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EFFECT OF FEEDING MOLASSES TREATED MAIZE COBS WITH SUPPLEMENTATION ON HAEMATO-BIOCHEMICAL PARAMETERS OF GROWING YANKASA RAMS

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Abstract
The study was conducted at the Abubakar Tafawa Balewa University Teaching and Research Farm, Bauchi, for a period of ten (10) weeks between October and December 2016, to evaluate the haemato-biochemical parameters of growing Yankasa sheep fed molasses treated maize cobs based diets with supplements. Sixteen (16) Yankasa rams with an average weight of 13.44 kg and aged 9 to 12 months old were randomly allotted to four (4) dietary treatments in a Completely Randomized Design. All the animals were fed a basal diet of molasses treated crushed maize cobs *ad-libitum*. In addition, animals received 300 g of the following supplements: maize bran alone (MB),MB + dried poultry litter, MB + cotton seed cake and MB + groundnut cake for treatments 1, 2, 3 and 4 (50:50) respectively. The results indicated that significant ($p<0.05$) difference were observed in haemato-biochemical indices.All the values for haemato-biochemical parameters, after feeding such as haemoglobin (7.93-11.69 g/dl), Packed Cell Volume (28.87-52.43 %), blood glucose (2.43-3.27 g/l), and blood protein (5.50-6.20 g/l) fell within the normal values for sheep. It may be concluded from this study that molasses treated and crushed maize cobs with protein supplements enhanced maize cobs utilization by Yankasa sheep. However, mixed supplements especially MB + CSC was more efficient in enhancing the utilization of the maize cobs in terms of higher DMI, daily weight gains and better feed conversion ratio. This treatment is therefore recommended for growing Yankasa sheep.

Keywords: haemato-biochemical maize cobs molasses Yankasa rams

Introduction
Ruminant animals belong to the order *artiodacyla* (*ungulate),* cloven hoofed and the suborder ruminantia. The suborder which are divided into five families comprises of about 155-170 species, ranging in weight from a 1 kg lesser mouseder (*Tragucus javanicu*) to a 1000 kg bull giraffe (*Giraffa camelopadis)* (Van Soest, 1988; Adegbola, 1998). Most of these species are wild and undomesticated. The domesticated species belong primarily to the *camelidae* and *bovidae*, and comprises globally an estimated 2.8 billion heads. Of that number, cattle and sheep comprise about 2.2 billion (McDowell, 1977).
Among all the livestock that makes up the farm animals in Nigeria, ruminant comprising sheep, goat and cattle constitute the farm animal largely reared by farm families in the country agricultural system. Nigeria has a population of 34.5 million goats, 22.1 million sheep and 13.9million cattle. Larger population of these animals population are however largely concentrated in the northern region of the country than the Southern region (FAO, 2003).
Economically, the value of Nigerian traditionally managed livestock resources at 1991 prices was estimated at 60 billion naira and at 1993 prices 86.65 billion naira (₦). They contribute about 20% of the agricultural gross domestic products (GDP) and (5%) of total GDP. This contrasts with the developed World in which animals contribute 51% of the total agricultural GDP, estimates indicate that in 1998, the value of Nigerian livestock resources was not less than 150 billion naira of which ruminant contribute about 90% (FLDPCS, 1991).

Ruminants play an important role in the social and religious life of Nigerians. They play prominent roles as source of meat or gift in marriages, naming ceremonies, burial and religious rites. Although there is no reliable estimate that is available, it is known that millions of animals are slaughtered annually nationwide during the feast of Ed el-Kabir and Christmas, worth millions of naira. With a population of 140 million in 2006 census, Nigeria is ninth populous country on the earth (Adegbola, 1998, Sudik, 2016, Sudip et al., 2019) and the most populous country in the African continent. In addition, a population growth rate of 3.1% per annum ensures a doubling time of 22 years at current growth rate. By the year 2020, Nigeria's population is expected to reach 200.5 million.
Also with the current situation of insecurity cause by activities of insurgent and farmers/herdsmen clashes in the country more especially in the Northern states has cause serious hindrance to the growth and development of livestock in this part of the country as it is the most largest producers of livestock. Indeed, these show serious economic implications especially in terms of food production. Access to adequate and balanced food constitutes the most serious problem for most Nigerian households today. Therefore the objective of this paper was to evaluate the haemato-biochemical parameters of Yankasa sheep fed experimental diets.

