Performance of Weaner Lambs on Conventional Feeds or Supplemented with Mango Seed Kernel (*Mangifera indica*) and Babul Pods Chuni (*Acacia nilotica*) under Intensive Production System*

L. H. Saiyed[1], S. Parnerkar[2], K. N. Wadhwani, P. R. Pandya[3] and A. M. Patel**
Department of Livestock Production, College of Veterinary Science and Animal Husbandry
Gujarat Agricultural University, Anand Campus, Gujarat, India

ABSTRACT : Twenty four weaner lambs, eight each of Marwari, Patanwadi and Merino×Patanwadi breeds (9.9 to 10.8 kg) were randomly divided into two dietary treatments on body weight basis Viz. T_1-conventional (Maize-38%, GN Cake-25%, Rice Polish-24%, Jaggery solution-10%, Mineral mixture-3%) and T_2-supplemented non conventional group (GN Cake-25%, Rice Polish-14%, Mango seed kernel-25%, Babul Pods chuni-23%, Jaggery solution-10%, Mineral mixture-3%). The Jaggery solution was prepared by mixing 6.5 kg Jaggery and 3.5 kg water. The average final body weight at the end of the experiment was recorded to be 19.33±0.76 and 19.72±0.8 kg in conventional and non-conventional groups, respectively. The total dry matter intake (DMI) during the entire experiment period was recorded to be 89.56±5.19 and 95.08±1.06 (kg/head) and 532.83±9.94 and 566.75±10.49 g/d in conventional and non-conventional groups, respectively. The body weight gain and body measurements did not influenced by diet. The ration effect was found to be significant when the DMI was expressed in terms of g/d. The crude protein (CP) and digestible crude protein (DCP) intake/head and per kg gain observed during experiment under conventional and non-conventional treatment group did not differ from each other. However, the total digestible nutrients (TDN) intake per kg gain was significantly ($p<0.05$) higher in supplemented non-conventional group. The intake values of DCP and TDN were more or less in agreement with Indian Council Agricultural Research (1985) recommendations. The estimated total feed cost (Rs./animal) for experimental lambs was 274.16±8.57and 242.67±5.10 in conventional and non- group, respectively. The non-conventional group had significantly ($p<0.05$) lower feed cost (11.6%). The return as percent of feed cost and feed cost/kg dressed weight were 92.89±5.58 (%) and Rs. 35.40±1.11 and 122.61±5.06 (%) and Rs.30.47±1.71 in conventional and non-conventional group ($p<0.05$), respectively which is the reflection of significantly lower total feed cost incurred during feeding in non-conventional group. Lambs fed non-conventional based diet had similar live weights as those fed conventional diets but costed less money to achieve those weights. ***(Asian-Aust. J. Anim. Sci. 2003. Vol 16, No. 10 : 1469-1474)***

Key Words : Mango Seed Kernel, Babul Pods Chuni, Weaner Lambs, Mutton, Intensive Production System

INTRODUCTION

India posses about 56.47million sheep (FAO, 1997) this is about 5.31 per cent of world population embracing just 2 percent geographical area of the world. It clearly indicates the heavy pressure of livestock per unit area. The quantity and quality of rangeland vegetation available for sheep and goats are highly variable depending on the state of the rangeland and season. About 80-90% of the Indian national rangeland could be name as "poor" to "very poor" (Sharma et al., 1992). It is paradoxical that on one side there is huge shortage of feed resources and on the other, India is endowed with an abundant variety of agro-industrial by products and non-conventional feed resources which are not effectively utilized to the extent they can be. Mango seed kernel (MSK) is one of the waste product of mango fruits canning industry which is available to the extent of one million tones per year in India (Kehar and Chanda, 1945) and about 2000 tones per year in Gujarat state and about 200,000 tones of Babul pods (BP) are available in Gujarat state only (Anonymous, 1989). National Commission on Agriculture (1976) has specifically recommended to use non-conventional feed stuffs like Mango seed kernel (*Mangifera indica*), Kuvadia seed (*Cassia tora*), Salseed cake (*Shorea robusta Geartin F.*), Mahuva cake (*Maduka indica*), Rubber seed cake (*Hanea brasiliense*) and many other by- products to improve nutritional status of livestock. So there is a need for designing and developing economic stall feeding system by way of using the available non-conventional feeds to the maximum possible extent without affecting health status and production of the animals. The experiment was initiated to study the feasibility of using MSK and BP Chuni in the ration of weaner lambs.

