PERFORMANCE AND HAEMATOLOGICAL PARAMETERS OF YANKASA SHEEP FED *Ficus sycomorus* SUBSTITUTING GROUNDNUT CAKE

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ABSTRACT

The effect of replacing groundnut cake (GNC) with *Ficus sycomorus* foliage on the performance of Yankasa rams. Sixteen (16) Yankasa rams weighing on the average 14.25 ±0.2kg were divided into four groups with four animals per group. Each group was randomly assigned to the four dietary treatments in a completely randomized design (CRD). The diets compared were 0%, 5%, 10%, 15% *ficus sycomorus* levels of inclusion designated as T_1, T_2, T_3, and T_4 respectively. Result indicates significant ($P<0.05$) differences in all the parameters studied for chemical composition of the experimental diets. T_1 had the highest values for dry matter (DM), Cellulose, acid detergent fibre (ADF) and neutral detergent fibre (NDF) respectively). The body weight gain, dry matter intake (DMI) and metabolic mass were higher for T_3= than other treatment groups. The nutrients digestibility investigated were significantly affected ($P<0.05$) with the substitution rate. Dry matter (DM) and the fibre fraction digestibility were generally low. Nitrogen intake and Nitrogen retained as % Nitrogen intake were not significantly affected ($p>0.05$) by the substitution rate. The results show no significant effect (p>0, 05) on the haematological parameters except for the white blood cell differentials (Lymphocytes, Neutrophils and Monocytes) which show significant difference ($p<0.05$) among treatment groups. Serum metabolites results were significantly not affect by the substitution rate except for urea, protein, globulin and alkaline Phosphatase which showed significant difference ($p>0.05$) amongst treatment. From the results, it can be concluded that F. sycomorus can used to substitute groundnut cake, though decrease in fibre digestibility should be taken into consideration. The best level of substitution 10% *F. sycomorus*.
Keywords: Browse, *ficus sycomorus*i, sheep, haematology, Digestibility and performance

INTRODUCTION

Small ruminants form an integral part of the livestock economy in Nigeria. The arid and semi-arid areas are home to over 80% of small ruminants and their sustenance is reducing due to dependence on natural pastures (Kosgey *et al.,* 2008). They support 46-58% of pastoral households and play a significant role in the food chain and overall livelihoods of rural households, where they are largely the property of women and their children (Lebbie, 2004).

Dry season feeding of ruminants in most tropical areas has always been a problem for farmers since little good pasture exists during this period. At this time, the performances of these animals are seriously impaired. One possible way to alleviate this problem and maintain production in the tropics is to feed them with crop residues and browse plants. These feed resources are not consumed by man but can be converted by ruminants into animal products desirable as human food. This therefore reduces total cost of animal production without a decrease in productivity and also maintains efficient feed utilization.

The multipurpose tree *Ficus sycomorus* is available in many parts of Nigeria. *F. sycomorus* tress grows best on drainage lines, streams, rivers, springs or dams (Bekele *et al.,* (1993); Belete *et al.,* 2016). The fruits of these trees are used for wild animals and birds (Belete *et al.,* 2016). *F.sycomorus* leaf and petioles are well accepted by West African Dwarf lambs and led to higher levels of apparent digestibility than the other tree species (Anugwa and Okori, 1987; Kassa and Mekasha, 2014). Feeding Ficus fodder to lambs is actively encouraged in Nigeria.

This MPT leaf (*F. sycomorus*) have been reported to have high nutritive value (Orwa *et al*., 2009). Njidda and Ikhimioya (2010) reported 95.6% DM, 14.90% CP, and 32.5% CF, 3% EE, 18% ash, 54.80% NDF, 33.4% ADF, 12.60 % ADL and 4.49 ME (MJ/kg DM) while Nkafamiya (2010) reported that the leaf of *F. sycomorus* has 14.12% moisture, 10.24% ash, 3% lipids, 31.52% CF, and 17.95% CP. *F. sycomorus* plant is known to have some pharmacological activities (Salvador *et al.,* 2012; Higa *et al*., 1987; Salvador *et al*., 2012; Yan *et al*., 2014), antioxidant (Sheikha *et al*., 2015a and 2015b, Afaf *et al*., 2015), antimicrobial (Sheikha *et al*., 2015a and 2015b, Afaf *et al*., 2015) and cytotoxic activity (Sheikha *et al*., 2015b). The study was therefore design to evaluate the effects of substituting groundnut cake with *F. sycomorus* leaf on performance haematological profile of Yankasa sheep.

