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RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES

Effect of supplemented Gum Arabic dust on blood urea and creatinine in sheep ration

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Abstract

The objective of the study was to evaluate the effect of adding different levels of Gum Arabic dust to the ration of sheep on urea and creatinine levels in blood. Twenty eight male desert sheep were divided in four groups of seven animals each. Gum Arabic was added to the ration at the rates of 0, 10, 20 and 30%. Blood serum urea level decreased progressively by the levels of 10 and 20% gum Arabic. The 20% Gum Arabic ration gave the significantly lowest final blood urea level, whereas the control gave the highest final blood urea level. The creatinine level showed no significant difference between the control and the Gum Arabic treatments. In conclusion, addition of 20% Gum Arabic decreased blood urea level and had no effect on blood creatinine level in sheep.

Keywords: gum Arabic; sheep; ration; urea; creatinine

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Introduction

Gum Arabic is the dried exudate obtained from the stems and branches of *Acacia senegal*. It consists of high-molecular weight polysaccharides and salts of calcium, magnesium and potassium, which on hydrolysis yield arabinose, galactose, rhamnose and glucuronic acid (FAO, 1997). Sudan produces about 80% of the world supply of Gum Arabic (AbdelNour, 1997). The goal behind the use of Gum Arabic is that it is easily prepared, ingested, palatable and has few side effects compared to other fibres used (Bliss et al., 1996). Also, since it is a soluble and fermentable dietary fibre, it will increase the number of bacterial mass in the human colon and hence utilization of the urea by the action of bacterial urease, and elimination of ammonia which is used for the synthesis of non-essential amino acids and protein for human subject and microorganism (Vince et al., 1973; Assimon and Stein, 1994; Rashida, 2002). The degradation of urea and the subsequent use of ammonia result in decreasing serum urea nitrogen and increasing faecal nitrogen excretion when taking low protein diet (Bliss et al., 1996).

Creatinine is synthesized in the liver from methionine, glycine and arginine. In skeletal muscle, it is phosphorylated to from phosphoryl creatinine which is an important energy store for ATP synthesis. Creatinine is formed from phosphoryl creatinine and its rate of production is relatively constant from day to day. It is slightly high in male and this variation is due to increased muscle mass (Ganong, 1999). The level of creatinine is fewer depends on diet but is more related to age, sex and muscle mass being high in males (Kumar and Clark, 1999; Esmail 2002; Ali et al., 2004). Depending on these facts, the current experiment was designed to find the effect of Gum Arabic as feed additive on serum urea and creatinine concentration in sheep.

Materials and Methods

Twenty eight male lambs (6 months old) were divided into four groups (each of seven animals) according to similar body weight. Four mesh diets containing different Gum Arabic levels were

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formulated. The levels of Gum Arabic were added at the levels of 0, 10, 20 and 30% of feed on fresh basis. The feed ingredients and chemical composition of the four treatments is given in Tables 1 & 2. The experimental diets and clean water were always available *ad libitum*. Blood samples for determination of serum urea and serum creatinine levels were taken every two weeks for two months. Blood levels of urea and creatinine were determined according to commercially available kits of Randox.

Statistical analysis

To test the significance of dietary treatment, the data were analyzed by two way ANOVA using the computer software SPSS.

Table 1: Percentage of ingredients used in the experimental rations (% of fresh basis in the mesh form)

Ingredients	Rations			
	1	2	3	4
Gum Arabic dust*	10	20	30	0
Ground nut hulls(GNH)	25	15	15	35
Dura	31	29	19	31
Salt	1	1	1	1
Salt licks	1	1	1	1
Wheat bran (WB)	21	21	18	21
Ground nut cake	11	13	16	11
Total	100	100	100	100

* Gum Arabic dust chemical analysis: 96% DM, 14.38% Ash, 2.60% C.P, 0.60% E.E, 2.80% C.F and 11 MJ /kg ME (According to Egan et al., 1981).