* Supported by Indian Council of Agricultural Research, New Delhi, India.
** Corresponding Author: Ashok M Patel. Tel: +91-02692-263685, Fax: +91-02692-263685, E-mail: amp@gau.guj.nic.in
[1] 1- Associate Program Executive, Directorate of Research, GAU, Govt. Bungalow No. 5, Near Dafnala, Ahmedabad-380 004.
[2] Associate Professor, Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, GAU, Sardar Krushinagar-385 506.
[3] Assistant Research Scientist, Animal Nutrition Research Station, College of Veterinary Science and Animal Husbandry, GAU, Anand Campus, Anand-388 110, Gujarat, India.
Received June 27, 2002; Accepted May 2, 2003

Table 1. Ingredients and proximate composition of experimental diets (%)

Particular	Conventional	Non-conventional	NB-21 grass	Mature pasture grass
Ingredients (%)				
Maize	38.00	-		
GN cake	25.00	25.00		
Rice polish	24.00	14.00		
Mango seed kernel	-	25.00		
Babul pods chuni	-	23.00		
Jaggery solution	10.00	10.00		
Mineral mixture	03.00	03.00		
Proximate composition (% on DM basis)				
DM	90.21	88.12	91.43	91.12
CP	17.16	17.10	9.10	02.21
CF	07.21	11.11	38.58	42.16
EE	04.80	05.13	02.70	01.74
Ash	09.71	11.88	08.57	08.88
NFE	61.12	54.78	41.05	45.01

Table 2. Least square means of body weight (kg), body weight gain (g/d) and body measurements of weaner lambs under feedlot system

Particular	Initial			Final			Significance test
				Body weight			
	Conventional	Non-conventional	AV±SE	Conventional	Non-conventional	AV±SE	
Marwari	9.4±0.93	10.55±0.93	9.98±0.66	17.88±1.31	20.51±1.31	19.19±0.93	NS
Patanwadi	10.60±093	11.60±0.93	11.10±0.66	20.93±1.31	20.50±1.31	20.17±0.93	NS
Crossbred	9.93±0.93	10.53±1.07	10.23±0.71	19.18±1.31	18.50±1.51	18.66±1.00	NS
AV±SE	9.98±0.54	10.59±0.57	-	19.33±0.76	19.72±0.80	-	
				Body weight gain			
Marwari	-	-	-	47.08±4.91	55.35±4.91	51.22±3.48	NS
Patanwadi	-	-	-	57.36±4.91	49.44±4.91	53.40±3.48	NS
Crossbred	-	-	-	51.39±4.91	42.34±5.17	46.58±3.75	NS
AV±SE				51.94±2.84	49.04±2.99	-	NS
				Body measurements			
HW	49.46±0.72	49.92±0.76	-	55.83±0.83	56.66±0.64	-	NS
HG	53.13±1.09	52.88±1.15	-	65.17±1.27	66.23±1.33	-	NS
BL	49.46±0.68	49.93±0.73	-	57.33±0.91	58.60±0.96	-	NS

MATERIALS AND METHODS

Twenty four weaner lambs, eight each of Marwari, Patanwadi and Merino×Patanwadi breeds (9.9 to 10.8 kg) were randomly divided into two dietary treatments on body weight basis. Treatment I (T_1): conventional (Maize-38%, GN Cake-25%, Rice Polish-24%, Jaggery solution-10%, Mineral mixture-3%) and Treatment I (T_2): supplemented non-conventional group (GN Cake-25%, Rice Polish-14%, Mango seed Kernel-25%, Babul Pods chuni-23%, Jaggery solution-10%, Mineral mixture-3%). The Jaggery solution was prepared by mixing 6.5 kg Jaggery and 3.5 kg water. Animals were fed in individual cement concrete manger on either conventional or non-conventional concentrate mixture+ad. Lib. mature pasture grass (*Dicanthium annulatum*), green NB-21 (*Napier Hybrid*) grass (200 g/d).All animals were dewormed with Banminth forte-II and Diadin bolus was given to remove oocyst of *coccidia*. The animals were offered water thrice in a day in plastic tub. The animals were given their required quota of concentrate mixture at 8.00 a.m. and green NB-21 grass at 10.00 a.m. after mixing along with mature pasture grass. Lambs were fed their treatment diets for 180 days at the Instructional Farm, Veterinary College, Anand. At the final stage of the feeding experiment, 4 lambs from each treatment were shifted to metabolism cages. An adaptation period of 7 days in cage was fallowed by 7 days of collection period during which quantity of feed offered, feed residue, total faeces voided and total urine output of animals were recorded over 24 h. Then samples of feed offered, residue, faeces and urine were preserved. The chemical analysis of the collected samples was carried out using AOAC (1975) methods. At the end of growth trial all the lambs from both the treatment groups were slaughtered by traditional Halal method. The organs, head, cannon, empty GI tract and primal cuts were weighed on sensitive dial type balance with a capacity of 2 kg whereas pelt free carcass, hot carcass, skin and GI tract filled with ingesta were weighed on pan balance. The realizable receipts were computed

