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Haematogical and Biochemical Profiles of Rabbits Fed Pelleted and non Pelleted Maize Substituted Sweet Potato Root Diets

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Abstract

Unpeeled, sliced sun-dried sweet potato roots were milled and replaced with maize at 0, 25, 50, 75 and 100% levels in the diets rabbits. Fifty mongrel rabbits aged between 8-10 weeks of average body weight of 650.25±0.33g were randomly allotted to the ten diets with five rabbits per diet. A group of five diets were fed in meal form while a second group was fed in pelleted form. The rabbits were fed and given water ad libitum for 10 weeks. At the end of the tenth week blood samples were collected from the marginal ear vein for haematological and serum profiles. Except for PCV and MCHC values of rabbits fed non pelleted total replacement of maize with sweet potato all the haematological and biochemical indices did not show any appreciable effects.

Introduction

Sweet potato is grown in all agro-ecological zones in Nigeria (Abu and Tewe, 2009). The crop is presently accepted as a minor root crop in Nigeria in spite of its high agronomic and utilisation potential. About 80-90% of the sweet potato tuber, on dry matter basis is made up of carbohydrates (Woolfe, 1992). In Africa only 3% of the total production estimate of sweet potato had been reported to be utilized for animal feed while over 20% of the total production is wasted (Calpe, 1991). This therefore suggests that improved processing techniques will possibly lead to a greater utilisation of this crop for human food, feeds and industrial uses. Afolayan *et al.* (2011) reported that replacement of maize with sweet potato root meal at 10 and 20% gave same performance in broilers both at the starter and finisher phases. Poor starch digestibility has been recognised as a major constraint in the utilisation of raw sweet potato in livestock feeding (Zhang *et al*., 1993). Previous studies have however shown that sweet potato starch is susceptible to α-amylase hydrolysis than in cooked cereal starches (Dreher *et al*., 1984; Tsou and Hong, 1989). Heating of sweet potato had been reported to improve starch digestibility by up to 37.8%, and that variation in sweet potato also exists (Zhang *et al*., 1993). Blood parameters are good indices for assessing the nutritional and pathological status of animals in addition to other zootechnical parameters. The study was carried out to evaluate the haematological and serum biochemical responses of rabbits fed diets in which sweet potato replaced maize and presented in meal and pelleted forms.

Materials and Methods

Whole sweet potato roots were purchased from a weekly market in Oyan, Osun state. The roots were washed, sliced, parboiled for 10 min, and then sun-dried on cement floor for about 14 days until moisture content was about 10%. The dried sweet potato was then milled to produce sweet potato root meal (SPRM). Five diets were formulated in which maize was replaced by SPRM at 0, 25, 50, 75 and 100% levels. A group of the diets was fed in meal form while the second group was fed in pelleted form. In all a total of 10 experimental diets were formulated. Diet composition is shown in table 1. A total of 50 rabbits of mixed breeds aged between 8-10 weeks of average body weight of 650.25±0.33g were randomly allotted to the ten diets using five rabbits per diet. The rabbits were housed individually and were given feed and water *ad libitum* for 10 weeks. At the end of the feeding trial blood samples were collected from the prominent ear vein of three rabbit per treatment. The haematological values were analysed using routinely available clinical methods by the Faculty of Veterinary Medicine, University of Ibadan. Packed Cell Volume (PCV), red blood cell count (RBC), white blood cell count (WBC) and Haemoglobin (Hb) concentrations were determined using Wintrop's microhaematocrit, improved Neubauer haemocytometer and cyano-methanemoglobin methods, respectively. The erythrocytic indices, mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC) were calculated. The data obtained were analyzed according to the procedure of the Statistical Analysis System (SAS, 1995)

Results and Discussion

The calculated proximate composition of the diets is shown in table 1.The protein, energy and fibre levels met the recommended requirements for the rabbits. Blood parameters investigated included; PCV, Hb and WBC. Total serum proteins, serum creatinine, serum albumin, serum globulins, blood urea and blood glucose changes were also studied. Table 2 showed the haematological and serum biochemical parameters of the rabbits. The haematology of the rabbis did not show a uniform pattern, except for the rabbits fed 100% maize based non-pelleted ration, all rabbits did not differ ($P > 0.05$) in their PCV values. Varying the levels of sweet potato root meal in the pelleted rations did not significantly affect ($P > 0.05$) the Hb and MCHC values but varied in the rabbit fed non pelleted rations as the level of SPRM exceeded 25%. Except of for rabbits fed 25% pelleted sweet potato root meal and 100% non pelleted sweet potato root meal diets the RBC values were not affected ($P > 0.05$). The WBC of rabbits fed pelleted and non pelleted rations, irrespective of the level of replacement of maize by SPRM, did not differ ($P > 0.05$). The diets appeared to be nutritionally adequate for growth of rabbits with respect to the haematological changes in the rabbits. Haematological values recorded in the feeding trial were also within the normal physiological levels for rabbits (Mitruka and Rawnsley, 1977). Creatinine and uric acid levels did not differ significantly ($P > 0.05$) for different levels of SPRM inclusion for pelleted and non-pelleted rations. Total protein levels for 75 and 100% SPRM non pelleted diets differ ($P < 0.05$) for other rations. However, albumin values were lower ($P < 0.05$) in 100% SPRM pelleted diets when compared with other diets. Blood urea levels were significantly lower ($P < 0.05$) in 0 and 10% SPRM non pelleted diets but the reason for this observation could not be elucidated since rabbits fed same levels of SPRM in meal form did not show high blood urea levels. However glucose levels did not show any uniform pattern contrary to the report of Oboh (1987) who observed increased glucose levels in the broiler as the level of sweet potato was increased in the diets.

