

Effects of *Atriplex amnicola* Hay Substitution for *Medicago sativa* Hay on Milk Production and Composition in Lactating Beetal Does

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ABSTRACT

Effect of *Atriplex amnicola* hay substitution for alfalfa hay on milk production and composition was studied in lactating Beetal does. Inclusion of different levels of *Atriplex amnicola* (saltbush) significantly improved the milk production. There were significantly higher values of solid not fat, acidity and ash per cent. However, no difference was found in protein, specific gravity, fat and total solids in milk of does fed on ration substituted with *Atriplex amnicola*. Results suggested that under range conditions and particularly in scarcity periods, saltbush could be added to small ruminant's diet. Saltbushes may better be utilised in mixed form without any ill effect on the performance of the animals.

Key Words: *Atriplex amnicola*; Lactating does; Small ruminants; Feeding

INTRODUCTION

The higher stocking rate coupled with poor production potential of animal results in poor economic return. The meagre financial resources of range farmers don't allow them to purchase feed but compel them to keep their animals unthrifty, weak and with stunted growth. Heavy grazing pressure is denuding the ranges. This situation has forced animal scientists to use the non-conventional feed resources to bridge the gap between feed supply and demand. The shortage of fodder has been attributed to an extremely low percentage of cultivated land being used for fodder crops and increasing trend of replacing the fodder cultivation with cash crops. In this situation, utilisation of the salt-affected areas may be the only best compensation for fodder to feed the animals for sustainable production. *Atriplex (A.) amnicola* (saltbush) has recently been introduced in saline range areas of Pakistan and its high nutritive value offer a good opportunity to be used as animal fodder. Goats have the ability to scavenge on pastures and forages that other ruminants would not normally consume. The present study was aimed to investigate the effect of saltbush hay substitution for alfalfa (lucerne; *Medicago sativa*) hay on milk production and composition in lactating Beetal does.

MATERIALS AND METHODS

The present research was conducted at Livestock

Experiment Station, Department of Livestock Management, University of Agriculture, Faisalabad, Pakistan. Fifteen mature lactating Beetal does of almost same age (30-32 months) and weight (41-43 kg) were randomly divided into three groups viz. A, B and C. The lactating Beetal does were in 2nd or 3rd lactation. Group "A" served as control and animals in this group were fed on basal feed (BF) comprising of alfalfa (*Medicago sativa*) and Mott grass (*Pennisetum purpureum*) hay in 50:50 ratio on dry matter (DM) basis. Animals in group "B" were maintained on *Atriplex* substituted feed 1 (ASF1) composed of *Pennisetum (P.) purpureum* hay 40%, alfalfa hay 40% and *A. amnicola* hay 20%. The does maintained in group "C" were given a ration comprising of *P. purpureum* hay 40 %, alfalfa hay 20% and *A. amnicola* hay 40% on DM basis. The animals were kept in especially designed metabolic cages as described by Horn *et al.* (1954). Feces were collected by using faecal collection bags fitted with the harness attached to the does as used by Balch *et al.* (1951). All animals were fed experimental ration *ad libitum* for a period of six weeks, excluding two weeks adjustment period. All does were given a compound feed comprising of 50% maize oil cake, 25% wheat bran, 20% cotton seed cake and 5% molasses @ 0.75% of the body weight. After six weeks of the experimental period, a two weeks digestion trial was run to determine the digestibility of different diets as described previously (Maynard & Loosli, 1973).

The proximate analysis of ration offered and refused was done (Association of Official Analytical

Chemists; AOAC, 1984). The digestibility of the feeding rations was determined for DM, OM, CF and CP in each group. The coefficients of digestibility of the nutrient fed, excreted and digested were calculated as described by Reaves and Henderson (1969). Data on daily milk production (MP) was recorded by milking the does twice a day manually at 06.00 and at 18.00 hours. The milk composition (fat, protein, specific gravity, total solids, solids not fat, acidity and ash) was determined by using the methods of AOAC (1984).

The data collected were analysed using one way analysis of variance (ANOVA). The Minitab (version 10.2, USA) statistical package was used to draw the valid conclusions. Tuckey's multiple range test was used to compare means at $P < 0.05$ (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

The does fed on diet (ASF1) containing 20% level of *A. amnicola* produced more ($P < 0.05$) milk than the basal feed (BF) and ASF2 where 40 % level of *A. amnicola* was substituted (Table I). The coefficient of digestibility for DM, OM, CF, and CP (Table II) among the treatments had no difference ($P > 0.05$). It was observed that the MP was significantly ($P < 0.05$) improved with the inclusion of *A. amnicola* (at 20% level). The analysis of data further revealed that the substitution of saltbush in the feeding rations of lactating Beetal does did not affect ($P > 0.05$) milk composition (fat, protein, specific gravity and total solids). There was higher ($P > 0.05$) MP along with the solid not fat, acidity and ash percentage ($P < 0.05$) in treatment ASF1, having *A. amnicola* (20% level). This could be attributed to more salt in the rations and increased water intake. The findings are in line with those of Klusmuyer and Clarke (1991), Chilliard *et al.* (1993) who explained that the use of salts in feeds of lactating goats increased the MP. The higher level of saltbush substitution (40% level) for traditional fodder did not increase the milk production which might be due to the decreased DM intake.

