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Performance of Female Garut Lambs Fed Diet in Different Ratio of Protein and Total Digestible Nutrients

(PERFORMANS ANAK DOMBA GARUT BETINA MASA PERTUMBUHAN YANG DIBERI PAKAN DENGAN IMBANGAN PROTEIN DAN TOTAL DIGESTIBLE NUTRIENT BERBEDA)

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ABSTRAK

Penelitian bertujuan untuk mengetahui pengaruh imbangan protein dan total digestible nutrients pada performans domba garut betina yang sedang tumbuh. Sebanyak 20 ekor domba garut betina umur 7-8 bulan dengan rataan bobot badan 15,72±1,33 kg dikandangkan secara acak dan diberikan empat perlakuan ransum dengan perbedaan rasio kandungan protein kasar dan total digestible nutrients, yaitu T1 = 11,53% : 63,13%; T2 = 10,78% : 70,06%; T3 = 13,54% : 63,18%; dan T4 = 13,67% : 69,18%. Masing-masing perlakuan diulang sebanyak lima kali. Penelitian dilakukan secara eksperimental selama 12 minggu dan data yang terkumpul dianalisis dengan uji jarak berganda Duncan. Konsumsi bahan kering ransum lebih tinggi ($p < 0,05$) pada perlakuan T1 (707,70 g/hari), T2 (677,71 g/hari), dan T4 (687,91 g/hari) dibandingkan dengan T3 (587,01 g/hari). Pertambahan bobot badan harian tertinggi ($p<0,05$) dan konversi ransum terendah ($p<0,05$) diperoleh pada perlakuan T4 (89,88 g/hari dan 7,75). Kecernaan bahan kering dan kecernaan bahan organik nyata lebih tinggi ($p < 0,05$) pada perlakuan T2 (63,93% dan 64,10%), dan T4 (59,73% dan 65,14%) dibandingkan dengan T1(49,98% dan 55,34%), dan T3 (44,68% dan 50,60%). Berdasarkan hasil penelitian, disimpulkan bahwa ransum perlakuan T4 yang mengandung protein kasar sebesar 13,67%, dan total digestible nutrients 69,18% menghasilkan performans anak domba betina yang terbaik.

Kata-kata kunci: domba garut betina; perfrormans; protein; total digestible nutrients

ABSTRACT

The study aimed to study the effect of protein and total digestible nutrients on performance of female Garut lambs. A total of 20 female Garut lambs aged 7-8 months at averaged body weight 15.72 ± 1.33 kg were allocated randomly into four treatment diets with different crude protein and total digestible nutrients ratios. The treatments were: T1 = 11.53%:63.13%; T2 = 10.78%:70.06%; T3 = 13.54%:63.18%; and T4 = 13.67%:69.18%. Each treatment was replicated five times. The research was conducted experimentally for 12 weeks and the collected data were analyzed by Duncan's multiple range test. The dry matter intake was significantly ($p<0.05$) higher in the treatments of T1 (707.70 g/d), T2 (677.71 g/d) and T4 (687.91 g/d) compared to T3 (587.01 g/d). The highest ($p<0.05$) average daily gain and the smallest ($p<0.05$) feed conversion ratio were significantly obtained by T4 (89.88 g/d and 7.75). Dry matter digestibility and organic matter digestibility was significantly ($p<0.05$) greater for T2 (63.93% and 64.10%) and T4 (59.73% and 65.14%) compared to T1 (49.98% and 55.34%) and T3 (44.68% and 50.60%) treatments. Based on the results, it can be concluded that T4 or the diet containing 13.67% crude protein and 69.18% total digestible nutrients yielded the best performance.

Keywords: female Garut lamb; protein; performance; total digestible nutrient

INTRODUCTION

Garut lamb is one of the important genetic resources of livestock in West Java, Indonesia that can be used as a meat supply. Garut lamb has a good response to good farming practices, compared to other local lamb in Indonesia. In addition, Garut lamb has a unique advantage, due to the high aggressiveness level especially rams and it can be used as regional tourism attraction, especially for bantam type sheep (Heriyadi, 2005).

