EFFECTS OF SUBSTITUTING GROUNDNUT CAKE WITH AMMONIATED FULL-FAT NEEM KERNEL MEAL ON HAEMATOBIOCHEMICAL COMPONENTS OF BROILERS

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Abstract

Effects of substituting groundnut cake (GNC) with ammoniated full-fat neem kernel meal (AFFNKM) on heamatobiochemical components of broiler chickens were investigated in the semi-arid zone of Nigeria. Eighty-day-old broiler chicks (straight runs) were brooded, weighed and randomly assigned to four dietary treatments of 20 chicks each in a completely randomized block design (CRBD). Each treatment had five replicates with five birds per replicate. AFFNKM replaced groundnut cake (GNC) at 0 (control), 5, 10 and 15% dietary levels, designated Ti, Tz, T3 and T4. The study lasted nine weeks. Red Blood Cell (RBC) counts in Ti (3.86×10^6 mm^3) and 14 (3.49×10^6 mm^3) were significantly ($P<0.05$) higher than that of ^ (3.07×10^6 mm^3), but RBC value for T4 did not differ significantly ($P>0.05$) from that ofTz (3.27×10^6 mm^3). White Blood Cell (WBC) count and Haemoglobin (Hb) concentration in т[, Tz and T4 were similar ($P>0.05$) but their values in Ta which were similar ($P>0.05$) to those in *T*^ and T4 differed significantly ($P<0.05$) from that in Ti. Packed Cell Volume (PCV) value in Ti differed significantly ($P<0.05$) from values in Ts and T3 but was similar ($P>0.05$) to that in T4. There were no significant ($P>0.05$) differences among all the treatment groups with respect to all the serum biochemical indices. No mortality was recorded due to treatment effect. Results showed that ammoniated full-fat neem kernel meal (AFFNKM) can replace groundnut cake up to 15% of the total diets of broiler chickens in the semi-arid zone without any adverse effect to their haematobiochemical components.

Key words: Neem kernel meal, broilers, groundnut cake, heamatobiochemical components.

Introduction

Owing to the increasingly escalating cost of conventional poultry feed ingredients especially protein sources, it becomes necessary to explore alternative sources that are locally available, cheaper and preferably not important as an item in human diet. Okonkwo and Igwebuike (1994) reported that formulating poultry diets with unconventional feed-stuffs is a viable alternative for achieving optimum performance and reducing the production cost. One of such ingredients is neem *(Azadirachta indica)* kernel.

The use of neem kernel as feed ingredient in animal diets has a limitation due to its bitter taste and toxic compounds. Such compounds include, nimbin, sodium nimbinate, salanin, nimbidin, meliantriol and azadirachtin (Kritikar and Basu, 1975; Devakumar and Sukh, 1993; NRC, 1992). However, some processing methods such as ammoniation have been employed to reduce their overall effects (Nagalakshmi *et al.,* 1999).

Since haematology reflects physiological responsiveness of the organism to its environment (Atwal, *et al.,* 1964) and nutrition (Swenson, 1993), adoption of such unconventional feed ingredients should be based on evaluation of health related parameters such as the blood.

It was observed by Adeyemi *et al.* (2000) that packed cell volume (PCV) and haemoglobin (Hb) are known to be positively correlated with protein levels. Verma *et al.* (1995) reported a significant reduction in blood glucose with water-washed neem seed cake (WWNSC) in growing goats. Similar effects have been noticed by Garg (1989) in calves. However, Nagalakshmi *et al.* (1996) and Nagalakshmi *et al.* (1999) reported that significant increase in total White Blood Cell (WBC) count was observed when peanut meal (PNM) in the diet of broilers was replaced completely with urea ammoniated neem kernel cake (UANKC) and alkali-treated neem kernel cake (ANKC). However, they also observed that neither the amount of urea used nor incorporation rate of the treated cake had influence on the concentration of haemoglobin (Hb) and total Red Blood Cell (RBC) counts.

The objective of this study was to determine the effects of ammoniated full-fat neem kernel meal (AFFNKM) on haematobiochemical components of broilers in the semi-arid zone of Nigeria.

MATERIALS AND METHODS

Eighty-day-old Anak broiler chicks (straight-runs) were brooded and fed on a commercial broiler starter diet during their first four weeks of age. The birds were then used in a five-week feeding trial with broiler finisher diets at the University ofMaiduguri Livestock Teaching and Research Farm. The birds were individually weighed and randomly assigned to four treatment groups of 20 chicks each. Each group was replicated four times with five chicks per replicate and reared in an open-sided deep litter house. The AFFNKM substituted groundnut cake (GNC) as the major protein source thus: Treatments Ti 0% (control), Tz 5%, Ts 10% and T4 15% of the total diets respectively (Table I). Neem kernels were collected, dehauled, soaked in water (1:1.5 *W/V)* in which fertilizer-grade urea was dissolved (30g/kg ofneem kernel) and kept in an airtight container for five (5) days. The kernels were sun-dried, ground and then incorporated into the test diets. Feed and water were provided *ad libitum* throughout the experimental period.Heat stress ameliorating measures, such as provision of water trays (shallow ponds) were employed to reduce the effect of high ambient temperature (37.5 -42.4°C) recorded during the period. (Kwari and Ubosi, 1991). Blood samples were collected at the end of the 9^{th} week from five (5) birds per treatment through the branchial vein using sterile disposable syringes and needles (23 guage needles). The sample from each bird was collected in 2 labelled sample bottles, one containing ethylene diamine tetra acetic acid (EDTA) and the other plain, for heamatological and serum biochemical analysis. Red Blood Cell (RBC) and WBC counts were determined using Nenbaur counting chamber (Brown, 1976). The microhaematocrit method (Coles, 1974) was used to determine the packed cell volume (PCV), while Haemoglobin (Hb) concentration was determined using the Sahli's method (Brown, 1976). The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and the mean corpuscular haemoglobin concentration (MCHC) were indirectly determined from the PCV, Hb and RBC counts using standard formulae (Swenson, 1993). Total plasma protein and serum glucose values were determined by the calorimetric method.

