Goat Breeds and Protein Requirements

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Abstract: Breed and environmental factors may affect protein and probably other nutrients requirements when compared with NRC recommendation. A study was conducted to evaluate the effect of feeding different levels of protein in three breeds of goats. The breeds are Shami, Baladi and crossbred (Shami × Baladi). A total of 54 (18 from each breed) weanling kids (75 to 90 days old) were randomly selected and individually housed at the experimental farm. The three dietary treatments were T1: Control ration, formulated according to NRC (1981) to cover the protein and other nutrients requirements 2: T2: ration formulated to cover only 75% of protein recommended by NRC T3: Control diet + undegradable methionine 2.4 g /day/ kid. Results of this field experiment indicated that feeding undegradable methionine above NRC protein recommendation level caused a significant improvement in general performance of crossbred growing kids, but no effect reported for the performance of growing Shami and Baladi kids. In conclusion, it is very clear that breed affect protein requirements of growing goats when compared with NRC (1981) which designed for international temperate breeds. So, further research is needed in the area of nutrients requirements of breeds raise in our region.
[Mutassim M. Abdelrahman, Mohsen M. Alobri and Faisal A. Alshamiry. **Goat Breeds and Protein Requirements.** *Rep Opinion* 2017;9(9):39-42]. ISSN 1553-9873 (print); ISSN 2375-7205 (online). http://www.sciencepub.net/report. 7. doi:10.7537/marsroj090917.07.

Keywords: Breeds, goats, NRC, Undegradable protein, performance.

1. Introduction

Goat is widely distributed in the Mediterranean region (Titi et al., 2008) as a major ruminant animal for meat production. Feeding goats in the Mediterranean countries depends on the natural range, crop residues (for a very short period of the year), limited barley and wheat bran supplementation (FAO, 1994). A shortage in protein and other nutrient are expected under this extensive system which may affect their general health and performance. Therefore, there is an urgent need to cover nutrients requirements to increase goats' productivity, through intensive farming. Unfortunately, there is a limiting data regarding the protein and other nutrients requirements of different goat breeds in the Mediterranean region. National Research Council (1981) identified the nutrient requirements of the international temperate breeds which may not be applicable to Arabian breeds, because of differences in growth potential and the environmental factors (Aregheore et al., 2003). Silva (2001) reported a higher net protein requirements for growing lambs from breed (Santa Ines lambs) to another (Ile de France lambs), and protein requirements levels were 20% higher than those recommended by ARC (1980). Supplementation of rumen protected methionine increases the proportion of dietary amino acids that is absorbed from the intestine (Archibeque et al., 2002). They reported that the absorbed methionine meets a critical limitation and improved the overall use of nitrogen in the diet. There is more potential to produce profit, while minimizing undesirable environmental impacts through modification of protein metabolism. On the other hand, regarding the effect of energy level on performance, Abdelrahman (2010) reported that NRC (1981) recommendation for energy for growing kids is adequate for proper growth and performance. Hence, a need for accurate level of protein requirements and effect on performance of different goat breeds is very crucial.

The main objective of this study is to determine the effect of feeding different levels of protein, using protected methionine, on the performance of growing kids from three breeds, Baladi, Shami and Crossbred, raised under semi arid conditions.

2. Materials and Methods

2.1. Animals, treatment and sampling

Weanling baladi, shami and crossbred kids (F1: 50% Shami breed x %0% baladi breed; n=18 kids for each breed), about 75 to 90 days old, were individually housed at our research station, Faculty of Agriculture, and injected sub-cutaneously with 2 mls enterotoxaemia vaccine. Kids were divided randomly to one of the three treatments. The 3 dietary treatments were T1: Control ration, formulated according to NRC (1981) to cover the protein and other nutrients required. T2: ration formulated to covered only 75% of protein recommended by NRC.

T3: Control diet + 2.4 g protected methionine /kid/day top dressing.

