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Keywords : *goats, bypass protein feeding.*

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Effect of Formaldehyde Treated Sesame Cake Feeding on Growth Performnce of Growing Female Goats in Fodder based Basal Diet

M.R. Tiwari[α], D. Adhikari[σ], D.P. Adhikari[ρ], R.P. Ghimire[ω] & S.H. Ghimire[¥]

Abstract - An experiment was carried out on fifteen growing female goats (50% Barberi 6, Kiko 6 and Khari 6) at the Agriculture Research Station (Goat), Bandipur for 90 days. Female goats of an average six months age and of body weight 7.82 kg were allocated into three groups having five animals in each group by using Complete Randomized Design (CRD). For T_1 and T_2 concentrate mixture was composed by using procured feed ingredients with 16% crude protein level while T_3 was fed with commercial feed. Experimental animals of T_1 group was provided forest mixed fodder (adlib) + formaldehyde treated sesame cake included concentrate mixture @ 1.5% of body weight, T_2 group was provided forest mixed fodder (adlib) + sesame cake included concentrate mixture @ 1.5% of body weight whereas T_3 was provided forest mixed fodder (adlib) + commercial concentrate mixture @ 1.5% of body weight. Experiment revealed that higher intake of concentrate feed was recorded for T_3 (139.79 g) followed by T_2 (123.1 g) and T_1 (116.36 g) which was highly significant ($P<0.001$) among diet groups. Similarly, fodder intake was noted significantly higher ($P<0.001$) among diet groups (1425.1 g, 1422.5 g and 1321.4 g for T_2, T_1 and T_3, respectively). Feed intake of different genotypes of goats was found to be non-significant whereas fodder intake was found to be significant ($P<0.05$) among goat breeds. In addition, feed conversion ratio per kg body weight gain was observed higher for T_3 (13.25:1) followed by T_2 (12.52:1) and T_1 (11.91:1). Likewise, daily crude protein intake was found higher for T_2 (82.59 g) followed by T_1 (81.4 g) and T_3 (79.13g) whereas crude protein expenditure per kg weight gain was found to be higher in T_3 (1.6 kg) followed by T_2 (1.52 kg) and T_1 (1.44 kg) which was none significant among diet groups. Initial body weight of T_1, T_2 and T_3 was 7.55 kg, 8.0 kg and 7.9 kg, respectively that reached 12.95 kg, 12.65 kg and 12.25 kg during 90 days of experiment for T_1, T_2 and T_3, respectively. Both initial and final body weight was non-significant among diet groups. Similarly, there was also non-significant effect of goat breed on body weight gain. Total body weight gain was recorded higher for T_1 (5.10 kg) followed by T_2 (4.9kg) and T_3 (4.45 kg) which was insignificant among diet groups. Similarly, average daily gain was also noted higher in T_1 (56.66g) followed by T_2 (54.44 g) and T_3 (49.44 g).

Keywords : *goats, bypass protein feeding.*

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I. Introduction

Goats, important domestic animals in many part of world, have served mankind for ages. They provide substance in term of food and clothing. These hardy ruminants can exist in harsh environment in which other livestock species would perish. Goats grow and reproduce under extreme conditions from rugged mountain areas where winters are bitter cold to desert regions where it is hot and dry, and water and forage are sparse. The goat has been considered as *poor man's cow* (mini cow) of poor people because of its immense contribution in rural economy and national income. Goat products like milk and meat are not only nutritious and easily digestible but also a great source of regular income for the poor, landless and marginal farmers. Being a small sized animal it can be easily maintained by women and children (Aziz 2010). Goat population of Nepal is estimated to be 9.19 million. Of 9.19 million, goat population of western hills is 1.13 million which account 12.32% of total goat population that producing 5284 mt meat per annum (MoAD 2012).

Bypass protein is that the original amino acids in the protein meal are absorbed in the small intestine instead of converted to microbial protein in the rumen. Another benefit of feeding meals with high bypass protein is that the portion of the protein that is rumen degradable breaks down in the rumen very slowly. Formaldehyde treatment is most widely used chemical treatment for the protection of protein. Generally there is increased fecal nitrogen and decreased urinary nitrogen which indicates effectiveness of protection. The use of formaldehyde to protect dietary protein for ruminants is based on the premise that bound formaldehyde markedly reduces the solubility of the protein thereby rendering it highly resistant to microbial attack in the rumen without significantly reducing its digestibility in the small intestine.

