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HAEMATOLOGICAL AND BIOCHEMICAL INDICES OF BREEDER COCKS FED COTTONSEED CAKE

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ABSTRACT

Hematological and biochemical profiles of 30 breeder cocks were investigated in a completely randomized design using replacement level of 0, 25, 50, 75 and 100% of Cottonseed cake (CSC) for Soyabean cake (SBC). Blood samples were collected at the 4th and 8th weeks of the feeding trial for analyses. The result showed no significant differences (p.>0.05) in Packed Cell Volume (PCV), Red Blood Cells (RBC), White Blood Cells (WBC) and Haemoglobin (Hb) of the bird at the fourth week of the experiment. But at the eight week of the trial, the Hb (13.89-69kg/dl) was significantly higher ($p<0.05$) in 75% CSC fed birds than the lower and 100% inclusion. Lymphocytes (Lym) of 75% CSC fed birds were significantly higher at the fourth week of trial than those on lower or 100% inclusions. Similarly, at the 4th week, the Neutrophils (47.89-52.73%) of 50% CSC fed birds were significantly higher than those on lower or higher inclusion levels. Effects of diet were not apparent in the total protein, albumin and globulin fractions of the bird at the 4th and 8th week of the experiment. The investigaton showed that replacing 75% soybean cake with CSC was not injurious to the health of breeder cocks.

Key words: Breeder cocks, Blood chemistry, Cottonseed cake, Hematology and Replacement.

Short title: Blood chemistry of breeder cocks fed cotton seed cake based diets.

INTRODUCTION

Cotton seed cake is an alternative protein source to soyabean cake and groundnut cake in the diets of poultry. Cotton plant production has dramatically increase in Northern Nigeria over the past two decades due to export and local demand of cotton wool by the textile industry, leading to increased availability of cotton seed cake (CSC), the byproduct from cotton seed after the lint and oil have been extracted. The CSC is an inexpensive protein source in animal diets.

Bamgbose and Niba (1998) reported that cottonseed cake is one of the Industrial by-products not consumed directly by human beings and are thus able to help reduce food scarcity for humans and reduce livestock feed cost.

Njike (1979) had reported that the bulk of cottonseed cake produced in Nigeria is used for ruminant feeding and was relatively cheaper than other concentrate feeding ingredients such as soybean meal

and groundnut cake. Various workers (Risco *et al* 1992, Blauwickel *et al* 1997, and Ikurior, 1998) have reported the presence of gossypol as an anti-nutritional factor in whole cotton seed diets. One important limitation of cotton seed cake utilization in the ration of animals is the presence of the anti nutritional factor 'gossypol' which has been know to bound with protein limiting its availability. Dabrowski *et al* (2001) reported that high CSC incorporation level decreased hematocrit and haemoglobin levels.

Literature on the occurrence and effect of gossypol as an anti-nutritional factor in the processed cottonseed cake has not been consistent and those available have also not agree on the quantity of residual gossypol present that is detrimental to the various classes of animals studied.

Feeding an animal long enough on a particular diet often reflects the adequacy and the potential of the feed to meet the animal's nutrient requirements. Tewe, Steinbach and Smidth (1981) established that the purpose of investigating blood composition is to have a way to distinguish normal states of stress. Such stress factors, when critically examined, could be nutritional, environmental or physical. The aggregate of these factors may culminate in undesirable performance of the animals. Babatunde *et al* (1987) stated that poor growth was brought about by limitation in dietary nutrient, which was detectable in the blood of the animal. It is proper and has been established that abnormality or ill-health in an animal can be assess through the examination of its blood.

This study therefore was designed to determine the effects of cottonseed cake on the hematology and blood chemistry of breeder cocks.

MATERIALS AND METHODS

Birds and their Management

Thirty breeder cocks of 21 weeks old were obtained from Nabest Poultry Parent Stock farm Ogbomosho, Oyo State, Nigeria. They were given anti-stress and anti-biotic for five days and stabilized for an additional nine days. After adaptation for two weeks, the birds were randomly distributed into five treatment groups in a completely randomized design.

