

IMPACT OF FOURWING SALTBUSH ON FEED AND WATER INTAKE AND ON BLOOD SERUM PROFILE IN SHEEP

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Summary

Sixteen Hamai males were used to evaluate the influence of varying levels of fourwing saltbush hay on feed and water intakes as well as the blood serum mineral status in a completely randomized design. The animals were grouped randomly into four, with four animals in each. The four groups were randomly allotted low, medium, high and very high levels of saltbush hay supplementation in addition to wheat straw. The animals were given fresh water at free of choice. Weekly body weight was recorded for each individual animal. Blood serum was collected for mineral contents. The experiment lasted for eight weeks. The inclusion of saltbush leaves in the diet showed a non-significant effect on the total dry matter intake at low, medium and high levels of saltbush whereas very high proportion of it decreased the total dry matter intake. There has been a significant increase in the water intake when very high levels of saltbush were included in the ration. Lower levels showed no effect on the water intake. The animals maintained their body weight from week 1 to week 8. No treatment by weeks interactions on the potassium and sodium levels were detected. However higher levels of saltbush increased significantly the potassium and sodium contents in the serum. Calcium contents were significantly ($p < 0.01$) lowered with the inclusion of saltbush leaves in the diet. Whereas Phosphorous contents showed an increasing ($p < 0.05$) trend with the higher levels of saltbush. No clinical or sub-clinical toxicological symptoms were observed in the sheep with the higher mineral contents.

(Key Words : Fourwing Saltbush, Intake, Water, Serum Profile)

Introduction

Balochistan is the largest province of Pakistan with an area of 34.2 million hectare, out of which 90% consists of rangelands which contribute about 60% of the total rangelands in the country. These ranges offer grazing tract for sheep and goats. Small ruminants in this province get their 90% of the feed requirements from these rangelands (Khan et al., 1990). These range lands have been heavily overgrazed in the past which has reduced the carrying capacity by 10-15% of their production potential (Government of Pakistan, 1983). This problem becomes serious when forage deficit coincides with the critical stages in the animal production. The small ruminants (sheep and goats) are scattered around in small flocks, where as larger flocks are maintained under the transhumance or nomadic in arid and semiarid regions of

the country. Animals depend exclusively on grazing, concentrates are fed in small quantities at certain times of the year. Due to low and erratic rain fall, shortage of plant biomass on ranges cannot help the animals in maintaining their production potential. Hence the animals are forced to utilize reserve body tissues. Under these circumstances it becomes imperative to explore the possibility of alternatives. Efforts to improve the range condition of Balochistan have been going on for the last few years, but the continuous degradation of rangelands does not cope with the increasing population of small ruminants.

Fourwing saltbush (*Atriplex canescens*) has been introduced as a winter maintenance forage for small ruminants. It is a perennial, cold and drought tolerant plant with moderate protein contents in the leaves. Saltbush has been studied for its potential both as a supplement to grazing on rangelands and as a supplement to feeds such as wheat straw. The studies on intake and digestibility of fourwing saltbush (FWSB) by sheep have shown its promise as a good winter feed (Atiq-ur-Rehman et al., 1990). However there has been some evidence that nutritional quality of FWBS may change during different

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Received March 6, 1995

Accepted August 31, 1995

stages of its growth round the year. Moreover high contents of mineral may have some negative impact on the intake of feed and water and also on the mineral status of blood serum profile.

Materials and Methods

The study was conducted at Arid Zone Research Institute (AZRI), Quetta, Balochistan, which is situated at an altitude of 1,750 m. The climate is harsh, with annual rain fall of 300 mm. Winters are cold with mean minimum temperature in January close to Zero (Atiq-ur-Rehman et al., 1990).

The leaves and twigs of FWSB were collected at AZRI farm in November-December, 1991. The forage was harvested, air dried in the forced oven at 70°C for 24 hours and stored at room temperature after filling in the bags. The samples of FWSB hay were collected for the proximate analysis by (AOAC, 1984) for dry matter, total ash, ether extract and NDF, ADF by using procedures of Goering and Van Soest, 1970. The experiment was conducted during June-August at Animal Nutrition Research Unit of AZRI.

Sixteen Hamai males of approximately two years of age were used in a completely randomized design. The animals were weighed, ear marked and divided randomly into four groups with four animals in each and put into feeding pens. In a preliminary stage of experiment the animals were offered ad-libitum chopped wheat straw and 200 g of undecorticated cotton seed cake. Later on during the main experimental stage four groups were offered (low) 150, (medium) 300, (high) 450 and (very high) 600 g/h/d of fourwing saltbush hay as treatments T1, T2, T3 and T4, respectively. The animals took a week to adjust to the new feeding regime. FWSB hay was offered at 08:00 hours in the morning and wheat straw at 18:00 hours in the late afternoon. The refusals of saltbush and wheat straw for each animal were recorded. Fresh water was offered twice a day at 09:00 hours in the morning and 15:00 hours in the afternoon and quantity taken by each individual sheep was recorded.

The blood serum samples (10 ml) were collected at the week end at 07:00 hours, before feeding from the jugular vein of each animal. The serum samples were allowed to clot for 30 minutes, then centrifuged at 1,000 rpm for 20 minutes. The serum was decanted and analyzed for the determination of sodium, potassium, calcium and phosphorus.

