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# Physico-chemical carcass characteristics of broiler chickens meat fed alkali processed karanj cake with methionine

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ABSTRACT

A study was conducted in broiler chickens to evaluate physico-chemical carcass characteristics of broiler chickens meat fed diets incorporated with alkali (1.5% NaOH, w/w) processed solvent extracted karanj cake (SKC), partially replacing soybean meal nitrogen of reference diet (12.5%) with or with out supplementation of methionine (0.2%). At the end of eight weeks of experimental feeding, two representative birds from each replicate in a dietary treatment were sacrificed through cervical dislocation to observed the carcass characteristics. Pressure cooked meat from thigh and breast region was organoleptically evaluated with salt (1.5%, w/w) by semi trained judges on 7 point Hedonic scale. The carcass traits did not vary significantly ($P>0.05$) due to dietary variations except per cent weight of liver and giblet. The per cent weight of liver was significantly ($P<0.05$) higher in the birds fed diet incorporated with alkali processed SKC as compared to that of birds fed on other two diets. Supplementation of methionine to alkali processed SKC containing diet resulted in a significant ($P<0.05$) reduction in hypertrophy of liver as compared to the per cent weight of liver from those fed alkali processed SKC as such. The same trend was noticed for giblet. The chemical components in the fresh meat was comparable and no untoward and abnormal qualities with regard to appearance, flavour, juiciness, tenderness and overall acceptability were revealed in meat of birds fed either reference or alkali processed SKC diet (with or without methionine supplementation). Alkali processed SKC by supplementing 0.2% methionine could, therefore, replace 12.5% nitrogen of soybean meal in broiler diets without any adverse effect on carcass characteristics and sensory attributes.

**Key words**: Alkali processed karanj cake, Broiler chickens, Carcass characteristics, Methionine, Sensory attributes

The ever-increasing cost and scarcity of conventional feed stuff in developing countries like India has compelled to search alternative feedstuffs for poultry feeding (Panda *et al.* 2004). Karanj seed cake is one such feed. However, the toxic nature of the cake due to the Presence of karanjin, a furanoflavonoid (Limaye 1925, Roy *et al.* 1977), in addition to tannins and trypsin inhibitors limits its utilization as livestock and poultry feeding. The potential of karanj cake as feed without processing, on carcass traits has been investigated by various workers (Mandal and Banerjee 1974 Gupta *et al.* 1981). However, no information is available on the effect of feeding processed solvent extracted karanj cake along with methionine on carcass and sensory attributes of broiler chicken meat. The present study was therefore, conducted to evaluate physico-chemical carcass characteristics and sensory attributes of broiler chickens meat fed diets incorporated with alkali processed karanj cake supplemented with methionine.

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## MATERIALS AND METHODS

*Processing of karanj cake*

Solvent extracted karanj cake procured from local market and detoxified, adopting various physico-chemical methods such as dry heat, water washing, pressure cooking, alkali and acid treatments and microbiological treatment with *Saccharomyces cerevisiae* (strain–49). Based on the residual toxins left in the processed cake, the NaOH (1.5%, w/w) treatment was selected for bulk preparation and animal experimentation. The sodium hydroxide treated SKC was thus prepared by soaking the cake for 24 h in water (W/V, 1:1). The processed cake was sun dried, ground and stored in gunny bags for incorporation into the diet to substitute soybean meal nitrogen for broiler feeding with or without methionine supplementation.

