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# The Impact of *Lannea coromandelica* Leaf Flour Supplementation on the Production Performance and Hematological Values of Local Goats

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**ABSTRACT**

Livestock productivity is inseparable from several factors, the main factor being feed which occupies a large proportion of all production factors Livestock. This research was conducted in the Experimental Cage owned by CV. Prima BREED, Tondo, Mantikulore Subdistrict, Palu City, Central Sulawesi Province, which took place from 24th November 2019 to 2nd February 2020. This research aims to determine the production performance of local goats fed with flour and *Lannea coromandelica* leaves. The research subjects comprised 18 local female goats, approximately 10 months old, exhibiting a body weight range between 10.80 kg to 16.29 kg. These indigenous Indonesian goats are well-adapted, characterized by relatively thin brown fur, a straight nose, short neck, forward-pointing short ears, a small, light head, and an average body height of 44 cm. The study employed a completely randomized design (CRD) consisting of three treatments, each repeated six times. The treatment groups were defined as follows: P0 = goats given 1.0% concentrate without *Lannea coromandelica* leaves; P1 = goats given 1.0% concentrate supplemented with 0.5% *Lannea coromandelica* leaves flour; and P2 = goats given 1.0% concentrate along with 0.5% *Lannea coromandelica* leaves. Analysis of variance indicated that the administration of *Lannea coromandelica* leaves flour significantly increased ration consumption and hematological values, such as blood cell count percentage. However, no significant differences were observed in body weight gain, ration efficiency, physiological status, and carcass and non-carcass components weight of local goats. The findings suggest that while *Lannea coromandelica* leaf supplementation affects certain aspects of goat health and nutrition, its impact on growth and productivity parameters is limited.

## 1. INTRODUCTION

Goats, small ruminants popular within Indonesian society, serve dual roles as easily maintained livestock and a form of tradeable savings [1-3]. Despite their popularity, goat farming in Indonesia remains largely a subsystem, with limited attention to cost and quality factors [4]. Furthermore, the scale of this sector is primarily small to medium, with industrial-style livestock rearing being relatively uncommon [5, 6].

Productivity, inherently linked to the purpose of goat farming, is a key consideration in business activities such as this [7, 8]. Various factors influence productivity, notably the level of production manifested as weight gain and slaughter yields.

Central to livestock productivity is feed, which represents a significant portion of all production inputs. Typical livestock productivity metrics encompass growth rate and reproduction rate, both significantly influenced by the quality and quantity of available feed. Therefore, the exploration of animal feed is important to overcome the limited availability of feed [9].

Staple feed, consumed in the largest quantities relative to other feed ingredients, is integral to livestock nutrition [10]. However, to promote high productivity commensurate with genetic capacity, the nutrient supply from staple feeds often falls short, both in terms of intake volume and nutrient balance. Consequently, nutritional deficiencies or imbalances in staple feed necessitate correction [11].

Efforts to bolster livestock production commonly involve the use of feed supplements or concentrates. However, these efforts often fail to optimize growth, as the available protein and energy are used by protozoa for their survival, thereby compromising the needs of bacteria. This results in suboptimal bacterial activity and feed degradation, leading to less than optimal rumen metabolites for bacterial growth and goats. Hence, the provision of saponification material is crucial to curtail protozoa growth and enhance bacterial growth. The increase in protozoa was followed by a decrease in the number of rumen bacteria as a predation effect of protozoa on bacteria.

One source of feed available throughout the year is *Lannea coromandelica* [12]. One of the advantages of *Lannea coromandelica* plant in Indonesia which is a typical plant for the treatment of wounds, dysentery, and other infectious diseases in several regions in Indonesia, as well as a source of feed for ruminants. *Lannea coromandelica* plant is thought to contain saponification compounds, thereby inhibiting the growth of protozoa and increasing bacterial growth. In

addition, *Lannea coromandelica* is known to contain secondary metabolites such as alcohol, steroids, triterpenoids, phenolics, flavonoids, tannins, and saponins. This compound is a group of bioactive compounds that produce antioxidant activity. Increased bacterial growth can increase consumption, digestibility and rumen metabolites so as to increase livestock growth [13, 14].