Blood chemistry of breeder cocks fed cotton seed cake based diets

The treatments were replicated thrice with 2 birds per replicate. The birds were raised on deep litter pens and had received necessary vaccinations and medications from the parent stock farm before purchase.

Diets and Feeding

Cottonseed cake was purchased from Caps Feed Mill, Iwo Road, Ibadan; they got the stock from Afcot Textile Industry Yola, Adamawa State. Five isocaloric and insonitrogenous diets, A, B, C, D and E containing 0, 25, 50, 75 and 100% CSC replacing soybean in an 18% crude protein diet respectively and 2800Kcal/KgME (Table 1) were formulated according to the recommendation of National Research Council (1988) and nutrient master plan of livestock feeds limited (2003), Lagos.

Table 1: Composition of CSC based Diets fed to Broilers at graded levels

Ingredients	A	B	C	D	E
Maize	57.33	55.10	54.50	54.50	55.60
SBC	21.70	14.98	10.30	5.10	0.00
SCS	0.00	8.84	17.68	26.52	32.00
Wheat offal	14.06	13.68	10.62	5.50	4.00
Fish meal	1.50	1.50	1.50	1.50	1.50
Blood meal	0.00	1.00	1.00	2.50	3.00
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Oyster shell	1.50	1.50	1.50	1.50	1.50
Bone meal	3.00	2.50	2.00	2.00	2.00
Salt	0.30	0.25	0.25	0.25	0.25
Breeder premix	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
(%)CP(Calculated)	18.48	18.46	18.43	18.47	18.40
ME (Kcal/Kg)	2,806	2,809	2,801	2,804	2,804

Blood Analyses

Blood samples were collected from the jugular vein of the birds at the fourth and eight week of the feeding trial for hematological and biochemical analyses. Blood samples were taken from each replicate in the morning before feeding into two separate tubes, one containing an anticoagulant (disodium salt of ethylene diamine-tetra acetic acid) and the other with no anticoagulant from which the sera were harvested for biochemical analyses. Red Blood Cells (RBC), Packed Cell Volume (PCV), hemoglobin (HB) and White Blood Cells (WBC) were analyzed using the methods described by Kelly (1979). Total protein was determined by kjeldahl method as described by Ritzmann and Daniels (1979), while albumin was determined using the BCG (Bromocresol green) method as described by Peters, Biamonate and Doumans (1982).

Chemical Analysis

The feed samples and test ingredient were oven dried at 65C for 72 hours, ground and composited for nitrogen, ash, crude fiber and ether extract according to (AOAC, 1990).

Statistical Analysis

Data were analysed using the general linear model procedure of statistical analysis system (SAS, 1999) package. Means were separated using Duncan multi-range test. (1955).

Results and Discussion

Shown in table 2 are the hematological indices of breed cocks fed cotton seed cake (CSC) based diets. There were no significant differences ($p>0.05$) between the values obtained in the PVC, WBC and Hb of the blood indicating that there were no infection or liver damage as a result of feeding CSC. This is

line with the findings of Lindsay, (1977) who posited that when the liver of an animal is damaged or infected it adversely affects the blood parameters mentioned above. Furthermore, this suggests that the blood of the birds had a higher oxygen carrying capacity which readily supported nutrient utilization.

The RBC values showed no significant differences (P>0.05) among the birds. The results agrees with the work of Adejinmi *et al* (2002) who reported inconsistent values of RBC in broilers fed varying levels of soldier fly larvae meal diets though no significant differences were recorded. It also agrees with the work of Akinmutimi (2001). Taking the RBC with WBC which follows the same trend in this work, suggests that cottonseed cake based diets did have a somewhat slightly negative effect on the hematology of the treated bids, indicating that the anti nutrient in cottonseed cake "gossypol" provoked a somewhat protective response from the blood, leucocytes against the anti nutrient.

The values for the differential counts (lymphocytes and neutrophils) showed significant differences (p<0.05) within treatments, which did not follow a particular trend. The values were within the range reported by Mitruka and Rawnsley (1977) but were slightly higher than the values reported by Etchu and Egbunike (2003). The high values suggest the resilience of the birds in disease conditions. For instance, high lymphocyte values would be recorded in viral or bacterial infection such as, infectious bronchitis while high neutrophil values would be recorded in parasitic infections e.g. mites.