*Stocks, husbandry and diet*

One hundred and twenty day-old broiler chicks were wing

Table 1. Ingredient and nutrient composition of experimental diets

| Ingredient | Diet | | |
|---|---|---|---|
| | D1 | D2 | D3 |
| Maize | 60.5 | 58.92 | 58.92 |
| Soybean meal | 35 | 30.5 | 30.5 |
| Karanj cake | 0 | 6.43 | 6.43 |
| DORB | 0.72 | – | – |
| Vegetable oil | – | 0.5 | 0.5 |
| Limestone | 1.6 | 1.5 | 1.5 |
| DCP | 1.3 | 1.3 | 1.3 |
| Lysin | 0 | 0.07 | 0.07 |
| Methionine | 0.16 | 0.16 | 0.36 |
| Salt | 0.4 | 0.3 | 0.3 |
| Trace mineral P[a] | 0.1 | 0.1 | 0.1 |
| Vitamin P[b] | 0.22 | 0.22 | 0.22 |
| Nutrient composition (Calculated) | | | |
| ME | 2894 | 2889 | 2889 |
| CP | 22.04 | 21.77 | 21.71 |
| Ca | 1.01 | 1.01 | 1.01 |
| NPP | 0.40 | 0.40 | 0.40 |
| Lysine | 1.20 | 1.19 | 1.19 |
| Methionine | 0.51 | 0.52 | 0.72 |

[a]Trace mineral premix contained: Cu 0.25 mg, Fe–80 mg, I–1.2 mg, Mn–65 mg and Zn -68 mg/kg diet.

[b]Vitamins premix contained: Calcium pantothenate–8 mg, choline chloride–1000 mg, niacin–12 mg, pyrodoxine hydrochloride–1.6 mg, vitamin A–8250 IU, vitamin $D_3$–1200 ICU, vitamin E–8 mg, vitamin K–10 mg/kg diet.

banded and distributed in a completely randomized design (CRD) into 3 groups of 40 chicks each, which was further replicated to 4. The chicks of each replicate were housed at random in the pens of wire floored battery having provision of feeders, waters and faecal trays from 1 to 56 days of age. All the chicks were vaccinated as per routine schedule and kept under uniform managemental conditions throughout the experimental period.

The chicks of the reference group were fed on diet containing soybean meal (D–1) and those of test groups were fed diets containing alkali (1.5% NaOH) treated SKC, partially replacing soybean meal nitrogen of reference diet (12.5%) without (D–2) or with supplementation of 0.2% methionine (D–3). All the diets were kept nearly isonitrogenous and isocaloric and contained 2900 kcal/kg and 22% CP (Table 1). Water and feed was made available *ad lib.* with a provision for measurement.

*Experimental procedure*

At the end of eight weeks of experimental feeding, two representative birds from each replicate in a dietary treatment (8/dietary group) were sacrificed through cervical dislocation after fasting for two hours with free access to water to observe the per cent weight of dressed carcass, primal cuts (breast, thigh, drumstick, back, neck and wing), giblet (liver, heart and gizzard), abdominal fat and digestive organs. Minced and ground samples of meat collected from thigh and breast region of the slaughtered birds were subjected to chemical analysis (AOAC 1995). Pressure cooked meat with salt (1.5%, w/w) was organoleptically evaluated by semi trained judges on 7 point Hedonic scale (Peryam and Pilgrim 1957). The data pertaining to various parameters were subjected to one way analysis of variance as per the methods of Snedecor and Cochran (1989). The means in different treatments were tested for statistical significance using Duncan's multiple range test (Duncan 1955).

## RESULTS AND DISCUSSION

The data on carcass traits, viz. dressing percentage, per cent weight of liver, heart, gizzard, abdominal fat, SI and LI and commercial cuts viz. per cent weight of breast, thigh, drumstick, back, wing and neck are shown in Table 2. The carcass traits did not vary significantly ($P>0.05$) due to dietary variations except per cent weight of liver and giblet. The per cent weight of liver was significantly ($P<0.05$) higher in the birds fed diet incorporated with alkali processed SKC as compared to the other two groups. Supplementation of methionine to alkali processed SKC containing diet resulted in a significant ($P<0.05$) reduction in hypertrophy of liver as compared to the per cent weight of liver from those fed alkali processed SKC as such. The same trend was noticed for giblet. Concomitant to the findings of the present study,

