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Effect of Inclusion of Enzyme and Probiotic in Basal Diet of Khari Goat Kids

Bimala Shah[1], Bhojan Dhakal[2], Luma Nidhi Pandey[1], Purna Shrestha[3], Nabaraj Paudel[2]

National Animal Nutrition Research Center, Khumaltar, Lalitpur
National Animal Science Research Institute, Khumaltar, Lalitpur
National Goat Research Programme, Bandipur, Tanahu

ABSTRACT

An experiment was conducted at National Goat Research Programme, Bandipur, Tanahu from 15th April to 12th July, 2020 for 90 days to test the effect of inclusion of enzyme and probiotics in basal diet of Khari goat kids. Altogether 20 Khari kids aged about 5-7 months were selected from National Goat Research Programme (NGRP) and divided into 5 treatments with 4 replications by using randomized complete block design (RCBD). The treatment combinations were Fodder only (T_0), Fodder + wheat bran (T_1), Fodder + Wheat bran + Probiotics (1kg/ton) (T_2), Fodder + Wheat bran + Enzyme (500gm/ton) (T_3) and Fodder + Wheat bran + Enzyme + Probiotics (T_4). Wheat bran was provided 100gm, 150gm and 200gm for first second and third month respectively. Parameters studied were digestibility co-efficient of the nutrients, feed conversion ratio, feed consumption and live weight gain. Feed intake was recorded daily and the body weight gain was recorded at fortnightly interval. The result of this study showed higher digestibility co-efficient of DM (83.20%), CF (71.94%), Ash (70.27%), CP (82.86%) and EE (84.54%) in goats fed Fodder + Wheat bran + Enzyme + Probiotics (T_4). Mean daily feed consumption was higher (0.52 kg) in goats fed Fodder + Wheat bran + Enzyme + Probiotics (T_4) followed by T2, T3 (0.51 kg). Feed conversion ratio was best in goats fed fodder along with wheat bran supplemented with enzyme and probiotics T_4. Fortnightly and daily body weight gains were highest in goats reared on Fodder + Wheat bran + Enzyme + Probiotics (T_4). Experiment suggested that the inclusion of enzyme and probiotics enhances the digestibility and weight gain of goat kids.

Key words: Wheat bran, different diet, body weight gain, cost benefit ratio

INTRODUCTION

Goat is an important domestic animal in the tropical livestock production system and in subsistence agriculture on account of its unique ability to adopt and maintain itself in harsh environment (Devendra and Burn, 1970). It is believed that goat was the earliest ruminant to be domesticated by man (Zeuner, 1963) and has the widest ecological range among the domesticated animals, (Epstein, 1997). Goat's enterprise fits for landless, marginal and small farmers because it provides continuous income and employment to the farmer's family, including women and children requiring less input. Goat (*Capra hircus* L.) is the major component of livestock species in Nepalese mixed farming system having total population 10986114 in the country (MoAD, 2020/21).

'Probiotic' can be defined as organisms or substances, which contribute to the intestinal microbial balance. The term has originated from two Greek words- Pro means 'for' and 'biotic' means 'life'. Fuller (1989) defined probiotic as live microbial feed supplements which beneficially affects the host animals by improving its intestinal microbial balance. The inclusion of probiotics in animal feed regulates gut ecology or enhances the microbial environment, reduces digestive upsets, improves feed utilization and increase production. Probiotic therapy has emerged as a popular valuable tool in human and veterinary medicine. A medical probiotics could best be described as a live microbial preparation which beneficially effect host animal by improving its intestinal balance. The use of probiotic such as *Lactobacillus* and *yeast* has been receiving much attention now a days. It is well reported that addition of probiotic to the diet decreases the mortality rate compared to control (Watkins and Miller, 1983).

Enzymes are organic compounds produced by living cells and are capable of accelerating specific organic reactions (Perry *et al.*, 2000). In animal production system, enzymes are commonly used to enhance the digestion of particular feed materials. Enzyme is also classified as a feed additive and defined as chemical products which are added to the feed to improve digestibility of certain feedstuffs (Pascal *et al*., 1996).