MATERIALS AND METHODS

Location of the study

The research was conducted was conducted at the Kaduna State University Teaching and Research Farm, Kafanchan campus, Jema'a local Government area of Kaduna state, Nigeria. The area is located within latitude $9^0$34'N and longitude $8^0$17'E. The vegetation of the area is Guinea Savannah and the area is designated as koppen's Aw climate with two distinct seasons, a wet season in summer and a dry season in winter. Rainfall occurs between the months of April to October with a peak in August. The mean annual rainfall is about 1800 mm and the mean monthly temperature is 25^0C, while the relative humidity is about 63^0, Ishaya and Abaje (2008).

Animals and treatments

Sixteen clinically healthy Sheep (rams) about 5 months old with 14.25±0.2 kg mean initial body weight (BW), were randomly assigned to one of four dietary treatments in a completely randomized design for a period of 77 days. The dietary treatments compared were: T_1 received diet containing 0% *Ficus sycomorus*, T_2 5% *F. sycomorus*, T_3 10% *F. sycomorus* and T_4 fed diet containing 15% *F. sycomorus* as shown in Table 1. The diets were offered twice daily (08.00 and 15.00 hours) respectively in two equal portions.

Metabolism trial

At the end of the feeding trial 12 rams, equally representing the four dietary treatments were selected at random and transferred to the metabolism cages for the metabolism trial. Animals were allowed to adjust to metabolism crates for 3 days prior to the start of the experiment, and were then offered the experimental diets for 10 days followed by 4 days of total collection of feed, faeces, and urine. Animals were offered the experimental diets. Total feces and urine voided were collected in plastic buckets; urine buckets contained 10 ml of conc. H_2SO_4. Faeces were weighed and urine volume measured and weighed prior to taking a 10% aliquot, and compositing for each animal.

Haematological and Biological assay

The Rams were bled through jugular vein and 10 ml of blood collected. 3ml of the blood samples was collected into plastic tube containing EDTA for haematological studies. The remaining 7ml of blood samples was deposited in anticoagulant free plastic tube and allowed to clot at room temperature within 3 hours of collection. The serum samples were stored at -20^{0}C for biochemical studies Total erythrocytic count and total leukocytic counts were determined with the aid of Haemocytometer (Neubaur counting chamber) and Hb concentration wad determined by Sahl's (acid haematin) method (Bengamin 1978). Mean corpuscular Haemoglobin Concentration (MCHC), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Volume (MCV) values were calculated (Jain, 1986) Serum Aspartate Aminotransferase, serum Alanine Aminotransferase and Alkaline Phospatase were analyzed spectrophotometric linked reaction method (Henry *et al*., 1960). Total protein by the Biuret method according to the procedure of Oser (1976), Albumin by Bromocresol green (BCG) method, serum glucose, creatinine and bilirubin by Peters *et al.,* 1982), Sodium ion and potassium ions by flame photometric method. Other biochemical analysis was done using the method describe by (Ogunsami *et al*., 2002).

Chemical Analysis

Samples of the experimental diets were collected and oven dry at 60°C for 96 h, ground separately to pass through a 1 mm sieve in a Wiley mill and sampled for chemical analysis using the standard methods of (AOAC) (2002). Fiber fraction analysis was by the methods of Van Soest *et al*. (1991). Hemicellulose and cellulose were estimated as differences between neutral detergent fiber (NDF) and acid detergent fiber (ADF) and ADF and lignin, respectively.

Statistical Analysis

Feed intake, digestibility, body weight gain and carcass parameters were subjected to analysis of variance (ANOVA) using the general linear model procedure in SAS soft ware (V9) (SAS, 2002). The association between nutrient intake, digestibility and body weight gain was tested using correlation analysis. Treatment means were separated using least significant difference (LSD). The model employed was: $Yij= \mu + ti + bj+ eij$,
Where; Yij = Response variable
μ = Overall mean ti = Treatment effect
bj = Block effect (initial body weight)
eij = Random error

RESULTS

Chemical composition of the diets

The results of the chemical composition of the experimental diets is shown in Table 2. There was significant effect (p<0.05) for all the parameters studied for the chemical composition. The DM, cellulose, ADF, NDF were observe to be high for diet T_1. The CP content was highest in T_2 (5%) *F. sycomorus*. The NDF values were moderate in all the treatment likewise the ADF but the ADL was high for all the treatment groups.

