Growth performance, haematological and biochemical profile of sheep fed mango kernel meal (MKM) based diets.

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Abstract

The study was carried out to investigate the effect of mango (*Mangifera indica*) kernel meal (MKM) based diets on the growth performance, haematological and biochemical parameters of sheep. Performance of sixteen yearling West African Dwarf rams were evaluated using rice straw as basal diet and four diets of mango kernel meal (MKM, 0, 50, 75 and 100%) as concentrate supplements based diets. The four diets (T0, T50, T75 and T100) were fed in a completely randomized design with four replicates to the ram at 2% of body weight, while the rice straw was fed ad-libitum daily. As a follow up, blood parameters were screened to identify any ill effects of MKM on the health status of the animal. There were no significant (P>0.05) differences in the performance of the animals fed the four diets. The haematological indices of these animals were within the normal range of sheep as reported by researchers. The biochemical indices were also within the normal range. These are indications of no deleterious effect of MKM on the health of the animals. It is thus concluded that MKM can be included in the diets of yearling West African Dwarf rams without any detrimental effect on the haematology and biochemical profile of sheep.

Keywords: Performance, Haematology, Unconventional feedstuff, Mango kernel.

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Introduction

Competition for conventional feedstuffs between man, industries and monogastric animals has necessitated the need to look for non-conventional feed materials that are cheap but high in quality. The problem of animal protein scarcity in Nigeria and other developing nations has attained a deplorable status which calls for urgent remedy to avert the imminent protein malnutrition [1]. Ruminant animals have a distinct advantage over monogastric animals being capable of converting fibrous organic materials that are unsuitable for human consumption, into products of high nutritive value to man. Nutritional constraints have been implicated as one of the major problems militating against small ruminant production in Nigeria [2]. This is especially so during the dry season when scarcity of feed materials exists. To salvage this nutritional problem, there is need for utilization of other cheap and indigenous sources of protein and energy particularly those that attract no competition from man and other types of livestock [3]. Mango kernel, which is not consumed by human beings, is a potential feed ingredient. Using these non-conventional feed ingredients can or may help reduce the cost of production, thus, reducing the cost of meat and make it available and affordable for people to be able to increase the animal protein content of their diets [4,5]. However, in the use of these non-conventional feed ingredients, it is important to assess the health status of the animals. A readily available and fast means of assessing clinical nutritional health status of the animals on feeding trial may be the use of blood analysis [6]. In Nigeria, presently, virtually all mango kernels are discarded after the fleshy pulp has been eaten. Mango seeds are, thus, a waste at present and pose an environmental pollution problem. However, its use as a feed source may help alleviate this problem [7]. The study is aimed at evaluating the growth performance, haematological and biochemical profile of West African Dwarf sheep fed mango kernel meal (MKM) based diets.

Materials and Methods

The experiment was conducted at the Sheep and Goat Unit of the Livestock Teaching and Research Farm of the University of Agriculture Makurdi in Benue State. Mango seeds were collected during the month of May (peak of the mango ripening season). The kernel was obtained by cutting the mature seed open with a knife. The fresh kernel was chopped to reduce the particle size, sun-dried until crispy (less than 10% moisture). The dried kernel was ground in a hammer mill and used in the formulation of the experimental diet. Four concentrate supplements designated I, II, III and IV were formulated such that mango kernel meal (MKM) and maize offal (MO) were mixed at the ratios of 0:100, 50:50, 75:25 and 100:0 respectively and used at 37% level as presented in Table 1**.** Sixteen (16) yearling West African Dwarf (WAD) rams were used. The rams were quarantined for six weeks. During this period they were treated against all primary infections to produce a uniform health status and were then vaccinated against *Peste des Petitis ruminante* (PPR) using the PPR vaccine. The animals were weighed and randomly allocated to four treatment diets with four replicates i.e., each animal served as a replicate, thus adopting a completely randomized design (CRD). The animals were fed the experimental diets for seven days to allow for adjustment before data collection commenced. Each animal was fed 2% of its body weight/head/day of the concentrate supplement from 09.00 to 12.00 hours. The animals were served rice straw and clean drinking water *ad libitum.* Altogether, the study lasted for 77 days. At the end of the experiment, blood

samples were collected aseptical from the jugular vein of three animals each from the four treatments which has four animals per treatment with the aid of a 21 G needles mounted on a 5 mL syringe. The blood samples for haematological parameters were collected into a bottle containing ethylene diamine tetra acetic acid (EDTA) as an anticoagulant, while the blood samples for serological tests were collected without anticoagulant. The uncoagulated blood samples were analysed for haematological parameters such as Packed cell volume (PCV), haemoglobin concentration (Hb), Erythrocyte count (RBC), Total Leucocyte count (WBC), Neutrophils, Lymphocyte, Monocyte, Eosinophils and Basophils by the methods. The blood meant for serological analysis was centrifuge at 1000G for 10 minutes, after which the serum was separated and was used for determination of Serum total protein, Albumin, Serum glutamic oxaloacetic transminase (SGOT) and Serum glutamic pyruvic transminase (SGPT) were determined by the method described by Cheeshrough [8]. The globulin concentration was obtained as the difference between albumin and total protein. Data generated from the trial were subjected to analysis of variance (ANOVA) using Minitab statistical software according to operational manual [9] for Completely Randomized Design (CRD). Significant means were separated using New Duncan's Multiple Range Test [10].