Considering the importance of probiotics and enzyme in animal feed, a study was conducted with the aim to determine the effect of seasonal tree fodder and wheat bran supplemented with probiotics and enzymes on the growth performance of raising stall fed of Khari goats.

MATERIALS AND METHODS

Experimental kid

An experiment was conducted at National Goat Research Programme (NGRP), Bandipur, Tanahu from 15th April to 12th July, 2020 for 90 days with one week adjustment period. Alltogether 20 kids of having age 5-7 months were selected with five treatments and replicated for four times in randomized complete block design (RCBD). All the goat kids were drenched with Fenbendazole @10mg/kg body weight against internal parasites before assigned in the experiment.

Diet Composition

Required feed ingredients and feed supplements like wheat bran, enzyme (Alvizyme), probiotics (Provilav), mineral (Agrimin-40) and salt were purchased from the local market. Enzyme @500gm/ton and probiotics @1kg/ton of feed was mixed in the wheat bran to be fed to the kids.

Chemical Analysis

All the samples were analyzed for dry matter (DM), crude protein (CP), crude fibre (CF), ash contents (TA) and ether extract (EE) in the laboratory of National Animal Nutrition Research Center, Khumaltar, Lalitpur. The DM was determined by oven drying at 100^0C for 24 hrs. Crude protein of the samples were determined by using the Kjeldahl method. Ash content was determined by ashing at 550^0C in a muffle furnace for 16 hrs. (AOAC, 1980). Crude ether of the sample was determined by using the Van Soest 1970).

Experimental Diet

The following experimental diet was provided to the goat kids (Table 1).

Table 1: Experimental diet

Treatment	**Diet**
T0	Adlib fodder
T1	Adlib fodder with wheat bran (100,150 and 200gm for 1st,2nd, and 3rd month)
T2	Adlib fodder + wheat bran + enzyme @500gm/ton
T3	Adlib fodder + wheat bran + probiotics @1kg/ton
T4	Adlib fodder + wheat bran + enzyme (500g/ton) + probiotics(1kg/ton)

Feeding Regime

Wheat bran was fed individually to the kids in the morning and evening by dividing the allowance in two equal parts. Tree fodder Bakaino (*Melia azedarach*) was weighed and fed to the kids ad-libitum. Wheat bran was given @100gm, 150gm and 200gm in the 1st, 2nd and 3rd month, respectively which was given in two split doses every morning and in the evening.

Data Measurement

The trial period consisted for three months. Quantity of concentrate mixture given daily to the kids was weighted and the refusal was recorded in next morning. The body weight gain was recorded every fortnightly early in the morning before feeding. Digestibility coefficient and feed conversion ratio was also recorded.

Data Analysis

The parameters measured during the experimental periods were: growth rate, average daily gain, daily feed consumption, feed efficiency and digestibility trial**.** Analysis of Variance (ANOVA) was done by using M-stat Version 1.3 Least Significance Difference (LSD) was used to compare the means.

RESULTS AND DISCUSSION

Chemical Composition of Concentrate mixture

The chemical composition of treated and non treated concentrate mixture is given in Table 2.

Table 2. Chemical composition of the compound feed (on DM basis)

Treatments	DM	CF	Ash	CP	EE
Wheat bran	93.28	14.00	14.80	16.75	5.80
Wheat bran + probiotics	92.62	15.20	14.80	17.06	5.20
Wheat bran + enzyme	94.27	14.70	12.90	14.21	5.90
Wheat bran + enzyme + probiotics	93.68	13.80	15.80	14.96	5.60
Bakaino	55.00	22.30	14.20	16.05	2.80

Digestibility co-efficient of the nutrients

Digestibility co-efficient of the nutrients are given in Table 3.

Table 3. Percent digestibility coefficient of nutrients of feeding materials.

