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Performance of West African Dwarf (WAD) Sheep Fed Diets Containing Lasalocid

[1]J.E.N. Olatunji, [1]C.F.I. Onwuka, [1]D. Eruvbetine, [1]O.O. Oduguwa and [2]A.B.J. Aina
[1]Department of Animal Nutrition,
[2]Department of Animal Production and Health, College of Animal Science and Livestock Production,
University of Agriculture, P.M.B. 2240, Abeokuta, Ogun State, Nigeria

Abstract: A study was conducted to investigate the effects of lasalocid on the performance of WAD sheep with a view to monitoring the feed intake, growth response, influence on digestion and optimum level of lasalocid inclusion in the diets of WAD sheep. Lasalocid was added to diets at four (4) different levels of 0.00, 0.01, 0.02 and 0.03% to represent the four treatments of the experiment. Experimental sheep weighing 13.48±0.95 kg were allowed to feed on the experimental diets for a period of 28 days before shifting to the next experimental diet in a cross over experimental design with each treatment replicated 8 times. Some blood parameters (Biochemical) total serum protein and serum urea and (Haemotological), packed cell volume and haemoglobin concentration as well as cost efficiency of including lasalocid in the feed were also monitored. Inclusion of lasalocid was found to enhance ($p<0.05$) weight gains, protein status of the experimental sheep as well as the cost efficiency in the experiment. 0.03% lasalocid inclusion level was the best and is therefore recommended in diets for WAD sheep.

Key words: Lasalocid, west african dwarf sheep, performance

INTRODUCTION

Digestion processes in the rumen of sheep are dominated by the activities of very complex and variable microbial population[1]. Volatile fatty acids (VFA) like acetic, propionic and butyric acids etc. are end products of carbohydrate fermentation in the rumen. The various proportions of these VFA depend on type of diet fed[2] and the condition prevalent in the ruminal environment. However, some of these VFAs are better utilized than the others. For example, propionic acid is more efficiently utilized in animals than acetic acid that results in production of a lot of methane gas and heat[3].

Some feed additives enhance the performance of ruminant animals by changing the ruminal environment to one favourable to the resident micro- organisms. These additives include antibiotics, buffers and bases, probiotics, ionophores, among others. The use of ionophores as rumen modifier includes the use of compounds such as monensin, lasalocid and salinomycin produced by fungi. Ionophores alter metabolic activities of certain classes of ruminal bacteria; they decrease the acetate to propionate ratio in the rumen and thereby decrease energy loss as methane[3].

This experiment was therefore designed to study the effects of feeding lasalocid containing diets on the feed intake, weight gain, nutrient digestibility coefficient and some of their blood parameters of West African Dwarf Sheep.

MATERIALS AND METHODS

Location of the study: The study was conducted in the small ruminant experimental unit of the College of Animal Science and Livestock Production (COLANIM)'s Teaching and Research Farm in the University of Agriculture, Abeokuta (UNAAB) in South Western Nigeria. (7°10`N and 3°2`E). The area lies in the tropical climate with an average annual rainfall of 1100mm; a mean ambient temperature of about 34°C and an average relative humidity of 82%.

Animals and their management: Eight (8) male WAD sheep aged between 9 and 12 months and weighing, on the average, 13.48 kg ± 0.95 were used for the study. The animals were treated for both internal and external parasites by the use of ivomec injection and asuntol solution respectively. They were certified helminth-free at the commencement of the experiment. The animals were allowed to adjust to the environment as well as to the supplementary concentrate feed used on the farm. They were housed individually in pens. Fresh clean water was given *ad libitum* daily.

