

NUTRITIONAL EVALUATION OF WHEAT STRAW BASED TOTAL MIXED RATION IN SHEEP

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Abstract: Fourteen adult sheep were used and classified into two group (7 animals each), in feeding trial to study the effect of wheat straw based total mixed ration on their digestibility and nutrient utilization. The sheep under control group (T_1) were fed wheat straw and concentrate separately where as sheep under treatment group (T_2) were fed wheat straw based total mixed ration. The results showed that, Non significant differences ($P>0.05$) were observed for DM intake as g per day. The CP, DCP and TDN intakes between group showed similar values. The digestibility of dry matter and organic matter in both groups was within the normal range with statistically non-significant. Similarly the digestibility of CP, CF, EE and NFE were differences between group were non-significant. The SRL pH, total-N and non protein nitrogen concentrations and average concentration of protein nitrogen in SRL were similar for both groups ($P<0.05$). The average TVFAs concentration was observed significantly higher in T_2 as compared to T_1 group ($P<0.05$). The average values of ammonia-N were highly significant between treatments ($P<0.01$).

Keywords: Total mixed ration, digestibility, sheep.

Introduction

Livestock production accounts for 40% of the world's gross agricultural production. Globally, sheep rearing is predominantly aimed at wool production. Success of the sheep rearing depends on the economics of production which in turns depend on growth performance of the breed [12]. India ranks fifth in sheep population where it shares 5.5% of the total world population. In Gujarat total sheep population is 2.06 millions [4].

The scarcity of green fodder and high cost of conventional feed ingredients have prompted the researchers to improve the feeding value of poor quality crop residues [1]. Inadequate availability of good quality feed is regarded as a major constraint to prevalent small ruminant production system [3] [13]. There is a need for better utilization of crop residues and agro-industrial by products to maximum extent through different feed processing methods and technologies to ensure better profit from the sheep. Hence, reduction in investment by incorporating hitherto wasted and unutilized agro-industrial by-products as protein supplements need to be scrutinized [10].

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The concept of feeding complete rations or Total Mixed Ration (TMR) with use of locally available crop residues seems to be ideal and promising method of improving the utilization of poor quality fibrous crop residues [2]. There is a need for better utilization of crop residues and agro-industrial by products to maximum extent through different feed processing methods and technologies to ensure better profit from the sheep. Feed ingredients of low palatability may also be better utilized in this feeding system because it prevents selection of ingredients during eating. The advantages for sheep production efficiency of a TMR over feed ingredients provided separately are thought to exist because concentrates and forages are mixed and offered together and are therefore fermented in the rumen simultaneously.

Materials and methods

The present study on adult sheep was conducted at Animal Nutrition Research Department, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand, to know the effect of *wheat* straw + *Amul dan* based TMR was fed to sheep to study the effect on voluntary feed intake, nutritional status, nutrient utilization and rumen fermentation pattern. For the purpose of this study fourteen adult sheep were randomly divided into two groups considering their body weight. The selected sheep were divided into two groups of seven each. The selected sheep in T₁ served as control received wheat straw and amul dan separately and T₂ as treatment that received wheat straw based Total Mixed Ration (TMR). Individual feeding of all the sheep was carried out during the study period. The nutrient requirements of sheep in terms of DCP and TDN were met as per [8] feeding standards. Proportion of roughage to concentrate ratio was 50:50. At the end of the experiment, a digestibility trial of five days collection period was conducted following conventional method. The experiment period was of 90 days and design of experiment Completely Randomized Design was followed. The digestion trial was conducted on all the animals at the end of experimental period. The collection period was of 5 days during which the representative samples of feed along with the left over and faeces voided were collected and analyzed for proximate as per [5].

Rumen liquor samples were collected from four sheep in each treatment once at the end of experiment. The samples were collected at 0 hr (pre feeding) and at 3 and 6 hrs post feeding to study progressive changes in the pH, total volatile fatty acids (TVFA) and various nitrogenous constituents of strained rumen liquor (SRL).

Observations of various parameters recorded during experimental period were tabulated and the data generated were analyzed statistically as per [15].

Results and discussion

The feeds and fodder used to prepare the total mixed rations for feeding of sheep during the experimental period were analyzed for chemical composition and results are presented in Table 1.

