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Effect of Replacing Soybean Meal with Raw or Fermented Melon Cake on the Performance of Broiler Chicks.

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ABSTRACT: A 4-week feeding trial was conducted to determine the effects of replacing soybean meal with Raw Melon Cake (RMC), Fermented Melon Cake (FMC) and Fermented Cooked Melon Cake (FCM) on the performance of broiler chicks. Each of the three test ingredients was included at 36% in a basal diet at the expense of soybean serving as control. Feed intake and weight gain were higher ($P < 0.05$) in Soybean Meal (SBM) fed broilers than those fed other diets while feed conversion ratio was similar ($P > 0.05$) among broilers placed on the three melon based diets. Birds fed on RMC had higher ($P < 0.05$) water intake than their counter parts offered FMC and FCM diets. Liver, kidney and spleen weights increased significantly ($P < 0.05$) in broilers given RMC based diets. The heart, gall bladder and pancreas weights were not significantly different among dietary treatments. It is concluded that although broiler chicks on the control diet performed best, birds placed on the Fermented Cooked Melon Cake (FCM) diet performed better than those on the RMC and FMC diets.

Key Words: Protein supplements; Soybean meal; Melon cake; Broiler chicks nutrition.

Introduction

There is a growing awareness that the cost and scarcity of traditional protein supplements is one of the most difficult aspects of world food production. The increased demand for livestock products arising from the expanding world population and rising standards of living make this problem more critical, It is therefore necessary that other non-conventional protein sources be explored as animal feeds (Ravindran, 1990).

Legumes constitute a very important source of protein in human and animal nutrition. Worldwide, they are the bedrock of national poultry and livestock industries. Their use is however limited by the presence of proteolytic inhibitors and other anti-nutrient factors (Nwokolo and Sim, 1987). The dwindling supply of the conventional feed resources makes it necessary to channel efforts towards utilizing non-conventional feed resources available in Nigeria for livestock feeding. These alternatives should have comparable nutritive value to conventional protein sources and should also be cheap (Atteh, *et al*, 1994).

Melon (*Citrullus vulgaris*) is a protein – rich legume seed widely grown in the tropics. In Nigeria, it is mostly grown in the south where most poultry farms in the country are located. The fruits mature within 3-4 months of planting (Oyenuga and Fetuga, 1975; Achinewhu, 1982). Melon seeds are highly nutritious and contain higher levels of protein and oil than other edible oil seeds (Nwokolo, 1990). Oyenuga and Fetuga (1975) reported that the protein content of melon seed ranged from 30.36 – 35.70% in the undefatted melon seed while it ranges from 68.8 to 76.7% in the defatted melon seed and that when used as the source of protein in a well balanced ration, it is readily digested, its biological value and the efficiency of its utilization were inferior only to those of animal proteins in the form of stock fish' and hen' egg. Nwokolo and Sim, (1987) and Oruwari *et al*,(1979)also reported that the amino acid availability of toasted melon seed is not significantly different from that of soybean meal.

Processing techniques are used to achieve desirable changes in the composition of legumes by removing undesirable component. Existing method of processing includes toasting, soaking, cooking , autoclaving, fermentation, solvent extraction and many more. The nutritional quality of legume is improved, and it's full potential as a feed stuff is effectively utilized (Gloria *et al*, 1995).

Fermentation is an economic processing method that can be used on food legumes to enhance the protein quality, increased the availability of various nutrients and causes the reduction or total elimination of some toxic components (Bressani, 1973; Obizoba, 1998; Achinewhu, 1998).

This study was undertaken to investigate the effect of replacing soybean meal with raw or fermented melon cake on the performance of broiler chicks.

Materials and Methods

One hundred day old broiler chicks were housed in an electrically heated broiler cage and fed control diets to equilibrate them for five days. The treatments consisted of using the various melon cakes as the sole source of protein in the experimental diets at 36% inclusion soybean meal (SBM) was used as the control.

The melon cakes were prepared by pressing to remove the oil and then oven dried at 60°C for 72, 96 and 120 hr for RMC, FMC and FCM respectively. The fermentation was for 7 days in each case. Proximate composition of the cakes and the percentage composition of the experimental diets are shown in Tables 1 and 2. The weight of the birds were taken at the end of every week. Weighed quantities of feed were measured out into polythene bags at the beginning of every week. Every morning, the feeding troughs were cleaned and feeds introduced into them from the bags. The birds were fed *ad libitum*. Feed consumed in each case was noted at the end of the week. Water intake was also measured on a daily basis.

At the end of the feeding trial, the birds were weighed and the organ to body weights noted. All values are means of three replicates. All data were subjected to analysis of variance (ANOVA) and significant differences between treatments were determined at 5% level using the Duncan's multiple range test (Duncan, 1955).