Correspoding Author: C.F.I. Onwuka, Department of Animal Production and Health, College of Animal Science and Livestock Production, University of Agriculture, P.M.B. 2240, Abeokuta, Ogun State, Nigeria

Experimental diets: Four diets, D_1, D_2, D_3 and D_4, were compounded to represent the four treatments of the experiment. Lasalocid was included at varying levels of 0.00, 0.01, 0.02 and 0.03g/100 g of the diets respectively as shown in Table 1 below:

Experimental design: There were four treatments in the experiment and each treatment had two replicates. The respective diets were administered to separate groups of animals. At the end of period one, animals used for treatment T_1 were shifted to treatment T_2 while those of treatment T_2 were shifted to Treatment T_3; treatment T_3 to treatment T_4 and treatment T_4 to treatment T_1 in a crossover experimental design. Each trial lasted twenty-eight (28) days and was followed by fourteen (14) days rest period before shifting over to the next treatment. The rest period was to minimize the residual effect of one treatment over the other. At the end of the experiment, metabolic trial was carried out with two replicates of each treatment for a period of 21 days each. The first fourteen (14) days served as adaptation period while the last seven (7) days served as the sample data collection period.

Estimates of feed intakes and weight gain: Forage was supplied at 8.00a.m. in the morning each day while supplementary concentrates were offered at 12 noon and the rejects weighed and recorded by the next morning. Weight of each animal was estimated by using a hanging scale every week. Daily weight gain was obtained from this.

Chemical analyses of the feed, faecal and blood samples
Feed and faecal samples: Samples of the forage consumed were obtained daily. The dry matter content was obtained by drying in a forced air-draught oven. They were then bulked together for the duration of the experiment. The forage was ground in mortar to maximum size of 2 mm and kept for further analyses. With the use of metabolic crates, the daily faecal output was collected and later weighed. However, aliquots were taken daily to determine their dry matter contents. The dried samples were bulked together and stored for further chemical analyses. Concentrate supplement, forage, as well as faecal samples, were analysed for their proximate contents by the methods of A.O.A.C.[4]. Average values were obtained from three replicates.

Blood parameters: 5 mL of blood sample were collected from each animal via the jugular vein; 2 mL were put into heparinized tube (in the anticoagulant) while 3ml were left in the syringe to coagulate. Haematological parameters were measured in the heparinized blood. Packed Cell Volume (PCV) was estimated using micro haematocrit method and Haemoglobin Concentration (Hb) was obtained calorimetrically using drabkins reagent kit, cyanmethemoglobin method[5]. However, blood chemistry parameters were measured in the serum: Total Serum Protein {Biuret method} and Serum Urea {Oxime method} according to Bauer *et al*., [6].

Statistical analysis: Data generated were arranged in a complete randomized design and analyzed by one-way analysis of variance (ANOVA) and significant means were separated using Duncan multiple range test[7].

RESULTS AND DISCUSSION

The proximate composition of the concentrate diets and the forage species fed to the experimental goats are shown in Table 1. The Dry Matter (DM) values were high (ranging from 90.00 to 92.00%) in the concentrate feeds while those of the forage were low (27.5% for *Andropogon gayanus* and 35.38% for *Aspilia africana*). Dietary crude protein values ranged between 10.57 and 14.10% for both the concentrate feeds and the forages. The dietary crude fibre values obtained for the concentrate feeds were low and range from 10.55 to 12.43% while those obtained for the forage species were high (21.38% for *A. gayanus* and 27.13% *A. africana*) as shown in Table 1.

The results from this experiment (Table 2) showed that inclusion of lasalocid did not significantly influence feed intake. Although it was expected that there would be

Table 1: Composition of the experimental diets (g100 g^{-1}) fed to the animals

	Treatments				Forages	
Ingredients	D_1	D_2	D_3	D_4	A. gayanus	A africana
Dried brewers grain	26.00	26.00	26.00	26.00		
Corn offal	63.00	62.99	62.98	62.97		
Bone meal	8.00	8.00	8.00	8.00		
Salt	3.00	3.00	3.00	0.00		
Lasalocid	0.00	0.01	0.02	0.03		
Total	100.00	100.00	100.00	100.00		
Determined nutrient composition						
DM	90.00	90.00	91.00	92.00	27.50	35.38
Crude protein	10.93	11.32	11.68	10.57	12.15	14.10
Ash	9.00	07.00	8.00	8.00	6.53	7.03
Ether Extract	4.50	3.50	5.00	4.50	6.53	7.03
Crude fibre	11.17	12.43	10.55	10.90	21.37	27.13
Non nitrogen free extract	64.40	65.75	64.77	66.03	51.45	42.85D_1,

D_2, D_3 and D_4 represent treatments with 0.00, 0.01, 0.02 and 0.03g/100g inclusion rates of lasalocid respectively