Supplementation with other palatable materials, mainly agro-industrial by-products has been used in many developed countries for improving locally available nutrients of feed resources (Xianjun *et al*. 2012). It is well established that feed cost accounts for more than 70% of the total cost in any livestock production. Hence, it is paramount important to

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incorporate locally available byproducts and raw materials into the feed of ruminant animals. Agricultural and industrial by-products that are relatively cheaper are best sources for supplementation of animals on fibrous basal feeds. Sesame cake is one of the byproducts available in Nepal at cheaper price throughout the year. The sesame oilseed cake contains DM (83-96%), CP (23-46%), ash (7.5-17%), ether extract (1.4-27%), NFE (25-32%) and crude fiber (5-12%), respectively (FAO 1990).

Growth comparison of goats fed with formaldehyde treated sesame cake is not evaluated so far in Nepal. Hence, a study was carried out to compare the growth performance of growing female goats fed with formaldehyde treated sesame cake mixed concentrate mixture at Agriculture Research Station (Goat), Bandipur, Tanahun.

II. Methodology

a) Experimental Animals

This experiment was carried out on fifteen growing female goats (50% Barberi 5, Khari 5 and Kiko goats 5) at Agriculture Research Station (Goat), Bandipur, Tanahun from 30 March to 26 June 2013 (069/12/17 to 070/03/12). Female goats of average five months old with average body weight of 11.86 kg were allocated into three groups having six animals in each group by using Complete Randomized Design (CRD). They were drenched with Fenbendazole @ 5 mg/kg body weight against internal parasites before assigning in experiment.

b) Concentrate mixture composition

Feed ingredients maize, soybean cake, rice bran, minerals and salt were procured from Khowpa Feed Industry, Bhaktapur. For T1 and T2 concentrate mixture were composed by using procured feed ingredients with 16% crude protein level that has been presented in Table 1 while for T3 commercial compound feed was used made by Pancharatna Feed Industry, Narayangadh, Chitwan.

Table 1 : Composition of concentrate mixture

S/n	Ingredients	T 1		T2	
		Part	Crude Protein (%)	Part	Crude Protein (%)
1	Maize	50	4.4	50	4.4
2	Rice bran	18	1.58	18	1.58
3	Til cake	20	5.61	20	5.61
4	Meat com bone meal	10	4.92	10	4.92
5	Mineral mixture	1	0	1	0
6	Salt	1	0	1	0
Total		**100**	**16.51**	**100**	**16.51**

c) Formaldehyde treatment of sesame cake

Sesame cake was treated with 1-1.2g formalin (40%)/100 g crude protein (CP) as suggested by (Thomas *et al*. 1979; Hagemeister *et al*. 1980). At first one part of formalin was diluted in nine part of water. That after formalin diluted solution was sprayed over cake and mixed manually for five minutes then the cake was stored in plastic bags.

d) Experimental diet of the animal

The dry matter requirement of goats was calculated based on 5 kg per 100 kg body weight. Following diets were formulated to the experimental animals (Table 2).

Table 2 : Experimental diets of the animals

Treatment	Experimental diet
1	Forest mixed fodder (adlib) + formaldehyde treated sesame cake included concentrate mixture @ 1.5% of body weight
2	Forest mixed fodder (adlib) + sesame cake included concentrate mixture @ 1.5% of body weight
3	Forest mixed fodder (adlib) + commercial concentrate mixture @ 1.5% of body weight

e) Feeding Regime

Concentrate mixture and *adlib* amount of fodder was provided to the experimental animals individually in plastic vessel. Concentrate mixture was provided once a day in the morning whereas fodder twice a day (morning and evening). Quantity of concentrate mixture and fodder given daily to the animals was weighed daily and refusal was weighed in next morning. Experimental animal had free access to drinking water.

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f) Chemical Analysis

The samples of feed ingredients, prepared concentrate mixture and forest mixed fodder were sent to the Animal Nutrition Division, Khumaltar, Lalitpur for proximate analysis. Representative samples were analyzed for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE) and total ash contents (TA). The DM was determined by oven drying at 100°C for 24 hrs. Crude protein of the samples was determined using the Kjeldahl method. Ether extract was determined using Soxhlet apparatus. Ash content was determined by ashing at 550°C in a muffle furnace for 16 hrs (AOAC 1980). Crude fibre of the samples was determined using the Van Soest method (Goering, H.K. and Van Soest 1970).

g) Results Recording

The trial period consisted 90 days after an adaptation period of 7 days. Total feed intake by the goats was recorded daily for entire experimental period. The body weight gain of individual animal was measured fortnightly in the morning before feeding.

h) Data Analysis

Data of feed intake and body weight gain were analyzed by "*One Way Annova*" test for every measurement using computer statistical package Minitab 2003, versions 13.20.

