SERUM BIOCHEMISTRY AND HORMONAL INDICES OF *KALAWAD* BUCKS FED *BRACHIARIA RUZIZIENSIS* AND *PANICUM MAXIMUM*

Olalere, J.O[1] , Toviesi[2], D.P, Oderinwale[3], O.A, Akinneye[1], K.A, Oluwatosin[2], B.O, Shittu, O.O[2], Sanusi, G.O [2] and Taiwo, S.F[1],

[1]Livestock Science and Sustainable Environment Programme,
World Bank Africa Centre of Excellence in Agricultural Development and Sustainable Environment, Federal University of Agriculture, Abeokuta.
[2]Institute of Food Security, Environmental Resources and Agricultural Research (IFSERAR) Federal University of Agriculture, Abeokuta, PMB 2240, Ogun State, Nigeria
[3]Department of Animal Production and Health, Federal University of Agriculture, Abeokuta, PMB 2240, Ogun State, Nigeria.
Corresponding Author Email: olalere.johnsono@pg.funaab.edu.ng/johnsonolayide28@gmail.com
Phone Contacts: +234(0)8066889899 / +234(0)9014937149

ABSTRACT
Rising interest in livestock development because of the demand for animal products, has led to research into identifying drought tolerant, more productive and persistent forages to support livestock productivity, among which are Guinea grass and Ruzi grass. Thus, a study was carried out to evaluate serum biochemistry and hormonal indices of Kalawad bucks fed Brachiaria ruziziensis and Panicum maximum. Twelve KALAWAD bucks were subjected to a completely randomized design for an 84 day study to evaluate the blood profiles of the goats fed two different grass forages in the wilted forms. The two forages were fed on experimental basis as the sole Panicum maximum (PM), the sole Brachiaria ruziziensis (BR) and ratio 1:1 mixture of Panicum maximum and Brachiaria ruziziensis (PMBR) and blood samples were collected for serum biochemical parameters. Total protein, Albumin, Globulin, Malondialdehyde, Superoxidedismutase, Total bilirubin, direct bilirubin, Glutathione, Cortisol, Copper, Zinc, Selenium, Potassium, Sodium and Magnesium. The results obtained revealed that haematology parameters of the goats fed with PM, BR and PMBR were within the standard values with no significant difference. Total bilirubin, Zinc and Sodium were significantly ($p<0.05$) influenced by the diets with bucks fed with PM having highest values of 0.22±0.02mg/dl, 0.46±0.04mg/L and 119.61±3.11mg/L respectively while Selenium was highest in bucks fed BR (1.06±0.12mg/L). The study concluded that the experimental diets did not adversely affect the growth and health of the animals.
Keywords: Serum biochemistry, Panicum maximum, *KALAWAD* buck, ruzi grass, hormonal indices.

INTRODUCTION

Goats are assumed to be the second most important livestock species in Nigeria and also contribute 24% of the meat supply in the country. Conversely, the major challenge to the production of goats is nutrition. In the tropics, natural pastures are the principal diets of ruminant animals. These natural pastures are scarce and have fluctuating quality all-year-round (Ajayi *et al*., 2005), especially in the dry season. Tolera *et al*. (2000) opined that during dry seasons, goats are generally affected thereby leading to low production, poor reproductive performance, slow growth performance and increased susceptibility to diseases and parasitic infections.

Guinea grass *(Panicum maximum)* is an extremely variable species; loosely to densely tufted, shortly rhizomatous, erect or geniculately ascending, rooting at the lower nodes (Cook *et al*., 2005). Guinea grass (*Panicum maximum*) is highly relished by goats and may be fed to stimulate ruminal micro-organisms.

Ruzi (Brachiaria ruziziensis) grasses have several desirable traits that include adaptation to marginal soils, water stress and shade tolerance. It has high biomass production potential, ability to sequester carbon, increase nitrogen use efficiency through biological nitrification inhibition (BNI) and subsequently reduce greenhouse gas emissions and groundwater pollution (Subbarao et al., 2009).

MATERIALS AND METHODS

Description of experimental site

The experiment was carried out at the Kalahari Red Goat Unit of Institute of Food Security, Environmental Resources and Agricultural Research (IFSERAR), Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The climate is humid with an annual rainfall of 1037mm and average temperature of 34.7°C. This area is located in the derived savannah vegetation zone of South Western Nigeria with latitude 7°13'32" N, longitude 3°26'04" E, altitude 76m above sea level and relative humidity of 82% (Google Earth, 2017).

Sources of Experimental Animals and Grasses

The goats used were sourced from the Livestock Production Research Program farm, IFSERAR. An existing paddock sown with *Brachiaria ruziziensis* was cut back four weeks before the start of the experiment to give allowance for the paddock regrowth, while re-growth of *Panicum maximum* was sourced at various places inside the University environment.

