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Original Article

Supplementation with *Moringa oleifera* Leaves on Hematological and Biochemical Indices of Uda Breed of Sheep on Natural Pastures

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Abstract

Aim: *Main purpose of the study was to explore the supplementation with Moringa oleifera leaves on hematological and biochemical parameters of Uda ewes on natural pastures.*

Method and materials: *The basic ration consisted of R0: (300g Dactyloctenium aegyptium + 300g Cenchrus ciliaris + 600g Panicum maximum); R1: R0 + 400g Moringa oleifera leaves; R2: R0 + 600g Moringa oleifera leaves at the end of growth, 5 animals per batch, aged 24 weeks, were taken at random from each batch and fasted for 12 hours, then sacrificed and blood collected directly into heparin tubes for assessment of haematological parameters and into non-heparin tubes for assessment of biochemical parameters.*

Results: *Results revealed that supplementation had no significant effect on haematological indices, but for biochemical indices, serum levels of glucose, total protein, creatine and ASAT significantly increased with increasing supplement levels in young Uda sheep.*

Conclusion: *It was concluded that 400g of Moringa oleifera leaves used with good results favoured protein supplement in Uda ewes.*

Introduction

Small ruminants play an important role in most domestic livestock production. The animals are also considered as a source of animal protein due to socio-economic and cultural roles played [1-4]. The productivity of these animals still remains low due to numerous feeding constraints resulting from low rainfall, which leads to a drastic drop in animal production [5].

Feeding small ruminants in Nigeria depends essentially on natural grazing, which, under the influence of the seasons, offers a low quality forage stock during the off - season, making it impossible to satisfy the livestock's maintenance needs [6] as the nutritional value deteriorates rapidly with age and the advance of the dry season [7-12]. This situation exposes small ruminants to food shortages, leading to a drop in animal performance. The drastic shortage of fodder during the dry season affects pregnant ewes and especially lambs [13,14], unlike goats, which can adapt to harsh conditions.

Improving ruminant production and productivity requires a good assessment of potential local feed resources [15]. The use of less costly non-conventional resources in animal feed has been increasingly explored in recent years. Among these sources, the leaves of *Moringa oleifera* proved to be an important source of protein in animal feed [16,17]. *Moringa oleifera is* a very leafy plant in the dry season, and is palatable to small ruminants [18]. Its leaf biomass is estimated at 200 kg of leaves for the pruned tree [19]. Its protein content ranges from 17-20% MS and its tannin content from 0.6% MF to 2.7% MS.

The work of Lemoufouet *et al*. [20] showed that organic matter digestibility (OMD) (35.43; 35.55; 35.85 and 37.10% MS) and digestible nitrogen matter (DNM) content (4.68; 5.47; 5.76 and 6.97 g/100 G mod) increased with the addition of *Moringa oleifera* pods in proportions of 0.10, 15 and 20% of the maize stubble-based ration respectively. Therefore, the study initiated to explore supplementation of *Moringa oleifera* leaf on haematological and biochemical indices of Uda ewes on natural pastures.

Materials and Methods

The study was conducted at the small ruminant research unit, University of Agriculture and Environmental Sciences Research and Teaching farm, Umuagwo, Imo State, Nigeria. Umuagwo is a town in the

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Ohaji/Egbema Local Government Area of Imo State, Nigeria. It is geographically situated at coordinates 5°18'25" N latitude and 6°56'37" E longitude. The community lies along the Owerri-Port Harcourt Road, roughly 26 km south of Owerri, Imo State, Nigeria. The year has two seasons: the dry season and the rainy season. The rainy season extends from April to October, with average rainfall varying from 400 to 800 mm [21] . The dry season, which lasts 6 months, is marked by the harmattan, a hot, dry wind that sweeps across the zone along a northeast to south-west axis. Temperatures oscillate between 20°C and 40°C. Vegetation was characterized by the shrub savannah in the southern part, dominated by *Moringa oleifera and Tephrosia vogelii*, depending on soil type.

A total of forty eight (48) Uda breed of sheep (45 non-pregnant females and 3 males) were purchased from local markets and used for the sheep breeding trials. Their average age, determined by the dentition analysis method [22], varied between 24 weeks and they weighed an average of 20.3 ± 1.2 kg. The animals were identified by a neck collar and housed in a stilted building constructed of planks (3 x 2.5 m).

Plant material

The plant material consisted of the basic forage grasses most abundant in the natural pastures *(Dactyloctenium aegyptium, Cenchrus ciliaris, Panicum maximum*) and *Moringa oleifera* leaves.

Ration formulation

Three rations were formulated and control ration (R_0) consisted solely of basic forages (300g *Dactyloctenium aegyptium* + 300g *Cenchrus ciliaris* + 600g *Panicum maximum*).