Treatments	DM	CF	Ash	CP	EE
Fodder only (T_0)	78.10^{b}	56.96^{b}	59.11^{b}	76.33^{b}	77.40^{b}
Fodder + Wheat bran (T_1)	83.00^{a}	64.50^{ab}	69.05^{a}	82.08^{a}	82.89^{a}
Fodder + Wheat bran + Probiotics (T_2)	82.37^{a}	65.94^{ab}	68.69^{a}	81.02^{a}	81.88^{a}
Fodder + Wheat bran + Enzyme (T_3)	83.00^{a}	67.69^{a}	69.88^{a}	82.63^{a}	82.54^{a}
Fodder + Wheat bran + Enzyme + Probiotics (T_4)	83.20^{a}	71.94^{a}	70.27^{a}	82.86^{a}	84.54^{a}
F-Value	9.00**	6.11**	15.46**	13.47**	8.31**
P-Value	<0.01	<0.01	<0.01	<0.01	<0.01
CV%	1.80	6.79	3.53	1.82	2.27
LSD	3.18	9.59	5.14	3.18	4.01

Means in column followed by same superscript is not significantly different (p>0.05) *significant at 5%, **significant at 1%, ^{ns}Not significantly different

Significantly higher digestibility co-efficient of DM (83.20%), CF (71.94%), Ash (70.27%), CP (82.86%) and EE (84.54%) was found in the treatment group (T_4) but statistically not significantly different (p>0.05) in DM, Ash, CP, EE of T_3, T_2 and T_1 except in CF of T_1 and T_2. However, lower digestibility coefficient of DM (78.10%), CF (56.96%), Ash (59.11%), CP (76.33%) and EE (77.40%) was found in the treatment group (T_0).

Daily feed consumption

The mean daily feed consumption of the experimental kids are given in Table 4.

Table 4. Mean daily feed consumption (kg) of experimental animals.

Treatments	Fortnightly period						Mean
	1st	2nd	3rd	4th	5th	6th	
Fodder only (T_0)	0.37	0.38	0.39	0.37	0.38^{b}	0.46^{b}	0.39^{b}
Fodder + Wheat bran (T_1)	0.37	0.42	0.47	0.48	0.54^{a}	0.66^{a}	0.49^{a}
Fodder + Wheat bran + Probiotics (T_2)	0.37	0.41	0.46	0.52	0.59^{a}	0.72^{a}	0.51^{a}
Fodder + Wheat bran + Enzyme (T_3)	0.36	0.41	0.46	0.52	0.60^{a}	0.74^{a}	0.51^{a}
Fodder + Wheat bran + Enzyme + Probiotics (T_4)	0.36	0.41	0.46	0.53	0.61^{a}	0.75^{a}	0.52^{a}
F-Value	0.87^{ns}	1.95^{ns}	1.49^{ns}	0.76^{ns}	4.78*	5.83**	17.92**
P-Value	>0.05	>0.05	>0.05	>0.05	<0.05	<0.01	<0.01
CV%	3.24	5.32	11.95	30.86	15.68	14.64	5.14
LSD	_	_	_	_	0.128	0.154	0.048

Means in column followed by same superscript is not significantly different (p>0.05) *significant at 5%, **significant at 1%, ^{ns}Not significantly different

The mean daily feed consumption in the 1st fortnight was observed non significant (p>0.05). Accordingly, similar mean daily feed consumption was observed in the 2nd, 3rd and in 4th fortnight.

Mean daily feed consumption in the 5th fortnight was observed significantly different (p<0.05) having higher (0.61kg) with the treatment group fed with Fodder + Wheat bran + Probiotics which was non-significant (p>0.05) with the treatments group fed with Fodder + Wheat bran, Fodder + Wheat bran + Enzyme and Fodder + Wheat bran + Enzyme + Probiotics. However, lower (0.38kg) mean daily feed consumption was observed with the treatment group fed with Fodder only.

Mean daily feed consumption in the 6th fortnight was observed significantly different (p<0.01) having higher (0.75kg) in the treatment group fed with Fodder + Wheat bran + Enzyme + Probiotics which was statistically similar with the treatments group fed with Fodder + Wheat bran, Fodder + Wheat bran + Probiotics and Fodder + Wheat bran + Enzyme. However, lower (0.46kg) mean daily feed consumption was observed with the treatment group fed with fodder only.

The overall mean daily feed consumption of the kids was observed significantly different ($p<0.01$) having higher (0.52kg) in the treatment group fed with Fodder + Wheat bran + Enzyme + Probiotics which was non significant ($p>0.05$) with the treatments group fed with Fodder + Wheat bran, Fodder + Wheat bran + Probiotics and Fodder + Wheat bran + Enzyme. However, lower (0.39kg) daily feed consumption was observed in the treatment group fed with Fodder only.

