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PERFORMANCE OF NUBIAN GOATS FED NATRON SALT SUPPLEMENTATION: FED AND WATER INTAKE, BODY WEIGHT AND FEED CONVERSION RATIO

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المستخلص

أجرى هذه البحث لدراسة الأداء الموسمى للماعز النوبية عند اضافة ملح العطرون بنسبة (0-2-3-4-5%) للعليقة المركزة. استخدمت 25 من صغار الماعز (اناث وذكور) يتراوح عمرها بين 7-9 شهور وقسمت عشوائيا إلى خمسة مجموعات متساوية أعطيت كل مجموعة واحد من تراكيز العطرون أعلاه. غطت مدة التجربة ثلاث مواسم هى الصيف الجاف- الصيف الممطر –والشتاء وشملت القياسات كل من كمية الماء المتناولة يوميا (لتر) وكمية الأكل من العليقة (كجم/يوم)تغير وزن الحيوان ومعدلات تحول العليقة.

أوضحت الإستجابة اثرا معنويا فى زيادة كمية الماء المتناولة يوميا فى المجموعة ذات التركيز 3% واثرا معنونيا بالمجموعة ذات التركيز العالى 5% .استمر النقصان فى كمية الماء المتناولة خلال فصل الصيف الجاف مقارنة بالصيف الممطر والشتاء حيث ازداد معدل الماء المتناولة يوميا فى فصل الشتاء بنسبة 3.5% مقارنة بالمجموعة 0% .

اوضحت الدراسةاثرا معنويا فى نقصان كمية الاكل المتناولة يوميا عند المجموعتين ذات تركيز العطرون 4% و 5% وصل الى 20% و 27% على التوالى مقارنة بالتراكيز الاقل (0-3%) استمر نمط النقصان فى معدل كمية الاكل فى مجموعة العطرون مقارنة بالمجموعة 0% خلال كل فصول السنة رغم ازدياد كمية الاكل المتناولة يوميا بنسبة 18% فى كلتا المجموعتين خلال فصلى الصيف الممطر والشتاء مقارنة بفصل الصيف الجاف.

معدل الزيادة فى وزن صغار الماعزلم يكن له اثر معنوى فى المجموعة ذات التركيز 3% كما تلاحظ إزداد وزن صغار الماعز فى المجموعتين خلال فصلى الصيف الممطر والشتاء بنسبة 12% و 28% على التوالى مقارنة باوزانهما خلال فصل الصيف الجاف.

اظهرت الدراسة ان زيادة معدل تحول العليقة تتناسب وتركيز العطرون حيث بلغت 11.8%, 21.8% و22.7% عند ادمجموعات ذات التراكيز 3, 4 و5% عطرون على التوالى مقارنة بالمجموعة 0%. سجلت معدلات تحول العليقة فى فصلى الصيف الجاف ةالشتاء مقارنة بفصل الصيف الممطر.

Abstract

This study was conducted to investigate the performance of Nubian goat fed a concentrate diet supplemented with natron levels at 0- 5%. where a total of 25 Nubian goat's kids of both sexes (7 - 9 month old) were used. They were divided into five equal groups each randomly allocated to the concentrate diet containing one of the above natron levels. The experimental period covered the three seasons; dry and wet summer, and winter. The measurements included water and food intakes, body weight changes and feed conversion ratio.

The responses showed a significant increase ($P<0.05$) in water intake at 3% natron level and a significant reduction ($P<0.05$) at 5% and agin in dry summer compared to wet summer and winter. In winter the water intake increased by 3.5% than the control group ($P<0.05$).

Progressive reduction ($P<0.05$) in food intake at 4 and 5% levels (20% and 27%) compred to low natron levels (0-3%) were observed. Daily feed intake in the natron supplemented groups was significantly ($P<0.05$) lower at all seasons than the control group. The daily feed intake during wet summer and winter increased by about 18%compared to dry season.

Metabolic body weight (kg0.75) was increased insignificantly ($P>0.05$) at 3% Natron. During wet summer and winter it increased by 12% - 28% in the supplemented and the control groups compared to dry season.

Feed conversion ratio increased significantly ($P<0.05$) and progressively with natron concentration 11.8% ,21.8% and 22.7% at 3%, 4% and 5% natron compared to the control group. its seasonal magnitudes were significantly ($P<0.05$) higher in the supplemented groups than the control one and higher ratio occurred in both groups during dry summer and winter.

