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Haemato-biochemical changes in raw Karanj (*Pongamia glabra vent*) cake fed broiler chicken and its amelioration

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ABSTRACT

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Raw expeller pressed karanj seed cake (EKC) @10% incorporated in broiler chicken ration by quantitatively replacing soyabean meal and studied the performance and haemato-biochemical changes. Day-old broiler chicks (Vencobb strain) were divided into five groups of 18 chicks each with various combinations of EKC, methionine and activated charcoal as group I: control feed (CF), group II: CF + EKC @ 10%, group III: CF + EKC @ 10% + methionine @ 0.2%, group IV: CF + EKC @ 10% + activated charcoal @ 0.1% and group V: CF + EKC @ 10% + methionine @ 0.2% + activated charcoal @ 0.1% for a period of 6 weeks. The results revealed reduced body weight gains, feed intake, increased feed conversion ratio and significant (P< 0.05) reduction in mean values of Hb, PCV, TEC, TLC, glucose, total protein, albumin and globulin levels and significant (P< 0.05) increase in the total cholesterol, creatinine and AST levels in EKC fed group in comparison to control group. The amelioration groups revealed improvement in performance and haemato-biochemical values in respect to EKC fed group.

Keywords: Activated charcoal, broiler chicks, karanj seed cake, haemato-biochemical changes, methionine

INTRODUCTION

Poultry industry in india is being challenged by the escalating cost of feed ingredients and shortage of conventional feed resources for increased productivity resulting in search of newer and alternative feed ingredients and their evaluation for optimum inclusion in the poultry ration. *Pongamia glabra vent*, popularly known as Karanj, belongs to natural order *Papilionosae* and family *Leguminaceae.* Karanj cake is very rich in protein (24.3 to 27.2%). It was advocated for its incorporation in various types of poultry rations as such without processing at very low levels[1]. Its incorporation was limited due to the presence of major toxic principle karanjin- a furanoflavonoid[2,3]. The present study was undertaken to asses the effects of feeding of raw expeller pressed Karanj seed cake (EKC) @10% of diet by replacing costly and scarce soyabean meal on haemato-biochemical parameters and efficacy of amelioration agents methionine and activated charcoal @ 0.2% and 0.1%, respectively.

METERIALS AND METHODS

Day-old broiler chicks (Vencobb strain) were divided into five groups consisting of 18 chicks in each group and the experiment was carried out with prior approval of institutional ethics committee. The basal diet was formulated and compounded to meet the nutritional requirements in starter and finisher rations. The treatment groups were fed with raw expeller pressed Karanj seed cake (Roshini Biotech, Hyderabad) at 10% of diet with partial replacement of soyabean meal. Ameliorating agents methionine (B.V. Bio-Corp Limited, Pune) at 0.2% level in group III, activated charcoal (Finar chemicals, Ahmedabad) at 0.1% level in group IV and both combined in group V were mixed thoroughly in the feed. The experimental design and feeding schedule for 6 weeks period was as follows: Group I - basal diet, Group II - 10% raw expeller pressed Karanj cake (EKC) by replacing soyabean meal (SBM) in basal diet, Group III - 10% raw EKC by replacing SBM in basal diet with methionine (at 0.2% level), Group IV - 10% raw EKC by replacing SBM in basal diet with activated charcoal (at 0.1% level), Group V - 10% raw EKC by replacing SBM in basal diet with methionine (0.2%) and activated charcoal (0.1%).

All the diets were nearly isonitrogenous and isocaloric through the adjustment of feed ingredients for the entire experimental period. The birds were monitored regularly for clinical symptoms and mortality if any. Body weights of all birds of all groups were recorded on 1st day and subsequently at weekly intervals till the end of the experiment. Total feed consumption was calculated by subtracting total left over feed for one week from total feed offered during that week. Average feed consumption and feed

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conversion ratios were calculated at weekly intervals by adopting the following formulae:

Average feed consumption =

$$\frac{\text{Total feed consumed during the week (g)}}{\text{No. of birds fed during the week}}$$

Feed conversion ratio =

$$\frac{\text{Average feed consumed/bird during the week (g)}}{\text{Average weight gain/bird during the week (g)}}$$

Six birds from each group were sacrificed randomly at the end of 2nd, 4th and 6th weeks of the experiment. Blood samples were collected prior to sacrifice in EDTA coated vacutainers and sterile test tubes for haematological and serobiochemical analysis, respectively. Serum was separated and stored at -20°C till further analysis. The whole blood samples were subjected to analysis immediately after collection in whole blood analyzer (Humacount, Medsource Ozone, Biomedicals Pvt. Limited) for total erythrocytes count (TEC), total leucocytes count (TLC), haemoglobin (Hb) and packed cell volume (PCV).

