The effect of sex on nutritional status of post-weaned Bligon goats under controlled feeding management

Latifah¹, D Maharani¹, T Hartatik¹, A Warih², A S Nurjannah² and Kustantinah²

¹ Department of Animal Breeding and Reproduction, Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia
² Department of Animal Nutrition and Feed Science, Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia

Corresponding author: kustantinah@ugm.ac.id

Abstract. Bligon is a crossbred goat that is widely raised in rural areas of Indonesia where goat farming is characterized by low productivity due to the low quality and availability of feed. The aim this study was to test the effect of sex on nutritional status of post-weaned Bligon goats under controlled feeding management. In total 16 post-weaned goats (age 4 months), were fed with the same diets that meet the basic requirements for goat maintenance. They were targeted to reach average daily gain (ADG) of 100 g. The diet contained 14.58% crude protein and 80.78% total digestible nutrient. All goats received 3% to 4% dry matter ratio of the body weight. Water was provided ad libitum. The variables observed were nutrient intake and digestibility, ADG, and feed conversion ratio (FCR). It was found that sex had a significant effect (p<0.05) on crude fiber (CF) intake, ADG and FCR, with mean values of 10.13±1.23 g/kg BW⁰.⁷⁵/day, 80.62±25.11 g, and 5.88±1.69 in female goats, respectively, and 11.06±1.64 g/kg BW⁰.⁷⁵/day, 132.25±27.71 g, and 3.61±0.62 in male goats, respectively. In can be concluded that sex affects CF intake, ADG and FCR of post-weaned Bligon goats.

1. Introduction
Bligon goat is the most numerous and widespread breed of goats in Indonesia, especially in Yogyakarta Special Region (DIY) and Central Java. It is a crossbreed derived from Etawah and Kacang goats. Its characteristics is close to Kacang goat, with percentage of more than 50%[1]. Bligon goats are widely raised by rural farmers due to their good adaptability to tropical conditions and larger body size than Kacang goats [2]. Animal productivity is influenced by genetic and environmental factors and their interaction, and can be evaluated according to their growth performance. Idiong et al. [3] found that feed intake affects growth performance of goats. Feed intake is influenced by feed availability needed for animal growth. Purbowati et al. [4] defined that feed is an important factor in animal productivity. An adequate feed availability is important for ensuring improved animal productivity. Moreover, it seems that feed intake in goats is affected by sex [3,5]. In the previous study, the nutritional status of Bligon goats raised in farmer group Sumber Rezeki of DIY with supplementation of protein sources has been studied by Setiyawan et al.[6] . As reported by Kustantinah et al. [7], protein dietary supplementation can improve the nutritional status of goats. In the present study, we tested the effect of sex on feed intake, nutrient digestibility, average daily gain...
ADG) and feed conversion ration (FCR) of post-weaned Bligon goats raised under controlled feeding management.

2. Material and methods

2.1. Material
This study was carried out on the laboratory’s farm of the Faculty of Animal Science, Universitas Gadjah Mada, from March to April 2017. A total of 16 Bligon goats (8 head for each sex) aging 4 months with initial live weight of 11.06±2.08 kg in females and 11.09±2.42 kg in males were monitored.

2.2. Methods
Adaptation to feeding was conducted during 2 weeks; feed intake, nutrient digestibility, average weight gain (ADG) and feed conversion ration (FCR) were observed during 2 months. The dietary treatment used in current study were a combination of king grass, caliandra and protein supplement in all goats with CP diet 13.09% and total digestible nutrient (TDN) 71.79%. All goats were managed in individual pens and fed twice daily, at 8 am and 3 pm. Drinking water was provided ad libitum. Feed residues were collected and weighed daily in the morning and subjected to analysis of DM, OM, CP, EE and ash contents according to the procedure outlined in AOAC [8].

