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PERFORMANCE OF GROWING BROILER CHICKENS FED TOASTED AND UNTOASTED MELON (Colocythis citrullis) SEED MEAL

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Target audience: Poultry farmers and animal scientists.

ABSTRACT

Seven isocaloric and isonitrogenous diets but differing in other essential nutrients resulting from the replacement of maize and other protein sources with toasted or untoasted melon seed meal (TMSM or UTMSM) were fed to 420 commercial broilers from four weeks of age. The TMSM or UTMSM provided 33.33, 50 or 66.66 % of the total protein of the diets. Results showed that feed intake of birds reduced ($P < 0.05$) as the inclusion of TMSM or UTMSM increased. Body weight gain and feed:gain ratio were also depressed ($P < 0.05$) in the melon seed meal diets. Physical limitations such as fibre, palatability or oesophagus irritation were suggested to be the cause of the depressed feed intake. Performance of birds in the UTMSM was comparably better than that of TMSM. The use of melon seed meal as a major protein source in broiler diets is not recommended.

Key words: Melon seed meal; broilers; performance.

DESCRIPTION OF PROBLEM

It has been estimated that feed forms a large proportion of the cost of feed in poultry production. In the third world countries, the cost of feed is known to be 70 - 80 % (1, 2) of the cost of production as compared to about 50 - 70 % in developed countries (3). Thus, the identification of non-toxic, cheap and readily available feed ingredients will tend to reduce feed cost and make poultry production more profitable. Since whole unextracted "full fat" melon seeds are a rich source of energy because of the oil (51 - 55 %) and crude protein (32.5 - 38.7 %) (4, 5), they have the potential of supplying more energy and protein in poultry diets. Also, since melon seeds are produced mostly in southern Nigeria, where grains are scarce but where poultry production is most highly concentrated, the determination of the usefulness of melon seed meals in poultry diets becomes necessary. Moreover, full fat melon seed has been found to have true metabolisable energy value of 4,800 - 4,940 Kcal/kg and 28.93 - 29.23 % crude protein (6).

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It would therefore adequately replace a substantial quantity of feed grains and vegetable protein sources in poultry diets, thereby offering the potential of a good source of energy and protein. It has been found that whole melon seed meal, apart form its protein content, has an excellent pattern of amino acids, especially the essential ones, with 96.11 % bioavailability (4).

However, melon seed meal has not been commonly used in animal diets probably because of its high demand by man. The objective of this experiment therefore was to determine the effective level of inclusion of toasted or untoasted melon seed meals (TMSM or UTMSM) on the performance of broiler chickens.

MATERIALS AND METHODS

Four hundred and twenty three week-old broilers were randomly picked from birds which were brooded and reared from day-old for this study. The broiler chicks were brooded in electrical brooder cages fitted with chick drinkers and feeders for three weeks. They were fed on a common commercial starter feed for the first three weeks. Thereafter, they were transfered to pens which were cleaned, disinfected and fitted with fresh wood shavings, adult feeders and drinkers. All the prescribed vaccinations were promptly given.

Toasted (melon seeds fried in a forced draught oven maintained at 100^{o} C for 15 min) and untoasted melon seed meals were used to formulate seven isocaloric (3430 Kcal/kg) and isonitrogenous (20 % crude protein) diets (Table 1). Some of the most important nutrients of melon seed used in the formulation of the experimental diets are shown in Table 2. The diets were formulated in such a way that the TMSM or UTMSM contributed 0, 33.33, 50 or 66.66 % of the total crude protein of the diets. The seven dietary treatments were each randomised five times and so a total of 35 pens were used with a random allocation of twelve birds per pen. The three-week old 420 birds were about the same weight (0.43 kg) and so the experimental design used was completely randomised design. Accordingly, they were randomly allocated to the pens in groups of twelve.

The birds were provided with the experimental diets and water *ad libitum*. At the end of each period of seven days, the birds were weighed individually and the remaining feeds weighed to determine body weight gain, feed intake and efficiency of feed conversion (feed:gain ratio). Final body weights were taken in each replicate after four weeks experimental period. Each replicate started with twelve broilers and so each dead bird was weighed on the day it died to adjust for the weekly weight gain for the computation of feed:gain ratio. Also, post-mortem examination was performed on each dead bird to ascertain that mortality was not due to dietary treatment. All data were subjected to analysis of variance (7) and the treatment means were separated using Duncan's multiple range test (8).

