Effect Of Vermicompost Dose on the Growth and Production of Forage *Corchorus aestuans*

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*ABSTRACT: One of the efforts to reduce ecosystem damage due to livestock waste is by managing waste into vermicompost. Vermicompost is a nutrient-rich organic fertilizer that can help optimize forage growth and production. Corchorus aestuans, found in the Purwakarta area with the local name Dengdek Poék, is a family of Tiliaceae. Corchorus aestuans contains anti-inflammatory substances that are used as a natural remedy for inflammation. Research was conducted to determine the effect of vermicompost dosage on the growth and forage production of Corchorus aestuans. The research was conducted in March-May 2024 in the research field of Animal Food Plant Laboratory, Faculty of Animal Husbandry and for soil and fertilizer analysis at the Laboratory of Soil Chemistry and Plant Nutrition, Faculty of Agriculture, Padjadjaran University. This research was conducted using a completely randomized design (CRD) with 5 treatments and 4 replications, so that this study consisted of 20 experimental units. The treatments were* T1= 0 g/polybag, T2 = 150 g/polybag, T3 = 300 g/polybag, T4 = 450 g/polybag, T5 = 600 g/polybag*. The research data were analyzed using ANOVA and* *Duncan‘s further test. The research results showed significant effect (P≤0,05) on the fresh weight and dry weight of forage C. aestuans, but had no significant effect on height and number of leaves of C. aestuans. It can be concluded that aplication of vermicompost doses has an effect on the production of forage of C. aestuans*

***KEY WARDS:*** *C. aestuans, Vermicompost, Growth, Production*

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# INTRODUCTION

Livestock waste management is important in maintaining the environmental ecosystem. The negative impacts caused by livestock waste such as water and air pollution, and harmful gases such as methane gas (CH4) that cause the greenhouse effect can damage the balance of environmental ecosystems. According to FAO, the production of beef cattle fecal waste in 2021 produces the highest concentration of CH4 in the world, which is 50.7% [8]. To reduce the negative impact of livestock waste, waste management can be done into vermicompost. Vermicomposting is a way to decompose organic waste with the help of earthworms, this process involves cooperation between earthworms (e.g. *Eisenia fetida*, *Eudrilus eugeniae*, and *Perionyx excavatus*) and microorganisms to produce a final product in the form of a stable, homogenous, and humus-like material called *cascing* [10] Vermicompost is an organic fertilizer rich in humus, NPK, micronutrients and beneficial soil microorganisms, growth hormones auxins, gibberelins, and cytokinins [3]. The use of vermicompost can help the growth and productivity of *C. aestuans* plants well, because one of the factors of plant growth is the level of soil fertility.

*Corchorus aestuans* is a plant that is used as a feed additive. *C. aestuans* has nutrients that are beneficial for livestock growth, in addition to its nutrients *C. aestuans* is known to contain various bioactive compounds, with various health-promoting properties. *Corchorus aestuans Linn* leaf extract is known to contain triterpenoids, cardiac glycosides, flavonoids, carbohydrates, saponins, phytosterols, and phenolic substances [13]. Flavonoids can inhibit enzymes that cause inflammation and reduce the production of molecules that cause inflammation [4]. The use of flavonoids can help alleviate conditions such as mastitis in dairy cows or arthritis in sheep. The use of *C. aestuans* as a feed additive is an alternative replacement for the use of antibiotics and synthetic anti-inflammatory drugs.

# MATERIAL AND METHODS

The research was conducted from March 18th to May 20th, 2024 in the research field of Animal Food Plant Laboratory, Faculty of Animal Husbandry, Padjadjaran University, while soil and vermicompost analysis in the Laboratory of Soil Chemistry and Plant Nutrition, Faculty of Agriculture, Padjadjaran University. This study used a completely randomized design (CRD) The experiment consisted of 5 treatment and 4 replications, resulting in 20 experimental units.

* 1. ***Experimental design***

*C. aestuans* planting is done by selecting uniform plant and planted in 40 x 40 cm polybags. The application of vermicompost is done by spreading it on the soil with 5 doses of vermicompost, namely: T1 = 0 g, T2 = 150 g, T3 = 150 g, T4 = 200 g, T5 = 300 g. Each treatment was carried out 4 times. during planting, watering was carried out every day as much as 200 mL and weeding every 3 days. After 60 days of planting *C. aestuans*, harvesting is done by cutting the stem 5 cm from the ground surface.

