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COMPARISON OF THE APPLICATION OF ORGANIC FERTILIZER BASED ON LIVESTOCK MANURE TO THE GROWTH OF ODOT GRASS (*PENNISETUM PURPUREUM* CV. MOTT)

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Abstract

The availability of forage in terms of quantity and quality is a major limiting factor in the success of ruminant livestock production. This study aimed to analyze the effect of applying various types of manure (cow, chicken, and pig) and to determine the type of organic fertilizer that provides the best vegetative growth response on Dwarf Elephant Grass (Pennisetum purpureum cv. Mott). This experimental study was conducted for 6 weeks at the Animal Husbandry Study Program Workshop, Universitas Pertahanan RI, using a Randomized Block Design (RBD) with 4 treatments and 6 replications. The treatments tested included P0 (Control/Without Fertilizer), P1 (Cow Manure 500 g/polybag), P2 (Chicken Manure 500 g/polybag), and P3 (Pig Manure 500 g/polybag). The parameters observed were shoot height, number of shoots, leaf width, and leaf length. Data were analyzed using Analysis of Variance (ANOVA) and continued with Duncan's Multiple Range Test (DMRT) at the 5% level. The results showed that the application of all types of manure significantly ($p < 0.05$) increased the vegetative growth performance of dwarf elephant grass compared to the control. Treatment P2 (Chicken Manure) consistently produced optimal growth with an average shoot height of 35.93 cm, number of shoots of 4.80, leaf width of 2.02 cm, and leaf length of 28.12 cm at the end of the observation. It is concluded that the use of chicken manure provides the best effectiveness in accelerating the early vegetative phase of dwarf elephant grass in the Belu region.

Keywords: *Manure, Vegetative Growth, Randomized Block Design, Dwarf Elephant Grass.*

Abstrak

Ketersediaan hijauan pakan secara kuantitas dan kualitas merupakan faktor pembatas utama dalam keberhasilan usaha peternakan ruminansia. Penelitian ini bertujuan untuk menganalisis pengaruh pemberian berbagai jenis pupuk kandang (sapi, ayam dan babi) dan menentukan jenis pupuk organik yang memberikan respon pertumbuhan vegetatif terbaik pada rumput odot (Pennisetum purpureum cv. Mott). Penelitian eksperimental ini dilaksanakan selama 6 minggu di Workshop Prodi Budi Daya Ternak Universitas Pertahanan RI menggunakan Rancangan Acak Kelompok (RAK) dengan 4 perlakuan dan 6 ulangan. Perlakuan yang diuji meliputi P0 (Kontrol/Tanpa Pupuk), P1 (Pupuk Kandang Sapi 500 g/polybag), P2 (Pupuk Kandang Ayam 500 g/polybag), dan P3 (Pupuk Kandang Babi 500 g/polybag). Parameter yang diamati adalah tinggi tunas, jumlah tunas, lebar daun dan panjang daun. Data dianalisis menggunakan Sidik Ragam (ANOVA) dan dilanjutkan dengan Uji Jarak Berganda Duncan (DMRT) pada taraf 5%. Hasil penelitian menunjukkan bahwa aplikasi seluruh jenis pupuk kandang secara signifikan ($p < 0,05$) meningkatkan performa pertumbuhan vegetatif rumput odot dibandingkan kontrol.

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Perlakuan P2 (Pupuk Kandang Ayam) secara konsisten menghasilkan pertumbuhan optimal dengan rata-rata tinggi tunas 35,93 cm, jumlah tunas 4,80, lebar daun 2,02 cm, dan panjang daun 28,12 cm. Disimpulkan bahwa karakteristik kotoran ayam yang memiliki konsentrasi nitrogen tinggi dan cepat termineralisasi sangat efektif digunakan sebagai sumber pupuk organik untuk memacu produktivitas vegetatif awal rumput odot.
Kata Kunci: Hijauan Pakan, Kotoran Ternak, Pertumbuhan Vegetatif, Pupuk Kandang, Rumput Odot.

