Effect of dietary protein levels on carcass traits and fleece characteristics of Markhoz goats

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Abstract: The effect of dietary varying levels of crude protein on carcass traits and fleece characteristic of Markhoz (Iranian Angora) kid goats was studied. Fifty four male kids were used in a completely randomized design with 3×3 factorial experiment and given different diets for 98 d. The results showed that, the effects of dietary different levels of CP were statistically significant (P<0.05). The higher supply of dietary protein resulted in heavier (P < 0.05) slaughter BW, empty BW, hot carcass weight and higher (P < 0.03) dressing percentage than lower dietary nutrient concentrations. Increasing dietary protein increased (P<0.05) fiber length and fiber diameter but had little effect on greasy fiber weight, fiber strength and fiber efficiency. In conclusion, it could be said that dietary nutrients concentration has a main role in increasing mohair fiber and particularly meat production by Markhoz kid goats.

[Farzad Abdollahzadeh, Rahim Abdulkarimi. **Effect of dietary protein levels on carcass traits and fleece characteristics of Markhoz goats**. *Life Sci J* 2012;9(3):2625-2628] (ISSN:1097-8135). http://www.lifesciencesite.com. 381

Key words: Mohair fiber, Carcass traits, fleece characteristic.

1. Introduction

Markhoz goat (Iranian Angora) is the only single coat goat producing shiny fine fibers in Iran. Markhoz goat population in Iran is estimated at 25000 heads in 1996 (Bahmani et al., 2011). The fleece taken from Markhoz goat is called mohair. Mohair production by Angora goats is an important livestock enterprise in some parts of the world (Luo et al, 2004). The nutritional management of the animal can interfere on the mohair production and a poor quality diet will curtail mohair development. Mohair fiber is pure protein thus, Angora goats has a high protein requirement due to their rapid hair growth compared to other ruminant species. It has been shown that fiber production (wool or mohair) can be increased by as much as 20% through the use of rumen by-pass proteins. The kind or quality of protein consumed by ruminants, including the Angora goat, is not considered to be particularly important. Production efficiency would potentially be improved if a significant proportion of these feed proteins could get through the rumen without being degraded. This would be especially true with respect to mohair production if the protein feeds used were made up of high quality protein, rich in limiting amino acids such as methionine. Some protein concentrates (fishmeal, blood meal, meat meal or feather meal) are poorly or slowly digestible and thus have some rumen escape properties. Fishmeal not only has escape value, but is also high in the sulfur containing amino acids and has been shown to be useful to increase fiber production.

Because nutritional variation and especially quality of dietary protein is the most important environmental factor influencing mohair growth and carcass components of Angora goat (Galbraith, 2000) this experiment have been undertaken to assess the effects feeding different levels of By-pass protein (Fishmeal) on fleece characteristics and diet digestibility of Angora male kid goats.

2.Material and Methods

2.1.Animals and management

The current experiment was carried out at the Saqqez Animal Breeding Research Institute, during 2008 to 2009. twenty four male Markhoz goat kids aged 4 months, and weighing 19.10 ± 3kg BW were selected for the feeding trial during 98 days (adaptation: 14 d and experimental period: 84 d). The animals were then allotted randomly to four treatments. At the beginning of the experiment, all goats were treated with an effective anathematic and vaccinated against enterotoxaemia. The kids were housed in individual metal-mesh cages (1.5m×1.0 m) and given ad libitum access to standard completely mixed diets (Table 1) throughout the study. The animals also, had free access to drinking water, limestone and salt at all times. Animal pens were cleaned weekly and the kids weighed monthly on two consecutive days (before morning feeding) for monitoring body weight gain. All animals taken into this study received equal management and the kids maintained good health throughout the study.

2.2.Feeds and experimental diets

Four diets contained different levels of CP (8, 10 and 12 percent) were fed to experimental animals for 12 weeks. The diets were prepared according to the NRC, (1981) guidelines and offered as total mixed rations twice daily, at 7:00 and 16:00 h, to ensure 10% refusal each day (as-fed basis). Ingredients and chemical compositions of the diets are presented in Table 1. Cottonseed meal and barley grain were used in diet as protein and energy supplements respectively.