Table 2. Carcass characteristics (% live wight) of broiler chickens at 8th week of age

| Characteristics (%) | D–1 | D–2 | D–3 | SEM |
|---|---|---|---|---|
| Dressing weight | 73.12 | 72.92 | 73.44 | 0.368 |
| Liver | 2.21[c] | 2.78[a] | 2.58[b] | 0.065 |
| Heart | 0.52 | 0.52 | 0.52 | 0.05 |
| Gizzard | 1.97 | 1.94 | 1.93 | 0.029 |
| Giblet | 4.70[c] | 5.24[a] | 5.03[b] | 0.065 |
| Abd. fat | 1.42 | 1.34 | 1.45 | 0.042 |
| Small intestine | 3.72 | 3.66 | 3.70 | 0.039 |
| Large intestine | 0.32 | 0.30 | 0.29 | 0.010 |
| Primal cuts (%) | | | | |
| Breast | 16.58 | 16.74 | 16.91 | 0.201 |
| Thigh | 10.92 | 10.82 | 10.55 | 0.188 |
| Drumstick | 10.79 | 11.02 | 10.88 | 0.102 |
| Back | 15.52 | 15.81 | 16.01 | 0.201 |
| Wing | 8.58 | 8.56 | 8.57 | 0.058 |
| Neck | 4.49 | 4.40 | 4.41 | 0.043 |
| Chemical composition (% fresh basis) | | | | |
| Mositure | 76.57 | 76.86 | 76.64 | 0.13 |
| Protein | 18.66 | 18.63 | 18.72 | 0.04 |
| Fat | 2.82 | 2.64 | 2.78 | 0.06 |
| Ash | 1.94 | 1.85 | 1.86 | 0.12 |

a, b, c, Means with different superscripts in a row differ significantly ($P<0.05$).

Table 3. Organoleptic evaluatin of pressure cooked broiler meat on 7 point Hedonic scale

| Attribute | D–1 | D–2 | D–3 | SEM |
|---|---|---|---|---|
| Appearance | 6.66 | 6.73 | 6.58 | 0.11 |
| Flavour/Teste | 6.03 | 6.33 | 6.25 | 0.13 |
| Juiciness | 6.50 | 6.33 | 6.58 | 0.14 |
| Texture/Tenderness | 6.16 | 6.33 | 6.16 | 0.10 |
| Overall acceptability | 6.38 | 6.58 | 6.41 | 0.22 |

Natnam *et al.* (1989) observed significant change in the weight of liver due to dietary incorporation of SKC at 10% level. However, Dhara *et al.* (1997) and Mandal and Banerjee (1982a) did not find any significant variation in the weight of liver, heart and gizzard by incorporating de-oiled karanj cake in the diet of Japanese qualis and White Leghorn pullets, respectively. Similarly, none of the slaughtered and dressing characteristics of lambs differed significantly due to incorporation of processed or unprocessed SKC to replace 25 and 50% nitrogen moiety of soybean meal of control diet (Prabhu 2002).

The chemical composition viz. moisture, protein, fat and ash in the minced meat samples obtained from thigh and breast region of birds did not vary significantly ($P>0.05$) due to dietary variations (Table 2). Prabhu (2002) also reported similar protein and fat content in meat of lambs fed control diet and those fed either SKC or NaOH treated SKC replacing nitrogen moiety of soybean meal of control diet.

No untoward and abnormal qualities with regard to appearance, flavour, juiciness, tenderness and overall acceptability were revealed in meat of birds fed either reference or alkali processed SKC diet (with or without methionine supplementation), when pressure cooked meat with 1.4% (w/) salt was subjected to organoleptic evaluation on 7 point Hedonic scale (Peryam and Pilgrim 1957) by semi trained taste panel (Table 3) as all sensory attributes were statistically comparable across the dietary groups. The results corroborated with the findings of Nagalakshmi (1993) and Elangovan (1999) who also did not observe imparting of any adverse qualities to the meat of broiler chickens and Japanese quails fed different unconventional feeds, respectively.

Thus alkali detoxified solvent extracted karanj cake could partially (12.5%) replace costly soybean meal nitrogen in broiler diet after 0.2% methionine supplementation without adversely affecting the physico-chemical carcass characteristics and sensory attributes.

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