**Bauhinia purpurea** L. leaves meal as goat feed

A M Tasse and W Kurniawan  
Faculty of Animal Science, Universitas Halu Oleo, Kampus Hijau Bumi Tridharma, Jl. H.E.A. Mokodompit, Anduonohu, Kendari, Indonesia  
E-mail: andimurlinatas@gmail.com

**Abstract.** Legume tree forages are generally a source of better feed quality, as a supplement to increase the productivity of ruminant that fed low-quality feed, especially during the dry season. Butterfly leaves (*Bauhinia purpurea* L.) is a leguminous tree with potential as a fodder source in the dry season because its leaves contain more crude protein than white kabesak (*Acacia leucophloea* Roxb.). Legume trees may complement a grass-based diet by providing protein during the dry season. This research aimed to evaluate the effect of *Bauhinia purpurea* L. leaves meal in complete feed on daily dry matter intake, dry matter digestibility, and average daily body weight gain of goats. The experiment design was a completely randomized block design with 4-four treatments and 4-four groups, using 16 local male goats aged 1–1.5 years and weighed 12.5±0.8 kg. Treatments consisted of four complete feeds containing different levels of *Bauhinia purpurea* leaves meal (0%, 5%, 10%, and 15%, respectively) in concentrate. Feeds were set up to 9.90±0.5% CP and 69.76±0.5% TDN. Analysis of data utilizes an analysis of variance (ANOVA) and Duncan Multiple Range Test. The results showed that 5–10% *Bauhinia purpurea* L. leaves meal in concentrate has no significant effect on daily dry matter intake but significantly decreased dry matter digestibility and increased average daily body weight gain. It can be concluded that *Bauhinia purpurea* L. leaves meal has the potential to be goat feed.

1. **Introduction**

Goats are predominant small ruminant species kept in Southeast Sulawesi Indonesia where almost all of them are kept under a traditional extensive management system and depend almost exclusively on natural grazing. Like many countries in the tropics, the nutritive value of natural pastures deteriorates and becomes many nutrient-deficient, especially protein. The livestock production from roughage usage through either supplementation or partial replacement by forage is essential [1].

Leguminous trees and shrubs are potential as protein supplement feeds as these feeds contain high protein. Supplementation with legumes feed for goats helps to improve utilization of low quality forage during the dry season [2]. The utilization of various tree forages is mostly employed in animal feeding on high protein content [3]. Tree legumes may complement a grass-based diet by providing protein during the dry season [4].

Supplementation of leguminous trees i.e., *Lablab purpures* and *Leucaena leucocephala* in concentrate mixture induced favorable average daily body weight gain (ADG) can be employed in feeding systems depending on their availability and relative cost [5]. Strategic supplementation of unexploited, cheap, less competitive, and year-round available and easily accessible protein sources like *Sesbania sesban* could be a feasible alternative to mitigate protein deficiency in poor-quality feeds during periods of feed scarcity [6].
Butterfly leaves (*Bauhinia purpurea* L) is a leguminous tree that contains high crude protein. Analysis done in Laboratory of Nutrition and Feed Technology, Universitas Halu Oleo shows that *B. purpurea* leaves have 23.34% crude protein, 34.43% crude fiber, 23.64% nitrogen-free extract, and 51.93% total digestible nutrient. Therefore this study aimed to evaluate the effect of *B. purpurea* leaves meal in dietary on daily dry matter intake (DDMI), dry matter digestibility (DMD), and average body weight gain (ADG) of the local goats.

