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Linear Body Measurements, Correlation Matrix, Hematological and Serum Biochemistry of Cattle Fed Supplemental Diet Containing Varying Inclusion Levels of Fermented Molasses Treated Sawdust

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Target audience: *Cattle Farmers, Animal scientist,Nutritionists, Extension workers.*

Abstract

A study was conducted to assess the Linear Body Measurements, Correlation Matrix, Hematological and Serum Biochemistry of Brahman x Sokoto Gudali cross fed inclusion levels of fermented molasses treated sawdust diet. A total of 30 Brahman x Sokoto Gudali cattle aged 12-15 months and weighing averagely 80-110 kg were randomly assigned to five treatment groups designated as T_1, T_2, T_3, T_4, andT_5 each comprising of two replicates, with three animals per replicate. The fermented molasses treated sawdust was included in the cattle diets at 0, 10, 20, 30 and 50% inclusion levels.. Feeding was twice daily for all the treatment groups. Supplementary diets were offered in the morning and in the evening with clean water given ad-libitum throughout the duration of the study that lasted for 12 weeks. The animals were allowed to graze from a pasture comprising of Bracharia ruziziensis, Chloris gayana, Digitaria smutsi,Stylosanthes hamata and Lablab pruriens for eight (8) hours daily. The results showed no significant difference (P>0.05). Among the Linear body measurements, chest girth is observed to be the most correlated (0.98**) to Body weight. Only Lymphocyte values are observed to be below the normal range among the hematological parameters. However, all the parameters measured in the serum were within the normal range. It was concluded that molasses treated sawdust can be included in cattle diets up to 20 % level without significantly affecting performance.

Keywords: Brahman x Sokoto Gudali cattle: molasses treated sawdust, growth, haematology

Description of Problem

Cattle and other ruminants constitute 83 per cent of food animals and produce over 45 per cent of meat products and over 90 per cent of available domestic milk supply. Report showed that livestock population of sub-Saharan Africa comprised of 191.3 million cattle, 158.7 million sheep, 182.1 million goats, 15.5 million pigs and 700 million chickens (1). Cattle contribute about 12.7% of the Nigeria's agricultural Gross Domestic Product (2). Cattle play major role as a source of animal protein in Nigeria and account for half of the total meat supply from domestic animals (3). Majority of cattle are produced from the range by Fulani pastoralists. . Most breeds of cattle in Nigeria are those kept by the nomadic tribes who have the largest proportion of the White Fulani (Bunaji), Sokoto Gudali (Bokoloji), Adamawa Gudali, Red Bororo (Rahaji), Wadara or Shuwa Arab, Azawak, Muturu, Keteku (Taurine x Zebu crosses), Ndama, and Kuri (4) for various purposes.

The cattle industry serve as revenue source for a major proportion of pastoral households and participants in the cattle value chain in the sub-humid and semi-arid ecological zones of Nigeria (5;6). Consequently, Interest is geared towards looking for cheap alternative feed stuffs, such as crop residues and industrial by- products to feed and maintain these animals year round.

(7). Utilization of alternative feed resources combined with other methods could reduce pressure on the need for conventional feed ingredients for livestock which would reduced feeding cost and may encourage accomplishment of feed security for livestock sub-sector (7).

Large quantities of agro-industrial wastes such as sawdust which are not being effectively utilized especially for feeding, are produced in large quantities annually in the tropics and are thereby constituting environmental and health hazards (8).

Sawdust is a product resulting from cutting, grinding, drilling or pulverizing wood with saw or other tool, it is compose of fine particles of wood, it could also be derived from certain animals, birds or insects which live in wood, such as wood pecker and carpenter ant(7) and it is abundant throughout year.. Growth improvements were observed when sawdust was included in beef finishing ration (9) and in high concentrate rations for dairy cattle (10). Several other reports (11: 12) cited By (13) indicate satisfactory results with sawdust and shavings in ration for lambs.

Utilization of sawdust as alternative source of roughages may possibly reduce cost of conventional livestock feed as it does not compete with humans and reduce the challenges of feed scarcity during draught periods (7). The present study investigated the effects of molasses treated sawdust on growth, haematology and serum biochemistry of cattle.

Materials and Methods

Experimental Location

The experiment was carried out at Massohi Farms and Livestock Development Company, km12 Minna-Bida road of Niger State, Nigeria. Massohi farms specializes in livestock breeding, dairy production and fisheries. Minna is located in the southern Guinean savannah zone on latitude $9^{0}31^{1}$ and $9^{0}42^{1}$ North and longitudes 06^{o} 29^{1} and 06^{o} 41^{1} East with annual rainfall range of 1,200-1300mm and average temperature range of 38^{0}-40^{0}C. The area has an altitude of 1,475m above sea level, and is characterized by two season, the wet season (April-October) and dry season (November-March) (14).