Table 1. Average chemical composition* (% on DM basis) of feeds, fodder and total mixed ration used under experiment

Feeds Constituents	Wheat straw	Compound concentrate mixture	Total Mixed Ration
CP	3.20±0.06	17.50±0.10	9.82±0.13
EE	1.18±0.01	3.28±0.02	2.55±0.04
CF	40.32±0.40	10.00±0.12	28.97±0.30
NFE	43.66±0.45	47.37±0.71	43.03±0.47
Ash	11.61±0.03	21.82±0.91	15.60±0.31
Silica	4.89±0.05	5.79±0.10	7.30±0.60
Ca	0.37±0.01	0.66±0.01	0.87±0.01
P	0.14±0.01	1.26±0.01	0.68±0.02

The average daily DM consumed by sheep was 895.40 g and 899.08 g under T₁ and T₂, respectively during the experimental period and the treatment differences were non-significant (P>0.05), corroborating the findings of [7]. The result in line with [11] [9]. Sheep fed daily consumed organic matter 763.78 g and 765.08 g under T₁ and T₂ group respectively (Table 2) which also almost similar. The CP, DCP and TDN intakes were 92.67 & 88.28, 50.14 & 45.76 and 487.10 & 475.16 g/d under T₁ and T₂, respectively in which treatment difference were non-significant which corroborating the finding of [14].

Table 2. Effect of wheat straw based total mixed ration on Nutrient intake

Particular	Group	
	T ₁ (Control)	T ₂ (Treatment)
DM intake (g/d)	895.40±40.91	899.08±34.43
OM intake (g/d)	817.22±33.07	806.74±31.05
CP intake (g/d)	92.67±4.23	88.28±3.38
DCP intake (g/d)	50.14±2.29	45.76±1.75
TDN intake (g/d)	487.10±22.26	475.16±18.20

The digestibility of dry matter (58.80 and 56.09% under T₁ and T₂, respectively) and organic matter (64.69 and 61.69% under T₁ and T₂, respectively) in both groups was within the normal range with statistically non-significant (Table 3). Similarly the digestibility of CP, CF, EE and NFE were 54.15 & 51.92, 67.01 & 64.20, 70.50 & 70.63 and 60.59 & 56.92 %

under T₁ and T₂, respectively in which treatment difference were non-significant. Similar values for DM and OM digestibility (P>0.05) were also reported by [2] [14].

Table 3. Effect of wheat straw based total mixed ration on Nutrient digestibility %

Particular	Group	
	T ₁ (Control)	T ₂ (Treatment)
DM	58.80±0.43	56.09±0.63
OM	64.69±1.00	61.69±0.86
CP	54.15±0.96	51.92±1.39
CF	67.01±1.53	64.20±1.87
EE	70.50±1.75	70.63±1.98
NFE	60.59±1.15	56.92±0.79

The higher SRL pH was observed for T₁ (6.51) as compared to T₂ (6.39), though the treatment difference was non-significant (P>0.05) similar to findings of [2]. The average TVFAs concentration was observed significantly higher in T₂ (134.46 mEq/L) as compared to T₁ (11.08 mEq/L) group (P<0.05) which agreed with [6]. The total-N and non protein nitrogen concentrations under T₂ (105.00 and 71.66 mg/dl, respectively) were higher than that of T₁ (94.13 and 70.00 mg/dl, respectively) (Table 4), however, the treatment differences for total-N was significant (P<0.05). The average concentration of protein nitrogen in SRL was slightly more (P>0.05) in T₂ (33.33 mg/dl) as compared to T₁ (24.13 mg/dl). The values observed by [16] [6] for total-N concentrations are in agreement with the values observed under the present study.

Table 4. Effect of wheat straw based total mixed ration on rumen parameters

Particular	Group	
	T ₁ (Control)	T ₂ (Treatment)
pH	6.5±0.16	6.39±0.14
Total N (mg/dl)	94.13±2.02	105.00±1.76
NPN (mg/dl)	70.00±4.5	71.66±2.95
Protein N (mg/dl)	24.13±2.48	33.33±1.19
TVFA (mEq/l)*	111.08±7.45	134.46±8.08
Ammonia N (mg/dl)*	28.26±4.20	24.71±2.78

Values with different superscript in row differ significantly (p<0.05)

Conclusions

Supplementation of wheat straw based total mixed ration to Adult sheep has no effect on feed/DM and nutrient intake, digestibility of nutrients. However, it improves rumen fermentation.

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