From the control ration, two other rations were created (R_1 andR_2), to which were added 400g and 600g of *Moringa oleifera* leaves respectively. The rations were as follows: - R_0: 300g of *Dactyloctenium aegyptium* + 300g of *Cenchrus ciliaris* + 600g of *Panicum maximum*; -R_1: R_0 + 400g of *Moringa oleifera* leaves; -R_2: R_0 + 600g of *Moringa oleifera* leaves*;* The different forages (Figure 1) and chemical composition of the forages used was recorded (Table 1). During breeding, animals in the control group returning from the grazing land received no supplement, while those in the supplemented groups received 400g and 600g of *Moringa oleifera* leaves respectively.

Trials conducted and data collection

Evaluation of supplementation of *Moringa oleifera* leaves on hemato-biochemical indices in young Uda sheep

At the end of growth, 5 animals per batch, aged 24 weeks, were taken at random from each batch and fasted for 12 hours, then transported to University of Agriculture and Environmental Sciences, Umuagwo, Imo State, Nigeria animal production slaughter laboratory and sacrificed by cervical dislocation followed by bleeding at jugular vein. Blood was drawn directly by cardiac puncture and collected in heparin tubes for evaluation of haematological indices and in non-heparin tubes for evaluation of biochemical indices. Recovered sera were frozen at -20°C until the day of analysis.

These indices included creatinine, total protein, triglycerides, total cholesterol, urea, albumin, aspartate amino transferase (ASAT) and alanine amino transferase (ALAT). The instrument used was a British-made Thermo Electron Corporation ultra-violet spectrophotometer. Hematological indices were determined using an automated system at Biochemistry laboratory, University of Agriculture and Environmental Sciences, Umuagwo, Imo State, Nigeria.

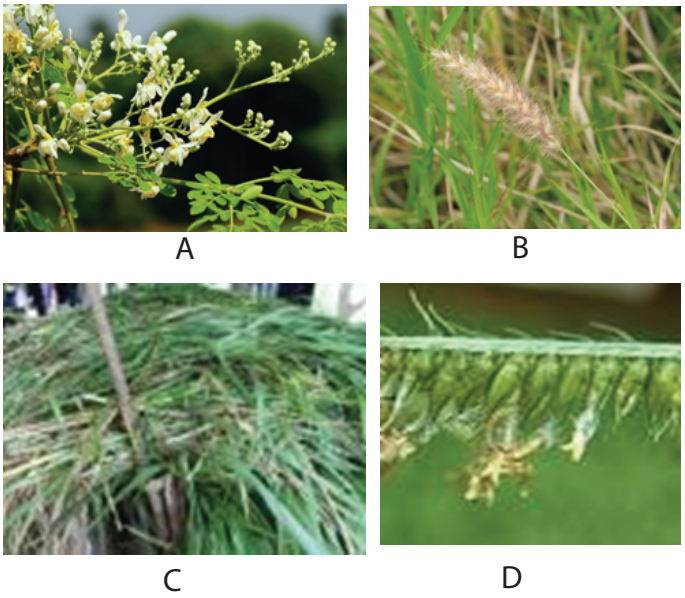

Figure 1. ***A*** *Moringa oleifera flower;* ***B.*** *Cenchrus ciliaris;* ***C.*** *Elephant grass (Pennisetum purpureum);* ***D.*** *Dactyloctenium aegyptium*

Figure 2. *Map of Umuagwo, Imo State, Nigeria.*

Table 1*: Chemical composition of forages used*

Chemical composition	Forages			
(% DM)	P. purperum	D. aegyptium	C. ciliaris	M. oleifera
Dry matter	91.16	93.75	95.79	95.6
Ash	11.91	7.11	4.22	6.62
Organic matter	79.24	86.63	91.56	88.98
Crude protein	13.12	9.5	16.06	21.85
Crude fiber	33.08	27.25	39.06	23.01
Fat	2.67	3.07	3.45	2.76

Mean corpuscular volume, mean corpuscular hemoglobin concentration, mean corpuscular hemoglobin content, hemoglobin, and mean corpuscular hemoglobin content, white blood cells and granulocyte were calculated or evaluated.

Data analysis

Data on haemato-biochemical indices were subjected to one-factor analysis of variance (feed intake) using the general linear where there were significant differences between treatments, Duncan's test was used to separate means at the 5% significance level [23]. SPSS 20.0 (Statistical Package for Social Sciences) was used for these analyses,

Results and Discussion

Supplementation of *Moringa oleifera* leaves on biochemical indices of young uda sheep. on serum levels of some biochemical indices (Glucose, Cholesterol, Triglyceride, Total Protein, Albumin, Creatinine, Urea, ASAT and ALAT) in young sheep was recorded (Table 2).