Table 1. Experimental diets differing in CP ratio fed in male goat kids

	Feeding treatments (diets)			
	1	2	3	4
item	control	10% cp	12% cp	14% cp
Alfalfa hay	40	36	34	26.5
Wheat straw	20	30.5	21	35
Barley grain	27.5	26	34	23
Cottonseed meal	11.2	6	9.5	14
Limestone	0.8	1	1	1
Salt	0.5	0.5	0.5	0.5
Chemical compositions:				
CP (%DM)	15	10	12	14
NDF(%DM)	52.6	53.3	43.8	45.5
ADF(%DM)	26	24.6	22	20.4
Ash (%DM)	8.1	9.4	9.2	8.7

∗ CP, crude protein; NDF, neutral detergent fiber; ADF, acid detergent fiber.

2.3. Data collection and laboratory analyses

Daily feed intake was monitored on individual goats and any refusals were taken into account, weighed and sub sampled for later analysis. The diet and refusal sub samples were ground through a 1.0 mm screen then analyzed for DM (using oven drying at 100 °C), CP (N × 6.251), and ash (combustion at 550°C for 6 h) according to standard procedures (AOAC, 1990). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) was determined as described by Van Soest et al., (1991). At the end of the experimental period goats were shorn and greasy fleece weight was determined just after shearing. A fleece sample (10-cm × 10-cm areas) from the mid side was meticulously sheared and bagged separately in moisture proof- plastic bags and taken to the Wool Laboratory for length (Hauteur and Barbe length items) and diameter analysis. The sub samples were prepared for measurement with the projection microscope technique in accordance with ASTM, (1988) short – section procedure to determine fiber diameter, as well was paralleled in fibro liner component of Almeter 100 (Peyer Texlab FDA 200 Siegfried Peyer Ltd. Ch- 8832 Wollerau – Switzerland), to determine the Simi rigid Hauteur and Barbe length. The staple strength of sub sampled fleece was determined using an Agritest Staple Breaker System (Agritest Pty, Sydney, Australia) as the maximum load (Newtons) needed to break a staple.

2.4.Carcass characteristics

At the end of the feeding trial (14d adaptation and 84d experimental period), half of the animals (3 kids/each treatment) were withheld for water and feed after an overnight period and slaughtered (according to Farid, 1989 procedure) the next morning after weighing. The abdominal fat was removed and measured then warm carcass weighed immediately after dressing and removal of the offal parts. Over and above, subcutaneous fat thickness was measured by caliper. The carcasses were split sagittally, weighed and taken for cooling in a cold storage chamber (from 2 to 4°C) for 24 hours. The left sides were quartered between the 12th and 13th ribs. At first subcutaneous fat and bone were physically separated from each quarter and the residual (e.g. lean and intramuscular fat) analyzed for moisture, crude protein, ether extract and ash according to AOAC, (1990) method.

2.5.Experimental design and statistical analysis

54 male kids (aged 4 months, 18.19 ± 3kg BW) in completely randomized design with a 3 × 3 factorial arrangement were used to evaluate the effects of feeding diets containing different levels of CP and ME. The kids were assigned randomly to each of the nine treatments (n= 6 kids per each treatment) and fed with experimental diets for 98 d. The collected data were subjected to statistical analysis using the PROC GLM procedure of SAS, (2001) (SAS Inst. Inc., Cary, NC). Level of significance was α=0.05, and the Duncan test was used to compare differences between treatments. The model used for this analysis was:

$$\hat{\mathbf{Y}}_{\mathbf{ijk}} = \boldsymbol{\mu} + \mathbf{E_i} + \mathbf{P_j} + \mathbf{E_j} \times \mathbf{P_k} + \sum \mathbf{e_{jk}}$$

Where Y is the dependent variable; μ is the overall mean; E is the effect of energy level (i= 2.1, 2.3 and 2.5 Mcal ME /kg DM); P is the effect of protein level (j= 8, 10 and 12 percent of CP); $E_j \times P_k$ is the interaction effect of energy and protein and ∑ is the random residual error term.