Materials and methods

Experiment Site

The experiment was carried out at the Department of Animal Production Teaching and Research Farm, Abubakar Tafawa Balewa University Bauchi, Yelwa Campus between October and December, 2016. The State is located within latitude 9^0 30′ North of the equator and longitude $8^0$50′ East .The Western and Eastern limit are bounded by longitude $8^0$50″ and 11^0 15″E. The area is situated within Savannah zone of Nigeria, the mean annual temperature of 30.40 ^{0}C within mean annual rainfall of 1020 mm (Kowal and Knabe, 1972), the vegetation is characterized in some cases by scattered trees but closely growing together in others. The soil of the area is moderately deep, well and is also characterized by tropical sandy loamy soil. The State has a prominent climate marked by dry and wet seasons. The rains commence in April and ends in October. The average rainfall is 700 mm in the northern parts and 1,300 mm in the southern parts. The wettest months are July, August and September; the dry season starts in November and ends in April.

Experimental Animals and their Management

Sixteen (16) growing Yankasa rams aged between 9 to 12 months with an average weight of 13.44 kg were purchased from a nearby market in Bauchi metropolis and used for the trial.
The animals on arrival were examined and quarantined for a period of two (2) weeks during which they were treated against ecto and endo parasites using ivermectin injection, dewormed with albendazole suspension (10%) at the rate of 1ml/10kg body weight and were given oxytytracycline long acting broad spectrum antibiotic at the rate of 1ml/10kg body weight, against any disease. The animals were also vaccinated against Petites des Petites Ruminate (PPR) using a tissue culture rinderpest vaccine. The deworming was repeated in the 6^{th} week of trial using the same drugs.
The rams were randomly allocated to the treatments diets (T_1, T_2, T_3 and T_4) and housed in a cross ventilated individual pens with slanted floors and offered liberal but known quatities of experimental diets for two (2) week preliminary period to enable the animals to adop tot the diets and pen environment. Fresh water was made available adlibitum, The initial weights of animals were recorded. The animals were weighed at the beginning of the experiment and weekly thereafter throughout the experimental period. The animals were fed according to the treatment groups. Feed and water were offered to each experimental animal and feed refusals were weighed and recorded daily throughout the experimental period to determine the voluntary intake of the basal feed.A quatities of 300 g of the supplements were offered to the animals in a split dose twice daily; morning and afternoon.

Experimental Diets Preparation

Two experimental diets were prepared for the experiment; basal and supplementary feeds. Maize cobs were obtained from the harvested maize farm within Bauchi metropolis. It was then crushed using crushing machine designated for crushing crop residues (locally fabricated). The crushed maize cobs were then sprinkled with 1% molasses (1 litre molasses /100 litres of water) to treat 100 kg of maize cobs (Ndlovu *et al.,* 1985). It was then allowed to dry under shade for seven days before been offered to the animals. The maize cobs served as the basal diet.

Four supplements were formulated using Maize Bran (MB), cotton seed cake (CSC), Dried Poultry Litter (DPL) and groundnut cake (GNC). Fresh Poultry Litter was obtained from poultry farm of Abubakar Tafawa Balewa University, Bauchi. The litter was sun-dried for two weeks to minimize the growth of pathogens. The litter was then thoroughly raked to remove foreign and caked materials and milled to powder and sieved. (this is termed as the dried poultry litter). Maize bran, cotton seed cake and groundnut cake were purchased from the Muda Lawal Market in Bauchi metropolis.

The supplementary diets were as follows:

Maize bran	T_1 100% (MB alone)
Maize bran + dried poultry litter	T_2 50:50 (MB+DPL)
Maize bran + cotton seed cake	T_3 50:50 (MB+CSC)and
Maize bran + groundnut cake	T_4 50:50 (MB+GNC)

The chemical composition of the experimental diets are presented in Table 12.

