

## Effect of white kabesak (*Acacia leucophloea* Roxb) leaves level in the diet on feed intake and body weight gain of Kacang goat

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### ABSTRAK

Tujuan penelitian ini adalah untuk menganalisis pengaruh tingkat penggunaan daun kabesak putih (*Acacia leucophloea* Roxb.) Willd. dalam pakan terhadap konsumsi, kecernaan pakan dan pertambahan bobot badan kambing Kacang. Rancangan Acak Kelompok dengan 5 perlakuan dan 5 ulangan digunakan dalam penelitian ini. Perlakuan tersebut berupa 5 pakan konsentrat yang masing-masing mengandung 0, 10, 20, 30, dan 40% daun kabesak putih berdasarkan bahan kering (BK) secara berturut-turut sebagai perlakuan T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, dan T<sub>4</sub>. Semua pakan dibuat dengan kandungan protein kasar (PK) berkisar 11,5-12,5%. Masing-masing pakan konsentrat diberikan pada 5 ekor kambing Kacang jantan (umur 1-1,5 tahun, berat badan awal 16,7±5,0 kg) ditambah rumput lapangan kering dengan imbalan 60:40. Hasil penelitian menunjukkan bahwa konsumsi BK, BO dan PK pada kambing yang diberi pakan T<sub>0</sub> tidak berbeda nyata dengan kambing yang diberi pakan T<sub>1</sub> tetapi lebih tinggi (P<0,05) dibanding pada kambing yang diberi pakan T<sub>2</sub>, T<sub>3</sub> dan T<sub>4</sub>. Kecernaan BK, BO, PK dan SK serta pertambahan bobot badan kambing yang diberi pakan T<sub>2</sub> secara nyata lebih tinggi dan mempunyai konversi pakan lebih baik (P<0,05) dibanding kambing dengan pakan perlakuan lain. penelitian ini adalah tingkat penggunaan daun kabesak putih yang paling optimal dalam pakan konsentrat adalah sebanyak 20% (T<sub>2</sub>).

**Kata Kunci:** pakan, konsentrat, suplemen, produktivitas, legium pohon

### ABSTRACT

This study was conducted to analysis the effect of levels of white kabesak (*Acacia leucophloea* Roxb.) Willd. leaves in the diet on feed intake, digestibility and body weight gain of Kacang goats. The completely randomized block design using 5 treatments and 5 replications was used in this experiment. The treatments were 5 concentrate feeds containing different levels of white kabesak leaves i.e. 0, 10, 20, 30 and 40% in the dry matter (DM) basis (representing T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> treatments, respectively). The feeds were set up to contain 11.5-12.5% of crude protein (CP). Concentrate feed and native grass was fed at ratio of 60 : 40 was fed to 5 local male goats (age 1-1.5 years old and initial weight of 16.7±5.0 kg). The results showed that DM, organic matter (OM), and CP intake of T<sub>0</sub> was not significantly different from those of T<sub>1</sub> goats, but it was significantly higher (P<0.05) than those of T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>. The DM, OM, CP, and crude fiber (CF) digestibility as well as body weight gain in T<sub>2</sub> goats were significantly higher (P<0.05) and had feed conversion ratio that was significantly better (P<0.05) compared to those of the other feed treatments. In conclusion, the most optimum level of white kabesak (*Acacia leucophloea* Roxb.) Willd. leaves used in concentrate feed for goat was 20 %.

**Keywords:** diet, concentrate, supplement, productivity, tree legumes

## INTRODUCTION

Productivity of local goats in semi-arid region of East Nusa Tenggara (NTT), Indonesia is considerably very low. Body weight gain of Kacang goats in Timor island of NTT was 25 g/head/day, which was lower than those of goats in the Western parts of Indonesia (50 g/head/day) and also compared to the goats that are kept under the experiment conditions (157 g/head/day) as reported by Johnson *et al.* (1986). The main factors causing low goat productivity in those area is due to the low availability and quality of forages which are mostly composed of native grass and crop residues especially in the dry season (Brown *et al.*, 2017). According to Muir *et al.* (2014) tree legumes may complement the grass-based diet by providing protein during the dry season.

