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Performance and Diet Digestibility of Male Garut Lamb Fed *Ipomea reptans* Seed

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ABSTRACT

The experiments aimed to study about the performance and diet digestibility of male Garut lamb were a diet containing *Ipomea reptans* seeds. Twenty two Garut sheeps at the age of 6-8 months with an average body weight of 16.17±1.33 kg were divided into four diet treatments containing 0%, 10%, 20%, and 30% *Ipomea reptans* seed and maintained for 10 weeks to measure the performance and digestibility of the diet. The study was conducted experimentally and the data collected and tested by Duncan's test. The results showed that the use of *Ipomea reptans* seeds up to 30% increased (P<0.05) feed intake, average daily gain, dry and organic matter digestibility, but it had no effect on feed conversion. In Conclusion, the use of *Ipomea reptans* seed up to 30% yielded the best performance and diet digestibility and produced the same quality of diet.

Keywords: Digestibility, *Ipomea reptans* seed, Lamb, Performance

Introduction

One of the livestock maintenance successes is influenced by feed. The feed consumed will provide a supply of nutrients to meet the basic living needs and production requirements for the livestock. The main problem in livestock is the limited supply of feed. The availability of conventional feed originating from cultivation and nature is limited because there are many land uses that are shifting functions as agricultural, residential and industrial land. The use of non-conventional feed sources is one of the efforts to overcome the shortage of feed and substitute conventional feed needs.

Kangkung is a vegetable favored by some people in Indonesia. According to Kusandryani and Luthfy (2006), there are two types of kangkung, namely land kangkung (*Ipomea reptans*) and water kangkung (*Ipomea aquatica*). Land kangkung grows on dry land and paddy fields, while water kangkung grows in water, both pool and river. A side from being food, in some places kangkung is sold as animal feed called rendeng kangkung.

The Directorate General of Horticulture (2015) noted that the production of kangkung in 2014 amounted to 319,607 tons. This plant has a fast growing period, which is 4-6 weeks and is relatively easy to do cultivation. Water kangkung cultivation requires seeds as seeds to grow into kangkung vegetable seeds. The great need for kangkung seeds causes some farmers/entrepreneurs to cultivate specifically to produce kangkung seeds.

Planting kangkung to produce seeds can be done three times in one year. One hectare of land will produce kangkung seeds as much as 1.5 tons, while the needs of kangkung seeds for cultivation only amount to 10 kg/hectare (BPTP Jambi, 2009). Harvest of kangkung seeds leaves the seeds that are not worthy, thus becoming waste and potentially as animal feed. The use of plantation and agricultural waste to date is only 30-40% (Indraningsih *et al*., 2012).

Expired kangkung seeds are widely circulating in West Java as a mixture of concentrates for ruminant feed. Until now there have been no reports that mention of kangkung seeds is dangerous for ruminants, however, it is necessary to study the benefits of kangkung seeds as animal feed. This research aims to study the performance and digestibility of rations of male Garut lamb given kangkung seeds in rations.

Materials and Methods

The study was conducted at Sheep and Goat Development and Breeding Center Margawati, Garut Regency, Food Security and

Animal Husbandry Service, West Java Province. Twenty-two male Garut lamb aged 6-8 months with a range of 16.17 ± 1.33 kg were allocated into 4 randomized rations, namely rations containing land kangkung seeds of 0% (R1), 10% (R2), 20% (R3), and 30% (R3) of dry matter (DM). Sheeps were placed into individual cages made of wood and bamboo blades with stage cage systems The first two weeks of the sheep experienced adaptation to treatment rations, then for 10 weeks recorded sheep performance included dry matter intake (DMI), average daily gain (ADG) and feed conversion (Supratman *et al.,* 2016).

The dry matter intake (DMI) is a number of dry matter forage feed and concentrates consumed by sheep. Calculation of dry matter intake is to use the method of reducing the weight of dry matter feed given reduced by the weight of the dry matter remaining feed (g/head/day). The daily dry matter intake formula is as follows:

Dry matter intake (g/head/day) = DM ration given - DM remaining ration

Consumption of crude protein and TDN is the result of multiplying the consumption of dry matter with the percentage of each crude protein and TDN contained in the ration.

Crude protein intake (g/head/day) = (DMI (g) X % Crude protein ration)/100%

TDN intake (g/head/day) = (DMI (g) X % TDN ration)/100%

Measurement of average daily gain is determined by reducing the final weight with the initial weight of the sheep at a certain time. Weighing body weight is done every two weeks during the 10-week study. The average daily gain of sheep is measured by the formula:

$$\text{Average daily gain (g/head/day)} = \frac{\text{Final weight - Initial weight}}{\text{Number of days of observation}}$$

Feed conversion is the amount of feed consumed to get a certain body weight and in a certain time. Feed conversion is the amount of feed intake each day to average daily gain. Feed conversion is calculated with the following formula;

$$\text{Feed conversion} = \frac{DMI\ (\frac{g}{head}/day)}{ADG\ (\frac{g}{head}/day)}$$

For one week a feces collection was carried out to measure the digestibility of dry matter and organic matter. Measurements of feed digestibility were carried out by the total collection method (AOAC, 1980). Digestion is determined by collecting feces taken every day during the total collection. Sample was homogenized and 10% were taken to analyze the contents of dry matter and organic matter.

