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Wayamba Journal of Animal Science is published by the Society of Animal Science of the Department of Livestock & Avian Science, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka.

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## EFFECT OF TEMPERATURE ON WATER INTAKE OF SAVANNAH BROWN GOATS FED GRADED LEVELS OF MAXIGRAIN ENZYME TREATED RICE HUSK DIETS SUPPLEMENTED WITH SHEA BUTTER LEAVES

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This study was conducted to investigate the water intake and influence of temperature on savannah brown goats fed graded levels of Maxigrain® enzyme treated rice husk supplemented with shea butter leaves. A total number of 36 He- Savannah Brown Goats aged between 2-3 months with an average body weight of 5.5 kg were assigned to four dietary treatments in a completely randomized design. Treatments consisted of varied inclusion (0, 25, 50 and 75%) of Maxigrain® enzyme treated rice husk and given four (4) litres of water daily *ad libitum* for eight (8) weeks experimental period, during which parameters like; body weight, ambient temperature, evaporatory water loss, feed and water intake were measured. The result showed that the highest total body weight gain (4139.01g), daily weight gain (73.67g) and the lowest value (0.3533) of feed conversion ratio (FCR) were obtained in goats fed diet T2 which differed significantly ( $P < 0.05$ ) from other treatment groups. This study revealed that a strong correlation between body weight, feed intake and water intake. Therefore, feeding Maxigrain® enzyme treated rice husk up to 25% in the diets of savannah brown goats can be recommended.

**Keywords:** Maxigrain® Body weight gain, Feed conversion ratio, Rice Husk.

Goat is an important animal in livestock production and can adapt and adjust itself in harsh environmental conditions (Odeyinka and Okunade, 2004). In 2010, the estimated average goat meat consumption per person in Nigeria was 9.6kg which was less than the average of 24.9kg consumed in the Middle East and other parts of Africa (Anzaku *et al.*, 2013). Goats are stubborn and destructive in

nature and adapt well to severe climate. Because of the feeding habits and physiological features of goat, they are able to browse on plants that would ordinarily not be eaten by other livestock (Gutierrez, 2003). The savannah brown goats are predominantly found in the Northern part of Nigeria, especially in Niger state. The ears are diminutive and engraved parallel. Both genders have horns. They are homogeneously brown in colour and have short fine hairs (Osinowo, 1992). High environmental temperature, its exposure, and humidity affects water intake of animal which is detrimental to livestock production in the tropics (NRC, 2007). Animals can be fed water from three sources: drinking water, feed water and metabolic water from nutrient catabolism (Esminger *et al.*, 1990). Water use of animals exposed to high temperatures is affected in two ways; decrease dry matter intake and increased evaporation and skin cooling (NRC, 2007). Feedstuff and their by-products which are unaffected by digestive enzymes encompass some components which endogenous enzyme may be insufficient to degrade (Ravindran *et al.*, 1999). These components may lead to reduction in performance by lowering the consumption of some dietary nutrients. Optimization of non- conventional feeds can be done through the addition of Maxigrain® enzyme which may ultimately improve the animal body weight gain, feed conversion ratio and considerably reduces incorporation of di- calcium phosphate levels in feeds (Polchem Innovative Solution, 2013). The aim of this work was to investigate the effect of ambient temperature and water intake on growth performance of Savannah Brown goats fed graded levels of

Maxigrain® enzyme treated rice husk supplemented with shea butter leaves.

## MATERIALS AND METHODS

The entire experiment was conducted at the livestock unit of the Teaching and Research Farm in the Department of Animal Production, Federal University of Technology Minna, Niger State.

### Management of experimental animal

Thirty six (36) savannah brown male goats aged between 2-3 months with an average body weight  $5.0 \pm 0.5$  were purchased from Beji market in Minna Niger State. The goats were housed in wooden slatted floor pens (1.20 m  $\times$  0.80 m  $\times$  0.70 m) equipped with feeding and drinking facilities. Thereafter, routine management and vaccination followed. The animals were allowed ad libitum access to water throughout the trial. The goats were weighed and randomly allotted to four dietary treatments of three goats per replicate using a completely randomized design (CRD). The animals were allowed 7 days of acclimatization period to the experimental diets, during which they were observed for any symptoms of disease(s).