I. INTRODUCTION

Forage for animal feed holds the largest portion in meeting the needs of ruminant rations, so that its quantity and quality determine the sustainability of the livestock business (Barus, 2025). However, limited land and declining soil fertility are often obstacles to providing year-round forage. One of the effective strategies to increase forage productivity is through fertilization using environmentally friendly organic matter (Satata & Kusuma, 2014). Odot grass (*Pennisetum purpureum* cv. Mott) is a superior forage of dwarf varieties that are preferred by farmers because they have fast growth, high palatability, and a relatively higher crude protein content than standard elephant grass (Najiib, 2023). This plant has a high potential for fresh production and is adaptive to be grown in tropical areas with dry climates (Daru *et al*., 2019). In order to optimize the genetic potential of odot grass, the availability of essential macronutrients in the form of Nitrogen (N), Phosphorus (P), and Potassium (K) in the soil must be met continuously during the initial vegetative phase (Andis *et al*., 2020).

The use of livestock manure as manure not only supplies plant nutrients, but also improves the physical, chemical, and biological properties of the soil (Kurniawati, 2019). However, the characteristics of manure vary depending on the type of livestock of origin, maintenance management, and the type of feed consumed (Manehat *et al*., 2016). Cow manure is characterized by a high content of crude fiber and is slow release (Qohar & Prasetyo, 2022). Pig manure has a predominance of intermediate nitrogen content with rapid decomposition (Nguru *et al*., 2025). Meanwhile, chicken manure is known to have a high concentration of macronutrients (Nitrogen) and decomposes quickly because it fuses with urine (Aisyah *et al*., 2022). The variation in specific nutrient content is the basis for the importance of this study to evaluate the best effectiveness among the three types of manure on the early vegetative growth of odot grass.

II. RESEARCH METHODS

The research was carried out for 6 weeks at the Workshop of the Livestock Cultivation Study Program, Faculty of Military Logistics Vocational, Defense University of the Republic of Indonesia, Belu Regency, East Nusa Tenggara. The main materials used include uniform odot grass stem cuttings, soil as a planting medium, and three types of manure (cows, chickens and pigs). The method applied was experimental using a Group Random Design (RAK) consisting of 4 treatments and 6 group replicas, so that there were 24 experimental polybag units (size 40 cm x 40 cm/10 kg). The formulation of fertilizer dosage treatment is regulated homogeneously as follows:

P0: Control (No fertilizer)

P1: Cow Manure 500 g/polybag + 9.5 kg Soil

P2: Chicken Manure 500 g/polybag + 9.5 kg Soil

P3: Pig Manure 500 g/polybag + 9.5 kg Soil

Planting is carried out using two cuttings per unit with a uniform inclined position. Maintenance includes daily routine watering and manual weeding. Vegetative parameters measured weekly include: bud height (cm), number of buds (saplings), leaf width (cm), and leaf length (cm). The observation data in week 6 that had been prepared was then analyzed using Various Fingerprints (ANOVA). If the treatment showed a noticeable effect (< 0.05), the analysis was followed by a follow-up *P test of Duncan's Multiple Range Test* (DMRT) at a significance level of 5% using IBM SPSS software version 25.0.

III. RESULTS AND DISCUSSION

The average effect of the application of various types of organic fertilizers based on animal manure on the vegetative growth parameters of odot grass during the 6-week observation period is presented in Table 1.

Table 1. Average Effect of Organic Fertilizer Application on Odot Grass Growth

Treatment	Parameter			
	Bud Height	Number of Buds	Leaf Width	Leaf Length
P0 (Control)	16,92[a]	2,58[a]	0,90[a]	13,06[a]
P1 (Cow Manure)	33,25[bc]	4,05[b]	1,70[b]	25,43[bc]
P2 (Chicken Manure)	35,93[c]	4,80[b]	2,02[c]	28,12[c]
P3 (Pig Manure)	28,89[b]	4,02[b]	1,63[b]	21,83[b]

Source: Processed By Researchers, 2026

Note: Numbers followed by different letters in the same column show a marked difference based on Duncan's follow-up test at 5% (0.05).

