



## Blood Profile of West African Dwarf Goats Fed *Panicum Maximum* Supplemented with *Myrianthus Arboreus* Leaf Meal

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**ABSTRACT:** A study was conducted to evaluate the haematological and serum biochemical indices of West African Dwarf (WAD) goats fed *Panicum maximum* supplemented with *Myrianthus arboreus* leaf meal. Four diets were formulated such that diets A contained 0, B 10, C 11 and D12% of *Myrianthus arboreus* leaf meal respectively to replace palm kernel cake in a complete concentrate diet. The diets were fed to twelve (12) (WAD) goats randomly assigned in a Completely Randomized Design with three animals per treatment, each serving as a replicate. Blood was collected from each animal via the jugular vein into bottles containing anticoagulant and without anti-coagulant for the measurement of haematological and serum biochemical indices respectively. The study lasted for 63 days. Results showed that the blood parameters were significantly ( $p < 0.05$ ) influenced by the diet. Goats fed diet D had the highest packed cell volume (30.33%), red blood cells ( $1.12 \times 10^6 \mu\text{l}$ ), white blood cell ( $0.33 \times 10^6 \mu\text{l}$ ), haemoglobin ( $9.67 \times 10^6 \mu\text{l}$ ), lymphocytes (64.67%) and neutrophil (25.33%). The serum biochemical parameters also indicated that, total protein (66.09g/l) was highest in diet C. The albumin (38.67g/l), albumin/globulin ratio (2.02) were higher in animals offered diet D, while the serum enzymes alanine amino transferase (8.80 iu/l) and aspartate aminotransferase (218.67iu/l) were least in animals fed diet C. The results suggest that *Panicum maximum* can be supplemented with *Myrianthus arboreus* at 12% inclusion level without adverse effect on the health status of the goats

**Keywords:** Aspartate aminotransferase; Globulin; Haematology; *Myrianthus arboreus*; WAD goats.

JoST. 2021. 11(1): 32-37

Accepted for Publication, March 13, 2021

### INTRODUCTION

Ruminants thrive on forages such as grasses and legumes as their main source of feed. However, sufficient forage may not be available throughout the year due to low production during the dry season and the few ones available are highly lignified. This trend has aroused several interests in the search for less expensive, less competitive, under-utilized, readily available feedstuffs as alternatives. In Nigerian livestock industry, browse plants are becoming an integral part of livestock feeds due to their high nutrient profile, seasonal availability and affordability (Amata, 2010). *Myrianthus arboreus* leaves are a good source of nutrients

(protein; 18.74% DW, ash; 16.4%) and can be used as a protein supplement in compounding livestock feed and the leaf meals can be well tolerated by most livestock. The leaves also contain appreciable level of sulphur containing amino acids, acceptable levels of anti-nutritional factors (Amata, 2010). In considering the health status of an animal, blood examination is an insightful pointer that reveals the health condition of the animal. Hence, the thrust of this study is to examine the influence of *Myrianthus arboreus* supplemented diets on the health status of West African Dwarf goats.

## MATERIALS AND METHODS

### Experimental Site

The experiment was conducted at the Small Ruminant Unit of the Teaching and Research Farm, The Federal University of Technology, Akure, Ondo state, Nigeria. Akure is located on longitude 4.944055° and 5.82864°E, and latitude 7.491780°N with annual rainfall ranging between 1300mm and 1650mm average maximum and minimum daily temperature of 38°C and 27°C respectively (Daniel, 2015).

### Experimental Animals

A total of twelve (12) West African Dwarf bucks weighing between 5.20-6.03kg were purchased from a reputable source and were randomly assigned to four dietary treatments of three replicates per treatment in a Completely Randomized Design.

### Experimental Diets and Animal Management

Four diets designated as diet A, B, C and D were formulated to contain 0, 10, 11 and 12% *Myrianthus arboreus* leaf meal respectively (Table 1). Before the commencement of the feeding trial, the pens were thoroughly cleaned and disinfected. An acclimatization period of 14 days was allowed before the commencement of

data collection during which the animals were maintained on *Panicum maximum* and cassava peel. At the commencement of the trial, the animals were fed 3% BW of the formulated diets as supplement to grass in the morning (8:00am) and the grass (*Panicum maximum*) 2%BW in the afternoon (2:00pm) and cool clean water was served. The feeding lasted for a period of 63 days.

