Evaluation of the palatability various types of green fodder to support the provision of high quality green feed for dairy goats

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Abstract. The objective of this study was to determine the effect of green fodder types on palatability of dairy goats, in order to obtain high-quality alternative forage. This study employed a completely randomised design, comprising four treatments of green fodder types: soybean (*Glycine max*), mung bean (*Vigna radiata*), maize (*Zea mays*), and rice (*Oryza sativa*), with four replications. Each Etawa Crossbred Goat (ECG) was used as a replicate. Significant differences were further analysed using Duncan's Multiple Range Test (DMRT). The results showed that the type of green fodder significantly influenced the palatability levels produced. The palatability test results indicated that the grasping time for all types of green fodder was not significantly different. The highest consumption rate per minute was observed in green fodder made from mung beans at 82.50 g/minute/goat, followed by maize 66.25 g/minute/goat, then rice and soybeans. The fastest consumption time to finish 100 g of green fodder was for mung bean 2.19 minutes/head and maize 2.20 minutes/head. From this study, it can be concluded that ECG will consume all four types of green fodder. However, mung bean and maize have the highest palatability and have the potential to be used as high-quality green fodder for dairy goats.

1 Introduction

The Etawa Crossbred Goat (ECG), a dual-purpose small ruminant resulting from a cross between the Indian Etawa and the Indonesian Kacang goat, produces both milk and meat. ECG milk yield ranges from 0.5–1.0 L/head/day [1], with higher nutritional value compared to cow's milk, highlighting its potential to support national milk demand. However, dairy goat production in Indonesia is constrained by limited forage land and feed shortages during the dry season, which reduce milk yield and quality.

This condition is urgent and must be addressed immediately to improve the production and quality of goat's milk in Indonesia. Green fodder serves as an important forage and a key

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nutrient source for milk. It is highly needed in ruminant farming because it contains high fiber, which enhances milk fat production through the contribution of volatile fatty acids (VFAs), particularly acetic acid and butyric acid, produced by carbohydrate fermentation in the rumen[2]. Among these, acetic acid is required in large concentrations [3]. VFAs also serve as the primary energy source for ruminants. They are easily absorbed into the bloodstream and transported to body tissues (liver), where they undergo gluconeogenesis and lipogenesis in peripheral tissues for milk synthesis [4].

Green fodder can be produced through hydroponic cultivation, an agricultural system using liquid media enriched with essential nutrients for plant growth [5]. The advantages of this system include more reliable plant growth and yield, more efficient use of fertilizers, faster plant growth, and higher production compared to conventional soil planting. Furthermore, it can be implemented on limited land areas [6]. According to Mulyani [7], this technique does not require large areas of land, as the plants can be grown on multi-tiered racks. Previous studies by the proposer showed that the best fodder production for maize and sorghum was obtained when harvested at 10 days of age [8]. This study therefore aimed to evaluate the effect of different green fodder types on the palatability of dairy goats, with the goal of identifying high-quality alternative forage sources for sustainable ruminant production.

2 Materials and Methods

2.1 Materials

The materials used included gramineae seeds maize (*Zea mays*), rice (*Oryza sativa*), leguminosae seeds mung bean (*Vigna radiata*), soybean (*Glycine max*), AB Mix mineral nutrient solution, 10% sodium hypochlorite solution, and male Etawa Crossbred Goats (ECG) aged approximately one year.

2.2 Methods

2.2.1 Preparation of nutrient solution

AB mix is a combination of inorganic fertilizer solutions consisting of two separate components, solution A and solution B. Solution A contains macro-nutrient elements such as Calcium (Ca) and Iron (Fe). Solution B contains various essential micro-nutrient elements required for plant growth, including Iron (Fe), Manganese (Mn), Zinc (Zn), Copper (Cu), Boron (B), Molybdenum (Mo), and Chlorine (Cl). A liquid fertilizer solution was prepared by mixing solution A and solution B at a ratio of 5 mL:5 mL per 1 L of water.

2.2.2 Seed preparation

The weight each seed was maize 500 g, rice 400 g, mung bean 500 g and soybean 500 g. Seeds were soaked overnight, and floating seeds were discarded. The viable seeds were immersed in an antifungal solution for 20 min. Plastic trays (with drainage holes) were used as growing media and placed on planting racks.

2.2.3 Seed planting

Prior to planting, water channels were sanitized with 10% sodium hypochlorite for 15 min, then rinsed with clean water. Seeds were spread evenly on the trays at a density of 0.36 g

cm^{-2}, covered with black plastic, and sprayed with water three times daily. After two days (germination stage), the cover was removed, and seedlings were maintained until harvest. Fertilization was applied on days 5, 7, and 9 via foliar spraying.

2.2.4 Harvesting

Green fodder was harvested at 10 days of growth.[8].

2.3 **Observed parameters**

The parameters observed in this palatability test were grasping time (seconds), consumption amount/minute (g), and consumption time/100g (minute) [9].

2.4 **Data Analysis**

Completely Randomized Design (CRD) with four treatments (soybean, mung bean, maize, rice) and four replications, in which each goat served as a replication unit. Significant differences among treatments were further analyzed using Duncan's Multiple Range Test (DMRT) with SPSS version 24.

3 Results and Discussion

3.1 Grasping time

The first parameter observed was grasping time, defined as the time required for goats to initiate feed intake. Shorter grasping time indicates higher feed palatability [5]. All fodder types were readily accepted at the first offering, with an average grasping time of 1.35 ± 0.81 s/head, showing no significant differences among treatments (Fig. 1). This result indicates that all goats were equally attracted to the four types of green fodder. However, soybean and maize fodder tended to be consumed more rapidly, possibly due to their aroma, which may have been more appealing to the goats. According to Scherer et al. [9], the aroma and taste of forages strongly influence ruminant feed preference.

