ORGAN WEIGHT CHANGES OF WISTAR RATS FED AFRICAN YAM BEAN *(Sphenostylis stenorcarpa)* 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 of ten rats each in a completely randomized design to investigate the organ weight changes of wistar rats fed diets containing African yam bean (AYB) soaked in acidic and alkaline media. Three diets were formulated to contain dehulled AYB- (T1), and dehulled AYB soaked in ogi liquor- (T2), dehulled AYB soaked in wood ash- (T3). The experiment lasted for 28days. Four rats per treatments were sacrificed by cervical decapitation to evaluate the organ weight changes of wistar rat fed experimental diets. Liver, lungs and spleen were influenced by dietary treatments and there was no significant (P>0.05) difference in heart and kidney across dietary treatments. Rats on T3 had the lowest value for liver (1.86g), lungs (0.58g), kidney (0.29g) and spleen (0.12g) while rats on T2 had the highest value for liver (3.13g) and lungs (0.88gIt could be concluded that dehulled AYB soaked in wood ash gave the best results when it comes to weight of internal organs

Key words: African yam bean, wistar rats, acidic medium, alkaline medium

Introduction

The cost of conventional protein feed ingredient such as soyabean, groundnut cake has been on the increase from year to year leading to increase in the price of animal protein sources (Taiwo *et al.*, 2005). The competition between man and livestock for these feed ingredients coupled with their high cost calls for search for alternative non-conventional feed ingredient that would be used in place of conventional feed ingredients. One of such unconventional protein feedstuff that is capable of substituting for expensive conventional ones is African yam bean. Africa yam bean (*Sphenostylis. stenocarpa*) is among the legumes found in tropical regions of the world. It belongs to the same family of leguiminosae and sub family of papillonaceae. Africa yam bean contain 20.51% protein, 10.20% fat, 52.33% carbohydrate, 60.00% crude fibre, 2.60% ash and 8.36% water, while calcium and phosphorus are in trace amounts (Eka and Akaninwor, 2000). However, the use of African yam bean is being limited due to long cooking hour'sand tedious manual removal of skin coat. Also, the presence of anti-nutritional factors which include tannins, trypsin inhibitor, hydrogen cyanide, saponins and phytic acid limits its use in feed formulation (Akinmuntimi *et al.*, 2006)

Processing methods such as heating, soaking, fermentation and toasting can be used to deactivate these anti-nutritional factors and improved nutritional value of African yam bean (*Sphenostylis stenocarpa)* and its by-product (Onyeike *et al.*, 1995). The objective of the study is to determine the organ weight changes of wistar rats fed African yam bean soaked in acidic and alkaline media

Materials and methods

Experimental site: The experiment was carried out at Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora in the derived savannah zone of Nigeria. The college is located on 7°15N AND 3°30E of the equator with average rainfall 1278mm and average temperature of27°C

Collection of sample: African yam bean was purchased from Bodija Market in Ibadan.

Pre-treatment of seed: 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 sample: Dehulled AYB seeds were soaked at the rate of 1kg/3L of raw maize liquor or 0.5% of wood ash solution for 24 hours. Initial and final pH was taken. The samples were sundried for 3 days, milled and then included in the diet accordingly.

Table 1: pH changes of dehulled African yam bean soaked in ogi maize liquor and wood ash

pH range	DAYBSO	DAYBSWA
Initial pH	3.9	10.0
Final pH	4.5	5.3

DAYBSO- Dehulled African yam bean soaked in ogi maize liquor, DAYBSWA - Dehulled African yam bean soaked in wood ash

Experimental diets: Three dietary treatments were compounded to supply 10% crude protein on dry matter basis Rats on T1 received dehulled AYB (control), T2 received dehulled AYB soaked in raw maize liquor (acidic medium) and T3 received dehulled AYB soaked in wood ash solution (alkaline medium).