Source of Experimental Diet:

The sawdust was sourced from saw mill in Shango, Minna. While other experimental ingredients such as maize, maize offal, groundnut cake, salt, lime stone, mineral premix were source from Kure market, Minna.

Collection and processing of Fermented Sawdust

Fresh sawdust was collected from timber mill Shango in Minna, Niger State. A 2mm size aluminium sieve was used to sieve the sawdust before fermentation. The process for the fermentation of corn-cob as described by (15) as cited and modified by (16) was used to ferment the sawdust with the following modifications. A large plastic polythene bag was positioned in a plastic drum to take its form and the blended mixture of sawdust and molasses in the gauge of 100kg per 10liters of molasses in 40 litres of Borehole water was packed inside the polythene bag. It was then tied securely with rope to make it air tight thus preventing exchange of gases between the fermenting material and the environment for a 15 day anaerobic fermentation period. The fermented sawdust was heated with Model AT-2 Steam Boiler (pressureless cooker) machine at 90^{0}c for 30minutes in order to take care of some bacteria, after which it was sundry to reduce the moisture content.

Experimental diet:

The diet were prepared with varying inclusion levels of fermented molasses treated sawdust (at 0%, 10% 20%, 30% and 40%) as source of roughage for the cattle; other ingredients include: Maize, Maize Offal, GNC, limestone,

mineral premixed in their various proportion. The prepared diets were administered to the cattle as supplement twice daily (7-9:00 am and 5- 7pm). Clean water was given *ad-libitum.* The animals were allowed to graze on pasture for 8 hours within the period of 9:00 am -5:00pm.

Experimental Design

The experimental design used was Completely Randomized Design (CRD). The 30 experimental cattle were randomly allotted to five treatment groups comprising of two replicates with three (3) animals per replicate. Treatment one (T_1) was cattle fed diet with 0% fermented molasses treated sawdust,T_2 was cattle fed diet with 10% of fermented molasses treated sawdust, T_3 were cattle fed diet with 20% of fermented molasses treated sawdust, T_4 were cattle fed diet with 30% of fermented molasses treated sawdust, T_5 were cattle fed diet with 40% of fermented molasses treated sawdust. The feeding trial lasted for 3 months.

Experimental Animals and Management

The breed of cattle used for this work were crosses between the exotic and indigenous breed. These include Brahman crossed with Sokoto gudali (Bokolo). About 30 mixed sex of Brahman Sokoto Gudali cross bred cattle of 12 to 15 month of age, averaging between 100kg- 120kg of weight, consisting of 10 female and 20 male sexes were assigned to five experimental treatments (T_1, T_2, T_3, T_4,andT_5). Six cattle were assigned to each experimental treatment in 2 replicates and 3 cattle each per replicate.Three cattle each per replicate were housed in pens with aluminium roofing sheath partitioned with iron bars having the height of about 18 ft, with the length of 12ft and breadth of 12ft. The cattle were managed under semi-intensive system. They were allowed to graze extensively at the 7.5 hectare pasture field of Massohi farms comprising of *Brachria ruzizienses, Chloris gayana, Digiteria smutzi,Panicum maximum* and *Stylozanthes hamata* for 7-8 hours after which 1.5kg of the experimental diet comprising of maize, groundnut cake, corn offal, fermented sawdust, salt, mineral premix, limestone formulated to meet the nutrient requirements of the cattle were given twice daily before and after grazing. Clean water was given *ad-libitum*. Each cattle were treated against ectoparasites using Amitix (Acaricides) sprayed; they were dewormed with Albendazol to take care of endoparasites and also injected intra-muscularly with Oxytetracycline 20% - long acting broad spectrum antibiotic as a precautionary measure against bacterial infections, and Samorine injection to take care of Trypanosomiasis.

Parameters Measured

The animals were allotted into five treatment groups and fed the experimental diet for a pre-treatment period of two weeks to enable them adapt to the experimental diet before the commencement of the data collection. The parameters measured were feed intake, body linear measurement such as body length, height at withers, chest girt length, facial length, fore and hind limb length. Hematology and serum biochemical parameters were equally measured.