The animals were weighed on weekly basis for any change (gain/loss) in the body weight by using a digital weighing balance. The animals were carefully observed by

a veterinarian for general health and for any other dysfunction caused by the varying levels of fourwing saltbush.

Results and Discussion

The data for feed intake, water intake, body weight and blood parameters were computed and statistically analyzed by using MSTAT program in the software computer. Proximate analysis of the fourwing saltbush used in the study were performed in the laboratory. It contained dry matter 92.73%, crude protein 18.66%, crude fibre 17.36%, Ash 17.63%, ether extract 2.29%, NDF 44.9%, ADF 23.9%, cellulose 18.3%, hemicellulose 21.0% and lignin 04.0%.

Feed and Water Intake

The Data on feed intake due to varying levels of FWSB have been computed in terms of total dry matter intake and it showed that there was a non-significant change in the total dry matter intake with the low, medium and high levels of saltbush. Total intakes at low and medium levels of inclusion of saltbush leaves were similar, but decreased as the proportion of saltbush leaves in the total diet increased. It was only possible to get the sheep to eat close to the highest level of saltbush leaves by limiting the amount of wheat straw on offer. One possible explanation for the limited intake of feed at very high level of saltbush could be that the leaves were harvested late in the season, when their digestibility was low and they might have developed some impalatable factors.

The data on effect of varying levels of FWSB hay in diet on water intake represents that there was a non-significant change in the intake of water due to low, medium and high levels of saltbush. Very high levels of saltbush increased significantly ($p < 0.05$) the intake of water. There has also been a significant change in the water intake from week 1 (2.02 L/day) to week 8 (3.47 L/day). This is possibly due the increased salt contents in the diet. Another reason for low feed intake and increased water intake could be that the study was conducted during the months of June-August when the nutrient requirements of sheep and goat is decreased and water requirement is increased as reported by Jasra et al., 1993. There is another report that the excessive intake of potassium in the diet can increase the thirst (Amanat, 1993).

No differences ($p > 0.05$) were found for the live weight of the animals between low, medium, high and very high levels of saltbush. The results were also non-significant for the body weight on week 1 and week 8

with the average values of 32.68 and 32.95 kg, respectively. No treatment by week interaction were detected.

TABLE 1. AVERAGE VALUES FOR FEED AND WATER INTAKES IN SHEEP SUPPLEMENTED WITH VARYING LEVELS OF FOURWING SALT BUSH

Treatment	DM intake (kg/h/day)	SE	Water intake (L/h/day)	SE
T1	0.833 ^a	0.61	2.69 ^b	0.84
T2	0.853 ^a	0.15	2.49 ^b	1.16
T3	0.770 ^{ab}	0.07	2.75 ^{ab}	0.99
T4	0.726 ^{bc}	0.16	2.84 ^a	0.99

Kg/h/d = Kilograms/head/day, L/h/d = Litres/head/day.

Letters with different superscripts show the level of significance.

Blood Serum Profiles

Serum profiles were evaluated for mineral contents at the end of week 8 (table 2). The potassium level in the blood serum was evaluated to assess the influence of higher levels of saltbush. The results showed a significant ($p < 0.01$) increase in the potassium contents in the blood from medium to very high levels of saltbush in the diet. No treatment by week interactions or week effects ($p > 0.38$) were detected for potassium contents. Sodium contents of the serum showed the same trend as in case of potassium. There was a significant ($p < 0.01$) increase in the sodium contents of blood serum at high levels of saltbush containing diet. The results are in line with the fact that there is some metabolic relationship between sodium and potassium in the animal body. The absorption of either increases with the increased level of the other and vice versa.

The data on calcium contents of blood serum showed a significant effect ($p < 0.01$) with the increased proportion of saltbush in the ration. It was found that inclusion of high saltbush proportion in the diet decreased the calcium contents. Weeks also exerted a significant effect ($p < 0.05$) in lowering the calcium contents. In contrast to the effect of varying levels of saltbush in the feed on calcium contents, phosphorus showed an increasing trend. High saltbush containing diets showed a significant effect ($p < 0.05$) on phosphorus contents in the blood serum. No treatment by weeks interaction or weeks effect were detected. The results are confirmed by the reports that metabolism of phosphorus in large part is

related to that of calcium. Calcium, phosphorous ratio in ration affects the absorption and excretion of these elements. If either is in excess, the excretion of the other is increased and vice versa. During the experimental trial the animals were keenly and regularly observed by a veterinarian. No clinical or sub-clinical effects of greater saltbush intake were detected in the animals.

Keeping in view the performance of sheep in terms of maintenance, intake and mineral contents in the blood serum, it can be concluded that fourwing saltbush hay can be safely used upto 600 g/head/day as a maintenance ration without the fear of any adverse effects.

TABLE 2. AVERAGE MINERAL CONTENTS OF BLOOD SERUM IN SHEEP SUPPLEMENTED WITH DIFFERENT LEVELS OF FOURWING SALT BUSH

Contents (mg/100 ml)	Treatments			
	T1	T2	T3	T4
Sodium	326.8 ^b	322.7 ^b	337.2 ^a	333.0 ^a
Potassium	12.99 ^b	13.66 ^b	14.83 ^a	15.49 ^a
Calcium	20.64 ^a	17.60 ^a	18.83 ^b	15.69 ^c
Phosphorous	11.61 ^b	11.63 ^b	12.28 ^{ab}	13.73 ^a

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