The stored serum samples were subjected to different biochemical assays in spectrophotometer (Tech Comp UV 7500; Tech Comp Limited. Kowloon Bay, Hong Kong). Aspartate transaminase (AST), total protein & albumin, total cholesterol, glucose and creatinine were estimated by the methods of Reitman and Frankel[4], Biuret & BCG dye binding[5], Trinder CHOD End point[6], End point assay[7] and Initial rate assay (Modified jafles reaction)[8], respectively and the recorded data were analyzed statistically by two-way ANOVA method[9].

RESULTS

Growth performance

Feeding of raw EKC at 10% level resulted in significant (P< 0.05) reduction in the body weight gains and feed consumption and increase in the FCR in comparison with control group (Table 1, Figs. 1, 2).

Table 1. Growth performance/week in different groups of birds

Groups	Mean body weight ± S.E	Mean feed consumption ± S.E	Mean FCR ± S.E
I	258.598±18.536^{d}	469.807±35.571^{e}	1.761±0.040^{a}
II	176.048±9.775^{a}	339.612±20.162^{a}	1.855±0.050^{d}
III	219.141±16.254^{c}	408.805±30.471^{d}	1.811±0.033^{b}
IV	193.717±11.874^{ab}	367.536±24.480^{b}	1.831±0.042^{c}
V	203.786±14.109^{bc}	382.540±26.712^{c}	1.819±0.036^{bc}

FCR: Feed conversion ratio; **S.E:** Standard Error; two way ANOVA; Means bearing common superscripts in coloums did not differ significantly (P<0.05)

Table 2. Haematological profile in different groups of birds at the end of the experiment.

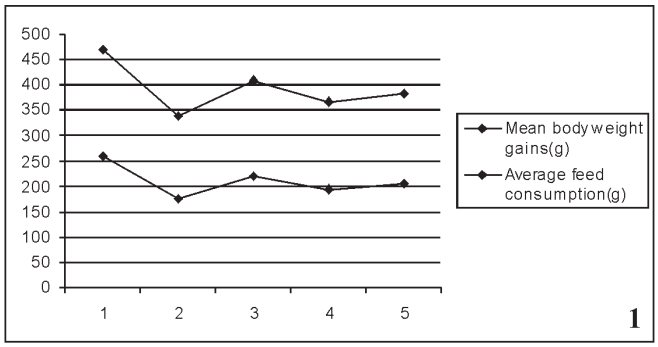
Groups	Hb (g%)± S.E	PCV (%)± S.E	TEC (10^6/Cmm)± S.E	TLC (10^3/Cmm)± S.E
I	12.811±0.196^{c}	22.800±0.670^{b}	1.592±0.041^{c}	27.127±0.956^{b}
II	10.992±0.257^{a}	19.816±0.847^{a}	1.293±0.032^{a}	22.033±0.265^{a}
III	12.250±0.159^{bc}	23.111±0.593^{b}	1.588±0.047^{bc}	26.227±0.577^{b}
IV	11.681±0.226^{ab}	22.245±0.692^{b}	1.430±0.050^{ab}	25.996±0.889^{b}
V	11.883±0.156^{b}	21.677±0.827^{ab}	1.476±0.042^{bc}	22.722±0.438^{a}

Hb: Haemoglobin, PCV: Packed cell volume, TEC: Total erythrocytes count; TLC: Total leucocytes count; S.E: Standard Error; Two way ANOVA; Means bearing common superscripts in coloums did not differ significantly (P<0.05)

Table 3. Serobiochemical profile in different groups of birds at the end of the experiment.

Groups	Glucose (g%)	Total Protein (g%)	Albumin (g%)	Globulin	A/Gratio	Total Cholesterol (mg%)	Creatinine (mg%)	AST (IU/L)
I	192.697±5.909^{c}	2.851±0.115^{c}	1.568±0.049^{c}	1.282±0.098^{b}	1.231±0.142^{a}	145.671±9.450^{a}	0.341±0.009^{a}	83.333±5.412^{a}
II	148.387±6.654^{a}	2.110±0.044^{a}	1.236±0.028^{a}	0.874±0.045^{a}	1.614±0.087^{a}	168.093±8.788^{b}	0.367±0.006^{b}	99.055±8.783^{b}
III	173.655±1.848^{b}	2.429±0.050^{b}	1.478±0.030^{b}	0.951±0.058^{a}	1.559±0.108^{a}	145.382±6.676^{a}	0.355±0.007^{ab}	89.333±8.630^{ab}
IV	169.399±3.320^{b}	2.381±0.041^{b}	1.456±0.033^{b}	0.925±0.058^{a}	1.579±0.209^{a}	155.968±8.075^{ab}	0.354±0.007^{ab}	9.555±10.122^{ab}
V	172.087±1.805^{b}	2.408±0.033^{b}	1.454±0.024^{b}	0.954±0.034^{a}	1.559±0.064^{a}	150.759±6.931^{a}	0.352±0.007^{ab}	92.833±8.025^{ab}

