Journal of Agriculture and Environment Vol. 16 No. 1, 2020: 41-48
ISSN: 1595-465X (Print) 2695-236X (Online)

EFFECT OF FEEDING GRADED LEVELS OF PROBIOTIC SUPPLEMENTED SUGARCANE BAGASSE ON PERFORMANCE AND HAEMATOLOGICAL PARAMETERS OF RED SOKOTO GOATS

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ABSTRACT

The aim of the study was to evaluate the effects of probiotic supplemented sugarcane bagasse on performance, haematology, digestibility, and economic analysis of Goats. Sixteen (16) Red Sokoto Goats were assigned to four treatments consisting of four replications in a Completely Randomized Design (CRD). The probiotic supplemented sugarcane bagasse was fed at a concentration of 0, 10, 20, and 30% representing treatments T1, T2, T3, and T4 respectively. The experiment lasted for 90 days after two weeks adaptation period. The treatment diets together with clean drinking water were offered to the animals *ad libitum*. The data collected were subjected to analysis of variance using Statistical Analysis System (SAS) computer application package. Means were separated by least significant difference (LSD). The result shows that final weight gain, total weight gain, daily weight gain and feed conversion ratio (FCR) were not significantly different (P>0.05) among the treatments. Treatment with inclusion levels of probiotic supplemented sugarcane bagasse had significantly higher values with treatment T2 (10% probiotic supplemented sugarcane bagasse) having the best performance. Total and daily feed intake were significantly affected (P<0.05) by the treatments. All the haematological parameters were not significantly affected (P>0.05) by the treatment diets and were within the normal range for healthy goats. It was concluded that sugarcane bagasse use in goat feed improved feed intake without adverse effects on performance and haematology.

Keywords: Probiotic; Sugarcane bagasse; Red Sokoto Goat

INTRODUCTION

The challenge facing all stakeholders in food production sector is the rapid increase in human population. This has necessitated research into tools for producing food to feed the ever-increasing world population (Wuanor and Ayoade, 2017). Globally, there is an urgent need to increase livestock production to meet the animal protein needs of the population (Atteh, 2011). Nigeria's per capita daily protein consumption is estimated to be 45.4g as against the recommended FAO minimum of 53.8g (Iyanbe and Orewa, 2009). Livestock production represents approximately 10% of agricultural activity and less than five *per cent* of the gross domestic product in Nigeria (Yousuf and Adeloye, 2010). This production rate of livestock needs to be increased due to high geometric progression of present human population and quest for animal protein consumption by humans in Nigeria. Livestock production in the tropics suffers major setback due to inadequate quantity and quality feeds for the animals especially during dry season. The major problem facing small ruminant animal producers is how to feed the animals adequately all year round (Wuanor and Ayoade, 2017). Ruminants and their great ability to live and produce on a diet rich in fibre have great potentials to contribute to a healthy sustainable human nutrition (Lebbie, 2004). Goat production can be used to improve animal protein intake due to its beneficial effects, some of which include short generation interval and being easy to manage (King, 2009), meat, milk, skin and hair, as a form of investment, assurance against crop failure, prestige, and source of income (Ayoade, 2010). Goats can therefore, help ease daily demand for meat as influenced by the ever-increasing human population (Mpendulo, 2016). World Goats population is estimated at 861.9 million, where 34% are found in Africa (Aziz, 2010). The population of goats in Nigeria has been put at 53.8 million and was reported to have contributed up to 16% of the total domestically produced meat in the country (Wuanor and Ayoade, 2017).