Table 2: Chemical composition of the experimental rations (on dry matter basis)

Component	Rations			
	0% G.A	10% G.A	20% G.A	30% G.A
Dry matter	95.3	89.8	91.7	90.8
Crude protein	14.4	14.4	14.1	14.1
Ether extract	3.4	3.0	3.0	2.5
Crude fiber	26.7	14.8	15.3	12.3
Ash	4.8	5.4	6.6	8.4
MEMJ/kg	10.0	10.8	10.7	10.8

Chemical analysis was performed according to AOAC (1990)

Table 3: Serum urea levels (mg/dl) of ram fed rations containing different concentrations of Gum Arabic

Time intervals	Levels of gum Arabic				Overall mean	SE
	0%	10%	20%	30%		
Ur_0 (before treatment)	22.9	23.7	22.4	21.7	22.5^{c}	1.09
Ur_1 (after 2 weeks)	54.9	40.2	34.0	49.6	44.6^{b}	1.79
Ur_2 (after 4 weeks	46.31	45.9	41.7	43.2	44.3^{b}	1.64
Ur_3 (after 6 weeks)	61.7	62.1	52.4	61.8	59.5^{a}	1.23
Ur_4 (after 8 weeks)	66.4	46.9	49.2	56.9	54.9^{a}	2.56
Overall mean	50.4^{a}	43.8^{b}	39.9^{c}	46.6^{b}	45.2	1.66

$^{a-c}$Different superscripts in a column differ significantly (P<0.05)

Table 4: Serum creatinine levels (mg/dl) of rams fed rations containing different concentrations of Gum Arabic

Time intervals	Levels of Gum Arabic				Overall mean	SE
	0%	10%	20%	30%		
Cr_0 (before treatment)	1.00	1.00	1.00	1.00	1.00	0.00
Cr_1 (after 2 weeks)	1.00	0.93	0.93	1.00	0.96	0.03
Cr_2 (after 4 weeks)	0.91	0.91	1.04	0.92	0.95	0.04
Cr_3 (after 6 weeks)	1.00	1.10	1.22	0.99	1.08	0.04
Cr_4 (after 8weeks)	1.30	1.10	1.10	1.40	1.25	0.09
Overall mean	1.04	1.01	1.06	1.06	1.05	0.04

Results

Average serum urea was significantly low in rams fed 20% Gum Arabic after the end of the experimental period (Table 3). No significant difference was found in creatinine concentration at different intervals between the treated groups (Table 4).

Discussion

The results of urea analysis showed significant (P<0.05) reduction of urea levels especially in the groups fed 10 and 20% Gum Arabic in comparison to the control. The mechanism by which this product reduces blood urea nitrogen is attributed to the role of rumen and gut flora. It is known that ruminal bacteria ferment dietary fibres which provide them energy, the net result of such process increases in high quality proteins, increases fecal bacterial mass, increases fecal nitrogenous matter excretion and subsequently lowers serum urea nitrogen (Bliss et al., 1996; Rashida, 2002). Also addition of digestible fibre to the diet stimulates bacterial growth and activity in the rumen. It was also reported that the gut bacteria produces urease that hydrolyses urea to ammonia and carbon dioxide. The resultant ammonia can then be incorporated into bacteria proteins, and they are subsequently excreted in the mass of the faeces. The net result is increased nitrogen metabolism by the animal and less urea is released into the blood.

Creatinine levels showed no significant (P>0.05) difference between the groups. The metabolism of creatinine increased insignificantly with the increase of percentage of treatments in the ration and this observation was substantiated by the findings of Esmail (2002). Creatinine analysis results indicated that Gum Arabica has no direct effect on creatinine concentration against time which is in favour of such material to be added to ruminant rations, and also according to the role of creatinine in tissues damage or kidney filtration of such material. Due to the physiology of creatinine in relation to liver and muscles, as shown by Ganong

(1999), its rate of production is relatively constant from day to day, and this is consistent with the current findings.

Conclusion

It could be concluded that the addition of Gum Arabic dust at 20% decreased serum urea level significantly. However no significant effect on the serum creatinine level in all rations fed was found.

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