2. Method
The study was conducted at Experimental Farm, Faculty of Animal Science Universitas Halu Oleo, Kendari, Indonesia from June to August 2019. The trial was set in a randomized completed block design (RCBD) with four treatments and four replications. Treatments consist of four complete feeds of 60% *Brachiaria decumbens* grass and 40% concentrate with 0%, 5%, 10% and 15% *Bauhinia purpurea* L leaves meal (BpLM) addition (table 1). The research material using 16 local male goats age 1-1.5 years and weighed 12.5±0.8 kg. Treatments consisted of four complete feeds containing different levels of *Bauhinia purpurea* leaves meal (0%, 5%, 10%, and 15%, respectively) in concentrate. Feeds were set up to 9.90±0.5% CP and 69.76±0.5% TDN. Analysis of data utilizes an analysis of variance (ANOVA) and Duncan Multiple Range Test by SAS [7].

Table 1. Ingredient and nutrient composition of each treatment

| Composition     | Treatments          | 0% BpLM | 5% BpLM | 10% BpLM | 15% BpLM |
|-----------------|---------------------|---------|---------|----------|----------|
| Ingredients     |         |         |         |          |          |
| Roughage        | 60      | 60      | 60      | 60       |
| *Brachiaria decumbens* |     |         |         |          |          |
| Concentrate     | 40      | 40      | 40      | 40       |
| *Bauhinia purpurea* L | 0   | 5       | 10      | 15       |
| Rice bran       | 49      | 41.5    | 40.5    | 35       |
| Sago dregs      | 20      | 22      | 24.22   | 30       |
| Onggok          | 29.5    | 30      | 24      | 19       |
| Urea            | 1.5     | 1.5     | 1.28    | 1.0      |
| Nutrients composition*) |     |         |         |          |          |
| DM              | 81.42   | 83.84   | 81.48   | 78.58    |
| Ash             | 7.38    | 6.85    | 7.37    | 7.07     |
| CP              | 9.38    | 9.45    | 10.22   | 10.03    |
| CE              | 6.34    | 6.36    | 6.20    | 6.20     |
| CF              | 17.65   | 17.68   | 18.23   | 19.24    |
| NFC             | 63.71   | 63.62   | 61.43   | 69.18    |
| TDN             | 70.38   | 70.33   | 69.24   | 9.19     |
| Ca              | 0.50    | 0.24    | 0.36    | 0.45     |
| P               | 0.26    | 0.28    | 0.32    | 0.38     |

*)Analysis results in the Laboratory of Nutrition and Feed Technology, Faculty of Animal Science UHO

Voluntary feed intake was calculated by subtracting the feed offered to feed refusal and value expressed in a fresh and dry matter basis while daily dry matter intake (DDMI) was computed by multiplying voluntary feed intake with percent DM present in the feed. The following equation was
used: $\text{DDMI (gd}^{-1}) = \frac{\text{(offered nutrient–refusal nutrient)}/\text{number feeding day}}{\text{total sample}}$. At the end of the digestibility trial, a fecal sample collected from each animal was thoroughly mixed, and 10% of the total sample collected from each animal was sub-sample, weighed, and partially dried at 60°C for 72 h. The partially dried sample of feces was ground to pass through a 1 mm sieve and stored in air-tight polyethylene plastic bags until required for further analysis. Thus there were a total of 4 composited from each animal separately and pooled per treatment. The apparent digestibility coefficient or dry matter digestibility was calculated as $\text{DMD (\%) = \frac{(total amount of nutrient in feed – the total amount of nutrient in feces)/total amount in feed \times 100}{\text{}}$ [8].

After an acclimatization or quarantine period of 15 days to the experimental diets and pen, the feeding trial was conducted for 90 days. The experimental goats were offered feeds in two equal portions at 08.00 and 16.00 h daily throughout the feeding trial. The feed was offered at a 20% refusal adjustment. Feed refusals were weighed and recorded for each day and the difference between daily offer and refusal was calculated to determine the daily feed intake of each experiment. The sample was taken from batches of feed offered, and refusals feed were collected per animal over the experimental period and pooled on a treatment basis for chemical analysis [8].

Initial and final body weights of the experimental goat were measured using a suspended weighing balance of 50 kg weighing capacity at the beginning and end of the experiment for two consecutive measurements after overnight fasting. To determine the weight changes subsequent body weight measurements were made at 10 days intervals throughout the experimental period. Average daily body weight gain (ADG) was calculated follow $\text{ADG = (final body weight - initial body weight)/number of feeding days}$ [8].