The digestibility value of dry matter and organic matter rations can be calculated using the formula:

$$\text{Dry matter digestibility/DMD (\%)} = \frac{\text{Dry matter intake - Excretion dry matter (feces)}}{\text{Dry matter Intake}} \times 100\ \%$$

$$\text{Organic matter digestibility/OMD (\%)} = \frac{\text{Organic matter intake - Excretion organic matter (feces)}}{\text{Organic matter intake}} \times 100\ \%$$

The study was conducted experimentally using a completely randomized design, the data collected was analyzed by Duncan's test (Steel and Torrie, 1993).

Result and Discussion

Kangkung seeds contain feed nutrients with high quality. Based on the proximate analysis results containing 10.25% ash, 14.49% crude protein, 4.36% crude fat, 15.07% crude fiber, 55.83% nitrogen free extract, and 68.11% total digestible nutrients (TDN). Based on the content of these nutrients, kangkung seeds are included in the energy source (Hartadi *et al.,* 2005). The crude protein content is almost the same, but crude fat is lower than rice bran, which is ± 11.14% and ± 7.43% respectively (Akbarillah *et al*., 2007).

Kangkung seeds are mixed as part of the concentrate with levels 0, 10, 20, and 30% of the dry matter of the rations (Table 1). In general, treatment rations have relatively the same content of nutrients and energy (TDN), namely 12% and 60-61.5% except crude fat which decreases along with the increasing use of kangkung seeds. The ration has the protein content and energy needed by the growing sheep. Rochana (2004) states that the need for crude protein and TDN rations to support the weight gain of sheep is 12.9 -15.47% and 59.22 - 64.81%. Then the experimental ration was tested in vivo for 10 weeks.

After 10 weeks of maintenance, performance data and ration digestibility of sheeps were obtained in Table 2. The table shows that there was a significant increase ($p < 0.05$) due to the use of kangkung seeds in rations on DMI, ADG, DMD and OMD, while feed conversion does not show significant differences.

Higher consumption in sheep given 30% kangkung seeds in the ration have a high level of palatability. Organoleptically, kangkung seeds do not have a pungent odor and even have a distinctive scent as kangkung seeds. The smell of feed will disturb palatability and affect the level of feed intake (Sudarman *et al.,* 2008).

Physical testing that has been done shows that kangkung seeds have a low level of the density of pile, namely 717-725 kg/m^3 compared to rice bran 373 kg/m^3 (Hidayat *et al.,* 2015). In the treatment ration (Table 1), it appears that the higher use of kangkung seeds is followed by a decrease in the content of rice bran. It is suspected that rations containing kangkung seeds have a low level of the density of pile. Toharmat *et al.,* (2006) stated that feed with higher levels of the density of pile can cause greater strain and provide a sensation of fullness when consumed by livestock, so that the voluminous properties can limit consumption in livestock. This is in line with the statement of Schneider and William (1975), that livestock fed containing ration with the higher

Tabel 1. Feed ingredients and compositions of the experimental rations

Feed ingredients	R0	R1	R2	R3
P. Purpureum cv Mott. (%)	50.00	50.00	50.00	50.00
Ipomea reptans seed (%)	-	10.00	20.00	30.00
Copra meal (%)	2.56	1.43	1.28	3.06
Soya pulp (%)	6.37	9.22	9.72	6.94
Rice bran (%)	18.00	17.00	13.00	5.00
Pollard (%))	21.06	10.35	4.00	3.00
Molasses (%)	1.00	1.00	1.00	1.00
Nutrients content :				
Dry matter (%)	36.51	37.15	35.91	36.64
Ash (%)	10.60	10.08	10.42	10.97
Crude protein/CP (%)	12.00	12.00	12.00	12.00
Extract ether/EE (%)	6.49	4.97	5.17	4.72
Crude fiber/CF (%)	20.23	20.33	21.12	21.87
Nitrogen free extract/NFE (%)	49.77	51.89	50.67	50.12
Total digestible nutrient/TDN (%) [1]	61.50	60.00	60.93	60.37

[1]TDN according to Sutardi (2001)
TDN % = 70.6+0.259%CP+1.01%EE-0.76%CF+0.0991%NFE.
R0: without *Ipomea reptans* seed; R1: 10% *Ipomea reptans* seed*;* R2: 20% *Ipomea reptans* seed; R3: 30% *Ipomea reptans* seed*.*

density of pile usually consume more feed to meet their basic energy needs.

On the other hand the presence of fat in the ration causes consumption to tend to decrease. The use of kangkung seeds will be the crude fat content in the ration to decrease, this resulted in an increase in feed intake. Harvatine and Allen (2006) report that an increase in high fat content decreases consumption of dry matter.

