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EFFECTS OF FEEDING GRADED LEVELS OF ASH SOAKED DEHULLED AFRICAN YAM BEAN (*SPHENOSTYLIS STENOCARPA*) ON HAEMATOLOGICAL INDICES AND SERUM BIOCHEMICAL PROFILE OF BROILER FINISHER

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Abstract

African yam bean (*Sphenostylis stenocarpa*) is a leguminous crop which is cultivated in tropical and subtropical area. The crude protein content of lablab ranges from 23- 29%, while the amino acid profile is similar to that of soyabean, it is a good source of protein, fibre and carbohydrate and contains all the amino acids found naturally in plant protein. However, it is an underutilized legume due the presence of anti-nutritional factors such as trypsin inhibitor, haemagglutinins, saponin, oxalate, phytate, cyanogenic glycosides. A total of 30 weaner rabbits were used for the study to determine the haematological indices and serum biochemical profile of ash-soaked African yam bean. The rabbits were randomly assigned into 5 dietary treatments of 6 rabbits per treatment consisting of 2 replicates of 3 rabbits in a completely randomized design experiment. The seeds used were purchased from Bodija market in Ibadan. The raw African yam bean seeds were pre-treated by soaking at the rate of 1kg/3L of water after which the pre-soaked seeds were soaked in 0.5% wood ash solution for 24hrs. The sample was sundried for 3days milled and then included in the diet accordingly. Rabbits on T1 received the control diet, T2 received 5% level of ash-soaked African yam beans, T3 received 10% level of ask soaked African yam bean, T4 received 15% level of ash-soaked African yam bean and T5 received 20% level of ash-soaked African yam bean. The experiment lasted for eight weeks, at the end of 8 weeks feeding trial two (2) rabbits per replicate were selected and blood samples were collected for haematological indices and serum biochemical profile into a sample bottle. Results showed that there were significant ($P<0.05$) differences in all the haematological parameters measured except for

monocyte. Rabbits on diet 4 had the highest haemoglobin (Hb) value (12.70g/dl), lymphocyte (70.50%) and platelets (252.00) while rabbits on diet 5 had the highest value of PCV (38.00%), white blood cells (WBC) (6.65×10^3) and eosinophil (4.00%). Rabbits fed diet 2 and 3 are statistically similar in packed cell volume. Statistical similarities exist in haemoglobin value between rabbits fed diet 1 and 2 and between rabbits fed diet 1 and 4. Also, statistical similarities exist in WBC value of rabbits fed diet 1 and diet 4.

The serum biochemical profile showed that total protein was not affected by dietary ($P < 0.05$) treatments, albumin, globulin, creatinine, ALT, AST were all significantly affected ($P > 0.05$) by dietary treatments. Rabbits fed diet 1 had the highest value of albumin (3.92g/dl), and AST (67.90IU/L), rabbits fed diet 3 recorded the highest creatinine value (2.08mg/dl) while lowest value was recorded for rabbits on diets 5. The highest value of ALT was recorded for rabbits on diets 2 (35.15iu/l). It was concluded that dehulled African yam bean soaked in wood ash can be fed to rabbits up to 15% level of inclusion without having any negative effects on the haematological indices and serum biochemical profile of weaner rabbits

Keywords: African Yam Bean, Haematology, serum, Replicate, Antinutritional factors

Introduction

Feed is a major component affecting net return from poultry, because cost of feed accounts about 65 to 70% for total cost in broiler production and is a major factor which affects the production cost (Srivastava *et al.*, 2013). The commonly relied source of quality protein which is plant protein is grossly expensive and scarce (Lawal *et al.*, 2005). Thus, non-conventional legumes are rich source of plant proteins which can serve as substitute for the scarce and expensive conventional plant proteins sources. It is in the light of this that African yam bean is considered for its feeding value. African yam bean is a leguminous crop which is cultivated in tropical and subtropical area. The crude protein content of lablab ranges from 21- 29%, while the amino acid profile is similar to that of soyabean (Kine *et al.*, 1991). African yam bean is a good source of protein fibre and carbohydrate, it contains all the amino acids found naturally in plant protein (Ekpo *et al.*, 2006)

It is an underutilized or neglected legume due to storage defects and presence of anti-nutritional factors such as trypsin inhibitor, haemagglutinins, saponin, oxalate, phytate, cyanogenic glycosides (Fadahunsi and Sanni, 2010, Agbede and Aleton 2003). These effects limit the use of African yam bean in livestock feed although various processing techniques tend to reduce the anti-nutritional factors content of the feed. However, most of these toxins are reduced to tolerate levels by simple preparative procedures such as fermentation, germination, roasting, enzyme, soaking, cooking, toasting (Oluwole and Taiwo, 2009). Amingo and Metzger (2005) have employed various processing methods which includes dehulling, fermentation and soaking to reduce or inactivate some of the anti-nutritional factor

Materials and Methods

Experimental Site: The experiment was carried out at the poultry unit, Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora, Oyo State Nigeria.