* 1. ***Parameters***

The parameters measured were plant height, number of leaves, fresh weight, and dry weight. Plant height was measured from the base of the plant to the highest leaf. The number of leaves was counted from fully grown leaves. Fresh weight was measured with digital scales immediately after harvest. Dry weight was measured on digital scales after drying in the oven for 72 hours.

* 1. ***Data analysis***

The data obtained were analyzed through two way ANOVA (Analysis of Variance) and further test used Duncan’s Multiple Range Test.

# RESULTS AND DISCUSSIONS

Based on the results of statistical data analysis, the vermicompost dose treatment did not significantly affect on plant height and number of leaves, but significantly affected on fresh weight and dry weight of *C. aestuans* so that the Duncan’s further test was carried out. The results of research on plant height, number of leaves, fresh weight, and dry weight shown on Table 1.

***Table I*. Duncan’s test on plant height, number of leaves, fresh weight and dry weight of C. *aestuans***

|  |  |
| --- | --- |
| Parameters | Vermicompost Dosage |
| T1 | T2 | T3 | T4 | T5 |
| Plant Height  | 37,3a ±7,18 | 43,65a ±10,68 | 49,52a ±2,37 | 48,82a ±7,33 | 49,65a ±5,72 |
| Number of Leaves | 86a ±17,90 | 117a ±40,93 | 150a ±16,25 | 159a ±42,10 | 164a ±15,71 |
| Fresh Weight | 21,91a ±10,72 | 37,57ab ±20,79 | 60,77b ±17,57 | 57,96b ±18,56 | 53,51b ±11,75 |
| Dry Weight | 4,2a ±1,90 | 6,86ab ±4,07 | 10,77b ±3,07 | 11,21b ±3,74 | 9,84b ±2,45 |

Description: The average followed by the same letter indicates that it is not significantly different at the 5% level

 on Duncan’s test

***Table II*. Chemical analysis of vermicompost compared with Indonesian National Standard (SNI 19-7030-2004) and Indonesian Regulation of the Minister of Agriculture (Permentan/SR.140/10/2011)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters | Unit | SNI 19-7030-2004 | Permentan/SR.140/10/2011 | Vermicompost |
| Texture | - | Smooth, moist | Smooth, moist | Smooth, moist |
| Color | - | Black | Black | Black |
| Odor | - | Smells of soil | Smells of soil | Smells of soil |
| C/N Ratio | - |  | 15-25 | 47,24 |
| N-Total | % | Min 0,40 | (N + P2O5 + K2O) Min 4 | 0,96 |
| Phosphorus (P2O5) | % | Min 0,10 | 0,34 |
| Potassium (K2O) | % | Min 0,20 | 0,01 |

* 1. ***Plant Height***

Plant height after vermicompost application showed results that were not significantly different (Table 1). The average value of plant height of *C. aestuans* tended to increase from treatment T1 (37.3 cm) to T2 (43.65 cm) and T3 (49.52 cm), then tended to decrease from P3 to P4 (48.82 cm) and tended to increase from T4 to T5 (49.65 cm). The increasing dose of vermicompost tends to increase plant height in *C. aestuans*. According to research about the use of chicken manure fertilizer in Corchorus olitorius affects the slow rate of decomposition of organic fertilizers and causes slow plant growth [madisa]. Plant height in the study was not too significant, the difference in height could be caused by the C/N in vermicompost which was still very high at 47.24 (Table 2), while according to the Ministry of Agriculture regulation No. 70/Permentan/SR.140/10/2011 the C/N ratio is between 15-25 [14]. The C/N ratio of organic matter is the ratio of the amount of carbon (C) compared to the amount of nitrogen (N) in organic matter. A C/N ratio that is too high will cause the activity of microorganisms in the soil to not work optimally. Conversely, if the C/N ratio is too low, nitrogen will be lost as ammonia, which is oxidized. Microorganisms need carbon and nitrogen for growth in forming their cells [7].

