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PERFORMANCE AND HAEMATOLOGICAL PROFILE OF GROWING WEST AFRICAN DWARF GOATS FED CONCENTRATE DIET SUPPLEMENTED WITH BROWSE PLANTS

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ABSTRACT

Sixteen (16) growing male West African dwarf goats were allotted to four (4) treatments (T1-T4) of four goats each. The goat were fed leaves from Gmelina aborea (T_1) Tamarindus indicus (T2), (Azadirachta indica (T_3) and Tectona grandis (T4) at 300g/goat/day and a concentrate supplement at 100g per goat/day for thirty five (35) days. To determine their performance and haematological profile in the last weeks of the experiment blood sample were collected from the jugular vein of the goat for haematological studies. There were significant ($p < 0.05$) differences in daily browse intake (134.22g-245.44g), daily weight gain (2.86g-30.00g) and feed conversion ratio (11.33-78.86) with goats on T1 having best values, however daily supplement intake was not significant. Mean corpuscular volume (1.09-1.16) was not significant ($p > 0.05$), red blood count (1.66-3.71 x 10^3/uL), white blood count (21.55-33.85 x 10^3/uL), haemoglobin (32.20-41.05 pg), monocytes and neutrophiles (5.55-33.30 and 27.60-40.75) were significant. Goats fed Gmelina (T1) gave the optimal performance in terms of browse intake (245.44g), daily weight gain (30.00g) and feed conversion the ratio (11.33). The haematological indices of the goats were also within normal range. It was therefore recommended that the four browse species were suitable and safe for goat feeding especially during the long dry season. Further research using other breed and classes of goat as well as other species of ruminant was also recommended.

Key words: Performance, WAD Goats, *Gmelina aborea,Tamarindus indicus, Azadirachta indica, Tectona grandis*

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INTRODUCTION

Nutrition is one of the most important factors that determine the development and expansion of livestock sector in the tropics. The inability of ruminant livestock farmers to feed their animals with high quality forage all year round remain the most wide spread technical constraint facing ruminant productivity in the developing nations (Bawala and Akinsoyinu 2002). Contemporary ruminant feeding in a developing country like Nigeria is partly geared towards searching for inexpensive readily available feed resources, which can partially or wholly serve as substitute for the scarce expensive feed stuffs and inadequate forage (Okoruwa and Adewumi, 2010). Inadequate grasses during the long dry season necessitate the use of browse species in feeding ruminant animals.

More over these browse species are evergreen and readily available within the study area.

Since grasses and legume which constitute a major proportion of forage which are the basal feed for ruminants, are usually in short supply during the long dry season, there is the need therefore to feed ruminants with leaves (browse) from trees especially those that are evergreen that do not bear fruits/seeds that are in direct use by man. Consequently this study was therefore designed to study the effect of four (4) browse species (*Gmelina aborea, Tamarindus indicus, Azadirachta indica, and Tectona grandis*) on the performance and haematological profile of growing West African dwarf goats.

MATERIALS AND METHODS

Location: The experiment was conducted at the Sheep and Goat unit of Livestock Teaching and Research farm, Kogi State University, Anyigba. Anyigba is located in the derived Guinea Savannah zone of Nigeria on latitude $7^0 15^{'}$ and $7^0 29^{'}$ N of the equator and longitudes $7^0$11' and $7^0$32'E of the Greenwich meridian. The zone lies in the warm humid climate of the tropics with clearly marked wet and dry season in April to October and November to March respectively with annual rainfall ranging from 1400-1500mm and an ambient temperature of about 25^0C with the highest in March and April (Ifatimehin *et al.,* 2009).

Feed preparation, Experimental Animals, and Management: A total of 16 growing male West African dwarf goats (bucks) were sourced from Anyigba and its environs. The animals were housed individually and treated with Ivomec®, for endo (internal) and ecto (external) parasite control at 0.3ml each and oxytetracycline hydrochloric and procaine penicillin at 2.0ml each as prophylactic dose to provide a common health status. The browse species used for this experiment were collected from within Kogi State University campus, Anyigba. Browse species were collected and wilted for 24hours to reduce the moisture content before feeding. The cashew nutshell was collected from Kogi State University Cashew processing plant and was pounded and mixed thoroughly with other feed ingredients such as Maize offal (MO), Bambara nut offal (BO), Fish offal (FO), Rice offal (RO), Wood ash (WA), Bone meal and table salt as shown in Table 1 below. These ingredients were ground to desired texture.

The goats were allotted in a Completely Randomized Design (CRD) into four (4) treatments. Each treatment had four (4) goats. Each goat was fed 100g of the supplement diet per day. The browse species *Gmelina (Gmelina aborea), Tamarind (Tamarindus indicus), Neem (Azadirachta indica)* and *Teak (Tectona grandis*) were wilted for 24 hours and fed at 300g/day for each treatment (T_1, T_2, T_3 and T_4 respectively) of which the browse were fed first, then the supplement one hour later.