Data collection and statistical analysis

The cattle were allowed one week adjustment period before data collection commenced. The mean initial body linear measurement, feed intake, Hematology and serum biochemical were recorded and subject to analysis of variance (ANOVA) Using General Linear Model (GLM) procedure of (17) and significant determination at 5% level of probability. The significant means were separated using (18).

Results

Proximate composition of unfermented and fermented molasses-treated sawdust

Table 1. showed the results of proximate

analysis of non-fermented and fermented molasses-treated sawdust. The results indicated that crude protein content (3.50 %), nitrogen free extract (36.64 %), ether extract (4.33%) and metabolizable energy (1420.60Kcal/kg) of the fermented molasses-treated sawdust are higher than the unfermented sawdust. The dry matter (90.20), crude fibre (41.23) and ash content (4.50) percent of the fermented molasses-treated sawdust are lower than the unfermented sawdust.

Proximate composition of experimental diets

Proximate analysis of the experimental diet is presented in Table 2. The results showed that as the inclusion levels of fermented molasses-treated sawdust increases in the feed, the crude protein, ether extract and ash content decreases. The dry matter composition of T_1 (90.20), T_2 (90.40), T_3 (90.8), T_4 (90.80) and T_5 (91.00) were similar among the treatments groups. Crude fibre content increases with increase in inclusion level while ether extracts decreases with increase in inclusion levels of fermented molasses-treated sawdust in the diet. T_1 (0 % fermented molasses-treated sawdust) recorded the highest (12.15 %) crude protein content while the lowest (9.05%) was observed in T_5 (40 % fermented molasses-treated sawdust). Nitrogen free extract also increases slightly as the inclusion level of fermented molasses-treated sawdust in the diet increases.

Table 1: Proximate composition of fermented molasses-treated sawdust and unfermented sawdust

Parameters (%)	Unfermented sawdust	Fermented molasses-treated sawdust
Dry Matter	92.40	90.20
Crude Protein	2.80	3.50
Crude Fiber	42.27	41.23
Ethe Extract	2.33	4.33
Ash	19.00	4.50
Nitrogen Free Extract	26.00	36.64
ME (Kcal/kg)	1361.70	1420.60

Keys: ME =Metabolizable energy ([ME=36x%CP+81.8x%EE+35.5x%NFE. (19)

Table 2: Proximate composition of the experimental diets fed to Brahman x Sokoto gudali cattle.

	Treatments				
Parameter (%)	T1	T2	T3	T4	T5
Dry Matter	90.20	90.40	90.80	90.80	91.00
Crude Protein	12.15	11.50	10.50	10.15	9.05
Crude Fibre	12.66	14.66	16.66	18.10	19.33
Ether Extract	16.00	16.00	15.00	14.00	14.00
Ash	10.50	9.00	8.33	8.00	7.50
Nitrogen Free extract	38.89	39.24	40.31	40.55	41.12
Energy (Kcal/kg)	3138.95	3126.60	3035.50	2958.50	2920.96

Keys

ME =Metabolizable energy ([ME=36x%CP+81.8x%EE+35.5x%NFE. (19).

T_1 = 0 % Inclusion of Fermented molasses-treated sawdust

T_2 = 10 % Inclusion of Fermented molasses-treated sawdust

T_3 = 20 % Inclusion of Fermented molasses-treated sawdust

T_4 = 30 % Inclusion of Fermented molasses-treated sawdust

T_5 = 40 % Inclusion of Fermentedmolasses-treated sawdust

Table 3: Percentage composition of supplemental diets fed to Brahman x Sokoto Gudali cattle.

	Percentage Composition				
Ingredient	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**
Maize	30	30	30	30	30
GNC	20	20	20	20	20
Maize offal	45	35	25	15	5
Sawdust	-	10	20	30	40
Limestone	4.5	4.5	4.5	4.5	4.5
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated analysis					
Crude protein	17.40	16.65	15.98	14.85	13.96
Energy (kcl/kg)	2336.60	2330.80	2234.90	2219.10	2172.70
Fibre	8.01	11.18	14.42	17.87	20.83

Keys

T_1 = 0 % Inclusion of Fermented molasses-treated sawdust
T_2 = 10 % Inclusion of Fermented molasses-treated sawdust
T_3 = 20 % Inclusion of Fermented molasses-treated sawdust
T_4 = 30 % Inclusion of Fermented molasses-treated sawdust
T_5 = 40 % Inclusion of Fermentedmolasses-treated sawdust

Table 4: showed the result of Body linear measurements of Brahman x Sokoto gudali cattle fed diet containing varying inclusion levels of fermented molasses-treated sawdust. The result showed insignificant difference (P>0.05) in all the parameters measured among the treatment groups. Although no significant difference (P>0.05) was observed in the body length among the treatment groups, the result showed that values of the body length and fore limb length decreases as the inclusion levels of fermented molasses-treated sawdust increases in the diet.