Utilization of feed supplement to the low quality feeds has been reported by many researchers to improve the quality and ruminant productivity. Rodriguez *et al.* (2014) stated that tropical grass feeding that are generally low in protein content must be supplemented by protein feed in order to improve the productivity of ruminants. The local protein source from forage shrubs and trees can be used to replace imported protein feed such as soybean meal (Traiyakun *et al.*, 2011). Ondiek *et al.* (2013) reported that leguminous trees and shrubs are potential as protein supplement feeds as these feeds contained high protein and minerals. Ruminant productivity

can be improved by combining basal feed with foliage of legume trees and shrubs available in the region as proposed by Olivares-Perez *et al.* (2011). Legume tree forages are generally a source of better feed quality for grazing and as a supplement to increase the productivity of ruminants fed low-quality feed, especially under harsh environmental conditions (Belachew *et al.*, 2013; Abdalla *et al.*, 2014). Isah *et al.* (2013) reported that supplementation with legume feeds for goats helped to improve utilization of low quality forage during the dry season. Jamala *et al.* (2013) and Sollenberger *et al.* (2014) indicated that leguminous species were contained 25 to 50% more crude protein than non-leguminous plants because it has capacity to fix atmospheric N<sub>2</sub>. In addition, Fuah and Pattie (2013) reported that during the dry season, local goat in Timor island fed native grass supplemented with acacia maintained their body weight gain better than goats fed only native grass. Gebeyew *et al.* (2015) reported that the chemical composition of acacia is an indication of the potency as feed supplement for livestock production.

White kabesak (*Acacia leucophloea*, Roxb.) Willd. (Figure 1) is a leguminous trees with an important role as a source of feed for goats and other ruminants on the island of Timor especially during the dry-season. This plant is an endemic plant and grows naturally in the island of Timor and produces leaves (Figure 2) throughout the year. In addition, Orwa *et al.* (2009) reported that white kabesak is an important source of fodder in

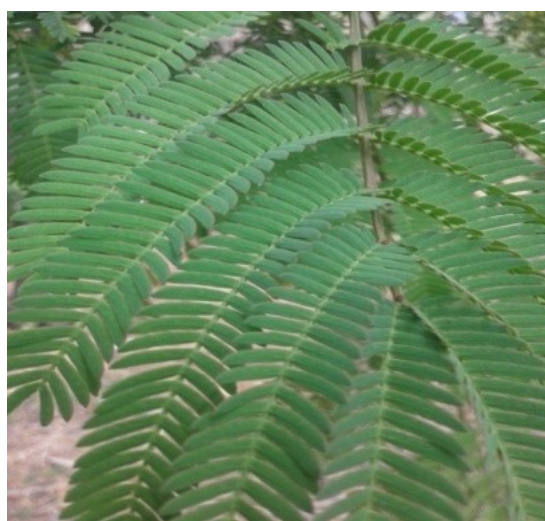


Figure 1 and 2. White Kabesak Tree and Its Leaves (personal document)

the dry season containing 15% of crude protein and 18% of crude fiber. According to Amanullah *et al.* (2006), the leaves of white kabesak contain DM 31.21%, CP 15.13%, crude fiber (CF) 18.46% and nitrogen free extract (NFE) 56.11%. White kabesak leaves contain tannin, the anti nutritive factors that may affect the use of feed. Sharifi *et al.* (2013) reported that the presence of tannins has been associated with lower nutritive value and lower biological availability of macromolecules like proteins and carbohydrates, but Bhat *et al.* (2013) reported that mixing legumes with grass hay-based diets has been hypothesized as an efficient way of diluting the negative effects of undesirable secondary compounds, such as tannins. However, so far there was no yet scientific data and report about the utilization of white kabesak leaves and its effect on goats performance. Therefore, this study was conducted to evaluate the effect of white kabesak leaves as feed component of diet on feed intake, digestibility of nutrients, body weight gain and feed conversion ratio of Kacang goat.