Table 2: Feed utilization by WAD sheep fed diets with graded levels of lasalocid

Parameters	Treatments			
	D_1	D_2	D_3	D_4
Feed Intake (kg/d)	1.59 ± 0.08	1.76 ± 0.09	1.68 ± 0.16	1.65 ± 0.09
DM intake (g/d)	704.67 ± 7.00	778.50± 0.00	782.57± 5.70	782.40 ± 40
Dmintake(g/d/Wkg$^{0.75}$)	100.16 ± 1.00	110.66 ±2.30	111.24 ± 0.80	111.22 ± 5.60
DM intake as % of live weight	5.23 ± 0.77	5.78 ± 1.25	5.81 ± 0.46	5.81 ±1.22
Weight gain (g/d)	28.57^{b} ± 5.00	32.16^{b} ± 3.50	53.57^{ab} ± 8.90	73.75^{a} ± 2.80
Weight gain (g/d/wkg$^{0.75}$)	4.06^{b} ± 0.74	4.57^{b} ± 0.50	7.61^{ab} ± 1.21	10.48^{a} ± 0.37
Feed conversion ratio (FCR)	24.66^{a} ± 1.40	24.21^{a} ± 1.45	14.61^{b} ± 2.8	10.61^{b} ± 1.9
Cost of daily concentrate intake (cent g^{-1}d^{-1})	3.63^{a} ± 0.04	4.75^{b} ± 0.10	5.24^{b} ± 0.08	5.26^{b} ± 0.07
Cost of feed per kilogram live weight gain ($ g^{-1}d^{-1})	1.34^{ab}±0.05	1.55^{a}± 0.05	1.04^{bc}±0.10	0.78^{c}± 0.06

a, b, c, = means in the same row with different superscripts differ significantly ($p < 0.05$), D_1, D_2, D_3 and D_4 – Diets with 0.00, 0.01, 0.02 and 0.03 % levels of lasalocid respectively

Table 3: Utilization of nutrients by WAD goats fed diets containing graded levels of lasalocid (g100g^{-1} DM)

Parameters	Treatments			
	D_1	D_2	D_3	D_4
Dry matter (g100g^{-1} diet)	79.01 ± 2.70	77.04 ± 2.6	78.07 ± 1.8	76.95 ± 2.1
Crude protein	73.61 ± 3.7	71.46 ± 3.64	75.77 ± 3.2	76.05 ± 1.8
Crude fibre	86.29^{a} ± 0.49	83.71^{ab} ± .97	79.34^{b} ± 1.0	64.21^{c} ± 1.45
Ether extract	78.02 ± 1.7	74.93 ± 2.37	81.14 ± 0.92	74.86 ± 1.4
Ash	78.44 ± 3.5	73.05 ± 4.2	75.30 ± 2.4	75.48 ± 1.4
Nitrogen free extract	79.12 ± 3.3	82.03 ± 2.8	80.80 ± 2.07	83.14 ± 1.11
Nitrogen intake (gd^{-1})	12.67 ± 0.52	13.63 ± 0.54	14.03 ± 1.07	14.02 ± 0.42
Nitrogen Output(gd^{-1})	3.34 ± 0.58	3.26 ± 0.44	3.13 ± 0.57	3.02 ± 0.05
Nitrogen balance (gd^{-1})	9.33 ± 0.49	10.37 ± 0.62	10.90 ± 0.85	11.00 ± 0.33a,

b, c = means in the same row with different superscripts differ significantly ($p<0.05$)., D_1, D_2, D_3 and D_4 = Diet 1 (0.00%), Diet 2 (0.01%), Diet 3 (0.02%) and Diet 4 (0.03% inclusion rate of lasalocid)

Table 4: Some blood parameters of wad sheep fed diets with graded levels of rumen modifier