Table 4: Body Linear Measurement of Brahman x Sokoto gudali cattle fed diets containing varying inclusion levels of Fermented molasses-treated sawdust

Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**SEM**	**LS**
Body length (cm)	126.50	128.17	125.50	124.00	123.50	0.95	NS
Height at withers (cm)	111.34	111.00	110.00	110.67	109.84	0.80	NS
Chest girth length(cm)	118.17	122.50	115.34	114.50	114.84	2.30	NS
Fore limb length (cm)	99.34	97.00	95.67	95.00	94.67	1.04	NS
Hind limb length (cm)	108.00	107.00	105.84	106.17	105.84	1.14	NS
Facial length (cm)	42.33	42.17	42.00	42.17	41.84	0.40	NS

Mean with different superscript (a b c) are significantly (P<0.05) different

Keys
T_1 = 0 % Inclusion of Fermented molasses-treated sawdust
T_2 = 10 % Inclusion of Fermented molasses-treated sawdust
T_3 = 20 % Inclusion of Fermented molasses-treated sawdust
T_4 = 30 % Inclusion of Fermented molasses-treated sawdust
T_5 = 40 % Inclusion of Fermentedmolasses-treated sawdust
SEM = Standard Error of Mean
LS = Level of Significance
NS = No Significance
* = Significant at P<0.05

Correlation matrix between body weight and body linear measurements of Brahman x sokoto gudali cattle fed diets containing varying inclusion levels of fermented molasses-treated sawdust

Table 5: showed the result of Correlation matrix between body weight and body linear measurements of Brahman x Sokoto gudali cattle fed diets containing varying inclusion levels of fermented molasses-treated sawdust. Positive and significant (P<0.01, P<0.05) correlations were observed generally between body weight and chest length in all the treatment groups. However, animals fed 0 % fermented molasses-treated sawdust recorded the highest (0.98) correlation coefficient between body weight and chest length. Similarly, animals fed 20 % inclusion of fermented molasses-treated sawdust had the strongest significant (P<0.05) correlation (0.72) between body weight and body length. Result of the correlation between body weight and height at wither of the experimental animals' shows no significant correlation among the treatments group. Animals fed 20 % and 40 % fermented molasses-treated sawdust showed negative correlation between body weight and forelimb length.

Table 5 Correlation matrix between body weight and body linear measurements of Brahman x Sokoto gudali cattle fed diets containing varying inclusion levels of fermented molasses-treated sawdust diet.

	Treatment				
Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**
Body weight and Body length	0.65*	0.56	0.72**	0.43	0.65*
Body weight and chest girth	0.98**	0.86**	0.95**	0.94**	0.94**
Body weight and Height at wither	0.46	0.32	0.50	0.51	0.53
Body weight and Fore limb length	0.63*	0.31	-0.03	0.75**	-0.03
Body weight and Hind limb length	0.54	0.76*	0.79*	0.65*	0.75*
Body weight and facial length	0.50*	0.39	0.75*	0.45	0.71*

** Correlation is significant at 0.01 level
* Correlation is significant at 0.05 level (2-tailed)

Keys
T_1 = 0 % Inclusion of Fermented molasses-treated sawdust
T_2 = 10 % Inclusion of Fermented molasses-treated sawdust
T_3 = 20 % Inclusion of Fermented molasses-treated sawdust
T_4 = 30 % Inclusion of Fermented molasses-treated sawdust
T_5 = 40 % Inclusion of Fermented molasses-treated sawdust.

Haematological parameters of Brahaman x sokoto gudali cross fed supplemental diet containing varying inclusion levels of fermented molasses treated sawdust.

The results of haematological parameters of Brahaman x sokoto gudali cross fed supplemental diet containing varying inclusion levels of fermented molasses treated sawdust is presented in Table 6. It was observed that all values obtained in all the parameters measured are within the normal range. However, the results reviewed significant (P<0.05) higher values (7.00) of final Red Blood Cell (RBC) count of animals fed 10 % of fermented molasses treated sawdust over those fed the control diet (5.00). Similarly, in Packed Cell Volume (PVC) of animals fed 30 and 40 % fermented molasses treated sawdust recorded significantly higher values (35.00 and 35.50) over those fed 20 % (28.00).