Martin *et al.* (1999) also reported that the type of fat supplemented in feed to lactating does did not affect the MP and chemical composition. Martin *et al.* (1999) further revealed that energy concentration in the diets of lactating does affected the milk fat production and the increase in total solids content. The milk production might be increased with the increase in water intake of the animals in different treatments (*A. amnicola* substituted feeds). The maximum water intake was found (3.93 ± 0.25 L) in group "C", Where 40% of

ration's DM was replaced by saltbush and minimum (1.69 ± 0.13 L) in control. The increased water intake in lactating does might have affected the MP. Water requirements might be increased with increased level of saltbush to excrete their high salt contents. Results are in line with Wilson *et al.* (1969), Wilson (1974) and Hassan *et al.* (1979). Gihad (1993) also reported that water intake increased by 61.4%, when sheep were fed *A. halimus* instead of clover hay.

Table I. Effect of different levels of *Atriplex amnicola* substitution for *Medicago sativa* and *Pennisetum purpureum* on milk production and composition

Parameter	BF (A)	ASF1 (B)	ASF2 (C)
Milk (kg)	0.45 ± 0.04^a	0.71 ± 0.00^b	0.44 ± 0.06^{ac}
Fat (%)	4.70 ± 0.07^a	4.90 ± 0.06^a	4.87 ± 0.04^a
Protein (%)	3.80 ± 0.05^a	3.90 ± 0.04^a	3.80 ± 0.04^a
Sp. gravity	1.03 ± 0.14^a	1.02 ± 0.03^a	1.03 ± 0.03^a
Total solids (%)	13.0 ± 0.14^a	13.13 ± 0.11^a	13.45 ± 0.01^a
Solid not fat (%)	8.29 ± 0.08^a	8.35 ± 0.09^{ab}	8.59 ± 0.05^c
Acidity (%)	0.22 ± 0.03^a	0.21 ± 0.03^{ab}	0.19 ± 0.03^c
Ash (%)	0.69 ± 0.02^a	0.80 ± 0.08^{ab}	0.81 ± 0.00^c

Table II. Effect of different levels of *Atriplex amnicola* substitution for *Medicago sativa* and *Pennisetum purpureum* on digestibility

Digestibility	BF (A)	ASF1 (B)	ASF2 (C)
Dry matter	72.02 ± 0.24^a	72.48 ± 0.61^a	70.78 ± 1.21^a
Organic matter	72.32 ± 2.34^a	63.85 ± 1.97^a	68.36 ± 1.13^a
Crude fibre	74.21 ± 0.89^a	76.33 ± 1.19^a	73.54 ± 1.46^a
Crude protein	60.76 ± 1.15^a	61.62 ± 2.62^a	61.52 ± 1.82^a

*Mean values with same superscript are non-significant ($P > 0.05$).

BF (control) = 50% Mott grass hay + 50 % alfalfa hay

ASF1 (Atriplex substituted feed 1) = 40 % Mott grass hay + 40% Alfalfa hay + 20 % *Atriplex amnicola* hay

ASF2 (Atriplex substituted feed 2) = 40 % Mott grass hay + 40% Alfalfa hay + 40 % *Atriplex amnicola* hay

CONCLUSIONS

The results of this study revealed that saltbush (*A. amnicola*) may be incorporated in diet of the lactating goats with the provision of fresh water *ad libitum*. The better production is achieved with 20% level of *A. amnicola* in mixed rations and a little of extra energy supplementation.

REFERENCES

- AOAC, 1984. *Official Methods of Analysis*. Association of analytical chemists. 14th ed. Association of Official Analytical Chemists, Washington, D.C., USA.

- Balch, C.C., S. Barlett and V.W. Johnson, 1951. Apparatus for the separate collection of feces and urine from cows. *J. Agri. Sci.*, 41: 1715-22.
- Chilliard, Y., M. Doreau, G. Gagliostro and Y. Elmedah, 1993. Protected (encapsulated or calcium soaps) lipids in dairy cow diets. *Productions Animales*, 6: 139-50.
- 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*. 1: 443-7. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Hassan, N.I., H.M. Abdul Aziz and A.E. El-Tabkh, 1979. Evaluation of some forages introduced to newly reclaimed areas in Egypt. *Wrld. Rev. Anim. Prod.*, 15: 2.
- Horn, L.H., M.L. Ray and A.D. Neumann, 1954. Digestion and nutrient balance stalls for steers. *J. Anim. Sci.*, 13: 20-7.
- Klusmeyer, T.H. and J.H. Clark, 1991. Effects of dietary fat and protein on fatty acid flow to the duodenum and in milk produced by dairy cows. *J. Dairy Sci.*, 74: 3055-67.
- Martin, L., P. Rodriguez, A. Rota, A. Rojas, M.R. Pascual and J. Tovar, 1999. Effect of fat supplementation to lactating goats on growth and fatty acids composition of perirenal fat in goat kids. *Anim. Sci.*, 68: 195-200.
- Maynard, L.A. and J. K. Loosli, 1973. *Animal Nutrition*. 6th ed., pp: 347. Tata Mc Graw Hill Publishing Company Ltd., Bombay, New Delhi.
- Reaves, P.M. and H.O. Henderson, 1969. *Dairy Cattle Feeding and Management*. 5th ed., pp: 25. Wiley Eastern Pvt. Ltd., New Delhi.
- Steel, R.G.D. and J.H. Torrie, 1980. *Principles and Procedures of Statistics*. 2nd ed. Mc Graw Hill Book Co., New York.
- Wilson, A.D., J.H. Leigh and W.E. Mulham, 1969. A study of Merino sheep grazing on Bladder saltbush (*A. vesicaria*) and cotton bush (*K. alphilla*) community on the riverine plain. *Australian 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. *Anstralian J. Agri. Res.*, 25: 339.

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