III. Results and Discussion

a) Chemical composition of feedstuffs

The result of chemical analysis has been given in Table 3 and crude protein content of prepared concentrate mixture was verified in laboratory that is presented in Table 4.

Table 3 : Chemical composition of different feed ingredients (% DM basis)

Ingredient	DM	OM	TA	CP	CF
Maize	87.69	97.97	2.03	7.53	2.34
Rice bran	87.85	89.5	10.5	11.52	4.83
Sesame cake	90.3	92.63	7.37	30.5	11.3
Meat come bone meal	93.22	67.2	32.8	49.93	3.43
Mixed forest fodder	39.94	90.01	9.99	11.16	NA

The calculated value of crude protein was verified with laboratory analysis, which is presented in Table 4.

Table 4 : Chemical composition of prepared concentrate mixture (% DM basis)

Particular	DM	OM	TA	CP	CF
Formaldehyde treated sesame cake included concentrate mixture	91.92	92.54	7.46	16.83	5.95
Sesame cake included concentrate mixture	91.58	92.10	7.90	16.92	5.64
Commercial feed	90.74	89.85	10.15	15.94	6.45

b) Feed Intake

Average daily intake of concentrate mixture and fodder by goats during experimental periods has been presented in Table 5.

Table 5 : Average feed intake of experimental animal/day/animal

Feedstuffs	Mean ± SD		
	T1	T2	T3
Feed intake (g)	116.36±52.92	123.10±49.44	139.79±47.39
Fodder intake (g)	1422.5±389.5	1425.1±397.9	1321.6±406.3
Daily crude protein intake (g)	81.4±23.46	82.59±23.38	79.13±23.01
Total protein intake (kg)	7.33	7.43	7.12
Daily dry matter intake (g)	675.11	681.91	654.7
Total dry matter intake (DMI) (kg)	60.76	61.36	58.92
Feed conversion ratio (FCR) (kg)	11.91:1	12.52:1	13.24:1
Crude protein expenditure per kg weight gain (kg)	1.44	1.52	1.6

Higher intake of concentrate feed was recorded for T_3 (139.79 g) followed by T_2 (123.1 g) and T_1 (116.52 g) which was highly significant ($P<0.001$) among diet groups. Similarly, fodder intake was also noted highly significant ($P<0.001$) among diet groups (1425.1 g, 1422.5 g and 1321.6 g for T_2, T_1 and T_3, respectively). Highest dry matter intake per day was higher in T_2 (681.91 g) followed by T_1 (675.11 g) and T_3 (654.7 g) which resulted higher total dry matter intake (61.36 kg, 60.76 kg and 58.92 kg for T_2, T_1 and T_3, respectively).

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Feed intake of different genotypes of goats was found to be non-significant among goat breeds whereas fodder intake differed significantly ($P<0.05$). In addition, feed conversion ratio per kg body weight gain was observed higher for T_3 (13.24:1) followed by T_2 (12.52:1) and T_1 (11.91:1).

Similarly, average crude protein intake per day per animal was recorded for T_2 (82.59 g) followed by T_1 (81.4 g) and T_3 (79.13 g) which resulted higher total crude protein intake (7.43 kg, 7.33 kg and 7.12 kg for T_2, T_1 and T_3, respectively). Furthermore, crude protein expenditure per kg weight gain was found higher in T_2 (1.52 kg) followed by T_1 (1.44 kg) and T_3 (1.6 kg). Both average crude protein intakes per day and crude protein expenditure per kg body weight gain was none significant among diet groups.

c) Growth Performance

The growth performance of experimental goats is presented in Table 6 and Figure 1. Initial body weight of T_1, T_2 and T_3 was 7.55 kg, 8.0 kg and 7.9 kg, respectively that reached 12.95 kg, 12.65 kg and 12.25 kg during the experimental period for T_1, T_2 and T_3, respectively. Both initial and final body weight was non-significant among diet groups. Similarly, there was also non-significant effect of goat breed on body weight gain. Total body weight gain was recorded higher for T_1 (5.1kg) followed by T_2 (4.9 kg) and T_3 (4.45 kg) which was non-significant among diet groups. Similarly, average daily gain was also noted higher in T_1 (56.66g) followed by T_2 (54.44 g) and T_3 (49.44 g) which also non-significant among diet groups.

