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Nutrient utilization and growth performance of *Jalauni* lambs fed energy supplemented stylo meal based diets

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Abstract
A feeding trial of 90 days duration was conducted to record the effect of energy supplementation on nutritional and growth performances in *Jalauni* lambs fed stylo meal based diets. Twelve *Jalauni* growing lambs (body weight 14.94±1.2 kg) were divided into two groups of six animals in each. In control group (G_1), the animals were fed sole stylo meal, while the animals of G_2 group were fed stylo meal supplemented with energy source (crushed maize grain) @ 0.5% of body weight for 90 days. DM intake (kg/100 kg body weight or g/kg $W^{0.75}$) was significantly ($P<0.05$) higher in G_2 than G_1. Digestibility coefficients of various nutrients viz DM, OM, CP were significantly ($P<0.05$) higher in G_2 than G_1. The daily live weight gain was 81 and 89 g, respectively in G_1 and G_2. The DCP intake in G_2 was 39.40% higher than G_1 which was sufficient for achieving a body weight gain of 90g daily. Similarly, the intake of TDN in G_2 was 32.38% higher than G_1. Blood metabolites like glucose, protein and urea were within the normal physiological range. It was concluded that supplementation of energy as maize grain @ 0.5% of body weight to stylo meal based diet can improve the dietary nutritive value and growth performance of *Jalauni* lambs.

Keywords: Energy supplementation, Growth performance, *Jalauni* lamb, Nutrient utilization, Stylo meal

Abbreviations: ADF: Acid detergent fiber; **CP:** Crude protein; **EE:** Ether extract; **NDF:** Neutral detergent fiber; **NFE:** Nitrogen free extract

Introduction

Stylo (*Stylosanthes hamata)* is one of the most important tropical perennial pasture legume which shows great promise both for biomass production for grazing ruminants (Meena *et al*., 2014) and also for commercial processing as stylo meal (Guodao *et al., 2014*). The production requirement of an animal is often met through specific protein supplements like groundnut cake, mustard cake or cottonseed cake and concentrates mixture. But the high cost of these supplements (oil seed cakes and concentrate mixtures), limits their widespread use in animals. The legumes like stylo are rich in protein and comparatively low in energy content. For efficient fermentation by the rumen microbes and better utilization by the animal, the ratio of protein and energy should be optimum in the diet. Therefore, present study was undertaken to evaluate the effect of energy supplementation on nutrient utilization and growth performance in *Jalauni* lambs fed stylo meal based diets.

Materials and Methods

Stylosanthes hamata was harvested at flowering stage and dried in sunlight. Thereafter, stylo meal was prepared by using thresher. Twelve *Jalauni* growing lambs (average body weight 14.94±1.2 kg) were divided into two groups of six animals in each. In control group (G_1), the animals were fed sole stylo meal, while the animals of group G_2 were fed stylo meal supplemented with an energy source of crushed maize grain @ 0.5% of body weight for 90 days. All the animals were dewormed with broad spectrum anthelmintic. The animals were placed in well ventilated shed having the facility of individual feeding. Diet was offered in individual trough once daily at 9.30 a.m. Body weight change were taken at 15 days interval. At the end of experimental feeding, a digestibility cum metabolic trial of seven days collection period was conducted. N content of feed, faces and urine samples were analyzed following the standard microkjeldhal method. Feed and faces samples were analyzed for proximate principles (AOAC, 1990) and cell wall constituents (Van Soest *et al*., 1991). Blood samples were collected after completion of metabolism trial in heparinized test tubes to estimate the various blood metabolites *viz*., glucose (Somogyi, 1945), urea (Rahmatullah and Boyde, 1980) and protein (Reinhold, 1953). Data were analyzed statistically using t test (Snedecor and Cochran, 1968).

Results and Discussion

Nutrient intake and utilization: The CP and NDF contents were 11.40 and 61.94% in *stylo* meal and 10.90 and 18.43% in maize grain, respectively. Similar protein and fiber content in stylo meal was reported earlier (Iyeghe-Erakpotobar, 2006). DM intake (kg/100 kg body weight or g/kg W $^{0.75}$) was significantly (P<0.05) higher in G_2 than G_1 (Table 1). DM intake in both G_1 and G_2 group was within the suggested range (ICAR, 1998). The improvement in DM intake in G_2 might be due to better palatability of the diet which provided optimum environment in the rumen for improved microbial growth of rumen microorganisms owing to optimum rumen environment (Bethard *et al*., 1997) as reported earlier (Muthukumar *et al*., 2005) in sheep fed groundnut haulm based diet. The CP digestibility was also significantly (P<0.05) higher in G_2 than G_1. The higher N balance in G_2 than G_1 was a reflection of higher intake and utilization of N from the experimental diets. In present study, N retention as percent of intake as well as absorbed N was higher in energy supplemented group than control group. The results of the present experiment corroborated with earlier findings in sheep fed tropical legume based diets (Reed *et al*., 1990). It was also suggested that tannin and other