Based on Indonesian National Standard No.7532: 2009, female Garut sheep have minimum quantitative aspects, i.e. 2.4 kg birth weight, 9.1 kg weaning weight, 37 kg mature body weight, 57 cm body length, 77 cm chest circle, and 66 cm shoulder height. To get a productive young ewe needs good lamb maintenance in order to become a replacement stock. If the lamb is not properly maintained, it will produce ewe with reproductive disorders. Livestock reproductive system will be affected by nutrient in the diet. Ruminant livestock that have a deficiency in protein, energy, and minerals will result in loss of body weight and significant impact on reproductive failure (Olson et al., 1999). A formulated diet to meet a normal requirement and physiological status is a very important factor to increase the population.

The diet formulation for ruminant is based on protein and total digestible nutrients (Rosendo et al., 2013). Total digestible nutrients is directly related to digestible energy. The balance of protein and total digestible nutrients (energy) in the diet has an effect on ruminant productivity (Nugroho et al., 2013).

Guidance on protein and energy requirement in female Garut lamb not yet exists, so breeder difficulty in making formulation. They only make formulations based on experience. The study aimed to investigate the effect of protein and total digestible nutrients on performance of female Garut lambs.

RESEARCH METHODS

The research was carried out at Development and Breeding Center for Sheep and Goat at Margawati, Garut Regency, West Java, Indonesia. This institution belongs to Food Security and Livestock Services of West Java Provincial Government, Indonesia. A total of 20 female Garut lambs aged 7-8 months and averaged body weight of 15.72 ± 1.33 kg were allocated randomly into four treatments of diets with different crude protein and total digestible nutrients ratios,: T1 = 11.53%:63.13%; T2 = 10.78%:70.06%; T3 = 13.54%:63.18%; and T4 = 13.67%:69.18%. Each treatment was replicated five times and the experimental animals were placed into individual cages. The research was conducted experimentally for 12 weeks

The diet consists of elephant grass (Pennisetum purpureum) and a mixture of concentrates. A concentrates was composed of various feed ingredients such as soybean meal, coconut meal, corn, rice bran, pollard, cassava waste meal, molasses, and mineral mix. The nutrients and total digestible nutrients from each treatment was presented in Table 1. Prior to the study, lambs were treated with anthelmintic orally. This drug is used to kill or prevent the growth of worms in the gastrointestinal tract of the lambs. The lambs were adapted to the treatment diets for four weeks before the experiment started. Feed intake, average daily gain, and feed conversion ratio were recorded (Supratman et al., 2016) for 12 weeks.

The dry matter intake is a number of dry matters of forage and concentrate consumed by lambs. The formula of feed intake is as follows:

Dry matter intake (g/d) = dry matters given –the remaining dry matter. Measurement of average daily gain was determined by reducing the final weight with the initial weight of the lamb divided by time of observation.

$$\text{Average daily gain (g/d)} = \frac{\text{Body weight (g)} - \text{Initial body weight (g)}}{\text{Number of days (d)}}$$

Feed conversion is the amount of feed intake to obtain a certain body weight within a certain time. Feed conversion is the amount of feed intake each day to increase average daily gain.

$$\text{Feed conversion ratio (g:g)} = \frac{\text{Feed intake (g/d)}}{\text{Average daily gain (g/d)}}$$

Measurement of both dry matter digestibility and organic matter digestibility were done by the total collection method (Ekawati et al., 2014).

Each feces sample was homogenized and 10% sample was taken for analysis of dry matter and organic matter digestibility. The sample was dried using sunlight and then put into an oven with a temperature of 105oC for six hours to measure the dry matter. Another samples were burned with electric furnaces on 600? C for six hours to measure ash content. The data was used to calculate the dry matter digestibility and organic dry matter digestibility.