The goats were weighed on a weekly basis; initial live weight was subtracted from the final live weight to obtain the total weight gain. Feed offered to the goats was weighed daily and the left over was also weighed and subtracted from the quantity of feed served to determine the feed intake. The goats were weighed in the morning (7:00-9:00am) prior to feeding each week. The values (data) obtained were used to determine Feed Conversion Ratio (FCR). The study lasted for thirty five (35) days after seven (7) days of preliminary feeding.

Table 1: Composition of Concentrate Diet (% DM)

Feed Ingredients	Composition (%)
Cashew nut shell (CNS)	10.00
Maize offal (MO)	27.00
Bambara nut offal (BO)	48.00
Fish offal (FO)	5.50
Rice offal (RO)	5.00
Wood ash (WA)	1.00
Bone meal	2.00
Table salt	1.50
Total	**100**
Calculated nutrient content:	
Crude protein	18.47
Gross energy (Kcal/kg diet)	3083.32
Crude fibre	14.16
Calcium	0.40
Phosphorus	1.20

Blood Sample Collection: Blood samples were collected from the jugular vein of each goat using sterile syringe and needle into a bottle containing ethylene diamine tetraacetic acid (EDTA) anticoagulant. Uncoagulated blood samples were analyzed for hematological parameters such as packed cell value (PCV), hemoglobin concentration (HB), red blood cell (RBC), white blood cell (WBC), Basophiles, Neutrophils and Eosinophils by the methods of Barker and Silverton, (1985).

Chemical Analysis: Samples of browse species and the supplement diet were analyzed for their proximate composition using standard procedure (AOAC, 1995).

Statistical Analysis: Data obtained were subjected to one-way analysis of variance (ANOVA) and treatment means were separated using Least Significant Difference (LSD) option of SPSS version 16 of 2006 edition (SPSS, 2006).

RESULTS AND DISCUSSION

The proximate composition of browse plants and the supplement (concentrate) is as shown in Table 2 below. It showed that the crude protein value of 17.23 % for the supplement diet fell within the range of 12 – 18 % recommended for growing ruminant in the tropics (NRC 1996).

The crude protein values for the browse plants were above the critical level of 8% crude protein reported by NRC (1996) necessary to provide minimum ammonia level required by rumen microbes. The ether extract level for the supplement diet (7.50%) was above the optimum range of 5 to 6 % recommended by Maithison *et al (*1997) for ruminant, while the ether extract values for the browse plants were within recommended levels. The nitrogen free extract value of 34.01% reported for teak was lower than 39.05% reported by Akubo (2011). The crude fibre value for gmelina (10.20%) was lower than 18.75% and 19.50% report by 0cheja *et al* (2014) and Akubo (2011) respectively.

The generally lower proximate values compared to previous reports was because the proximate analysis was determined on actual basis. Since proximate values will increase when determined or converted to dry matter basis.

Performance Characteristics of Experimental Animals: The Performance characteristics of experimental Animals are as presented in Table 3. The values obtained for total weight gain and daily weight gain were significantly ($p < 0.05$) different.The total weight gain (0.10kg to 1.05kg) and daily weight gain (2.86g to 30g) obtained in this study were lower than 4.5-5.0kg and 84.9-94.0g respectively reported by Olomola *et al.,* (2008). These differences may be due to experimental diets used, as well as breed and age of goats used. .

Table 2: Proximate Composition of browse plant and supplement diet (Actual basis %)

Treatments	**T1**	**T2**	**T3**	**T4**	
Browse plants	***Gmelina aborea***	***Tamarindus indicus***	***Azadirachta indica***	***Tectona grandis***	**Suplement diet**
Crude Protein	9.98	11.55	8.68	9.64	17.23
Crude fibre	10.20	11.50	12.66	10.88	15.50
Nitrogen free extracts	30.12	32.06	34.01	32.23	51.85
Ether Extracts	2.10	1.89	2.05	2.35	7.50
Ash	6.10	5.80	6.60	5.25	3.40
Moisture	4.50	37.20	36.00	39.65	4.52

The values obtained for daily supplement and browse intake were significant ($p < 0.05$) with T_1 having the best (i.e. 94.43 and 245.44g). This was in line with the report of Tolera *et al.,* (2000) who stated that supplementation of forages with concentrate feed stuff is a necessity in improving goats' productivity. Treatment effect on daily browse plant intake was significant ($p < 0.05$) with T_1(Gmelina) having the highest value (245.44g). The values obtained for daily feed intake (225.53-339.87g) were within the range of values (235.91-388.32g) reported by Ifut *et al.,* (2011). The significant ($p < 0.05$) differences in the daily browse intake could be attributed to differences in the species of browse plants of which Gmelina appear to be the most palatable. This suggest that T_1 (Gmelina) is the best supplement diet. The overall best performance of T_1 (Gmelina) could be attributed to highest browse intake and hence highest total feed intake. This may suggest that gmelina was the most palatable and most nutritious of the browse plant fed to the goats Feed conversion ratio were significantly ($p < 0.05$) different with T_1 having the best.