## MATERIALS AND METHODS

### Research Sites

The research was conducted in the Center for Training Ranch, Agency for Education and Human Resource Development of Agriculture, Ministry of Agriculture, Noelbaki, Kupang, East Nusa Tenggara (NTT).

### Research Design

Twenty-five male Kacang goats aged 1-1.5

years old with an average body weight of block I = 11.82 kg, II = 13.54 kg, III = 15.4 kg, IV = 18.04 kg, V = 24.82 kg were used in this study. The goats were divided into five groups based on their initial body weight and allotted into a completely randomized block design (Steel and Torrie, 1980) using five treatments and five replications.

### Management of Feeding

The treatments were diet composed of natural grass hay and five different concentrate feeds containing different levels of white kabesak leaves, i.e. 0%, 10%, 20%, 30%, and 40% in DM basis representing for T<sub>0</sub> to T<sub>4</sub> diet as treatment, respectively. All diets were formulated to contain 11.5 to 12.5% of CP (NRC, 2007). Feed composition of each treatment diet is presented in Table 1. The goats were adapted to the treatment diets for two weeks prior to the daily data collection that was done for 75 days.

The data collected in this study were DM, OM, CP and CF intake and digestibility, body weight gain, and feed conversion ratio. Feed offered, refusal and feces of each goat were daily measured and the samples were collected for DM, OM, CP, and CF laboratory analysis (AOAC, 2000). Each goat was weighed every week to measure body weight change during the study.

### Statistical Analysis

The data were subjected to analysis of variance according to a completely randomized block design and Duncan's multiple range test using SPSS software for Windows 17 series (Stell

Table 1. Feed Composition of Each Treatment Diet

Feed Ingredients	Treatments				
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Native grass (%)	60	60	60	60	60
Soybean meal (%)	5.0	4.0	3.0	2.0	0.0
Coconut cake (%)	8.0	6.0	5.0	4.0	0.0
Rice bran (%)	15.0	10.0	7.0	2.0	0.0
Corn flour (%)	12.0	10.0	5.0	2.0	0.0
Kabesak white leaves (%)	0.0	10.0	20.0	30.0	40.0
Total	100	100	100	100	100

and Torrie, 1980) was used in this study.

## RESULTS AND DISCUSSIONS

### White Kabisak Leaves

Table 2 showed that white kabisak leaves collected from those area is fairly good as protein source feed with CP content of 14.72%. The CP content of white kabisak leaves was slightly lower than of reported by Arulnathan and Chellapandian (2016) that was 16.20%. However, the CP content of white kabisak leaves was lower than CP content of other leguminous tree leaves, such as *Calliandra* (18.45%) (Jayaprakash *et al.*, 2016).

White kabisak leaves contains 0.97 % total tannins with 0.49 % condensed tannins (CT) and total phenol 3.52%. Total tannins, CT and total phenols contents were lower than those in *Calliandra calothyrsus* (total tannins 5.06-13.3% DM, CT 3.74% DM) and *Acacia villosa* (total tannins 3.21-16.4% DM, CT 1.26% DM) as reported by Wina (2010). The CT and total phenol content of *Acacia siberiana* were 1.68 and 1.63% DM) and those in *Acacia hebeclada* were 1.56 and 0.58% DM (Mokoboki, 2011).

### Chemical Composition

All treatment diets contained a comparable DM, OM, and CP content (Table 3), but increasing level of white kabisak leaves in the diet (T<sub>0</sub> to T<sub>4</sub>) increased slightly OM and CF content of the diets. Based on those data, it was shown that white kabisak leaves had potential to be used as concentrate feed component substituting commercial feed protein such as soybean meal, coconut cake, rice bran, and corn flour, which are commonly high in price.