In addition to efforts to increase the activity of rumen microorganisms in order to increase the digestibility of the ration, one of the efforts to overcome the low digestibility value and increase the nutritional value of the ration is physical, chemical treatment and the assistance of other organisms (biological). One of the physical treatments to increase the degradation value is to reduce the particle size of a feed ingredient. Explain that reducing the particle size of feed can increase the nutritional value and digestibility [15]. Also said that the particle size of corn kernels greatly affects the starch digestion process in the rumen so that it can be used as a treatment in terms of manipulation of the fermentation process [16]. Body weight gain in livestock is influenced by several important factors in growth including breeding, feeding, and management. These three factors are an equilateral triangle whose balance must be considered, but many breeders have not paid attention to these three factors. Therefore, many breeders experience losses, one of which is the very slow increase in body weight of livestock. The use of forage feed technology, such as the use of *Lannea coromandelica* leaves, is expected to maintain the quality of livestock to achieve a proportionate increase in body weight and other production performance factors of local goats. This study aims to determine the production performance of local goats which are fed with wheat flour and *Lannea coromandelica* leaves.

## 2. MATERIALS AND METHODS

This research was conducted in the Experimental Cage owned by CV. Prima BREED, Tondo, Mantikulore Subdistrict, Palu City, Central Sulawesi Province, which takes place from 24th November 2019 to 02nd February 2020.

***Experimental goats***

The livestock used in this research were 18 female local goats aged ± 10 months with a body weight range between 10.80 kg to 16.29 kg.

***Cage***

The cages used were stage cages with a tin roof, plank floors, walls made of boards measuring 7 × 20 m. The cages were divided into 18 plots with a size of 1.0 × 1.75 meters each which was occupied by an experimental female local goat. Each plot is equipped with a feed trough made of planks and a basin for drinking. Three days before the cage was used, the cage was first cleaned and sprayed using Rodalon with a dilution rate of 15 cc per 10 liters, so that the cage was free from germs.

***Animal feed***

The feed given during the study consisted of concentrate and *Panicum sarmentosum* Roxburg (Roxb). The concentrate used was a mixture of several ingredients such as 4.80% milled soybeans, 61.20% rice bran, and 34.00% ground corn and *Lannea coromandelica* leaves as treatment. 1.0% concentrate was given at 07.30 in the morning and 0.5% dry matter of *Lannea coromandelica* leaves from body weight, while *Panicum sarmentosum* Roxburg (Roxb) was given after the concentrate and treatment had been consumed ad libitum. The nutritional content of the feed provided is listed in Table 1.

***Making flour and hay of Lannea coromandelica leaves***

*Lannea coromandelica* Leaves obtained from plantations and community yards, then chopped using a chopper and dried in the sun until the moisture content reaches (20-30%), after drying it is put in sacks as feed ingredients for Hay of *Lannea coromandelica*, while *Lannea coromandelica* flour is first ground. Flour and Hay of *Lannea coromandelica* leaves were analyzed proximately to determine the nutritional content. Flour of *Lannea coromandelica* leaves and Hay of *Lannea coromandelica* leaves (HLCL) are ready to be given to experimental animals mixed with concentrate.

**Table 1.** Nutritional content and composition of concentrated ingredients used

| Feed Ingredients | Dry Material Content* | Crude Protein* | Crude Fiber* | Crude Fat* | TDN* |
|---|---|---|---|---|---|
| Soybean Flour | 92.13 | 31.35 | 9.73 | 11.65 | 61.00 |
| Ground Corn | 90.23 | 14.06 | 3.35 | 5.80 | 86.74 |
| Rice Bran | 88.83 | 14.24 | 19.72 | 2.41 | 62.30 |
| *Lannea coromandelica* Leaves Flour | 87.83 | 15.06 | 16.53 | 3.19 | 67.45 |
| Hay *Lannea coromandelica* Leaves | 87.24 | 15.06 | 16.53 | 3.19 | 67.45 |
| *Panicum sharmentosum* | 26.29 | 11.51 | 30.20 | 1.90 | 59.54 |

Description: *The results of the analysis of the Nutrition and Animal Feed Laboratory of the Faculty of Animal Husbandry and Fishery, Tadulako University in 2019.

*Lannea coromandelica* leaves obtained from the community's plantations and yards are then chopped and dried on a tarpaulin to dry in the sun. Every day the bed is turned over every 1-2 hours, drying time is carried out several days until a moisture content of 20-30% is reached, marked with a yellowish green color. Then a prosimate analysis was carried out to determine the nutritional content. *Lannea coromandelica* leaf hay is ready to be given to experimental livestock mixed with concentrate.