### Diets

All diets were formulated to meet the nutritional requirements of growing goats based on (NRC, 2007) recommendations and animals were fed twice daily with ad libitum access to clean water. The proximate composition of the diets was determined following the method of (AOAC, 2007). Rice bran treated with Maxigrain® enzyme at 0, 25, 50, and 75 % was used in composing the diet. The table for composition of experimental diet is shown in Table 1. Shea butter leaves were supplemented alongside their experimented diet and were given to the goats in the evening. The goats were fed 450g each of the experimental diet at 7am-8am daily while the supplementary feed was offered at 4pm-5pm. Four (4) litres of water was offered to each goat daily. Ambient temperature was measured between 12am-2pm daily with a suitable thermometer hanged inside the goat's pen. Feed intake and water intake were measured daily.

### Data collection

The initial body weights of the goats were measured using standing scale and subsequent weighing were done weekly throughout the experimental period. Feed and water offered, left over were also measured daily. The water intake was obtained by deducting the water leftover and the evaporatory loss from the water offered daily in accordance with NRC, (2007) recommendation that growing sheep and goats will consume 2-4 litres of water per day at higher ambient temperatures. Feed conversion ratio (FCR) was computed as the ratio of total feed intake to the body weight gain.

### Statistical analysis

Data collected were subjected to analysis of variance (ANOVA). The means were separated using statistical package for SPSS (2008). Pearson's correlation analysis was carried out between feed intake, water intake, ambient temperature and evaporatory loss for all the treatment groups used in the experiment.

## RESULTS

Table 2 showed the proximate composition of the experimental diets and shea butter leaves fed to Savannah Brown goats. The dry matter was higher in T4 (92.67%) and lowest in T2 (85.33%). Nitrogen free extract was higher in T3 (55.74%) and lowest in T2 (46.49%). T4 recorded the highest value in Ash (12.00%) and T3 has the lowest value (7.00%). Ether extract in T1 was higher in value (9.50%) and T4 has the lowest value (4.00%). T4 recorded the highest value in crude fibre (11.33%) and the lowest in T1 (8.33%). Crude protein in T4 recorded the highest value of (14.13%) and the lowest value in T2 (12.06%). Table 3 showed growth performance of Savannah brown goats fed graded levels of Maxigrain® enzyme treated rice husk diets were not significantly different ( $P > 0.05$ ) between all the treatment groups. Table 4 showed the water intake of Savannah Brown goats fed Maxigrain® enzyme treated rice husk diets and there were no significant differences ( $P > 0.05$ ) between all the treatment groups. The rectal temperature at week 2, 4 and 6

Table 1: Composition of the experimental diets and calculated nutrients fed to Savannah Brown Goats.

INGREDIENTS	TREATMENTS			
	T1	T2	T3	T4
Maize	71.50	53.55	35.70	17.97
Rice husk	0.00	17.85	35.70	53.93
Groundnut cake	8.0	7.50	7.50	6.50
Maize bran	19.50	19.50	20.00	20.50
*Premix	0.50	0.60	0.60	0.60
Salt	0.50	0.80	0.60	0.60
Total	100.00	100.00	100.00	100.00
Calculated				
Metabolizable Energy (Kcal/kg)	3581.8	3074.6	3349.8	2973.6
Crude Protein (%)	14.12	12.06	13.38	14.13

T1 - Control (0% Maxigrain<sup>®</sup> enzyme treated rice husk diet)  
T2 - 25% Maxigrain<sup>®</sup> enzyme treated rice husk  
T3 - 50% Maxigrain<sup>®</sup> enzyme treated rice husk  
T4 - 75% Maxigrain<sup>®</sup> enzyme treated rice husk

Table 2: Proximate Composition of Experimental Diets and Shea Butter Leaves

Proximate Composition (%)	T1	T2	T3	T4	SBL
Dry Matter	91.00	85.33	92.00	92.67	93.87
Crude Protein	14.12	12.06	13.38	14.13	7.00
Crude Fibre	8.33	11.14	9.38	11.33	30.00
Ether Extract	9.50	8.14	6.50	4.00	3.50
Ash Content	8.00	7.50	7.00	12.00	6.00
Nitrogen Free Extract	54.05	46.49	55.74	51.21	47.37

SBL- Shea Butter Leaves

Table 3: Growth Performance of Savannah Brown Goats fed Graded Level of Maxigrain<sup>®</sup> enzyme treated rice husk Diets

