

Performance of Weaned Boer Cross Goats with Supplementation of Hibiscus (*Hibiscus rosasinensis* L) Leaf Powder

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Abstrak

This study aimed to determine the performance of weaned Cross Boer goats by feeding supplementation of Hibiscus leaves. The performance of weaned Cross Boer goats at different body weights was evaluated based on feed intake, daily weight gain, and feed conversion ratio. The research was conducted at JK Community as a goat breeding commodity for cross-boer goats. This study used an experimental method using a Randomized Group Design (RGD) with 3 treatments and 4 replicates with 12 sample units of weaned Cross Boer goats. The treatment feed consisted of P0 = Basal feed without Hibiscus leaf supplementation, P1 = Basal feed + 2% Hibiscus leaf supplementation, and P2 = Basal feed + 4% Hibiscus leaf supplementation. Weaned Cross Boer goats as test material have an average age of 3 months of male and female sex with an average body weight at the beginning of maintenance of 8.2 - 9.7 kg. The study was conducted with a maintenance time of 30 days. The results showed that feed intake and conversion of weaned male Cross Boer goats significantly affected the treatment but did not show any effect on body weight gain.

1. INTRODUCTION

Goats are a type of small ruminant widely recognized in Indonesia. As meat and milk producers and because their skin has economic value, goats in Indonesia have the potential for high productivity (Soetriono *et al.*, 2020). Cross Boer goats began to be widely developed because of their high adaptation to various environmental conditions and good reproductive power with an average number of kids per birth of up to two heads (Parasmawati *et al.*, 2013). The maintenance of cross-boer goats is inseparable from quality feeding to affect fast growth rates, good endurance, and optimal ration efficiency if feeding is by the standard adequacy of the goat's nutritional value (Pribadi *et al.*, 2021). Feed is anything that can be eaten by livestock, can be digested, and does not harm the livestock's body.

The growth of preweaning goats depends on the feed nutrients they consume to stimulate the development of the digestive tract so that livestock can consume feed like ruminants (Adiguna *et al.*, 2020). Solid feeding in the form of forage or concentrates can start at 2-3 weeks. According to Kartiko *et al.*, (2018), one of the factors causing the low level of livestock productivity is the low quantity and quality of feed intake.

Feed is a fundamental problem for a livestock business because it has limited availability owned by farmers (Sukmawan *et al.*, 2014). Efforts are made to provide materials, namely looking for alternative feed ingredients that have the potential to meet livestock needs, are cheap and easy to obtain, and are available throughout the year (Riski *et al.*, 2016). Subagyo (2019) stated that finding alternative feed ingredients that are cheap and do not compete with human needs is one form of effort to meet animal feed needs. Alternative feeds are generally obtained from plantation by-products, agriculture, human food, and familiar plants in the community. Still, their potential as feed ingredients is not yet known with certainty, one of which is *Hibiscus* leaves.

Hibiscus (*Hibiscus rosa sinensis* L) is a shrub of the genus *Hibiscus* of the Malvaceae family originating from East Asia. It is widely grown as an ornamental plant in tropical and subtropical areas (Riwanti, 2021). *Hibiscus* is found growing in lowlands and highlands. *Hibiscus*, which is known as an ornamental plant, has bioactive compounds of saponins and tannins in stems, leaves, and flowers. *Hibiscus* leaves in the feed will provide saponins that can reduce rumen microbes. According to (Wahyuni *et al.*, 2014), the population of protozoa is reduced due to disruption of protozoa growth due to the bond between saponins and sterols on the surface cell wall of protozoa. In addition to saponins, found in *Hibiscus* leaves, they contain tannins. Ani & Pujaningsih (2015) stated that protection with tannins in ruminants can protect the feed nutrients from rumen microbial degradation and can improve the absorption process.

Body weight gain is strongly influenced by the quality and quantity of feed as well as the level of feed intake. The amount of feed intake is the most critical factor in determining the food obtained by livestock (Mariam, 2004). Factors that affect body weight gain are total protein consumed, type of livestock, age, genetic state of the environment, condition of each individual, and management (Alim, 2014). Based on the description above, researchers are interested in researching the performance of cross-boer goats off-weaning by using *Hibiscus* leaf flour supplementation.

2. MATERIALS AND METHODS

2.1. Time and Location

This research was conducted from August to October 2023 at Juragan Kambing Community (JK Community) in Tandassura Village, Limboto District, Polewali Mandar Regency. Geographically, it is located \pm 10 km from the capital city of Limboto District and the capital city of Polewali Mandar Regency \pm 50 km, and \pm 284 km from the capital city of West Sulawesi Province.

