Nutrient Digestibility and Haematological Indices of West African Dwarf Goats Fed Plant Leaves Supplemented with Cassava Peels and/or Cowpea Husks

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Abstract:-**The experiment was conducted to determine the nutrient digestibility and haematological indices of West African Dwarf goats fed *Gmelina arborea* and *Ficus* sycomoros leaves supplemented with cassava peels/ cowpea husk. Gmelina and Ficus leaves were fed *ad libitum* while cassava peels and cowpea husk was fed at 300 g/head/day. Sixteen goats with body weight of 7± 1.04 kg were used for the study. The goats were weighed and divided into four (4) groups, each group of four (4) goats were randomly assigned to one of the four treatments in a completely randomized design (CRD), clean drinking water and mineral salt lick were provided *ad libitum* throughout the experimental period. The result of proximate composition showed that all the experimental diets have adequate CP content; neutral detergent fibre (NDF) and acid detergent fibre (ADF) except cassava peels which had lower CP content. The result of nutrient digestibility showed significant (P<0.05) differences between treatments. There were no significantly (P>0.05) differences in all the parameters measured in haematological indices except PCV, MCHC and MCV which differ (P<0.05) between the treatments. All the parameters measured were within the normal physiological range values for healthy goats except mean corpuscular haemoglobin (MCH) (2.51-4.29 %). In conclusion the result of the study showed that cassava peels and cowpea fed at 300g/head/day improved nutrient digestibility and did not have any adverse effect on haematological status of the experimental goats.**

Key words: **Nutrient, Digestibility, Haematological, Supplement, Cassava, Cowpea, Gmelina and Ficus**

I. INTRODUCTION

In many underdeveloped countries, malnutrition has been identified as the single most important public health problem (Adeyeye and Afolabi, 2004). The nutritional requirement of the human body reflects the nutritional intake necessary to maintain optimum body function to meet the body`s daily needs (FAO, 1999). Consequently, the indices of nutritional disease malnutrition are on increase (FA O, 1999). The recommended total protein intake for normal growth and development in human is 85.99g per person, per day, out of which approximately 39g should be of animal origin, but the average Nigerians consumes about 33g (Adegbola, 2002). This therefore calls for increase in livestock production in order to increase the nutritional status of Nigerians through provision of high quality animal products, such as meat, milk and egg. This therefore calls for reasonable level of feed supplementation in small ruminant such as goat with particular emphasis on the energy, protein and minerals.

Blood is used in nutritional evaluation and health survey of animals, therefore blood analysis is important because it contains a myriad of metabolites and other constituents which provide a valuable medium for clinical investigation and nutritional status of human beings and animals (Abegunde, 2008). According to Yusuf *et al* (2012) the blood profile of animals often reflect their nutritional adequacy or otherwise. Therefore, dietary components have measurable effects on blood constituents, such that significant changes in their values can be used to draw inference on the nutritive values of feeds to animals. The objectives of this paper are designed to assess the proximate composition of the experimental diets, nutrient digestibility and haematological parameters of West African dwarf goats fed Gmelina and Ficus leaves supplemented with cassava peels and / or cowpea husk.

II. MATERIALS AND METHODS

Study area

The experiment was carried out at the Small Ruminant Unit of the Teaching and Research Farm Federal Polytechnic Bali, Taraba State. Bali is situated at latitude $7^{0"}$12N to 12^{0}00" North of the equator and longitude 10^{0}00 "N to 12^{0}00" east of Greenwich Meridian (GWM) and at altitude of 450mm above sea level. And it`s annual rainfall ranges from 450-1000mm, with temperature of 28^{0}C - 34^{0}C and lies within the Guinea Savannah zone of Nigeria (TSD. 2008).

Experimental layout and Animal management

There were four treatments, replicated four times, given a total of sixteen (16) experimental animals. The experimental diet consists of T1 (*Gmelina arborea* leaves+ 300 g/h/day of cassava peels), T2 (*Gmelina arborea* leaves+ 300 g/h/day of cowpea husk), T3 (*Ficus sycamorus*l eaves+ 300 g/h/day cassava peels) and T4 (Ficus sycamorus leaves + 300 g/h/day cowpea husk). The Gmelina and Ficus leaves

formed the basal diets and fed *ad- libitum*. Sixteen female goats' ranges between the ages of 6- 9 months, with mean weight of 7±1.04kgwere sourced from local market within Bali Local Government Area of Taraba state. Their ages were determined through their dental formulae. The animals were quarantined to check for diseases problems and adaptations for the period of two weeks. They were dewormed with Albendazole and vaccinated against Petes de Pest Ruminant (PPR) and Contagious Caprine Pleuropneumonia (CCPP). At the end of the adaptation period, the animals were tagged, randomlyallocated to four (4) treatments and on weight bases for all treatments.