### Nutrient Intake, Digestibility, Body Weight Gain and Feed Conversion Ratio

Data of feeding trial included nutrients intake and digestibility of diet, live weight gain, and feed conversion ratio of goats fed concentrate feed containing different levels of white kabisak leaves were presented in Table 4. The DMI in this study ranged from 49.6 to 68.7g/kg BW<sup>0.75</sup>/d or 2.68 to 3.91% of body weight from T<sub>4</sub> to T<sub>0</sub>. The DMI was still in the range of those stated by NRC (2006) that was 2-3% of body weight and those reported by Sultana *et al.* (2015) that DMI of goats fed on grass supplemented with *moringa oleifera* was 3.39-3.97% of body weight. Data on Table 4 showed that increasing level of white kabisak leaves in the diet decreased total DM, OM, CP and CF intake significantly (P<0.05) and consistently. The highest DM intake was T<sub>0</sub>

Table 2. Proximate Analysis and Tannin Content of White Kabisak Leaves

Parameter	Content (%)
Dry matter	90.2
Organic matter	93.3
Crude protein	14.7
Crude fiber	30.4
Ether extract	0.07
NFE	48.1
Total Tannins	0.97
Condensed Tannins	0.49
Total phenol	3.52

NFE = Nitrogen free extract

Table 3. Dry Matter, Organic Matter, Crude Protein and Crude Fiber Content of Each Treatment Diet

Feed Ingredients	Treatments				
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Dry matter (%)	89.8	89.9	89.8	89.9	90.1
Organic Matter (% DM)	87.9	87.9	88.2	88.5	88.5
Crude protein (% DM)	12.1	12.1	12.3	12.4	11.7
Crude fiber (% DM)	27.9	28.3	28.6	31.2	34.5

Table 4. Average Nutrients Intake, Digestibility, Body Weight Gain and Feed Conversion by Goats Fed on Treatment Diets Containing Different Proportion of Concentrate and White Kablesak Leaves