Serum concentrations of bio-indices were not significantly (P>0.05) influenced by *Moringa oleifera* leaf supplementation in any of the batches, with the exception of glucose, cholesterol, total protein, creatinine and AST. Indeed, serum glucose, total protein, creatinine and AST levels increased significantly ($p<0.05$) with increasing level of supplementation in young uda sheep batches. On the other hand, the opposite trend was observed for serum cholesterol levels. Supplementation of *Moringa oleifera* leaves on haematological indices in young Uda sheep was observed (Table 3). It was showed that supplementation with Moringa oleifera leaves had no significant effect (P>0.05) on haematological indices in any of the batches considered Serum concentrations of biochemical Serum concentrations of biochemical indices were not significantly influenced by supplementation with *Moringa oleifera* leaves in the rations, with the exception of glucose, cholesterol, total protein, creatinine and AST. Serum glucose, total protein, creatinine and AST levels increased significantly with increasing supplementation levels in ewe rations. The significant increase in serum protein may be explained by the effect of *Moringa oleifera* leaves on rumen microorganisms specifically proteolytic and ammonia producing bacteria, leading to a reduction in protein degradation and inhibition of the degradation of ammonia which was used efficiently in the gut, thereby increasing the protein available to the animal [24,25].

The results thus obtained were similar to those obtained by Mekuiko et al. [25] when they incorporated the essential oil of *Callistemon viminalis* of Guinea dwarf goats.

Blood indices were considered to be the main pathophysiological [26] and nutritional [27] indices for assessing the state of an organism. Any change in blood constituents compared with normal values was an important step for interpreting the metabolic state of the animal, but also the quality of the diet [28]. Decreased red blood cell count

Table 2: *Supplementation With Moringa oleifera leaves on biochemical indices of young Uda sheep*

Biochemical Indices	Lot_0	Lot_1	Lot_2	p
Glucose (g/l)	0.52±0.03b	0.65±0.08a	0.72±0.06a	0.006
Cholesterol (g/l)	0.54±0.09a	0.53±0.13a	0.36±0.02b	0.019
Triglycerides (g/l)	0.14±0.03	0.13±0.01	0.13±0.02	0.646
Total Protein (g/l)	71.65±2.92c	75.28±1.29b	80.01±1.74a	0.001
Albumin (g/l)	24.04±0.92	26.74±1.98	24.36±2.59	0.239
Creatinine (mg/l)	11.80±0.09b	12.60±0.70a	12.79±0.62a	0.007
Urea (g/l)	0.27±0.10	0.27±0.12	0.32±0.10	0.859
ASAT (UI/l)	81.37±1.05c	83.10±0.60b	87.00±1.05a	0.001
ALAT (UI/l)	25.33±2.12	26.84±2.53	25.93±2.43	0.865

a, b, and c: Values assigned the same letter on the same line do not differ significantly (p>0.05). Lot 0 (control) = dominant rangeland forage without Moringa oleifera Lot 1 = dominant rangeland forage + 400g Moringa oleifera; Lot 2= dominant rangeland forage + 600g Moringa oleifera; P = Probability, IU=International Unit.

Table 3: *Supplementation With Moringa oleifera leaves on haematological Indices of young Uda sheep*

Haematological Indices	Lot_0	Lot_1	Lot_2	p
Ht (%)	49.83±1.98	48.69±1.69	48.60±1.96	0.728
GR(1012/l)	5.05±0.09	5.03±0.08	5.03±0.07	0.697
Hgb (g/l)	112.22±3.40	105.34±3.09	109.38±3.92	0.191
CCMH (g/l)	274.14±0.27	274.11±0.19	274.52±0.29	0.062
VGM (fl)	80.05±0.08	80.06±0.06	80.07±0.12	0.843
TCMH (p/g)	22.70±0.81	21.88±1.26	21.98±0.72	0.603
GB (109l)	9.86±0.23	9.16±0.35	9.62±0.83	0.156
GN (109l)	4.37±0.10	4.61±0.19 4	.42±0.14	0.167

a, b: Values assigned the same letter on the same line do not differ significantly (p>0.05). Batch 0 (control)= dominant rangeland forage without Moringa oleifera Batch 1= dominant rangeland forage + 400g Moringa oleifera; Batch 2= dominant rangeland forage + 600g Moringa oleifera; P = Probability; P = Probability; MGV: Mean Globular Volume; MBCC: Mean Corpuscular Hemoglobin Concentration; TGMH: Mean Globular Hemoglobin Content; Hgb: Hemoglobin; Ht: Hematocrit; TCMH: Mean Corpuscular Hemoglobin Content GB: white blood cells; GN: granulocyte

is usually associated with poor-quality feed. Hemoglobin determines an animal's ability to withstand a certain level of respiratory stress and hematocrit was the proportion of red blood cells in a blood pellet [29]. When their values were high, referred to as characterizes polycythemia and when they were low was called anaemia [30].

In the present study, supplementation had no significant effect on hematological indices regardless of the ration used. Nevertheless, the values of the various haematological indices obtained in this study were similar to those obtained by Ndoutamia and Ganda [31] on the determination of haematological and biochemical indices of small ruminants in Nigeria.

Conclusion

It was concluded that supplementation with Moringa oleifera leaves in the diet of Uda ewes on natural pastures in the peri-urban area of Southern Nigeria showed that the supplement had no significant effect on haematological indices. However, with regard to biochemical indices, serum levels of glucose, total protein, creatine and ASAT increased significantly with increasing levels of supplementation in young Uda sheep.

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