Table 6: Haematological Profile of Brahman x Sokoto Gudali cattle fed diets containing varying inclusion levels of fermented molasses-treated sawdust.

Treatment Parameter		T_1	T_2	T_3	T_4	T_5	SME	LSD	NR
PC V (%)	Initial	29.50	29.50	27.50	28.50	37.50	1.63	NS	24-46
	Final	30.00^{ab}	31.50^{ab}	28.00^{b}	35.00^{a}	35.50^{a}	1.13	*	
ESR (%)	Initial	21.00^{ab}	14.50^{b}	19.50^{ab}	21.00^{ab}	30.50^{a}	2.08	*	15-38
	Final	18.00	16.00	20.50	18.50	33.00	2.71	NS	
RBC ($X10^6$/UL)	Initial	6.00	6.50	5.50	5.00	7.00	0.33	NS	5-10
	Final	5.50^{bc}	7.00^{a}	5.50^{bc}	5.00^{c}	6.50^{ab}	0.28	*	
WBC ($X10^6$/UL)	Initial	3.00	5.00	4.00	3.50	5.50	0.44	NS	4-12
	Final	5.00	5.50	5.50	5.00	5.50	0.21	NS	
HB (G/DL)	Initial	9.80	9.80	9.15	9.40	12.45	0.54	NS	8-15
	Final	10.50^{ab}	9.75^{ab}	9.00^{b}	11.50^{ab}	12.05^{a}	0.43	*	
Basophile	Initial	2.50^{ab}	2.00^{b}	2.00^{b}	2.00^{b}	3.00^{a}	0.15	*	0-12
	Final	2.50	2.00	2.00	2.00	2.50	0.13	NS	
Lymphocyte	Initial	34.50^{ab}	34.00^{ab}	37.00^{a}	26.50^{b}	37.50^{a}	1.57	*	45-75
	Final	33.50^{ab}	33.5^{ab}	35.00^{a}	30.00^{b}	36.50^{a}	0.80	*	
Monocyte	Initial	5.50	6.50	6.0	6.0.0	6.0	0.26	NS	2-7
	Final	6.00	6.50	6.50	6.50	6.50	0.16	NS	
Eosinophile	Initial	5.50	5.0	5.50	5.50	5.50	0.22	NS	2-10
	Final	6.00	5.00	5.00	5.50	6.50	0.27	NS	
Neutrophile	Initial	6.00	6.50	6.50	5.50	8.50	0.56	NS	4-12
	Final	6.50	7.00	6.00	6.00	8.50	0.42	NS	

Means with different superscript (a,b) are significantly different at P<0.05 across the table

KEY

PCV= Packed Cell Volume
RBC= Red Blood Cell Count
ESR= Electron Spin Resonance
WBC= White Blood Cell Count
HB= Haemoglobin
LS= Level of significant
* = Significant at P<0.05
NR=Normal Range
SEM=Sandard Error of Mean

Biochemical profile of Brahaman x Sokoto gudali cross fed supplemental diet containing varying inclusion levels of fermented molasses treated sawdust.

Table 7: showed the result of serum Biochemical profile of Brahaman x sokoto gudali cross fed supplemental diet containing varying inclusion levels of fermented molasses treated sawdust. The values recorded for all the parameters are within the normal range as indicated by the results. However, the Cholesterol (mmol/l) values of animals fed 40 % fermented molasses treated sawdust are observedto be significantly lower (1.35) than those fed control diet(2.20). The results also showed that the Cholesterol (mmol/l) levels significantly decreases as the level of inclusion increase.A similar trend is observed in ALT where those animals fed 20 % recorded significantly lower values (24.00) over those fed the control diet (35.50).

Table 7: Serum Biochemical profiles of Brahman x Sokoto gudali cattle fed diets containing varying inclusion levels of fermented molasses-treated sawdust diet