Experimental Animals and Management:

A total number of 12 *KALAWAD* bucks were selected from a herd in the experimental site. The age of the animals was less than a year, with an average liveweight of (13±1kg). Three experimental (3) treatments with four (4) animals per treatment were used.

The dietary treatments were:

100% *Panicum maximum* and 0% *Brachiaria ruziziensis*
0% *Panicum maximum* and 100% *Brachiaria ruziziensis*
50% *Panicum maximum* and 50% *Brachiaria ruziziensis*

The goats were intensively managed and fed the experimental diets in the wilted form. Feeding period lasted for 84 days**.**

Blood Samples Collection

Blood samples were collected from each of the experimental animals via jugular vein punctured with new hypodermic needle fitted on a 10mL calibrated syringe in the morning before and the end of the experiment. Five (5mL) of the blood samples collected was deposited into plain bottles for serum biochemistry analysis.

RESULTS AND DISCUSSION

Table 1: Chemical composition of Panicum, Brachiaria and the mixture of experimental diets (%)

Parameters (%)	PM	BR	PMBR
Dry matter	90.33±0.38^{ab}	89.87±0.20^{b}	90.93±0.22^{a}
Crude protein	7.35±0.66	5.68±0.22	6.61±0.76
Crude fibre	37.75±1.14^{a}	30.67±0.86^{b}	34.84±1.20^{c}
Ether extract	1.11±0.04	0.90±0.08	0.82±0.14
Ash	11.38±0.24^{a}	7.55±0.44^{c}	9.39±0.61^{b}
Nitrogen free extract	43.08±1.36^{c}	55.19±1.30^{a}	48.34±1.41^{b}
Neutral Detergent Fibre	71.03±0.82^{a}	66.56±0.47^{b}	67.66±1.30^{b}
Acid Detergent Fibre	48.42±2.02^{a}	37.03±4.01^{b}	43.27±0.43^{ab}
Acid Detergent Lignin	40.92±0.41^{a}	30.83±0.42^{b}	32.55±2.88^{b}
Hemicellulose	22.61±0.31^{b}	29.53±0.13^{a}	24.39±0.20^{ab}
Cellulose	7.50±0.21^{a}	6.20±0.11^{ab}	10.72±0.09^{b}
*ME (MJ/kgDM)	12.30±0.03	12.40±0.02	12.40±0.01

^{abc}Means within the same row with different superscripts are significantly different at P<0.05.
ME(MJ/KgDM) = 12.86+0.0265EE+0.0056ADF+0.0153ASH-0.0253ADL Where EE = ether extract, ADF = acid detergent fibre and ADL = acid detergent lignin PM = *Panicum maximum,* BR = *Brachiaria ruziziensis,* PMBR = *Panicum maximum* and *Brachiaria ruziziensis,* ME = Metabolizable Energy.

Table 2: Phytochemical compositions of *Panicum maximum*, *Brachiaria ruziziensis* and the mixture of the two grasses.

Parameters	PM	BR	PMBR
Oxalate (%)	7.16±2.55	6.95±0.43	5.68±1.37
Tannins (g/kg)	0.11±0.00	0.18±0.00	0.00±0.00
Alkaloids (%)	1.34±0.38	2.62±1.40	0.96±0.02
Saponin (%)	0.01±0.002	0.01±0.001	0.04±0.03
Flavonoids (Mg/Kg)	0.58±0.01	1.22±0.18	1.39±0.31

PM = *Panicum maximum,* BR = *Brachiaria ruziziensis,* PMBR = *Panicum maximum* and *Brachiaria ruziziensis*

Table 3: Serum biochemical parameters and hormonal profile of *KALAWAD* goats fed *Panicum maximum*, *Brachiaria ruziziensis* and their mixtures.