Dry matter digestibility (%) = $\frac{\text{Dry matter intake (g)} - \text{Dry matter feses (g}}{\text{Dry matter intake (g)}} \times 100\%$

Organic matter digestibility (%) = $\frac{\text{Organic matter intake (g)} - \text{Organic matter feses (g}}{\text{Organic matter intake (g)}} \times 100\%$

The experimental study was conducted using a complete randomized design and the collected data were analyzed by using Duncan's multiple range test

RESULTS AND DISCUSSION

The result showed that T1 and T2 treatments had relatively the same protein in the range of 11.53%-10.78%, whereas total digestible nutrients were 63.13% and 70.06%. Moreover, T3 and T4 Treatments had different protein and total digestible nutrients balance, with relatively the same protein contents of 13.54% and 13.67% as well as different total digestible nutrients of 63.18% and 69.81% (Table 1). Therefore, each treatment diet had different protein and total digestible nutrients balance. The diet also had different ratio of grass and concentrate mixture percentage 60:40 on T1 and T3 and 40:60 on T2 and T4 treatments. The grass and concentrate balance had an impact on the content of crude fiber and nitrogen free extract. Crude fiber and nitrogen free extract for T1 and T3 were 23.79%, 23.58% and 46.69%, 45.02%, respectively, while crude fiber and nitrogen free extract for T2 and T4 were 19.36%, 18.81% and 55.18%, 53.41%, respectively.

Female Garut lambs performance data were presented in Table 2. According to Table 2, the lamb's body weight averaged at ± 15.72 kg at the beginning with a coefficient of variation was 8.46%, it showed that the lambs used in this experiment had relatively a similar weight. The final body weight showed a variation where the R4 treatment yielded higher body weight ($p < 0.05$) than other treatments. This difference illustrated that there was an increased body weight due to diet treatment. The same feed intake was achieved in the treatment of T1, T2 and T4, except for treatment T3 which had the least ($p<0.05$). The highest average daily gain ($p < 0.05$) was obtained by T4 treatment with being smallest feed conversion ($p < 0.05$), while the highest dry matter digestibility and organic matter digestibility ($p < 0.05$) were obtained by the treatments of T2 and T4.

Dry matter intake affects the amount of intake of nutrients that enter and digested by the body. The greater the nutrients intake is the more nutrients used by the body for growth. This was reflected in the lowest T3 treatment of average daily gain proportional to the number of diets consumed was similarly lower than other treatments. High consumption will be followed by high body weight gain in animals (Rianto et al., 2006). However, that does not apply to all treatments, this is indicated by treatments of T1, T2 and T4, had the same feed intake, but having different average daily gain (Table 2). This condition depends on the quality of the diet given. Feed intake in ruminants is strongly influenced by external factors (environment), internal factors (the condition of the livestock itself) and feed given (quality) (Astuti *et al*., 2009). In addition, feed consumption is also influenced by feed digestibility. Easily digestible feed will facilitate the rate of passage of ingesta and emptying of the digestive tract so that will affect the consumption of diet (Uhi, 2006).

High digestibility reflects the amount of nutrients and energy metabolized in the body for better maintenance and production requirements. The digestibility coefficient value is not fixed for each feed or each animal, but is influenced by several factors, namely chemical composition, feed processing, amount of feed provided, and type of livestock (Astuti *et al*., 2009).

Different digestibility of each treatment has different protein and total digestible nutrients balances. The highest digestibility of diet was obtained by T4 treatment, which was caused by the highest protein and total digestible nutrients ratio that were 13.67% and 69.81%, respectively. Proteins provide sources of N for rumen microbial

growth (Chikunya et al., 1996) to digest feed more optimally.

The addition of protein without sufficient carbohydrate would not result in increasing digestibility. This is in line with finding of Cruz Soto *et al*. (1994) that the addition of protein sources could not stimulate rumen microbe growth in the absence of soluble carbohydrate supplementation. Soluble carbohydrates included into the non-structural carbohydrate fraction of the nitrogen free extract. This nitrogen free extract is easily digestible components by rumen microbes, where in T4 treatment the content of nitrogen free extract was 53.41%. This content was higher than other treatments except for T2 treatment. The non-structural carbohydrate degraded microbes use the ammonia as N source for the protein synthesis process, and they are likely growing faster than structural carbohydrate degraded microbes (Russel *et al*., 1992). The ease of non-structural carbohydrate digest-

