

HAEMATOLOGICAL INDICES OF WISTAR RATS FED DEHULLED AFRICAN YAM BEAN (*Sphenostylis stenocarpa*) SOAKED IN ACIDIC AND ALKALINE MEDIA

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ABSTRACT

A total of thirty Wistar rats weighing 40±50g were randomly allocated to three dietary treatments in a completely randomized block design to investigate the haematological indices of Wistar rats fed dehulled African yam bean (*Sphenostylis stenocarpa*) soaked in acidic and alkaline media. Three diets were formulated to contain dehulled AYB- (T1), dehulled AYB soaked ogi liquor (acidic medium)-(T2) and dehulled AYB soaked in wood ash (alkaline solution)-(T3). The experiment lasted for 28 days. Two rats per treatment were sacrificed by cervical decapitation, Red Blood Cell (RBC), lymphocyte AST and creatinine were not affected by dietary treatments while Packed Cell Volume, Haemoglobin, White Blood Cell, Neutrophils, Monocytes, Basophil, Platelets, total protein, albumin, globulin and ALT were significantly affected ($P>0.05$) by dietary treatments. Rats on T3 had the highest haemoglobin value (15.6g/dl) and PCV (48.0%). Rats on T2 and T1 had the highest value of monocyte (2.00%) and basophil (2.00%) However, values of PCV and Haemoglobin followed similar pattern. In conclusion dehulled African yam bean seeds soaked in ogi liquor (acidic medium) and wood ash (alkaline medium) can be fed to rats without having adverse effects on haematological indices of the rats

INTRODUCTION

The use of grain legumes as conventional source of protein and energy has contributed immensely to the survival of livestock industry in Sub-Saharan Africa. Soyabean with 44-48% crude protein is the major source of plant protein in livestock diets. However, the price of soyabean meal is increasing at higher rate on the international market due to the high demand (Taiwo *et al.*, 2005). As a result, there is the risk that the traditional source of protein for livestock would become too expensive and scarce in the years to come particularly in low income African countries. It is therefore necessary to search for good alternatives which is affordable and can replace the expensive soyabean. One of such alternative ingredient capable of substituting expensive Soyabean is African yam bean (*Sphenostylis stenocarpa*). African yam bean is an underutilized but exceptionally productive large seeded tropical legume. It has a crude protein content that ranges between 22-29% depending on stages of maturity. Moreover, the amino acid (lysine and methionine) values in African yam bean seeds are higher than in Pigeon pea, Cowpea, and Bambara groundnut (Uguru and Madukaife, 2001). As reported by (Ekpo 2006), the amino acid profile of African yam bean compares favorably with the whole chicken's egg and meets the daily requirement prescribed by Food and Agriculture Organization (FAO) and World Health Organization (WHO). However, one of the problems with legume utilization is the presence of anti-nutritional

factor which limit their use as animal feed. Ajibade *et al.*, 2005 have identified the presence of some ANF such as alkaloids, flavinoids, saponins, lectin, trypsin inhibitors, phytate and oxalate in the seeds of AYB. Boiling, toasting and soaking are some of the processing methods which had been used (Ahamefula, 2000) to inactivate these anti-nutritional factors.

MATERIALS AND METHODS

Experimental site: The experiment was carried out at the Teaching and Research Farm, Oyo State College of Agriculture, Igboora, Oyo State
Collection of seeds & pre-treatment: Wild African yam bean was purchased from Bodija market, in Ibadan. Raw AYB seeds were soaked at the rate of 1kg/3L of water for 12 hours after which the water was decanted and the bean dehulled.

Treatment of dehulled seeds & experimental diets: Dehulled AYB seeds were soaked at the rate of 1kg/3L of raw ogi maize liquor (acidic medium) or 0.5% of wood ash solution (alkaline medium) for 24 hours, initial and final pH was taken. The samples was sundried for 3 days, milled and then included in the diet accordingly. Three dietary treatments were compounded to supply 10% crude protein on dry matter basis. Rats on T1 received dehulled AYB, T2 received dehulled AYB soaked in acidic medium and T3 received dehulled AYB soaked in alkaline medium.

Experimental design and animal management

Thirty Wistar rats of an average initial weight of 40 ± 50 g were used for the study. The rats were weighed and randomly assigned on the basis of body weight into three dietary treatments of ten rats each in a completely randomized block design experiment. Rats in each experimental animal group were housed singly in a well-ventilated stainless metabolic rat cages and allowed access to one of the three experimental diets. The trial commenced after a 5-day acclimatization period and lasted for 28-days. Water and diets was allowed *ad libitum* and the weight of animals was taken at the beginning, weekly and at the end of the (28 days).

Collection of blood samples for haematological indices

Blood samples were collected with the aid of an heparinized capillary tube in to a sample bottles for haematological analysis. Parameters determined include PCV, haemoglobin (Hb), differential counts, White blood cells (WBC), Red blood cells (RBC) and platelets

Statistical analysis

Data collected was subjected to statistical analysis of variance (ANOVA) using SAS 1999 version and means separated by Duncan Multiple Range Test.