Livestock palatability is influenced by the physical appearance of the feed, including its texture, color, and aroma prior to consumption. Before grasping feed, animals typically smell the feed; if they are unfamiliar with it, they require time to adapt [10].

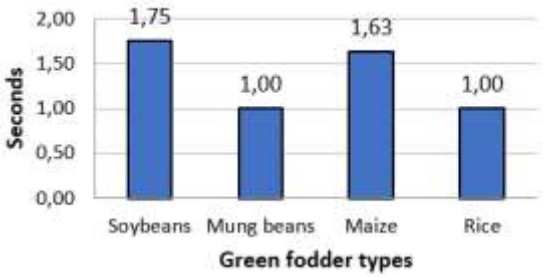

Fig. 1. Grasping time (seconds/head).

3.2 Green fodder consumption rate

Significant differences ($P < 0.05$) were observed in the consumption rate (g/min) among fodder types. Mung bean and maize fodders were consumed at higher rates compared to rice and soybean fodders, although mung bean (82.5 g/head/min) was slightly higher than maize (66.25 g/head/min) (Fig. 2).

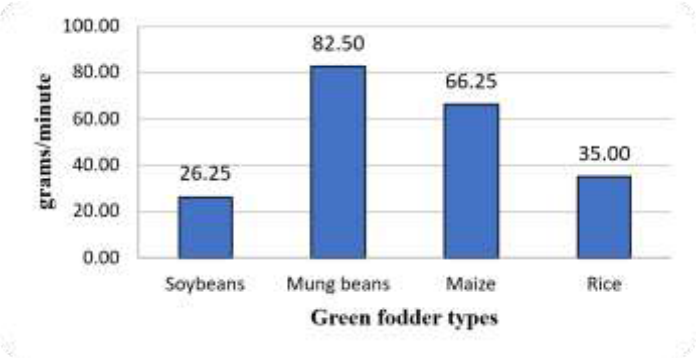

Fig. 2. Green fodder consumption per minute.

These findings indicate that mung bean and maize were more palatable to ECG. Although all fodder types were initially accepted (as reflected in the grasping time), mung bean and maize remained preferred until the end of the feeding test. This preference may be related to their morphological characteristics at 10 days of growth, when both produced more abundant leaves with a bright green appearance (Fig. 3). Palatability is influenced by both animal-related factors (species-specific preferences, health condition) and plant-related factors (growth stage, maturity, and morphology) [11]; [12].

It was further stated by [13] the term "palatability" generally refers to the feed qualities that elicit an animal's sensory responses and is considered a consequence of the animal's appetite. Moreover, it has been demonstrated that physical characteristics play a role in shaping the sensory responses triggered by the feed. The palatability quality of the hydroponic fodder makes it highly competitive for livestock production systems.

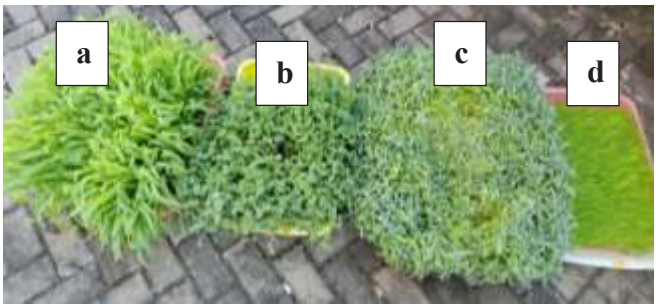

Fig. 3. Types of green fodder: maize (a), soybeans (b), mung beans (c), and rice (d).

3.3 Time required to consume 100 g of green fodder

The time required to consume 100 g of fodder also differed significantly ($P < 0.05$) among treatments. Mung bean and maize fodders were consumed most rapidly (Fig. 4), confirming their higher palatability. In contrast, rice fodder was consumed more slowly, likely due to the

presence of husks at the root zone, which reduced acceptability [8]. Soybean fodder was also less preferred, as at 10 days of harvest it produced fewer leaves and retained relatively large seeds, which may have lowered its attractiveness.

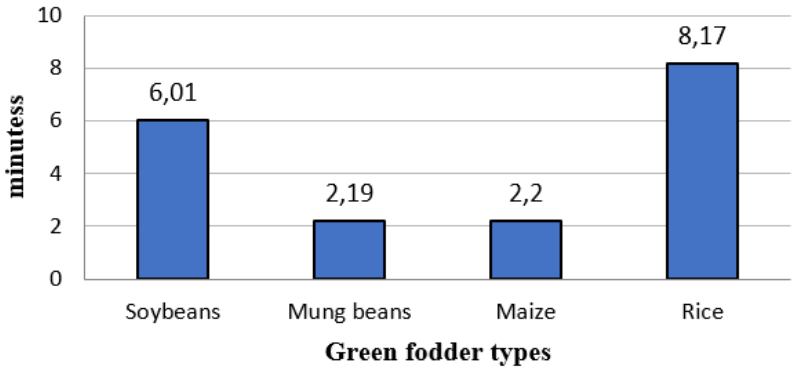

Fig. 4. Time required to consume 100g of green fodder (minutes/head).

Overall, among the tested fodders, mung bean showed the highest palatability, followed by maize, while rice and soybean fodders were less preferred.

4 Conclusion

The type of plant significantly influenced the palatability of green fodder in Etawa Crossbred Goats (ECG). Among the tested fodders (soybean, mung bean, maize, and rice), mung bean showed the highest palatability, followed by maize, as indicated by consumption rate and the time required to consume 100 g of fodder.

The authors would like to thank the Ministry of Higher Education, Science, and Technology of Indonesia for funding the research conducted through the Research funding sources in 2025.

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