### Blood Collection

Thereafter, blood samples (5ml) was collected from each goat via the jugular vein into sterilized bottles with and without anti-coagulant for haematological and serum analyses respectively. The haematological indices were determined as described by Olafadehan (2011), serum proteins and enzymes were evaluated as described by Akinrinmade and Akinrinde (2012), Reitman and Frankel (Olafadehan, 2011) respectively.

### Statistical Analysis

All data obtained were subjected to one way analysis of variance (ANOVA) of SAS (2012) and significant means were separated using the Duncan's multiple range test of the same package.

**Table 1: Gross Compositions of Experimental Diets**

Ingredients	Diet (%)			
	A	B	C	D
Maize Offal	47.00	47.00	47.00	47.00
Rice bran	27.00	27.00	27.00	27.00
Palm kernel cake	22.00	12.00	11.00	10.00
<i>M. Arborues</i>	0.00	10.00	11.00	12.00
Urea	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00
Salt	1.00	1.00	1.00	1.00
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

## RESULTS

The chemical composition of the experimental diets is presented in Table 2. The dry matter of the experimental diets ranged between 91.33-92.55% while the crude protein was between 19.03- 20.55%. The crude protein values compared favourably with the report of Asaolu

*et al.* (2012) for goats fed *Moringa oleifera*, *Gliricidia sepium* and *Leuceana leucocephala* dried leaves as supplements to cassava peels. All the diets had crude protein values higher than 8% reported by Norton (2003) as adequate to satisfy the maintenance requirement for

ruminants. The high ash content obtained suggests high mineral concentrations in all the diets. The neutral detergent fibre, acid detergent fibre and acid detergent lignin values ranged from 54.12-59.71%, 32.08-36.15% and 24.65-27.80% respectively. The high fibre fractions in the diets suggests that the diets are adequate in fibre necessary for effective rumen function.

The haematological response of WAD goats fed the experimental diets is presented in Table 3. The results were significantly ( $p < 0.05$ ) influenced by the diets except ESR and basophils. Erythrocyte Sedimentation Rate (ESR) values observed was 1.00mm/hr in all diets. The packed cell volume (PCV) values of the goats fed the diets ranged from 26.00% (diet A) to 30.33% (diet D). Red Blood Cell (RBC) count observed ranged from  $0.94 \times 10^6/\mu\text{l}$  (diet A) to  $1.12 \times 10^6/\mu\text{l}$  (diet D). White Blood Cell (WBC) count observed ranged from  $0.28 \times 10^6/\mu\text{l}$  to  $0.33 \times 10^6/\mu\text{l}$ , goats fed diet C had the least WBC count while goats fed diet D had the highest. Haemoglobin (Hb) content observed ranged from 8.77g/dL to 9.67g/dL, with goats fed diet C having the least haemoglobin content while goats fed diet D had the highest. Lymphocytes content ranged from 62.33% to 64.67%, the goats fed diet B had the least while goats fed diet D had the highest. Neutrophils content ranged from 23.67% to 25.33%, the

goats fed diet C had the least while goats fed diet D had the highest. Monocytes content ranged from 7.00% (diets D) to 11.67% (diet C). Eosinophils content ranged from 2.00% (diets C and D) to 2.33% (diet A and B) while the Basophil content was the same value (1.00%) in all the goats fed the experimental diets.

The result of the serum biochemical indices of West African Dwarf (WAD) goats fed the experimental diets is revealed in Table 4. Total protein, albumin, globulin, aspartate aminotransferase and alanine aminotransferase were significantly ( $P < 0.05$ ) influenced by the inclusion of *Myrianthus arboreus* in the diets with the exception of albumin/globulin ratio. Total protein ranged from 49.96 g/l to 66.09g/l with goats fed diet B having the least value while goats fed diet C had the highest value. Albumin observed was highest (38.67g/l) in goats fed diet D and least 27.51g/l in goats fed diet B). The highest (36.26g/l) globulin was obtained in goats fed diet C, while least (19.11g/l) was observed in diet D. Albumin/globulin ratio observed ranged from 0.82 (Diet C) to 2.02 (Diet D). Aspartate aminotransferase (AST) was highest 240.67 iu/l in animals on diet A and least 218.67 iu/l in diet C fed animals while Alanine aminotransferase (ALT) value (17.20 iu/l) was highest in goats fed diet B and least (8.80 iul) in diet C fed goats.