3. Results and Discussion

3.1.Fleece characteristics

Influence of diets differing in ratio of CP on mohair fiber characteristics are shown in Table 2. As a result, fiber diameter and fiber length (Hauteur and Barbe length) was affected significantly ($P<0.05$) by dietary nutrient concentration but, differences between treatments for greasy fleece weight, strength fiber and fiber efficiency (e.i. kg fiber/kg live body weight) was not significant. In the mohair production industry, mean fiber diameter is one of the main criteria used in determining the price of mohair (Taddeo et al., 1998). Table 2 showed that, fiber diameter in diets contained highest and lowest level of CP varied as 26 versus 24 respectively and diet 1 (control) had lower fiber diameter than other treatments. In general, present results are in agreement with those observed in similar experiments.

Table 2. Effects of diets differing in CP ratio on fleece characteristics in male goat kids

	Feeding treatments (diets)					
	1	**2**	**3**	**4**		
	control	10% cp	12% cp	14% cp		
items					SEM	P value
Greasy fleece(g)	453	493	450	469	0.30	0.64
Fiber diameter (μm)	24^{b}	24.2^{ab}	25^{ab}	26^{a}	0.16	0.02
H length (mm)	31.5^{b}	29.5^{a}	34^{a}	29	0.46	0.01
B length (mm)	46.5^{a}	49.7^{a}	55^{a}	48.1	0.13	0.02
Fiber strength	8.1	8.0	8.	7.16	0.44	0.28
Fiber efficiency	28.4	27.8	25.5	28	0.38	0.08

SEM, Standard error of the mean.
Means in a row with a different letters (a, b, c) differ ($P < 0.05$).

Both the rate of fiber growth and fiber diameter were increased when the dietary energy (Huston, 1980; Calhoun et al., 1988) or protein (Stewart et al., 1971; Deaville and Galbraith, 1992; Shahjalal et al., 1992; Hart et al., 1993; Sahlu et al., 1993) Angora goats was increased.

3.2.Carcass traits

Effects of dietary treatments on some carcass traits are listed in Table 3. Analysis of these data showed significant differences for empty (digesta-free) BW, hot carcass, dressing percentage and carcass length among treatments. Table 3 also showed the mean values for some chemical compositions (dry matter and crude protein) of animal carcasses which was affected significantly (p<0.05) by feeding treatments. The higher supply of dietary protein resulted in heavier slaughter BW ($P < 0.02$), empty BW ($P < 0.04$), hot carcass weight ($P < 0.03$) and higher dressing percentage ($P < 0.03$) than lower dietary nutrients concentration. In addition, the animals fed diets containing highest protein level presented greater carcass chemical components compared to lowest level. These data confirm earlier report (e.g. Shahjalal et al., 1992) which suggested that some carcass characteristics improved by dietary protein supplementation.

Table 3. Carcass characteristics and carcass compositions of Angora male kids given diets differing in ratio CP

	Feeding treatments (diets)					
	1	**2**	**3**	**4**		
	control	10% cp	12% cp	14% cp		
items					SEM	P value
Slaughter weight, (kg)	22.4^{c}	26.2^{ab}	25.9^{ab}	27.4^{a}	0.42	0.02
Empty BW, (kg)	18.3^{b}	20.9^{ab}	22.8^{ab}	24.6^{a}	0.66	0.04
Hot carcass, (kg)	8.5^{b}	10.1^{ab}	10.8^{ab}	11.4^{a}	0.52	0.03
Dressing percentage	39.1^{b}	41.7^{ab}	42.8^{ab}	44.2^{a}	0.34	0.03
Carcass length, cm	49.3^{b}	47.8^{ab}	51.3^{ab}	52.2^{a}	0.38	0.01
Chemical compositions of carcass components:						
Dry matter %	47.2^{a}	42.6^{b}	43.6^{b}	46.2^{ab}	0.45	<0.01
Crude protein ,%DM	32.7^{b}	33.7^{b}	36.8^{ab}	38.7^{a}	0.39	<0.01
Fat, %DM	31.8	31.6	30.3	36.9	0.35	<0.06
Ash, %DM	8.4	8.6	9.2	9.4	0.65	<0.07

SEM, Standard error of the mean.
Means in a row with a different letters (a, b, c) differ ($P < 0.05$).