PARAMETERS(g)	TREATMENTS				LS
	T1	T2	T3	T4	
Initial body weight	5666.63±166.65	5444.43±96.24	5500.00±0.00	5666.63±166.65	NS
Final body weight	9083.33±2268.44	9583.00±877.97	9250.00±2222.05	9000.00±1322.88	NS
Total weight gain	3416.67±2171.8	4139.01±75.34	3750.00±22.05	3333.33±452.7	NS
Daily weight gain	60.67±39.07	73.67±15.50	66.67±39.71	59.00±26.15	NS
Weekly weight gain	426.67±271.59	517.00±109.53	468.33±277.62	416.33±181.58	NS
Daily feed intake	33.24±8.01	25.75±2.87	26.86±2.79	59.00±26.15	NS
Weekly feed intake	232.72±56.08	180.25±20.07	188.05±19.49	29.27±6.94	NS
Total feed intake	1861.00±448.64	1442.05±160.55	1488.41±147.57	1639.38±388.57	NS
Feed conversion ratio	0.6767±0.32	0.3533±0.04	0.6233±0.58	0.6433±0.53	NS

LS – Level of significance, ± - Standard error of mean, NS – Not significance

were significantly different ( $P < 0.05$ ) from other weeks. At week 2, rectal temperature of goats fed (0%) Maxigrain<sup>®</sup> enzyme treated rice husk diets were significantly ( $P < 0.05$ ) lower than the rectal temperature of goats fed 25% and 50% Maxigrain<sup>®</sup>

enzyme treated rice husk diets. However, the rectal temperature of goats fed 25% and 50% were not significantly different ( $P > 0.05$ ) from each other. The rectal temperature of goats fed 75% Maxigrain<sup>®</sup> enzyme treated rice husk diets were



Table 4: Water intake and Evaporatory Loss treatment period of Savannah Brown Goats fed graded levels of Maxigrain<sup>®</sup> enzyme treated rice husk diets

PARAMETERS	TREATMENTS				
	T1	T2	T3	T4	LS
Average daily water intake(L/day)	0.64±0.95	0.58±0.87	0.68±0.18	0.68±0.13	NS
Weekly water intake (L)	4.42±0.69	4.07±0.59	4.77±1.32	4.79±0.92	NS
Total water intake (L)	35.35±5.48	32.55±4.76	38.14±10.56	38.32±7.39	NS

Table 5: Mean weekly Rectal Temperature of Savannah Brown Goats fed Graded Levels of Maxigrain<sup>®</sup> enzyme treated rice husk diets

Weekly Rectal Temperature(°C)	TREATMENTS				
	T1	T2	T3	T4	LS
Week 1	39.17±0.74	39.93±0.87	39.40±0.26	38.83±0.51	NS
Week 2	36.97 <sup>a</sup> ±1.74	38.98 <sup>b</sup> ±0.35	39.37 <sup>b</sup> ±0.53	37.73 <sup>ab</sup> ±0.15	*
Week 3	38.20±0.36	38.33±0.12	38.93±0.61	37.77±1.00	NS
Week 4	38.47 <sup>b</sup> ±0.46	38.53 <sup>b</sup> ±0.40	38.30 <sup>b</sup> ±0.66	37.33 <sup>a</sup> ±0.31	*
Week 5	38.97±0.23	38.93±0.05	38.97±0.81	38.63±0.21	NS
Week 6	38.87 <sup>ab</sup> ±0.60	38.30 <sup>ab</sup> ±0.00	38.93 <sup>b</sup> ±0.90	37.77 <sup>a</sup> ±0.38	*
Week 7	39.20±1.15	38.47±0.31	38.10±0.46	38.17±0.74	NS
Week 8	38.73±0.35	38.17±0.45	38.30±0.36	37.93±0.58	NS

\*Significant difference (P<0.05)

Table 6: Correlation coefficient of Body weight, Feed intake, Feed conversion ratio and Rectal Temperature of Savannah Brown Goats fed Graded Levels of Maxigrain<sup>®</sup> enzyme treated rice husk diets