Feed intake, nutrient digestibility, ADG and FCR were measured and calculated. All data were analyzed using independent sample t-test with mathematical model as follows:

\[ t = \frac{\bar{X}_1 - \bar{X}_2}{Sp \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \]

Where \( \bar{X}_1 \) = Mean value of observed trait in the male group; \( \bar{X}_2 \) = Mean value of observed trait in the female group; \( Sp \) = Standard deviation; \( n_1 \) = Total sample in the male group; \( n_2 \) = Total sample in the female group.

3. Results and discussion

3.1. Feed intake
Feed intake of male and female Bligon goats is presented in Table 1. It was found that male goats gained higher dry matter intake than female goats.

Table 1. Feed intake in Bligon goat (g/ BW\(^{0.75}\)/day)

| Intake (in 100% DM) | Sex       |
|---------------------|-----------|
|                     | Male      | Female    |
| DM                  | 78.41 ± 8.94 | 73.63 ± 8.08 |
| OM                  | 69.23 ± 7.81 | 65.04 ± 7.21 |
| CP                  | 13.72 ± 1.89 | 13.10 ± 1.62 |
| EE                  | 3.75 ± 1.11  | 4.09 ± 0.67  |
| CF                  | 11.94 ± 1.73 \(^a\) | 10.13 ± 1.23 \(^b\) |
| NFE                 | 50.22 ± 6.33 | 48.74 ± 5.40 |
| TDN                 | 61.52 ± 8.08 | 58.53 ± 6.92 |

Note: DM = dry matter; OM = organic matter; CP = crude protein; CF = crude fiber; EE = extract ether; NFE = nitrogen-free extract; TDN = total digestible nutrients.

\(^{ab}\) means within a row with different superscripts differ (p<0.05)
The results of this study implied that the consumption of dry matter intake of male and female Bligon goats meets the basic requirements. Statistical analysis showed that sex had only significant effects on crude fiber (CF) intake (p<0.05). The study on Bligon goats raised in Brebes, Central Java, showed that the consumption of dry matter (DM), CF and TDN in males was higher than those in female goats [4]. Dong et al. [5] reported that male goats and goats fed with 6.5 g/kg LW (CP 6.5) gain higher feed intakes of elephant grass, soybean meal and copra meal compared to female goats and goats fed with 5.5 g/kg LW (CP 5.5) (p<0.05), and thus, male goats have higher DM and organic matter (OM) intake (p<0.05) than female goats.

3.2. Nutrient digestibility
Nutrient digestibility of Bligon goats is shown in Table 2. There was no significant effect of sex on the digestibility of DM, OM, CP, EE, CF, NFE and TDN (p>0.05). Nutrient digestibility can be affected by the type of feed eaten by the animals. No significant differences in nutrient digestibility between males and females might be due to similar feed ingredients given to the animals. Nutrient digestibility is closely related to crude fiber content in feed ingredients. Feed with higher crude fiber content can affect nutrient digestibility as it is difficult to degrade by microbes in the rumen [9]. There is a negative relationship between crude fiber and nutrient digestibility; nutrient digestibility is reduced along with higher crude fiber content in the feed. Yustiati et al. [10] reported that male Bligon goats had higher proportion of N digested (0.58 g/kg BW^0.75/day) than male (0.70 g/kg BW^0.75/day) and female (0.81 g/kg BW^0.75/day) Kejobong goats.

| Digestibility (%) | Male          | Female         |
|-------------------|---------------|----------------|
| DM                | 75.31 ± 3.50  | 75.07 ± 1.69   |
| OM                | 87.90 ± 6.98  | 84.17 ± 7.20   |
| CP                | 80.58 ± 4.33  | 79.48 ± 2.36   |
| EE                | 90.43 ± 5.34  | 93.44 ± 4.95   |
| CF                | 83.66 ±11.02  | 75.02 ±11.51   |
| NFE               | 74.33 ± 7.03  | 77.45 ± 1.51   |
| TDN               | 78.49 ± 5.10  | 79.45 ± 1.76   |

Note: DM = dry matter; OM = organic matter; CP = crude protein; CF = crude fiber; EE = extract ether; NFE = nitrogen-free extract; TDN = total digestible nutrients.

