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Comparison of Growth Performance of Khari Goats Fed with Different Level of Rice Bran and Urea Treated Rice Straw (UTRS) in Fodder Based Diets

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Abstract

For correcting, the nutritional imbalance of rice straw feed diet by supplementing energy and protein rich concentrate (rice bran) an experiment was carried out in growing male goats at Agriculture Research Station (Goat), Bandipur, Tanahun from November 2009 to Januwary 2010. Twelve goats of 6-7 months of age and similar body weight were divided into four treatment groups having three animals in each group by using complete randomized design. Four types of diet were formulated for these experimental animals. The animals of control group (treatment 1) were provided UTRS, Raikhanayo and concentrate mixture at the rate of 65, 25 and 10% of dry matter requirement, respectively. Dry matter requirement of treatment 2 was fulfilled by providing urea treated rice straw (UTRS), Raikhanayo and rice bran @ 65, 25 and 10%, respectively. Treatment 3 received dry matter requirement by UTRS, Raikhanayo and rice bran @ 55, 25 and 20%, respectively whereas treatment 4 got @ 45, 25 and 30 percent UTRS, Raikhanayo and rice bran, respectively. The study revealed that there was no significant effect in fodder and UTRS intake between diet groups except rice bran ($P<0.001$). Likewise, there was highly significant ($P<0.001$) effect in total dry matter intake between diet groups. The highest body weight gain was observed in treatment 4 (17.5 ± 1.8 kg) followed by treatment 3 and 2 (15.66 ± 1.15 kg and 15.5 ± 3.27 kg, respectively). The lowest body weight gain was noted for treatment 1 (14.5 ± 1.80 kg); however, it was also found non-significant between diet groups. Average daily gain was recorded highest in treatment 4 (50 g /day) followed by treatment 2 (31.44 g /day) whereas average daily gain for treatment 1 and 2 were recorded similar (27.77 g /day).

Key words: feeding trial, urea treated rice straw, rice bran, feed intake and body weight gain

Introduction

Goats, thought to be one of the earliest domesticated ruminants in the race of human civilization have a multidimensional economic and socio-cultural significance for the Nepalese farmers. They have wide range of adaptability thrive well in natural grasslands, forests and crop residues and are found from the southern Terai plain to the northern Trans Himalayan region. They are source of meat (protein), manure, hides and fibre. Goat is handy source of money therefore called "*Poor Man's Cow*". The population of goats in the country has been estimated to be 8.84 million and producing 50315mt meat per annum (CBS

2009/10). These are increasing at the rate of 4.18 percent / annum in population and 4.08 percent / annum for meat production (2007/08-2009/10) (CBS 2009/2010).

Rice straw is usually fibrous, low in nitrogen and minerals. In Nepal, approximately 5898193.2-mt rice straw is produced every year (Shrestha 2002). It is potential energy feed because of high cellulose (30-42%) hemicellulose (16-27%) and lignin (3-13%) contents (Slonekar 1976). Although these lingo-cellulose crop residues are energy feed but their energy is inadequate even to meet the maintenance needs of ruminants due to the presence of lignin. Due to low digestibility and mineral contents, the intake of the straw is lower and lignin acts as a metabolic block (Chesson and Orskov 1984). In order to improve efficient utilization of this lingo- cellulosic residue, to enhance the nutritional quality of straw (nitrogen content), palatability and digestibility treatment of rice straw with urea is necessary (Oji and Mowat 1978). To correct the nutritional imbalance of rice straw diet, supplementation of energy and protein rich concentrate has been suggested by Umunna *et al* (1995).

Rice bran is locally available and cheap energy and protein source. It supplies energy to the rumen microbes and ensures synchronicity of the protein and energy in urea treated rice straw diet for more efficient utilization and microbial protein synthesis. Nevertheless, the higher level affects microbial growth and ultimately affects the nutrients digestibility. Therefore, this study was initiated with the aim of comparing the growth performance of Khari male goats fed with different level of rice bran and UTRS in fodder based diets.