Conclusion

The replacement of maize with sweet potato root meal up to 100% substitution did not appreciably affect the haematological and serum biochemical profile of rabbits. Pelleting the diets did not also show any appreciable superiority over non pelleted diets.

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Table 1. Ingredient composition of experimental diets fed young growing rabbits

Ingredient (%)	T1	T2	T3	T4	T5
	Levels of replacement of maize with SPRM				
	0%	25%	50%	75%	100%
Maize	40.0	30.0	20.0	10.0	0.0
Sweet potato root meal	0.0	10.0	20.0	30.0	40.0
Brewers dried grains	40.0	40.0	40.0	40.0	40.0
Soyabean meal	15.0	15.0	15.0	15.0	15.0
Fish meal	1.0	1.0	1.0	1.0	1.0
Bone meal	2.0	2.0	2.0	2.0	2.0
Oyster shell	1.0	1.0	1.0	1.0	1.0
Table salt (NaCl)	0.5	0.5	0.5	0.5	0.5
Premix*	0.5	0.5	0.5	0.5	0.5
Calculated nutrient levels					
CP (%)	18.57	17.69	17.22	16.77	16.2
CF (%)	9.64	9.54	9.44	9.34	9.24
ME MJ/Kg DM	11.13	11.05	10.92	10.82	10.75

** Supplying per Kg diet: Vit A, 4,000,000 IU; Vit D_3, 1,200,000 IU; Vit E, 3,200 IU; Vit B_{12}, 4.8mg; Biotin, 12mg; Pantothenic acid, 2,800mg; Folic acid, 240mg; Choline chloride, 200,000 mg; Vit C, 4,000mg; Fe, 2,400mg; Mn, 32,000mg; Copper, 3,200mg; Zn, 20,000mg; Co, 180m; Iodine, 800m; Selenium, 40mg; Anti-oxidant, 2,400mg; Calcium carbonate, Q.S., 1000mg*

Table 2. Haematological and Biochemical indices of rabbits fed pelleted and non pelleted sweet potato based diets

Indices	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
PCV (%)	41.3^{a}	40.7^{ab}	40.4^{abc}	40.9^{a}	39.1^{c}	40.7^{ab}	39.9^{abc}	40.2^{abc}	38.8^{c}	35.9^{d}
Hb (%)	15.8^{a}	15.5^{ab}	15.4^{ab}	15.1^{ab}	15.1^{ab}	15.0^{c}	15.2^{ab}	14.3^{c}	10.8^{d}	11.0^{d}
RBC (x 10^6/µl)	6.8^{b}	7.6^{a}	6.5^{bc}	6.3^{bc}	6.4^{bc}	5.5^{d}	5.8^{cd}	5.3^{d}	5.5^{d}	4.5^{e}
WBC (x 10^3/ µl)	8.6^{d}	8.8^{cd}	8.7^{cd}	9.0^{bcd}	8.8^{cd}	9.2^{abc}	9.6^{a}	9.0^{bcd}	9.5^{ab}	9.4^{ab}
MCV (*fl*)	61.1^{ef}	53.7^{f}	62.4^{def}	64.9^{cde}	61.1^{ef}	73.9^{abc}	69.2^{bcde}	75.5^{ab}	71.1^{abcd}	79.3^{a}
MCH (*pg*)	23.4^{bc}	20.4^{cd}	23.8^{ab}	23.9^{ab}	23.7^{bc}	27.3^{a}	26.4^{ab}	26.8^{ab}	19.8^{d}	24.3^{b}
MCHC (%)	38.3^{a}	38.1^{ab}	38.2^{a}	36.9^{b}	38.8^{a}	36.9^{b}	38.1^{ab}	35.5^{c}	27.8^{c}	30.7^{d}
Creatinine (*g/dl*)	1.9^{a}	1.9^{a}	1.8^{ab}	1.7^{c}	1.9^{a}	1.8^{ab}	1.7^{bc}	1.9^{a}	1.9^{a}	1.9^{a}
Uric acid (mg/*dl*)	1.5^{b}	1.7^{a}	1.7^{a}	1.5^{b}	1.5^{b}	1.4^{bc}	1.3^{c}	1.3^{c}	1.4^{bc}	1.1^{c}
Total protein (*g/dl*)	6.5^{a}	6.6^{a}	6.3^{a}	6.1^{a}	6.6^{a}	6.1^{a}	6.2^{a}	6.1^{a}	4.8^{b}	5.5^{b}
Albumin (*g/dl*)	3.2^{bc}	3.4^{b}	3.4^{b}	3.2^{bc}	4.0^{a}	3.2^{bc}	3.4^{b}	3.2^{b}	2.8^{b}	3.4^{b}
Globulin (*g/dl*)	3.3^{a}	3.2^{ab}	2.9^{abc}	2.9^{abc}	2.6^{bc}	2.9^{abc}	2.8^{abc}	2.8^{abc}	2.4^{c}	1.7^{d}
BUN (mg/*dl*)	20.9^{c}	20.6^{c}	25.2^{ab}	25.4^{ab}	25.9^{ab}	25.4^{ab}	25.3^{ab}	25.6^{b}	25.0^{ab}	26.3^{a}
BG (mg/*dl*)	135.2^{a}	135.6^{ab}	130.8^{cd}	130.6^{cd}	129.4^{d}	132.6^{cd}	129.9^{cd}	126.8^{c}	125.7^{c}	131.4^{bc}

Means with the same superscripts are not significantly different ($P > 0.05$) Diets T1-T5 (pelleted diets), Diets T6-10 (non pelleted diets)
BUN = Blood urea nitrogen
BG = Blood glucose