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INCREASING GROWTH AND PRODUCTION OF PEANUT PLANTS (Arachis hypogaea L.)THROUGH PROVIDING LIQUID ORGANIC FERTILIZER (POC) FROM CATFISH FARMING WASTEWATER AND VERMICOMPOST FERTILIZER

Syahriandi Akbari[1], Fuad Balatif[2], Nurhayati[3], Darius El Pebrian[4]
[1,2,] Program Studi Agroteknologi Universitas Al Washliyah Medan
[3] Program Studi Agroteknologi Universitas Islam Sumatera Utara
[4] Fakultas Perkebunan dan Agroteknologi, Universiti Teknologi MARA, Cabang Melaka, Kampus Jasin, 77300, Melrimau Melaka, Malaysia
Email: syahriandia@gmail.com

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Abstract

This study aimed to evaluate the effect of liquid organic fertilizer (POC) from catfish farming wastewater and vermicompost on the growth and production of peanut (Arachis hypogaea L.) plants. The study was conducted in the experimental field of the Faculty of Agriculture, Al Washliyah University using a factorial Randomized Block Design (RBD) with two factors, namely the dose of POC (0, 150, 300, and 450 ml/plot) and the dose of vermicompost (0, 1, 2, and 3 kg/plot). The parameters observed included plant height, number of productive branches, and pod weight per plot. The results showed that the application of POC, vermicompost, or a combination of both did not have a significant effect on all observed parameters. Although the highest treatment showed an increasing trend in the average observed value, the results were not statistically significantly different from the control. This is thought to be caused by the relatively low nutrient content of organic fertilizers and their volatile nature and not being able to optimally meet plant nutritional needs.

Keywords: ***Peanuts, liquid organic fertilizer, catfish wastewater, vermicompost,***

Introduction

Peanuts (Arachis hypogaea L.) are a food crop with high economic value due to their high protein and fat content, which reaches 40–50% (Marzuki, 2009). Demand for peanuts in Indonesia continues to increase in line with population growth, community nutritional needs, consumption diversification, and the needs of the food and animal feed industries (Sembiring et al., 2014; Balitkabi, 2008). However, national production is not yet sufficient to meet demand, so Indonesia still relies on imports. Peanut productivity in Indonesia is relatively low, only around 1.26 tons/ha in 2012, still far compared to other countries such as the United States, China, and Argentina which have reached more than 2 tons/ha. Although productivity has increased slightly, total production has actually decreased from 770,054 tons in 2008 to 709,063 tons in 2012. One of the causes is the suboptimal pod filling process, where many pods are not filled completely (Kasno, 2005). Pod yield is greatly influenced by the accumulation of photosynthesis results, especially during the seed filling phase (Purnamawati et al., 2010).mTo increase crop yields, proper cultivation technology is required, one of which is through fertilization (Novizan, 2005). Fertilizer plays a crucial role in increasing agricultural yields, contributing approximately 20% to production success. However, excessive use of chemical fertilizers can damage soil structure, making organic fertilization a more environmentally friendly alternative (Suwahyono, 2011). Organic fertilizers have many advantages, such as improving soil structure, increasing the activity of soil microorganisms such as rhizobium and mycorrhizae, and providing essential macro and micro nutrients for plants (Musnamar, 2003). Furthermore, organic

fertilizers do not leave harmful residues on crops. One potential source of organic fertilizer is wastewater from catfish farming. This waste is rich in nutrients, but its utilization by the community is still limited (Andriyeni et al., 2017). Furthermore, vermicompost is also effective in increasing soil fertility due to its high humus content, around 13.88%. Humus plays a crucial role in improving the physical, chemical, and biological properties of the soil. Based on this, we want to conduct research on increasing the growth and yield of peanut plants by providing liquid organic fertilizer (POC) from catfish farming wastewater and vermicompost.

