Studies on the Pathology of Sunflower Cake and Karanj Seed Cake in Comparison to Groundnut Cake in Lambs

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ABSTRACT

The choice of oil seed cake by resource poor farmers is usually driven by two factors, viz., availability and cost. Limited supply and seasonal availability of groundnut cake (GNC) result in high price, on the other hand sunflower cake (SFC) and karanj seed cake (KSC) are cheaper protein sources and could be used as ruminants feed supplements. A study was undertaken in lambs to study the effect of haematobiochemical and pathological changes by incorporating two alternate protein supplements viz., karanj seed cake and sunflower cake as sole protein source in complete diets. Twenty one Nellore Brown lambs (9-10 months) of uniform body weight (27.62 kg ±1.026) were randomly divided into 3 groups with 7 lambs in each treatment and fed the respective diets for an experimental period of 150 days. No adverse effect of feeding either SFC or KSC was observed on Hb, TEC, TLC and concentration of total protein, creatinine and urea. However, the albumin globulin ratio increased (P<0.01) when fed KSC diets compared to other two diets. Histologically, the heart, liver, spleen and testes did not reveal any changes of pathological significance in GNC group. In SFC group mild fatty changes in liver and in kidney the tubules were mildly swollen with shrunken glomerular tuft. In KSC group liver showed marked fatty changes and perivascular cuffing with mononuclear cells, the kidney tubules were swollen, edematous with infiltration of neutrophils in the glomeruli and marked deposition of haemosiderin in spleen. Mild to moderate testicular degeneration and desquamation of the epithelium was observed in both SFC and KSC fed groups.

Keywords: Albumin globulin ratio, Groundnut cake, Karanj seed cake, Sunflower cake

1 INTRODUCTION

In livestock production unavailability of quality feed and its escalating cost; resulting in effect on economics through adversely affecting health and production. Hence, reduction in investment by incorporating cheaper and unutilized agro-industrial by-products as protein supplements need to be scrutinized. However, the choice of oil seed cake by resource poor farmers is usually driven by two factors, viz., availability and cost.

In India, production of sunflower (Helianthus annus) and karanj (Pongamia glabra) for edible oil and industrial (biodiesel)/medicinal purpose is gaining popularity and as a result sunflower seed cake (SFC) and karanj seed cake (KSC) are available for its use in animal feed. The SFC contains 30-40% protein and is free of anti-nutritional components. While KSC with 24-34% crude protein (CP) contains a furanoflavonoid, karanjin an anti nutritional factor that adversely affected the performance in various species. Groundnut cake is traditionally used protein supplement in feed of ruminants. However limited supply and seasonal availability of GNC result in high price, on the other hand sunflower cake and karanj cake are cheaper protein sources and could be used as ruminants feed supplements. Thus a long-term study was undertaken to study the effect of haematobiochemical constituents and pathological changes by incorporating two alternate protein supplements viz., karanj seed cake and sunflower cake as sole protein source in complete diets.

2 MATERIALS AND METHODS

a. Animals and housing management

Twenty one Nellore Brown lambs (9-10 months) of uniform body weight (BW) (27.62 kg ±1.026) were randomly divided into 3 groups with 7 lambs in each treatment following completely randomized design with the prior approval of Institutional Animal Ethics Committee. The lambs were housed in a well-ventilated shed, cement floored barn provided with open paddock, where the lambs were allowed to roam for about 2h in early morning to have sufficient exercise. All lambs were reared under hygienic and uniform managemental conditions and were dewormed at monthly intervals throughout the experimental period of 150 days.
b. Feeds and feeding

Three isonitrogenous and isocaloric sorghum stover based complete diets (roughage concentrate ratio, 40:60) were formulated with three sole protein supplements viz., groundnut cake (GNC), sunflower cake (SFC) and expeller karanj seed cake (KSC). The lambs were offered daily weighed quantities of the respective concentrate mixtures thrice a day to meet the nutrient requirements for maintenance and a daily weight gain of 100g. The quantity of the complete diets to be offered daily was adjusted fortnightly as per BW recorded at the end of every fortnight. Fresh clean water was provided ad libitum.

c. Blood sampling

Blood samples were collected in non heparinized vacutainer tubes from each lamb before feeding at 75 d of experiment and transferred 5ml into bottle containing ethylene diamine tetra acetate for haematological parameters, then centrifuged at 1,100g for 10 min to obtain serum and stored at -20°C for biochemical estimations.

d. Pathological studies

Detailed necropsy was carried out on all the dead and sacrificed experimental lambs and gross abnormalities of all the organs were noted if any. The representative tissue pieces of heart, lungs, liver, kidney, testes, spleen and intestines were collected in 10% neutral buffered formal saline for histopathological studies. The fixed tissues were subjected to overnight washing, dehydrated in ascending grades of alcohol, cleared in xylene, embedded in paraffin and further the paraffin blocks were cut into 4-5μ thickness sections with the help of microtome. Sections were lifted on precoated slides and subjected to routine haematoxylin and eosin stain after drying and were examined for histological changes.

e. Analytical procedure

The haemoglobin (Hb), total erythrocytes count (TEC) and total leukocytes count (TLC) were estimated by Cyanomethemoglobin method using Hayem’s fluid and using white blood count (WBC) diluting fluid respectively. Serum samples were analyzed for total protein by Biuret method, albumin by Bromocresol green (BCG) dye binding method and globulin concentration was calculated by subtracting the albumin from total protein and urea nitrogen was estimated by diacetyl monoxime (DAM) method given by.

f. Statistical analysis

Data obtained was subjected to statistical analysis under completely randomized design employing one-way analysis of variance. The means of different treatments were compared with Duncan multiple range tests.

