

Effect of Saltbush (*Atriplex amnicola*) Hay Substitution for Lucerne Hay on Intake and Digestibility in Beetal Goats

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ABSTRACT

Fifteen lactating Beetal goats were used to observe the effect of saltbush (*Atriplex amnicola*) hay substitution for lucerne hay on intake, weight gain and digestibility. Inclusion of different levels of saltbush significantly ($P < 0.05$) affected the dry matter intake, organic matter intake, water intake and daily weight gain. No difference was found in dry matter digestibility between the treated and control groups. Correlations between treatments and dry matter intake, daily weight gain and organic matter intake/Kg metabolic weight were negative. Water intake was positively correlated ($r = 0.61$) with dry matter intake. Daily weight gain and feed conversion ratio was found non-significant, although the feed conversion ratio showed a positive correlation ($r = 0.301$) with saltbush addition. The addition of saltbush showed a negative ($r = -0.56$) trend (non-significant) in daily weight gain. Results suggested that under range and scarcity periods saltbush can be added to small ruminant's diet up to 20% level on dry matter basis.

Key Words: Saltbush; *Atriplex amnicola*; Goats; Feeding; Intake; Digestibility

INTRODUCTION

The increasing pressure of urbanization and direct competition between man and animals for land to be used for food production is constantly reducing the availability of land for fodder production. In this situation, ranges are the only best alternative to be used for fodder to feed the animals for sustainable production. However, the higher stocking rate coupled with poor production potential of animals results in poor return/hectare of rangeland. The meager financial resources of range farmers do not allow them to purchase feed but compel them to keep their animals unthrifty, weak and with stunted growth, and result in poor economic return. This situation has forced animal scientists to use the non-conventional feed resources to bridge the gap between feed supply and demand. Saltbush (*Atriplex amnicola*) is commonly found in saline range areas of Pakistan and its high nutritive value offers a good opportunity to be used as animal fodder. The present study was aimed to investigate the effect of saltbush hay substitution for lucerne hay on intake and digestibility in Beetal goats.

MATERIALS AND METHODS

This research was conducted at Livestock Experiment Station, Department of Livestock Management, University of Agriculture, Faisalabad, Pakistan. Fifteen mature lactating Beetal goats of almost same age (30-32 months) and weight (41-43 kg) were

randomly divided into three groups viz. A, B and C. Group 'A' served as control and animals in this group were fed Lucerne and Mott hay in 50:50 ratio on dry matter (DM) basis. For the animals in groups 'B' and 'C' the 20% and 40% DM of ration 'A' was replaced with saltbush DM. These animals were kept in individual wooden pens (6'x4') and fed experimental rations *ad libitum* for a period of six weeks, excluding two weeks adjustment period. After six weeks, a two-week-digestion trial was run to determine the digestibility of different diets.

The DM of ration offered and refused was obtained by using "Carbolite PF-200" oven (Carbolite, Auston Lane, Hoper, Sheffield, SO3- 2RR, UK). Data on daily feed intake (DMI), water intake (WI) and weight gain (WG) were recorded. The feed conversion ratio (FCR), daily weight gain (DWG), organic matter intake/Kg body weight (OMI Kg⁻¹BW) and organic matter intake/Kg metabolic weight (OMI Kg⁻¹W^{0.75}) were also worked out. The collected data were analyzed using Minitab (version 10.2, USA) statistical package to draw the valid conclusions.

RESULTS AND DISCUSSION

The means and correlations of daily DMI, OMI, WI, DWG, FCR, digestibility of organic matter (OMD) and OMI Kg⁻¹W^{0.75} are given in Table I and II. Analysis revealed that inclusion of saltbush significantly ($P < 0.05$) but negatively affected the DMI and OMI. The inclusion levels of saltbush were negatively correlated

($r = -0.346$) with DMI (Table II). It was found that OMI for treatment 'A', 'B' and 'C' was 28.68 ± 0.76 , 23.44 ± 1.05 and 17.11 ± 0.91 ; and 71.95 ± 2.06 , 57.66 ± 2.53 and 42.67 ± 2.19 g, respectively for kg^{-1}BW and

$\text{kg}^{-1}\text{W}^{0.75}$ (Table I). Means for these parameters differed significantly ($P < 0.05$) and were negatively correlated ($r = -0.47$) with treatments. The OMD was non-significant with negative trend. Similar observations have been reported previously (Riaz *et al.*, 1994).

Table 1. Effect of different inclusion levels of saltbush on different production parameters

Treatment	A	B	C
DMI (kg)	1.28 ± 0.05^a	1.01 ± 0.45^b	0.79 ± 0.05^c
OMI(kg)	1.13 ± 0.04^a	0.86 ± 0.04^b	0.66 ± 0.04^c
WI/Animal/day(L)	2.21 ± 0.13^a	3.24 ± 0.09^a	3.09 ± 0.17^a
W1/Kg DMI(L)	1.69 ± 0.13^a	3.31 ± 0.15^b	3.94 ± 0.26^c
W1/Kg OMI(L)	1.92 ± 0.13^a	3.86 ± 0.16^b	4.66 ± 0.30^c
DWG (kg)	0.042 ± 0.03^a	0.073 ± 0.003^a	0.014 ± 0.034^a
FCR ((kg)	17.98 ± 1.33^a	22.20 ± 10.2^a	27.498 ± 6.70^a
OMI(g)/kg b.wt.	28.68 ± 0.76^a	23.44 ± 1.05^b	17.11 ± 0.91^c
OMI(g)/kg $\text{W}^{0.75}$	71.95 ± 2.06^a	57.66 ± 2.53^b	42.67 ± 2.19^c
OMD (Kg)	72.01 ± 0.24^a	72.48 ± 0.62^a	70.78 ± 1.21^a