Performance characteristics

Dry matter Intakes of the diets were greater ($P < 0.05$) for T_2 than the other treatment groups likewise the weight gain and metabolic mass ($P < 0.05$). Intakes of DM (Kg day^{-1}) relative to the control and the treatments receiving *F. sycomorus.* Diet had effect (p<0.05) on feed: gain ratio (Table 3).

Apparent nutrient digestibility

The nutrient digestibilities were generally low for all the nutrients with more adverse effects on the fibre fractions. The CP and EE had low to moderate digestibility with higher values in T_3. Animals on diet T_3 were observed to have better digestibility ($p < 0.05$) values compare to other treatment groups (Table 4)

N use efficiency

N intake and retention were greater ($P < 0.05$) for the T_2 diets than for the control diet. Urinary, absorbed, retained and N absorbed as percent N intake was greater ($P < 0.05$) for T_2 than the other treatment groups (Table 5).

Hematological indices

Whereas Hb concentration, MCV, PCV, Lymphocytes and Neutrophils were higher ($P < 0.05$) for T_4, other hematological parameters were similar (P > 0.05) among the diets (Table 6).

Biochemical profiles

Except for urea N, Total protein and alkaline phosphate (ALP concentrations which were affected (P < 0.05) by dietary treatments, other indices of serum biochemistry showed no (P > 0.05) difference (Table 7).

DISCUSSION

The chemical composition of the experimental diets is shown in Table 2. The dry matter (DM) content of experimental diets was observe to be high (897.30 to 915.10 g Kg^{-1} DM) for all the dietary treatments. The DM content of the diets may be attributed to the high DM content of *F. sycomorus* leaf meal. This was similar with the findings of Njidda *et al.* (2010) and Achi *et al*. (2018) who reported DM content of 956.00 and 895.60 g Kg^{-1} DM for *F. sycomorus*. The CP content of the diets in this study was observe to increase with increase in the level of CP. Njidda *et al.* (2010) and Njidda *et al.* (2013c) reported that browse plants such as *Ficus polita, Ficus thonningii and Khaya senegalensis* had above 13% CP content which is an indicator that most tropical browse species are high in CP content and can be used to supplement poor roughage to increase productivity for ruminant livestock in tropical region. The *F. sycomorus* leaf meal used in this study had lower (172.26 g Kg^{-1} DM) crude fibre (CF) content compared to the 325.00 g Kg-1 DM reported by Njidda *et al*. (2011) and 181.90 g Kg-1 DM reported by Achi *et al.* (2018). One of the characteristics of most browse leaves is that they have relatively high CF value which could be attributed to the high cell-wall constituents usually present in the leaf meal as this is indicated in the high fibre content of the diets.

The NDF, ADF and ADL values of the experimental diets were higher than earlier reports on the tropical forage species (Njidda 2008, Njidda *et al.* 2012a; Njidda *et al.* 2012b and Njidda *et al.* 2016). Difference in compositions may be due to variation in age, environmental and soil conditions and climatic factors. Although the NDF was slightly higher than the recommended value of 20–35% for effective ruminal degradation (Norton 1994; Bakshi and Wadhwa 2004; Njidda *et al.* 2013b), it was lower than 60% value at which feed intake is depressed (Meissner *et al*., 1991).

PERFORMANCE AND INTAKE OF YANKASA SHEEP FED *F. sycomorus* LEAF MEAL

The effect of feeding varying inclusion levels of *F. sycomorus* leaf meal substituting groundnut cake on feed intake and weight gain of Yankasa rams is shown in Table 4. The DMI was significantly (P<0.05) different across treatments. Animals fed diets T_3 (10% inclusion of *F. sycomorus* had significantly (P<0.05) higher DMI (3.25 kg day^{-1}) while those on 5% inclusion level had the lowest (2.26 kg day^{-1}). The high DM intake observe in T_3 was probably due to better balace between energy and protein as more organic matter was consumed from the leaves. Lawan *et al.* (2008) also reported that supplements containing more degradable protein enhance complete utilization of structural carbohydrates in the ingested forage. Final weight and total weight gain was significantly (P<0.05) influenced by the levels of *Ficus sycomorus* in the diet. Animals fed diets T_3 FSLM at 10% inclusion level had highest (8.62 kg) weight gain, respectively. While those on 5% inclusion levels recorded the least values statistically.