Variable	Treatment				
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Nutrient intake (g/kg BW <sup>0.75</sup> /day) :					
DMI Native grass	49.9 ± 6.56	38.7 ± 6.98	38.4 ± 6.06	32.1 ± 5.92	30.6 ± 4.22
DMI Concentrate	18.8 ± 0.93	13.8 ± 1.53	8.78 ± 1.07	4.74 ± 0.24	0
DMI White kablesak	0	4.74 ± 0.53	9.08 ± 1.10	14.8 ± 0.72	19.0 ± 1.53
Total DMI	68.7 ± 7.14 <sup>b</sup>	57.2 ± 5.04 <sup>ab</sup>	56.30 ± 4.52 <sup>a</sup>	51.6 ± 6.22 <sup>a</sup>	49.6 ± 5.40 <sup>a</sup>
OMI Native grass					
OMI Concentrate	42.9 ± 4.49	33.3 ± 6.21	33.30 ± 5.41	27.6 ± 5.40	26.4 ± 3.77
OMI White kablesak leaves	17.4 ± 0.86	12.7 ± 1.41	8.14 ± 0.99	4.39 ± 0.22	0
Total OMI	60.3 ± 15.05 <sup>b</sup>	50.40 ± 4.41 <sup>ab</sup>	49.9 ± 4.01 <sup>a</sup>	45.8 ± 5.68 <sup>a</sup>	44.2 ± 4.86 <sup>a</sup>
CPI Native grass					
CPI Concentrate	3.83 ± 1.27	2.96 ± 0.54	2.94 ± 0.46	2.46 ± 0.45	2.35 ± 0.33
CPI White kablesak leaves	3.50 ± 0.17	3.28 ± 0.36	3.31 ± 0.07	3.17 ± 0.26	0
Total CPI	7.33 ± 1.38 <sup>b</sup>	6.94 ± 0.17 <sup>b</sup>	7.69 ± 0.56 <sup>a</sup>	7.66 ± 0.60 <sup>b</sup>	5.15 ± 0.51 <sup>a</sup>
CFI Native grass					
CFI Concentrate	20.3 ± 5.50	17.0 ± 1.97	16.90 ± 2.06	14.6 ± 2.68	8.10 ± 1.62
CFI White kablesak leaves	1.95 ± 0.10	1.45 ± 0.16	0.87 ± 0.11	0.46 ± 0.03	0
Total CFI	22.3 ± 5.56 <sup>b</sup>	19.90 ± 1.67 <sup>b</sup>	20.50 ± 1.81 <sup>b</sup>	19.50 ± 2.75 <sup>b</sup>	13.90 ± 1.91 <sup>a</sup>
Digestibility of nutrients:					
DM digestibility (%)	69.3 ± 7.76 <sup>ab</sup>	69.8 ± 5.12 <sup>b</sup>	75.7 ± 4.89 <sup>b</sup>	63.8 ± 6.96 <sup>a</sup>	67.1 ± 6.44 <sup>a</sup>
OM digestibility (%)	68.9 ± 7.71 <sup>ab</sup>	69.7 ± 4.78 <sup>ab</sup>	75.3 ± 5.10 <sup>b</sup>	62.8 ± 7.20 <sup>a</sup>	66.4 ± 6.78 <sup>a</sup>
CP digestibility (%)	77.8 ± 7.20 <sup>b</sup>	77.5 ± 4.36 <sup>b</sup>	82.4 ± 4.91 <sup>b</sup>	75.4 ± 5.54 <sup>b</sup>	65.9 ± 4.97 <sup>a</sup>
CF digestibility (%)	63.3 ± 10.5 <sup>b</sup>	66.5 ± 6.29 <sup>bc</sup>	73.6 ± 6.32 <sup>c</sup>	61.5 ± 7.71 <sup>b</sup>	52.0 ± 12.3 <sup>a</sup>
Digestible nutrients intake (g/kg BW <sup>0.75</sup> /d):					
DDMI	47.4 ± 2.34 <sup>b</sup>	39.9 ± 4.20 <sup>ab</sup>	42.5 ± 3.50 <sup>ab</sup>	33.1 ± 7.05 <sup>a</sup>	33.4 ± 5.88 <sup>a</sup>
DOMI	41.4 ± 0.78 <sup>c</sup>	35.1 ± 3.41 <sup>ab</sup>	37.5 ± 3.14 <sup>bc</sup>	28.9 ± 6.40 <sup>a</sup>	29.4 ± 5.34 <sup>a</sup>
DCPI	5.71 ± 1.52 <sup>b</sup>	5.38 ± 0.53 <sup>b</sup>	6.03 ± 0.39 <sup>b</sup>	5.93 ± 0.66 <sup>b</sup>	3.39 ± 0.43 <sup>a</sup>
DCFI	13.9 ± 3.92 <sup>b</sup>	13.2 ± 1.38 <sup>b</sup>	15.10 ± 1.65 <sup>b</sup>	12.10 ± 2.98 <sup>b</sup>	7.31 ± 2.51 <sup>a</sup>
DMI (g/h/d)	466.18 ± 3.20	459.10 ± 3.19	458.90 ± 3.26	443.29 ± 5.04	434.89 ± 5.51
BWG (g/h/d)	65.20 ± 4.57 <sup>bc</sup>	64.03 ± 4.84 <sup>bc</sup>	66.7 ± 6.27 <sup>c</sup>	62.70 ± 5.54 <sup>b</sup>	56.70 ± 6.64 <sup>a</sup>
Feed conversion	7.15 ± 0.70 <sup>bc</sup>	7.14 ± 0.66 <sup>b</sup>	6.88 ± 0.52 <sup>a</sup>	7.07 ± 0.91 <sup>b</sup>	7.67 ± 0.83

a, b, c Means within same row with different superscripts were significantly different (P < 0.05).

DMI = Dry matter intake, OMI = organic matter intake, CPI = crude protein intake, CFI = crude fiber intake, DDMI = digestible dry matter intake, DOMI = digestible organic matter intake, DCPI = digestible crude protein intake, DCFI = digestible crude fiber intake, BWG = body weight gain

( $68.7 \pm 7.14$  g/kg BW<sup>0.75</sup>/day) and the lowest was T<sub>4</sub> ( $49.6 \pm 5.40$  g/kg BW<sup>0.75</sup>/day). The decrease of those nutrients intake was not only due to the decrease of concentrate feed intake but more importantly also due to the decrease of native grass intake as a basal diet. The decrease of nutrients intake due to the increase of white kabesak leaves level in the concentrate feed was mostly due to the increase of anti nutritive factors (phenolic compound) and CF. Abdu *et al.* (2012) stated that the presence of anti nutritive factors especially condensed tannin in some tree leaves decreased feed intake and livestock performance, mainly when the tree leaves are fed in large quantity. However Sedighi-Vesagh *et al.* (2015) reported feeding diet containing 32% *Pistachio*-by product was not affect significantly by DMI of goat.