Methodology

Experimental Animals

This experiment was carried out in growing male goats at Agriculture Research Station (Goat), Bandipur, Tanahun from November 2009 to Januwary 2010. Twelve goats of average 6-7 months of age and similar body weight were divided into four treatment groups having three animals in each group by using complete randomized design (CRD). They were drenched against internal parasites, vaccinated against infectious diseases, and were kept individually in wooden cages of 1 x 1 x 0.4 m.

Experimental Diets

The dry matter (DM) requirement of goats was calculated based on 4 kg per 100 kg body weight. The following diets were formulated for the experimental animals (Table 1).

Table 1. Experimental diets for the goats

S/n	Treatment	Experimental diets
1	Treatment 1 (Control)	UTRS @ 65% of the total DM requirement + Raikhanayo (*Ficus semicordata)* @ of 25% of the total DM requirement + Concentrate mixture of Hetauda Cattle Feed @ 10% of the total DM requirement
2	Treatment 2	UTRS @ 65% of the total DM requirement + Raikhanayo @ 25% of the total DM requirement + Rice bran @ 10% of the total DM requirement
3	Treatment 3	UTRS @ 55% of the total DM requirement + Raikhanayo @ 25% of the total DM requirement + Rice bran @ 20% of the total DM requirement
4	Treatment 4	UTRS @ of 45% of the total DM requirement + Raikhanayo @ of 25% of the total DM requirement + Rice bran @ of 30% of the total DM requirement

Feeding Regime

Chopped Raikhanayo and UTRS were mixed thoroughly and provided to the goats individually thrice a day (morning, afternoon and evening). Similarly, concentrate mixture and rice bran were provided individually in plastic vessel once a day in the morning. Rate of Raikhanayo, UTRS, concentrate mixture, rice bran were corrected fortnightly according to the body weight attained. Quantity of Raikhanayo, UTRS, concentrate mixture and rice bran were given daily to the goats were weighed and refusal was weighed in the next morning. Drinking water was provided thrice a day in adequate amount. The concentrate mixture was used was manufactured by Hetauda Cattle Feed Industry (HCF), rice bran was procured from local market and rice straw was treated as suggested by Rai *et al* (1993).

Procedure of Urea Treatment of Rice Straw

For preparing 4% urea treated rice straw (UTRS), can be mixed 40 g of urea in one liter of water then diluted

thoroughly. After dilution, one kg of rice straw is mixed in this solution. Now this treated rice straw is put into plastic bag and leave it for 21 days in airtight condition. After this open plastic bag and dry, the rice straw in shadow condition until the flavor of ammonia is not disappeared. Thereby the straw becomes ready for livestock feeding.

Chemical Analysis

The samples of Raikhanayo, concentrate mixture, UTRS and rice bran were sent to the Animal Nutrition Division, Khumaltar, Lalitpur for proximate and detergent 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. Total 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. & Van Soest 1970).

Chemical Composition of Feedstuffs

The result of chemical analysis is given in Table 2.

Table 2. Chemical composition of different feedstuffs (percentage on DM basis)

Ingredients	DM	OM	TA	CP	CF	EE	Ca	P
Raikhanayo	36.77	82.66	17.34	11.43	NA	NA	NA	NA
Concentrate mixture of HCF	74.99	89.98	10.02	15.07	6.93	NA	NA	NA
UTRS	86.0	83.45	16.55	8.2	NA	NA	NA	NA
Rice bran	86.67	87.3	12.7	11.05	10.84	4.79	0.32	0.66

DM = dry matter, OM = organic matter, TA = total ash, CP = crude protein, CF = crude fibre, EE = ether extract, Ca = calcium and P = phosphorous

Recording of data

The trial period consisted 90 days after an adaptation period of 7 days. Total feed intake by the animals was recorded daily for the experimental period. The body weight gain of individual animal was taken at 15 days interval in the morning before feeding.

Data Analysis

Obtained data were analyzed by using one way ANOVA, Statistical Package for Social Study (SPSS 11.5 versions).