Feed conversion ratio (FCR)

The mean feed conversion ratio of the experimental kids are given in Table 5.

Table 5. Mean feed conversion ratio (FCR) of experimental animals.

Treatments	Fortnightly period						Mean
	1st	2nd	3rd	4th	5th	6th	
Fodder only (T_0)	9.70	10.46	10.75	11.00^{a}	11.50^{a}	12.02^{a}	10.90^{a}
Fodder + Wheat bran (T_1)	8.98	9.25	8.14	8.59^{b}	8.02^{b}	9.00^{b}	8.66^{b}
Fodder + Wheat bran + Probiotics (T_2)	10.46	9.73	8.40	7.77^{c}	7.47^{b}	9.00^{b}	8.80^{b}
Fodder + Wheat bran + Enzyme (T_3)	9.20	8.09	9.85	7.20^{cd}	7.07^{b}	8.12^{b}	8.25^{b}
Fodder + Wheat bran + Enzyme + Probiotics (T_4)	10.46	7.69	7.65	6.78^{d}	7.33^{b}	7.93^{b}	7.97^{b}
F-Value	0.40^{ns}	0.94^{ns}	0.86^{ns}	41.85**	22.38**	9.92**	13.98**
P-Value	>0.05	>0.05	>0.05	<0.01	<0.01	<0.01	<0.01
CV%	22.50	26.12	31.23	6.24	9.35	11.32	6.93
LSD	_	_	_	0.80	1.93	1.61	0.95

Means in column followed by same superscript is not significantly different ($p>0.05$) *significant at 5%, **significant at 1%, ^{ns}Not significantly different.

The mean feed conversion ratio in 1st fortnight was observed non significant ($p>0.05$). Accordingly, similar result was observed in 2nd and 3rd fortnight reading.

Mean feed conversion ratio in 4th fortnight was observed significantly different ($p<0.01$) having higher (11.00) in the treatment group fed with Fodder only. However, lower (6.78) mean feed conversion ratio was observed in the treatment group fed with Fodder + Wheat bran + Enzyme + Probiotics. Others were within this range.

Mean feed conversion ratio in 5th fortnight was observed significantly different ($p<0.01$) having higher (11.50) in the treatment group fed with Fodder only. However, lower (7.07) in the treatment group fed with Fodder + Wheat bran + Enzyme. Statistically similar result was observed in 6th fortnight.

The overall mean feed conversion ratio of kids was observed significantly different ($p<0.01$) having higher (10.90) in the treatment group fed with Fodder only. However, lower (7.97) mean feed conversion ratio was observed in the treatment group fed with Fodder + Wheat bran + Enzyme + Probiotics.

Cumulative body weight

Cumulative mean live weight gain of experimental kids are given in Table 6.

Table 6. Cumulative mean live weight (kg) of experimental animals.

Treatment	Fortnightly period								
	Initial	1st	2nd	3rd	4th	5th	6th	Total wt.gain	Av. daily wt gain (gm)
Fodder only (T_0)	5.75	6.23^{c}	6.35^{c}	6.48^{c}	7.08^{c}	7.3^{c}	7.8^{c}	2.05	22.77
Fodder + Wheat bran (T_1)	5.70	6.30^{bc}	7.0^{b}	7.87^{b}	8.79^{b}	9.9^{b}	11.0^{b}	5.30	58.88
Fodder + Wheat bran + Probiotics (T_2)	6.12	6.75^{a}	7.5^{a}	8.4^{a}	9.38^{ab}	10.8^{ab}	12.0^{a}	5.88	65.33
Fodder + Wheat bran + Enzyme (T_3)	6.02	6.7^{a}	7.45^{a}	8.4^{a}	9.45^{ab}	11.0^{ab}	12.37^{a}	6.35	70.55
Fodder + Wheat bran + Enzyme + Probiotics (T_4)	6.0	6.6^{ab}	7.5^{a}	8.5^{a}	9.8^{a}	11.17^{a}	12.6^{a}	6.60	73.33
F-Value	1.23^{ns}	4.93*	29.04**	168.19**	13.41**	17.17**	38.90**		
P-Value	>0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01		
CV%	5.52	3.29	2.59	1.65	6.63	7.72	5.67		
LSD	-	0.330	0.28	0.20	0.90	1.19	0.97		