Table 1. Nutrient intake and utilization in lambs fed stylo meal based diets

Parameter	G_1	G_2	t value
Body weight (kg)	16.4 ± 1.56	14.6 ± 0.93	-
DMI (g/d)	668^b ± 52.95	545^a ± 40.28	2.33
DMI% BW	4.09 ± 0.14	3.73 ± 0.14	1.47
DCPI	46^b ± 6.17	33^a ± 3.41	3.38
TDNI	417^b ± 36.85	315^a ± 33.16	3.78
Digestibility coefficients (%)			
DM	62.64^b± 1.64	57.78^a ± 2.96	2.63
OM	63.92^b ± 1.61	59.14^a ± 2.82	2.84
CP	58.61^b ± 3.14	51.07^a± 3.04	3.15
NDF	50.29 ± 1.87	49.71 ± 2.89	0.40
ADF	50.42 ± 2.72	49.45 ± 3.14	0.62
EE	62.98^b ± 2.58	54.11^a ± 2.25	2.58
NFE	67.53^b ± 1.43	61.89^a ± 3.15	3.70
N retention (g/d)			
N intake	12.43 ± 1.15	10.13 ± 0.72	2.41
Fecal N	5.07 ± 0.36	4.91 ± 0.38	0.29
Urine N	2.06 ± 0.36	2.14 ± 0.19	0.59
N balance	5.40^b ± 0.82	3.07^a ± 0.46	2.45
N retention as % intake	43.39^b ± 3.58	30.35^a ± 3.07	3.47
N retention as % absorbed	73.24^b ± 2.70	58.97^a ± 4.24	2.96

Table 2. Nutrient density, growth performance and blood metabolites of lambs fed stylo meal based diets

Parameter	G_1	G_2	t value
Nutrient density (%)			
DCP	6.81 ± 0.34	5.94 ± 0.34	3.58
TDN	62.11^b±1.63	57.29^a ± 2.73	2.78
Growth performance			
Initial B. W. (kg)	9.28 ±0.46	8.12 ±0.26	-
Final B. W.	17.30 ± 0.54	15.42 ±0.26	-
Gain (kg)	8.02 ± 0.14	7.30 ± 0.30	2.14
Daily gain (g/d)	89.07 ± 1.61	81.11 ± 3.34	2.14
Blood metabolites			
Glucose (mg/dl)	48.54 ± 0.25	46.98 ± 0.18	1.80
Protein (g/dl)	7.80 ± 0.23	7.94 ± 0.17	0.60
Urea (mg/dl)	27.30 ± 0.32	28.54 ± 0.39	1.87

^{a,b}Means bearing different superscript in a row differ significantly (P<0.05)

phenolics may cause reduced N utilization from tropical legumes. Indeed, the presence of phenolics and deficiency of energy leads to lower utilization of N in animals under G_1group.

Nutrient density, growth performance and blood metabolites: The DCP content of experimental diets G_2 was higher than G_1group, however, TDN content of G_2 was significantly ($P<0.05$) higher than G_1 group (Table 2). A similar observation was reported earlier in sheep (Pailan *et al*., 2005) and buffalo calves (Yadav *et al*., 2007). The daily live weight gain was comparatively lower in animals of G_1 (81 g) than G_2 group (89 g), although the difference was statistically non-significant. The DCP intake in animals of G_2 group was 39.40% higher than G_1 group, which was sufficient for achieving a daily gain of 90 g (ICAR, 1998). The elevated efficiency of protein utilization with energy increment might be related to changes in the available glucose supply which would positively affect protein utilization (Fujita *et al*., 2006). Similarly, the intake of TDN in animals of G_2 group was 32.38% higher than G_1. However, energy supplementation did not have any influence on blood metabolites of lambs fed stylo meal based diets (Table 2). Blood metabolites like glucose, protein and urea were within the normal physiological range. Indeed, blood total protein is a major index for the protein status. In the present study, protein intake and blood total protein were at the same level in all the experimental lambs as reported earlier (Zhang *et al.,* 2009). Similar blood glucose concentration in control as well as energy supplemented group also indicated that there exist a mechanism to regulate the blood glucose concentration within the physiological range in a healthy animal.

Conclusion

It was concluded that maize grain @ 0.5% of body weight could be used as energy suppl ement to improve the nutritive value and growth performance of *Jalauni* lambs fed stylo meal based diets.

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