2.2. Materials and Tools

The materials used in this study were 12 weaned Cross Boer goats in JK Community cages, with an average age of 3 months, male and female sex, and an initial body weight of 5 – 13 kg. The feed ingredients used in this study were soybean meal, coconut meal, ground corn, rice bran, tapioca, minerals, molasses, salt, and supplementation of *Hibiscus* leaf flour (*Hibiscus rosa-sinensis L.*), which also became the research treatment material.

The tools used in this research were 12 individual goat pens made of wood measuring 75 x 75 x 75 cm. The cage equipment consisted of feeders, drinkers, renhe brand sitting scales with a capacity of 100 kg for weighing *Hibiscus* leaves, sonic brand digital scales with a capacity of 250 kg of weighing goats, and Camri brand digital scales with a capacity of 10 kg of weighing treatment feed samples, and other supporting tools such as stationery, cameras, plastic bags, cleaning equipment such as cart, hoes, machetes, brooms, sacks, buckets.

2.3. Research Procedures

The materials used in this study were basal feed based on the formulation at JK Community in the form of soybean meal, coconut meal, ground corn, rice bran, tapioca, minerals, molasses, salt, and research treatments with *Hibiscus* leaf meal supplementation. The Cross Boer goats used were male and female weaned goats aged 3 months with a body weight of 5 - 13 kg/head which amounted to 12 goats. Feed mixing is carried out by weighing feed ingredients from each ration formulation arrangement, namely a mixture of soybean meal, coconut meal, ground corn, rice bran, tapioca, minerals, molasses, salt, and the percentage of addition of *Hibiscus* leaf meal supplementation according to the treatment group. Ingredients are weighed according to the needs of the ratio and then mixed until homogeneous or evenly mixed. After mixing homogeneously, the ratio is put into plastic in each treatment. The treatments tested were as follows: P₀ = Basal diet without *Hibiscus* leaf meal supplementation (0%); P₁ = Basal diet + *Hibiscus* leaf meal supplementation (2%); and P₂ = Basal diet + *Hibiscus* leaf meal supplementation (4%). Cage preparation includes the preparation of tools used, namely feed and drinking water containers, knives, analog scales, digital scales, and plastic bags for the remaining feed. Wooden stage-type cages were used in the JK Community to prevent the onset of various diseases. Goats were weighed initially using digital scales. goats were put into individual plots of cages. The division of groups was based on body weight of 5-7 kg, 7-8 kg, 8-10 kg, and 11-13 kg. The nutritional needs of goats are based on the Regulation of the Minister of Agriculture of the Republic of Indonesia Number 102 of 2014 concerning Guidelines for Good Goat and Sheep Breeding.

Table 1. Composition of Feed Nutrition Content in JK Community

No	Volume	CP	Protein %
1	S20	20	1,60
2	Lamtoro flour	28	2,80
3	Coconut meal	21	2,52
4	Soybean meal	46	4,6
5	Rice bran	10	0,89
6	Pollard	16	1,60
7	Tapioca meal	16	3,36
8	Maize	9	0,72
9	Coffee bark	11	1,10
11	Molasses	4,2	0
12	Mineral	-	-
13	Salt	0,4	-

Source: JK Community

The making of *Hibiscus* leaf flour begins with the initial stage, namely the process of taking *Hibiscus* leaves, after which comes the separation between the leaves and stems of *Hibiscus*, then the process of drying in the sun until the *Hibiscus* leaves dry. The next stage is grinding the *Hibiscus* leaves using a blender until fine flour is formed. *Hibiscus* leaves ground into flour are packaged for storage and then continued with proximate test analysis to determine nutrient and tannin content.