RESULTS AND DISCUSSION

The results of haematological indices of Wistar rats fed dehulled African yam bean soaked in acidic and alkaline media is presented in Table 3. Red Blood Cell (RBC) and Lymphocyte were not affected by dietary treatments. Packed Cell Volume, Haemoglobin, White Blood Cell, Neutrophils, Monocytes, Basophil and Platelets were significantly affected ($P > 0.05$) by dietary treatments. Rats on T3 had the highest haemoglobin value (15.6g/dl) and PCV (48.0%). Rats on T2 and T1 had the highest value of monocyte (2.00%) and basophil (2.00%) However, values of PCV and haemoglobin followed similar pattern. The highest WBC (10.4) value observed for Rats on T1 suggested that there was microbial infection or the presence of foreign body or antigen in the circulatory system. The low level of haemoglobin for rats on T1 implies that dietary protein were not of high quality due to traces of ANFs in the tested diets. This agrees with the observation of Akinmutimi (2004) that processing methods reduces but do not completely eliminate all traces of ANFs in feed. The lower Hb concentration for rats on T1 might be linked to depressed serum thyroxine function. The high neutrophil value recorded was in a bid to fight against foreign bodies. Rats on

T2 recorded low lymphocytes which indicated a less effective antibody production as reported by Fradson (2003) that one of the major functions of lymphocytes is their response to antigen by forming antibodies that circulate in the blood or in the development of cellular immunity. A non-significant difference in lymphocyte count recorded in this study suggested that the rats were not susceptible to any secondary infection, as reported by Ihedioha (2008) who stated that lymphocyte are responsible for immune-mediated defense of the body (cell-mediated and humoral immunity) and that low percentage of lymphocyte implies that the animals appears to be more susceptible to secondary infections.

Conclusion

In conclusion dehulled African yam bean seeds soaked in ogi liquor (acidic medium) and wood ash (alkaline medium) can be fed to rats without having adverse effects on haematological indices

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Table 1: Composition of experimental diets (%)

Ingredients	T1	T2	T3
Corn starch	17.10	5.60	2.80
Casein	-	-	-
African yam bean	47.90	59.40	62.20
Sucrose	12.25	12.25	12.25
Groundnut oil	8.00	8.00	8.00
Glucose	6.00	6.00	6.00
Non- nutritive cellulose	5.00	5.00	5.00
Oyster shell	1.00	1.00	1.00
Di calcium phosphate	2.00	2.00	2.00
Table salt	0.25	0.25	0.25
Vit-mineral premix*	0.50	0.50	0.50
Total	100.0	100.0	100.0

T1-dehulled AYB, T2- dehulled AYB soaked in raw ogi maize liquor (acidic medium), T3-dehulled AYB soaked in wood ash (alkaline medium), Composition of premix: Vit A 10,000,000IU, Vit D₃ 2000,000IU, Vit E 23,000mg, Vit K₃ 2,000mg, Vit B₁ 3,000mg, Vit B₂ 6,000mg, Niacin 50,000mg, Calcium pantothenate 10,000mg, Vit B₆ 5,000mg, Vit B₁₂ 25mg, Choline chloride 400,000mg, Biotin 50mg, Manganese 120,000mg, Iron 100,000mg, Zinc 80,000mg, Copper 8,500mg, Iodine 1,500mg, Cobalt 300mg, Selenium 120mg, Antioxidant 120,000mg

Table 2: Proximate analysis of experimental diets

Treatments	T1	T2	T3
CP	12.11	11.42	11.00
EE	4.88	4.76	4.69
CF	2.48	2.79	2.85
Ash	6.15	7.08	7.12
DM	92.53	92.32	92.21
NFE	66.70	66.27	66.55

T1-dehulled AYB, T2- dehulled AYB soaked in raw ogi maize liquor (acidic medium), T3-dehulled AYB soaked in wood ash (alkaline medium), CP-Crude protein, EE- Ether extracts, CF-Crude fibre, DM- Dry matter and NFE- Nitrogen free extracts

Table 3: Haematological indices of Wistar rat fed processed African yam bean

Parameters	T1	T2	T3	SEM
Packed cell volume (%)	34 ^a	39 ^{bc}	47.0 ^{cd}	2.51
Haemoglobin (g/dl)	11.45 ^d	13.05 ^{bc}	15.6 ^{ab}	0.84
White Blood cell (10 ³ UL)	10.4 ^a	5.98 ^c	5.28 ^d	0.99
Redbloodcell (10 ⁶ UL)	5.88	6.49	8.06	0.43
Lymphocyte (%)	70.5	68.5	70.0	0.99
Neutrophil (%)	26.0 ^c	28.5 ^{ab}	28.0 ^{ab}	1.04
Monocytes (%)	1.50 ^{ab}	2.00 ^a	1.50 ^{ab}	0.27
Basophil (%)	2.00 ^a	1.00 ^{bc}	0.50 ^d	0.23
Platelets	17.8 ^{ab}	10.35 ^{bc}	9.25 ^c	1.79

a,b,c,d: Means with different superscript on the same row are significantly different (P > 0.05)