Table 1. Feed ingredients and compositions of the experimental diets

Feed ingredients	Treatments			
	T1	T2	T3	T4
Elephant grass (%)	60.00	40.00	60.00	40.00
Soybean meals (%)	0.50	0.50	4.58	9.10
Coconut meals (%)	13.29	28.30	12.92	21.17
Corn (%)	0.50	0.50	0.50	0.50
Rice brand (%)	9.65	0.50	8.73	0.50
Pollard (%)	9.56	0.50	10.77	0.50
Cassava waste (%)	4.49	27.70	1.00	24.24
Molasses (%)	1.00	1.00	1.00	1.00
Minerals Mix (%)	1.00	1.00	1.00	1.00
Nutrients content				
Ash (%)	11.93	9.49	11.94	9.55
Crude protein (%)	11.53	10.78	13.54	13.67
Extract ether (%)	4.62	4.13	4.51	3.50
Crude fiber (%)	23.79	19.36	23.58	18.81
Nitrogen free extract (%)	46.69	55.18	45.02	53.41
Calcium (%)	0.47	0.41	0.47	0.42
Fosfor (%)	0.51	0.41	0.52	0.43
Total digestible nutrients (%)	63.13	70.06	63.18	69.81

Table 2. Performance of female garut lambs

Variables	Treatments			
	T1	T2	T3	T4
Initial live weight (kg)	15.86±0.45	15.96±1.48	14.66±1.14	16.38±1.37
Final live weight (kg)	21.11±1.32b	21.76±1.79c	18.69±2.12a	23.93±1.08c
Dry matter intake (g/d)	707.70±57.73b	677.71±20.87b	587.01±52.42a	687.91±39.92b
Average daily gain (g/d)	62.50±9.84b	69.10±8.06b	47.98±12.80a	89.88±11.19c
Feed conversion ratio (g:g)	11.45±1.05bc	9.94±1.42ab	12.92±3.68c	7.75±1.10a
Dry matter digestibility (%)	49.98±7.62ab	63.93±8.77c	44.68±8.79a	59.73±8.31bc
Organic matter digestibility (%)	55.34±6.74ab	64.10±9.00b	50.60±7.73a	65.14±7.13b

Values are expressed as mean±SD (n=5), different letters within rows represented significant differences ($p < 0.05$)

ibility will provide a high energy (total digestible nutrients) contribution to ruminants. The synchronous protein and energy ratio will show optimal rumen fermentation efficiency, in which the energy of feed was utilized optimally (Gosselink *et al*., 2003; Ginting, 2005).

The high N content in the diet (Table 1) and with digestibility of nutrient (Table 2) resulted in high nutrient and energy intake for growth and development of body cells so that average daily gain on T4 treatment had the highest value of 89.88 g/h/day. High levels of protein in the diets causes an increase availability of amino acids in the body, one of which is used for growth (Puastuti, 2007), while energy is used for the maintenance of body tissues, for production and turns into heat or energy lost as heat (Tillman *et al*., 1998). According to Habib *et al*. (2001), the factor that enhances livestock weight gain is not only from protein, but involving the energy sources from both carbohydrates and fats.

The average daily gain on T4 is higher than the local female Thin Tail sheep of Mathius et al. (1996) which gained growth of 56.6 g/h/day. Garut lambs are more responsive to good farming practices compared to local sheep and other sheep in Indonesia (Heriyadi *et al*., 2012).

Feed conversion ratio is expected to be maximally utilized by the animal body for growth to produce a high level of efficiency. The efficiency of feed used can be demonstrated by the feed conversion ratio. This value also reflects the quality of the feed. The lower feed conversion ratio value indicates that the diet is used by the livestock body with more efficient for basic needs and productions (Sudarman *et al*., 2008). The treatment of T4 yielded the smallest feed conversion ratio value of 7.75. Although its feed intake was higher than T3 and was equal to T1 and T2, but lambs on T4 treatment provided the highest level of average daily gain, resulting in the lowest feed conversion ratio. From data in Table 1 and 2, the protein and total digestible nutrients balance in the diet is important for female Garut lambs.

CONCLUSION

Protein and total digestible nutrients balance in the diet at the value of 13.67%:69.18% resulted in the highest performance of female Garut lambs.

SUGGESTION

The breeders can use protein and total digestible nutrients balance of 13.67%: 69.18% in making diet for female Garut lamb.

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