Animals Feeding

Basal diets; maize cobs were offered to each animal *adlibitum* per day. The feed refusals were weighed to ascertain total feed intake.Three hundred (300 kg) of the supplements were given per animal per day in a split dose twice daily; at 8:00am and 9:00 pm. Water and mineral potash 'kanwa' were provided to each animal *adlibitum*. The trial lasted for ten (10) weeks after the two weeks adjustment period.

Experimental Design

The experiment was conducted in a Completely Randomized Design (Steel and Torrie,1980) with four treatments of four animals each.

Results

Table 1 shows the effect of feeding molasses treated maize cobs with supplementation on haemato biochemical parameters of growing yankasa rams as described under the following headings.

Blood glucose (BG)

No significant (P> 0.05) differences was observed across the treatments in the BG values (before and after feeding). The BG values (before feeding) range between 1.77 g/l for animals supplemented with MB+DPL and 3.23 g/l for those supplemented with MB+GNC. Animals supplemented with MB alone and those supplemented with MB+CSC recorded values of 2.30 and 2.10 g/l respectively .The BG (after feeding) range between 2.43 g/l(MB+DPL) and (3.27 g/l) for those supplemented with MB+GNC values are highest on supplemented with MB+GNC. Rams on MB alone and those supplemented with recorded 2.97 g/l and 3.00 g/l values respectively.

Blood Urea (BU)

No significant (P> 0.05) different was observed across the dietary treatments in BU values (before feeding). The BU (before feeding) values were highest on animals fed MB alone 3.27 Mmol/l and the least values of 2.70 Mmol/l in those supplemented with MB+DPL and MB+GNC respectively. Animals supplemented with MB+CSC had 3.00 Mmol/. The BU values (after feeding) range between

3.63 Mmol/l (MB+CSC) and (5.63 Mmol/l) for those animals supplemented with MB+GNC. Animals supplemented with MB alone and those supplemented with MB+DPL recorded 4.73 and 4.70 Mmol/l values respectively.

Blood Protein (BP)
No significant (P>0.05) difference was observed in BP values across the treatments. The BP values (before feeding) range between 5.23 g/l for animals supplemented with MB+DPL and 5.77 g/l (MB+GNC). The values of 4.57 g/l and 5.33 g/l were values recorded for those animals supplemented with MB alone and MB+CSC respectively. The BP values (after feeding) range between 5.50 g/l and 6.20 g/l for animals supplemented with MB+CSC and MB alone respectively. Rams supplemented with MB+DPL and MB+GNC recoded the values of 5.60 and 5.70 g/l respectively.

Packed Cell Volume (PCV)
The PCV values recorded (before feeding) was not significantly (P> 0.05) different across the diets.However, PCV (after feeding) was significantly (P< 0.05) different across the dietary treatments. The PVC vlues (before feeding) range from 21.30 % (MB+CSC) and 53.90 % recorded for animals supplemented with MB+DPL. Animals supplemented with MB alone and MB+GNC had the values of 27.33 % and 33.20 % respectively. The corresponding PCV values (after feeding) were highest on Animals supplemented with MB+DPL (52.43 %) and those supplemented with MB alone (28.87 %), had the least. Animals supplemented with MB+DPL and MB+CSC recorded the values of 33.36 and 48.93 % respectively.

Red Blood Cell (RBC)
Significant (P< 0.05) differences were observed in RBC values (before and after feeding) among rams fed the experimental diets.The RBC values (Before feeding) range between 5.63 µl (MB+CSC) and 8.29 µl for Animals supplemented with MB+DPL.The values of 7.24 µl and 6.88 ul were recorded for animals supplemented with MB alone and MB+DPL respectively. The RBC values (after feeding) ranged between 5.58 µl for animals supplemented with MB+CSC and 8.74 µl for those supplemented with MB+GNC. Those supplemented with MB alone and MB+DPL recorded values of 7.31 and 6.43 µl respectively.

White Blood Cell (WBC)
No significant (P>0.05) differences were observed in WBC values (before and after feeding). The WBC values (before feeding) range from 110.57 µl (MB+GNC) to 143.42 µl for those fed MB+CSC. The values of 143.37 and 119.43 µl were recorded for the animals supplemented with MB alone and MB+DPL respectively. The WBC (after feeding) values range between 150.30 µl (MB+CSC) and 193.53 µl for animals supplemented with MB alone. Animals supplemented with MB+DPL and MB+GNC had recorded the values of 163.60 and 153.17 µl respectively.

