Different Levels of Protein by Dietary Addition of Cottonseed Meal on the Performance of Iranian Sannen Kids

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ABSTRACT

The objective of this study was to investigate different levels of crude protein by dietary addition of Cottonseed meal on the growth and performance of Iranian Sannen kids. Twelve Iranian sannen kids were used in a complete randomized design with 60-d periods. Kids were divided equally into three groups. Three treatments were formulated: 1) 14% CP 2) 15% CP and 3) 16% CP. Feed intake was measured every day. The body weight and body measurement were measured at an interval of 15 day prior. Samples of feed and fecal for determination of apparent digestibility in last week were collected. Rumen fluid for determine pH and NH3-N at an interval of 15 days at 3 h post feeding were collected. Statistical analysis was performed using the GLM procedure of SAS ($p< 0.05$). Treatment means were compared using Duncan's test. There were no significantly differences in DMI, ADG and feed efficiency between experimental diets, but as the amount protein in the diet increased, DMI, ADG and feed efficiency were tended to increase. Apparent digestibility OM and CP in level of 15% CP were higher than levels of 14 and 16% CP. Conversely, digestibility for ADF and NDF in level of 15% CP were lower than levels of 14% and 16% CP ($p> 0.05$). The pH and ammonia-N concentration were significantly increased as the of protein level in the diet increased ($p< 0.05$). The body measurements (Body length, Withers height, Heart girth and Hip-pin interval) were not affected by the experimental diets. In conclusion, the increasing CP levels from 14 to 16% in diet improved feed intake, average body gain and feed efficiency and on apparent digestibility of nutrients and body dimensions did not differ between treatments, therefore growth results showed that recommended 18% dietary CP for Iranian Sannen kids.

Key Words: Performance, Rumen parameters, Body measurements, Saanen kids

INTRODUCTION

Goats play an important role as a source of produce meat and milk in Iran. Iran has 26 million goats and kids (FAO 2010). Dietary nutrient, especially energy and protein, are major factors affecting meat production in goats, thus a sufficient protein supply can improve growth and performance of them. Optimum protein level for achievement to high growth and performance efficiency is variable. Prieto et al (2011) reported that optimum protein level for fatting of kids were about 14 %, while Hwangbo et al (2009) reported that optimum protein level for feedlot of goats was 18% and showed that the kids fed with 18% crude protein in diet had significantly higher Average Daily Gain compared with the kids fed with 14, 16 and 20% crude protein in diet. Therefore the objective of this study was to investigate different levels of crude protein by dietary addition of Cottonseed meal on the growth and performance of Iranian Saanen kids.

MATERIALS AND METHODS

Twelve Iranian saanen kids were used in a complete randomized design with 60-d periods. Kids were divided equally into three groups with four animals (2 male and 2 female) per group. Each kid was confined in a separate digestion and metabolism crate. Three treatments with different crude protein levels were formulated: 1) 14% 2) 15% and 3) 16% crude protein. The experimental diets were containing 65% concentrate and 35% Lucerne hay

(Table 1). Feeds were offered once at 9:00 h and daily records of feed offered and residues left were measured. Feed intake was calculated as the difference between the amounts of offered and feed refusal. The body weight and body measurement were measured at an interval of 15 day prior to feeding and from the initial until the end of the trial. Clean and fresh water was freely available to all the kids. During the last 7 days of period samples of feed intake and fecal were collected. Chemical analysis for determination of apparent digestibility was donning. Rumen liquor samples for determine the pH and NH3-N were collected from all kids at an interval of 15 days at 3 h post feeding.

Table 1. Ingredients and chemical composition of experimental diet

Ingredients and chemical composition	Experimental diets		
	14% CP	15% CP	16% CP
Ingredients of diet (% of diet)			
Lucerne hay	35	35	35
Corn grain	35.1	35.1	35.1
Cottonseed meal	16.58	13	9.42
Sugar beet pulp	12.35	15.92	19.5
Limestone	0.39	0.39	0.39
Mineral Mix	0.58	0.58	0.58
Chemical composition of diet (% DM)			
DM	88.34	88.20	87.54
CP	16	15	14
NDF	29.1	29.7	30
ADF	19.1	19.2	19.2
ME (Mcal kg^{-1})	2.45	2.44	2.43
EE	2.6	2.6	2.6
Ca	0.9	1	1
P	0.5	0.5	0.5

Statistical analysis was performed using the GLM procedure of SAS ($p < 0.05$). Treatment means were compared using Duncan's New Multiple Range test.

RESULTS AND DISCUSSION

There were no significantly differences in performance parameters of kids such as DMI, ADG and feed efficiency between experimental diets, but as the amount of protein in the diet increased, DMI, ADG and feed efficiency were tended to increase. The result obtain from this study agreement with Ahn and Moon (1985) and Choi et al. (2005), who reported no significant differences in feed intake and feed efficiency when sheep were fed diets with difference CP levels which ranged from 9 to 13 % and when Korean black goats consumed diets containing 12 to 18% CP, respectively. Negesse et al (2001) found that increase Body weight gain (BWG) for Sannen kids fed with 17.6% CP compare to 14.4%, 11.4% and 8.7% CP level. But, BWG and feed conversion efficiency in Barbari kids was similar when fed with different protein levels in the diet (Dutta et al 2009). Also, Hwangbo et al (2009) found that low feed efficiency for Korean black goats fed with 18% CP level compare with 20, 16 and 14% CP levels. In this study increasing CP level increased BWG in the Sannen kids (Table 2).

