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Effect of Training of Goats to Non-Conventional Feed on Their Subsequent Performance

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ABSTRACT

This research project was designed to test the hypothesis that animals having ruminal microflora adjusted to a non-conventional feed may perform better than those having no exposure to such feeds. Twenty four, Teddy male goats were allotted three feeding regimes, i.e., R1, R2, R3. The experiment was divided into three phases, i.e. up to 4 weeks, 5-8 weeks and 9-12 weeks. In the 1st phase, one of the experimental groups (R2) were exposed to Atriplex substituted ration (ASF) as a non- conventional ration; whereas, the other groups were kept on basal feed (BF). In the 2nd phase, all the groups were kept on BF. In the 3rd phase, animals of group R1 were continued on BF; whereas, R2 and R3 were switched over to ASF. The performance of animals was evaluated on the basis of feed and water intake, weight gain, and digestibility of the rations. It was concluded that there was better feed utilization in group having pre-exposure to non-conventional feed. There was no variation ($P<0.01$) in the body weight among three groups. Water intake was similar ($P<0.01$) in R2 and R3 groups but it was higher ($P<0.01$) as compared to R1. Crude protein utilization was better in R2 having pre-exposure to ASF. It was observed that goats accustomed to non-conventional feed performed better than those having no exposure of such feeds earlier.

Key Words: Ruminal microflora; Non-conventional feed; Goats

INTRODUCTION

Teddy goat has emerged as an efficient meat supplier due to its high prolificacy and early maturity. Feeding resources for livestock in the country have been meager and scanty (Riaz *et al.*, 2003), which results in loss of weight and wretched condition of animals (Hanjra & Rasool, 1993). Rangelands are the single grazing lands being used for feeding of small ruminants in the country (Qureshie & Hanjra, 1969). Heavy grazing pressure, however, is denuding the rangelands. Other soil hazards like salinity and water logging are further aggravating the situation. Alternative left is to utilize the country wastelands/salt affected lands for salt tolerant forages to support the livestock population. Goats are endowed with the ability to browse on bitter taste forages and bushes. Saltbushes, therefore, could be well utilized by the goats as a forage. Ruminal microflora adjusted to non-conventional feeds , however, may retain most of nutrients for animal use (LeHouerou, 1991). This study was designed to study the effect of training of goats to saltbush diet on their subsequent performance.

MATERIALS AND METHODS

Teddy goats being a small sized model ruminant were selected for this study. Traditional fodder (berseem) and saltbush forage were made available in hay form. Wheat straw was used as basis in preparing rations just to represent a poor quality feed of scarcity season. Twenty four male Teddy goats having age about 10-12 months were randomly allotted to three different feeding regimes (Table I). Approximate chemical composition of different diets is given in Table II. Goats were kept in especially designed wooden cages (Horn *et al*., 1954), throughout the experimental period.

All animals were provided with *ad-libitum* feeding and plenty of fresh drinking water was made available round the clock during the experimental period. Trial lasted for 14 weeks; two weeks were given as adjustment period for new regimes and 12 weeks were used for feeding trial and data collection for daily feed intake (DMI), daily water intake and weekly weight variations. A digestibility trial was run for further two weeks at the end of feeding trial. Faeces were collected with special harness applied to goats as mentioned by Balch *et al.* (1951). Chemical composition for samples of feed offered and refused was done (AOAC, 1990). Faecal samples were analyzed for dry matter (DM), organic matter (OM), crude fibre (CF) and crude protein (CP) contents according to AOAC (1990). Digestibility coefficients were also determined (Reaves & Henderson, 1969).

Data collected on various parameters of feeding and digestibility trials were subjected to statistical analysis using completely randomized design. Tuckey's multiple range test was used to compare the means (Steel & Torrie, 1980).

Table I. Plan of feeding trail

Groups	1st Phase (1-4 wks)	2nd Phase (5-8 wks)	3rd Phase (9-12 wks)
R1 (n=8)	BF	BF	BF
R2 (n=8)	ASF	BF	ASF
R3 (n=8)	BF	BF	ASF

R1= Control group; R2= Atriplex pre-exposed group; R3= Atriplex un-exposed group; wks= Weeks; BF= Basal feed (60% wheat straw + 40% ***Trifolium alexandarium***); ASF=Atriplex substituted feed (30% wheat straw + 20% ***Trifolium alexandarium*** + 50% *Atriplex amnicola* leaves)

Table II. Chemical composition of experimental diets

Items (%)	Diets	
	BF	ASF
Dry matter	87.28	88.65
Crude protein	11.04	11.93
Ether extract	3.50	5.25
Crude fiber	24.29	23.50
Nitrogen free extract	50.97	41.18
Ash	10.20	18.14