Research methods

This research was conducted at the Experimental Field of the Faculty of Agriculture, Al Washliyah University, Jl. Sisingamangaraja No. 10, Harjosari I, Medan Amplas District, Medan City, North Sumatra Province at an altitude of ± 25 meters above sea level., with flat topography. This research began in November and was completed.
Tools and materials The tools and materials used in this research are: hoes, buckets, meters, analytical scales, knives, bamboo, machetes, plastic ropes, watering cans, stationery, treatment boards, research title boards, calculators, documentation tools, Hypoma 1 variety peanut seeds, POC for catfish cultivation water, Vermicompost organic fertilizer, and other tools and materials that support the implementation of the research.

This study used a Factorial Randomized Block Design (RAK) with two factors, namely: Factor of liquid organic fertilizer administration for catfish cultivation water (L) L0 = Control, L1 = 150 ml, L2 = 300 ml, L3 = 450 ml/l/plot and factor of vermicompost organic fertilizer administration (K) K0 = control (Without vermicompost organic fertilizer) K1 = 1 kg/plot, K2 = 2 kg/plot, K3 = 3 kg/plot The research began with the land being cleared of weeds using a machete or hoe, then leveled and cultivated to facilitate plot creation. Liquid organic fertilizer (POC) was made by mixing 25,000 ml of catfish cultivation water, 150 ml of EM4, and half a glass of liquid brown sugar in a drum, then stirred thoroughly, covered, and fermented for one week until ready for use.
After the land was clean, 48 experimental plots measuring 100 cm x 100 cm were created with a distance of 50 cm between plots and between replications. The plot is loosened and leveled, then a ditch is made around the area. Planting distances of 20 cm x 20 cm were made using nylon thread and measuring tape to reduce competition for the absorption of light, water and nutrients.

POC is applied one week before planting by watering it onto the soil surface according to the dosage. Vermicompost fertilizer is applied two weeks before planting, sprinkled evenly on the surface of the soil and mixed until combined. The seeds used are around 100 days old, do not have an inner membrane, are dried in the sun for 4-5 days, and stored for 3-6 months so that the quality of the seeds is better. The seeds are planted in 3 cm deep holes spaced 20 cm x 20 cm apart, one seed per hole. After planting, the holes are covered with soil up to the base of the stem, then watered until sufficiently moist to protect against pests. Watering was done twice daily, in the morning and evening, except during rain. While the plants were still young, watering was done carefully to avoid damaging them. The first weeding was carried out three weeks after planting by manually removing weeds around the plot every three days, while loosening the soil. Dead plants were replaced one week after planting using seedlings of the same age from the research area.

Pests and diseases are controlled manually by removing affected parts. Pesticides are only used if pest or disease infestations are serious. Harvesting is carried out approximately 90 days after the stems have hardened, the leaves have turned yellow, and the pods are full and blackish-brown. Harvesting should be done early to prevent the seeds from germinating underground. The parameters taken are plant height measurements carried out starting from the age of 2 weeks after planting (WAP), with a weekly interval until entering the generative phase. Measurements are carried out from the stem neck to the highest growing point using a meter, with a stake as a marker for the basic measurement point near the base of the stem, observations of the number of productive branches also begin at the age of 2 WAP until the end of the vegetative phase, carried out every week. The branches counted are those that produce perfect flowers, and the average number of branches is taken from all sample plants. Calculations are carried out manually and the weight of the pods per plot is weighed using an analytical balance after the pods are dried in the sun after harvest. All pods from the plot are collected and weighed to obtain the total weight.

Results and Discussion

Plant Height (cm)

The results obtained from the research on the growth and production of peanut plants through the provision of liquid organic fertilizer (POC) from catfish farming wastewater had no significant effect on plant height and increasing the growth and production of peanut plants through the provision of vermicompost fertilizer had no significant effect on plant height while the interaction response to increasing the growth and production of peanut plants through the provision of liquid organic fertilizer (POC) from catfish farming wastewater and vermicompost fertilizer had no significant effect on plant height.

