EFFECTS OF RAW KARAYA GUM TREE (*Sterculia setigera*) SEED MEAL ON HAEMATOLOGICAL AND SERUM BIOCHEMISTRY INDICES OF GROWER RABBITS

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Abstract

Effects of feeding raw Karaya gum tree seed meal on haematological and serum indices were studied in a ten (10) weeks experiment using grower rabbits. Four diets were compounded with the control diet having no Karaya gum tree seed meal while diets 2, 3, and 4 had 2%, 4% and 6% respectively. Thirty-six mixed breed grower rabbits with an average initial weight of 600±10g were allocated to the four diets in a completely randomized design with nine rabbits per treatment. At the end of the feeding trial, blood samples were collected for haematological and serum biochemical indices. All the parameters determined for both haematological and serum indices were significantly ($P<0.05$) influenced with increase in the test ingredient. It is thus concluded that raw Karaya gum tree seed meal had effect on the health status of grower rabbits.

Keywords: Karaya gum, grower rabbits, compounded, heamatological, serum.

Introduction

High cost of feed and feed ingredients has necessitated the need to look for alternative sources of feed ingredient which are nutritionally adequate, affordable and available locally to reduce competition between man and livestock. Utilization of locally available cheap and less competitive feedstuff in feeding rabbits will minimize the incorporation of the highly cost feed sources while maximizing output at least cost of production. (Onyekwere *et al.*, 2010). Karaya gum tree (*Sterculia setigera* Del.) is a savanna tree, widespread in savanna areas of tropical Africa with natural distribution from Senegal to Cameroon in West Africa, eastwards to Eritrea, and southwards to Angola (Agishi, 2004). The tree produces seeds in hairy pods that split open when ripe to reveal black seeds that are less competed for by man and animals and could therefore be alternative source of feed ingredient for livestock.

Materials and Methods

This research work was carried out at the Teaching and Research Farm of Federal College of Wildlife Management, New Bussa, Niger State, Nigeria. Matured seeds were collected from ripened fruits of Karaya gum tree (*Sterculia setigera* Del.) collected within New Bussa. The seeds were cleaned to be free from unwanted particles; sun dried to constant weight, and milled for inclusion in the rabbit diets. Four experimental diets were compounded with raw karaya gum tree seed meal included in the diets at graded levels of 0%, 2%, 4% and 6% respectively (Table 1). Thirty-six mixed breed grower rabbits with average initial weight of 600±10g were used. The rabbits were divided into four treatment groups. Each treatment had triplicates with 3 animals per replicate housed in wooden/wire hutches in a well-ventilated pen. They were allotted to the four treatment diets in a completely randomized design. Prior to the experiment, the animals were given prophylactic treatment against parasites (with ivermectin) and coccidiosis (with coccidiostat). 2 weeks adjustment period was given for adaptation followed by 10 weeks experimental period. Feed and water were served ad-libitum. Feed intake and weight gains were determined over the 10 weeks experimental period after which digestibility trial was conducted over 1 week.

Faecal samples were collected over the 1week digestibility period. Karaya gum tree seed meal, feed and faecal samples were analysed for nutrient composition according to AOAC, (1990) methods.

At the end of the digestibility trial, blood samples were collected into sterile universal bottles containing anti-coagulant, Ethylene Diamine Tetra Acetic acid (EDTA), for haematological parameters evaluation while blood samples were also collected into sterile bottles without anti-coagulant for serum biochemical indices. Packed cell volume (PCV), haemoglobin (Hb), red blood cells (RBC) and white blood cells (WBC) were determined while their differentials that include mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC) were calculated according to Jain (1986). Serum biochemical indices determined include total protein, albumin, urea, serum glutamate oxalotransaminate, serum glutamate pyruvate transaminate, total bilirubin and conjugate bilirubin. All data collected were subjected to analysis of variance (ANOVA) according to the procedure of Steel and Torrie (1980) while means were separated using Duncan's Multiple Range Test (Duncan, 1955).

