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Haematological Indices of West African Dwarf Goat Fed Leaf Meal Based Diets

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Abstract

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Growing West African dwarf (WAD) goat (n=20) fed four different leaf meal based diet were compared in a completely randomized design model to determine the relationship between feed intake and haemotological indices for a 56 day period. The experimental diets consist of A (Akee apple leaf meal), B (*Etanda africana* leaf meal), C (*Gliricida sepium* leaf meal) and D (Baobab leaf meal). The results showed significant differences ($P<0.05$) in all the parameters (DMI, CPI, CFI, EEI, NDF intake and ADFF intake) determined but without corresponding influence ($P>0.05$) in the haematological indices (PVC, He, RBC, WBC, lymphocytes, neutrophils oesinophils, monocytes and Batophils. In conclusion, the results suggest that heavy ruminant production may benefits from the use of leaf meal prepared from Akee apple leaves, *Etanda africana* leaves, *Gliricida sepium* leaves and Baobab leaves without any detrimental effect on the health status of the animals.

Key words: leaf meal, intake, haematological indices, West Africa dwarf goat

Introduction

Ligneous plants which may be trees, small trees shrubs or undershrubs are vital component of the fodder resources for livestock animals (Baumer, 2007). The values of their leaves and fruits are often superior to herbaceous plants. It provides the greatest part of the protein especially during the dry periods of the year. It is estimated that 80% of the protein ration is provided by the plant of the family *Cappa-raceae* in Sahel regions during the driest months of the year.

The cutting of leaves for animals was dated back to the Roman times. While the nutritional value of *Gliricid*ia specie as a supplement to the natural flora (mixed with 50% grass) for the feeding of livestock animals mostly during the dry period of the year was discovered a few decades ago. In Central Ethopia, *Erythrina burana* was reported used for the feeding of livestock by farmers. The pods,

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leaves and even the bark of the plant were found to be palatable to livestock animals.

It is noteworthy that not all fodder trees are legumes and most of the legumes are rich in protein but they are not the only plant family that is rich in protein. Additionally, not only high protein makes a good fodder plant but the digestibility of such plant is of great importance. Hence, leaves and fruits of ligneous species have a higher digestible protein (DCP) than other fodder sources (Guerin et al., 1986).

Leaf meal made from fodder shrubs is helping small scale farmers in Tanzania to boost their yield (Spore, 2006). Leaf meal made from *Leucana leucocephal*a is widely produced and marketed in Tanzania by compressing the leaf meal into bricks or pellets so as to reduce the cost of transportation. Despite, the importance of leaf meal, it is known that the leaves harbour wide range of toxins like tannins, haemoggl-utinins, saponin, and prosopine etc, hence the potential use of the leaf meal is still in doubt. However, the sourcing for readily and locally available feed ingredients to enhance food production, stimulated this research which aimed at evaluating the efficacy of leaf meal on the hematological parameters of West African dwarf goat fed leaf meal based diets.

Materials and Methods

Experimental Site and Climate

The experiment which was conducted during the rainy season (July) in Nigeria was carried out at the Animal Pavilion of the Department of Animal Production, University of Ilorin, Nigeria. The University of Ilorin lies in the middle belt region of Nigeria with seven months of rainy season (annual rainfall of 1500 mm) and five months of dry season.

Animal and Management

Twenty growing West African dwarf goats (average initial weight of between 4 and 7 kg) used for the experiment were kept in individual pen measuring 1.5x0.75x1.8 m with asbestos roof and dwarf walls.

Two weeks prior to the start of the experiment the pen were thoroughly washed and the cob web removed and the whole place disinfected with strong antiseptic (Morigad). Prior to the commencement of the experiment the animals were also treated against ecto and endo parasites using Ivomec super (Ivermectin 10 mg/ml) manufactured by Menal of France while oxytetracycline LA (Oxytetracycline, 200 mg/ml) manufactured by *Invesa of Spain* was used against pneumonia and cold. The animals were weighed at the start and end of the experiment to obtain weight gain.

Collection and Preparation of Leaf meals

Various leaves used for the experiment were collected around the University of Ilorin, main campus, Nigeria. The leaves were washed in water so as to clean soil and dust off the leaves. The washed leaves were air dried in shade and later milled to prepared the leaf meal

Experimental Diet

The experimental diets consist of Akee apple leaf meal (Diet A), *Etanda africana* leaf meal (Diet B), *Gliricidia sepium* leaf meal (Diet C) and *Baobab* leaf meal (Diet D). While other ingredients are of fixed proportion (Table 1). The experimental animals were randomized against the experimental diets in a completely randomized design model for a 14 day preliminary and adjustment period followed by a 56

Table 1

The components of the experimental diets, %

Ingredients	Diet A	Diet B	Diet C	Diet D
Cassava waste	38	38	38	38
Leaf meal	40.00a	40.00b	40.00c	40.00d
Wheat offal	20.5	20.5	20.5	20.5
Salt	1	1	1	1
Vitamin-mineral premix	0.5	0.5	0.5	0.5
Total	100	100	100	100

Note: a = *Akee apple leaf* meal
b = *Entanda africana* leaf meal
c = *Gliricidia sepium* leaf meal
d = *Baobab leaf meal*

Table 2

Proximate analytical composition of the experimental diets and leaf meals on dry matter basis

