



Dietary Crude Protein and Total Digestible Nutrient on The Performance of Boerka Goats Male Growing Phase

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Abstract

Boerka goat is the best meat type goat. Feed quality is one of the biggest factors that affect productivity, so it is necessary to know in advance the need for nutrients. The purpose of this study was to determine the dietray of crude protein (CP) and Total Digestible Nutrients (TDN) in efficient feed for the production of Boerka goats male growing phase. This study was designed in a completely randomized design, consisting of six combination feed treatments with six replications. Namely: 1 (CP 13.00% and TDN 63.10%); 2 (CP 13.03% and TDN 65.07%); 3 (CP 13.00% and TDN 70.00%); 4 (CP 15.00% and TDN 62.69%); 5 (CP 15.12% and TDN 65.00%); 6 (CP 15.00% and TDN 70.00%). The observed variables were feed consumption, feed consumption ratio (FCR), nutrient digestibility (dry matter, organic matter, crude protein) and average daily gain (ADG). Results of this study show that the balanced of CP and TDN has no significant effect on consumption and FCR. However, it was significantly different for digestibility and ADG. Feed treatment (CP 13.03% and TDN 65.07%) obtained the higher digestibility of DM and OM (71.49 and 70.5%), while the highest CP digestibility was treated with CP 15.05% and TDN 62.69% (71.59%). The ADG response of Boerka goats with CP 13.03% and TDN 65.07% was the good results (144.90 g head⁻¹day⁻¹) while the lowest response was on CP 13.08% and TDN 63.10%. It is concluded that the dietray of CP 13.03% and TDN 65.07% is a recommended of Boerka goat male growing phase.

Keywords: Boerka goat, crude protein, TDN, feed consumption, digestibility.

Background

Boerka goat is small ruminant that have good characteristics as meat goats and have potential as superior goat breeds (Richard, 2011; Elieser *et al.* 2012). The young male of Boerka goat is a feeder that can be used as seeds that can produce meat-producing livestock, in that phase the need for feed (quality and quantity) must be fulfilled with the aim of spurring growth in order to achieve maximum body weight when used as a stud goat or cut according to size, with its biological level (Ginting and Fera, 2008).

Feed is the biggest factor affecting livestock productivity. Growing goats need energy for life, growth, muscle movement, and synthesis of new tissues (Arthur *et al.* 2011; Moroz and Samorukov, 2020). Feed conditions, such as insufficient quality and quantity, lead to low livestock productivity, as indicated by a slow growth rate and low body weight. One of the efforts that can be done to increase the productivity of young

male Boerka goats is to provide good feed with sufficient nutrient content. The availability of nutrients in the right amount, composition and at the right time greatly affects the level of livestock productivity (Sampurna, 2013; Rohayati, 2019).

Crude protein (CP) and Total Digestible Nutrients (TDN) or energy are nutrients that are needed. Lack of energy in livestock rations can reduce rumen function and reduce the efficiency of protein use and inhibit livestock growth. Protein deficiencies include anorexia, decreased growth rate, decreased or unbalanced N, decreased feed efficiency, decreased serum protein concentration, anemia, fat accumulation in the liver, edema (in some cases), decreased birth weight, decreased milk production, decreased enzyme synthesis and certain hormones (Chakeredza *et al.* 2008; FAO, 2012).

The availability of energy in the ration consumed is very important for livestock, because it can affect the efficiency

of protein use in synthesizing body tissues (Charles and Glen, 2017). Protein availability is one of the nutritional components needed by young livestock for growth. Feed protein that enters the rumen will initially undergo proteolysis by protease enzymes into peptides, then hydrolyzed into amino acids which are then rapidly deaminated into ammonia (Sok *et al.* 2017; Suryani *et al.* 2020). The presence of protein and energy in the feed will be used by rumen microbes for cell protein synthesis and in the rumen it acts as a digester of crude fiber feed and as a source of protein for the landlady.

