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The Effect of Energy and Protein Balance Ration to The Garut Ewes' Growth

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Abstract

The purpose of this research was to determine the effect of energy and protein balances on the growth of Garut ewes. The variables are daily consumption, daily weight gain, and conversion ratio value. The treatments given included R1 (12% protein and 60% TDN), R2 (12% protein and 65% TDN), R3 (14% protein and 60% TDN), R4 (14% protein and 65% TDN), R5 (16% protein and 60% TDN), and R6 (16% protei n and 65% TDN). The feed is arrange using field grass, fine bran, onggok, soy sauce pulp, coconut cake, and premix. The design of the room uses a Completely Randomized Design (CRD), with 4 (four) replications. Data analysis used variance analysis and Duncan's multiple analysis. The results showed that various protein and energy ratio had a significant effect on daily consumption (whereas R1, R3, and R5 gave better results), but did not affect the daily weight gain and feed conversion ratio value. R6 is the best treatment because it is efficient in consumption and optimal in PBBH and ration conversion value.

Keywords: Garut ewes, protein and energy balances, growth

Introduction

Feed ingredients are all ingredients that can be eaten by cattle without disturbing the health of livestock. A mixture of two or more feed ingredients that can fulfill the needs of livestock for 24 hours is called a ration. Rations are needed to fulfill the basic necessities of life and livestock production (Tillman et al., 1991).

In order to fulfill basic needs and production, livestock need feed intake. Rations contain various food substances needed by livestock. The food substances contained in feed consist of macro and micro foods. Macro substances (needed in large quantities) include carbohydrates, proteins, fats. Micronutrients (needed in small amounts) include vitamins and minerals (Sunita, 2009).

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Livestock needs energy for their basic needs and production. Energy sources include carbohydrates, fats, and proteins. Most of the energy needed by ruminants is obtained from carbohydrates. This can be understood because the use of large amounts of fat can have a negative effect on livestock. While protein is an expensive energy source compared to carbohydrates and fats. TDN (Total Digestible Nutrient) is a representative of feed energy. Carbon chains from carbohydrates can be used by livestock as a framework for the formation of muscle mass or lactose milk. In order to complete the formation of muscle mass, another important substance is made up of proteins (Anggorodi, 1979).

Protein is an organic compound consisting of elements C, H, O, N, S, P. Protein is an essential compound needed by the body. Protein is the only compound that can contribute nitrogen. Protein is often also referred to as a builder substance, but utilization will not be optimal without the presence of carbon chains from carbohydrates. If there is an excess level of carbohydrates and nitrogen in the ration, there will be inefficiency both economically and physiologically. Excess protein will be removed through urine (Anggorodi, 1979).

The balance of energy and protein in the ration will produce optimal growth for livestock. Growth is the result obtained from an animal at a certain time size, while the growth calculation indicators in this study are consumption, daily body weight gain (PBBH), and ration conversion value.

Ruminants are the most effective livestock in utilizing low-quality feed. This happens because in the body of ruminants there are microorganisms that are able to change the food content in the ration to be used by the body as a provider of food substances for ruminants themselves. Large ruminant animals such as cattle have become the object of research on energy and protein balance, so that the optimal standard of energy needs and protein ration has been known (Tillman, 1991).

The need for crude protein and TDN for sheep with a body weight of 15 kg was 12.50% crude protein and 55% TDN (Ranjhan, 1981). Based on the research of Ekawati et al. (2014) regarding the efficiency and digestibility of sheep rations with a balanced treatment of 12.97% PK and 64.82 TDN, 13.31% PK and 65.12% TDN, and 13.53% PK and 66, 22% TDN, showed that sheep fed rations with a balance of 12.97% PK and 64.82 TDN had the best influence on the efficiency and digestibility of sheep rations. This includes the protein and energy balance ranges of Rochana (2004), which are 12.9-15.47% protein and 59.22-64.81% TDN. So it is necessary to examine the protein balance at levels 12 and 14% and TDN at levels 60 and 65% in order to know the accuracy of the best protein and energy balance for sheep.

Small ruminants are still rarely the object of research on energy balance and protein ration, so it is not known exactly what the energy and protein needs of small ruminant livestock rations in Indonesia, especially female Garut Sheep. Garut sheep is native West Java germplasm. Garut sheep are prolific ruminants (can breed more than one animal in a year) that have good adaptability, relatively fast growth, and a good percentage of the carcass (Heryadi et al., 2002). Garut sheep is the best alternative candidate as a provider of animal protein sources from red meat, therefore research on energy and protein balance in the ration of female Garut sheep is very important to do.