Table 6 : Growth performance of goats

Parameter	Mean ± SD		
	T1	T2	T3
Initial Body weight (kg)	7.55±0.79	8.0±1.35	7.9±2.66
Initial metabolic weight (kg)	4.55	4.75	4.71
Final Body weight (kg)	12.95±1.17	12.65±1.59	12.25±3.45
Final Metabolic weight (kg)	6.83	6.70	6.55
Total weight gain (kg)	5.1±1.46	4.90±1.15	4.45±1.20
Average daily gain (g)	56.66±16.27	54.44±12.82	49.44±13.38

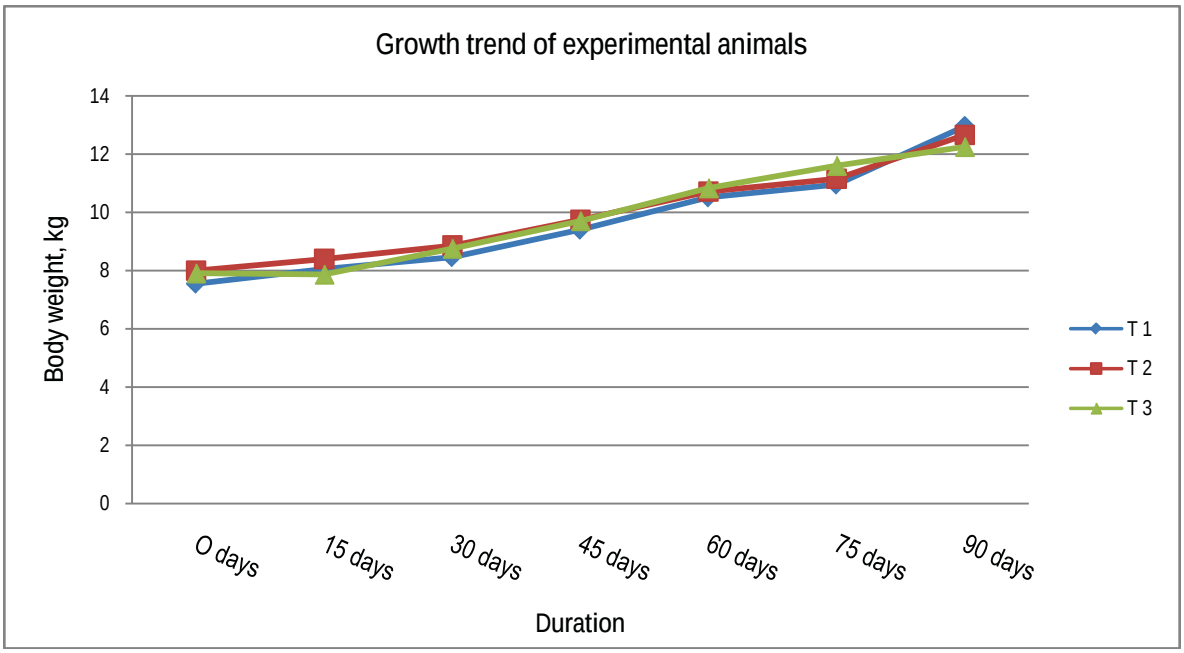

Figure 1 : Body weight gain trend of goats during experiment period

IV. Discussion

This study was initiated with objective to compare the growth performance of female goats of different breeds fed with formaldehyde treated and none treated sesame cake incorporated concentrate mixture, and commercial compound feed on fodder based basal diet. Result revealed that concentrate feed and fodder intake was highly significant ($P<0.001$) among diet groups. Both initial and final body weight was not significant among groups. Similarly, total weight gain and average daily gain also found to be non significant

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among the diet groups. Furthermore, average crude protein intake and crude protein expenditure per animal per day was also not significant among diet groups. Several work has been done by different researchers to improve the bypass protein level in goats through heat treatment but feeding of formaldehyde treated sesame cake to goats is not recorded / documented.

V. Conclusion

Our experiment revealed that there is no significant effect of formaldehyde treatment of sesame cake on body weight gain of goats, however, feed and fodder intake differed significantly. Therefore, it can be concluded that formaldehyde treatment of sesame cake does not improve the bypass of protein in goats. Hence, sesame cake can be incorporated in concentrate mixture of goats without any treatment.

VI. Acknowledgement

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