* 1. ***Number of Leaves***

Application of vermicompost had no significant effect (P>0,05) on the number of leaves of *C. aestuans* (Table 1.). The mean number of leaves of *C. aestuans* successively tended to increase from treatment T1 (86 leaves), T2 (117 leaves), T3 (150 leaves), T4 (159 leaves) and T5 (164 leaves). The addition of vermicompost tended to increase the number of leaves but not significantly. Based on the results of research by about the use of vermicompost brand pramva with the content of N 2-2.5%, P 1-1.5%, K 0.9-1%, can increase the number of leaves of okra plants at 100 HST which is as much as 9 strands [acharya]. The content of N, P, K has not met the standards of the Ministry of Agriculture regulations, according to Number 70/Permentan/SR.140/10/2011 the value of the N + P2O5 + K2O content of solid organic fertilizer is at least 4% (Table 2.). Leaf development and growth can be influenced by the high content of nitrogen (N) in the soil [5]. The more nitrogen absorbed by plants, the more the amount of leaf chlorophyll produced. Chlorophyll is a green leaf color pigment that helps the photosynthesis process, thus producing energy for plants for plant growth [15]. Chlorophyll is the green color pigment of the leaves that helps the photosynthesis process, thus producing energy for plants for plant growth.

* 1. ***Fresh Weight***

Based on Anova test, the dose of vermicompost had a significant effect (P<0.05) on the fresh weight of *C. aestuans* forage (Table 1.). The average value of fresh weight of C. aestuans increased from treatment T1 (21.91 g) to T2 (37.57 g) and T3 (60.77 g), then decreased from T3 to T4 (57.96 g) and T5 (53.51 g). The results of the study are in accordance with the research about adding 6 tons/fed of nile compost fertilizer, which is made from processed agricultural waste, with a content of 2% N, 0.6% P, 6% K, can increase the production of fresh weight and dry weight of *C. olitorius*, with the production of the first season in 2010 of 11.54 tons/fed and in the second season in 2011 of 12.87 tons/fed [6]. Fresh weight is influenced by factors such as environmental conditions, nutrient availability, quality of growing media, and biological activity in the soil. Soil with a good texture will make it easier for water and nutrients to spread evenly in the soil, making it easily absorbed by the roots. The use of vermicompost helps the absorption of nutrients in the soil that cannot be taken by plants [9]. Plant nutrient uptake will be easier if given vermicompost which will ultimately increase plant fresh weight production.

* 1. ***Dry Weight***

 Based on Anova test , the dose of vermicompost had a significant effect (P<0.05) on the dry weight of *C. aestuans* forage. The average value of C. aestuans forage dry weight increased from treatment T1 (4.2 g) to T2 (6.86 g), T3 (10.77 g), and T4 (11.21 g) then decreased from T4 to T5 (9.84 g). The results of the study are in accordance with the research about the application of various types of organic and organic fertilizers to *C. Olitorius* showing that 20t/ha of compost fertilizer with 17.2% N, 10.2% P, and 11.3% K content produced the highest dry weight of 8.6 g/ha compared to the application of urea fertilizer and cow dung fertilizer [16]. Insignificant forage production can occur because additional nutrients from the dose of vermicompost there is no big difference. Nutrients available in the soil are needed for plant metabolic processes, if nutrients are met and absorbed properly, vegetative growth such as height, number of leaves, and larger roots will help increase plant dry weight. Healthy plants are better at absorbing nutrients, thus supporting optimal growth and development. Vermicompost increases seed germination rates and healthy growth, thus benefiting agriculture by increasing production yields [9]. Optimal absorption of nutrients in the soil can increase plant production. Organic fertilizers increase nutrient uptake by plants by resisting unfavorable pH changes and increasing soil water availability through retention and aeration, both of which help plants use nutrients more effectively [2].

# CONCLUSIONS AND RECOMMENDATIONS

The results of data analysis showed that the provision of vermicompost affected the fresh weight and dry weight of C. aestuans, but had no effect on plant height and number of leaves of C. aestuans. Dosing 15 t/ha of vermicompost produced the highest fresh weight of C. aestuans forage, while the highest dry weight of forage was achieved by dosing 22.5 t/ha of vermicompost. Fertilization of C. aestuans is recommended to use a dose of vermicompost 22.5 t/ha to get more efficient results.

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