**Research method**

This study was designed using a completely randomized design (CRD) which consisted of 3 treatments and was repeated 6 times. The treatments were:

$P_0$=Giving concentrate 1.0% without *Lannea coromandelica* leaves.

$P_1$=Giving concentrate 1.0% + Flour of *Lannea coromandelica* leaves 0.5%.

$P_2$=Giving concentrate 1.0% + Hay of *Lannea coromandelica* leaves 0.5%.

**Research variable**

Body weight gain is obtained from the quotient of the difference between the final body weight and initial body

weight, in the length of time of observation. Weighing is done every week, before being given feed. The calculation refers to the formula:

$$\text{DBWG (gram/head/day)} = \frac{W2 - W1}{T2 - T1}$$

Remarks:
*DBWG:* Daily body weight gain (gram)
*W1:* Initial weighing
*W2:* Final weighing weight
*T2-T1:* Time difference (days) between the second weighing minus the first weighing

Ration consumption based on dry matter (grams) is obtained by calculating the difference between the amount of feed given and the amount of feed remaining, then multiplied by the resulting dry matter content, which is expressed in grams/head/day.

**Data analysis**

The data obtained were analyzed statistically according to the design used Analysis of the t-test with the following formula [17]:

$$t = \frac{x_1 - x_2}{\sqrt{\frac{(n_1 - 1){S_1}^2 + (n_2 - 1){S_2}^2}{n_1 + n_2 - 2}(\frac{1}{n_1} + \frac{1}{n_2})}}$$

Remarks:
*t*: Observation response from research results
$x_1$: Median value of giving concentrate without Java wood leaf hay
$x_2$: Median value of concentrate + 0.5% Java wood leaf hay
$n_1$: Number of replications of treatment given concentrate without Java wood leaf hay
$n_2$: Number of replications of treatment given concentrate + 0.5% Java wood leaf hay
${S_1}^2$: Variety of treatments of giving concentrate without Java wood leaf hay
${S_2}^2$: Variety of treatments given concentrate + 0.5% Java wood leaf hay

## 3. RESULTS AND DISCUSSION

**The effect of treatment on growth**

The results of observations of the weight gain, dry content consumption, crude protein consumption, efficiency of dry content use and efficient use of protein rations for local goats (Kambing Kacang) are listed in Table 2.

The increase in weight, the efficiency of using dry content and the efficiency of the use of protein rations do not have a significant effect (P>0.05), but the consumption of dry matter and crude protein rations are significantly different (P<0.05) with control treatment.

Table 2 shows that the consumption of dry content and crude protein in goat rations with *Lannea coromandelica* leaves flour and *Lannea coromandelica* leaves hay is significantly higher than the control treatment. The high level of feed consumption can be influenced by particle size and palatability of livestock in the form of a bitter taste of feed if given *Lannea coromandelica* leaves containing saponins which stimulate ration consumption. The palatability of an animal can be affected by the taste, color, texture and smell of the feed [18]. Goats are generally able to distinguish bitter, sweet, salty and sour tastes and have a high tolerance for bitter tastes, so that taste stimulation will determine whether the feed will be consumed by livestock or not [19]. In addition, the ability of goats to consume dry matter is influenced by the capacity of the rumen and the adequacy of nutrients in the feed given, this greatly affects their productivity because the ability to consume dry matter is a limiting factor in feed utilization.

**Table 2.** Average body weight gain, ration consumption and efficiency of ration use on local goats given *Lannea coromandelica* leaves

| Parameter | Treatment | | |
|---|---|---|---|
| | Control | *Lannea coromandelica* Leaves Hay | *Lannea coromandelica* Leaves Flour |
| Body Weight Gain (g/head/day) | 36.31[a] | 37.50[a] | 41.98[a] |
| Consumption of Dry Content Ration (g/head/day) | 542.55[a] | 612.80[b] | 610.73[b] |
| Consumption of Raw Protein Ration (g/head/day) | 199.89[a] | 212.01[b] | 211.55[b] |
| Efficiency of Use of Ration Dry Content | 0.067[a] | 0.061[a] | 0.069[a] |
| Efficiency of Using Rough Protein ration | 0.181[a] | 0.177[a] | 0.199[a] |

Description: Numbers followed by different letters in the direction of the row indicate a significant difference.