Treatment / Parameter		T_1	T_2	T_3	T_4	T_5	SME	LSD	NR
Glucose (mmol/l)	Initial	5.95	6.25	5.15	7.60	6.65	0.47	NS	2.8-8.9
	Final	6.00	6.25	5.25	7.70	6.70	0.47	NS	
Urea (mmol/l)	Initial	7.70^{ab}	6.40^{b}	8.75^{ab}	7.15^{ab}	9.40^{a}	0.44	*	3.3-14.9
	Final	7.55	6.55	8.50	7.10	8.90	0.37	NS	
Creatine (mmol/l)	Initial	70.00	81.00	86.00	85.50	84.00	2.57	NS	71-256
	Final	72.00^{b}	78.00^{ab}	82.00^{ab}	87.00^{a}	88.00^{a}	2.40	*	
Cholesterol (mmol/l)	Initial	1.95^{ab}	1.60^{ab}	1.75^{ab}	2.10^{a}	1.40^{b}	0.10	*	1-2.1
	Final	2.20^{a}	2.05^{ab}	1.90^{ab}	1.70^{ab}	1.35^{b}	0.12	*	
Alkaline phosphate (u/ml)	Initial	28.50	34.50	37.50	33.50	34.00	2.99	NS	0-40
	Final	26.50	38.00	32.50	36.50	31.50	2.74	NS	
Albumin (g/dl)	Initial	5.90	4.65	4.80	5.35	5.45	0.32	NS	1.3-6.4
	Final	5.90	5.60	4.40	5.85	4.95	0.38	NS	
Protein (g/dl)	Initial	4.90	6.35	6.20	6.45	6.60	0.29	NS	2.8-10.1
	Final	5.15	6.35	5.85	6.60	6.20	0.27	NS	
AST (mu/ml)	Initial	51.50	36.00	34.00	34.00	43.50	2.82	NS	22.3-68.7
	Final	44.50	41.50	38.50	38.50	44.50	1.60	NS	
ALT (mu/ml)	Initial	37.00^{a}	24.50^{b}	24.00^{b}	26.00^{b}	23.50^{b}	1.90	*	11-40
	Final	33.50^{a}	27.00^{ab}	24.00^{b}	30.50^{ab}	25.00^{ab}	1.41	*	

Means with different superscript (a,b) are significantly different at $P<0.05$ across the table

KEY

AST= Aspartate Aminotransferase
ALT= Alanine Aminotransferase
LS= Level of significant
NR=Normal Range
* = Significant at $P<0.05$

Discussion

The results of correlation between body weight and linear body measurements, which showed chest girth as the most correlated to body weight is in agreement with the report of (20) who reported a high body weight correlation with chest girth, body length and height at wither. High correlation coefficient has also been reported between body weight and chest girth by (21). (22) observed a similar trend that body weight was highly correlated (r = 0.96) with body length, chest girth and height at withers.

The non significant ($P<0.05$) variation recorded in Red Blood Cell count between animals fed control diet and those fed above 10 % fermented molasses treated sawdust could imply that the fermented sawdust in the experimental diet has little or no effect on the Red Blood Cell count of the animals. (23) reported that Red blood cell variations in cattle are probably due to the availability of oxygen and the iron metabolism. High RBC counts may be associated with condition that cause the body to produce many red blood cells (polycythemia) or impaired pulmonary function, while low RBC count may be associated with iron deficiency, internal bleeding.

The Packed cell volume (PCV) observed in this study were within the normal range (24-46) which suggested that the tested diet is not toxic to the breed of cattle used and does not have any adverse effect on blood formation. (13) reported that no health challenges resulted from incorporation of sawdust in rations. (24) correlates Haematological trait of PCV with the nutritional status of animal. Also, increment in PCV might be attributed to high environmental temperature this is similar to disease infection and low level is an indication of disease infection and poor nutrition (25, 26). PCV is used as an index of toxicity but its composition varies among breeds (27). The non-significant differences observed in the final serum biochemical profile among most parameters measured and their values that are found within the normal range suggested that the test ingredients (fermented molasses treated sawdust) had no negative effect on the animals. (28) reported that normal range of biochemical profile indicates good health condition and nutritional status of the animal. (29) also reported that serum biochemical parameters gave an immediate indication of animals' nutritional status. (30) ,(31) reported that serum biochemicalparameters represent an integrated index of the adequacy of nutrient supply in relation to nutrient utilization of animals. The lower cholesterol values (1.35) of animals fed 40 % fermented molasses treated sawdust compare to the values (2.20) of those fed control diet could indicate that the test ingredient(fermented molasses treated sawdust) is capable of reducing the serum cholesterol level of the animal used.

Conclusion and Applications

Based on the results, it was concluded that:

1. Up to 20 % of fermented molasses-treated sawdust can be included in the diet of Brahman x Sokoto Gudali cattle for optimum body linear measurements
2. Chest girth can be used as a selection criterion for predicting body weight of Brahman x Sokoto gudali cattle.
3. Haematological and biochemical profile of Brahman x Sokoto Gudali cattle were not negatively affected by the inclusion of fermented molasses-treated sawdust in the diet.

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