3. RESULTS

a. Haematological and biochemical studies

In the present study GNC was considered to be as control group. The effect of feeding SFC and KSC on haematological and biochemical constituents in lambs is given in Table 1. No adverse effect of feeding either SFC or KSC was observed on haematological constituents (Hb, TEC and TLC) and concentration of total protein, creatinine and urea in serum. However, the albumin concentration was higher (P<0.01) and globulin concentration decreased (P<0.01) in lambs fed KSC based diets, compared to GNC or SFC fed lambs. The differences were reflected in AG ratio, it increased (P<0.01) when fed KSC diets compared to other two diets. No differences in these variables were observed when fed SFC instead of GNC.

b. Gross and Histopathological changes

The lambs fed either of vegetable protein supplements as sole source of protein did not reveal any gross changes of the organs except palor of liver in KSC fed lambs.

Histologically, the heart, liver, spleen and testes did not reveal any changes of pathological significance in GNC group. In SFC group mild fatty changes in liver and in KSC group liver showed marked fatty change and perivascular cuffing with mononuclear cells. The tubules of the kidney were mildly swollen and the glomerular tuft was shrunken in SFC group whereas the kidney tubules were swollen and edematous with infiltration of neutrophils in the glomeruli in KSC group. Spleen revealed marked deposition of haemosiderin. Spleen did not reveal any changes of pathological significance in SFC group. Mild to moderate testicular degeneration and desquamation of the epithelium was observed in both SFC and KSC fed groups.
4. DISCUSSION

a. Haematological and biochemical studies

No adverse effect of feeding either SFC or KSC was observed on haematobiochemical values. However, the albumin concentration was higher (P<0.01) and globulin concentration decreased (P<0.01) in lambs fed KSC based diets, compared to GNC or SFC fed lambs. Similarly, 4 have observed no effect of feeding deoiled KSC in cross bred cows up to 24.9% in concentrate mixtures on Hb, TEC and TLC while plasma protein was lower (P<0.05) in calves fed 24.9% deoiled KSC but not at 16.6% incorporation.

The differences were reflected in A/G ratio, it increased (P<0.01) when fed KSC diets compared to other two diets. No differences in these variables were observed when fed SFC instead of GNC. The blood urea levels were higher in SFC fed lambs 18 and cows 19 compared to those fed mustard seed cake (MSC) or soyabean meal (SBM), respectively owing to higher rumen degradability of SFC compared to MSC or SBM. Feeding of 40% expeller (EKC) or solvent extracted (SKC) KSC in broiler diets depressed the Hb and total protein concentration compared to reference diet containing SBM 5. No significant difference on the serum protein concentration was observed due to incorporation either 16% SKC 6 or 20% SKC/24% EKC 7 in the concentrate mixture of lambs.

b. Gross and Histopathological changes

The present study observations are comparable to the studies of 21 and could not observe any gross pathological lesions fed either 24% EKC or 20% SKC in concentrate mixture in their study of 285d in sheep but histologically, testicular degeneration and moderate to massive haemosiderosis of spleen was noted. 4 observed mild to moderate changes in skeletal muscle, spleen, thyroid and pancreas in lambs fed concentrate mixture containing 20% SKC for 150 days. The liver in isolated cases revealed mild degeneration of hepatocytes having granular cytoplas. The spleen showed mild to moderate deposition of hemosiderin pigment within the macrophages and pancreas indicated mild shrinkage of acini and comparatively reduced number of islets of Langerhans.

reported histopathological lesions in kidney, liver and spleen of broilers fed 25% of raw or processed EKC. Liver showed hepatic degeneration with distortion, kidney revealed tubular degeneration with necrotic lesions, spleen showed degeneration with necrotic foci and depletion of lymphocytes. While birds fed processed SKC showed degenerative changes of testicular follicles and vacuolation indicating affect on spermatogenesis. The effect was severe in broilers fed 40% EKC diet in liver, kidneys and pancreas. The hepatocytes were more disorganized and degenerated with distended sinusoidal space and severe fatty changes. Kidney tubules were swollen with vacuolations and lobules of pancreas were shrunken with increased interlobular connective tissue.

5. CONCLUSION

The present study indicated that albumin concentration was higher and globulin concentration decreased in lambs fed KSC based diets. Histologically mild changes in liver, kidney and testes were observed in SFC fed lambs where as in KSC fed lambs the changes were moderate to severe compared to GNC fed lambs.

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