Acknowledgements:

Authors are grateful to the Islamic Azad University, Maku Branch, Maku, Iran for financial support to carry out this work.

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References

1. AOAC, 1990. Association of Official Analytical Chemists, Official Methods of Analysis. 15th Edition. Washington, DC.
2. ASTM, 1988. Standard tests method D584: wool content of wool laboratory scale. In: Annual book of ASTM Standards. Am. Soc. Testing Materials, Philadelphia, PA.
3. Bahmani, H. R., Tahmoorespur, M., Aslaminejad, A.A., Abbasi M.A and Ebnabbasi, R. 2011. Assessment of Demographic, Geographical and Genetic Risks in Markhoz Goat Population. J. Anim. &Vet. Adva. 10: 162-168.
4. Calhoun M. C., Lupton C. J., Kuhlmann S. W., Baldwin B. C., 1988. Dietary energy intake effects on mohair growth. Texas Agric. Exp. Sta., PR 4589, Texas A&M Univ. p 53.
5. Deaville E. R., Galbraith H., 1992. Effect of dietary protein level and yeast culture on growth, blood prolactin and mohair fiber characteristics of British Angora goats. Anim. Feed Sci. Technol. 38,123-133.
6. Farid A., 1989. Direct, maternal and heterosis effects for slaughter and carcass characteristics in three breeds of fat tailed sheep. Livest. Prod. Sci. 23, 137-162.
7. Hart S.P., Sahlu T., Fernandez J.M., 1993. Efficiency of utilization of high- and low-quality forage by three goat breeds. Small Rum. Res. 10, 293-301.
8. Huston J.E., 1980. Supplemental energy and protein effects on growth rate and mohair production in weaned Angora female kids. Progress report, Texas Agricultural Experiment Station, No. 3706.
9. Luo, J., Goetsch, A.L., Nsahlai, I.V., Sahlu, T., Ferrell, C.L., Owens, F.N., Galyean, M.L., Moore, J.E., Johnson, Z.B., 2004. Prediction of metabolizable energy and protein requirements for maintenance, gain and fiber growth of Angora goats. Small Rumin. Res. 53, 339–356.
10. NRC, 1981. Nutrient Requirements of Goats. National Academy Press, Washington, DC.
11. Sahlu T., Hart S. P., Fernandez J. M., 1993. Nitrogen metabolism and blood metabolites in three goat breeds fed increasing amounts of protein. Small Ruminant Res. 10,281-292
12. Shahjalal M., Galbraith H., Topps J.H., 1992. The effect of changes in dietary protein and energy on growth, body composition and mohair fiber characteristics of British Angora goats. Anim. Prod. 54, 405–412.
13. Stewart J. R., Shelton M., Haby H. G., 1971. Nutritional investigations with Angora goats. Texas Agric. Exp. Sta., PR 2933, Texas A&M Univ. p 64.
14. Taddeo H.R., Allain D., Mueller J., de Rochambeau H., 1998. Factors affecting fleece traits of Angora goat in Argentina. Small Rumin. Res. 28 (3) 293–298.
15. Van Soest P.J., Robertson J.B., Lewis B.A., 1991. Methods for dietary fiber, neutral detergent fiber and nonstarch polysaccharides in relation to animal nutrition. J. Dairy Sci. 74, 3583-3597.
16. Galbraith, H, 2000. Protein and sulphur amino acid nutrition of hair fiber-producing Angora and Cashmere goats. Livest. Prod. Sci. 64: 81- 93.

9/6/2012