Also apparent digestibility for OM, CP, ADF and NDF were not affected by the experimental diets, but digestibility OM and CP in level of 15% CP were higher than levels of 14 and 16% CP. Conversely, digestibility for ADF and NDF in level of 15% CP were lower than levels of 14% and 16% CP (Table 2). Shahjalal et al (2000) found that goats fed with high protein diet had significantly higher values for the digestibility of CP and EE compared to those received the low protein diets. Atti et al (2004) reported that kids fed with 12 and 15% CP level had

significantly high apparent digestibility for CP compared with 10% CP levels, in contrast kids fed with 10% CP levels had significantly high apparent digestibility for organic matter compare with 12 and 15% CP level. Atti et al (2004) reported that increasing CP level from 8% to 15.5% increased organic matter, crude fiber and ether extract digestibility; they concluded that the lowest N level may have limited the development and activity of rumen microbes where as higher CP level might have stimulated microbial activity on fermentation and microbial protein synthesis.

Table 2. Effects of different levels of protein on performance of Sannen dairy kids

Performance factors	Experimental diets			
	14% CP	15% CP	16% CP	SEM
DMI (g day^{-1})	478.5	480.2	519.75	17.500
Average Daily Gain (g day^{-1})	88.06	93.53	102.79	3.251
Feed efficiency	5.42	5.18	4.90	0.214
Apparent digestibility (%)				
OM	70.69	71.37	70.72	0.575
CP	75.83	77.85	77.27	0.852
ADF	46.37	45.66	46.44	0.551
NDF	59.71	58.63	60.30	0.484
Rumen parameters				
pH	6.26^{a}	6.42^{ab}	6.61^{b}	0.290
NH3-N	22.38^{a}	24.34^{b}	26.60^{c}	0.340
Body measurement (cm)				
Body length	59.34	59.80	61.03	1.38
Withers height	54.22	54.48	53.75	1.11
Heart girth	63.21	62.95	63.87	1.85
Hip-pin interval	19.01	19.63	19.85	0.43

Means within the same row with different letters are significantly different ($p < 0.05$).

The pH and ammonia-N concentration in the rumen fluid were significantly increased as the of protein level in the diet increased ($p< 0.05$). Dutta et al (2009) reported that increasing CP level from 12 to 14.1% had not significant effect on pH but ammonia-N increased. They concluded that this increase could probably be due to higher incorporation of ammonia-N in the microbial protein. The body measurements (Body length, Withers height, Heart girth and Hip-pin interval) were not affected by the experimental diets.

In conclusion, the increasing CP levels from 14 to 16% in diet improved feed intake, average body gain and feed efficiency and on apparent digestibility of nutrients and body dimensions did not differ between treatments, therefore growth results showed that recommended 18% dietary CP for Iranian Sannen kids.

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REFERENCES

Ahn, B. H. and Y. H. Moon. 1985. Effect of dietary protein and calcium levels on nutrition in sheep I. Effect of dietary protein and calcium levels on digestibility, nitrogen balance and some mineral retention in sheep. Kor. J. Anim. Sci. 27:507-514.

Atti, N., H. Rouissi and M. Mahouachi. 2004. The effect of dietary crude protein level on growth, carcass and meat composition of male goat kids in Tunisia. Small Rumin., 54: 89-97.

Choi, S. H., S. W. Kim, B. Y. Park, B. D. Sang, Y. K. Kim, J. H. Myung and S. N. Hur. 2005. Effects of dietary crude protein level on growth and meat quality of Korean native goats. J. Anim. Sci. Technol. (Kor.) 45:783-788.

Dutta, T. K., M.K. Agnihotri, P.K. Sahoo, V. Rajkumar and A. K. Das. 2009. Effect of different protein-energy ratio in pulse by-product and residue based pelleted feeds on growth, rumen fermentation, carcass and sausage quality in Barbari kids. Small Rumin., 85: 34-41.

FAO. 2010. Food and Agriculture Organization. Database available at www.fao.org.

Hwangbo, S., S. H. Choi, S. W. Kim, D.S. Son, H. S. Park, S. H. Lee and I. H. Jo.2009. Effects of Crude Protein Levels in Total Mixed Rations on Growth Performance and Meat Quality in Growing Korean Black Goats. Asian-Aust. J. Anim. Sci.Vol. 22, No. 8 : 1133 – 1139.

Negesse, T., M. Rodehutscord and E. Pfeffer. 2001. The effect of dietary crude protein level on intake, growth, protein retention and utilization of growing male Saanen kids. Small Rumin., 39: 243-251.

Prieto, I., A. L. Goetsch, V. Banskalieva, M. Cameron, R. Puchala, T. Sahlu, L. J. Dawson and S. W. Coleman, 2011. Effects of dietary protein concentration on postweaning growth of Boer crossbred and Spanish goat wethers. J ANIM SCI 2000, 78:2275-2281.

Shahjalal, M., M. A. A. Bishwas , A. M. M. Tareque and H. Dohi, 2000. Growth and carcass characteristics of goats given diets varying protein concentration and feeding level. J. Animal Sci., Vol 13, 5: 613-618.