BF= Basal feed (60% wheat straw + 40% ***Trifolium alexandarinum***); ASF=Atriplex substituted feed (30% wheat straw + 20% ***Trifolium alexandarium*** + 50% *Atriplex amnicola* leaves)

RESULTS AND DISCUSSION

Dry matter intake. Average DMI on both the BF and Atriplex substituted feed (ASF) are given in Table III. There was no significant change in DMI due to treatments. There was a gradual increasing trend for DMI when the goats were fed on BF but it showed a decreasing trend for the DMI due to weeks on ASF group pre-exposed to ASF but still remained comparable to control. DMI was significantly decreased ($P<0.05$) in R_3 group. These findings are in line with those of previous studies (LeHouerou, 1991; Riaz *et al.*, 1994, 1999, 2003; Riaz & Ahmad 1999). Goats maintained on R3 with no exposure to non conventional feed continued a decreasing DMI trend due to time. It was concluded that there was significantly ($P< 0.05$) less DMI and OMI per kg body weight (Table IV) due to weeks on the overall experimental period for goats (R_3) which were not pre-exposed to new feed (ASF). Slight fluctuations for decrease or increase in DMI on the three phases of feeding trial might be due to the choosy habits of goats on non conventional feed (Riaz, 2000). Kenny *et al.* (1984) also reported that DMI varies with high DM% in the diet. Less DMI on ASF regime may also be attributed to high ash content and low level of non-structural carbohydrates in Atriplexes (Kandil & El Shaer, 1988) but training of animals made significant ($P<0.05$) effect.

Water intake Average daily water intake is given in Table V and VI. Maximum water intake was observed on R2 feeding regimes with ASF in overall experimental period as well as in the last four weeks of the feeding trial. There were no significant differences in the last four weeks of experimental period among the R_2 and R_3 groups. It was noted that when animals shifted on ASF either of pre-exposed or non exposed group, they behaved

Table III. Average daily DMI (g), DMI kg^{-1} b.wt. (g) and DMI kg$^{0.75}$ (g)

Period	DMI day			DMI kg b.wt.$^{-1}$			DMIkg$^{-0.75}$		
Weeks	R1	R2	R3	R1	R2	R3	R1	R2	R3
1-4	339±22	407±28	283±023	26.31±1.48	30.96±2.11	22.39±1.65	49.69±2.80	58.89±3.87	41.48±30.17
5-8	380±25	396±34	373±029	30.13±1.72	31.21±2.33	29.16±2.02	56.58±3.29	58.56±4.48	53.82±3.75
9-12	446±52	369±48	339±038	33.65±3.56	28.79±3.12	27.72±2.53	64.18±6.95	58.89±6.14	51.64±4.91
Overall	383±21^{a}	394±21^{b}	311±173^{c}	29.45±1.43^{a}	30.84±1.48^{b}	25.89±1.22^{c}	55.75±2.77^{a}	58.18±2.86^{ab}	47.99±2.32^{c}

R= Feeding regimes

Table IV. Average OMI (g), OMI kg^{-1} b.wt. (g) and OMI kg$^{-0.75}$ (g)

Period	OMI day		OMI $^{-1}$g b.wt.			OMI/kg $^{0.75}$(g)			
Weeks	R1	R2	R3	R1	R2	R3	R1	R2	R3
1-4	305±19	357±25	254±21	23.62±1.33	27.32±1.91	20.24±1.44	44.63±2.51	51.97±3.50	37.99±2.77
5-8	341±23	355±30	325±28	27.05±1.55	28.61±2.09	27.12±1.99	50.80±2.96	53.71±4.02	50.48±3.78
9-12	401±47	326±43	298±33	30.05±3.20	25.39±2.84	24.33±2.22	57.33±6.25	47.85±5.61	45.32±4.31
Overall	343±18	349±19	274±15	26.45±1.28	27.36±1.32	22.77±1.08c	50.07±2.49	51.61±2.54	42.24±2.05

R= Feeding regimes

Table V. Average WI^{-kg} DMI (L) and WI^{-kg} OMI

Period	WI /kg DMI (L)			WI/kg OMI (L)		
Weeks	R1	R2	R3	R1	R2	R3
1-4	3.22± 27.1^{a}	3.91 ± .880^{b}	4.343±0.54^{bc}	3.58± .303^{a}	4.45± .101^{b}	4.843±0.59^{bc}
5-8	3.25± 15.8^{a}	2.49 ± .252^{a}	2.271±0.25^{a}	2.51± .17^{a}	2.76± .28^{a}	2.658±0.25^{a}
9-12	2.67± 35.4^{a}	4.66±.523^{b}	4.293±0.056^{bc}	289± .39^{a}	3.91± .59^{b}	4.881±0.64^{bc}
Overall	2.67± 16.2^{a}	3.59± .363^{b}	3.71±0.289^{bc}	2.95± .18^{a}	4.06 ± .41^{b}	4.201±0.32^{bc}