Table 3. Least square means of feed intake, digestibility co-efficient and nitrogen balance of experimental lambs during metabolism trial

Particulars	Conventional	Non-Conventional	Significance test
No. of animals	5	5	-
Body weight (kg)	18.92±0.90	20.18±1.01	0.93 NS
Dry matter intake			
Concentrate (g/d)	286.24±14.40	308.71±18.47	0.96 NS
Roughage (g/d)	284.56±28.61	324.52±14.94	1.24 NS
Total (g/d)	570.50±15.71	633.24±20.73	2.40 NS
g/kg $w^{0.75}$	63.40±2.88	66.97±3.18	0.83 NS
kg/100 kg	3.05±0.18	3.17±0.18	0.47 NS
C: R ratio	50.17:49.83	48.75:51.25	-
Nutrient digestibility (%)			
DM	57.93±2.83	57.73±2.17	0.06 NS
OM	63.09±1.91	61.98±1.53	0.45 NS
CP	74.36±0.89	75.10±1.07	0.53 NS
CF	61.58±2.95	64.22±1.39	0.81 NS
EE	70.94±2.57	72.83±1.78	0.60 NS
NFE	60.78±3.21	62.32±1.78	0.30 NS
Nutritive value			
DCP (%)	7.62±0.52	7.54±0.20	0.14 NS
TDN (%)	60.18±1.65	61.10±1.83	0.37 NS
Nutrient intake			
DCP/head/day (g)	43.68±1.86	47.85±2.57	1.31 NS
DCP/kg $w^{0.75}$/day/(g)	4.80±0.26	4.97±0.36	0.38 NS
TDN/head/day (g)	342.54 ± 6.02^{A}	386.03 ± 10.85^{B}	3.50*
TDN/kg $w^{0.75}$/day (g)	38.06±1.61	40.73±1.22	0.32 NS
Nitrogen balance (g/head/d)			
Intake	9.26±0.31	9.99±0.50	1.24 NS
Balance	3.92±0.07	4.26±0.22	1.47 NS
g/kg $w^{0.75}$	0.44±0.02	0.45±0.04	0.36 NS

NS=Non significant, * $p<0.05$.

based on the information from retailers in the local market. The mutton and liver were sold on weight basis but the skin, head, cannon, empty rumen, and the intestine were sold on fixed price irrespective of weight. The data were analysed under least squrares analysis procedures as per Model-1 of Harvey (1990).

RESULTS AND DISCUSSION

Ingredient/proximate composition of experimental diets

The proportion of different ingredients used in formulation of conventional and non-conventional concentrate mixtures and proximate composition of concentrate mixtures, dry and green fodders used in the experiment is presented in Table 1.