Sugarcane bagasse is the fibrous residue of cane stalk, left after crushing and extraction of the juice. Bagasse is a rich source of fibre which could be exploited for animal feeding (Tosh and Yada, 2010). Bagasse contain high fibre (43%) and low nitrogen (0.2%); it has limited use as animal feed without any proper treatment (Ramli *et al*., 2005). However, its low digestibility limits its use in its raw form (Anakalos and Anakalo, 2009). If Bagasse is used as a basal diet, it is important to give the correct supplementation in order to obtain satisfactory physical and economic responses. The supplementation must take account of productivity of the animals (e.g. growing, fattening, and lactating.) (Mahala *et al*., 2007). In Nigeria, in addition to industrial extraction several tonnes of sugarcane were consumed annually which has resulted to a large quantity of waste blocking waterways both in urban and rural parts of the country resulting into land pollution. Incorporating bagasse into livestock feeds can reduce environmental problems caused by the waste (Maidala *et al*., 2016). Sugarcane bagasse could be used as a fibre source in a goat ration, but its use should be restricted or it should be processed before mixing due to the high content of fibre (ligno-hemicellulose and ligno-cellulose) (Ramli *et al*., 2005).

The use of biotechnology such as exogenous enzymes and probiotics to enhance quality and digestibility of fibrous forage is on the verge of delivering practical benefits to ruminant production systems (Mijinyawa *et al.*, 2016). Probiotic is defined as "Live microbial feed supplement which beneficially affects the host animals by improving its intestinal microbial balance (Fuller, 1989). Salvedia and Supungco (2017) study the effects of probiotic supplementation to crossbred dairy goat kids and reported that the control group had significantly ($P \leq 0.05$) lower weight gain compared to probiotic treated groups. The objective of this study was to investigate the effects of probiotic supplemented sugarcane bagasse inclusion in the diets of goats on performance and haematology.

MATERIALS AND METHODS

Experimental Animals and Management

The study was conducted at the Teaching and Research Farm of Modibbo Adama University of Technology, Yola, located in Girei Local government of Adamawa State, Nigeria. The study lasted for 90 days and was carried out using sixteen (16) male red Sokoto goats of between 5 and 7 months old. The animals were obtained from local markets within Adamawa state. The animals were treated with Ivometin^{R} injection against internal and external parasites. A completely randomised design (CRD) with four (4) treatments and four (4) replications was used. The animals were adapted to the experimental diets and the environment for two weeks before the commencement of data collection. The animals were kept intensively throughout the period of the experiment.

Experimental Diets Preparation

The experimental diets are presented in Table 1. The ingredients used in compounding the diets were maize bran, cowpea husk, rice offal, groundnut cake (GNC), table salt and bone meal. The probiotic supplemented sugarcane bagasse was used at inclusion levels of 0, 10, 20, and 30% in diets T1 (control), T2, T3, and T4 respectively.

Table 1: composition and calculated analysis of the experimental diets

Ingredients	Treatments			
	T1	T2	T3	T4
Sugarcane bagasse	0%	10%	20%	30%
Maize bran	32	28	26	25
Cowpea husk	30	26	20	17
Rice offal	20	18	16	10
GNC	15	15	15	15
Bone meal	2	2	2	2
Common salt	1	1	1	1
Total	100	100	100	100
Calculated chemical composition				
Crude protein	14.47	13.81	13.17	12.70
Energy (kcals ME/kg)	3134	2823	2923	2795

Data Collection

The animals were initially weighed at the start of the experiment and were balanced for weight. Weekly body weight gain was recorded throughout the period of the experiment. Feed was given two times daily in the morning (8am) and in the evening (4pm) with fresh water given *ad-libitum*. Daily feed intake was obtained by subtracting the left over from the total amount of feed offered the previous day. Feed conversion ratio was calculated as the ratio of daily feed intake to daily weight gain. The digestibility study was conducted during the last 14 days of the feeding trial. Two animals from each treatment were confined in separate pens for 14 days adaptation period and collection of faeces for seven (7) days. The faecal samples collected were used for determination of DM, CP, CF, and EE digestibility using the techniques outline by AOAC (2000).