3. Result and discussion

Table 2 shows that 5–10 % BpLM in concentrate has no significant effect on dry matter intake (DMI). This is due to similar CP and TDN content among treatments. The same result was also obtained by Lawa et al (2017) reported that dry matter intake of concentrate feed containing 10–40% legumes tree (white kabesak) was not significantly different among treatment goats [5]. BpLM in concentrate consistently decreased DMD, although DDMI was not significantly affected. The fibrous component as crude fiber (CF) among BpLM treatment were higher than non-BpLM. This is due to a decrease in DMD. The present study was supported by the study of Ahmad et al (2018) stated that tree forages can improve rumen fermentation in goats, and forages for animal feed, and Azavedo et al (2012) who assessing the nutritional value and biological effort of tree forages that are highly essential [3,9].

Treatments only had a significant effect on DMD, BWE, and FE. BpLM level 5–10% in concentrate increase BWG but not significantly different from the comparison level. The present study shows that BpLM in concentrate contains 9.90±0.5% CP, which meets CP requirements for local goats. This implies that CP BpLM concentrate can optimize the use of protein dietary rations for ruminant-fed grass-based. The present study is supporting the results of the previous studies. Many CP containing leguminous tree leaves (K. hospita, L. leucocephala, and G. sepium) [2], white kabesak [5], acacia forages [10], green trees [11] can be optimized when supplementing in ruminant fed low-quality roughage.

Increasing the level of BpLM in the concentrate decreased DMD of the ration. This means that an increase in BpLM levels inhibits dry matter degradation by rumen micro-organisms. The inhibiting factor for the ability of microbes to degrade dry matter components is thought to be due to the presence of secondary metabolic substances as anti-nutrients such as tannins. The presence of tannin is associated with lower nutritive value and lower biological availability of macromolecules like protein, and carbohydrates [10].

The result of this study was different from those reported Abdu et al [12], in that the presence of anti nutritive factor especially condensed tannin in some tree leaves decreased feed intake and livestock performance. But other studies Tekliye et al (2018); Sharifi et al (2015) supported that feeding diet containing Pistachio sp was not affect significantly DDMI of the goat [13,14]. The increase of level
BpLM 5%–15% in concentrate increased significantly on average daily body weight gain (ADG), although it decreased DDMD. The results indicated that (1) in this study goats were more tolerant of the presence of tannins or total phenolic in ration, (2) kind of the tannins in BpLM inhibits the digestive process in the rumen but do not interfere with the absorption of nutrients and, (3) macronutrient components in dry matter escaping from the digestive tract are thought was proteins that can supply amino acids for muscle building and body weight gain.

### Table 2. Daily dry matter intake, dry matter digestibility, average daily body weight gain, of goat fed on a different level of *Bauhinia purpurea* leaves meal.

| Parameters                        | Treatments  |
|-----------------------------------|-------------|
|                                   | 0% BpLM  | 5% BpLM | 10% BpLM | 15% BpLM |
| Daily dry matter intake (DDMI, gd⁻¹) | 140.25±4.45 | 127.50±5.40 | 122.50±10.54 | 153.45±8.61 |
| Dry matter digestibility (DMD, %)  | 66.10±1.12ᵃ | 69.59±4.52ᵃ | 64.75±0.50ᵇ | 63.28±0.41ᶜ |
| Average daily body weight gain (ADG, gd⁻¹) | 1.10±0.21ᵃ | 2.48±0.64ᵇ | 2.52±0.72ᵇ | 2.72±0.77ᵇ |

Numbers followed by different letter in the same row mean significantly different based on DMRT 0.05, BpLM (*Bauhinia purpurea* leaves meal).

4. Conclusion

*Bauhinia purpurea* leaves meal can be used for goat feed because it increases body weight gain of goats.