Final weight and total weight gain was significantly (P<0.05) influenced by the levels of *Ficus sycomorus* in the diet. Animals fed diet T_3 FSLM at 10% inclusion level had highest (22.97 and 8.62 kg) final and total weight gain, respectively. While lower values were obtained for those on 0, 5 and 15% levels of *F. sycomorus* levels of inclusion. The ADG varied from 0.03 to 0.10 kg day^{-1} with T_2 having the lowest (0.03 kg day^{-1}) ADG, suggesting a low efficiency in utilization of the experimental diet. Almost all literature on the use of shrub and tree fodders to supplement either natural grasses or crop residues have shown positive responses with respect to the productivity of cattle, sheep and goats (Norton, 1998)

However, among the supplemented group, sheep in T_3 performed significantly better (P<0.05) than sheep in T_2 and T_4. Inclusion of *F.sycomorus* also significantly increased (P<0.001) FCE and FBW of sheep on diet T_3 compared to other treatment groups. Adebowale *et al.* (1991) reported that low degree of digestion coupled with low passage rate through the alimentary tract limit net energy availability for production. Though the inclusion of *F. sycomorus* (T_2-T_4) sheep did significantly (P>0.01) differ in these parameters. Supplementation of MPT to small ruminants improved growth performance as documented earlier (Reed *et al.*, 1990; Njidda and Ikhimioya 2010; Kassa and Mekasha., 2014). It has been reported that fodder trees would be good protein supplements for ruminants, provided that they are degraded adequately in the rumen to make the protein available to the animal and non-toxic (Leng, 1997). Anugwa and Okori (1987) reported that, West African dwarf lambs gained 71 g/day over a 14-day period when fed a sole diet of *F. elasticoides* foliage. However, the *F. sycomorus* leaf, in the present showed positive body weight change, possibly due to sufficient supply of protein. Generally, supplementation with MPTs like *F. sycomorus* leaf, BW gain of sheep at 10% level of inclusion, probably either by providing nutrient available for absorption or by enhancing microbial protein synthesis. Though there has not been exhaustive study conducted on *F. sycomorus* in Nigeria on one hand and Yankasa sheep on the other.

NUTRIENTS DIGESTIBILITY

The lower DM digestion coefficients observed for all the treatments could be due to the relatively higher fiber fraction contained in the diets. However, among supplemented group, the apparent digestibility coefficient of CP and EE were significantly higher (P<0.01) for T_3 compared to T_2 and T_4. The digestibility coefficient of CP was significantly higher (P < 0.001) for T_3 followed by T_3, T_4. The finding is in agreement with McDonald *et al., (*2002) who reported that higher CP intake is associated with better CP digestibility. There is no statistically significant difference (p<0.05) between, T_2 and T_4 in CP digestibility. The DM digestibility of the supplemented group in the present study is comparable with 75.8-80% reported by Tegbe *et al.,* (2005) in West African dwarf goats fed basal diet of *Panicum maximum a*nd supplemented with *M. indica, F. thonningii, G. sepium* leaf and concentrate. Similarly, dry matter digestibility (DMD), which is related to nutrient composition, varied widely among tree and shrub species. Anugwa and Okori (1987) also reported that the fresh Ficus leaf and petioles were well accepted by West African dwarf lambs and led to higher levels of apparent digestibility than the other tree species, ranging from 70.1% for crude fibre (CF) to 81.8% for crude protein. Ahn *et al.,* (1989) and Njidda (2013a) have shown that drying of MPT leaf decreases tannin content and showed increase in digestibility of protein from 64-84%. McSweeny *et al.* (2001) also reported that tannins could reduce fibre digestion by complexing with lignocelluloses and preventing microbial attachment and degradation, or by directly inhibiting cellulotic microorganisms, or both. A low level of CP (less than 80 g kg^{-1} DM) is shown to depress digestibility (T_2), as it is not sufficient to meet the needs of the rumen bacteria (Norton, 1998). Lignification of the plant cell wall decreases the digestibility of plant material in the rumen. Bakshi and Wadhwa, (2004) also reported that high NDF and ADL depress DM intake DM digestibility.