Growth performance

The data on average body weights, body weight gain and body measurements of experimental lambs are given in Table 2. The average final body weight at the end of the experiment was recorded to be 19.33±0.76 and 19.72±0.8 kg in conventional and non-conventional groups, respectively. The treatment groups did not differ from each other. The period effect was also not significant. The animals of Marwari, Patanwadi and crossbreds breed group attained body weight 19.19±0.93, 20.17±0.93 and 18.66±1.00 kg, respectively and they did not differ significantly ($p<0.05$). The live weight observed in this study are similar to those reported by others for Marwari (21.9 kg, Shukla, 1973), Patanwadi (18.1 kg, Vataliya, 1994) and Merino×Patanwadi (17.4 kg, Vataliya, 1994). The average daily gain of lambs in present experiment (Semi arid) in conventional and non-conventional group was found to be 47.08±4.91 and 55.35±4.91 in Marwari, 57.36± 4.91 and 49.44±4.91 in Patanwadi and 51.39±4.91 and 42.34 ±5.17 in crossbred lambs. The differences in body weight gain due to treatments, breed groups and periods were not significant. Vataliya (1994) reported average daily gain of 29.85 to 44.84 g in Patanwadi and 30.87 to 43.95 g in Merino×Patanwadi crossbred lambs in North Gujarat (Arid) conditions under semi intensive system of management.

The overall trend of increase in heart girth, height at withers and body length indicated that the inclusion of non-conventional concentrate mixture did not have any adverse effect on these measurements.

Table 4. Least Square means of feed and water intake and feed efficiency of weaner lambs

Breed/Ration	Marwari		Patanwadi		P×M		Ration	
	Conventional	Non-covn.	Conventional	Non-covn.	Conventional	Non-covn.	Conventional	Non-conv.
Dry matter intake								
Daily (g/d)	487.75±17.53[a]	578.75±17.23[b]	559.50±17.23[b]	558.50±17.23[a]	551.50±17.23[a]	563.00±19.90[b]	532.83±9.94	566.75±10.49
kg/100 kg	3.65±0.22	3.97±0.22	3.77±0.22	3.60±0.22	4.06±0.22	4.00±0.25	3.83±0.13	3.86±0.13
g/kg $B^{0.75}$	68.93±2.93	76.36±2.93	72.21±2.93	72.36±2.93	75.70±2.93	76.35±3.38	72.28±1.69	75.02±1.78
Total (kg)	81.98±8.98	96.56±8.98	93.97±8.98	91.23±8.98	92.71±8.98	94.57±10.37	89.56±5.19	95.08±1.06
Nutrient intake (g/h/d)								
CP	46.22±1.61	52.83±1.61	52.94±1.61	51.44±1.61	52.22±1.61	51.72±1.83	50.44±0.94	52.00±1.00
DCP	35.05±1.22	40.44±1.22	40.22±1.22	39.38±1.22	39.66±1.22	39.60±1.44	38.33±0.72	39.83±0.72
TDN	279.64±1.22	327.78±10.06	314.18±1.22	319.89±10.06	309.99±10.06	321.00±11.66	301.27±5.81	322.89±6.13
Water intake								
Daily (l)	1.39±0.20	1.63±0.2	1.42±0.20	1.44±0.20	1.40±0.20	1.68±0.22	1.40±0.11	1.58±0.12
L/kg DM	2.80±0.32	2.86±0.32	2.55±0.32	2.57±0.32	2.56±0.32	2.56±0.32	2.64±0.19	2.81±0.02
Intake/kg gain								
DM (kg)	10.11±0.84	9.78±0.84	9.18±0.84	10.85±0.84	10.30±0.84	12.51±0.96	9.86±0.48	11.08±0.51
CP (g)	1,025.25±83.9	963.50±83.90	931.00±83.90	1,078.25±83.9	1,046.00±83.90	1,232.3±96.8	1,000.75±48.8	1,091.36±51.06
DCP (g)	828.00±56.61	737.25±56.81	708.25±56.81	826.00±56.81	793.25±56.81	943.67±65.00	776.50±48.44	835.64±34.57
TDN (g)	6.08±0.51	5.98±0.51	5.53±0.51	6.71±0.51	6.20±0.51	7.64±0.59	5.94±0.29[a]	6.78±0.31[b]