Kids were individually fed ad libitum their respective diets (Table 1.) for 12 weeks and feed intake were recorded daily for each kids from each breed. The objective of recording the feed intake was to calculate the accumulated feed conversion ratio to be able to compare between breeds and not performance of individual breed. Clean water was available throughout the day. Initial and monthly body weights were also recorded to calculate the accumulate weight gain, accumulated average daily gain and accumulated feed conversion ratio for comparison between breeds as shown in table 2. At the end of the experiment, three kids from each treatment were slaughtered and kidney, liver and spleen were taken and weighted.

2.2. Statistical analysis

Data were analyzed using the General Linear Model (GLM) of Statistical analysis system (SAS, 2010) as a complete randomized design (CRD) with repeated measurements. Protected LSD test was used to compare between means for significances.

3. Results and Discussion

Sufficient supply of protein and well balance amino acids especially the most essential amino acid, methionine and lysine, is a very crucial factor for proper growth and productivity of ruminant animals. Breed and environmental factors may affect protein absorption and amino acids kinetics by ruminant animals and probably other nutrients requirements when compared with NRC recommendation. So, it very crucial to investigate the effect of feeding different levels of protein above and below the NRC recommendation on the performance of different goat breeds raised in the semi arid Mediterranean region.

3.1. Performance of baladi, shami and crossbred kids

Reducing the dietary protein level below the NRC recommendation (T_1) caused a significant decrease in accumulated live weight gain ($p<0.05$), accumulated average daily gain ($p<0.05$) and increase the accumulated feed conversion ratio ($p<0.01$) of baladi kids. There was no significant effect detected on final body weight and total feed intake as a result of changing the protein levels. Furthermore, feeding growing baladi kids undegradable methionine (T2), above the NRC (1981) recommended level didn't cause any improvements in accumulated weight gain, average daily gain and FCR when compared with the control. Moreover, there was no significant effect of crude protein level on dressing percentage (49.69, 48.78 and 49.93% respectively) of baladi kids. It is very clear that feeding black baladi kids below the NRC requirements of protein (75% of NRC recommendation) is negatively affect the growth performance and feed efficiency of the growing baladi kids. Undegradable methionine (Smartamine®) supplementation (2.4 g/day/kid) cause very minor improvement on kids' performance. So, the recommended protein level by NRC for growing kids cover properly the requirements of the black baladi kids for maximum growth and productivity.

For shami kids, reducing the dietary protein level below the NRC recommendation (T1) caused a significant decrease in accumulated live weight gain ($p<0.05$), accumulated average daily gain ($p<0.05$) and increase the accumulated feed conversion ratio ($p<0.05$). There was no significant effect ($P>0.05$) of the treatments on the total feed intake, dressing percentages, as the hot carcass weight was (48.9 vs 47.81 and 49.3%, respectively). Furthermore, feeding growing Shami kids undegradable methionine (T2), above the NRC (1981) recommended level didn't cause any improvements in accumulated weight gain, average daily gain and FCR when compared with the control.

For the crossbred kids, feeding crossbred growing kids bypass methionine above NRC recommendation significantly ($P<0.05$) improve final body weight, accumulated total weight gain, accumulated average daily gain and decrease accumulated feed conversion ratio when compared with the control and T1 groups. Feeding bypass methionine above NRC protein recommendation level cause a significant improvement in performance of crossbred growing kids.

For the feed intake, the result was consistent with Prieto et al. (2000) and Chobtang et al. (2009) who found that there was no significant effect of different levels of protein in diet on the feed intake of Thai indigenous male goats, Spanish and Boer-Spanish crossbred kids. Moreover, Zundit et al. (2002) did not detect significant effect of increasing dietary crude protein on dry matter intake by growing lambs which agreed with ours. In contrast, there was evidence that dry feed intake in Alpine and Nubian goats linearly increased as a result of increasing dietary crude protein levels (Lu and Potchoiba, 1990). Negesse et al. (2001) also confirmed the same trend in increasing feed intake with increasing dietary protein. It is possible that the difference in animal breed and feed ingredients composition and environmental factors are the reason for variation.