NITROGEN UTILIZATION

The nitrogen utilization trial showed a significant (P<0.05) effect among dietary treatments. Nitrogen (N) intake and Urinary N of sheep on T_2 (16.38 and 1.25 g/day) were significantly (P>0.05) higher than the other treatment groups. Yankasa rams receiving *F. sycomorus* inclusion in their diets had higher N retention compared to the control group receiving 0% *F. sycomorus.* Abdu *et al.* (2012) had similar observation when F. sycomorus was included in Yankasa rams diets. The urinary N output was significantly (P<0.05) influenced by the dietary treatment groups, with sheep on T_2 (1.25 g/day) being the highest output and T_3 (0.58 g/day) being the lowest. Nitrogen balance (g/day) was significant (P<0.05) among the dietary treatments. The findings of an increased N balance in Yankasa rams is consistent with the findings of Silva *et al.* (2004) who reported higher level of N retention in sheep fed forage based diets but also observed an increased DMI and CP intake (g kg^{-1} $W^{0.75}$) in ram lambs. These authors suggest a higher utilization of recycled N as a mechanism for the improved N balance. N retention is considered a better criterion for measuring protein quality tha digestibility. N retention is associated with the amount of N used for protein deposition and biological value isa measure of protein quality (Silva *et al.,* 2004; Wildeus *et al.*, 2007). The browse forage offered gave a positive N balance. This demonstrated that the browse forages were efficiently used as fermentable N source for microbial growth in the rumen. The values for the N balance were higher than the values (1.50 to 7.69 g day^{-1}) reported by Wampana *et al.* (2008) who fed agro-industrial by-product and also higher than the values (0.59 to 8.11 g day^{-1}) reported by Njidda *et al.* (2018) who fed *Daniellia oliveri* foliage.

HAEMATOLOGY SERUM CHEMISTRY

The result of the haemoglobin (Hb) value shows that sheep had higher values than other breeds but the value obtained in this study fall within the normal range (9,80 to 12.90 g/dl) reported for sheep (Baneejee, 2007 and Njidda *et al.,* 2014). The observed suggest the oxygen carrying capacity of the blood was higher in the experimental animals. Generally, increase in the Hb concentration is associated with greater ability to resist disease infection and low level is an indication of disease infection and poor nutrition (Cheesbrough, 2004; Tambuwal *et al*., 2002; Njidda *et al.,* 2014). The values of MCV, MCHC and MCH significantly increased and are very important in the diagnosis of anemia and also serve a useful index of the capacity of the bone marrow to produce red blood cells (Awodi *et al*., 2005). The increased in MCV, MCHC and MCH are greatly influenced by age and sex (Egbe–Nwiyi, 2000).

The packed cell volume (PCV) obtained in the present study (11.15 to 15.50%) was lower than the normal range (28.47 to 30.25%) reported for sheep (Rusuff *et al*. 1954; Bianca 1955; Baneejee, 2007; Njidda *et al.,* 2014). A decreased PCV generally means red blood cell loss from any variety of reasons like cell destruction, blood loss, and failure of bone marrow production. The RBC values obtained in this study were within the normal values reported by (Campbell *et al*., 2003) but lower than the values reported by Njidda *et al*. (2014). The difference may be due to age, sex breed or nutrition. RBC is a signal of the health status of the animals. The low RBC counts may be associated iron deficiency, internal bleeding, some types of anemia or some vitamin deficiency. The white blood cell differentials (Neutrophils and monocytes) levels are comparable among treatments groups. There was significant influence ($p>0.05$) of diet on lymphocyte count. The value for lymphocytes was higher for T_4 than the other treatment groups. The lymphocytes constituted majority of the WBC counts and the cells increased with age in early life in both sexes of sheep and goats (Egbe-Nwiyi *et al*., 2000). The high lymphocyte counts in the animals in this study are favoured by the findings of (Milson *et al*., 1960) and (Wilkins and Hodges, 1962) and it might be attributed to stress and immune response to the environment (Cole, 1986). The urea level in the study falls within the range (4.4 to 8.9 mmol/L) reported by Njidda *et al.* (2014) and 8 to 20 mg/dl reported by (Banejee, 2007) in matured domestic animals and 5.28 mg/dl for free ranging desert big-horn sheep. High level of serum urea has been attributed to excessive tissues protein catabolism associated with protein deficiency (Oduye and Adedevon (1976).