PARAMETERS (g)	TREATMENTS			
	T1	T2	T3	T4
Body weight & Feed intake	0.924	0.959	- 0.870	- 0.996
Body weight & Feed conversion ratio	-0.976	-0.985	-0.990	-0.997*
Body weight & water intake	0.995	-0.048	0.784	0.053
Feed intake & Feed conversion ratio	-0.986	-0.896	0.793	1.000*
Feed intake & water intake	0.958	-0.329	0.988	0.040
Feed intake & Rectal temperature	0.619	0.380	0.995	0.526
Water intake & Feed conversion ratio	-0.993	-0.123	-0.690	0.024
Water intake & body weight	0.958	-0.329	0.988	0.040
Water intake & feed intake	0.955	-0.48	0.784	0.053
Water intake & Rectal temperature	0.819	-0.999*	0.967	0.871

\*Significant difference (P<0.05)

significantly comparable (P<0.05) to the rectal temperature of goats fed 0%, 25% and 50% Maxigrain<sup>®</sup> enzyme treated rice husk diets respectively. At week 4, rectal temperature of goats fed 75% Maxigrain<sup>®</sup> enzyme treated rice husk diets were significantly lower (P<0.05) than the rectal temperature of goats fed 0%, 25% and 50%. However, the rectal temperature of goats fed 0%, 25% and 50% were not significantly different (P>0.05) from each other. At week 6, the rectal temperature of goats fed 75% Maxigrain<sup>®</sup> enzyme treated rice husk diets is

significantly lower(P<0.05) than the rectal temperature of goats fed 0%, 25% and 50% Maxigrain<sup>®</sup> enzyme treated rice husk diets. However, the rectal temperature of goats fed 0%, 25% and 50% Maxigrain<sup>®</sup> enzyme treated rice husk diets were significantly comparable to goats fed 50% and 75% Maxigrain<sup>®</sup> enzyme treated rice husk diets. Table 6 shows the correlation of body weight, feed intake, water intake and feed conversion ratio of Savannah Brown goats fed graded levels of Maxigrain<sup>®</sup> enzyme treated rice husk diets. There was no

significant correlation ( $P>0.05$ ) between body weight, feed intake and feed conversion ratio.

## DISCUSSION

The non-significant difference observed in daily water intake and the ratio of water intake to feed intake could be due to the same ambient temperature which the goats were exposed to, also the level of Maxigrain® enzyme treated rice husk inclusion does not have any positive effect on daily water intake. Feed intake was observed to be positively correlated with water intake. This agrees with both Dozie, (2003) and Misra and Khub Singh, (2002) who reported that dry matter intake is correlated strongly with water intake in goats. Wani (2010) reported that the amount of water requirement for goats depends on their needs for the maintenance of normal water balance and for satisfactory levels of production. The ratio of water to feed intake obtained was lower than those of Daramola and Adeloye (2004), who reported that the ratio of water to dry matter intake of goats fed maize cob diet ranges from 2.96:1 to 7.04:1. Winchester and Morris (2009) reported that the ratio of water intake increases with an increase in ambient temperature. The negative correlations observed in some of the treatments among water intake with feed conversion ratio (FCR), body weight and feed intake were not in agreement with the report of (Abioja *et al.*, 2010) who reported positive significant correlation between water intake and feed conversion ratio (FCR) for West African Dwarf goats ( $P<0.05$ ,  $r=0.316$ ). As the ambient temperature reduces, the goats losses more heat to the environment and more energy will be required to maintain a constant body temperature through increased feed intake (Abioja *et al.*, 2010). The non-significant differences in rectal temperature observed in week 1, 3, 5, 7 and 8 could probably be due to exposure of the goats to same ambient temperature. The result was in agreement with Adogla- Bessa (2000) who reported that animal drank less water in winter than in summer and they consume more feed, convert feed more efficiently and

gain more weight in winter than in summer. Also, the significant differences in rectal temperature observed in week 2, 4 and 6 was in agreement with St-Pierre *et al.*, (2003) who reported that animal health, growth and reproduction are adversely impacted by high temperatures. The better performance by goats fed 25% Maxigrain® enzyme treated rice husk diets in total weight gained and feed conversion ratio over control (0%) and T4 may probably be due to better utilization of feeds by the goats in the group and a positive effect of the enzyme in the diet.