Parameters Measured

Parameters determined, were digestibility of the experimental diets, haematological indices andproximate compositions of the experimental feed. Proximate composition were determined using the methods described by AOAC (2005) In determining the digestibility, the experimental diets were fed to the animals in a known amount and the faecal output were collected and weighed daily for seven days. Pooled and a sub sample was taken for proximate analysis using the method described by AOAC (2005).Haematological parameters were determined by drawing 5mls of blood from a jugular vein of each animal into a sample bottle containing anti- coagulant; Ethylene Diamante Tetra Acid (EDTA). The experimental goats were fasted overnight before blood collection. The samples were used for the determination of the packed cell volume (PVC), Haemoglobin (Hb) concentration, Red Blood cell counts (RBC) and White blood cell counts (WBC).

Packed cell volumes (PVC) was measured for each animal using the microhaematocrit method. Haemoglobin concentration was also measured using Sahl's (acid haematin), Oni *et al* (2010). Red blood cell was determined with acid of Neubator counting chamber (Haematocytometer). Blood smears were used for total white blood cell (WBC) counts determination.

Data analysis

All data obtained were subjected to analysis of variance (ANOVA) using Statix 9.1 package and means were separated using LSD.

III. RESULTS AND DISCUSSIONS

The chemical composition of *Gmelina arborea* leaves, *Ficus sycamores* leaves Cassava peels, and Cowpea husk are shown in Table 1. The dry matter of the experimental diets in percentage varied slightly from each other (89.22, 88.25, 88.19 and 91.25%), for Gmelina and Ficus leaves, cassava peels and cowpea husk respectively. The high dry matter observed in all the experimental feeds, was an indication of adequate nutrient content that can support andlivestock production and reproduction. Evidently can be stored for a longer period of time. The result of the proximate composition recorded in the present study differs from the report of other workers (Gidado*et al* 2012; Barde*et al* 2014; Lamidi and Ogunkule *et al*., 2015 and Liman *et al*., 2016). The variation in proximate composition might be attributed to soil, season, locationand differences in sampling and analytical procedures (Gizzi and Givens, 2004). Generally, all the experimental diets used in the present study had a crude protein content of above 7 % DM which can support optimum microbial growth except cassava peels which had lower value (4.69) than the minimum value reported by (Norton, 1985).

Table1: Proximate composition (% DM basis) of feeds ingredients.

Parameters (%)	GL	FL	CP	CH
Dry matter	**89.22**	**88.25**	**88.19**	**91.25**
Crude protein	**12.84**	**11.36**	**4.69**	**12.39**
NDF	**31.46**	**39.51**	**26.93**	**37.64**
ADF	**28.54**	**28.93**	**18.74**	**28.73**
Hemicellulose	**2.92**	**10.58**	**8.19**	**8.91**
Ash	**6.86**	**16.49**	**6.74**	**7.10**

GL=Gmelina leaves, FL= Ficus leaves, CP= cassava peels and CH= cowpea husk

However, the crude protein value (4.69) in CP, appears to be lower than the crude protein requirement of 15-18% of growing kids and lambs, but adequate for matured animal as reported by (Aruwayo *et al*., 2009). Ash values were 6.86 %, 16%, 6.24% and 7.10% for Gmelina leave, Ficus leaves, cassava peels and cowpea husk respectively. The crude protein content appears in cassava peels can be compared to what were reported by Fanimo and Oduronbi (2006) and Ajila*et al.* (2010).The ADF and NDF content appear to be lower in all feeds, this is an indication that all the experimental diets will support digestibility. This agreed with the report of (Norton, 1998) who reported that NDF and ADF content (20-35 %) has been shown to result in high, digestibility, while lignification of the plant cell decrease the digestibility of plant material in the rumen.In general, the NDF and ADF were within the range of 26.93-37.64 % and 18.74-28.93%, as compared to the present findings in respect of feeding ruminants (Topps, 1992; Budi and Wina, 1995).

Table 2: Nutrient Digestibility of West African Dwarfof goats fed Gmelina and Ficus leaves as basal diet supplement with cassava peels and Cowpea husks.