Haemoglobin(Hgb)
The Hgb (before feeding) values were not significantly (P> 0.05) different across the treatments. The Hgb values range between 9.03 g/dl (MB alone) and 11.30 g/dl for those animals supplemented with MB+GNC. Animals supplemented with MB+DPL and MB+CSC recorded 9.60 g/dl and 7.13 g/dl values respectively. However, the Hgb values (after feeding) were significantly (P< 0.05) different across the treatments. The least value of 7.93 g/dl was recorded for animals supplemented with MB+CSC. Animals on the other treatments had recorded the highest values of 9.57, 9.93 and11.69 g/dl while those animals supplemented with MB alone, MB +DPL and MB+GNCrespectively.

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Mean Corpuscular Volume (MCV)

The mean corpuscular volume values (before feeding) were not significantly (P> 0.05) different among the dietary treatments and range between 36.03 fl (MB alone) and 49.60 fl for those supplemented with MB+DPL. The values of 39.30 and 39.06 fl were recorded for animals supplemented with MB+CSC and MB+GNC respectively. However, the MCV (after feeding) values observed were significantly (P< 0.05) different among the diets. The significantly higher values for animals given MB+DPL(67.20 fl) and least for those on the other treatments.

Mean Corpuscular Haemoglobin (MCH)

No significant (P> 0.05) differences in MCH values recorded before and after feeding.The MCH (before feeding) range from 13.10 pg (MB alone) to 14.00 pg for animals supplemented with MB+DPL. The values of 13.7 and 13.57 pg were recorded for those animals supplemented with MB+CSC and MB+GNC respectively. The MCH values (after feeding) followed the same trend as before feeding. Those supplemented with MB alone and MB+GNC recorded values of 13.40 and 14.47 pg respectively. Animals supplemented with MB+CSC and MB+CSC recorded values of 14.30 and 14.07 pg respectively.

Mean Corpuscular Haemoglobin Concentration (MCHC)

No significant (P> 0.05) difference was observed in the MCHC values among the animals fed experimental diets (before feeding)..The MCH values (before feeding) range between 15. 93 g/dl (MB+DPL) and 33.30 g/dl for animals supplemented with MB alone. Animals fed MB+CSC and MB+GNC recorded values of 27.40 and 28.53 g/dl respectively. The MCHC values (After feeding) differed significantly (P< 0.05) and the values were higher for animals given MB alone, followed by those on MB+GNC, MB+CSC and MB+DPL.The values were 33.30, 28.53, 27.40 and 15.93 g/dl for treatments 1,4,3 and 2 respectively.

Table 1: Effect of Feeding Molasses Treated Maize Cobs with Supplementation on Haemato biochemical Parameters of Growing Yankasa Rams

Parameters	Period LS	Treatments				SEM	
		1	2	3	4		
Blood Chemistry							
Glucose (g/l)	BF	2.30	1.77	2.10	3.23	0.282	NS
	AF	2.97	2.43	3.00	3.27	0.179	NS
Urea (Mmol/l)	BF	3.27	2.70	3.00	2.70	0.202	NS
	AF	4.73^{ab}	4.70^{ab}	3.63^{b}	5.63^{a}	0.167	*
Protein (g/l)	BF	5.57	5.23	5.33	5.77	0.205	NS
	AF	6.20	5.60	5.50	5.70	0.166	NS
Blood metabolite							
Packed Cell Volume (%)	BF	27.33	53.90	21.30	33.20	6.244	NS
	AF	28.87^{b}	52.43^{a}	33.36^{b}	48.73^{ab}	4.802	*
Red Blood Cell (µl)	BF	7.24^{b}	6.88^{ab}	5.63^{b}	8.29^{a}	0.348	*
	AF	7.31^{b}	6.43b^{c}	5.58^{c}	8.74^{a}	0.397	*
White Blood Cell (µl)	BF	193.53	163.60	150.30	153.17	19.409	NS
	AF	140.37	119.43	110.57	143.40	21.431	NS
Haemoglobin (g/dl)	BF	9.03	9.60	7.13	11.30	0.533	NS
	AF	9.57^{ab}	9.93^{a}	7.93^{b}	11.69^{a}	0.431	*
Mean Corpuscular Volume (fl)	BF	36.03	49.60	39.30	39.06	7.995	NS