Results and Discussion

Feed Intake

Average daily intake of fodder, concentrate mixture, UTRS and rice bran by experimental animals is given in Table 3.

Table 3. Feed intake of experimental animals/animals/day

Feedstuffs	(Mean ± SD)			
	Treatment 1	Treatment 2	Treatment 3	Treatment4
Raikhanayo (g)	631.37± 9,57	690.56±146.18	693.04±67.84	738.84±73.84
Urea treated rice straw (UTRS) (g)	153.51±40.50	192.48±51.94	148.03±6.19	118.4±14.21
Concentrate mixture (HCF) (g)	62.79±15.54	0	0	0
Rice bran (k)g	0	63.72±12.82	116.42±12.55	195.77±12.84
Total DMI / animal (kg)	37.0±135.55	42.71±120.80	43.46±133.41	48.88±240.86

Average fodder intake for treatment1, 2, 3 and 4 were recorded 631.37±9.57 g, 690.56±146.18 g, 693.04±67.84 g and 738.84±73.84 g, respectively. Similarly, intake of UTRS was noted 153.51±40.50 g, 192.48±51.94 g, 148.03±6.19 g and 118.4±14.21 g for treatment1, 2, 3 and 4, respectively. However, intake of fodder and UTRS was not significant between diet groups. The highest intake of fodder was recorded for treatment 4 (738.84±73.84 g) followed by treatment 3 and 2 (693.04±67.84 g and 690.56±146.18 g, respectively). The least amount of fodder intake was observed in treatment 1 (631.37±9.57 g). Likewise, intake of UTRS

was highest in treatment 2 (192.48±51.94 g) followed by treatment 1 and 3 (153.51±40.50 g and 148.03±6.19 g, respectively). In case of rice bran intake, highest intake was monitored for treatment 4 (195.77±12.84 g) followed by treatment 3 and 2 (116.42±12.55 g and 63.72±12.82 g, respectively) which was highly significant (P<0.001) between the diet groups. The intake of concentrate mixture for treatment 1 was observed 62.79±15.54 g. In case of total DMI, there was highly significant (P<0.001) effect between diet groups.

Growth Performance

The growth performance of experimental animals is given in Table 4 and Figure 1.

Table 4. Growth performance of goats

Parameter	**(Mean ± SD)**			
	Treatment 1	**Treatment 2**	**Treatment 3**	**Treatment 4**
Initial body weight (kg)	12.0 ± 1.80	13.0 ± 2.46	12.83 ± 2.46	13.0 ± 1.0
Initial metabolic weight (kg)	6.44	6.84	6.77	6.84
Final body weight (kg)	14.5 ± 1.80	15.5 ± 3.27	15.66 ± 1.15	17.5 ± 1.8
Final metabolic weight (kg)	7.43	7.81	7.87	8.55
Total weight, gain (kg)	2.5 ± 0.86	2.5 ± 0.86	2.83 ± 2.25	4.5 ± 0.86
Changes in metabolic weight (kg)	0.99	0.97	1.1	1.71
Average daily gain (g)	27.77	27.77	31.44	50
Feed Conversion Ratio (FCR) (kg)	14.8:1	17.08:1	15.35:1	10.86:1