Table 1. Composition of melon seed based experimental diets[2]

Ingredients	UTMSM/ TMSM 0	TMSM 1/3	TMSM 1/3	TMSM 2/3	UTMSM 1/3	UTMSM 1/3	UTMSM 2/3
Untoasted melon seedmeal	0.00	0.00	0.00	0.00	23.14	34.71	46.29
Tosted melon seedmeal	0.00	23.38	35.07	46.77	0.00	0.00	0.00
Yellow corn	65.00	57.00	47.00	22.98	52.00	43.34	20.00
Palm oil	6.52	1.00	0.00	0.00	2.00	0.00	0.00
Fishmeal	7.00	7.00	4.00	1.80	6.00	4.70	1.40
Yeast (Brewers' dried yeast)	6.00	6.00	5.50	2 00	6.44	3.70	1.26
Palm Kernel cake	2.40	1.00	3.98	10.00	4.26	7.10	14.60
Blood meal	8.23	1.16	0.00	0.00	1.41	0.00	0.00
Rough rice	3.40	2.01	3.00	15.00	3.30	5.00	15.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vit/trace min. premix.	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Bone meal	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated energy (ME) (Kcal/gm)	3.45	3.45	3.44	3.43	3.43	3.44	3.44
Calculated protein (%)	20.45	20.45	20.01	20.00	20.00	20.00	20.01
Calculated fibre (%)	3.01	3.97	5.07	10.27	4.65	5.88	8.96

*Vitamin/trace mineral premix provides per milligram diet: Vitamin A, 20,000 IU; Vitamin D_3, 4,000 IU; Vitamin E, 20 IU; Vitamin K_3, 12.00mg; vitamin B, 12, 00mg. nicotinic acid, 5000 mg; pantothenic acid 22.00 mg; vitamin B; 3.00mg; folic acid; 1.00mg; Vitamin B_{12}, 0.02mg; choline choride, 500.00mg; antioxid ant, 250.00mg; Fe, 50.00mg; Mn, 160.00mg; Zn, 100mg; Cu; 4.00mg; 1, 2.40mg; Co, 0.40mg; Se, 0.20mg.

[1]Figures represent the fraction of total protein supplied by either untoasted (UTMSM) or toasted melon seedmeals (TMSM) in the test diets.

Table 2: Nutrient Composition of TMSM and UTMSM

Nutrients	Average Analysis	
	TMSM	UTMSM
Moisture (%)	3.88	6.75
Crude protein (%)	29.23	28.93
Ether extract (%)	55.09	51.00
Crude fibre (%)	6.5	6.10
Calcium (%)	0.62	0.54
Phosphorus (%)	0.91	0.52
True metabolisable energy (Kcal/kg)[1]	4,940	4,800
Methionine (%)	1.5	1.42
Lysine (%)	0.97	0.92
Ash (%)	7.45	6.75

[1] Determined by the method of Sibbald (1976) and calculated by the method of Kessler and Thomas (1981).

RESULTS AND DISCUSSION

The performance of birds fed TMSM- and UTMSM-based diets is in Table 3. A significant ($P < 0.05$) difference in feed intake was observed with the control birds consuming more than those in other dietary treatments. Feed intake was significantly ($P < 0.05$) less in the diets containing 66.66 % crude protein contribution from either TMSM or UTMSM. Weight gain expressed as weight gain per week or final body weight was significantly ($P < 0.05$) higher in control than the other treatments. Again, weight gain was significantly ($P < 0.05$) less in diets containing 66.66 % crude protein contribution from either TMSM or UTMSM.