3.3. Average Daily Gain (ADG) and Feed Conversion Ratio (FCR)
The results of statistical analysis showed (Table 3) that there were significant differences in ADG and FCR between male and female Bligon goats (p<0.05). Male goats gained higher ADG than female goats, but males had lower FCR than females. This implied that controlled feeding management in male goats is more effective than in female goats. It can be noted that higher ADG values lead to lower FCR values. The FCR value can be used as an indicator in measuring feed efficiency of animals. The FCR is defined as the amount of feed consumed per unit of weight gain. The lower of FCR leads to the higher weight gain. As defined by Nuraini et al. [2] and Dong et al. [5], animals with low FCR are more efficient in converting feed into mass. In this study, FCR mean value of 0.47 in male goats was higher than that of 0.36 in female goats. Almeida et al. [11] reported that efficiency of energy utilization for maintenance in Saanen goats was 0.627. During the growth phase, NE differs between the sexes (p<0.01); intact males, castrated males, and females show an average NE g to 15.2, 18.6, and 22.7 MJ/kg of empty weight gain, respectively.
Table 3. ADG and FCR of Bligon goats

| Parameter | Sex            |         |         |
|-----------|----------------|---------|---------|
|           | Male           | Female  |
| ADG (g/day) | 132.94 ± 27.71\(^a\) | 80.63 ± 25.12\(^b\) |
| FCR        | 3.61 ± 0.62\(^a\) | 5.88 ± 1.70\(^b\) |

**Note:** ADG = average daily gain; FCR = feed conversion ratio

\(^ab\) means within a row with different superscripts differ (p<0.05).

4. Conclusion

It can be concluded that there is a relationship between sex and CF intake, ADG, and FCR of Bligon goats. The male goats appear to show a higher CF intake and ADG, and a lower FCR than female goats. The present results imply that male goats are more efficient in converting feed into mass.

Acknowledgement

The study was supported by the grant from the Indonesia Higher Education (Dikti) in PDD (Doctoral Research Program) program scheme with contract no. 2894/UN1.DITLIT/DIT-LIT/LT/2019.

References

[1] Budisatria I G S, Panjono, Agus A and Udo. H M J 2012 *Proceedings of the 15th AAAP Animal Science Congress* pp 1250–6
[2] Nuraini N, Budisatria I G S and Agus A 2014 *Bul. Peternak.* 38 34
[3] Idiong N B and Udom N G 2011 *Electron. J. Environ. Agric. Food Chem.* 10 2350–5
[4] Purbowati E, Rahmawati I and Rianto E 2015 *Pastura* 5 10–4
[5] N T K Dong and Thu N V 2018 *The 4th International Asian-Australasian Dairy Goat Conference* pp 262–9
[6] Setiyawan A I, Kustantinah, Budhi S P S, Zuprizal and Dono N D 2016 *Proceeding The 16th AAAP Congres* (Yogyakarta: Proceeding The 17th Asian-Australasian Association of Animal Production Societies Animal Science Congress) pp 889–92
[7] Kustantinah A, Indarto E, Rusman, Budisatria I G S and Adiwinarti R 2016 *The 17th Asian-Australasian Association of Animal Production Societies Animal Science Congress* (The 17th Asian-Australasian Association of Animal Production Societies Animal Science Congress) pp 889–92
[8] AOAC 2005 vol 18th editi
[9] Rustiyyana E, Liman and Fathul F 2016 g *J. Ilm. Peternak. Terpadu* 4 161–5
[10] Yusufi L M, Hanim C, Budisatria I G S and Nugraha R A 2017 *The 7th Internasional Seminar on Tropical Animal Production* pp 885–8
[11] Almeida A K, Resende K T, St-Pierre N, Silva S P, Soares D C, Fernandes M H M R, Souza A P, Silva N C D, Lima A R C and Teixeira I A M A 2015 *J. Anim. Sci.* 93 3932–40