Guidelines for Chemical Analysis of Soil, Plants, Water and Fertilizers. Soil Research Institute. Bogor.
2. Djohar, Adityo Wibowo. 2009. Characteristics of Some Chemical Properties of Andisol in Main Materials and Different Geological Formations in Bandung Regency, West Java.
3. Farastuti, D., & Henuhili, V. 2018. The Effect of Variations in Fertilizer Types on the Growth and Development of Tomato Plants (Lycopersicum esculentum var. Intan). Biology-S1, 7(6), 429-440.
4. Firmansyah, I., Syakir, M., &Lukman, L. 2017. The Influence of Dose Combination of N, P, and K Fertilizers on the Growth and Yield of Eggplant (Solanum melongena L.)[The Influence of Dose Combination Fertilizer N, P, and K on Growth and Yield of Eggplant Crops (Solanum melongena L.)]. Journal of Horticulture, 27(1), 69-78.
5. Gardner, FP, Pearce RB and Mitchell, RL 1991. Translation: Susilo and Subiyanto. Cultivation Plant Physiology. University of Indonesia Publisher (UI Press), Jakarta.
6. Hardjowigeno, Sarwono. 2015. Soil Science. Pressindo Academy. Jakarta
7. Kasno A. 2006. A Profitable Alternative Green Beans Planted in Dry Land. PT Duta Karya Private. Jakarta.
8. Lingga P, Marsono. 2011. Instructions for Using Fertilizers. Jakarta (ID): Independent Spreader.
9. Mahdiannoor, N. Istiqomah, and Syarifudin. 2016. Application of LOF on the Growth and Yield of Sweet Corn. Ziraa'ah Journal, vol. 41 no. 1. Pages 1 – 10.
10. Mashtura, SP, Sufardi, S., & Syakur, S. 2013. Effects of Phosphate and Sulfur Fertilization on Growth and Nutrient Uptake and Yield Efficiency of Lowland Rice (Oryza sativa L.). Journal of Land Resource Management, 2(3), 285-295.
11. Pardosi, AH, Irianto, and Mukhsin. 2014. Response of Corn Plants to LOF of Vegetable Waste on Ultisol Dry Land. Proceedings of the National Seminar on Suboptimal Land
12. Regulation of the Minister of Agriculture Number 43/Permentan/SR.140/8/2011 Concerning Organic Fertilizers, LOF and Soil Repairers.
13. Center for Soil and Agro-climatic Research (PUSLITATANAK). 2000. Indonesian Land Resources and Management. Agricultural Research and Development Agency, Ministry of Agriculture.
14. Rosmarkam and Nasih Widya Yuwono. 2002. Soil Fertility Science. Canisius. Yogyakarta
15. Suwahyono, Lucky. 2011. Practical Instructions for Using Organic Fertilizers Effectively and Efficiently. Jakarta: Independent Spreader.
16. Wasonowati, C. 2011. Increasing the growth of tomato plants (Lycopersicum esculentum Mill) with a hydroponic cultivation system. Agrovigor volume 4. Pp 21-28.
17. Wihardjaka, A. Poniman. 2015. Contribution of Sulfur Nutrients to Rice Productivity and Greenhouse Gas Emissions in Paddy Fields. Food Crops Science and Technology, 10(1), 9-17.