Table 1. Plant Height Parameters (cm) in Increasing Growth and Production of Peanut Plants (A. hypogaeaL.) By Providing Liquid Organic Fertilizer (POC) from Catfish Cultivation Wastewater and Vermicompost Fertilizer

POC Catfish (L)	Vermicompost (K)				Average
	K0	K1	K2	K3	
L0	17.33	22.03	24.07	22.37	21.45
L1	18.63	22.97	20.75	23.79	21.54
L2	23.03	22.73	21.00	21.40	22.04
L3	24.07	21.77	23.37	24.15	23.34
Average	20.77	22.37	22.30	22.93	

Based on table 1 above, it can be seen thatIncreasing the growth and production of peanut plants through the application of liquid organic fertilizer (POC) from catfish farming wastewater had no significant effect on the average plant height. The highest average height of peanut plants was in the L3 treatment (450 ml/plot), namely 23.34 cm, and the lowest average height was in the L0 treatment (control), namely 21.45 cm. This may be due to the provision of liquid organic fertilizer POC from catfish cultivation wastewater not being able to meet the growth and production needs of peanut plants because the use of liquid organic fertilizer POC in plant cultivation is very easy to evaporate into the air because of its liquid nature, plus the provision of liquid organic fertilizer POC from catfish cultivation wastewater has a complete/abundant nutrient content but in small amounts so that the growth and production of peanut plants are not optimal (Sama, 2019).

Meanwhile, increasing peanut plant growth and production through the application of vermicompost fertilizer had no significant effect on average plant height. The highest average peanut plant height was in the K3 treatment (3 kg/plot), namely 22.93 cm, and the lowest average plant height was in the K0 (control) treatment, namely 20.77 cm. The growth of peanut plants is influenced by the availability of nutrients in the soil. This is because nutrients encourage the division of meristem cells so that plants can grow taller, as stated by Kurniawan et al., 2017, who said that plant height growth is influenced by the availability of nutrients to encourage the division of meristem cells so that plant height increases. However, vermicompost fertilizer has not been able to meet the nutrient needs of peanut plants, resulting in insignificant growth in peanut plant height between one level and another. In addition, peanut plant height or peanut growth is also influenced by factors from within the seed itself. According to Darmawan, et al., 2015. Factors that influence plant growth consist of internal and external factors. Internal factors are factors found in the seed or plant itself. External factors are factors found outside the seed or plant. One of them is the plant's genes. One plant with another plant has different characteristics even within the same species, let alone different species (Fuad Balatif et al., 2023).

Number of Branches Per Sample

Increasing the growth and production of peanut plants through the provision of liquid organic fertilizer (POC) from catfish farming wastewater has no significant effect on the number of branches per sample and increasing the growth and production of peanut plants through the provision of vermicompost fertilizer has no significant effect on the number of branches per sample while the interaction response of increasing the growth and production of peanut plants through the provision of liquid organic fertilizer (POC) from catfish farming wastewater and vermicompost fertilizer has no significant effect on the number of branches per sample

Table 2. Parameters of the Number of Branches Per Sample in Increasing the Growth and Production of Peanut Plants (A. hypogaeaL.) By Providing Liquid Organic Fertilizer (POC) from Catfish Cultivation Wastewater and Vermicompost Fertilizer

POC Catfish (L)	Vermicompost (K)				Average
	K0	K1	K2	K3	
L0	8.47	8.67	8.87	8.93	8.73
L1	9.00	8.60	9.00	9.13	8.93
L2	8.87	8.93	9.20	9.00	9.00
L3	8.93	9.20	8.80	9.50	9.11

