Alternative Vegetable Protein Sources In Broiler Rations

DEVELOPING COUNTRIES, and in particular India, are paying considerable attention to the development of small poultry farming in the rural sector and the improvement of the poultry industry in general. Unfortunately, the supply of the major input of efficient and economic feeds has lagged behind the rapid and enthusiastic growth of the Indian poultry industry in both the rural and commercial poultry sector.

The increasing demand for energy and protein feedstuffs and the prospect of spiralling costs, particularly for sources of protein, is already having its effect on the supply of quality finished compounded feeds. In India, groundnut oil cake (peanut oil cake—POC) is the most widely-used vegetable protein source for poultry feeding since it is abundantly available. Although, around 7.0m tons of peanuts are produced annually in India, there has been an increase in the demand of POC due to rapid expansion of the poultry industry with the result that prices have risen. Thus the situation warrants exploring the possibilities of using alternative vegetable protein sources in order to meet the increasing deficit of POC.

Niger (*Guizotia abysbinica* CASS) a native of tropical Africa is known for its oil seed value and is grown in many parts of India. The annual production of niger seed is estimated to be 70 000 tons and the oil content ranges from 36-43%. Safflower *(Certhamus tinctorius)*, a native of Abyssinia and Afghanistan, has been recognised as one of the economic oil seed crops. It has an oil content of 25-30% and is also being used as a dye for colouring purposes. The oil from both these protein sources is edible and used for many industrial applications. The niger oilcake (NOC) and Safflower oil cake (SOC), although rich in protein are not extensively used in livestock feeds and there is little information on the composition and nutritional characteristics of these two vegetable protein sources as alternative sources to POC. This neglect is understandable and has been largely due to dependence upon the use of POC in the formulation of conventional compounded poultry feeds in India.

Compositional Assays:

Expeller-pressed peanut and niger oil cake and decorticated, *ghani* pressed safflower oil cake were obtained from local commercial sources in sufficient quantities for use in the experiments. The nutritive value of peanut, niger and safflower oil cakes was measured in terms of chemical composition, amino acid composition, protein quality (gross protein value and net protein value) and metabolizable energy content.

The chemical composition was determined by proximate analysis (Table 1) as was the amino acid composition of the three oil cakes and the results shown in Table 2. The gross

Table 1:

Percent Chemical Composition of Groundnut, Niger and Safflower Oil Cakes (Dry Matter Basis)

Constituent	Groundnut oil cake	Niger oil cake	Safflower oil cake
Crude protein	43.95	43.07	47.36
Crude fibre	8.36	14.33	9.92
Ether extract	8.31	9.46	10.36
Total ash	6.87	8.02	7.50
Nitrogen free extract	32.52	25.12	24.87
Calcium	0.33	0.63	0.33
Phosphorus	0.70	0.96	0.53

Table 2:

Amino Acid Composition of Groundnut, Niger and Safflower Oil Cakes (g/16 g nitrogen)

Amino acid	Groundnut oil cake	Niger oil cake	Safflower oil cake
Lysine	3.63	3.35	2.30
Histidine	2.17	1.90	2.11
Arginine	12.11	8.89	9.91
Aspartic acid	11.42	8.23	10.05
Serine	4.65	4.56	4.20
Threonine	2.48	2.78	2.80
Clutamic acid	21.65	24.64	23.27
Proline	4.66	3.56	3.89
Glycine	5.94	5.02	5.75
Alanine	3.81	3.35	4.16
Cystine	0.91	1.38	1.41
Valine	3.92	4.28	4.48
Mothionine	0.78	1.48	1.27
Isoleucine	2.98	3.49	3.09
Leucine	6.05	5.89	6.00
Tyrosine	3.72	1.97	2.95
Phenylalanine	5.16	3.78	4.30

protein value (GPV), the net protein value (NPV), the metabolizable energy content (both classical and nitrogen corrected) of the three oil cakes are shown in Table 3.

Feeding Trial:

An 8-week feeding trial was conducted with broiler chicks by using peanut oil meal (POC) as the main vegetable protein source in the control diet. The niger oil cake (NOC) and safflower oil cake (SOC) were used by substituting (POC) (control diet) either at 25, 50, 75 and 100% levels. All the diets were made iso-caloric and iso-nitrogenous, both in broiler starter and finisher diets. The iso-nitrogenous substitutions were facilitated, wherever necessary, by inclusion of glucose monohydrate. In all, there were 9 diets, each of which was used on a 3 replicate groups consisting of 10 chicks each. Weekly bodyweights, feed consumption and feed efficiency were calculated. The performance of the broiler chicks at the end of 8 weeks is shown in Table 4.