Mean with different superscripts in row differ significantly

Digestibility of proximate nutrients and digestible nutrients intake

During metabolism trial, the total dry matter intake (Table 3) in terms of g/d, g/kg $w^{0.75}$ and as percent of body weight was 570.50±15.71 and 633.24±20.73, 63.40±2.88 and 66.97±3.18 and 3.05±0.18 and 3.17±0.18 in conventional and non-conventional treatment groups, respectively. The digestibility (%) of DM, OM, CP, CF, NFE and EE for lambs fed either conventional or non-conventional concentrate mixture did not differ significantly. The values are similar to those of Ravikala (1992). However inclusion of alcohol treated de-oiled Mahua cake in the ration of lambs depressed the digestibility of proximate nutrients (Singh et al., 1992). The average DCP and TDN intake (g/head/day) of the lambs of the conventional and non-conventional groups were 43.68±1.86 and 342.54±6.02 and 47.85±2.57 and 386.03±10.85, respectively. The daily TDN intake in non-conventional was significantly ($p<0.05$) higher than conventional group. The DCP and TDN intake level indicated that non-conventional feed based ration could provide nutrients as efficiently as the conventional ration. The mean retention of nitrogen (g/head/day) in lambs in conventional (3.92±0.07) and non-conventional (4.26±0.22) groups was statistically similar. It can be inferred that MSK (25%) and BP chuni (23%) can be incorporated in the ration of lambs without affecting nutrient utilization and N balance.

Feed intake and feed efficiency

The total dry matter intake (kg/head) during the entire experiment period (Table 4) was recorded to be 89.56±5.19 and 95.08±1.06 for conventional and non-conventional group, respectively. The ration effect was found to be significant when the dry matter intake was expressed in terms of g/d. The present findings on DM intake are in agreement with those reported for lambs fed on 30 percent Prosopis juliflora Pods ration (Ravikala, 1992), non-conventional concentrate mixture (Patel, 1995) and Azolla based total mixed non-conventional ration (Wadhwani, 1999). The values of DM intake indicated that the incorporation of MSK and BP chuni in the concentrate mixture had no adverse effect on voluntary feed intake of experimental lambs. The CP and DCP intake/head and per kg gain observed during experiment under conventional and non-conventional treatment group did not differ from each other. However, the TDN intake per kg gain differed significantly ($p<0.05$). The breed effect was on par for DM, DCP and TDN intake. The DM, CP, DCP and TDN intake/kg gain in present study were similar to those reported by Wadhwani (1999). The average figures of ICAR (1985) recommendations for supporting a daily body weight gain of 50 g was worked out to be 553 g DM, 43.3 g DCP and 306.7 g TDN/d for lambs (10-20 kg). In this study the DM, DCP and TDN intakes in conventional and non-conventional group were 532.83 and 566.75 g, 38.33 and 39.83 g and 301.27 and 322.89 g, respectively. The values for DCP and TDN were more or less in agreement with ICAR (1985) recommendations. This indicated that non-conventional feed based ration could provide nutrients for growth as efficiently as the conventional ration.

Economics of feeding

The total feed cost (Rs./animal) for experimental lambs (Table 5) was estimated to be 274.16±8.57and 242.67±5.10 in conventional and non-conventional group, respectively. The non-conventional group recorded significantly ($p<0.05$) lower feed cost (11.6%). This is due to the use of cheaper ingredients in formulation of non-conventional concentrate mixture. The difference due to breeds was found to be non

Table 5. Least squares means of economic traits

Breed	Character	Total feed cost (Rs./animal)	Return over feed cost (Rs../animal)	Return as (%) of feed cost	Total realizable receipt (Rs./animal)	Receipt (Rs./animal)		Feed cost/kg dressed (Rs.)
						Mutton	Liver	
Marwari	Conv.	243.35±9.74[a]	262.93±20.34	106.72±9.01	506.28±25.86	340.98±25.22	12.30±1.21	34.60±2.04
	Non-conv.	244.76±9.74	305.59±20.34	124.76±9.01	550.35±25.86	386.40±25.22	10.95±1.21	29.22±2.04
	Average	244.06±6.89	284.26±14.38[b]	115.74±6.37[b]	52.31±18.29	363.39±17.83	11.63±0.86	31.91±1.45
Patanwadi	Conv.	287.92±9.74	268.51±20.34	93.25±9.01	556.25±25.86	392.15±25.22	11.40±1.21	33.85±2.04
	Non-conv.	238.87±9.74[b]	322.80±20.34	134.53±9.01	561.68±25.86	394.98±25.22	13.65±1.21	28.33±2.04
	Average	263.40±6.89	295.66±14.38[b]	113.89±6.37	559.11±18.29	393.56±17.83	12.52±0.86	31.09±1.45
Crossbred	Conv.	291.08±9.74	228.04±20.00	78.72±9.01	519.11±25.86	355.24±25.22	10.86±1.21	37.76±2.04
	Non-conv.	244.62±11.25	253.91±23.46	103.84±10.40	498.87±29.86	334.27±29.12	11.60±1.40	33.86±2.36
	Average	267.85±7.44	240.97±15.53[a]	91.28±6.88[b]	508.99±19.75	344.75±11.26	11.24±0.93	35.81±1.56
T-1	Conventional	274.16±8.57	253.16±12.66[a]	92.89±5.58[a]	527.31±18.49			35.40±1.10[b]
T-2	Non-conv.	242.67±5.10	294.10±20.69[b]	122.61±5.06	540.41±17.61			30.47±1.71[a]