DISCUSSION

Bud Height

Based on the results of the DMRT test in Table 1, all manure applications (P1, P2, and P3) resulted in significantly different bud heights (<0.05) and significantly higher compared to controls (P0, 16.92 cm). This phenomenon confirms that the addition of organic matter is essential to trigger cell division and elongation in the apical meristem tissue of plants *p*(Manehat *et al*., 2016). P2 treatment (Chicken Manure) recorded the highest average value of 35.93 cm. Statistically, P2 was significantly different from P3 (28.89 cm) but showed comparable or no results significantly different from P1 (33.25 cm). The optimal response to P2 treatment is triggered by the characteristics of chicken manure which is rich in macro nitrogen elements and has soluble properties so that it is ready to be absorbed by the roots in a short time (Wahyuni *et al*., 2025). The element N plays a crucial role in making up chlorophyll and spurring plant protein synthesis, which has a direct impact on the high acceleration of shoots at the beginning of grass growth (Andis *et al*., 2020).

Number of Buds

On the bud count parameter, the control crop (P0) gave the lowest yield (2.58 buds) and was markedly different from all organic fertilizer treatments. Duncan's further test explained that among the groups given manure (P1, P2, and P3), no significant differences were found from each other (< 0.05), where the three shared the same letter 'b' notation. This condition indicates the influence of the *pthreshold effect* on nutrient absorption by plants. Odot grass is a *dwarf variety* that is genetically equipped with abundant internal potential to produce lateral saplings (Najiib, 2023). When the minimum nutrient requirements, especially Phosphorus (P) for root initiation and Potassium (K) for energy translocation, have been met from the optimum dose of manure, then the differentiation of the side meristems is no longer dominated by external nutrient variations (Daru *et al*., 2019). This phase of new shoot formation is further controlled by genetic expression as well as the availability of plant non-structural carbohydrate reserves (Qohar & Prasetyo, 2022).

Leaf Width

The results of statistical testing on the leaf width parameter show a very strong response trend. The P2 treatment (Chicken Manure) produced the largest average leaf width of 2.02 cm and was significantly different (< 0.05) from all other treatments. In the second place, the P1 (1.70 cm) and P3 (1.63 cm) treatments showed no noticeable difference, but

both proved to be significantly wider than the P0 (0.90 cm) control. Leaf width is a vital morphological indicator in forage production, as the expansion of leaf leaf surface area is linearly correlated with increased light-capturing capacity for plant photosynthesis p(Djami *et al*., 2024). Chicken manure (P2) excels in this parameter because it contains macronutrients (N and P) that are ready to be absorbed by plants, so that the process of chlorophyll formation becomes faster. The effect is that the lateral expansion of leaf cell division is optimal, resulting in wider leaf characters and succulents that are highly favored by ruminant livestock (Aisyah *et al*., 2022).

Leaf Length

In line with the trend of high-performance shoots, the leaf length of odot grass also shows optimal performance in organic fertilizer treatment. The P2 (Chicken Manure Fertilizer) treatment produced the longest leaves of 28.12 cm which was significantly different from P3 (21.83 cm) and P0 (13.06 cm), but statistically showed comparable results (no significant difference) with the P1 treatment (25.43 cm). Leaf length describes an elongated (longitudinal) growth process that is greatly influenced by the adequacy of groundwater supply and the efficiency of nitrogen absorption into the plant fronds tissue (Kurniawati, 2019). Of the total vegetative parameters observed, P2 treatment (Chicken Manure) consistently dominated the best growth achievement for odot grass during the observation period. This fact confirms that chicken manure which is rich in essential nutrients and has a relatively low C/N ratio is very effective to be applied to intensive cut feed forage crops such as odot grass (Satata & Kusuma, 2014).

V.CONCLUSION

The application of organic fertilizer based on livestock manure has a real effect (< 0.05) in increasing the vegetative growth of odot grass (p*Pennisetum purpureum* cv. Mott) compared without fertilization. The best growth response characteristics were consistently shown by the P2 (Chicken Manure Fertilizer) treatment with a bud height of 35.93 cm, the number of shoots of 4.80, the leaf width of 2.02 cm, and the leaf length of 28.12 cm at the age of 6 weeks of observation.

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