## CONCLUSION

The results of this study demonstrate that dietary level of 25% Maxigrain® enzyme treated rice husk fed to the Savannah brown goats had the best growth performance and highest correlation coefficient between body weight gain and feed intake. Ambient temperature and rectal temperature has no significant correlation on water intake, feed intake and body weight gain. Therefore 25 % inclusion of Maxigrain® enzyme treated rice husk supplemented with shea butter leaves in the diet of Savanna brown goats is recommended.

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## HAEMATOLOGY PARAMETERS OF SAVANNAH BROWN GOATS FED MAXIGRAIN ENZYME TREATED RICE HUSK SUPPLEMENTED WITH SHEA BUTTER LEAVES

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This study was conducted to determine the haematology parameters of savannah brown goats fed Maxigrain® enzyme treated rice husk supplemented with shea butter leaves. A total number of 36 He- Savannah Brown Goats aged between 2-3 months with an average body weight of 5.5 kg were assigned to four dietary treatments in a completely randomized design. Treatments consisted of varied inclusion (0, 25, 50 and 75%) of Maxigrain® enzyme treated rice husk for eight (8) weeks experimental period. The different level of Maxigrain® enzyme treated rice husk had significant differences ( $P < 0.05$ ) on White Blood Cell (WBC), Absolute Lymphocyte (LY#), Lymphocyte % (LY), Absolute Granulocyte (GRAN #) and Haemoglobin (HB). While Mid cell (MID), Granulocyte (GRAN), Absolute Mid cell (MID#), Red Blood Cell (RBC), Haematocrit (HCT) reveal no significant ( $P > 0.05$ ) difference among the treatment mean. Haemoglobin (HB), Red Blood Cell (RBC), Haematocrit (HCT) and Granulocyte (GRAN) fell within range value of the goat's blood showing that Maxigrain enzymes treated rice husk has no detrimental effect on the haematology.

**Keywords:** Maxigrain® Haematology, Rice Husk.

Maxigrain® enzymes are natural product of fermentation and therefore pose no threat to animal or the consumer (Aguihe *et al.*, 2016). It is a bacterial xylanase enzyme. It is a product which helps to optimize the use of non-conventional feed ingredients and help improve feed conversion efficiency (Wikipedia, 2014). It helps to reduce levels of di-calcium phosphate absorption in the feed substantially (Polchem Innovative

Solution, 2013). Rice husk is a byproduct of rice obtained from the outer layer of the rice kernel during milling. It is rich in fibre, minerals, B vitamins, antioxidants and phytic acids (Holland *et al.*, 1991). Hence, rice husk together with forages can serve as a vital source of nutrient requirements for ruminant Animals (Young, 2000). Goat meat contributed about 24% to Nigeria meat supply (Oni, 2002). The high preference for goat meat consumption is due to its attributes such as tenderness and juiciness of the meat (Babiker *et al.*, 1990). Goats are well adapted to different environmental conditions and utilize feed efficiently to produce high protein product (Kadim *et al.*, 2003). Haematological studies are very vital in the diagnosis of many diseases as well as the extent to which blood is damaged (Onyeyili *et al.*, 1992; Togun *et al.*, 2007). Also, investigation of blood can be used to determine the presence of several metabolites and other constituents which may affect the physiological, nutrition and pathological states of an Animal (Aderemi, 2004; Doyle, 2006). As reported by Olafedehan *et al.*, (2010), there are millions tonnes of unconventional Animal feed resource that are accessible but not fully utilized for ruminant Animal production. Hence, there is need to search for alternative quality but low cost feed for feeding these animals especially during the dry season. Emphasis by Animal nutritionist is usually on nutrient digestibility, feed utilization and farm Animal performance (Uko and Ataja, 1998). However, it is important to consider the health status of the Animals used in various feeding trials. The objective of this study was to use haematological parameters to determine the effect of feeding

Maxigrain<sup>®</sup> enzyme treated rice husk supplemented with shea butter leaves on Savannah brown Goats.

## MATERIALS AND METHODS

The entire experiment was conducted at the livestock unit of the Teaching and Research Farm in the Department of Animal Production, Federal University of Technology Minna, Niger State.

### Management of experimental animal

Thirty six (36) savannah brown male goats of 2-3 months of age and of comparable sizes were purchased from Beji market in Minna Niger State. The goats were housed in wooden slatted floor pens (1.20 m × 0.80 m × 0.70 m) equipped with feeding and drinking facilities. Thereafter, routine management and vaccination followed. The animals were allowed ad libitum access to water throughout the trial. The goats were weighed and randomly allotted to four dietary treatments of three goats per replicate using a completely randomized design (CRD). The animals were allowed 7 days of acclimatization period to the experimental diets, during which they were observed for any symptoms of disease(s).