Nutrients, %	Feeds (Diet)				Leaf Meal			
	A	B	C	D	A *Akee apple leaf meal*	B *Etanda Africana* leaf meal	C *Gliricidia sepium* leaf meal	D *Baobab leaf meal*
Dry matter (DM)	92.5	93.26	96.25	93.8	93.65	93.8	94.1	93.85
Crude fibre	14.49	14.32	11.12	11	14.1	10.71	13.23	10.55
Crude protein	11.95	10.33	11.71	10.4	18.69	13.3	19.99	13.76
Ether extract	3.57	4.02	3.95	3.31	3.9	2.88	4.25	3.36
NDF	63.49	62.16	62.73	55.3	70.69	60.7	66.5	66.13
ADF	56.2	55.01	51.03	59.8	62.54	53.81	50.75	57.96
Lignin	11.3	9.5	9.25	8.64	10.5	8.42	8.35	7.35

day experimental period while feeding and watering were given *ad libitum.*

Blood Collection

Blood samples were taken from the jugular vein of the experimental animals fortnightly into sample bottle containing EDTA. The contents were gently mixed for hematological parameters.

The red blood cell and white blood cell were determined by the method of Wootton (1964). The Packed cell volume (PCV) was measured by the method of Jain (1993). Hemoglobin concentration was estimated by the method of Drakben (1949).

Table 3

Daily feed intake of the experimental animals fed leaf meal based diets

Parameters, g/day	A	B	C	D	±*SEM*
Dry matter intake	301.80a	208.90c	252.80b	295.90a	11.05*
Crude protein intake	35.00a	21.63c	29.63c	30.45b	1.12*
Crude fibre intake	43.75a	29.88b	28.13c	32.63bc	1.42*
Ether extract intake	10.76ab	9.80ce	9.99acd	8.40bde	0.72*
NDF intake	191.63a	130.00c	158.50b	163.50b	6.75*
ADF intake	169.63a	114.75c	129.00b	167.75a	6.17*
Lignin intake	34.13a	19.88c	23.38b	25.50b	1.12*

Means with the same letters in each row are not significantly differently (P>0.05)

Analyses

The chemical analysis of the feed was determined by AOAC (1990) method while all data collected were subjected to analysis of variance of a completely randomized design model. The means were separated by Duncan (1955) multiple range test (Tables 2 and 3).

Results and Discussion

The evaluation of the haematological indices is in line with the view of WHO (1963) that blood examination is a good way of assessing the health status of animals as it plays a vital role in the physiological, nutritional and pathological status of animals.

The values of PCV (Packed Cell Volume) (Table 4)obtained for animals on Diets A, B, C and D fell between the values (22-38%) reported by Lazzaro and Saanendoah (2005) and Belewu et al. (2006). It also fell between 21 and 35% reported by Daramola et al. (2005) as normal for West African dwarf goats. However, the PCV of animals on diet C fell below the two ranges by 1.5 and 0.5% respectively. Hence, diets A, B and D can be described as diets that maintain animals on normal PVC value. It is worth noting that animals on diet C did not show any symptoms of poor health.

The Hb (haemoglobin) (Table 4) values of the animals on diets A to D was in agreement with the reports of Daramola et al. (2005), Lazzaro Saanendoah (2005) and Belewu et al. (2006). Since, haemoglobin function as a career of oxygen to target organs by forming oxyhaemoglobin (Harmon, 2006) hence animals on diets A to D are at advantage. The value of red blood cell (RBC) (Table 4) reported herein agreed with the values reported by Lazzaro and Saanendoah (2005) and Belewu et al. (2006) for similar animal. This shows that the diets supported the health status of the animals. The value of the white blood cell (WBC) obtained in this experiment supported the reports of Daramola et al. (2005) that WAD goats possesses a protective system providing a rapid and potent defense against any infectious agent and this probably form the physiological basis for the adaptation of the species to West African eco-zone which is characterized with high prevalence of diseases. The percentage distri-

Table 4

Haematological values of WAD goat fed leaf meal based diets+

Parameters	Diet A	Diet B	Diet C	Diet D	±*SEM*
Packed cell volume, %	23.25	22.25	20.5	24.8	2.4NS
Haemoglobin, g/dl	7.76	5.71	6.71	8.3	0.92NS
Red blood cell x 10^{12}c	6.5	6.54	6.09	9.52	0.54NS
White blood cell x 10^{11}c	5.49	5.24	4.16	4.94	0.57NS

NS = Not significant (P>0.05)

\+ = Mean of 4 determinations

Table 5

Percentage distribution of leukocytes in the blood of WAD goat fed leaf meal based diet +

Parameters	Diet A	Diet B	Diet C	Diet D	± *SEM*
Lymphocytes,%	49.91	49.83	53.66	51.91	1.74NS
Neutrophils, %	46.8	46.3	44.5	45.8	2.4NS
Eosinophils, %	3.16	3.25	1.66	2.08	1.36NS
Monocytes, %	-----	-----	-----	-----	------
Basophils, %	1.66	2	0.66	0.66	1.22NS

NS = Not significant (P>0.05)

+ = Mean of 4 determinations

bution of the White blood cell precursors (Table 5) in all the animals conform to the reported values of Lazzaro and Saanendoah (2005) and Belewu et al. (2006). This probably shows that animals placed on diets A to D maintained an active immune system that defends the body against infection, allergic reactions, parasites and antigens.

Conclusion and Implications

The results of this study revealed that animals fed diets A to D maintained normal haematological indices, thereby keeping all animals on healthy condition. Hence, feeding leaf meal based diets *(Akee apple, Etanda africana*, *Gliricidia and Baobab leaf meals*) to West African dwarf goats should be encouraged among farmers in order to improve ruminant performance.

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