A/G ratio: albumin to globulin ratio, AST: Aspartate transaminase; Two way ANOVA; Means bearing common superscripts in coloums did not differ significantly (P<0.05)



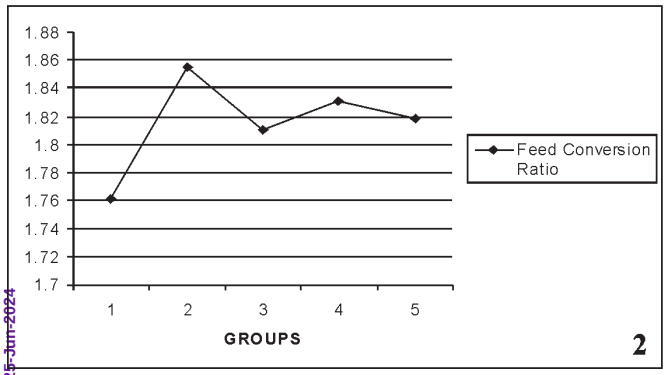


Fig. 1. Mean body weight gains and feed consumption in different groups of birds; **Fig. 2.** Feed conversion ratio (FCR) in different groups of birds.

Significant (P< 0.05) improvement was noted in amelioration groups in comparison with EKC fed group.

Haematological parameters

Feeding of raw EKC at 10% level resulted in significant (P< 0.05) reduction of Hb, PCV, TEC and TLC mean values in comparison with control group (Table 2). The amelioration groups revealed improvement in haematological values with respect to EKC fed group. Methionine amelioration (0.2%) was effective in comparison to activated charcoal (0.1%) and methionine (0.2%) + activated charcoal (0.1%).

Biochemical assay

The serobiochemical assays showed a significant (P< 0.05) reduction in glucose, total protein, albumin and globulin levels while significant (P< 0.05) increase in total cholesterol, creatinine and AST levels was observed in EKC fed group in comparison to control group (Table 3). Reduction in glucose levels might be due to disturbance in the carbohydrate metabolism. Significant improvement was noted in the above parameters in amelioration groups in comparison to EKC fed group. Among amelioration groups, EKC + methionine group showed significant improvement over the other groups.

DISCUSSION

The adverse effects of raw EKC on body weight gains, feed consumption and FCR were in accordance with the reports of various workers[10,11,12,13,14] with Karanj seed extract, neem seed cake, karanj seed cake and jatropha cake diet in broiler chicken respectively. The deleterious effects might be due to the reduced feed intake and disturbances in the metabolism due to Karanjin. The ameliorative groups revealed significant (P< 0.05) improvement with respect to EKC fed group might be due to their protective action.

Changes in haematological profile in EKC fed group might be due to the disturbance of metabolisms which might have led to deficiency of clotting factors. Improvement in ameliorative groups might be due to the protective action of methionine and activated charcoal. These findings were in agreement with the reports on Jatropha cake feeding with activated charcoal amelioration[15], on neem seed cake[11], with methionine amelioration on induced aflotoxicosis in broiler chicken[16].

The decreased mean total protein, albumin and globulin levels, increased mean total cholesterol levels and increased AST activity in EKC fed group might be attributed to liver insufficiency and hepatotoxic action of karanjin. Increased creatinine levels in EKC fed group might be due to failure of filtration process by glomeruli and tubules. The findings on Karanj cake feeding[17], on Jatropha cake feeding to broiler chicken along with activated charcoal amelioration[15], and cotton seed cake feeding to growing-fattening lambs[18] confirmed the present observations. Improvement in ameliorative groups attributed to the protective action of amelioration agents.

The present study indicated significant toxic effects of raw EKC on growth performance and haemato-biochemical parameters. The amelioration by methionine (0.2%) was effective in comparison to activated charcoal (0.1%) and methionine (0.2%) + activated charcoal (0.1%) amelioration in counteracting the toxic effects of raw Karanj seed cake at 10% level.

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