Significant and decreasing of DM, OM, CP, and CF digestibility and consequently intake of digestible DM, OM, CP, and CF took place also due to the increase of level of white kabesak leaves in the diet from T<sub>0</sub> to T<sub>4</sub>. However, the increase of level of white kabesak leaves in the diet from T<sub>0</sub> to T<sub>4</sub> affected significantly but not consistently body weight gain, and feed conversion. Body weight gain increased and feed conversion decreased from T<sub>0</sub> to T<sub>2</sub>, but body weight gain decreased and consequently feed conversion increased from T<sub>3</sub> to T<sub>4</sub>. In the other words, goat fed on diet containing 20% white kabesak leaves (T<sub>2</sub>) showed significantly ( $P < 0.05$ ) highest body weight gain and the lowest feed conversion compared to other treatment feeds. These phenomenon on all variables was most presumably due to the increase of tannin or total phenolic content of the diet with the increase of level of white kabesak leaves in the diet. Sandoval-Castro *et al.* (2005) reported that phenolic compounds, alkaloids, tannins and aromatic compounds in the diet are known to depress feed palatability hence decreased feed intake, regardless the nutrients content of the feed. Lamy *et al.* (2011) reported that selection of cattle to feed depends mainly on the palatability of the feed and tannins are usually associated with the decrease of palatability which results in decreased vigor grazing of livestock. Total tannin content of white kabesak leaves in this study is 0.97% and condensed tannin is 0.49% it means that total condensed tannins intake by goat in this research increased from 0;  $0.20 \pm 0.03$ ;  $0.41 \pm 0.06$ ;  $0.61 \pm 0.09$ ; and  $0.82 \pm 0.13$  g/kg DM from T<sub>0</sub> to T<sub>4</sub>, respectively. According Amanullah *et al.* (2006)

and Orwa *et al.* (2009) white kabesak leaves were poorly given as a single feed for ruminants because it contains fairly nutritious. In addition lower body weight gain on treatment T<sub>3</sub> and T<sub>4</sub> must also be caused by lower feed intake and digestibility as also reported by Pineiro-Vasquez *et al.* (2015).

The results of this study were not different from those reported by Traiyakun *et al.* (2011) in goats given feed containing different levels of *lamtoro* leaf meal 0, 25, 50 and 75 percent as a substitute for soybean meal in feed concentrates; but lower than the goats given legume leaf of *Serecia terminalia*, *Combretum apiculatum* and *Eulea schimperi* as a supplement in the buffel grass basal ration (Aganga and Monyatsiwa, 1999). OM, CP, and CF intake showed also the same phenomenon with the dry material in which the control treatment showed significantly higher consumption than the treatment using white kabesak leaves.

Average body weight gain of goats was significantly ( $P < 0.05$ ) influenced by the use of white kabesak leaves in feed. Goats fed on feed containing 20% white kabesak leaves (T<sub>2</sub>) showed the highest body weight gain followed by goats that received rations T<sub>0</sub>, T<sub>1</sub>, T<sub>3</sub> and T<sub>4</sub>. The results of this study were similar to that found by Mousa (2011) who reported that the use of *acacia* forage in the ration of growing sheep up to 40% improved growth performance, economic efficiency, carcass percentage and lower feed costs per kg of body weight. Abegunde *et al.* (2017) found the best level of combination of *Tithonia diversivolia* and *Veronia amygdalina* in the concentrate feed of 10% as feed supplement for low quality grass fed to goat. Even Rahman *et al.* (2015) concluded from their research that supplementation with green trees in the feeding system of goats produced higher weight gain, digestibility and nitrogen balance than goats fed on only grass.

## CONCLUSION

The use of white kabesak leaves in the diet of goats at level of 20% showed the best results in feed intake, digestibility, body weight gain and feed conversion.

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