Feed conversion also followed the same pattern with treatment significance. Birds on the UTMSM generally performed better than those on TMSM. Performance of birds decreased ($P < 0.05$) with incremental levels of melon seed meal protein, an observation more pertinent with TMSM-based diets. Feed intake reduced as the level of UTMSM or TMSM increased in the dietary treatments. Accordingly, feed intake was least in the two treatments where UTMSM or TMSM contributed 66.66 % of the total crude protein of the diets. Considering that the diets were isocaloric, the observed depressed feed intake could be associated with physical rather than metabolic factors. The melon seeds were decorticated but they had high crude fibre (6.1 %) compared to other vegetable protein sources such as soyabean meal (5 %). Moreover, in balancing the diets to be isocaloric and isonitrogenous, these two diets have the highest percent fibre (8.96 and 10.27 %) which of course could reduce feed intake, considering that fibre imposes a physical limitation upon intake of digestible nutrients (9).

Table 3. **Performance** of birds fed toasted and untoasted melon sedmeal[1]

	UTMSM/ TMSM 0	TMSM 1/3	TMSM 1/3	TMSM 2/3	UTMSM 2/3	UTMSM 2/3	UTMSM 2/3
Weekly Feed intake (gm)	776.1 ± 2.00 [a]	676.90 ± 0.76[b]	637.2 ± 1.78 [c]	626.29 ± 3.34[d]	709.38 ± 0.85 [b]	659.54 ± 1.00 [d]	635.04 ± 2.13[d]
Weekly Weight gain (gm)	266.42 ± 0.01 [a]	231.56 ± 0.67[b]	202.37 ± 0.11[c]	186.27 ± 0.93[d]	258.3 ± 0.20[a]	233.94 ± 0.62[b]	200.13 ± 1.15[c]
Feed Conversion ratio (feed/gain)	2.92 ± 0.04[a]	2.93 ± 0.3[a]	3.15 ± 0.06[b]	3.36 ± 0.01[c]	2.75 ± 0.03[a]	2.82 ± 0.09[a]	3.18 ± 0.04[b]

[1]Data are **Means ± SEM** of 5 replicates of 12 broilers each.
a, b, c, d **Means** within the row not bearing the same superscripts differ significantly (P<.05).

Nonetheless, since the fibre level in these diets was not so much above the recommended level (9 %) for growing broilers (9), it appeared that some other physical limitations upon feed intake, such as palatability (10) or oesophagus irritation (11), were responsible. It has been observed that melon seed meal in chicken diets reduced feed intake (4).

The observed significantly ($P < 0.05$) lower body weight gain in the melon seed meal dietary treatments appeared to be caused by the significantly lower feed intake in the diets since body weight gain reduced progressively as feed intake reduced (Table 3). The observation that birds in the control treatment gained weight better ($P < 0.05$) than the melon seed dietary treatments, showed that the melon seed diets were biologically deficient for the growth of broilers. This suggestion was made because in these diets TMSM or UTMSM contributed the main source of protein especially in the 50 and 66.66 % crude protein replacement diets. In the 33.33 % crude protein replacement diet enough fishmeal and bloodmeal complemented the melon seed meal protein to yield a comparatively better result than the other melon seed meal diets. Utilisation of melon seed meal in diets of broilers therefore tended to show that fortification of its protein with animal protein sources would be required and accordingly should be used at a level to supply much less than 33.33 % of the total crude protein in broiler diets. This suggestion appears to be useful in this study since melon seed meal is deficient in lysine (4) compared to fishmeal and bloodmeal (Table 1). The observed significantly lower weight gain in the TMSM diets compared with the corresponding UTMSM diets tended to indicate that toasting of melon seeds has no biological advantage over non-toasting.

Feed conversion was measured in this study because of a probable commercial benefit. However, the significantly ($P < 0.05$) lower feed conversion in the control diet compared with that of the melon seed meal diets indicated that its use in broiler diets has no commercial benefit.

CONCLUSIONS AND APPLICATION

1. As the inclusion rate of TMSM or UTMSM increased feed intake decreased.
2. The cause of the depressed feed intake was suggested to be a physical limitation such as fibre, palatability or oesophagus irritation.
3. Similarly, body weight gain and feed:gain ratio were depressed.
4. Performance of birds in the UTMSM was comparatively better than that of those on TMSM.
5. Melon seed meal should not be the major protein source in broiler diets.

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