R= Feeding regimes

similarly as far as the water intake is concerned. It was also observed that goats maintained on basal feed drank less (P<0.01) water as compared to those on ASF. Results of the present study are in line with the earlier studies (Lange *et al.,* 1984; Arieli *et al*., 1989; Gihad, 1993, Riaz *et al.*, 1994; 1999; 2003). Wilson and Leigh (1969) also ranked the saltbush as a high mineral diet and noted high water intake with saltbush.

Body weight changes The variations in body weight are presented in Table VII. Analysis of the data showed a non-significant (P>0.05) difference in average daily or weekly weight variation among various groups. This suggested that Atriplex could be substituted in conventional rations fed during scarcity periods. Better results could be obtained if salt-bushes are supplemented or mixed with good quality fodders. The weight loss in all experimental rations might be due to poor digestibility of BF and ASF rations prepared as representative of scarcity periods. The two experimental diets contained a high proportion of wheat straw supposed to be a major cause of poor digestibility and weight loss. High salt contents in ASF group with low energy might not help in utilizing NPN for body needs. Results are in close agreement with those of the earlier studies (Clark, 1982; Rehman *et al*., 1989; Riaz *et al.,* 1994). Clarke (1982) further concluded that weight loss is common in sheep grazing on salt bushes during summer and it varied from 0-3 kg and remained constant thereafter.

Digestibility. There was no significant difference observed in DMD (Dry matter digestibility), OMD, and CFD (Table VIII). Slight decrease in DMD, OMD and CFD might be due to more water intake on both experimental diets caused by high salt concentration in ASF and due to more ambient temperature in summer on overall basis which might led to decrease in digestibility with increased flow rate and decrease in the retention of feed in the rumen. Results are in line with Van Soest (1965) and Riaz *et al.* (1994). However, nitrogen/crude protein was better in ASF group having pre exposure to saltbush than the ASF group with no exposure as also reported previously (LeHouerou, 1991; Swingle *et al*., 1994).

Table VIII. Average digestibility in different feeding regimes

Parameters	R1	R2	R3
Dry matter digestibility	67.42±1.18	66.98±0.89	65.53±0.68
Organic matter digestibility	64.45±1.30	62.16±0.42	63.29±0.52
Crude fibre digestibility	65.34±0.63	65.52±0.44	63.19±2.70
Crude protein digestibility	62.55±3.80^{a}	63.46±1.07^{ab}	57.19±1.27^{c}

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Table VI. Average WI^{-kg} bwt and WI^{-} kg $^{0.75}$

Period	WI^{-kg} b.wt. (mL)			WI^{-} kg $^{0.75}$		
Weeks	R1	R2	R3	R1	R2	R3
1-4	78.41± 4.3a	114.5 ± 8.7b	86.8±7.4ac	148.8± 8.4a	217± 16.5b	163.1±13.9ac
5-8	62.5± 2.4a	68.7 ± 2.4a	64.8±3.2a	117.8±3.9a	128±4.2a	119.5±5.5a
9-12	62.1± 2.0a	102.7 ± 4.5b	100.2±4.4bc	116.2± 4.1a	193.4 ± 9.1b	185.4±7.7bc
Overall	67.2±1.9a	93.6± 3.9b	82.9±3.9bc	126.5± 3.8	175.9± 7.6b	153.9±6.2bc

R= Feeding regimes

Table VII. Weight variation $week^{-1}$ and day^{-1} (kg)

Period	Weight variation per animal $week^{-1}$			Weight variation $animal^{-1}$ day^{-1}		
Weeks	R1	R2	R3	R1	R2	R3
1-4	-0.31± 0.11	-0.23 ± 0.10	-0.44±0.13	-0.04± 0.02	-0.03± 0.01	-0.065±0.02
5-8	-0.02± 0.04	-0.09 ± 0.04	0.04±0.05	-0.003±0.01	-0.01± 0.01	-0.001±0.01
9-12	-0.09± 0.03	0.05 ± 0.23	-0.01±0.05	-0.01± 0.01	0.01 ± 0.03	-0.001±0.01
Overall	-0.12± 0.04	-0.08± 0.08	-0.12±0.05	-0.02± 0.06	-0.01± 0.01	-0.02±0.01

R= Feeding regimes

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