The following conclusions were drawn from the results of this study.

1. Peanut, niger and safflower oil cakes were comparable in their crude protein content with a slightly higher protein value in safflower oil cake. Niger oil cake contained a higher percentage of crude fibre, calcium and phosphorus than the other two oil cakes.

2. NOC protein was superior to SOC in lysine content. Both NOC and SOC proteins were superior to POC in methionine, cystine, isoleucine, and glutamic acid. The test of the amino acid composition of the three oil cakes was similar.

3. There was no appreciable difference between POC and NOC when their protein quality was measured in terms of gross protein value or net protein value. However, the GPV and NPV were lower for safflower oil cake compared to POC and NOC. The ME content of the three oil cakes were 2614, 2556 and 2594 K.cal/kg respectively.

4. The bodyweight gains of broilers fed POC as the sole vegetable protein source was highest, although it did not differ significantly with the groups fed POC|NOC combination diets at 75:25, 50:50, 25:75 or POC:SOC diets at 75:25 combination. When NOC was fed as sole protein source or when SOC replaced POC at more than 25% level there was a significant depression in weight gains.

5. Feed consumption of broilers was significantly reduced when SOC replaced more than 50% of POC protein. However, no significant depressions in feed efficiency were recorded even when SOC replaced more than 75% of POC protein in the diet. Similar was the trend with the replacement of POC with NOC.

It may be concluded from this study that the POC protein in broiler ration can be replaced up to 75% with NOC protein or 25% level with SOC protein without any detrimental effects for optimum performance of broiler chicks.—Dr C.V. Reddy, Facult of Vety. Sciency, A.P.A. U. Hyderabad. □

Table 3:

Nutritional Value of the Oil Cakes

Type	G.P.V.	N.P.V.	M.E. (N_2 corrected (K.Cal/Kg)
Groundnut cake	46.8	40.8	2614
Niger oil cake	45.6	37.7	2556
Safflower oil cake	41.8	30.3	2594

Table 4:

Influence of different experimental diets on the performance of broiler chicks (0-8 weeks)*

Type of diet	Average body weight (Gms)	Feed consumption (per bird/per day) gms.	Feed efficiency (feed/gain)
POC(Control diet)	1274^{d}	56^{bc}	2.50^{ab}
POC:NC			
75:25	1263^{d}	55^{bc}	2.49^{ab}
50:50	1233^{d}	56^{bc}	2.68^{abc}
25:75	1245^{d}	58^{c}	2.75^{abcd}
0:100	1145^{c}	52^{bc}	2.95^{cd}
POC:SOC			
75:25	1234^{d}	50^{bc}	2.40^{a}
50:50	1097^{c}	48^{b}	2.56^{ab}
25:75	893^{b}	37^{a}	2.84^{bcd}
0:100	708^{a}	32^{a}	3.08^{d}

*Means carrying at least one same super script do not differ significantly ($P < 0.05$)

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Field Cases of Ochratoxicosis

North Carolina researchers have reported on investigations of 5 separate cases of ochratoxicosis on commercial farms. These cases involved 70 000 laying hens, 970 000 turkeys and 12 million broilers.

Ochratoxins are a group of toxic products from various fungal species (moulds). Some of the ochratoxins are more toxic than others and animals and birds differ in susceptibility.

Symptoms

In laying hens the toxin apparently caused a drop in egg production of about 10% and an increase in thin and rubbery eggshells which resulted in more downgrades and loss of eggs. On necropsy pale, swollen kidneys were observed. Ochratoxin was found at 4ppm in one case and .3ppm in another. The problem was abated when the feed bins were cleaned and a mould inhibitor was included in the feed.

In broilers pale, swollen kidneys were also found. Feed efficiency, growth and pigmentation were adversely affected.

As with other mould problems the key to prevention is to clean up all feed storage bins, augers, boots, tanks, hoppers and troughs or pans between flocks. This should be repeated if any mouldy feed is observed and definitely if problems are occurring. Feed tanks and feeders should be allowed to empty at regular intervals for inspection.