Alternatively, kangkung seeds contain little or no antinutrients and poisons, so they do not inhibit the digestibility or metabolism in the body. The absence of interference from antinutrients and poisons was proven by high digestibility of dry matter and organic matter, especially in the treatment by 30% (Table 2), each with an average of 72.50% and 72.58%. Feed digestibility is related to feed flow rate. Feeds that are easily digested will facilitate the flow of feed, so that the rumen will quickly empty and livestock will feel hungry as a result of consuming more rations (Marhaeniyanto and Susanti, 2011). In line with the statement of Rianto *et al.,* (2006) and Pulungan *et al.,* (1985) that the higher feed digestibility results more feed intake.

The presence of fat in the ration affects digestion. Treatment rations that do not contain kangkung seeds (R0) have higher crude fat. Fat will disturb digestibility because the presence will envelop the feed particles and the digestive enzymes from the rumen microbes cannot penetrate and digest the feed particles. The covering of feed particles by fat causes microbial access to these to be inhibited and will ultimately reduce rumen microbial metabolism (Tanuwiria *et al*., 2011) in digesting feed. Reddy *et al*. (2003) also reported that the addition of fat in the diet results a decrease in digestibility of dry matter.

Digestion is also related to protein intake and TDN. High consumption of protein and TDN will supply nitrogen and energy needs for the development of rumen microbes which have a role in digesting feed. Cruz Soto *et al.* (1994) stated that the addition of protein sources cannot stimulate rumen microbial growth without an energy source. Synchronous protein-energy ratio will show optimal fermentation efficiency, in this case the feed energy used for the process will be optimal (Gosselink *et al.,* 2003; Ginting, 2005). Rumen microbes use ammonia as a source of N for the process of protein synthesis, and grow faster if the energy source is sufficient (Russel *et al.,* 1992).

High feed intake with high digestibility in sheep fed rations containing kangkung seeds at 30%, led to more crude protein and TDN intake compared to other treatments, namely 97.14 g/head/day and 488.69 g/tail/day (Table 2) which results in higher average daily gain. Availability of feed nutriens and TDN will increase metabolism in cells, so that cells develop and multiply in the body's organs. The higher digestibility results more feed intake, so that increase average daily gain (Rianto *et al*., 2006).

Average daily gain in the treatment of 30% of kangkung seeds reached 106 g/head/day. This result was higher (106 vs 88.2 g/head/day) compared to the study of Supratman *et al.* (2016)

Table 2. Means of treatment effect on performance and diet digestibility of Garut Sheep

Variables	R0	R1	R2	R3
Feed intake (g/head/day)	720.95±12.03^{a}	749.00±11.45^{a}	779.23±8.97^{b}	809.49±8.53^{c}
Crude protein intake (g/head/day)	86.51±3.23^{a}	89.88±3.07^{a}	93.51±2.63^{b}	97.14±2.50^{c}
TDN intake (g/head/day)	443.38±16.54^{a}	449.40±15.36^{a}	474.78±13.39^{b}	488.69±12.61^{b}
Average daily gain (g/head/day)	89.32±4.84^{ab}	76.46±11.56^{a}	85.80±10.05^{ab}	106±5.81^{b}
Feed convertion	8.18±0.53	11.04±2.10	10.10±4.36	7.71±0.41
Dry matter digestibility (%)	65.56±2.11^{a}	68.66±1.05^{ab}	69.93±1.21^{ab}	72.50±2.37^{b}
Organic matter digestibility (%)	66.51±1.85^{a}	69.07±1.05^{ab}	70.74±1.17^{ab}	72.58±2.50^{b}
N	5	5	6	6

^{a,b,c} Different superscripts at the same row indicate significant differences (P<0,05)).
R0: without *Ipomea reptans* seed; R1: 10% *Ipomea reptans* seed*;* R2: 20% *Ipomea reptans* seed; R3: 30% *Ipomea reptans* seed.

in growing male Garut sheep fed rations consisting of grass and concentrates from a mixture of conventional feed ingredients with relatively equal levels of protein and TDN, namely 12% and 59.7%. In fact, these results were still higher (106 vs 100.3 g/head/day) compared to the ration in the Supratman *et al*. (2016) which had increased crude protein content and TDN to 14% and 66.2%.

Feed conversion indicate the level of efficiency of feed use by livestock which reflects the quality of the feed (Sudarman *et al.*, 2008). The smaller the feed conversion, the more efficient the livestock are in using the ration (Munawaroh *et al*., 2015). The results showed that feed conversion was not significantly different. It seems that high feed intake at the treatment of kangkung seeds was also balanced with high average daily gain, this resulted in the same ratio of feed conversion. The feed conversion which is not significantly different reflects the quality of the same ration. Thus the use of kangkung seeds up to 30% results in the same level of quality of ration compared to rations that do not contain kangkung seeds.

The use of kangkung seeds is up to 30% more efficient in the use of rations for the growth of Garut sheep. This is indicated by a lower feed conversion value of 7.71 compared to the results of research on Garut Sheep conducted by Supratman *et al.,* (2016), which is equal to 8.62 and 8.19 with relatively the same and higher ration quality compared to the ration in this study. Therefore 30% of kangkung seeds is very good to use in sheep rations.

Conclusions

The use of kangkung seeds up to 30% produces the best performance and digestibility and produces the same quality of ration.

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