At the end of the feeding trial, blood samples were taken with hypodermic needles from the jugular vein of three animals from each of the treatment into vacutainer tubes containing *ethylene diamine- tetra- acetate* (EDTA) to prevent the blood samples from clotting. Capillary tubes were filled with the samples, sealed and then centrifuged at 3000 revolutions per minute (rpm) for 5 minutes using a micro- haematocrit centrifuge (GCH-24). The capillary tubes were removed after 5 minutes, for the determination of the packed cell volume (PCV) using the haematocrit counter. The haemoglobin (Hb) was determined spectrophotometrically, the red blood cell (RBC) and white blood cell (WBC) subsequently calculated as described by Doxey (1977), Greenwood (1977) and Potter (1986). The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated as described by Jain (1986).

Mean Cell Volume (MCV) $= \frac{\text{Hematocrit} \times 10}{\text{RBC}}$

Mean Cell Haemoglobin (MCH) $= \frac{\text{Hemoglobin} \times 10}{\text{RBC}}$

Mean Cell Haemoglobin Concentration (MCHC) $= \frac{\text{Hemoglobin} \times 100}{\text{HCT}}$

Where; RBC = Red Blood cell and HCT = Haematocrit.

Statistical Analysis

Data collected were subjected to Analysis of Variance (ANOVA), using Completely Randomized Design (CRD). Significant differences between treatment means were separated by Least Significant Difference (LSD). Statistical Analysis System (SAS, 2008) version 9.2 was used for the analysis.

RESULTS AND DISCUSION

Proximate compositions of the experimental diets used in this study are presented in Table 2. Dry matter content ranges from 91.07 to 93.75 % indicating high content of dry matter. The crude protein (13.07 to 15.85 %) of the experimental diets decreased as the level of inclusion of Probiotic supplemented sugarcane bagasse increase. The crude fibre (10.98 to 15.19 %) of the diets follows a regular pattern. It increased as the inclusion level of the Probiotic supplemented sugarcane bagasse increase.

The result of the performance of goat fed inclusion levels of Probiotic supplemented sugarcane bagasse is shown in Table 3. The final body weight and the daily weight of the goats did not differ significantly (P>0.05) across the treatments. This is similar to the findings of Ashiru *et al*. (2017) when Yankasa sheep were fed with complete rations containing different inclusion levels of ensiled sugarcane waste with poultry litter. The authors discovered that the treatment diets did not significantly (P>0.05) affect the final live weight and daily weight gain of the animals. Although not significantly different, the daily weight gain observed in this study (ranging from 18.06 to 35.28g/day) is higher than the value recorded by Saleh and Abubakar (2016) for daily weight gain (17.22 to 30.03g/day). Treatment 1 (0% Probiotic supplemented sugarcane bagasse) have the lowest weight gain. This conform to the findings of Salvedia and Spungco (2017) in which supplemented Probiotic was fed to crossbred dairy goat kids and it was found out that the control group had lower weight gain compared to the Probiotic treated groups. The average daily feed intake differs significantly in this study similar to the findings of Sale and Abubakar (2016). However, the values recorded for the daily feed intake (221.66 to 281.49 g/day) is lower than the value reported by Saleh and Abubakar (2016) and 710.8g/day recorded by Ramli *et al*. (2005) for goats fed fermented sugarcane bagasse feed. This difference could be as a result of many factors such as the breed and age of the animal and method of processing the sugarcane bagasse. The FCR (10.02 to 12.86) recorded in this study is better than the values recorded (26.45 to 144.05) by Saleh and Abubakar (2016) but similar to 10.77 to 13.90 reported by Jiwuba *et al*. (2016).

Table 2: Proximate composition of the experimental diets

Parameters	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)
Dry matter	92.02	91.07	93.15	93.75
Crude protein	15.85	15.15	14.90	13.09
Crude fibre	10.98	13.95	14.16	15.19
Ash	12.73	10.04	9.50	12.07
Ether extract	7.15	6.32	7.16	5.50
Nitrogen free extract	55.75	49.60	50.75	52.80
Neutral detergent fibre	58.15	60.20	51.02	59.09
Acid detergent fibre	40.60	45.18	45.69	47.19

Table 3: Performance of goat fed graded levels of Probiotic supplemented sugarcane bagasse