**Table 2: Chemical Composition (%) of the Experimental Diets**

Parameters	A	B	C	D
	0%	10%	11%	12%
Dry matter	91.33	91.91	91.34	92.55
Crude protein	19.17	19.03	19.12	20.55
Crude fibre	9.23	10.79	10.68	13.08
Ether extract	11.01	12.62	11.74	11.94
Ash	12.33	11.18	12.14	13.97
Nitrogen free extract	48.26	46.38	46.32	40.46
Neutral detergent fibre	54.12	59.71	56.53	58.50
Acid detergent fibre	36.15	34.18	32.08	38.44
Acid detergent lignin	25.04	25.52	24.65	27.80
Hemicellulose	17.97	25.53	24.45	20.06
Cellulose	11.11	8.66	7.43	7.74

A, B, C, D = Levels of *M. arboreus* leaf meal inclusion

**Table 3: Haematological indices of WAD Goats Fed Experimental Diet**

Parameters	A	B	C	D	±SEM
	0%	10%	11%	12%	
ESR (mm/hr)	1.0	1.0	1.0	1.0	0.01
Packed cell Volume (%)	26.00 <sup>c</sup>	27.00 <sup>b</sup>	27.00 <sup>b</sup>	30.33 <sup>a</sup>	0.89
Red Blood Cell (x 10 <sup>6</sup> µl)	0.94 <sup>ab</sup>	0.99 <sup>a</sup>	0.99 <sup>a</sup>	1.12 <sup>b</sup>	0.05
White Blood cell (x 10 <sup>6</sup> µl)	0.30 <sup>ab</sup>	0.29 <sup>b</sup>	0.28 <sup>ab</sup>	0.33 <sup>a</sup>	0.01
Haemoglobin (g/100ml)	9.00 <sup>ab</sup>	9.43 <sup>ab</sup>	8.77 <sup>b</sup>	9.67 <sup>a</sup>	0.20
Lymphocytes (%)	62.67 <sup>b</sup>	62.33 <sup>b</sup>	64.33 <sup>a</sup>	64.67 <sup>a</sup>	0.79
Neutrophil (%)	24.00 <sup>bc</sup>	24.67 <sup>b</sup>	23.67 <sup>c</sup>	25.33 <sup>a</sup>	0.54
Monocytes (%)	8.00 <sup>b</sup>	7.33 <sup>c</sup>	11.67 <sup>a</sup>	7.00 <sup>c</sup>	0.28
Eosinophil (%)	2.33 <sup>a</sup>	2.33 <sup>a</sup>	2.00 <sup>ab</sup>	2.00 <sup>ab</sup>	0.11
Basophil (%)	1.00	1.00	1.00	1.00	0.11

a,b,c= means within the same row with different superscripts are significantly different (p<0.05)

A, B, C, D = Levels of *M. arboreus* leaf meal inclusion

ESR = Erythrocyte sedimentation rate

**Table 4: Serum Biochemical Indices of WAD Goats Fed Experimental Diet**

Parameters	A	B	C	D	±SEM
	0%	10%	11%	12%	
Total protein (g/l)	55.13 <sup>c</sup>	49.56 <sup>d</sup>	66.09 <sup>a</sup>	57.78 <sup>b</sup>	2.11
Albumin (g/l)	30.17 <sup>ab</sup>	27.51 <sup>bc</sup>	29.83 <sup>b</sup>	38.67 <sup>a</sup>	2.59
Globulin (g/l)	24.96 <sup>b</sup>	22.05 <sup>b</sup>	36.26 <sup>a</sup>	19.11 <sup>c</sup>	4.06
Albumin/globulin	1.21	1.25	0.82	2.02	0.29
Alanine amino transferase (iu/l)	16.67 <sup>b</sup>	17.20 <sup>a</sup>	8.80 <sup>c</sup>	16.80 <sup>b</sup>	1.73
Aspartate amino transferase (iu/l)	240.67 <sup>a</sup>	228.00 <sup>ab</sup>	218.67 <sup>b</sup>	228.17 <sup>ab</sup>	3.51

a,b,c = means within the same row with different superscripts are significantly different (P<0.05)