The amount of ration consumption can increase the weight gain of body and the efficiency of ration use, but in this research, it has not been able to provide a real difference, this is probably due to the presence of saponification. Saponins as one of the anti-nutritional substances in plants will result in a decrease in nutrient utilization, feed conversion efficiency and livestock productivity [20]. Thus, body weight gain and efficiency in the use of dry content and crude protein have the same impact on all treatments. The value of protein efficiency should be in high value. This is because protein efficiency is important in livestock business because of the high price of protein source feed. In addition, it is expected that the feed ingredients provided can be used appropriately to increase the efficiency of the livestock business.

**The effect of treatment on physiological status**

The results of observations of measurements of body temperature, respiration frequency and pulse frequency of local goats (nut goats) are listed in Table 3.

The results of statistical analysis show that giving *Lannea coromandelica* leaves flour and *Lannea coromandelica* leaves hay has no effect on body temperature, respiration frequency and pulse frequency of goats. The results of this study indicate that the body temperature of the goats obtained is same as the results of the research [21], namely 38.23℃-38.48℃, but respiration is higher at 22.06-23.07 times/minute and the pulse is lower at 92.24-94.49 times/minute. Factors that can affect the pulse include the amount of feed in the digestive tract which makes pulsus increase due to rumen contraction,

livestock age, sex, livestock condition, environmental temperature, muscle activity and stress. Respiration is influenced by several factors, namely physiological responses because the changes in environmental temperature, body temperature, body size and pregnancy.

**Table 3.** Average status of local goats given *Lannea coromandelica* leaves

| Parameter | Treatment | | |
|---|---|---|---|
| | Control | *Lannea coromandelica* Leaves Hay | *Lannea coromandelica* Leaves Flour |
| Body Temperature (°C) | 38.41[a] | 38.43[a] | 38.45[a] |
| Respiration Frequency (times/minute) | 36.24[a] | 37.17[a] | 41.42[a] |
| Pulse Frequency (times/minute) | 73.20[a] | 76.74[a] | 75.59[a] |

Description: Numbers followed by different letters in the direction of the row indicate a significant difference.

**The effect of treatment on hematological value**

The results of the observation of the measurement of the number of white blood cells, red blood cells, hemoglobin and blood hematocrit of local goats are listed in Table 4.

The results of statistical analysis show that giving *Lannea coromandelica* leaves flour and *Lannea coromandelica* leaves hay affect on the hematological value of goat blood. Goats given *Lannea coromandelica* leaves were significantly higher than control goats. This is due to the presence of saponin activity in *Lannea coromandelica* leaves which can act as an immunostimulator which increase the immune system [22].

The results of statistical analysis of the number of erythrocytes, hemoglobin levels and hematocrit values of goats are affected by treatment. Goats feed by *Lannea coromandelica* leaf flour different from the goats feed by *Lannea coromandelica* leaf hay and the control one. All treatments indicate the number of leukocytes which was still in the range obtained by the study [23]. It was 13.01 thousand/µl and 19.81±5.75 thousand/µl. The results of this research are the same as the range of the number of erythrocytes, hemoglobin levels and hematocrit values from the research results of the studies [24, 25] which is 6-16.7 × 106/µL. 5.4-12.0 g/dL, and 15.6-29.4%. In intensively reared ewes local goat, the average number of erythrocytes is 13.23±1.74 × 106/µL. 9.09 g/dL, and 28.58%. The results of studies [23, 24], in ewe local goats in Mojosarirejo village, Driyorejo Gresik, obtained an average number of erythrocytes of 14.57±2.3 × 106/µL, 8.7 g/dL, and 15.32%. The number of erythrocytes, hemoglobin and hematocrit values are still in the normal range.

**Table 4.** The average hematological value in local goats given *Lannea coromandelica* leaves

| Parameter | Treatment | | |
|---|---|---|---|
| | Control | *Lannea coromandelica* Leaves Hay | *Lannea coromandelica* Leaves Flour |
| White Blood Cells (thousands/mm$^3$) | 11.47[a] | 14.33[ab] | 16.00[b] |
| Red Blood Cells (million/mm$^3$) | 9.07[a] | 11.05[a] | 15.08[b] |
| Hemoglobin (g/dl) | 8.30[a] | 9.03[a] | 10.13[b] |
| Hematocrit (%) | 25.47[a] | 28.02[ab] | 30.65[b] |

Description: Numbers followed by different letters in the direction of the row indicate a significant difference.