Inorganic phosphate (P04) was determined using fix Subborow (direct) methods (Swenson, 1993). All data were subjected to analysis of variance and means were separated using Least Significant Difference (LSD) where applicable (Steel and Torrie, 1980).

TABLE

RESULTS AND DISCUSSION

Haematological Parameters

Data on the haematological parameters are shown in Table 2. Birds in Treatment 1 (control) had significantly ($P<0.05$) higher RBC count than those in treatments 2 and 3, but there was no

significant (P>0.05) difference between RBC values in treatments 2 and 4. There was no definite trend in the RBC counts among all treatment groups.

The RBC values obtained in this study were within the normal range of 2- 3.8 x lO^mm^3 reported by Freeman (1971). It could be seen from the RBC values that high ambient temperatures which prevailed during the study did not seem to have adverse effects on the RBC values of the experimental birds. This report did not agree with those of Huston (1960) and Kwari and Ubosi (1991) who reported that in broiler chickens, RBC count decreases with increased environmental temperature. This possibly is a result of the cooling effect of dipping the birds in water and the provision of the water-trays (Shallow Ponds), during last three weeks of the experiment, which reduced the adverse effects of heat stress in the birds (Kwari and Ubosi, 1991). The haemoglobin values were 8.76, 8.2, 7.8 and 8.48g/dl for treatments I (control), 2, 3 and 4 respectively (Table 2). The mean Hb value for birds in Treatment 3 was significantly lower (P<0.05) than those in the control (T)) which did not differ significantly (P>0.05) from values obtained from birds in treatments 2 and 4. The Hb values obtained in the present study were within the normal range of6.5-9.0g/dl for chickens reported by Swenson (1993). Results of the present study agreed with those of Nagalakshmi *et al.* (1996), but differed from those of Christopher *et al.* (1976) who reported adverse effects of neem treatment on Hb concentration. This possibly was due to urea ammoniation of the neem kernal which might have reduced the bitter constituents of neem like azadirachtin, nimbin, salanin etc, to an acceptable or safe level. Packed Cell Volume (PCV) values of 26, 25, 24.8 and 25.6% are shown in Table I for Treatments I (control), 2, 3 and 4 respectively. Birds in Treatment 1 (control) had similar (P>0.05) PCV value to those in Treatment 4 which did not differ (P>0.05) from the value for birds in Treatment 2. Although birds in Treatment 3 had the least PCV value, the value was comparable (P>0.05) to those in Treatment 2.

In general, the significantly (P<0.05) low Hb. RBC and PCV values of birds fed neem kernel diets as reported by Gowda *el al.* (1998) were not consistent with results of the present study. This could partly be due to the processing (ammoniation) of the neem kernel in the present study.

The WBC counts were 15.3, 12.9, 11.5 and 13.5x 1 O^mm^3 for treatments 1 (control), 2, 3 and 4 respectively. There were no significant (P>0.05) differences among the values for birds in Treatments I (control), 2 and 4. Birds in Treatment 3 had the least WBC count but similar (P>0.05) to the values for birds in Treatments 2 and 4. The WBC counts for all the Treatment groups fall within the normal physiological limits (12-30 x lO'Vmm^3) as reported by Zinki (1986).

TABLE

Biochemical Indices

Data on biochemical constituents; such as plasma glucose, protein, albumin, globulin, serum phosphate, cholesterol and serum calcium are presented in able 3. Treatment effects were not significant (P> 0.05) for all the parameters evaluated. However, plasma protein, globulin and albumin (Table 3) were slightly lower than the reported ranges by Swenson (1993). This could be attributed in part to the high enviromental temperatures recorded during the experimental period (37.5-42.4°C), despite the provision of shallow ponds. This result is consistent with the reports ofDeaton *et al.* (1969) and Kwari and Ubosi (1991) who indicated that high environmental temperatures decreased blood protein in domestic fowls. The plasma glucose values obtained in this study agreed with earlier report by Gowda *et al.* (1998). The serum calcium values were slightly higher than the range 4.5-6.0 meq/1 (9-12 mg/dl) reported by Swenson (1993) except for treatment 3. This result is in agreement with the report of Kwari and Ubosi (1991) which stated that blood calcium levels in fowls increase with calcium intake. The serum phosphate for all treatment groups were within the normal range of 3-6 meq/1 (6- 12 mg/dl) as reported by Swenson (1993), while serum cholesterol values were generally low.

TABLE

CONCLUSION

Results from this study showed that ammoniated full-fat neem kernel meal (AFFNKM) can substitute groundnut cake up to 15% in diet of broiler chickens in the semi-arid zone of Nigeria, without any adverse effect on most of the heamatobiochemical components.

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