Results and Discussion

Composition of the experimental diets is shown in Table 1. The result of proximate analysis (Table 2) of the test ingredient had shown that the seed is relatively high in protein (18.72%), fat (18.80%) and nitrogen free extract (45.23%). This is an indication that the seed could be a good source of nutrient for livestock to be used as replacement for costly ingredients. The crude protein used in this study is 18.12% - 18.50% which is sufficient for grower rabbit. Aduku and Olukosi (1990) had recommended 16-18% protein for growing rabbits. Haematological indices of the experimental rabbits are represented in Table 3. The haemoglobin (Hb), packed cell volume (PCV), red blood cells (RBC) and mean corpuscular haemoglobin concentration (MCHC) were higher (14.60g/dl, 37.50%, 7.06 x 10^9l and 38.93% respectively) in control (diet 1) than diets 2,3 and 4 with the lowest in diet 4. The values decreased with increase in test ingredient. The values for haemoglobin were all within the normal range (9.9-19.3g/dl) (Tuffery 1995) for healthy rabbits. PCV has highest (37.50%) in diet 1 and lowest (29.68%) in diet 4. The values for diets 1, 2 and 3 were within the normal range (31-50%) (Mitruka and Rawnsley,1977) while PCV for diet 4 was below the normal range. The similar trend for Hb and PCV could be ascribed to the relationship between Hb and PCV (Jain, 1986). White blood cells (WBC) decreased with increase in the test ingredient while red blood cells decreased with increase in the test ingredient. This might be due to presence of anti-nutritional factors. MCV values did not follow the same trend with Hb, PCV, WBC and RBC. MCV for diet 1, was below the normal range (57.8 – 65.4μ^3) while diet 4 (96.68 μ^3) was above the normal range. MCH values were not in definite order. However, MCH of diets 1, 2 and 3 were within the normal range of 17.1 – 23.5µµg (Mitruka and Rawnsley, 1977) but higher than normal range for diet 4. The normal MCH values indicate that the animals were free from anaemia. MCHC values were higher than normal range for diets 1,2 and 3 but favoured diet 4. The MCHC of diet 4 was within the normal range. Higher MCHC suggests presence of hyperchromasia. Serum biochemistry indices are presented in Table 4. The result had indicated total protein to be between 4.30g/dl and 6.75g/dl with the highest value in diet 4 while diet 1 had the lowest value. The values increased with increase in test ingredient. Low level of total protein is an indication of adequacy of protein in the diets. This is in line with Fasuyi and Ibiayo (2010) who stated that total protein is indirect indices for measuring the nutritional protein adequacy. Albumin values were between 3.00 g/dl and 3.75g/dl with the highest in diet 1 and lowest in diet 4. The values decreased with increase in test ingredient. This could be due to anti-nutritional factors in the seed. Ewuola *et al.* (2010) stated that high albumin is an indication that the rabbit did not suffer from any toxin or infection. Urea values increased with increase in the seed meal. This may be an indication of amino acid imbalance which resulted in increased blood urea as reported by Olafadehan *et al.* (2010). Serum glutamate oxalotransaminate (SGOT) and serum glutamate pyruvate transaminase (SGPT) followed the same trend with urea. The values increased with increase in seed meal in the diets. This could also be as a result of anti-nutritional components. This agreed with Olafadehan *et al.* (2010) who reported that an increase in serum SGOT and SGPT signify necrosis and myocardial infection or response to the presence of a number of toxic factors. Total bilirubin and conjugate bilirubin increased with increase in the seed meal in the diets. However, the total and conjugated bilirubin values were within the normal range of 0-6mg/dl and 0-3mg/dl respectively (Sirois, 1995; Olafadehan *et*

al., 2010). All the values for heamatological and serum biochemical parameters were significantly (P<0.05) different between the treatments.