Experimental design and animal management

Thirty wistar rats of an average initial weight of 40-50g were used for the study. The rats were randomly assigned on the basis of body weight into three dietary treatments of ten rats each in a completely randomized 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 28days. Water and diets was allowed *ad libitum*

Table 2: Gross composition of experimental concentrate diets (%)

Ingredients	T1	T2	T3
Corn starch	17.10	5.60	2.80
African yam bean	47.90	59.40	62.20
Sucrose	12.25	12.25	12.25
Groundnut oil	8.0	8.0	8.0
Glucose	6.0	6.0	6.0
Non-nutritive cellulose	5.0	5.0	5.0
Oyster shell	1.0	1.0	1.0
Di calcium phosphate	2.0	2.0	2.0
Table salt	0.25	0.25	0.25
Vit-mineral premix	0.5	0.5	0.5
Total	100.0	100.0	100.0

T1- control diet, T2- dehulled AYB soaked in raw ogi maize liquor,
T3-dehulled AYB soaked in wood

Composition of premix: Vit A 10,000000IU, Vit D_3 2000,000IU, Vit E 23,000mg, Vit K_3 2,000mg, Vit $B_1$3,000mg, Vit B_2 6,000mg, Niacin 50, 000mg, Calcium pantothenate 10,000mg, Vit B_6 5,000mg, Vit B_{12} 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

Parameters determined

At the end of the experiments, four rats per treatment were sacrificed by cervical decapitation. They were fasted for 8 hours, heart, lungs, liver, spleen and kidney were removed and weighed separately using sensitive scale and values recorded.

Statistical analysis

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

Result and discussion

The high value of liver weight for rats on T2 could be attributed to the effect of processing on the anti-nutrients. The liver and the kidney are major detoxifying organs, hence enlargements and increase in weight are result of increase in activity of the organs to detoxify residual anti-nutrient. Akanji *et al.* (2003) reported that any processing methods that could not completely remove trypsin inhibitors actively could also not lead to complete removal of ANF(s) which had been reported to cause liver hypertrophic effect leading to an increase in weight. Also, high value of liver obtained for rats T2 (3.13g) might also be due to excess carbohydrate in the body which yield higher glucose molecules which is converted to glycogen during glycogenesis, and might lead to build up of fat in the liver adding to the weight of the liver observed. It was observed that the kidney was not influenced by dietary treatments, although rats on T2 had highest kidney weight (0.63g) which indicated the diet fed has a higher content of ANF present.

Table 3: Antinutritional factors composition of raw and processed AYB seed

Antinutrients	Tannin(mg/g)	Phytate(mg/g)	T.I(TIU/mg)	Lectin(HIU/g)	Saponin(mg//kg	Oxalate(mg/g)
Raw AYB	0.09	0.57	31.67	58.24	0.32	0.25
DAYBSO	0.06	0.35	0.23	17.24	0.23	0.13
DAYBSWA	0.05	0.32	0.06	6.35	0.21	0.12

DAYBSO-Dehulled African yam bean soaked in ogi liquor, DAYBSWA - Dehulled African yam bean soaked in wood ash, T.I- Trypsin inhibitors

Table 4: Organ weight changes of wistar rats fed dehulled African yam bean soaked in acidic and alkaline media

Organs	T1	T2	T3	SEM
Liver	2.12^{b}	3.13^{a}	1.86^{c}	0.28
Heart	0.42	0.63	0.47	0.33
Lungs	0.85^{ab}	0.88^{a}	0.58^{bc}	0.07
Kidney	0.34	0.63	0.29	0.05
Spleen	0.51^{a}	0.25^{d}	0.12^{e}	0.06

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

Ologhobo *et al.* (1993) reported increase in the weight of kidney of broiler fed raw lima bean and this was attributed to the fact that the key enzyme in cyanide detoxification (Rhodanase) is located mainly in the kidney therefore the increased activity of the kidney might have led to an increase. Ahamaefule *et al.* (2006) also reported that weights of some internal organs like kidney, lungs of animal may be used in animal feeding experiment as evidence of toxicity. Hence, presence of some anti-nutritional compounds could account for the increase liver weight in an attempt to detoxify them. Rats on T3 had the highest lungs weight (0.88g) and heart weight (0.63g) this suggest that anti-nutrients present was able to cause observable damage to the lungs and heart for rats on T3.

Conclusion

It could be concluded that duhulled AYB soaked in wood ash gave a slight improvement on internal organs when fed to rats

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