Parameters	T1(0%)	T2 (10%)	T3 (20%)	T4 (30%)	SEM
Initial weight (kg)	6.90	6.85	6.90	6.80	0.155^{ns}
Final weight (kg)	8.53	10.03	8.85	8.68	0.295^{ns}
Total feed intake (g)	20118.3^{b}	25333.8^{a}	19949.5^{b}	20654.8^{b}	660.929
Daily feed intake (g)	223.55^{b}	281.49^{a}	221.66^{b}	229.50^{b}	7.343
Total weight gain (kg)	1.63	3.18	1.95	1.88	0.281^{ns}
Daily weight gain (g)	18.06	35.28	21.67	20.84	3.121^{ns}
FCR	12.86	10.02	10.87	11.86	0.887^{ns}

SEM = Standard error of mean; ns = not significant (P>0.05); a, b = mean in the row bearing different superscripts differ significantly (P<0.05); FCR = feed conversion ratio

Table 4: Haematological parameters of goat fed graded levels of Probiotic supplemented sugarcane bagasse

Parameters	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	SEM
PCV (%)	28.00	27.67	21.67	22.33	1.334^{ns}
Hb (g/dl)	13.33	12.33	9.33	10.33	0.678^{ns}
RCB ($x10^6/mm^{3)}$	9.56	9.67	8.83	8.51	0.258^{ns}
WBC ($x10^3/ \mu l$)	10.67	9.67	8.67	9.33	0.753^{ns}
MCV (fl)	29.34	29.09	24.93	26.23	1.507^{ns}
MCH (pg)	14.12	12.72	10.59	12.04	0.633^{ns}
MCHC (g/dl)	48.04	47.15	44.55	46.12	3.078^{ns}

SEM = Standard error of mean; ns = not significant (P>0.05); a, b = mean in the row bearing different superscripts differ significantly (P<0.05)

The haematological profile of goats fed Probiotic supplemented sugarcane bagasse is presented in Table 4. There were no significant differences (P>0.05) observed in all the haematological parameters measured in this study. However, there is a slight decrease from treatment T1 to treatment T3 in the values of the haematological parameters. The PCV (packed cell volume) in the present study (which ranges from 21.67 to 28.00 %) is within the normal range of 20 to 28 % reported for clinically healthy goats by Sirois (1995) but slightly lower than 22 to 38 % reported by Kramer (2000). This could have been caused by vitamin B_{12} deficiency. Aikhuomobhogbe and Orheruata (2006) observed that low PCV results to Anaemia. The PCV values obtained in this study is similar to the values of 22.04 to 28.27 % obtained by Olafadehan (2011) and Babale *et al*. (2018). The RBC (red blood cells) values found in this study ranges from 8.51 to 9.56 $x10^6/mm^3$ and haemoglobin (Hb) ranges from 9.33 to 13.33 g/dl and are all within the normal range reported by Radostits *et al*. (2000). The RBC found in this study is similar to 9.2 to 13.5 reported by Daramola *et al*. (2005). The RBC values is higher than the values reported by Ibrahim *et al*. (2014) for Red Sokoto bucks fed diets containing various levels of Sabara leaf meal. The normal RBC values indicated the absence of haemolytic anaemia and depression of erythrogenesis (Olafadehan, 2011). The WBC observed in this study range from 8.67 to 10.67 $x10^3$/ µl which is within the normal range of 6.8 to 20.1 $x10^3$µl and 4 to 13 reported by Daramola *et al*. (2005) and Radostits *et al*. (2000) respectively. The values recorded in this study for MCV (24.93 to 29.34 fl), MCH (10.59 to 14.12 pg), and MCHC (44.55 to 48.04 g/dl) were all above the range reported by Daramola *et al*. (2005) for goats.

CONCLUSION

It was concluded that Up to 30 % Sugarcane bagasse supplemented with Probiotic can be included in goats' diet without adverse effects on growth performance and haematology of Red Sokoto Goat.

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