Table 2. Proximate Test of *Hibiscus* Leaf Flour Content

Nutrient content	Composition (%)
Water	12,10
Ash	14,69

Crude Protein	14,08
Extract Ether	7,00
Crude Fiber	15,74
Nitrogen-free extract (NFE)	48,50

Source: Feed Chemistry Laboratory, Hasanuddin University (2024)

The application stage in livestock consists of the adaptation, introduction, and observation stages. The livestock adaptation stage aims to obtain comfortable physiological conditions of livestock at the research site and the type of feed that is adjusted to the treatment feed. This stage lasts for approximately 7 days. Livestock is weighed first as initial body weight data before being put into the cage, then the livestock with the environment and new feed that will be given, followed by an adaptation of the treatment feed. The preliminary stage was carried out by weighing 12 weaned Cross Boer goats before morning feeding and recording their body weight. Then, they were put into individual cages randomly equipped with feed and drinking places. Basal feed rations with *Hibiscus* leaf meal supplementation were mixed homogeneously and given to livestock according to treatment. Observations were made for 30 days with weaned Cross Boer goats feeding in the research sample given according to their respective treatments. A basal feed with *Hibiscus* leaf meal supplementation was prepared, then weighed and distributed in the morning at 08.00 WIB for 100 g and feeding in the afternoon at 16.00 WIB, namely 1.5 kg of forage feed.

2.4. Research Design

The experiment used a Randomized Group Design consisting of 3 treatments and 4 replicates (groups). The variables measured in this study were daily feed intake, average daily gain (AVG), and feed conversion. Oneway ANOVA analyzed data using the personal computer software Statistical Product and Service Solution (SPSS) series 26. If there is a significant effect, Duncan's Multiple Range Test (DMRT) will be continued to see the differences in each treatment.

3. RESULT AND DISCUSSION

The performance of goats can be improved through feeding that has high nutritional content and is optimal for digestion by livestock. Daily feed intake values are used to assess livestock performance on the amount of feed intake from the daily period. Daily body weight measurement criteria of livestock performance in determining their growth development and an assessment of feed conversion as a basis for measuring livestock's ability to digest feed to become meat. Based on the research results from the supplementation of *Hibiscus* leaf meal to basal feed to affect the performance of weaned Cross Boer goats, it is presented in [Table 3](#) below:

[Table 3. Average Yield of Ferporma of Weaned Boer Cross Goats](#)

Treatments	Feed intake (g)	Average daily gain (g)	Feed conversion
P ₀	30,31 ^a ±13.81	72±29.94	0,42 ^a ±0.08
P ₁	81,78 ^b ±10.45	66±10.84	1,27 ^b ±0.34
P ₂	62,57 ^b ±28.48	76±13.25	0,82 ^{ab} ±0.39

Treatments: P₀ = Basal diet without *Hibiscus* leaf meal supplementation (0%); P₁ = Basal diet + *Hibiscus* leaf meal supplementation (2%); P₂ = Basal diet + *Hibiscus* leaf meal supplementation (4%).

3.1. Daily Feed Intake

Based on [Table 3](#), the results showed that the performance of weaned Cross Boer goats based on the daily feed intake value of basal feeding supplemented with *Hibiscus* leaf meal at different levels has an average daily feed intake value of 58.22 g/day. The highest feed intake was found in P₁ with *Hibiscus* leaf meal supplementation (2%) with a feed intake value of 81.78 g/day, then P₂ with *Hibiscus* leaf meal supplementation (4%) had a feed intake value of 62.57 g/day, and the lowest feed intake value was P₀ without *Hibiscus* leaf meal supplementation at 30.31 g/day.

The results of the analysis of variance (ANOVA) indicate that supplementation of *Hibiscus* leaf flour to basal feed can affect the performance of cross-boer goats on the assessment of feed intake with a significant value (P-Value 0.013 <0.05). The results of this study are in line with [Widyawati et al., \(2017\)](#), that the use of *Hibiscus* leaves in the ration can improve the digestibility of goats where newly weaned goats maximize the amount of feed intake. The results of this study were supported by [\(Yulistiani et al., 2010\)](#), who found that the daily feed intake of weaned goats amounted to ± 57 g/head/day. The difference in the amount of feed ingredients that make up the ration can cause differences in the level of palatability, which causes differences in the amount of feed intake by goats. The results of this study are more significant according to SNI on the daily feed intake of cempe/weaned goats of 55 g/head/day.

Improving the quality of feed ingredients will physically affect the characteristics of degradation in the rumen so that it can increase livestock performance to the maximum, including feed intake. The effect of daily feed intake of weaned Cross Boer goats on the results of the study could be due to the performance of saponin content in *Hibiscus* leaves; saponins are known to have an effect as antimicrobials that can reduce the number of protozoa so that changes in rumen microbial composition that dominate fiber-rumen bacteria and the digestion process can increase. This is in line with [Widyawati et al., \(2017\)](#), which states that using

Hibiscus leaves in feed will provide saponins that can reduce the population of protozoa. The presence of saponin in the feed can provide a defaunation effect and good feed fermentability by goats. This is supported by [Sispitasari \(2018\)](#), who states that *Hibiscus* leaves contain flavonoid compounds and saponins, which can be utilized as an alternative to inhibit the development of protozoa infection. Suppression of the number of protozoan bacteria can improve the digestibility of goats, including in the process of fiber degradation in the rumen of goats.