Table 3: Performance Characteristics of goats fed concentrate supplemented with browse plants

Treatments	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Browse plant fed	***G. aborea***	***T. indicus***	***A. indica***	***T. grandis***	
Parameters:					
Duration (days)	35	35	35	35	-
Initial weight (kg)	5.00	5.10	5.05	5.00	0.03
Final weight (kg)	6.05^{a}	5.20^{b}	5.55^{b}	5.20^{b}	0.80
Total weight gain (kg)	1.05^{a}	0.10^{b}	0.50^{b}	0.20^{b}	0.25
Daily weight gain (g)	30.00^{a}	2.86^{b}	14.29^{b}	5.71^{b}	7.14
Daily supplement intake (g)	94.43^{a}	91.30^{a}	75.33^{b}	82.40^{b}	3.66
Daily browse intake (g)	245.44^{a}	134.22^{c}	180.44^{b}	175.24^{b}	17.98
Total daily feed intake(g)	339.87^{a}	225.53^{b}	255.76^{b}	257.63^{b}	18.56
Feed conversion ratio	11.33^{c}	78.86^{a}	17.90^{c}	45.12^{b}	9.11

^{*abc}Treatment means on the same row with different superscripts differ significantly ($p<0.05$)
SEM = Standard error of means

Haematological profile: The effect of browse species on the Haematological profile of experimental animals is as presented in Table 4. There was no

significant effect on Mean Corpuscular Volume (MCV).

Mean Corpuscular Haemoglobin (MCH) values (32.20-41.05pg) in this study were a bit higher than the values (30.28-31.40) obtained by Ikhimioya *et al.* (2010). Mean Corpuscular Haemoglobin Concentration-MCHC (28.75-35.25gm/dl) fell within range (32.70-33.48) reported by Ikhimioya *et al.*(2010); and monocytes values (5.55-33.50%) in this study was higher than the values (0.50-2.50) reported by Ikhimioya *et al*. (2010). The packed cell volume range of 23 -34.10% were lower than 32-45% reported by Baneerjee (2005) for West African dwarf goat. The MCHC, MCV and MCV values suggest that the animal were not aneamic. The decreasing while blood count and monocytes values could not be explained however very high white blood count suggest health challenges in animals.

The values for lymphocytes (51.65-69.50%) in this study fell within the range of (60-70%) as obtained by Ocheja *et al*. 2012. Eosinophils (27.60-40.75%) obtained in this study were higher than the values (1.00-2.00%) reported by Ocheja *et al.* (2014) for weaner West African Dwarf Goats fed graded level of cashew nut shell. Gmelina (T1) appears to have the best values for most of the haematological parameter considered. This could be linked to its array of nutrient as well as its assimilation by the goats.

Table 4: Haematological Profile of goats fed concentrate supplemented with browse plants

Treatments	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Browse plant fed	***G. aborea***	***T. indicus***	***A. indica***	***T. grandis***	
Parameters:					
White Blood Count ($x10^3$/ul)	21.55^b	33.85^a	29.50^a	22.25^b	4.09
Red Blood Count ($x10^6$/ul)	3.71^a	2.61^b	1.66^c	2.82^b	0.37
Packed Cell Volume (g/dl)	31.40^a	27^b	23 c	24.10c	0.87
Haematocrit (%)	39.75^a	28.20^b	19.25^c	32.40^b	3.57
Mean Corpuscular volume (fl)	1.09	1.10	1.16	1.15	2.19_{NS}
MCH (pg)	32.20^c	36.05^b	41.05^a	33.00^c	1.79
MCHC (gm/dl)	29.65^c	32.75^b	35.25^a	28.75^c	1.27
Lymphocytes (%)	51.65^b	58.50^a	69.50^a	52.75^b	6.61
Monocytes (%)	33.50^a	8.90^b	5.55^b	6.90^b	6.42
Neutrophils (%)	40.50^a	27.60^b	29.45^b	40.75^a	5.99

*^{abc}Means on the same row with different superscript(s) differs significantly ($p < 0.05$)

SEM = Standard error of mean; MCH = Mean Corpuscular Haemoglobin; MCHC = Mean Corpuscular Haemoglobin Concentration.

CONCLUSION

- Gmelina fed at 300g per goat per day with supplement diet at 100g per goat per day produced the optimal performance characteristics in terms of feed intake, daily weight gain and feed conversion ratio.

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