Collection of Samples: African yam bean seeds was bulk purchased from Bodija market in Ibadan

Pre-Treatment of Seed: Raw African yam bean seeds were soaked at the rate of 1kg/3litres of water for 12 hours after which the water was decanted

Treatment of Sample: The pre-soaked African yam bean seeds were again soaked in 0.5% wood ash solution. Initial and final pH were taken

Experimental Design and Animal Management: A total of 30 weaner rabbits were used for the study and were randomly assigned into 5 dietary treatments of six (6) rabbits consisting of 2 replicates of 3 rabbits per replicate in a completely randomized design experiment.

Table 1: pH changes of African yam bean Soaked in Wood Ash

pH	DAYBSWA
Initial pH	8.1
Final pH	8.9

DAYBSWA – Dehulled African yam bean soaked in wood ash

Table 2: Gross Composition of Experimental Diets

Ingredients	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)
Maize	42.00	41.02	39.94	38.93	37.91
Wheat offal	38.00	38.00	38.00	38.00	38.00
African yam bean	0.00	1.60	3.37	5.03	6.69
Soyabean	13.00	12.38	11.69	11.04	10.40
Bone meal	2.00	2.00	2.00	2.00	2.00
Oyster shell	4.00	4.00	4.00	4.00	4.00
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.20
Salt	0.30	0.30	0.30	0.30	0.30
Broiler premix	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated analysis					
Crude protein (%)	15.17	16.00	15.90	15.81	15.72
ME (kcal/kg)	250.88	2510.23	2518.21	2525.72	2532.81

ME- Metabolizable energy

Blood Collection: At the end of the experiment, 2 rabbits per treatment were randomly selected and blood were collected for haematological indices and serum biochemical profile. Blood samples were collected into sample bottles containing ethylene diamine tetra acetic acid (EDTA) for haematological indices and into a plain bottle for serum biochemical profile and transported to the laboratory

Statistical analysis. Data collected were subjected to statistical analysis of variance (ANOVA) using SPS 2003 version and means separated by Duncan Multiple Range Test.

Results and Discussion

Table 3 showed the haematological indices of weaner rabbits fed graded levels of dehulled ash-soaked African yam bean. Results showed that there were significant ($P < 0.05$) differences in all the haematological parameters measured except for monocyte. Rabbits on diet 4 had the highest haemoglobin (Hb) value (12.70g/dl),

lymphocyte (70.50%) and platelets (252.00) while rabbits on diet 5 had the highest value of PCV (38.00%), white blood cells (WBC) (6.65×10^3) and eosinophil (4.00%). Rabbits fed diet 2 and 3 are statistically similar in packed cell volume. Statistical similarities exist in haemoglobin value between rabbits fed diet 1 and 2 and between rabbits fed diet 1 and 4. Also, statistical similarities exist in WBC value of rabbits fed diet 1 and diet 4.

The serum biochemical profile of weaner rabbits fed graded levels of dehulled African yam bean soaked in wood ash solution. Results showed that total protein was not affected by dietary ($P < 0.05$) treatments, albumin, globulin, creatinine, ALT, AST were all significantly affected ($P > 0.05$) by dietary treatments. Rabbits fed diet 1 had the highest value of albumin (3.92g/dl), and AST (67.90IU/L), rabbits fed diet 3 recorded the highest creatinine value (2.08mg/dl) while lowest value was recorded for rabbits on diets 5. The highest value of ALT was recorded for rabbits on diets 2 (35.15iu/l).