Parameters	Treatments			
	D_1	D_2	D_3	D_4
Packed cell volume %	28.33± 0.5	32.00 ± 0.5	30.67 ± 0.7	33.01 ± 2.1
Haemoglobin concentration (g/dl)	9.50 ± 0.2	10.60 ± 0.2	10.23 ± 0.3	11.00 ± 0.8
Serum Urea (mg/dl)	50.67 ± 1.4	56.61 ± 1.7	58.00 ± 1.7	59.33 ± 3.7
Total serum protein(mg/dl)	85.00^{b} ± 3.2	119.33^{a} ± 4.0	118.67^{a} ± 0.5	124.33^{a} ± 1.7

a, b, c = means in the same row with different superscripts differ significantly ($p<0.05$), D_1, D_2, D_3 and D_4 = Diet 1 (0.01%), Diet 2 (0.01%), Diet 3 (0.02%) and Diet 4 (0.03% inclusion rate of lasalocid)

change in the nutrient and rumen microbial metabolisms upon inclusion of lasalocid, the changes however did not significantly ($p>0.05$) affect the intake by WAD sheep in the experiment. This was in line with the results obtained when Rose and Spears[8] fed monensin to finishing steers. In the work of Huston *et al.*,[9] lasalocid did not have effect on feed intake in lamb and Angora goat kid but increasing monensin concentration reduced feed intake in both animals.

In clusion of lasalocid into the diet of WAD sheep tended to increase ($p<0.05$) its average daily weight gain. The effect at the 0.03% levels of inclusion was significantly higher than 0.00 and 0.01% but not higher than 0.02%. This may be indicating that minimum amount of 0.02% of lasalocid must be added to WAD sheep feed before an appreciable increase in daily weight gain is obtained. Likewise, feed conversion ratio (FCR) tended to decrease as the level of lasalocid inclusion increased. 0.00 and 0.01% as well as 0.02 and 0.03% RM levels did not significantly differ from each other. However, 0.03% level was significantly lower than 0.00 and 0.01%. 0.03% Level was the most efficient in terms of feed utilization in the experiment. It should be noted that as FCR becomes lower, it means less quantity of feed is needed to produce a unit live weight gain and this indicates better-feed efficiency. The fact that lasalocid enhanced weight gain and reduced feed conversion ratio was supported by the works of Huston *et al.*, McMeniman *et al.*,[9,10] and Erasmus *et al.*, Huston *et al.*[7,9] suggested that such efficiency could have been as a result of therapeutic value of the ionophore or an improvement in physiological efficiency of the animals.

The cost of concentrate taken daily by the animals was significantly increased upon inclusion of lasalocid. Cost of feed per kilogram live weight gain tended to decrease from inclusion level of 0.01 to 0.03% level. 0.03% level of lasalocid had the lowest cost and therefore was the most efficient.

In clusion of lasalocid did not significantly affect digestibility of nutrients (except crude fibre) in the experiment. The reduction in the crude fibre digestibility coefficients by ionophore was supported by the work of Mir[9] and could have been due to depression in the activities of the cellulolytic bacteria[11].

It can be observed from the experiment that addition of lasalocid tended, non significantly to increase nitrogen intake and nitrogen balance while the reverse was observed for nitrogen output.

In the experiment, inclusion of lasalocid up to 0.03% did not significantly affect Packed Cell Volume (blood dilution), Haemoglobin Concentration (i.e., capacity of the blood to transport oxygen) and Serum Urea levels upon inclusion of lasalocid. However, lasalocid enhanced Total Serum Protein in the experiment. Packed Cell Volume, Haemoglobin Concentrations and Total Serum Protein are indices that measure protein adequacy in animals. Results from the experiment indicated that there were enough proteins in the blood circulation to meet the demand of the animals.

CONCLUSION

Though inclusion of lasalocid up to 0.03% in the feed of WAD sheep did not have significant influence on its feed intake and nutrients digestibility yet growth response was positive with increasing levels of lasalocid. The lasalocid improved feed conversion ratio and lowered the cost per kilogram live weight gain in this trial, as obtained at 0.03% lasalocid inclusion rate.

Lasalocid inclusion in WAD sheep diet did not affect significantly, the blood dilution and oxygen carrying capacity of the blood but it enhanced protein status of the animals.

It can be recommended from the experiment that a minimum of 0.03% lasalocid be included in WAD sheep diets for better performance and cost efficiency. Further research should also be conducted to know the optimum inclusion level of lasalocid in the diets of WAD sheep.

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