Parameters	SV	PM	BR	PMBR
Total protein (g/dL)	6.4 – 7.0	7.00±0.27	6.59±0.14	6.93±0.18
Albumin (g/dL)	2.7 – 3.9	4.06±0.14	3.66±0.09	3.06±0.20
Globulin (g/dL)	2.7 – 4.1	2.95±0.28	2.94±0.09	3.06±0.20
Malondialdehyde (μ/Lx10^{-09})		2.40±0.55	1.70±0.14	1.95±0.18
Superoxidedismutase (μ/mL)		0.00±0.00	0.00±0.00	0.00±0.00
Total bilirubin (mg/dL)	0 – 0.1	0.22±0.02^{a}	0.19±0.02^{b}	0.18±0.02^{ab}
Direct bilirubin (mg/dL)	0 – 0.1	0.10±0.01	0.09±0.01	0.11±0.02
Glutathione (μ/L)		172.00±26.30	150.04±16.37	158.61±18.18
Cortisol (ng/mL)		5.25±0.26	5.26±0.27	5.16±0.22
Copper (mg/L)	4.14 – 5.22	0.33±0.03	5.26±0.27	5.16±0.22
Zinc (mg/L)		0.46±0.04^{a}	0.49±0.02^{ab}	0.41±0.04^{b}
Selenium (mg/L)		0.95±0.08^{b}	1.06±0.12^{a}	0.81±0.09^{ab}
Potassium (mg/L)	3.5 – 6.7	3.17±0.31	3.34±0.25	3.17±0.31
Sodium (mg/L)		119.61±3.11^{a}	114.54±5.11^{b}	127.04±4.07^{ab}
Magnesium (mg/L)	2.8 – 3.6	2.09±0.16	2.09±0.18	2.02±0.15

^{ab}Means within the same row with different superscripts are significantly different at P<0.05

PM = *Panicum maximum,* BR = *Brachiaria ruziziensis,*PMBR = *Panicum maximum* and *Brachiaria ruziziensis,* SV = Standard values.

RESULTS

Table 1 showed the result of chemical composition of the experimental diets. All the parameters were significant (p<0.05) except CP and EE. PMBR recorded the highest dry matter percentage while CF and Ash were highest in PM with the value of 37.75% and 11.38% respectively. The highest value of NFE was found in BR (55.19%). NDF, ADF and ADL were significantly higher in PM. The value of hemicellulose ranged from 22.61% - 29.53%. Cellulose was highest (7.50%) in PM and lowest (10.72%) in PMBR.

Phytochemical composition of experimental diets were shown in Table 2. Oxalate, Tannins, Alkaloids, Saponin and Flavonoids were not significant (p>0.05).

Table 3 presented the serum biochemical parameters and hormonal profile of *kalawad* goats fed experimental diets. Total bilirubin, Zinc, Selenium and Sodium were significant (p<0.05). Total bilirubin was highest with the goats fed PM 0.22mg/dL. Zinc (0.46mg/L) and Sodium (119.61mg/L) were highest in goats fed PM while goats fed BR recorded 1.06mg/L as the highest selenium content.

Discussion

Phytochemicals otherwise known as anti-nutritional factors (ANFs) in the forages are meant to prevent and protect plants from insect attacks and the likes. Some of the ANFs considered in this study were tannins, saponin, oxalate, alkaloid and phenol. The two major ones of discussion were tannin and saponin since their contributions to the nutrition of the experimental animals had no deleterious effect. Threshold concentrations of 5% tannin have been reported, beyond which there may be rejection of browse plants by goats. In sheep and cattle, dietary tannin level of 2 and 5%,

respectively have also been reported to have adverse effect on digestibility, lower feed intake, reduce palatability, inhibit digestive enzymes and was toxic to rumen microorganisms. The availability of sulphur and iron was shown (Dynes and Schlink, 2002) to be limiting to animals consuming tannin rich foliage. The decrease observed in this study in the tannin content is supported by Baloyi *et al*. (2001) who reported that proportion of condensed tannin in selected forage grown in Zimbabwe, was greater in younger than in mature forages. Beck and Reed (2001) reported that most forage herbivores selectively consume plants of relatively low tannin concentration. The saponin levels reported in this study were lower than those reported by Lu and Jorgensen (1987), who showed that alfalfa saponins inhibited microbial fermentation and synthesis in the rumen and altered the sites of nutrient digestion in sheep. These authors indicated that total protozoa count in the rumen was reduced by 34 and 66% by saponins at levels of 2 and 4% dietary dry matter, respectively. The levels of saponin in the present study did not have any adverse effect on animal.

The influence of *Brachiaria ruziziensis* (BR)*, Panicum maximum* (PM) and their mixtures (PMBR) on serum biochemical parameters of *KALAWAD* goats were examined (Table 3). Serum parameters have been reported to be important in the proper maintenance of the osmotic pressure between the circulating fluid and the fluid in the tissue space so that the exchange of materials between the blood and cell could be facilitated (Isidahomen *et al.*, 2012; Shittu *el at*., 2016). It had also been reported by Ikhimioya and Imasuen (2007) that serum proteins are important in osmotic regulation, immunity and transport of several substances in the body. The level of heart and liver function, protein quality and amino acid requirements in animals can be estimated by serum biochemical analysis. Feeding Brachiaria and Panicum grasses either solely or mixtures would improve the quality of blood serum biochemistry and the general health of the goats.

CONCLUSION

The study showed that feeding of Brachiaria, Panicum maximum or their mixture did not adversely affect the wellbeing of the animals rather it improved the general health status of the animals.

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