The balance of energy and protein is important because it can affect the dynamics of the microbial fermentation process in the rumen (Castillo *et al.* 2014). Microbes need an energy source for growth, generally only use carbohydrates. The carbohydrates are needed as a source of carbon atoms (C) to form the structural framework of rumen microbial protein (Ginting, 2005). Proteins that are degraded (deaminated), in addition to releasing ammonia (NH₃) groups, will produce carbon chain groups which can also be substrates in the rumen microbial fermentation process. Synchronous protein-energy ratio will show optimal fermentation efficiency, in this case the feed energy used for the process will be optimal as well. So it is necessary to study how much energy can be utilized by livestock fed with different CP and TDN balances.

Synchronization between energy and protein availability in the rumen, apart from increasing microbial activity, can also

increase rumen microbial protein synthesis and livestock performance. The results of research by Martawidjaja *et al.* (1999) reported that feeding with higher protein and energy levels resulted in higher dry matter consumption, protein and energy in goats. Based on these problems, a study is needed on how much protein and energy needs in efficient feed for the productivity of male Boerka goats in the young phase.

Materials and Methods

This activity was carried out in the laboratory and experimental cage Indonesian Goat Research Station, Deli Serdang Regency, North Sumatera. The study was conducted for six months using Boerka goats male growing phase at the age of five months. A total of 36 male Boerka goats (mean live weight 11.2 ± 1.33 kg) were randomly placed in individual cages and given a basic diet of 3.8% of body weight based on dry matter (NRC, 1981). Water is given freely (*ad libitum*). Basic feed is given for two weeks with the aim that the goats can adapt to the form of feed that will be given during the observation period. The goats were randomized to get one of the six treatment feeds that had been prepared. The treatment feed provided consisted of two levels of crude protein content and three levels of Total Digestible Nutrients. There were six combinations of feed treatments in this study (Table 1). Feed treatment is given in a single feed (3.8% of life weight), and adjusted every two weeks so that it is in line with the life necessities

Table 1. Combination of feed treatments with different protein content and TDN

No	Treatment	Treatment combination
1	P ₁ TDN ₁	Protein 13.00% + TDN 63.10%
2	P ₁ TDN ₂	Protein 13.03% + TDN 65.07%
3	P ₁ TDN ₃	Protein 13.00% + TDN 70.00%
4	P ₂ TDN ₁	Protein 15.00% + TDN 62,69%
5	P ₂ TDN ₂	Protein 15.12% +TDN 65.00%
6	P ₂ TDN ₃	Protein 15.00% + TDN 70.00%

Table 2. Composition of feed materials and nutrient content

Description	P ₁			P ₂		
	TDN ₁	TDN ₂	TDN ₃	TDN ₁	TDN ₂	TDN ₃
Ration material (%)						
Indigofera	30	30	20	30	27	20
Palm fronds	5	5	3	5	4	3
Palm kernel cake	20	15	6.5	25.5	19	6.5
Decanter Solid	21	12	5	20	15	5
Soybean Meal	2	4	8	3	5	11
DDGS	4	7	12	7	10	14
Cassava pulp	12	23	20.5	3.5	15	17.5
Cassava			21			18
Molasses	5	3	3	5	4	4
Ultra Mineral	0.3	0.3	0.3	0.3	0.3	0.3
Clam Flour	0.5	0.5	0.5	0.5	0.5	0.5
Salt	0.2	0.2	0.2	0.2	0.2	0.2
Total (%)	100	100	100	100	100	100
Nutrient Components (%)						
Dry matter	92.14	92.5	92.78	92.11	92.23	92.76
Crude protein	13.00	13.03	13.00	15.00	15.12	15.00
Crude fat	7.1	5.9	4.06	7.71	6.64	4.14
Crude fiber	22.88	22.4	16.26	22.57	21.39	15.9
TDN	63.10	65.07	70.00	62.69	65.00	70.00

The parameters observed are consumption, feed consumption ratio (FCR), nutrient digestibility (dry matter, organic matter, protein) and live weight changes. Consumption data were obtained from the difference between giving and the rest feed every day. The feed samples were analyzed proximately, with the AOAC method (1995), while the Energy Content is used by Adiabatic Bomb Calorimeter (Gallenkamp Autobomb). Digestibility values were carried out using the method of Tillman *et al.* (1991). To determine changes in live weight, goats were weighed every two weeks before being fed in the morning.