Wiese et al. (2003) found that increasing the dietary level of methionine by using Smartamine to Merino lambs did not lead to any increase in growth rate, daily feed intake, feed conversion or final body weight which completely agreed with findings of the present for the baladi and shami kids and disagreed with crossbred results.

In a different study conducted by Shahjalal et al. (2000), studying effect of diets with 16.9 and 20.35% CP, in black Bengal goats, indicated a higher live body weight gain with increasing dietary protein (20.3%) which disagreed with our findings. This disagreement may be resulted from breed, feed type, stage of growth and environmental factors (Negesse et al., 2001).

According to previous studies regarding the dressing percentages, feeding high protein levels even in the form of undegradable protein did not cause any significant effect on dressing percentage (Shahjalal et al., 2000: Rocha et al., 2004; Choi et al., 2007). Moreover, Wiese et al. (2003) reported that feeding lambs protected methionine did not improve hot carcass weight and dressing percentage which agreed with the present findings of the three breeds.

3.2. Breeds' performance differences

Breeds of sheep differ markedly in adaptability to different environments and in performance for traits, observed at the level of protein and amino acid kinetics in response to nutrient supply in major tissues, which influence efficiency of production and product quality. Characteristics of each breed have a genetic basis and can therefore be exploited in structured crossbreeding systems designed for specific production-marketing situations. Table 2. shows the effect of breed on the performance and tissues percentages (carcass weight). The results indicated a significant differences between breeds in term of accumulated live weight gain ($p<0.001$), accumulated average daily gain ($p<0.001$) with higher values for shami kids compared with the control and T1 groups. Moreover, A significant lower ($P<0.05$) accumulated feed conversion ratio for shami and crossbred kids compared to control group. Furthermore, there are no significant differences ($P>0.05$) between breeds in the hot carcass percentages, liver, kidney, spleen and heart percentages as shown in table 2. There were clear differences in production traits in term of protein and amino acid kinetics in response to nutrient supply in major tissues of the three goat breeds, which were in accordance with their genetic differences.

Table 1. Feed composition (As fed)

Ingredients (%)	**Control (NRC, 1981 protein recommended)**	**Treatment (75% of protein recommended by NRC, 1981)**
Corn	15.0	15.0
Barley	55.4	61.4
SBM	6.0	0.0
Tibin	10	10
Wheat bran	12.0	12.0
Salt	0.5	0.5
CaCO3	1.0	1.0
Min. & Vit.	0.1	0.1
Total	100.0	100.0
Chemical composition (As fed):		
Dry matter%	89.23	89.11
Crude protein (g/ kg)	129.95	101.45
Metabolizable energy (Mcal/ kg)	2.53	2.53
Calcium (g/ kg)	4.79	4.64
Phosphorus (g/ kg)	4.45	4.28

Table 2. Effect of breed on the performance and tissues percentage to carcass weight (CW)

	Baladi	**Crossbred**	**Shami**	**SE[1]**	**Sign.**
Dressing percentage	49.8	49.67	51.43	0.448	NS
Weight gain (Kg)	9.48a	10.71b	13.81c	1.85	***
Average daily gain (Kg)	0.109a	0.124b	0.161c	0.002	***
Feed conversion ratio	7.45a	6.62b	6.75b	1.21	*
Liver percentage	5.167	4.533	4.620	0.163	NS
Kidney percentage	0.747	0.780	0.697	0.05	NS
Spleen percentage	0.447	0.340	0.373	0.02	NS
Heart percentage	1.093	1.206	1.013	0.01	NS

1 standard error of means

* $P<0.05$; *** $P<0.001$; NS not significant

4. Conclusion

The NRC recommendation level of protein for growing kids cover the requirements of growing baladi and shami kids raised in the semi arid Mediterranean region. On the other hand, feeding higher level of protein, bypass methionine, above NRC protein recommendation level cause a significant improvement in performance of crossbred growing kids. Breed and environmental factors may affect protein and probably other nutrients requirements when compared with NRC recommendation. Further research is needed.

Acknowledgement

This project was funded by King Saud University, Deanship of Scientific Research, College of Food and Agricultural Sciences, Research Center.

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9/25/2017