Table 2: Hematological Indices of Experimental Birds Fed Cottonseed Cake-Based Diets.

	DIETS				
Parameter	**I**	**II**	**III**	**IV**	**V**
PCV (%)	29.50	32.67	31.00	31.00	34.00
RBC ($XIO^6 mm^3$)	5.11	4.21	5.31	4.20	3.73
WBC ($XIO^6 mm^3$)	3.30	4.33	3.83	4.07	3.57
Haemoglobin (g/dl)	9.50	10.63	9.87	9.87	10.73
Lymphocytes (%)	57.00	74.00^a	50.67	69.67^a	49.67^b
Neutrophils (%)	42.5^{ab}	25.67^{ab}	50.33^a	30.33^b	43.67^a

ab: Means in the same column with different superscript are significantly different (P<0.05)

Table 3: Serum metabolites of Breeder cocks fed Cottonseed Cake-Based Diets.

Parameter	DIETS I	II	III	IV	V
Total protein (g/dl)	8.65	7.87	8.77	8.07	7.93
Albumin (A) (g/dl)	3.20	2.87	3.27	2.97	2.90
Globulin (G) (g/dl)	5.45	5.00	5.50	5.10	5.03
A.G ratio	0.59	0.57	0.59	0.58	0.58

Hematological Values

Results of diets and the hematological parameters shown in Table 2 did not follow a particular trend. The PCV and Haemoglobin values fell within the reported range (PCV; 26.0-45.2 % and Hemoglobin: 7.50-13.1g/dl) for cocks as given by Mitruka and Rawnsley (1977). While the RBC falls slightly outside the normal range (2.90-4.10 X 10^6/mm^3) the WBC fell well outside the normal range (9.76-31.0 x 10^3/mm^3) reported by Mitruka and Rawnsley (1977). The values for the RBC and WBC cannot be taken as an indication of a depression of erythrogenesis or leucogenesis as the reported range for all the parameters by Mitruka *et al* (1977) were determined in the temperate region. The PCV values showed no significant difference (P>0.05) within treatments. These results agrees with the work of Adejinmi, Adejinmi and Adeleye (2002) who fed broilers with varying levels of soldier fly larvae meal and it also agrees with the report of Maxwell *et al.*, (1990). Generally, the result indicates the good health status of the birds as low PCV values are taken to indicate anaemia.

The Hb values showed no significant differences with the treatment, the Hb values agrees with the report of Akinmutimi (2001) and Ethu and Egbunike (2003). This suggests that the levels of cotton seed cake fed were nutritionally sufficient to meet the protein needs of the birds since Hb concentration decreased in animals on low protein intake, parasite infection or liver damage (Lindsay, 1977). Furthermore, this indicates that the blood of the birds had a higher oxygen carrying capacity.

Biochemical estimations

Table 3 shows the result of the serum protein values observed which did not show significant difference (P>0.05) between treatments. The total protein in an animal is a reflection of the level of dietary protein available and the health status of the animal. Serum protein could be constant at a fairly high dietary protein level. The level of albumin in the present study seemed to be adequate in all the treatments as shown in Table 3. This is in agreement with Babayemi *et al.*, (2003) who stated that the level of albumin tends to remain constant throughout life after reaching a maximum at about three weeks of age.

The albumin, globulin and Albumin:Globulin ratio observed in this study attests to the nutritional adequacy of cotton seed cake based diet in meeting the protein need of the birds. This further

butress the fact that cottonseed cake can adequately replace soyabean cake in meeting the nutritional needs of breeder chickens. This result is consistent with the work of Henry *et al.*, (2001) who fed CSC to broilers and that of Adeyemo *et al.*,(2000) who similarly fed broilers with an alternative protein source to ascertain its adequacy in the rations of chicken.

CONCLUSION

From the results observed, replacing 75% of SBC with CSC in the diets of breeder cocks had no deleterious effect on the haematology and blood chemistry of the birds. Thus, 75% CSC can effectively substitute SBC in diets of breeders providing the needed protein and quality feed essential in the performance of the breeder.

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