Material dan Methods

The study used 24 young female Garut sheep aged 3-4 months for 12 weeks with an average body weight of 10.74 ± 1.05 kg. The feed ingredients used to compile this research ration are field grass obtained from around the research enclosures as well as local feed ingredients used in preparing feed concentrates namely fine bran, onggok, soy sauce pulp, coconut cake, and premix. The ration used is made in the form of a complete ration, which is by forage and the concentrate is mixed until it is homogeneous. The formulation and food content of the research ration are presented in Table 1.

Table 1. Formulation and composition of the research feed ration

Feeds	**Treatment**					
	R1	**R2**	**R3**	**R4**	**R5**	**R6**
	......................................(%)......................................					
Grass	63,45	40,97	58,21	43,49	54,41	37,99
Soy Sauce Pulp	7,94	6,96	19,84	13,03	28,91	26,12
Fine brine	7,61	19,12	7,04	5,44	5,45	3,80
Onggok	7,61	13,68	7,38	11,14	4,83	12,35
Coconut Cake	13,32	19,22	7,48	26,85	6,35	19,69
Premix	0,05	0,05	0,05	0,05	0,05	0,05
Total	100	100	100	100	100	100

Table 2. Chemical composition of the feed ration

Zat Makanan	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**
Crude Protein	12,00	12,00	14,00	14,00	16,00	16,00
TDN	60,00	65,00	60,00	65,00	60,00	65,00
Ether Extract	24,14	20,51	23,98	22,15	24,46	21,76
Crude Fiber	6,31	7,56	6,48	6,91	6,54	7,07
Non nitrogenous organic matter	47,27	48,89	44,73	45,90	41,56	43,77
Ash	10,47	10,32	12,59	10,93	14,29	13,12
Ca	0,29	0,25	0,32	0,28	0,34	0,31
P	0,38	0,57	0,38	0,44	0,36	0,42

The parameters measured in this study were dry matter consumption, body weight gain, and ration conversion value. This study used the experimental method and Completely Randomized Design (CRD). Each treatment was repeated 4 (four) times to obtain 24 experimental units. Data were analyzed using variance analysis and to find out the differences between treatments using Duncan's Multiple Distance Test. The experimental treatment consisted of:

R1 = Ration with protein content 12% dan TDN 60%
R2 = Ration with protein content 12% dan TDN 65%
R3 = Ration with protein content 14% dan TDN 60%
R4 = Ration with protein content 14% dan TDN 65%
R5 = Ration with protein content 16% dan TDN 60%
R6 = Ration with protein content 16% dan TDN 65%

Result and Discussion

Effect of Treatment on Dry Matter Consumption

Feed consumption is the amount of feed ingredients eaten or consumed by livestock. There are several factors that influence feed consumption in ruminants, namely: livestock factors, feed conditions, pH of fluid in the rumen caused by the influence of feed fermentation, and external factors such as temperature and air humidity (Sarwono and Hario, 2001).

After 60 days of diving, the daily consumption data obtained are presented in Table 2. Table 2 shows that there are significant differences (P <0.05), where treatments R1, R3, and R5 produce higher daily consumption compared to R2, R4, and R6. This means that the treatment ration given has an effect on the consumption of dry matter. This is thought to be due to the protein and energy balance as well as the ration arrangement which shows the proportions in treatments R1, R3 and R5 having a larger portion of grass compared to the concentrate. The Garut sheep used previously was predominantly given forage, so the ration that was more dominant in grass was preferred (palatable). Based on the data presented in Table. 1 knows that rations R1, R3 and R5 contain field grass above 50%, while R2, R4 and R6 are below 50%.

In line with the results of the study of Tillman et al. (1991) stated that besides the palatability, the proportion of ration constituent material should be taken into account because it can affect palatability and the amount consumed by livestock. Furthermore Ensminger and Olentine (2002) explain that, ration consumption is influenced by the chemical composition in the ration. Foods that have good palatability will be consumed more by livestock.

Table 3. Effect of Treatment on Dry Matter Consumption

Treatment	Average Dry Matter consumption (g/day)	Significance
R1	537	a
R5	535	a
R3	530	a
R2	467,5	b
R4	462,5	b
R6	455	b

In ruminant animals, as in sheep, digestion is strongly influenced by the presence of rumen microbes. These microbes carry out activities in fermenting or degrading the feed ingredients they consume. Rumen microbes play an important role in the fermentation process of feed ingredients and the products they produce are mainly in the form of methane gas and VFA. The fermentation products are partly used by rumen microbes for their growth, so that their availability affects rumen microbial growth which in turn will also affect their digestibility. Orskov (1988) states that between fermentation and microbial growth are interdependent. The end result of fermentation is in the form of VFA and methane gas which will then join with Non-Protein Nitrogen (NBP) into microbial cells.