Statistical Analysis

The study was conducted in a completely randomized design (Gomez and Gomez, 1984) with six treatments (feed composition) and six replications. All data obtained were analyzed with correlation analysis with SPSS version 16.0 program. Significant differences among treatment means were tested using Duncan's multiple range test (DMRT) at the 5% level of.

Results and Discussion

Consumption, feed consumption ratio and digestibility

The value of consumption, FCR and digestibility (dry matter, organic matter, crude protein) for six treatment combinations of feed with different energy and protein content given as a single feed to goats is shown in Table 3.

The effect of balances CP and TDN on treatment feed on dry matter (DM) consumption and FCR of young male Boerka goats was not significantly different ($P > 0.05$). Average consumption is 105.90 g head⁻¹day⁻¹. Numerically, the highest level of consumption was found in goats fed with P₁ TDN₂ (1119.55 g) and the lowest was in P₁ TDN₁ (986.40 g) treatment, almost comparable to the study of Rochana *et al.* (2020), with a balance of 12% protein and 60% TDN can consume 973.26 g head⁻¹day⁻¹ dry matter. The level of feed consumption in this study was moderate and did not affect the value of the obtained FCR (average 8.44).

Table 3. Consumption, FCR and digestibility of feed nutrients

Description	P ₁			P ₂			Average
	TDN ₁	TDN ₂	TDN ₃	TDN ₁	TDN ₂	TDN ₃	
Consumption (g)	986,40	1119,55	1105,20	1024,01	991,17	1091,03	1052,90
FCR	8.22	8.42	8.58	8.08	8.5	8.86	8.44
Digestibility (%)							
Dry matter	62.05 ^a	71.49 ^a	51.09 ^b	68.7 ^a	60.06 ^{ab}	64.38 ^a	62.96 ^a
Organic matter	58.72 ^b	70.5 ^a	49.25 ^b	62.15 ^{ab}	59.6 ^b	60.87 ^{ab}	60.18 ^a
Crude protein	57.31 ^b	70.92 ^a	50.15 ^b	71.59 ^a	62.49 ^{ab}	67.04 ^a	63.25 ^{ab}

Different superscripts in the same row indicate significant differences (P<0.05)

The highest dry matter digestibility value was found in treatment P₁ TDN₂ (71.49 %), although it was not significantly different from the other treatments (P₁ TDN₁, P₂ TDN₁, P₂ TDN₂, P₂ TDN₃), each obtained 62.05, 68.7, 60.06, 64.38 and 62.96 % respectively. However, it was significantly different (P<0.05) with P₁ TDN₃ which had the lowest digestibility (51.09%). This figure is relatively low with the DM digestibility in the study of Mathius *et al.* (2002) 74.40% used young PE goats with different protein and energy balances. Differences in acid detergent fibers may cause differences in the level of digestibility. The feed component in this study using palm fronds is a component of the ration containing lignin and is known to be unable to be broken down/digested by rumen microorganisms. As a consequence the digestibility of DM will be affected (Van Soest, 1982; Yanti *et al.* 2004).

The highest organic matter digestibility was obtained by P₁ TDN₂ (70.5%), not significantly different from treatment of P₂ TDN₁ and P₂ TDN₃, each obtained 62.15 and 60.87%. However, it was significantly different from the treatment of P₁ TDN₁, P₁ TDN₃ and P₂ TDN₂ which had OM digestibility of 58.72, 49.25 and 59.6% respectively.

The highest crude protein digestibility was found in the combination of treatment P₂ TDN₁, each obtained 71.59 and 70.92%, not significantly different from P₂ TDN₂ and P₂ TDN₃ (62.49 and 67.04%). However, it was significantly different from P₁ TDN₁ and P₁ TDN₃ (57.31 and 50.15). These results are different from reported by Teti *et al.* (2018) with low protein balance

(10.78%) and high TDN (70.06) obtained a higher digestibility of 78.83%. Most likely with a high TDN content, the ration will be more easily degraded and fermented by rumen microbes. To digest crude fiber requires high energy (TDN) (Tilman *et al.* 1998).

Average daily gain

The effect of several of feed treatment on the average daily gain of Boerka goats male growing phase is presented in Figure 1.