Keywords: Natron salt supplementation, Nubian goats, seasons, feed intak, feed conversion rate.

Introduction

Goats play an important role in generating employment, income, capita storage and improving household nutrition. To enhance the production potential of the goat breeds over the entire world is to introduce superior technologies for mass adoption and to create the necessary facilities vital for adoption of improved practices of goat keeping (Pannin and Mahabile, 1997). Nutritional disturbances and different management systems have greater impact in the reproductive ability of dairy goats in Sudan, poor nutrition was identified as the main cause of poor reproductive performance in goats, therefore introduction of improved feeding practices based on strategic supplementation using locally available resources will not only increase milk production and reproduction performance but also establish sustainable farming practices that will ensure continued supply of milk with reasonable cost.

Although minerals make up only 4-6% of the body weight of vertebrate animals, their diverse metabolic roles gives them widespread importance in nutritional biochemistry. Where animals particularly ruminants rely on natural vegetation for optimum supply of minerals, simple induced or multiple deficiency often occur. In tropical agriculture the important deficient mineral is phosphorus, alone or combination with hypoproteinaemia. Furthermore, deficiencies of macro elements, sodium, sulpher, and the microelements copper and cobalt are often encountered . Indigenous goats generally have to survive and reproduce in harsh environments with extremes of environment and an erratic and insufficient food supply (Meuret *et al.,* 1993; Ramsay *et al.*, 1987). It is reasonable to assume that nutrition is therefore a major constraint on their productivity.

Natron is a natural mineral salt ($Na_2CO_3.10H_{20}$) used by herders in Sudan as they believe it improves their herd health, production and reproduction. During dry summer and winter a small percent is usually mixed with drinking water offered to the animals whereas in wet summer where water is abundant, it is mixed with animals' feeds. The present study was thus initiated to examine

the effect of natron supplementation in goats' diet in term of feed intake, water intake, metabolic weight and feed conversion rate..

Materials and Methods

Experimental Site

The present experiment was carried out under the semi-arid conditions of Sudan, at the Central Veterinary Laboratories, 18 km from Khartoum capital.

A pilot study had been carried out to determine the optimum level of natron salt intake mixed within a concentrate diet. Three levels were used: 10, 7 and 5 %. The concentrate diet consisted of 32 % sorghum grain, 23 % ground cake, 44 % wheat bran and 1 % salt. This study utilized six Nubian goats and lasted for two weeks. The optimum intake was found to be at the 5 % natron inclusion in the concentrate diet.

Feeds

Taking 5 % as a maximum level of natron salt in the diet of goats, lower percentages were proposed. Hence five percentage levels were included These were 0 %, 2 %, 3%, 4 % and 5 % each mixed separately in the concentrate diet used in the pilot study. In addition to the concentrate diet *Sorghum bichlore* (Abu70) was offered ad libitum as dry roughage while fresh green Alfa Alfa was given every 14 days as a source of carotin (vitamin A).

Animals

A total of 25 Nubian kids were used. They bore the typical characteristics of the Nubian breed, head convex with pronounced running nose and long pendulous ears. Black being the dominant color with gray ears, light marbling found in some animals. Mature animals body weight ranged from 18 -35 kg and body size 70-75 cm at wither height. In this experiment the kids used were identified dentally and were found to be between 7-9 months. Body weight ranged between 9-13 kg at the beginning of the experiment.

Feeding Trials

The Nubian kids were subjected to an adaptation period of 14 days. They were dewormed against internal parasites using Anizole 10 % and 2.5 % vapcotox. They were also vaccinated against pest depetits Ruminant disease (P.P.R). They were randomly allocated to a completely randomized design where each group of five animals received one level of natron as shown in Table 1. Each group was housed in a separate cage 2 m x 3 m with concrete floor and complete shade of slopping roof made of asbestos. In each cage the animals were offered a concentrate diet, ad libitum roughage and free drinking water. A measurement period of 6 months was undertaken. During this period food and water intake of each group were determined by measuring amount of concentrate residues and water left. Body weight was done before feeding at weekly interval.

Statistical analysis:

Data were subjected to statistical analysis by Generalized Linear Model procedures (GLM) of SAS (1989). The Model included experimental day, temperature and various interactions. Duncan's multiple range tests was used for comparing significant group differences.