Serum biochemical indices is used to determine the level of heart attack, liver damage and to evaluate protein quality and amino acid requirements in animals as reported by (Harper *et al*. 1979). The values of serum electrolyte of sodium, potassium and chloride ranged from 122.00 to 129.0 mmol/L, 4.00 to 4.83 mmol/L and 98.50 to 105.00 mmol/L respectively. The values obtained in this study are above the normal range reported by Baneejee (2007; Njidda *et al.* 2014). The electrolytes are known to regulate osmotic pressure, maintain membrane potentials and acid base balance and transmit nerves impulses sodium and potassium deficiency affect the tubes of kidney resulting in inability to concentrate urine (Latimer *et al*., 2004). The result of hydrogen carbonate ions reveals that there is breed and sex difference with Balami rams having higher values than other breeds.

Blood metabolites were used to monitor nutrient status and associated muscle mass (creatinine). Differences in N utilization among treatment groups were apparently not of sufficient magnitude to be reflected in blood urea-N concentrations (Kohn *et al*., 2005). Horton and Burgher (1992) observed higher blood urea-N concentrations in growing Katahdin lambs

The creatinine values in the present study were within normal range and differ ($P<0.05$)

among treatments. High creatinine is indicative of poor protein and amino acid metabolism that can lead to impaired renal function and cardiac infarction (Gray and Howarra, 1980). Increased creatinine has been associated with tannin toxicosis in cattle consuming tannin-rich oak fodder (Garg *et al*, 1992).

The glucose levels was observe to decrease with increase in the level of *F. sycomorus.* This follow the same pattern with energy content of the diets. Serum glucose is an indicator of cito metabolism in high energy diets (Coles, 1986). When glucose is lower than the normal range is an indication of hypoglycemia while higher levels are indication of hyperglycemia (Olorunnisomo, 2012). The values for total protein concentration obtained were within the range (55.0 to 94.0 g/L) reported by Njidda *et al.* (2014). Kamalu *et al*. (1988) and Duke (1955) that plasma protein help to transport calcium and phosphorus and other substances in the blood by attachment to the albumin. The albumin level in this study shows that Yankasa sheep had lower compared to the reports of Njidda *et al.* (2014). A reading of albumin less than the normal physical value of albumin usually indicates hypoalbuminemia (Altman, 1979). The result of the ALT and ALP were higher in the rams than in ewes while for AST the result is in consistent. Contrary to the results obtained for the lambs, all the aminotransferases (AST and ALP) clearly shows that there is a significant influence ($P<0.05$) of these parameters on the experimental animals. AST level is helpful for the diagnosis and following of cases of myocardial infarction, hepatocellular disease and skeletal muscle disorders. In trauma or in diseases affecting skeletal muscle, after a renal infarct and in various haemolytic conditions (Alex and LaVerne, 1983). The concentration of Serum Alanine Aminotransferase in tissues is not nearly as great as for Serum Aspartate Aminoferase. It is present in moderately high concentration in liver, but is low in cardiac and skeletal muscles and in other tissues. Their uses for clinical purpose are primarily for the diagnosis of liver diseases (DeRitis *et al*., 1972) and resolve some ambiguous increase in serum Alanine Aminotransfase in cases of suspected myocardial infarction (Aach *et al*., 1981). When both enzymes (i.e. Alanine Aminotransferase and Aspartate Aminotransferase) are elevated in serum, the liver is the primary source of the enzymes (liver ischemia because of congestive heart failure or other sources of liver cell injury) (DeRitis *et al*., 1972). If the serum Aspartate Aminotransferase is elevated while the serum Alanine Aminotransferase remains within normal limit in case of suspected myocardial infarction, the results are compatible with myocardial infarction (Alex and LaVerne, 1983).

CONCLUSIONS

Weight gain of rams fed 10% level of inclusion of *F. sycomorus* was higher than the other treatment groups which signify efficient energy and protein utilization at tissue level. Dry matter intake (Kg $BW^{0.75}$) was similar among T_1 to T_3 dietary treatments, but rams had a higher apparent digestibility of most feed fractions compared to T_1 and utilized available N more efficiently than T_1. Both the haematological and serum metabolites are within range except the PCV that is low.