### Diets

All diets were formulated to meet the nutritional requirements of growing goats based on (NRC, 2007) recommendations and animals were fed twice daily with ad libitum access to clean water. The proximate composition of the diets was determined following the method of (AOAC, 2007). Rice husk treated with Maxigrain<sup>®</sup> enzyme at 0, 25, 50, and 75 % was used in composing the diet. The table for composition of experimental diet is shown in Table 1. Shea butter leaves were supplemented alongside their experimented diet and were given to the goats in the evening.

### Blood sampling and analysis

Blood samples were collected from the goat per replicate at the 4<sup>th</sup> and 8<sup>th</sup> of the experiment. 3ml of blood was collected into a bottle containing Ethylene Diamine Tetra Acetic Acid (EDTA), from each animal through the jugular venipuncture using 21-gauge needle while observing all aseptic

precautions. The samples were kept in ice packed container processed and subjected to haematological parameter analysis. Haemoglobin concentration was determined by Sahl's (acid haematin) method (Benjamin 1978). MCHC values were calculated from Hb and RBC values (Jain 1986).

### Statistical analysis

All data collected were subjected to one way analysis of variance (ANOVA). Significantly means were separated using Duncan multiple range test (1999). All the data collected were analyzed using statistical package for social sciences (SPSS, 2006).

## RESULTS

Table 2 showed the proximate composition of the experimental diets and shear butter leaves fed to Savannah Brown goats. The dry matter was higher in T4 (92.67%) and lowest in T2 (85.33%). Nitrogen free extract was higher in T3 (55.74%) and lowest in T2 (46.49%). T4 recorded the highest value in Ash (12.00%) and T3 has the lowest value (7.00%). Ether extract in T1 was higher in value (9.50%) and T4 has the lowest value (4.00%). T4 recorded the highest value in crude fibre (11.33%) and the lowest in T1 (8.33%). Crude protein in T4 recorded the highest value of (14.13%) and the lowest value in T2 (12.06%). The result of haematological parameter of savannah brown goat fed maxigrain enzymes treated rice husk shown on Table 3, revealed that WBC, LY, LY#, GRAN and HB were significantly different ( $P < 0.05$ ) among treatment means. However, MD, GRAN, MID#, RBC and HCT were not significantly different ( $P > 0.05$ ). WBC, LY# and HB were significantly higher in the control, compare to all other treatments which were similar. LY% differ significantly ( $P < 0.05$ ) in T4 (54.15%) compare to the other treatments and the least was recorded in T3 (24.45%). The mean values of haematological indices of Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC) and Mean Corpuscular Volume (MCV) as shown on Table 4 revealed no significant differences ( $P > 0.05$ ) among the treatment means.

Table 1: Composition of the diet fed to the goats

INGREDIENTS	TREATMENTS			
	T1	T2	T3	T4
Maize	71.50	53.55	35.70	17.97
Rice husk	0.00	17.85	35.70	53.93
Groundnut cake	8.0	7.50	7.50	6.50
Maize bran	19.50	19.50	20.00	20.50
*Premix	0.50	0.60	0.60	0.60
Salt	0.50	0.80	0.60	0.60
Total	100.00	100.00	100.00	100.00
Calculated Metabolizable Energy (Kcal/kg)	3581.8	3074.6	3349.8	2973.6
Crude Protein (%)	14.12	12.06	13.38	14.13

T1 - Control (0% Maxigrain® enzyme treated rice husk diet)

T2 - 25% Maxigrain® enzyme treated rice husk

T3 - 50% Maxigrain® enzyme treated rice husk

T4 - 75% Maxigrain® enzyme treated rice husk

Table 2: Proximate Composition of Experimental Diets and Shea Butter Leaves

Proximate Composition (%)	T1	T2	T3	T4	SBL
Dry Matter	91.00	85.33	92.00	92.67	93.87
Crude Protein	14.12	12.06	13.38	14.13	7.00
Crude Fibre	8.33	11.14	9.38	11.33	30.00
Ether Extract	9.50	8.14	6.50	4.00	3.50
Ash Content	8.00	7.50	7.00	12.00	6.00
Nitrogen Free Extract	54.05	46.49	55.74	51.21	47.37