	AF	39.20[b]	67.20[a]	60.43[b]	38.53[b]	8.663	*
Mean Corpuscular Haemoglobin (pg)	BF	13.10	14.00	13.17	13.57	0.228	NS
	AF	13.40	14.47	14.30	14.07	0.405	NS
Mean Corpuscular Haemoglobin Concentration (g/dl)	BF	34.00	21.40	31.83	35.60	2.607	NS
	AF	33.30[a]	15.93[c]	27.40[bc]	28.53[b]	2.592	*

[abc] Means within the same row with different superscript are significantly different. * P < 0.05, SEM = Standard Error of the Mean, LS = Levels of Significant, Treatments 1(Maize bran 100%), 2(Maize bran 50% + Dried poultry litter 50%), 3(Maize bran 50% + cotton seed cake 50%), 4(Maize bran 50% + Groundnut cake 50%).
BF = Before Feeding, AF = After Feeding.

DISCUSSION

Blood Glucose (BG)

The BG values (before and after feeding) e differed and range between 1.77 to 3.23 g/dl and 2.43 to 3.27 g/dl respectively for all animals across the dietary treatments. These results fall within the normal range (2.40 – 4.50 g/dl) for sheep (Sirois, 1995). This also shows that enough energy was made available to the animals since serum glucose is an estimation of blood sugar content (Iyayi and Tewe, 1998).

Blood Urea (BU)

The BU values after feeding range from 3.63 to 5.63 Mmol/l. The values after feeding were within the range of 2.5 to 7.5 Mmol/l recommended by Mehrez (1976) for sheep. According to Iyayi and Tewe (1998), BU level depends on both the quality and quantity of the protein supplied in the diets and higher levels of urea in blood could be attributed to the presences of some antinutritional factors, which might have lowered the quality of the protein, indicating imbalance of amino acids in the diets and caused elevated BU concentration.

Blood Protein (BP)

The range of BP values obtainted in this study (5.50 to 6.20 g/dl) was lower compared to the normal range of 6.4 to 7.0 g/dl reported by Kaneko (1989) for sheep.

Packed Cell Volume (%)

Packed Cell Volume (PCV) of a blood gives an indication of the nutritive value of the experimental diets. The PCV values before feeding (21.30 to 53.90 %) and (28.87 to 52.43%) were comparable to the range of normal values (24 to 45 %) reported by Sirois (1995) for sheep. PCV values variations observed could be due to differences in nutrient utilization within an individual animal.

Red Blood Cell (RBC)

The range of values of RBC obtained in this study were 5.63 to 8.29 µl (before feeding) and 5.58 to 8.74 µl (after feeding) were higher than the normal range of 4.70 to 5.70 reported for sheep by Jain (1993).

White Blood Cell (WBC)

The white blood cell values recorded in this study before feeding (150.30 to 193.53 µl) and after feeding (110.57 - 143.40 µl) was also fall within the normal values for healthy animals (Jain ,1993).

Haemoglobin (Hgb)
The range of figures for haemoglobin obtained in this study before feeding (7.13 to 11.30 g/dl) and after feeding (7.93 to 11.30 g/dl) were within the normal range of values of 9.0 to 15.0 g/dl recorded for healthy sheep (Radostits et al., 2000).This is an indication that the diets were capable of supporting high oxygen carrying capacity in animals.

Mean Corpuscular Volume (MCV)
The range of MCV values in this study (36.03 to 49.60 fl) before feeding and (38.53 to 67.20 ft) after feeding.There were within the normal range of MCV values (28.00 to 40.00 fl) for healthy sheep (Kramer, 2000) .

Mean Corpuscular Haemoglobin (MCH)
The MCH values recorded in this study before feeding (13.10 to 14.00 pg) and after feeding (13.40 to 14.47 pg) were slightly higher than the normal values of 8.00 to 10.00 pg for sheep reported by Duncan and Prasse (1986) and Radiostits (2000).