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Table 1: Composition of the experimental diet (%)

	Treatment s			
Ingredient	**T_1**	**T_2**	**T_3**	**T_4**
Ficus sycomorus	0	5	10	15
Groundnut cake	20	15	10	5
Rice bran	19	19	19	19
Sorghum Stover	10	10	10	10
Sorghum offal	10	10	10	10
Maize offal	20	20	20	20
Wheat offal	20	20	20	20
Bone meal	0.5	0.5	0,5	0.5
Salt	0.5	0.5	0.5	0.5
Total	**100**	**100**	**100**	**100**
Calculate ME/MJ	**10.61**	**10.06**	**9.51**	**9.00**
Calculate CP	**16.92**	**16.55**	**15.33**	**15.01**

*ME = Metabolizable energy, CP = Crude protein

Table 2: Chemical composition of the experimental died (g kg^{-1} DM)

	TREATMENTS					
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**	**FSL**
Dry mater	915.10^a	902.30^b	897.30^b	899.30^b	0.24	901.12
Crude fibre	286.90^a	221.90^c	266.30^{ab}	241.30^{bc}	1.65	172.60
Crude protein	78.40^c	102.40^a	84.90^c	95.10^b	0.65	180.20
Cellulose	266.10^a	209.30^b	257.20^{ab}	225.00^{ab}	0.30	197.10
Hemicelluloses	95.00	96.80	89.20	99.90	1.87	64.90
Ether extract	12.40^c	42.40^a	28.40^b	31.10^b	0.37	29.60
Acid Detergent Fibre	361.10^a	306.10^d	346.40^b	324.90^c	0.41	283.30
Acid Detergent Lignin	102.90^c	113.40^{ab}	106.40_{ab}	115.90^a	0.39	86.2
Neutral Detergent Fibre	456.10^a	402.90^d	435.60^b	424.80^c	2.39	348.20
Ash	21.10^d	116.30^a	70.20^c	82.90^b	0.28	8.35

a, b, c, d means with different super script within the same row are significantly different ($P<0.05$).

Table 3: Performance and nutrient intake of Yankasa sheep fed *ficus* sycomorus

	Treatments				
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Initial body weight (kg)	14.25	14.25	14.25	14.25	NAS
Final body weight(kg)	20.87^b	17.40^d	22.97^a	19.72^c	0.76
Weight gain(kg)	6.60^b	3.15^d	8.62^a	5.47^c	1.02
Average Daily Gain (kg day^{-1})	0.07^b	0.03^d	0.10^a	0.06^b	0.002
Dry matter intake (kg day^{-1})	2.56^b	2.26^c	3.25^a	2.35^c	0.57
Dry matter intake (kg $W^{0.75}$)	2.02	2.05	2.42	1.89	0.86
Metabolic mass (kg $w^{0.75}$)	15.65^b	13.05^d	17.22^a	14.79^c	0.32
Feed conversion ratio	0.42^b	0.79^a	0.42^b	0.47^b	0.04

a, b, c, d means with different super script within the same row are significantly different ($P<0.05$).

Table 4: Effect of *ficus sycomorus* supplementation on nutrient digestibility of Yankasa sheep (g kg^{-1} DM)

	Treatments				
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Dry matter	28.90^a	10.40^{bc}	06.40^c	14.50^b	0.22
Crude fibre	02.10^d	86.50^b	146.80^a	48.10^c	0.95

Crude protein	89.23^{c}	235.40^{a}	765.60^{a}	237.60^{b}	0.40
Ether extract	161.30^{b}	625.00^{a}	764.00^{a}	588.40^{a}	8.52
Cellulose	91.70^{b}	164.40^{a}	70.70^{b}	149.40^{a}	0.93
Hemicellulose	95.80^{b}	83.60^{b}	48.20^{c}	136.20^{a}	1.30
Acid Detergent Fibre	15.30^{c}	87.50^{a}	64.90^{b}	61.50^{b}	042
Acid Detergent Lignin	06.80^{b}	08.80^{b}	23.50^{b}	169.20^{a}	1.23
Neutral Detergent Fibre	13.50^{c}	45.20^{b}	61.50^{a}	15.10^{c}	0.33

a, b, c, d means with different super script within the same row are significantly (P<0.05).

Table 5: Nitrogen balance of Yankasa breed of sheep fed *ficus sycomorus* g day^{-1}