SBL- Shea Butter Leaves

Table 3: Haematological Parameters of Savannah Brown Goat Fed Maxigrain Enzyme Treated Rice Husk

Parameter	T1	T2	T3	T4	SEM	LS
WBC ( $10^9/L$ )	168.10 <sup>a</sup>	17.50 <sup>b</sup>	19.05 <sup>b</sup>	16.52 <sup>b</sup>	24.67	*
LY (%)	42.80 <sup>ab</sup>	36.15 <sup>ab</sup>	24.45 <sup>b</sup>	54.15 <sup>a</sup>	4.72	*
MID (%)	2.55	27.50	5.60	22.80	6.14	NS
GRAN (%)	54.60	36.35	69.95	23.05	8.71	NS
LYN ( $10^9/L$ )	72.75 <sup>a</sup>	6.27 <sup>b</sup>	4.70 <sup>b</sup>	9.16 <sup>b</sup>	11.58	*
MID # ( $10^9/L$ )	4.36	4.51	1.07	2.93	0.89	NS
GRAN # ( $10^9/L$ )	91.15 <sup>a</sup>	6.71 <sup>b</sup>	13.30 <sup>b</sup>	4.41 <sup>b</sup>	14.10	*
RBC ( $10^9/L$ )	2.75	0.07	0.09	0.00	0.67	NS
HB (g/L)	362.00 <sup>a</sup>	95.50 <sup>b</sup>	80.00 <sup>b</sup>	99.00 <sup>b</sup>	45.58	*
HCT (L/L)	0.31	0.01	0.01	0.00	0.08	NS

a, b, mean with different subscript on the same row are significantly different ( $P < 0.05$ )  
 \*= significantly difference ( $P < 0.05$ ), NS= No significant difference ( $P > 0.05$ ), WBC- white blood cell, LY- lymphocyte, MID- mid cell, GRAN- granulocyte, RBC- red blood cell, HB- haemoglobin, GRAN#- absolute granulocyte, MID #- absolute mid cell, HCT- haematocrit.

Table 4: Differences in Red Blood Cells Indices

INDICES	T1	T2	T3	T4	SEM	LS
MCH	37.80	444.85	301.60	0.00	124.27	NS
MCHC	337.00	0.00	0.00	0.00	84.25	NS
MCV	96.50	88.50	85.00	90.00	3.45	NS

MCH- mean corpuscular haemoglobin, MCHC- mean corpuscular haemoglobin concentration, MCV- mean corpuscular volume.

## DISCUSSION

The health status of an experimental animal is normally known when blood parameters are measured. This is because blood plays a vital role in physiological, nutritional and pathological status of animal (Kakade *et al.*, 1972). Physiological parameter is a valuable means of diagnosing a disease (Santschi *et al.*, 1988 ; Ganong 2005) and protein status in goats (Daramola *et al.*, 2005).

The total WBC count in T1 was higher than T2, T3 and T4 also more than the value obtained in Red Sokoto Goats (Tambuwal *et al.*, 2002). This differences may be as a result of the goats in T2, T3 and T4 trying to adjust to the physiological and nutritional changes in Maxigrain® enzyme supplementation in the feed.

The highest level of haemoglobin (Hb) was observed in T1. Haemoglobin value in T2, T3 and T4 fell within the range given by Research Animal Resources (RAR 2009) and within the range 7-15% and 9.15-10.75% g/L for West African Dwarf Goats (Daramola *et al.*, 2005). Savannah brown goats seem to possess relatively high Hb values, and this is an advantage in terms of the oxygen carrying capacity of the blood (Akinyemi *et al.*, 2010).

The absolute granulocyte were significantly different ( $P < 0.05$ ) in T1 due to the active infection ([www.emedicinehealth.com](http://www.emedicinehealth.com)) and lower level in T2, T3 and T4, which could be associated with the feed quality.

## CONCLUSION

The findings of this study may serve as references in which enzyme supplementation in feed, Physiological and health status can be compared both for diagnostic and therapeutic purposes in Savannah Brown Goats in this ecological zone. Also, based on the result of this study, it is therefore concluded that Maxigrain® treated rice husk supplemented in diet of Savannah Brown Goat has no harmful effect on the haematological parameters.

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