The fermentation rate that is high in the rumen will accelerate the feed flow rate which has an impact on the level of emptying the stomach. An empty stomach will quickly stimulate livestock to consume feed ingredients. The degradation of feed by microbial enzymes describes the residence time of feed in the rumen. This situation is very closely related to feed consumption (Tomaszewska et al., 1993). Reksohadiprodjo (1995) states that in ruminants low feed consumption is associated with a low digestibility value because the slow reshuffle of particle size becomes a measure that can leave the rumen. This causes low speed of flow rate, rumen development and low feed consumption. High feed digestibility will make the stay shorter than the feed which has a low digestibility value.

Effect of treatment on body weight gain

Growth is a change in the size or weight of an animal as a manifestation of hyperplasia or increase in the number of cells and hypertrophy or enlargement of cell size (Soeharsono, 1976). In the growth period there are two things that occur namely an increase in body weight or body components until reaching an adult size called growth and the existence of conformational changes caused by differences in the growth rate of tissue or different body parts with the development process, fattening process is included in development. Feed factor is the main factor that determines success in raising livestock, meaning that the food provided must be of high nutritional value and the feed ingredients are balanced with each other and fulfill the livelihood needs of livestock (McIlroy, 1977).

The weight of livestock body is calculated in certain units either by using scales or certain body size measurements so that the exact coefficient numbers are obtained. The average increase in body weight of the experimental Garut sheep is presented in Table 4.

Table 4. Effect of Treatment on Daily Body Weight Growth

Treatment	ADG (g/day)	Significance
R3	70	a
R6	67,5	a
R2	65	a
R5	65	a
R1	62,5	a
R4	62,5	a

The table above shows that all ration treatments provide the same weight gain. This data is not in line with the consumption of rations which shows a difference, the higher the amount of dry matter consumed, the higher the weight gain. This is thought to be related to protein and energy balance in each treatment. Protein and energy balance has an influence on the ability of rumen microbes in utilizing rations. Tillman et al. (1991) stated that if in the ration there is a good balance of protein and energy, then animal weight gain will increase, apart from the amount of protein consumed, ration palatability can also affect body weight gain. Besides that, it seems that the difference in consumption of rations between treatment with one another is not far adrift so that the difference has not had much effect on the intake of food substances that enter the body of ruminants which will be used for rumen microbes and animal growth.

The ration payment is recommended according to the standard of needs and must be sought at a cheap price (Djunaedi, 1978). Furthermore it was said that in terms of animal feed, the quality and quantity of food and the way it was given greatly affected the performance of livestock. The low availability of rations results in low levels of livestock growth both economically and technically. The ration must contain all food substances that are balanced, digestible, and palatable, so that livestock can be consumed according to their needs. Kearl (1982) states that sheep with an average body weight of 10 kg and PBBH 100 gr / day need BK 210 gr, TDN 230 gr and Protein 70gr.

In general, livestock rations function to: (1) fulfill daily needs (principal), so that sheep live, (2) production and reproduction, and (3) growth (for bone growth, meat, fat, and bone formation, meat, and others as in fetus / fetus) (Tillman, et al., 1991).

Effect of Treatment on Ration Conversion Value

Conversion value is an illustration of the efficiency of feed use for animal weight gain. Efficiency of feed use can be seen from the size of the conversion value. The smaller the conversion value, the more efficient the cattle are in using feed for meat production. Conversely, if the conversion value gets bigger, then the ration is inefficient. The provision of a lot of feed does not contribute more to meat production compared to the provision of small amounts of feed (Baihaqi, 2004)

The results of the analysis using the Duncan test showed that the treatment ration did not show a significant difference. This means that all treatments provide the same efficiency in the use of rations. The ration conversion is the rusultan of the amount of feed consumed with the realization of the body weight gain produced. Judging from the consumption data and body weight gain there appears to be a similar proportion between all treatments between consumption and weight gain. Although the consumption of dry matter is greater, at rations R1, R3, and R5 which produce the same weight gain compared to R2, R4, and R6.

Table 5. Effect of Treatment on Ration Conversion Value

Treatment	Average Ration Conversion	Significance
R1	9,22	a
R5	8,81	a
R3	8,19	a
R2	8,11	a
R4	7,64	a
R6	7,35	a

Seeing the performance above the treatment ration R6 with the proportion of protein and energy 16:65 gives the most efficient and optimal results, considering that the treatment of R6 is consumed lowest among other treatments (cheap), but superior to PBBH and the ration value (most efficient). The experimental ration was prepared from local raw materials, where the availability fluctuated. Rations with high protein with high energy will be closely related to the price of the ration given, where to achieve these conditions usually contain expensive raw materials.

Conclusion

Protein and energy balance has a significant effect on the average daily consumption of female Garut Sheep ($P < 0.05$), where treatments R1, R3, and R5 give higher results compared to R2, R4 and R6, but do not significantly affect PBBH and ration conversion value. R6 is the best treatment because it is efficient in consumption and optimal at ADG and ration conversion value.

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