	Treatment s				
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Nitrogen intake	12.54^{d}	16.38^{a}	13.58^{c}	15.22^{b}	1,02
Nitrogen in faeces	0.93^{a}	0.50^{b}	0.78^{ab}	0.59^{b}	0.12
Nitrogen in urine	0.74^{ab}	1.25^{a}	0.58^{c}	1.03^{ab}	0.13
Nitrogen absorbed	11.61^{c}	15.88^{a}	12.75^{bc}	14.63^{ab}	0.94
Nitrogen retained	10.87^{c}	14.63^{a}	12.22^{bc}	13.60^{ab}	0.89
Nitrogen balance ($BW^{0.75}$)	5.98^{ab}	7.48^{a}	6.53^{a}	7.08^{a}	1.23
Total Nitrogen	1.67	1.75	1.36	1.62	0.92
Percent as N intake					
Faeces N	7.41^{a}	3.05^{b}	4.27^{b}	3.87^{b}	2.02
Urine N	5.90^{c}	7.63^{a}	5.74^{c}	6.76^{b}	0.37
Absorbed	92.50^{b}	96.74^{a}	93.88^{ab}	96.13^{a}	1.27
Retained	86.66	89.31	90.31	89.35	4.08

a, b, c, d means with different super script within the same row are significantly differently (P<0.05).

Table 6: Effects of *ficus sycomorus* on the haematological parameters of yankasa sheep.

	Treatment s				
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Hb (g/.dl)	8.10±1.52	9.50±1.52	9.10±1.52	10.80±1.52	1.52
MCH (pg)	27.55^{a} ±0.39	13.05 ^{a} ±0.39	11.60 ^{a} ±0.39	13.50^{b} ±0.39	0.39
MCHC(g/dl)	26.55^{a} ±0.53	18.05^{c} ±0.53	23.35^{b} ±0.53	15.55^{b} ±0.53	0.53
MVC(fi)	17.30±2.34	15.30±2.34	18.10±2.24	18.00±2.34	2.34
PVC (%)	12.80±2.08	14.55±2.08	11.15±2.08	15.50±2.08	2.08
RBC (×10^{2} /1)	3.88±087	3.88±0.87	2.62±0.87	3.458±0.87	0.87
Lymphocyte (%)	28.80 ^{b} ±1.16	19.15^{c} ±1.16	16.35^{d} ±1.16	48.55^{a} ±1.16	1.16
Neutrophils (%)	11.20^{b} ±0.23	9.20^{b} ±0.23	10.10^{c} ±0.23	16.50^{a} ±0.23	0.23
Monocytes (%)	14.78^{b} ±1.02	13.60^{b} ±1.02	17.60^{a} ±1.02	13.60^{b} ±1.02	1.02

*abcd means with difference super script within the same row are significantly different (P<0.05). **Note**: Hb = hemoglobin, PCV = packed cell volume, RBC = Red blood cell, WBC = white blood cell.

Table 7: Blood chemistry of yankasa bread of sheep fed *ficus syncomorous*

	Treatments				
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Urea (mmol/L)	4.81^{b}±0.66	6.50a±0.66	5.60ab±0.66	5.60ab±0.66	0.66
Sodium (mmol/L)	129.00±15.85	127.00±15.85	122.00±15.85	124.50±15.85	15.86
Potassium (mmol/L)	4.83±0.97	4.00±0.97	4.83±0.97	4.83±0.97	0.97
Chlorine (mmol/L)	98.50±4.74	101.00±4.74	105.00±4.74	103.00±4.74	4.74
Glucose (mmol/L	5.70±1.14	4.81±1.14	4.50±1.14	3.53±1.14	12.35
Creatinine (mmo/L)	88.50±12.35	97.00±12.35	86.50±12.35	96.00±12.35	12.35
Total Protein (g/L)	66.00^{ab} ±4.92	69.00^{ab} ±4.92	63.50^{b} ±4.92	75.50^{b}±4.92	4.92
HCO^{-3} (mmol/L)	29.00±6.59	28.50±6.29	28.50±6.29	29.50±6.59	6.59

Globulin (g/L)	44.00^{a} ±3.19	33.00^{b} ±3.19	33.50^{b} ±3.19	47.00^{a} ±3.19	3.19
Albumin (g/L)	53.00±9.24	42.00±9.24	37.00±9.24	49.00±9.24	9.24
AST (IU/L)	12.50±2.23	14.00±2.23	13.00±2.23	11.00±2.23	2.23
ALP (IU/L)	29.00^{ab} ±4.85	25.00^{a} ±4.85	25.00^{b} ±4.85	39.00^{a} ±4.85	4.85
ALT (IU/L)	32.0± 1.72	17.0± 0.47d	39.0± 0.62	38.0± 0.78	2.35

a,b,c means with different super scrip within the same row are significantly different ($p>0.05$).

AST= Aspartate Aminotransferase; ALT= Alanine Aminotransferase; ALP= Alkaline Phosphate