Mean values with same superscripts do not differ; A= control group fed lucerne and mott hay in 50:50 ratio; B= group of animals fed ration of group A replaced by 20% of saltbush DM; C= group of animals fed ration of group A replaced by 40% of saltbush DM; DMI= dry matter intake; OMI= organic matter intake; $\text{W}^{0.75}$ = metabolic body weight; WI= water intake; DWG= daily weight gain; FCR= feed conversion ratio; OMD= digestibility of organic matter

Table II. Correlation between inclusion levels of saltbush and different parameters

Parameter	Correlation
DMI (kg)	-0.346*
OMI(g)/kg $\text{W}^{0.75}$	-0.470*
W1/kg DMI (L)	0.61*
DWG (g)	-0.56
FCR (kg)	0.301

Mean values with same superscript do not differ; DMI= dry matter intake; OMI= organic matter intake; $\text{W}^{0.75}$ = metabolic body weight; WI= water intake; DWG= daily weight gain; FCR= feed conversion ratio

Water intake was significantly and positively ($r = 0.61$) correlated with DMI. The maximum WI was found (3.93 ± 0.25 L) in group 'C', Where 40% of ration's DM was replaced by saltbush and minimum in control (1.69 ± 0.13 L). The ratio between DMI/OMI and water intake was almost 1:4.5. Increasing the saltbush levels in animals' rations, WI was increased and this trend might be due to the higher salt level of saltbush (Jackson, 1977), thus requiring more water to excrete the high salt contents. Results are in line with Wilson *et al.* (1969), Wilson (1974) and Hassan *et al.* (1979). Gihad (1993) also reported that WI increased by 61.4%, when sheep were fed *Atriplex halimus* instead of clover hay. Reduction in DMI has also been reported due to higher

water intake (Raza & Rowlinson, 1995). DWG was not affected significantly by different levels of saltbush but a negative trend was associated with inclusion levels of saltbush. There was a non-significant and negative correlation ($r = -0.56$) between different treatments and DWG. The maximum daily weight gain (0.073 ± 0.003 g) was observed in 'B' and the lowest value was found in treatment 'C' (Table I). The saltbush inclusion alongwith high mineral content might have affected the energy concentration or physiological status of the animals. The effect of saltbush intake on weight gain would depend on the ability of animals to adjust feed intake to compensate the lower dietary density. As a result of the lower energy density in saltbushes weight gain may reduce with the same DM or lower than can be achieved on conventional diets. Alternatively, intake will have to be higher in order to achieve weight gains possible on conventional diets Swingle *et al.* (1994). The feed conversion ratios for different treatments was calculated and found to be 17.98 ± 1.33 , 22.20 ± 10.2 and 27.49 ± 6.70 kg, respectively for treatment 'A', 'B' and 'C'; and was positively correlated ($r = 0.301$) with treatments.

Either scenario would increase feed requirements per unit gain (reduce gain per unit feed). Wiley (1982) and Glenn *et al.* (1992) also reported that the reduced feed conversion ratio may be a constant penalty for using saltbush in livestock feeding systems.

CONCLUSIONS

The results revealed that saltbush (*Atriplex amnicola*) can be incorporated in small ruminants diet up to 20% on DM basis without any adverse effect on the performance of goats in severe fodder scarcity periods.

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REFERENCES

- Gihad, E. A., 1993. Utilization of high salinity tolerant plants and saline water by desert animals. In: *Towards Rational Use Of High Salinity Tolerant Plants*. Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 443-7.
- Glenn, E. P., W.E. Coates, J.J. Riley, R.O. Kuchl and R.S. Swingle, 1992. *Salicornia bigelovi* torr, a seawater irrigated forage for goats. *Anim. Feed Sci. Technol.*, 40: 21-30.
- Hassan, N.T., H.M. Abdul Aziz and A.E. El-Tabkh, 1979. Effect of barley supplementation on the nutritive evaluation of saltbush (*Atriplex numularia*). *Wrl. Rev. Prod.*, 15: 47.
- Jackson, M.G., 1977. Review Article. The alkali treatment of straw. *Anim. Feed Sci. Tech.*, 2:105-130.
- Quraishee, M.A.A., 1993. *Range Management in Pakistan*. 1st ed., University of Agriculture, Faisalabad, Pakistan.
- Raza, S.H. and P. Rowlinson, 1995. Partial replacement of grass silage with whole-crop cereal silage for growing beef cattle. *Aust. J. Anim. Sci.*, 8: 281-7.
- Riaz, M., S.H. Hanjra, R.A. Gill and A.A. Gill, 1994. Growth and carcass characteristics of Teddy goats affected by *Atriplex* feeding. *Pak. J. Agri. Sci.*, 31: 318-21.
- Swingle, S.R., P.G. Edward and J.J. Riley, 1994. Halophytes in mixed feeds for livestock. In: *"Halophytes as a resource for livestock and for rehabilitation of degraded lands"* Eds. V.R. Squires and A.T. Ayoub, Kulwer Academic Publishers, The Netherlands.
- Wilson, A. D., J.H. Leigh and W.E. Mulham, 1969. A study of Merino sheep grazing on Bladder saltbush (*Atriplex vesicaria*) cotton bush (*Kochia alphilla*) community on the riverine plain. *Aust. J. Agri. Res.*, 20: 1123.
- Wilson, A.D., 1974. Water consumptions and water turnover of sheep grazing semi-arid pasture communities in New South Wales. *Aust. J. Agri. Res.*, 25: 339.
- Wiley, S.T., 1982. Nutritive value for goats of *Atriplex* species grown with hypersaline water. *MS Thesis, University of Arizona, Tucson, AZ, USA*.

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