Table 1: Percentage Proximate Compositions of Cakes

Constituent %	RMC	FMC	FCM
Moisture	5.35	4.95	4.32
Dry Matter (DM)	94.65	95.05	95.68
Crude protein	43.86	46.38	46.81
Ether Extract	21.05	20.57	22.87
Crude fibre	7.00	5.45	5.25
Ash	4.00	5.25	5.75
Carbohydrate	18.28	17.40	15.00

Table 2: Percentage Composition of Experimental Diets

Constituent	RMC	FMC	FCM	SBM
Maize	46.00	46.00	46.00	46.00
Melon Cake	36.00	36.00	36.00	-
Soybean meal	-	-	-	36.00
Maize Bran	6.00	6.00	6.00	6.00
BBG	8.00	8.00	8.00	8.00
Bone Meal	2.44	2.44	2.44	2.44
Oyster Shell	1.10	1.10	1.10	1.10
Salt	0.2	0.2	.2	0.2
Vit./Mineral premix	0.25	0.25	0.25	0.25
*Lysine/Methionine	0.01	0.01	0.01	0.01

*Lysine for melon cake and methionine for soybean diet.

Results and Discussion

Plates 1 to 5 give a pictorial outlook of the physical appearance of the birds given the melon cake based diets and those fed the soybean meal diet. Plate 1 shows the control (SBM) birds while Plates 2, 3 and 4 show birds fed on the RMC,FMC and FCM diets respectively. Plate 5 shows the representative of the birds from each of the experimental groups.

Birds in the control groups appeared healthier and bigger than all the others placed on the melon cake diets. The worst birds in terms of physical appearance were those placed on the RMC diets while those on the FCM diets were the next best to the SBM fed birds.

Table 3 shows feed intake, weight gain, water intake and feed gain ratio of the broiler chicks. There was reduced feed intake in broilers feed on both RMC and FMC compared with those fed on FCM and control diets. This agrees with the work of Oruwari *et al* (1999). The weight gains of birds placed on the control diets were higher than those placed on the melon di*et al*though birds placed on the FCM diets performed better than those placed on the RCM and FCM diets. There was a significant ($P < 0.05$) difference in the weight of birds fed on RCM and FCM diets.

Table 3: Feed intake, weight gain, feed conversion ratio and water intake of broiler chicks.

Treatment	Daily feed intake (g/bird/day)	Daily weight (g/bird/day)	Feed conversion ratio	Water intake (ml)
Control				
(SMB)	$37.97^{a} + 0.90$	$18.90^{a} + 1.83$	$2.03^{a} + 0.13$	110.52^{a}
RCM	$29.58^{b} + 1.21$	$7.66^{b} + 0.86$	$3.90^{b} + 0.37$	55.13^{b}
FMC	$29.61^{b} + 1.85$	$7.89^{b} + 0.53$	$3.77^{b} + 0.24$	44.88^{c}
FCM	$35.55^{a} + 0.278$	$10.18^{b} + 0.27$	$3.49^{b} + 0.09$	45.76^{c}

Depressed feed intake could be associated with factors such as high fibre content of the diets, irritation of the oesophagus, and taste of the feed (Nwokolo and Sim, 1987, Oruwari *et al*, 1999). Since the melon cake diets were still high in fat content, oesophageal irritation as well as unpleasant flavour may be responsible for the decreased feed intake. The results of the dietary treatments on the organ weights expressed as percentages of the live weight are as shown in Table 4. Liver, kidney and spleen weights increased significantly ($P < 0.05$) in broilers fed RMC based diets, while the heart, gall bladder and pancrease weights were not significantly different ($P > 0.05$) among all dietary treatments. According to Bragg *et al* (1973), liver weight is influenced by the nature of fat in the diet. The highest gizzard weight of 0.16% was also found in birds fed RMC diets which had the highest fibre content. Similar increase in gizzard weight of laying hens fed with fibrous sunflower products and cockerels fed melon husk diets had earlier been documented by Deaton *et al* (1979) and Akinola and Abiola (1999).

Table 4: Organ to Body Weight Ratios

Organ (%)	SBM	RMC	FMC	FCM
Liver weight (g/birds)	775.00a	250.00c	416.67b	443.33b
Liver	0.09^{b}	0.11^{a}	0.07^{a}	0.07^{a}
Heart	0.01^{a}	0.03^{a}	0.02^{a}	0.02^{a}
Spleen	0.004^{b}	0.01^{a}	0.002^{b}	0.003^{b}
G/Bladder	0.003^{a}	0.01^{a}	0.002^{a}	0.002^{b}
Gizzard	0.07^{a}	0.16^{a}	0.08^{a}	0.08^{a}
Intestine	0.24^{a}	0.19^{a}	0.18^{a}	0.22^{a}
Lungs	0.02^{b}	0.05^{a}	0.02^{a}	0.02^{b}
Pancreas	0.01^{b}	0.025^{a}	0.001^{b}	0.01^{b}
Kidney	0.02^{b}	0.08^{a}	0.02^{b}	0.03^{b}

Means with same letter are not significantly different.

Nwokolo (1990) reported that the anti-nutrient factors in melon seeds seems to be heat labile since cooking, toasting and other heat treatments are able to enhance the nutritional quality of melon seed. This trend is observed in the present study since birds fed on fermented cooked melon cake (FMC) diet generally performed better than the others placed on the RCM or FMC diets.

It is concluded that birds placed on soybean meal based diets performed better than those placed on melon seed cakes, indicating that melon seed cake in the raw form, is not a very good substitute for soybean meal particularly when used as the sole source of protein. However, processing in form of cooking and fermentation, could increase its potential as a substitute for soybean meal in broiler diets.

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