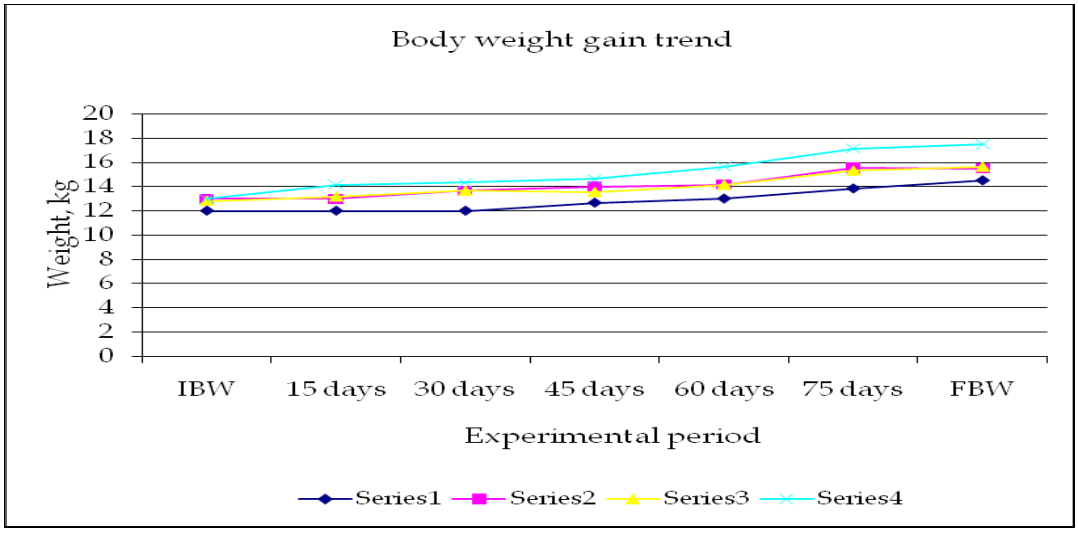

Fig. 1

The initial weight of experimental animals ranged from 12 to 13 kg and which reached 14.5 to 17.5 kg by the end of experiment (90 days). However, initial and final body weight of goats was not differed significantly between diet groups. The highest body weight gain during 90 days of trial period was observed in treatment 4 (17.5kg) followed by treatment 3 and 2 (15.66 and 15.5 kg, respectively). The lowest body weight gain was noted for treatment1 (14.5 kg). Average daily gain (ADG) was recorded highest in treatment 4 (50 g /day) followed by treatment 2 (31.44 g /day) whereas ADG for treatment 1 and 2 was recorded similar (27.77 g /day). The feed conversion ratio (FCR) was higher for treatment 2 (17.08:1 kg)

followed by treatment 3 and 1(15.35:1 and 14.8:1 kg, respectively). The least FCR was recorded for treatment 4 (10.86:1 kg).

Discussion

In this study, intake of total dry matter was recorded for treatment 2 (42.7 kg), treatment 3 (43.46 kg), treatment 4 (48.88 kg), and treatment 1 (37kg) that was highly significant ($P<0.001$) between diet groups. Similarly, body weight gain was also found to be increased when level of rice bran was increased and UTRS level was decreased (Table 4). This study revealed that there was positive correlation between weight gain and level of UTRS and rice bran inclusion in diet. The enhancement in DMI and weight gain might be due to providing greater amount of rumen degradable organic matter through rice bran supplementation which improved the microbial activity and fibre degradation which could result to higher intake of goats subsequently body weight gain. Thus, the comparatively low intake of total DMI among animals of treatment 1 and 2 addressed the need for energy supplementation, which will match the highly soluble nitrogen from UTRS to encourage adequate consumption.

Upreti *et al* (2006) conducted a feeding trial on goats by supplementing UTRS in diets and found that the average daily weight gain was not significantly different ($P>0.05$) between diet groups. Furthermore, they suggested that UTRS could be used for goat feeding without affecting the growth.

Upreti and Edgar (2008) conducted a trial by formulating four types of diets that included four levels of rice bran: 0, 10, 20 and 30% rice bran in basal diets. Their findings showed that inclusion of 20% rice bran significantly ($P<0.05$) improved in total DMI than the other levels. A 30% rice bran inclusion was not able to improve further the total DMI, which might be due to the negative effect of higher level of anti nutritional factor in rice bran. The 20 and 30% rice bran inclusion resulted significantly ($P<0.05$) higher OM digestibility of UTRS based diet with Leucaena supplementation.

The inclusion of rice bran instead of concentrate mixture up to 30% and UTRS level up to 45% increased total dry matter intake of fodder-based diets. Therefore, present study suggested that inclusion of cheap and locally available rice bran instead of concentrate mixture and UTRS could be beneficial for goat feeding when green fodder availability get exhausted. Furthermore, this type of experiments should be carried out in farmers' field also for the sake of wider dissemination of the technology.

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