A, B, C, D=Levels of *M. arboreus* leaf meal inclusion

## DISCUSSION

The chemical composition (Table 2) depicting the nutritional quality of the experimental diets had earlier been reported (Fajemisin *et al.*, 2018). Shown in Table 3 is the haematological results. Elevated Erythrocyte sedimentation rate (ESR) is an indication of infection in mammals (Olorunnisomo and Abiola, 2015). The low level of ESR obtained in this study is an indication that the animals did not suffer any form of infection. The packed cell volume (PCV) of WAD goats are within the normal range of 21-35% reported for healthy goats (Daramola *et al.*, 2005). Red blood cell values obtained is comparable with the reports of Adebosin (2009) and Daramola *et al.* (2005) who reported 0.7 g/dl to 1.03 g/dl. Plumb (1999) reported that concentration of haemoglobin (Hb) in the cytoplasm of the red blood cells gives an indication of the oxygen carrying capacity of the blood of the individual.

The haemoglobin concentration obtained in this study (8.77- 9.67 g/dl) were within the range of haemoglobin values (7-15 g/dl) for healthy goats, suggesting that the goats had sufficient blood pigment for proper transportation of oxygen for healthy living. Goats fed the experimental diets had their white blood cell (WBC) values within the normal range reported by Plumb (1999). This revealed that the goats would have defense ability against infection. A low white blood cell count indicates decrease in disease-fighting cells (leucocyte) in the animal's circulatory system. Lymphocytes are responsible for humoral and cell-mediated immunity responses (Mahgoub *et al.*, 2008). The lymphocytes values are within the range recommended by Plumb (1999) and Tambuwal *et al.* (2002). The observed level of lymphocytes of goats in the study implied that the diets were adequate in nutrients to have

conferred some level of immunity on the experimental goats thereby protecting them against infection. The lymphocytes values obtained in this study were comparable to the range of 47-82% (Daramola *et al.*, 2005) and 51.6% reported by Tambuwal *et al.* (2002) for WAD goats. The eosinophils aligns with the normal range suggested for healthy goats (Plumb 1999). This indicated that there was no allergic reaction imposed by the dietary treatment.

The biochemical indices results is presented in Table 4. The high values of serum total protein in goats are indicator of quality protein in the experimental diet (Aletor *et al.*, 1998). The concentration of total protein obtained in this study is slightly lower than the range 64-78 g/l reported by Opara *et al.* (2010) for normal range of healthy goats except in goats fed diet C which had a higher value of 66.09 g/l. Values obtained were also lower than the report ( 65.00- 97.54 g/l) of Ibhaze et al 2021 for WAD goats fed treated maize cob and maize husk based diets with mixture of microorganisms. Albumin helps to hasten blood clot during injury thereby reducing loss of blood. The higher the value of albumin, the higher the clotting ability of the blood hence prevention of hemorrhage (Roberts *et al.*, 2003). The albumin values obtained in

this study were slightly higher than the range 24 g/l to 44 g/l (Opara *et al.*, 2010) for healthy goats. This therefore suggests that the platelets will be available for blood clotting if the need arises. The globulin values were lower than the range (34.40 g/l to 55.70 g/l) in a healthy goat (Kaneko, 1989). Awojobi and Opiah (2000) observed that the higher the value of globulin, the greater the ability to fight infection because globulin is known to fight infection. Akinmutimi and Eburuaja (2010) noted that low level of globulin could lead to high mortality, however, no mortality was recorded during the experimental period. AST is an enzyme abundantly found in the liver and heart muscles and plays an important role in amino acid metabolism (Vojta *et al.*, 2011). Daramola *et al.*, (2005) reported 20.9 iu/l of AST in WAD goats which is lower than those reported in this study. The ALT is also an enzyme found in the liver and typically used to detect liver injury (Pratt, 2010). The values observed in this study were within the same range (8.9 u/l) reported by Daramola *et al.* (2005) for healthy goats. These values are indications that the goats were not challenged and the inclusion of *Myrianthus arboreus* in their diets did not cause any form of tissue damage in the animals.

## CONCLUSION

The appreciable levels of the red blood cells and packed cell volume suggests that *Myrianthus arboreus* may possess compounds that could improve erythropoiesis in mammals.

Supplementing *Panicum maximum* diet with 12% *Myrianthus arboreus* in the diet of West African Dwarf goats would improve the health of WAD goats.

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