Results and Discussion

The results of the growth performance of sheep fed diets containing mango kernel meal (MKM) are presented in Table 2**.** All the parameters measured with the exception of mean daily weight gain were not significantly (P>0.05) different among the treatment. The fact that all the sheep had weight gain in the present study indicate that MKM concentrate supplements in different proportions was above maintenance requirement [11-16]. The non-significant difference among the treatment also indicate that the experimental diet did not pose any nutritional stress on the animals. The results on the effect of experimental diets on the haematological and biochemical indices are shown in Tables 3 and 4**.** All the parameters measured for haematology with the exception of PCV and Hb were significantly (P<0.05) different among the treatments but fall within the normal range reported by researchers for small ruminants. The erythrocyte values ranged between (6.89×10^6/µL and 11.55×10^6/µL). These values fall between 9.2-13.5 $\times 10^6$/µL and 5.28-7.09 $\times 10^6$/µL reported by Daramola et al. [14] respectively. The leucocytes values ranged between (2.80×10^3/µL and 8.13×10^3/µL). These values fall within the values reported by Schalm et al. [15]. The total protein from this study was higher compared

Table 1. *Composition of experimental diets.*

Nutrients %	T_1 (0%MKM)	T_2 (50%MKM)	T_3 (75%MKM)	T_4 (100%MKM)
Mango kernel meal (MKM)	0.00	18.50	27.75	37.00
Maize offal	37.00	18.50	9.25	0.00
Palm kernel cake	20.00	20.00	20.00	20.00
Dried brewer grain	40.00	40.00	40.00	40.00
Bone ash	2.00	2.00	2.00	2.00
Salt	1.00	1.00	1.00	1.00
Total	100	100	100	100

Table 2. *Feed intake and performance of sheep fed supplemented with concentrate containing various levels of mango kernel meal.*

Parameters	Dietary				SEM
	T_1 (0%MKM)	T_2 (50%MKM)	Treatment T_3 (75%MKM)	T_4 (100%MKM)	
Mean concentrate intake (g/d)	276.86	235.64	247.89	226.35	84.40ns
Mean Rice straw intake (g/d)	267.28	261.57	259.57	268.03	18.75ns
Mean total feed intake (g/d)	544.14	497.21	507.46	494.38	93.19ns
Mean total feed intake (g/wkg$^{0.75}$)	112.28	105.22	106.47	104.71	14.45ns
Initial mean body weight (kg)	14.70	14.53	14.23	14.65	2.93ns
Final mean body weight (kg)	17.53	16.28	16.48	16.18	3.99ns
Mean daily weight gain (g)	40.47 ^{a}	25.00^{a,b}	32.14^{a,b}	21.78^{b}	18.64
Feed Conversion ratio	33.39	21.20	18.68	27.62	17.61ns
Mortality	0	0	0	0	

^{a,b}Means in the row with similar letter(s) are not significantly different at the 5% level.
ns: Not Significant; MKM: Mango Kernel Meal; SEM: Standard Error of the Mean Difference.

Table 3. *Haematological parameters of sheep fed supplemented with concentrate containing various levels of mango kernel meal.*

Parameters	Diets				SEM
	T_1 (0%MKM)	T_2 (50%MKM)	T_3 (75%MKM)	T_4 (100%MKM)	
Packed Cell Volume (%)	21.67	25.67	20.00	25.33	6.93ns
Haemoglobin Concentration (g/dL)	7.22	8.55	6.67	8.45	2.31ns
Total Erythrocyte Count (× 10^6/µL)	11.55^{a}	11.55^{a}	6.98^{b}	11.15^{a}	2.08
Total Leucocytes Count (× 10^3/µL)	8.13^{a}	6.67^{a}	2.80^{b}	5.93^{a,b}	3.24
Neutrophils (× 10^3/µL)	2.82^{a}	2.25^{a,b}	0.81^{b}	1.70^{a,b}	1.61
Lymphocyte (× 10^3/µL)	4.10^{a}	3.02^{a,b}	1.71^{b}	4.05^{a}	1.63
Monocyte (× 10^3/µL)	0.24^{a}	0.11^{b}	0.09^{b}	0.08^{b}	0.09
Eosinophils (× 10^3/µL)	0.16^{a}	0.01^{b}	0.01^{b}	0.04^{b}	0.11
Basophils (× 10^3/µL)	0.13^{a}	0.00^{b}	0.05^{a,b}	0.06^{a,b}	0.08

^{a,b}means in the row with similar letter(s) are not significantly different at the 5% level.
ns: Not significant; MKM: Mango Kernel Meal; SEM: Standard Error of the Mean Difference.

Table 4. *Serum biochemistry of sheep fed supplemented with concentrate containing various levels of mango kernel meal.*

Parameters	Diets				SEM
	T_1 (0%MKM)	T_2 (50%MKM)	T_3 (75%MKM)	T_4 (100%MKM)	
Total Protein (g/dL)	11.03[a]	11.17[a]	10.63[a,b]	9.33[b]	1.46
Albumin (g/dL)	4.80[a]	4.80[a]	4.87 [a]	3.93[b]	0.57
Globulin (g/dL)	6.23[ab]	6.37 [a]	5.77[ab]	5.40[b]	0.92
SGOT (I.U/L)	2.80[a]	2.73[a]	2.80[a]	2.07[b]	0.40
SGPT (I.U/L)	1.53	1.60	1.57	1.67	0.37ns

[a,b]means in the row with similar letter(s) are not significantly different at the 5% level.
ns: Not Significant; SGOT:Serum Glutamic Oxaloacetic Transaminase; SGPT: Serum Glutamic pyriuvic Transaminase; MKM: Mango kernel Meal; SEM: Standard Error of the Mean Difference.

with the reported range obtained by Tambuwal et al. [17]. The high protein is an added advantage to the animals. These results agreed with the report of Eggum et al. [18] that total protein contents also depend on quality and quantity of the protein supplied in the diet [15-19].

Conclusion

This study demonstrated that MKM can be incorporated in the sheep diet as alternative feed ingredient without negative effect or deleterious to the health of the animals.

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