3.2. Average Daily Gain (ADG)

Based on [Table 3](#), the results showed that the performance of weaned Cross Boer goats based on the ADG value of basal feeding supplemented with *Hibiscus* leaf meal at different levels had an average ADG value of 71 g/day. The highest ADG was found in P₂ with *Hibiscus* leaf meal supplementation (4%) with an ADG value of 76 g/day, then P₀ without *Hibiscus* leaf meal supplementation with an ADG value of 72 g/day, and the lowest ADG value was P₂ with *Hibiscus* leaf meal supplementation (2%) having an ADG value of 66 g/day.

The results of the analysis of variance (ANOVA) showed that supplementation of *Hibiscus* leaf flour to basal feed has not been able to affect the performance of Cross Boer goats on the assessment of ADG with a significant value (P-Value 0.740 > 0.05). The study results align with [Sundari \(2011\)](#), who found that the use of rations with the supplementation of *Hibiscus* leaves has no significant effect on daily body weight gain (ADG). The results of this study were supported by [Widaningsih \(2012\)](#), who found that the average ADG of Cross Boer goats ranged from 39.69 to 78.41 g/head/day.

Maximum body weight growth can be realized if the quantity of feed is well considered; the average daily gain of ruminants such as goats is strongly influenced by the quality and amount of feed provided. The provision of basal feed supplemented with *Hibiscus* leaf flour in the results of the study has not been able to have a good effect on the ADG of weaned cross-boer goats. This is due to the protein consumption in the ration of each goat not being too different from the feed, which is almost relatively the same, so it can not impact ADG. Protein in the ration is used for production and daily weight gain. This is in line with [Ali et al., \(2024\)](#) that protein retention in the ration consumed by goats will determine their production and growth; better protein retention in each ration formulation will improve growth and increase goats' body weight. This is supported by [Munira et al., \(2016\)](#), who states that poor protein retention in the ration consumed by goats can cause tendon tissue supplementation to be not optimal, so the increase in daily body weight is slow.

3.3. Feed Conversion

Based on [Table 3](#), the results showed the performance of weaned Cross Boer goats based on feed conversion value. The calculation of feed conversion only calculates the total amount of daily feed intake from basal feeding supplemented with *Hibiscus* leaf flour every day of 100 g, then subtracts the total remaining feed and divides the length of time of maintenance. The average feed conversion value was 0.84 g/day. The highest feed conversion value was found in P₁ with *Hibiscus* leaf meal supplementation (2%) at 1.27 g/day, then P₂ *Hibiscus* leaf meal supplementation (4%) had a feed conversion value of 0.82 g/day, and the lowest feed conversion value was P₀ without *Hibiscus* leaf meal supplementation at 0.42 g/day.

The results of the analysis of variance (ANOVA) showed that supplementation of *Hibiscus* leaf meal to basal feed could affect the performance of Cross Boer goats on the assessment of feed conversion with a significant value (P-Value 0.012 <0.05). This is due to the feed intake by weaned Cross Boer goats having a high protein content so that it has good feed palatability. The research results showed an increase in weaned Cross Boer goats' feed intake and body weight gain in each treatment, so the feed conversion value decreased. This is in line with [Supratman et al., \(2016\)](#), which states that the quality of the ration will affect the amount of protein consumed, palatability, capacity of the digestive apparatus, and the ability to use absorbed food substances are factors that help determine the level of consumption and affect the value of feed conversion.

This is supported by [Wunga et al., \(2020\)](#), which states that factors that affect the value of feed conversion, especially in ruminants such as goats, include feed quality, weight gain, and good digestibility. [Gading et al., \(2022\)](#) added that the amount of feed intake shows the value of feed palatability and feed quality, and palatability affects the amount of feed intake. Ration consumption depends on the palatability and characteristics of the feed itself ([Devendra and Leng, 2011](#)).

4. CONCLUSION

Based on the results of the study, it can be concluded that the use of hibiscus leaf flour as supplementation in basal rations can increase feed consumption and feed conversion of weaned Cross Boer goats but has not been able to affect the ADG of weaned Cross Boer goats to the maximum.

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