Conclusion

Conclusively, the results of this study had shown that feeding diet with raw karaya gum tree seed meal had effect on both haematological and serum biochemical indices of grower rabbits. There is therefore need to detoxify the test seed before inclusion in rabbit diet.

Table 1: Composition of the experimental diets

	Diet			
Ingredients (%)	1 (0%)	2 (2%)	3(4%)	4 (6%)
Maize bran	66.76	65.00	63.00	61.00
Groundnut cake	18.24	18.00	18.00	18.00
Rice husk	7.00	7.00	7.00	7.00
Blood meal	4.00	4.00	4.00	4.00
Sterculia setigera	-	2.00	4.00	6.00
Bone meal	3.00	3.00	3.00	3.00
Salt	0.50	0.50	0.50	0.50
Premix	0.50.	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00

*SS = *Sterculia setigera* seed meal

Table 2: Proximate Composition of the experimental diets and *Sterculia setigera* seed meal

	Diet				
Nutrient (%)	1 (0%)	2 (2%)	3(4%)	4 (6%)	*Sterculia setigera* seed meal
Dry matter	91.67	91.95	92.11	92.11	95.17
Crude protein	18.12	18.20	18.35	18.50	18.72
Crude fibre	11.69	11.65	11.59	11.53	8.82
Fat	16.74	17.42	18.35	18.79	18.80
Ash	6.32	6.65	6.84	7.12	3.60
Nitrogen free extract	39.00	38.03	36.98	36.17	45.23

Table 3: Haematological indices of rabbits fed diets containing *Sterculia setigera* seed meal

	Diet				
Parameters	1 (0%)	2 (2%)	3 (4%)	4 (6%)	SEM
Haemoglobin (g/dl)	14.60 ^{a}	13.85 ^{a}	11.72 ^{b}	9.98 ^{c}	0.98
Packed cell volume (%)	32.50 ^{a}	35.87 ^{b}	32.43 ^{c}	29.68 ^{d}	1.46
White blood cells ($x10^4/mm^3$)	6.24 ^{c}	6.63 ^{c}	8.56 ^{b}	10.71 ^{a}	0.53
Red blood cells ($x10^{22}/mm^3$)	7.06 ^{a}	6.92 ^{a}	5.30 ^{b}	3.07 ^{c}	0.37
Mean Corpuscular Volume (μ^3)	53.12 ^{c}	57.84 ^{c}	61.19 ^{b}	96.68 ^{a}	2.68
Mean Corpuscular Haemoglobin (µg)	20.68 ^{c}	20.01 ^{c}	22.11 ^{b}	32.51 ^{a}	1.36
Mean Corpuscular Haemoglobin Conc.(%)	38.93 ^{a}	38.61 ^{a}	36.14 ^{b}	33.63 ^{c}	1.51

$^{a.b.c.d}$Means in the same row with different superscripts differ significantly (P<0.05)
SEM = Standard Error of Mean

Table 4: Serum biochemical indices of rabbits fed diets containing *Sterculia setigera* seed

	Diet

Biochemical Parameters	1 (0%)	2 (2%)	3 (4%)	4 (6%)	SEM
Total Protein (g/dl)	4.30 c	4.80 c	5.70 b	6.75 a	0.34
Albumin (g/dl)	3.75 a	3.68 a	3.50 a	3.00 b	0.10
Urea (mg/dl)	4.10 d	4.63 c	5.82 b	6.90 a	0.26
Serum glutamate oxalotransaminase (µ/l)	10.15 c	10.75 c	12.43 b	15.23 a	1.58
Serum glutamate pyruvate transaminase (µ/l)	9.86 c	10.07 c	11.68 b	13.37 a	1.43
Total Bilirubin(mg/dl)	3.45 c	3.87 c	5.21 b	7.43 a	0.87
Conjugate Bilirubin (mg/dl)	1.80 c	2.42bc	2.86 b	3.68 a	0.09

a.b.c.dMeans in the same row with different superscripts differ significantly (P<0.05)
SEM = Standard Error of Mean

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