Means with different superscript in column differ significantly.

Table 6. Least Square means of carcass traits of weaner lambs

Particulars	Conventional	Non-conventional
Post fasting weight (kg)	18.57±0.73	19.52±0.71
Carcass weight (kg)	7.93±0.39	8.13±0.42
Dressing (%) on		
Live weight	42.56±0.65	41.49±0.69
Empty weight	56.64±0.41	56.27±0.43
Weight of head(g)	1,373.16±38.35	1,415.00±40.43
Weight of skin (g)	2,020.63±122.37	1,987.78±128.98
Weight of cannon (g)	485.42±33.19	494.44±34.98
Weight of edible organs (g)		
Liver	167.06±14.44	206.39±15.23
Heart	87.92±5.29	78.75±5.60
Kidney	47.08±3.38	50.28±3.57
Kidney fat	271.67±17.04	258.89±17.96
Spleen	29.58±3.93	25.83±4.14
Diaphragm	61.25±4.19	57.22±4.42
Omental fat	157.92±25.00	185.68±26.35
Weight of non edible organs (g)		
Lungs and treachea	224.58±13.16	244.72±13.86
Empty rumen and intestine	868.75±40.80	908.89±43.01
Blood	496.66±35.32	539.72±37.23
GI tract (kg)	4.68±0.15	5.11±0.15

significant. The total realizable receipt (Rs./animal) in conventional and non-conventional group was 527.31±18.49 and 540.41±17.61, respectively, which was statistically similar ($p>0.05$). Similarly, the receipts from mutton and liver were statistically similar with respect to treatments and breeds.

The return over feed cost (Rs./animal) was 253.16±12.66 in conventional and 294.10±20.69 in non-conventional group. The return as percentage of feed cost was 92.89±5.58 and 122.61±5.06 in conventional and non-conventional group, respectively. The difference was statistically significant ($p<0.05$).The non-conventional group recorded significantly ($p<0.05$) lower feed cost per kg dressed weight (Rs. 30.47±1.71) than the conventional group (Rs. 35.40±1.10). Our findings on the comparative feeding cost of the two treatments agree with the findings of other researchers in India (Ravikala. 1992; Patel. 1995; Shekh. 1998; Wadhwani, 1999). namely, non- conventional feeds reduce the cost of rearing lambs.

Carcass traits

The mean hot carcass weight (Table 6) was 7.93±0.39 and 8.13±0.42 kg in conventional and non-conventional group, respectively. The average values of dressing percentage in lambs on live and on empty live weight basis were 42.56±0.65 and 56.64±0.41 and 41.49±0.69 and 56.27±0.43 in T_1 and T_2 group, respectively. The ration and breed effect was not significant. The dressing percentage values are in agreements with the findings of other workers for native breeds (Arora and Acharya, 1972; Mali and chougule. 1985; Prasad, et al., 1991). The major constraint in comparing the performance of different native breeds is the lack of uniformity in slaughter age and feeding and management conditions in which they are maintained before slaughter. The contribution of different primal cuts in hot carcass weight was highest for hind legs (36.50%) followed by neck and shoulder (27.12%), forearm and leg (10.28%), rack (9.30%), breast (9.01%) and loin (8.62%). The treatment differences were not significant except for weight of kidney and kidney fat. The breed effect was not significant. The results implied that use of MSK and BP chuni in the ration had no any adverse effect on carcass traits.

Haematological studies

The average values of hemoglobin, packed cell volume, total erythrocyte and total differential counts were statistically not different in conventional and non-conventional groups. Our data are similar to those complied by Bhaumik et al. (1992).