Means in column followed by same superscript is not significantly different (p>0.05)

*significant at 5%, **significant at 1%, ^{ns}Not significantly different

The mean body weight of kids in initial reading was observed non significant (p>0.05). The mean body weight of kids in the 6th fortnight was observed significantly different (p<0.01) having higher (12.60kg) in the treatment group T_4 which was statistically similar with the treatment groups T_2 (12.0 kg) and T_3 (12.37kg). However, lower (7.80kg) mean body weight of the kids was observed in the treatment group T_0. Total body weight gain was found highest (6.60kg) in T_4 and goes on decreasing respectively in T_3 (6.35kg), T_2 (5.88kg) and T_1 (5.30kg) where as lowest in T_0 (2.05kg). Average daily weight gain was found highest in T_4 (73.33gm) and lowest in T_0 (22.77gm).

DISCUSSION

This study was done to evaluate the effect of enzyme and probiotic on weight gain of kids. The digestibility co-efficient of the nutrients of different feeding materials was also compared in this study. The results of digestion trial showed that the digestibility co-efficient of different nutrients DM, CP, Ash, CF and Ether extract in different feeding materials was highest from goat kids fed fodder with probiotics and enzyme supplemented diet. The digestibility co-efficient of DM, CP, Ash, CF and Ether extract was affected by the supplementation of probiotics with enzyme. This finding was also in agreement with the findings of Malik, 1993 who reported that the supplementation of probiotics increased the in vivo DM and CF degradability. Stokes and Zheng, 1995 and Sanchez *et al.,* 1996 reported that the application of fibrolytic enzymes had improved both intake and digestion. The increase in feed intake might be due to better utilization of nutrients. This result was supported by the work of Kim *et al.,* 1992 and Das *et al.,* 2001.

The result showed that the weight gain of the Khari kids were found highest in the treatment group fed diet in combination with probiotics and enzyme. This increase in weight gain might be due to better utilization of nutrients where enzyme and probiotics were supplemented in the diet. Newbold, 1996; Durand- Chaucheyras *et al.,* 1997 reported that the increase in the number of total culturable bacteria in the rumen appears to be one of the most consistently reported responses to yeast supplementation. Generally, same trends were observed for cellulolytic and lactic acid consuming bacteria but in a lesser extent (Newbold, 1998). Chaucheyras *et al.,* 1995 reported that the Yeast had been shown to provide vitamins (especially thiamin) to support the growth of rumen fungi.

Carro *et al.,* 1992 reported that the concentration of ammonia was decreased by 10 to 35 per cent in vitro by the use of probiotics. Similar results had been reported by Harrison *et al.,* (1988), Newbold *et al.,* (1990). Incorporation of ammonia into microbial protein was enhanced due to supplementation of yeast (Carro *et al.,* 1992; Olson *et al.,* 1994), which was confirmed by greater microbial yield and microbial true protein reaching the duodenum (Erasmus, 1991). Yeast culture may alter the pattern of VFA production (Martin *et al.,* 1989). The total VFA (TVFA) concentration was increased from 172.2 to184.5 mol/d (Harrison *et al.,* 1987).

Beauchemin *et al.,* 1996 and McAllister *et al.,* 1998 had reported that over-application of enzyme is possible, such that increased application costs are not recovered by corresponding improvements in animal performance. Several researchers had reported that the exogenous enzymes can enhance fiber degradation by ruminal microorganism's in vitro (Forwood *et al.,* 1990; Varel *et al.,* 1993; Hristov *et al.,* 1996; Feng *et al.,* 1996; Dong *et al*., 1999) and in situ (Lewis *et al.,* 1996).

CONCLUSION

Results obtained from this trial showed that the supplementation of enzyme and probiotics in the Khari goat kids diets could enhance the digestibility co-efficient of the nutrients and improve live weight gain upto 73.33gm/day. So, we can recommend that the use of enzyme and probiotics in the combined form is beneficial for the farmers.

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