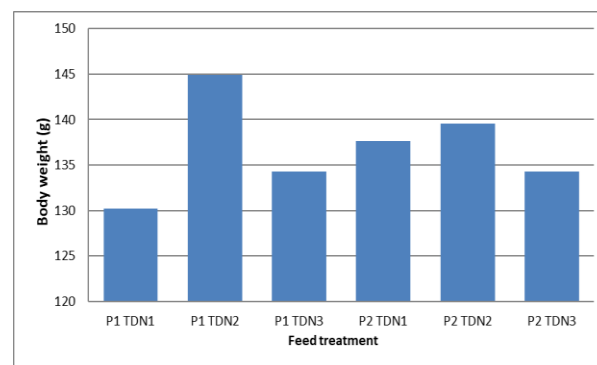


Figure 1: Average daily gain

The value of Average daily gain (ADG) above shows that the lower of TDN content consumed, the lower the response that can be shown by goats in the form of ADG. However, data obtained on Boerka goats showed that all feed treatments gave a fairly good response to the appearance. The average of ADG obtained was 136.81 g head⁻¹day⁻¹, ranging from 130.21-144.90 g head⁻¹day⁻¹. The results of this study is higher compared to those reported by Rochana *et al.* (2020), the balance of 16% protein and 65% TDN obtained ADG of 114.28 g head⁻¹day⁻¹. Mathius *et al.* (2002)

reported that young male PE goats obtained an average of 86.40 g head⁻¹day⁻¹. While research by Nugroho *et al.* (2013) obtained 73.86 g using a 16% PK balance and 66% TDN in the feed.

The results obtained in Figure 1 show that the P₁ TDN₂ feed treatment obtained the highest ADG yield, significantly different (P<0.05) from the P₁ TDN₁ treatment. The results of statistical tests showed that there was no significant difference in the treatment of P₁ TDN₃, P₂ TDN₁, P₂ TDN₂, and P₂ TDN₃. The response of young Boerka goats with a protein balance of 13.03% and TDN of 65.07% was sufficient to obtain very good results on ADG. Meanwhile, the lowest response occurred in goats that received treatment with low TDN levels (63.10%). Goats that received treatment with a high protein level of 15.00% and high TDN of 70.00% in this study numerically did not show optimal results even though they were not significantly different from low protein 13.03% and medium TDN (65.07%).

The Average daily gain obtained in this study is also known to have a relationship with a high level of feed digestibility. The digestibility of feed (DM, OM and CP) in the P₁ TDN₂ treatment was high compared to other treatments, each obtaining 71.49, 70.5, 70.92% (Table 3). Each of these relationships follows the ADG equation, the higher the consumption and digestibility of the feed, the higher the ADG obtained. This results in more nutrient intake which will be used for livestock growth (Ayuningsiha *et al.* 2018). Meanwhile, ruminants that experience a lack of protein and energy result in loss of body weight and have an impact on reproductive failure (Olson *et al.* 1999). The rate of degradation of carbohydrates as a source of energy and protein feed in the rumen can have a major influence on the final product of fermentation and livestock performance (Russel *et al.* 1992). If substance N is degraded faster than the energy source (TDN), then the ammonia resulting from the degradation of compound N will be transferred to the liver, and then recycled to the digestive tract (a small portion) and most of it is lost with urine secretion. On the other

hand, if the amount of available energy exceeds the availability of N, the microbial growth and efficiency of rumen fermentation decreases. If feed degradation is slow, consumption will be depressed and some nutrients cannot be fermented optimally in the rumen (Ginting, 2005). Therefore, it is necessary to balance protein and energy in the ration.

Conclusion

The effect of dietary crude protein and TDN has no significant effect on consumption and FCR. However, it gave a good response to the value of feed digestibility and average daily gain. Feed treatment with CP 13.03% and TDN 65.07% obtained the highest digestibility of DM (71.49%) and OM (70.5%), and gave the best performance for ADG (144.90 g head⁻¹day⁻¹). Thus, the treatment level of CP 13.03% and TDN 65.07% can be recommended for the use of male Boerka goat male feed in the growing phase.

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