Table 3: Haematological Indices of weaner rabbits Fed Graded Levels of dehulled Ash-Soaked African yam bean

Parameters	T1 (0)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)	SEM
Packed cell volume (%)	27.00 ^b	31.50 ^c	34.50 ^{cd}	36.00 ^a	38.00 ^e	1.72
Haemoglobin (g/dl)	12.00 ^{ab}	11.50 ^b	10.00 ^c	12.70 ^a	8.70 ^d	0.65
White blood cells (10^3)	5.65 ^b	4.25 ^d	3.85 ^e	5.23 ^{bc}	6.65 ^a	0.45
Red blood cells (10^3)	5.95 ^{bc}	8.04 ^a	4.58 ^d	6.56 ^b	4.31 ^d	0.61
Eosinophil	3.00 ^{ab}	2.00 ^c	3.50 ^{ab}	4.00 ^a	4.01 ^a	0.33
Monocyte	2.00	1.00	1.00	1.50	2.00	0.20
Neutrophil	33.00 ^b	37.00 ^a	31.50 ^c	24.00 ^d	32.00 ^b	1.89
Lymphocyte	55.00 ^{bc}	62.50 ^d	65.50 ^{ab}	70.50 ^a	63.00 ^{bc}	2.18
Platelets	112.50 ^c	67.00 ^d	52.50 ^e	252.00 ^a	134.00 ^b	31.61

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

Table 4: Serum biochemical profile of weaner rabbits Fed Graded Levels of dehulled Ash-Soaked African yam bean

Parameters	T1 (0)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)	SEM
Total protein (g/dl)	4.46	4.68	4.68	5.67	3.97	0.25
Albumin (g/dl)	3.92 ^a	3.65 ^c	3.61 ^d	3.07 ^b	3.62 ^d	0.40
Globulin (g/dl)	2.50 ^c	3.06 ^{ab}	3.09 ^{ab}	3.60 ^a	2.36 ^d	0.20
Creatinine (mg/dl)	0.74 ^c	1.89 ^{ab}	2.08 ^a	0.65 ^d	0.53 ^e	2.63
Aspartate amino transferase	20.90 ^a	18.25 ^b	18.85 ^c	18.90 ^d	19.02 ^e	7.94
Alanine amino transferase	18.40 ^c	35.15 ^a	18.97 ^c	24.31 ^b	24.34 ^b	2.69

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

Table 5: Proximate composition of experimental diet

Parameters	T1 (0)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)
Crude protein	21.05	19.25	21.10	22.75	21.03
Ash	8.50	8.40	8.80	8.60	7.70
Ether extract	7.20	7.13	6.90	7.10	7.06
Crude fibre	5.30	5.22	4.72	5.00	5.10
Dry matter	91.31	90.51	90.71	91.63	92.13

Discussion

The statistical similarities observed in haemoglobin values of birds on T1 and T2 and between birds on T1 and T4 is an indication that that the birds were not anaemic and that dietary proteins were of high quality. (Abu *et al.*, 1998). This suggests that soaking in wood ash is adequate as a processing method for detoxification of lablab seed. The lower Haemoglobin (Hb) concentration for birds on T5 might be linked to depressed serum thyroxine function. However whatever negative influence of toxicity of tannin produced, the Hb level of the animals is not enough to alter the oxygen transportation within the bird's physiological system. The WBC value observed for birds in the study suggested that there was no microbial infection or the presence of foreign body or antigen in the circulatory system. It has been reported that the higher the value of WBC the better phagocytosis and hence the ability to fight disease (Robert *et al.*, 2003). But abnormally high WBC could suggest the invasion of a foreign body in the body which will trigger off immune response by the production of more WBC (Ahmaefule, 2005). However, the values of WBC in the study compared with the control indicating that the experimental animals were not challenged by any disease.

Serum albumin is a strong predictor of health, low albumin concentration is a sign of poor health. The values of globulin obtained in the study indicated that birds in all the treatments were not prone to excessive haemorrhage as the diets promote serum albumin which is important for blood clotting Akinmutimi *et al.*, 2004. With significant ($P < 0.05$) difference in ALT and AST, the values obtained for rabbits fed experimental diets were slightly higher compared with the control. Obikaonu *et al.*, (2012) observed that higher values of AST and ALT indicates an increase in liver activities in order to reduce toxic effects of diet. This showed that the processing methods employed in the study was able to reduce ANFs in the seed.

Conclusion

It was concluded that dehulled African yam bean seed soaked in wood ash can be fed to birds at 15% level of inclusion without having any negative effects on the haematological and serum biochemical profile of weaner rabbits

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