It can be inferred that incorporation of Mango seed kernel (25%) and Babul Pods chuni (23%) in non-conventional concentrate mixture reduce the feed cost

significantly and can be incorporated safely in the ration of the weaner lambs without affecting, feed intake, nutrient utilization, growth rate, carcass traits and blood profile.

REFERENCE

AOAC. 1975. Official methods of analysis of the Association of official Analytical chemists 12th edn. Published by AOAC., P.O. Box 540, Benjamin Franklin station, Washington D.C. 20044.

Arrora, C. L. and R. M. Acharya. 1972. Improvement of Mandya sheep in Karnataka.A review: Indian J. Anim. Sci. 46(7):340-45.

Anonymous 1989. Annual Progress report of the ICAR scheme AICRP on determination of the availability of animal feed emphasis on crop residue, by-product of industries, forest, aquatic, and slaughter house in origin and animal organic waste for evolving economic ration of livestock and poultry ration. Animal Nutrition Research Station, Gujarat Agricultural University, Anand-388 110. India.

Bhaumik, A., M. C. Sharma, F. Peer, J. Baig and S. B. Lal 1992. Importance of hematological examination in diseases of domestic animals.The veterinarian 16(7):5-10.

FAO. 1997. FAO Statistics on Livestock Population, Asian Livestock 17:150.

Harvey, W. R. 1990. User's guide for mixed model least squares and maximum likelihood computer program pc-2, version, USDA-ARS.

ICAR. 1985. Nutrient requirements of Livestock and poultry. ICAR, New Delhi, pp. 5-7.

Kehar, N. D. and R. Chanda. 1945. Investigation of famine ration-Mango seed kernel. Indian J. Vet. Sci. and A. H. 15(4):280.

Mali, S. L. and B. A. Chougule. 1985. Studies on body weights at different stages and post slaughter parameters in Deccani and Dorset×Deccani crossbred lambs. Indian. J. Anim. Sci. 62(1):56-59.

NCA. 1976. National Commission on Agricultural, Part VII Animal Husbandry. Govt of India, New Delhi, pp. 382-435.

Patel, K. M. 1995. Feasibility of rearing weaner indigenous lambs on non-conventional concentrate mixture under feedlot. M. V. Sc. Thesis, Gujarat Agricultural University, Sardar Krushinagar-385 506, India.

Prasad, R. D. D., E. K. Charyulu, D. Sreenirasulu, T. M. Rao and D. Manirathanm. 1991. Carcass characteristics of Mandya, Nellore and their halfbreds with Dorset under feedlots. Indian. . Anim. Sci. 61(2):226-27.

Ravikala, K. A. L. 1992. Feedlot performance of growing lambs on complete feed with varying levels of Prosopis Juliflora Pods. Ph. D. thesis, Gujarat Agricultural University, Sardar Krushinagar-385 506, India.

Sharma, K., J. L. Orga and N. K. Bhattacharyam. 1992. Development of agro-silivipasture for goats. Research ingoats, Indian experience Publish by CIRG, Makhdoom, Mathura India. pp.66-73.

Shekh, M. A. 1998. Growth performance and nutrient utilization by weaner lambs on non-conventional total mixed ration. M. V. Sc. thesis, Gujarat Agricultural University, Sardar Krushinagar -385 506, India.

Shukla, R. K. 1973. Quantitative genetic studies of some economic traits of sheep breeds of Gujarat Ph. D. thesis. Gujarat Agricultural University, Sardar Krushinagar-385 506, India .

Singh, P., O. N. Agrawal and V. K. Jain. 1992. Effect of feeding deoiled Mahua (*Bassia Latiflia*) seed cake with or without aqueous alcohol treatment on growth d nutrient utilization in lambs. Indian. J. Anim. Nutr. 9(3):168-172.

Vataliya, P. H. 1994. Study on genetic parameters of early and lifetime productivity traits in Patanwadi and crossbred sheep. Ph. D. thesis. Gujarat Agricultural University, Sardar Krushinagar-385 506, India.

Wadhwani, K. N. 1999. Feedlot performance of weaner lambs of Azolla based non-conventional under intensive production system. Ph. D. thesis, Gujarat Agricultural University. Sardar Krushinagar-385 506, India.