Results and Discussion

Water and food intake:

The average daily water intake, feed intake, metabolic body weight as well as feed conversion ratio were shown in Tables 1 and 2. The average daily water intakes were higher at 3% natron supplementation compared to the control and all other feeding traits. At 5% the water intake decreased significantly ($P<0.05$) this decrease reached 9.5% from that of the control group. A non significant increase in daily water intake recorded in dry and wet summer ($P>0.05$) whereas, in winter the water intake increased by 3.5% than the control group ($P<0.05$) Table2. On the other hand the quantities of water intake in the control group was not affected throughout the seasons.

Table 1: Effect of different levels of Natron supplementation on water intake, feed intake, metabolic body weight and feed conversion ratio of goat's kids

Natron	Water intake L/day	Feed intake gm/day	Body weight Kg	Feed conversion ratio
0%	9.45±0.848[a]	2.064±0.311[a]	7.467±0.9018[a]	3.667±0.3215[a]
2%	9.45±0.879[a]	2.064±0.311[a]	7.467±0.9018[a]	3.433±0.5033[ab]
3%	11.43±0.949[b]	2.064±0.311[a]	8.133±1.0017[a]	4.100±0.3464[ab]
4%	9.36±0.740[a]	1.65±0.152[b]	7.400±1.2531[a]	4.467±0.5686[b]
5%	8.55±0.810[c]	1.489±0.063[c]	6.867±0.6351[a]	4.500±0.4359[b]

Values with different superscript letters within same column are significantly different at P<0.05, ANOVA

Table 2: Seasonal effect of natron supplementation on water intake, feed intake, metabolic body weight and feed conversion ratio of goat's kids

Parameter	Dry summer	Wet summer	Winter
Water intake:			
Natron Supplemented group	9.520±1.370[a]	9.680±1.460 [a]	9.880±1.209 [a]
Control group	9.430±0.994[a]	9.390±0.963 [a]	9.540±0.502[b]
Feed intake:			
Natron Supplemented group	1.574±0.251 [a]	1.935±0.325 [a]	1.938±0.325 [a]
Control group	1.696±0.293[b]	2.246±0.029[b]	2.250±0.000[b]
Body weight:			
Natron Supplemented group	6.575±0.411 [a]	7.400±0.698 [a]	8.425±0.624 [a]
Control group	6.600±0.8 00[a]	7.400±0.1 00[a]	8.400±0.9 00[a]
Feed conversion ratio:			
Natron Supplemented group	4.125±0.206 [a]	3.775±0.639 [a]	4.475±0.741 [a]
Control group	3.900±0.8 00[b]	3.300±0.6 00[b]	3.800±0.6 00[b]

Values with different superscript letters within same column are significantly different at P<0.05, Student T- test

The magnitude of daily feed intake is higher ($P<0.05$) at lower-moderate levels of natron supplementation (0-3%) compared to higher levels 4% and 5% level, which dropped by 20% and 27.4% , respectively. Although feed intake in the supplemented groups is lower than the control group ,yet it increased significantly ($P<0.05$) in wet summer and winter compared to dry season and amount as 18.6% and 18.8% respectively. During dry summer, due to the high surrounding temperature, goats' appetite dropped significantly which led to significant drop in feed intake in both supplemented and control groups. Whereas, feed intake increased significantly during both wet summer and winter. This was accompanied by significant increase in water intake in winter.

Similarly, it was pointed that, water intake is related to feed intake through its functions in the processes of digestion, elimination of undigested residues and the excretion of waste products of metabolism (Phillips, 1960).

metabolic body weight and feed conversion ratio: Highest metabolic body weight (kg0.75) observed in 3% natron inclusion. It increased significantly and progressively ($P <0.05$) at both supplemented and control groups from dry to wet summer and winter which amounted as 12% and 28% in wet summer and winter, respectively.

Feed conversion ratio showed different responses. It increased significantly ($P<0.05$) and progressively with natron concentration to 3%, 4% and 5% of 11.8% ,21.8% and 22.7% as compared to the control group. Moreover, the seasonal magnitudes of feed conversion ratio were significantly ($P<0.05$) higher in the supplemented groups than the control one. In both groups it decreased during wet summer .

Final metabolic body weight changes could be related to feed conversion ratio at different levels of natron within each season and between seasons. At the 3% level increase in body weight was corresponded by better conversion ratio within all seasons. Also the winter season showed the best gain and best conversion food ratio.

Conclusions: It could be concluded that natron ingredients provided most of the minerals required by ruminants for normal body functions. However, addition of natron above 3% seemed to have adverse effect on dry matter intake. Seasons showed a significant effect on goat's kids performance where dry summer showed the most deleterious effect.

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