Based on table 2 above, it can be seen thatIncreasing the growth and production of peanut plants through the provision of liquid organic fertilizer (POC) from catfish cultivation wastewater had no significant effect on the average number of branches per sample. The highest average number of branches per peanut sample was in the L3 treatment (450 ml/plot), namely 9.11, and the lowest average number of branches per sample was in the L0 (control) treatment, namely 8.73. This is thought to be because the number of leaves of peanut plants is influenced by the availability of N in the soil. In the treatment of providing liquid organic fertilizer (POC) from catfish cultivation water because of its nature that easily evaporates into the air when applied to peanut plants due to the sunlight that exposes it, this results in reduced N availability, resulting in a low number of branches per peanut plant sample. According to Walunguru, 2019. The N nutrient content in POC is very easily reduced by 30% of its total nutrient content. In addition, other factors that affect nitrogen absorption are respiration, soil compaction, nutrient concentration, density, and root distribution (Fajarditta, et al., 2012).

Meanwhile, increasing the growth and production of peanut plants through the application of vermicompost fertilizer had no significant effect on the average number of branches per sample. The highest average number of branches per peanut sample was in the K3 treatment (3 kg/plot), namely 9.14, and the lowest average number of branches per sample was in the K0 treatment (control), namely 8.82. This is because the soil used has a fairly high level of fertility so that without any soil treatment it can contribute nutrients to the peanut plants so that the peanut plants can grow well. Therefore, what causes fertile soil to not require further fertilization is because the nutrients in the soil are already available for peanut plants to meet their growth (Zulfansyah et al., 2021).

Pod Weight Per Plot

Increasing the growth and production of peanut plants through the provision of liquid organic fertilizer (POC) from catfish farming wastewater had no significant effect on the weight of pods per plot and increasing the growth and production of peanut plants through the provision of vermicompost had no significant effect on the weight of pods per plot while the interaction response of increasing the growth and production of peanut plants through the provision of liquid organic fertilizer (POC) from catfish farming wastewater and vermicompost had no significant effect on the weight of pods per plot.

Table 3. Parameters of Pod Weight Per Plot in Increasing the Growth and Production of Peanut Plants (A. hypogaeaL.) By Providing Liquid Organic Fertilizer (POC) from Catfish Cultivation Wastewater and Vermicompost Fertilizer

POC Catfish (L)	Vermicompost (K)				Average
	K0	K1	K2	K3	
L0	641.67	896.67	751.67	745.00	758.75
L1	781.67	618.33	901.67	871.67	793.33
L2	828.33	808.33	796.67	901.67	833.75
L3	821.67	880.00	830.00	903.33	858.75
Average	768.33	800.83	820.00	855.42	

Based on table 3 above, it can be seen thatIncreasing the growth and production of peanut plants through the application of liquid organic fertilizer (POC) from catfish farming wastewater had no significant effect on the average pod weight per plot. The highest average pod weight per peanut plot was in the L3 treatment (450 ml/plot), namely 858.75, and the lowest average pod weight per plot was in the L0 treatment (control), namely 758.75. Meanwhile, increasing peanut plant growth and production through the application of vermicompost fertilizer had no significant effect on the average pod weight per plot. The highest average pod weight per peanut plot was in the K3 treatment (3 kg/plot), namely 855.42, and the lowest average pod weight per plot was in the K0 (control) treatment, namely 768.33.

This is because the use of organic fertilizers has not been able to significantly meet the production of peanut plants because fertilizers contain macro and micro nutrients and have soil microorganisms but the nutrient content in small amounts so it has not been able to meet the nutrient needs for the growth and production of peanut plants (Sama, 2019). Organic fertilizers/the use of organic materials can improve physical and biological properties to maintain soil fertility (Elfarisna and Dea, 2022) but cannot meet the chemical properties of the soil in large quantities. However, there are other factors that also influence fertilization, namely the nature and characteristics of the soil itself, soil texture, climate, temperature, soil air, agricultural patterns, fertilizers used, and so on (Fuad Balatif et al., 2023)

Conclusion

The provision of liquid organic fertilizer (POC) from catfish farming wastewater, vermicompost fertilizer, or a combination of both did not have a significant effect on the growth and production parameters of peanut plants (Arachis hypogaea L.) observed.

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