The high number of erythrocytes, hemoglobin levels and hematocrit values in goats fed with *Lannea coromandelica* leaf flour is caused by the smaller particle size which affect the formation of the goat's hematological value. Explained that reducing the particle size can increase the nutritional value and digestibility [15]. Also reported that particle size greatly affects the process of starch digestion in the rumen thereby increasing the amount of ration consumption [16]. That age and environment affect the blood picture [26], stated that the blood picture in some animal species is influenced by sex, race, fed quality, and rearing management.

**The effect of treatment on carcass and non carcass**

The results of weighing and measuring the weight and percentage of carcass and non-carcass components of local goats are listed in Table 5.

Table 5 shows that the average weight and percentage of carcass and non-carcass components of local goats given *Lannea coromandelica* leaves do not show a significant difference except for the percentage of non-external carcass and non-carcass edible. Carcass weight and non-carcass components which do not differ from the addition of flour and hay from *Lannea coromandelica* indicated that carcass weight is closely related to slaughter weight of livestock. This is in line with the studies [27, 28] the opinion that the body weight gain of ruminants is strongly influenced by the quality and quantity of feed, meaning that the body weight gain of livestock is proportional to the ration consumed.

**Table 5.** Average carcass weight and percentage, carcass components and non-carcass components of local goats given *Lannea coromandelica* leaves

| Parameter | Treatment | | |
|---|---|---|---|
| | Control | *Lannea coromandelica* Leaf Hay | *Lannea coromandelica* Leaf Flour |
| Carcass Weight (kg) | 7.02[a] | 7.35[a] | 7.38[a] |
| Carcass Percentage (%) | 46.60[a] | 48.26[a] | 48.82[a] |
| Internal Non Carcass Weight (kg) | 1.22[a] | 1.23[a] | 1.24[a] |
| Internal Non Carcass Percentage (%) | 8.04[a] | 8.04[a] | 8.17[a] |
| External Non Carcass Weight (kg) | 2.04[a] | 2.12[a] | 2.14[a] |
| Percentage of Non External Carcass (%) | 13.51[a] | 13.86[b] | 14.10[b] |
| Non Edible Carcass Weight (kg) | 2.47[a] | 2.55[a] | 2.59[a] |
| Percentage of Non Edible Carcass (%) | 16.33[a] | 16.72[ab] | 17.10[b] |

Description: Numbers followed by different letters in the direction of the row indicate a significant difference.

Carcass weight and non-carcass components (internal and external) and non-edible (edible) components are not different, probably due to the same nutritional quality of the fed given, especially the protein content and energy of the ration. The protein content of concentrate given is 15% whichis almost the same as *Lannea coromandelica* protein, it is 15.06%. Thus, the addition of *Lannea coromandelica* leaves did not change the nutritional content of the fed consumed by livestock. Meanwhile, livestock which are not provided by *Lannea coromandelica* leaves will meet their nutritional needs by consuming more forage. Stated that rumen capacity will determine the level of fed consumption, because livestock will stop eating when the rumen is full of feed even though their nutrient needs have not been met [29, 30].

Non-carcass components consist of blood, head, feet, skin, tail, digestive tract, urinary bladder, heart, trachea, lungs, kidneys, spleen, liver and fat tissue [31, 32]. According to studies [33, 34] feed can affect the weight gain of non-carcass components. Therefore, goats that consume feed with the same energy will have the same component weight. According to studies [35, 36], local goats at the age of one year with a slaughter weight of 15,000 g had a non-carcass weight of 8.742 g, consisting of 678 g of blood, 1.114 gof head, 924 g of skin, 448 g of legs, 5.569 g of digestive tract and 18 g of tails.

## 4. CONCLUSIONS

Based on the results of this research, it can be concluded that giving *Lannea coromandelica* leaf flour is able to increase the amount of ration consumption and the hematological value of goats, but is not able to provide a significant difference to body weight gain, ration efficiency, physiological status and carcass weight and non-carcass components of local goats. The giving Lannea coromandelica leaves flour hay affect on the hematological value of goat blood. Further studies are needed to assess sustainability after using alternative food sources of feed that are easy to grow and thrive on marginal land.

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