PARAMETERS	TREATMENTS			
	T1 (GL+CP)	T2 (GL+CH)	T3 (FL+CP)	T4 FL+CH)
Dry matter	**66.66^{d}**	**75.0^{c}**	**84.61^{a}**	**82.35^{a}**
Crude protein	**86.88^{c}**	**92.59^{a}**	**84.09^{d}**	**88.91^{b}**
NDF	**49.64^{a}**	**47.60^{c}**	**51.45^{a}**	**45.81^{d}**
ADF	**41.33^{a}**	**39.70^{ab}**	**43.52^{a}**	**37.61^{d}**
Hemicellulose	**8.31**	**7.09**	**7.93**	**8.02**
Ether extract	**54.58^{c}**	**64.01^{a}**	**47.03**	**56.33^{b}**
Ash	**61.22^{d}**	**71.44**	**68.01^{b}**	**66.03^{c}**

*a,b.c = means in the same row with different superscripts are differssignificantly (P<0.05)

The nutrient digestibility of the experimental goats is presented in Table 2.There was significant (P<0.05) differences in all the parameters measured. Goats on T_3 and T_4 diets had better dry matter digestibility (DMD) than those in

T_1 and T_2. Theirdifference in DMD might be due to interaction and associative effects or stress factor associated with the animals (Preston, 1986). And also differences in basal diet and the test material. The mean CP digestibility range from 84.09 -92.59 % in T_3 - T_2. The higher CP digestibility recorded by goats in T_2 might be attributed to higher CP content of the experimental diet as shown in Table 1. The NDF and ADF digestibility were better in T_3 and T_1, this implied that fibre fraction digestibility in diets T_3 and T_1 were better and improved microbial activity in the rumen. The higher EE and ash digestibility values recorded for goats in T_2 implied that, the diets were more effective in improving the utilization of EE and ash.

Table 3: Haematogical Analysis of West African Dwarf Goats Fed Gmelina and Ficus leavesas based diet supplemented with cassava peels and cowpea husk.

Parameters	Treatments				
	T_1 (GL+CP)	T_2 (GL+CH)	T_3 (FL+CP)	T_4 (FL+CH)	SEM
PCV (%)	**26.08^{c}**	**32.44^{b}**	**36.01^{a}**	**31.05^{b}**	**2.7031**
Hb (%)	**11.21^{a}**	**10.04^{a}**	**9.06^{ab}**	**11.03^{a}**	**8.3540**
WBC (%)	**9.59^{a}**	**7.20^{ab}**	**9.61^{a}**	**6.64^{a}**	**1.5771**
RBC (%)	**11.25^{a}**	**9.41^{a}**	**12.63^{a}**	**9.99^{a}**	**0.9961**
MCH (%)	**4.29^{a}**	**3.09^{a}**	**2.51^{a}**	**3.55^{a}**	**0.0718**
MCHC (%)	**42.98^{a}**	**30.94^{c}**	**25.14^{d}**	**35.52^{a}**	**0.0346**
MCV (%)	**23.18^{d}**	**34.47^{a}**	**28.45^{c}**	**31.08^{b}**	**3.6378**

The result of haematological indices of the experimental goats is presented in Table3. There were significant (P<0.05) difference in all the parameters measure except Hb, WBC, RBC and MCH which did not differ (P> 0.05) significantly from each other. The mean PCV, Hb, WBC, RBC and MCV levels in the experiment though differed among treatments were within the normal range for healthy goatsJain (1993). The quality of the test feeds was good enough to maintain the good health of the experimental goats for production. The higher (P<0.05) values observed in PCV and Hb concentration of the experimental goats indicates the quality of these diets tobe properly utilized by the goats for the formation of Hb concentration and compensatory accelerated production of PCV. The higher values of WBC recorded in all the treatments is an indication of the ability of the experimental goats to fight against the presence of foreign body in the circulating system (Fasae*et al*., 2016). The lower MCV value recorded in the study might be due to age and sex of the experimental goats, this agreed with the report of Dukes (1955) and Afolabi*et al*., (2010) reported that haematological values of farm animals are influenced by age, sex, breed, climate, geographical location and nutritional status of the animal.

IV. CONCLUSION

The study concluded that the supplementation of *Gmelina arborea* and *Ficus sycomoros* leaves with cassava peels and cowpea husk improved nutrient digestibility and did not have any adverse effects on haematological parameters of the experimental goats.That any intending small ruminant farmer can rely on this finding for efficient production.

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