Mean Corpuscular Haemoglobin Concentrations (MCHC)
The MCHC range of values obtained in this study before feeding (21.40 to 35.60 g/dl) and after feeding (15.93 to 33.30 g/dl) were within the normal range of values (31.00 to 34.00) reported for sheep (Duncan and Prasse, 1986; Kramer, 2000).

CONCLUSION
It can be concluded from the current study that the feeding value of molasses treated crushed maize cobs was enhanced by supplementing with maize bran alone or in a mixture of 50 % maize bran plus any of the following; dried poultry litter, cotton seed cake and groundnut cake. This led to improved haemato-biochemical values across the treatments.

REFERENCES

Adegbola, T. A. (1998). Sustainable Ruminant Production for Human Nutrition and National Development. Inaugural Lecture series No. 7, University Inaugural Lecture Delivered on 21st January, 1998 at Abubakar Tafawa Balewa University, Bauchi, Nigeria.

Duncan, J. R. and Prasse, K. W. (1986). *Veterinary Laboratory Medical Clinical Phatology*,ed 2,Ames Iowa State, University Press.

FAO (Food and Agriculture Organization) (2003): FAOSTAT Database.

FLDPCS (1991), FLDPCS RIMS Report.Federal Livestock Department and Pest Control Services.

Iyayi, E. A. and Tewe, O. (1998). Serum Total Protein. Urea and Creatinine levels as Indices of

Quality of Cassava Diet for pig. *Tropical Veterinary*. **36:** 59 – 67

Jain, N. C. (1993). Essential of Veterinary Haematology Lea and Febiger, Malvern, Pennysylvania, U.S.A.

Kaneko, J. J. (1980). **Clinical Biochemistry of Domestic Animals**, 4th edition, New York, Academic Press.

Kowal, J. M and Knabe, D. T. (1972). Agroclimato logical Atlas of the Northern States of Nigeria with Explanatory Notes. Ahmadu Bello University Press, Zaria, Nigeria. 128 Pp.

Kramer, J. W. (2000). Normal Haematology of Cattle Sheep and Goats.**In:**Feldman,B. F.,Zinkl, J. G., Jain, N. C., Editors:*Schlams Veterinary Heamatology*, ed5, Philadelphia, Williams and Wilkins.

McDowell, R .E. (1977). Ruminant products: more than meat and milk. Winrock report, Winrock *International Livestock Research and Training Centre,* Persit Jean Mountain, Monillon. AR

Mehrez, A. Z. (1976). Assessement of nitrogen requirement of rumen fermentation in sheep.PHD Thesis. University of Aberdem

Ndlovu, L. R. and Buchanan-smith. J. G. (1985). Utilization poor quality roughage by sheep; effect of alfalfa supplementation an ruminal parameters, fiber digestion ad rate of passage from the rumen. *Canadian J.Anim. Sci.*, **65** (3); 693-703.

Radostits, O. M., Gay, C. C., Blood, D. C, arid hmcliff, K W. (2000**).** Veterinary Medicine**:** A Textbook of the Diseases of Cattle, Sheep, Pigs**,** Goats and Horses. 9th Ed. W. B. Saunders

Sirois, M. (1995). Veterinary Clinic Laboratory Procedure Louis, USA pp160

Sudik S. D. (2016). Nutritional distribution and biochemical studies of acha (Digitaria spp) in infant weaning foods and oultry diets. PH.D Thesis Federal Uuniversity of Technology Akure, Nigeria PP.301

Sudik, S. D; Ijarotimi, O. S; Agbede, J. O. and Igbasan, F. A. (2020). Nutritional and bio-efficacy of acha (*D. iburua* and *D. exilis*) and soybean (*Glycine max*) flour blends in rats. *Archivos de Zootecnia*, 69 (267): 262-271. at: https://www.uco.es/ucopress/az/index.php/az/

Van Soest, P. J. (1988). Nutritional Ecology of the Ruminant**.** O. and B. Books, Inc, Corvallis,Oregon, USA. Pp. 75-260.