### References

[1] Hills J L, Wales W J, Dunshea F R, Garcia S C and Roche J R 2015 Invited review: An evaluation of the likely effects of individualized feeding of concentrate supplements to pasture-based dairy cows. J. Dairy Sci. 98 1363–401

[2] Ondiek J O, Ógore P B, Shakala E K and Kaburu G M 2013 Feed intake, digestibility and performance of growing small East African goats offered maize (*Zea mays*) stover supplemented with *Balanites aegyptiaca* and *Acacia tortilis* leaf forages, Basic Res J. Agric. Sci. Rev. 2 21–2

[3] Ahmed M A, Jusoh S, Alimon A R, Ebrahimi M and Samsudin A A 2018 Nutritive and anti-nutritive evaluation of *Kleinhovia hospita*, *Leucaena leucocephala* and *Gliciridia sepium* with respect to their effects on *in vitro* rumen fermentation and gas production Trop. Anim. Sci. J. 41 128–36

[4] Muir J P, Pitman W D, Dubeux Jr J C B and Foster J L 2014 The future or warm-season, tropical and subtropical forage legumes in sustainable pastures and range lands African J. Range Forage Sci. 31 187–98

[5] Lawa E D W, Marjuki, Hartutik and Chuzaemi S 2017 Effect of white kubesak (*Acacia leucocephala* Roxb) leaves level in the diet on feed intake and body weight gain of Kacang goat J. Indonesian Trop. Anim. Agric. 42 255–62

[6] Ahmed M A, Adeyemi K D, Jahromi M F, Jusoh S, Alimon A R and Samsudin A A 2017 Effects of dietary *Kleinhovia hospita* and *Leucaena leucocephala* leaves on rumen fermentation and microbial population in goats fed treated rice straw Trop. Anim. Health Prod. 49 1749–56
[7] SAS 2012. *SAS Institute Inc*, Online Doc 9.4 ed. (USA: SAS Institute Inc)

[8] Taklehaymanot A 2019 Feed intake, digestibility and growth performance of Begait sheep fed hay basal diet and supplemented with tsara (*Pterocarpus lucens*), pigeon pea (*Cajanus cajan*) leaves and concentrate mixture *Int. J. Livestock Prod.* 10 204–12

[9] Azavedo Junior R I D, Olivio C J, Bem C M D, Aguirre P F, Quatrin M P, Santos M M D and Horst T 2012 Forage mass and nutritive value of pastures mixed with forage peanut and red clover *R. Bras. Zootec.* 41 827–34

[10] Mousa M R M 2011 Effect of feeding acacia as supplements on the nutrient digestion, growth performance, carcass traits and some blood constituents of Awassi lambs under the conditions of North Sinai *Asian J. Anim. Sci.* 5 102–17

[11] Rahman Z, Akbar A, Hossan A and Ali Y 2015 Effect of tree forage supplementation on growth performance of goats *Asian J. Med. Biol. Res.* 1 2009–15

[12] Abdu S B, Hasan M R, Adamu H Y, Yashimi S M and Abdullah M J 2012 Intake, nutrient digestibility and nitrogen balance of *Acacia auriculata*, *Gmelina arborea* and *Butyro spermum*, parkii by Yankasa bucks *Iranian J. Appl. Anim. Sci.* 2 121–25

[13] Tekliye L, Merkuriaw Y, Asmare B and Mehret F 2018 Nutrient intake, digestibility, growth performance and carcass characteristics of Farta sheep fed urea-treated rice straw supplemented with graded levels of dry *Sesbania sesban* leaves *Agric and food sec.* 7 1–10

[14] Sharifi M, Naserin A A, GhiFFeri M H and Petit H Y 2015 Effects of *Pistachio* by-product on digestibility milk production, milk fatty acid profile and blood metabolites in Saanen dairy goats *Anim. Physiol. Anim. Nutr.* 99 777–87