THE EFFECT OF COTTONSEED MEAL (CSM)/GROUNDNUT MEAL (GNM) MIXTURE AND PROTEIN LEVELS IN PRACTICAL BROILER DIETS

By

M. C. NJIKE
National Veterinary Research Institute, Vom, Nigeria

SUMMARY

Two experiments were conducted with Ross-type chicks to determine the optimum substitution level of CSM for GNM protein in both starter and finisher rations. In the first experiment 500 day old broilers were used in a 42—day 5 × 2 factorial arrangement to study the effects of 0, 10, 20, 30, 40 or 50% CSM and 24 to 26% protein diets on final body weight, rate of gain and feed efficiency. The basal diet was supplemented with methionine to meet ARC (1975) recommended level and 0.2% lysine. The results indicate that up to 40% of GNM could be replaced with CSM without any adverse result on rate of gain, final body weight and feed efficiency. Chicks on 26% protein diets grew better than those on 24% but the differences were not statistically significant.

In the second experiment 20% protein diet was substituted up to 100% with CSM protein. It was found that up to 70% protein of GNM could be replaced by CSM in a broiler finisher with slight but non-significant differences in the rate of gain, feed efficiency and final body weight. The results as well as economic implication of these findings are fully discussed.

INTRODUCTION

Further expansion of poultry industry in Nigeria is seriously limited by shortage of high quality protein feeds. Groundnut meal (GNM) which forms the main source of protein for chicks is in short supply and expensive. Cottonseed meal (CSM) is produced in commercial quantity in this country and is relatively cheap. The bulk of the production, however, is used for ruminant nutrition. Extensive research carried out in the United States (see review by Phelps, 1966) showed that CSM in combination with other protein supplements could be an excellent protein source for chicks. Earlier work in this laboratory with pullet chicks indicated that up to 30% of GNM protein could be replaced with CSM without any adverse effect on growth rate and feed efficiency (Njike, 1976). The present paper describes two experiments conducted to obtain information on the value of CSM in rations for broilers.

MATERIAL AND METHODS

Experiment 1, Starters. Commercial prepress solvent extracted CSM was fed at various levels in rations composed on conventional feedstuffs.

Day old Ross-type broiler chicks were used in duplicate lots of 50 chicks each. The CSM was used at various levels to replace zero, 20, 30, 40 and 50% protein of GNM in the second control diet. The two control and treatment diets were maintained at two protein levels, 24 and 26% (Table 1). These levels have been recommended for broiler starters in the Tropics (Babatunde and Fetuga 1976; Olomu 1976). The chicks were provided with water and feed *ad lib.* Chicks were weighed in groups at weekly intervals but feed remnants were collected and weighed daily. The experiment was terminated at the end of six weeks. The performance data were analysed statistically.

Experiment 2, Finishers. The experimental procedure for the finisher period (6—12 weeks) was essentially the same as the starter except that both the control and treatment diets were tested at one protein level (20% (Table 2). The results were analysed by analysis of variance followed by Duncan's multiple range test (Steel and Torrie, 1960).

Results and Discussion:

Experiment 1: The results of the experiment at the end of 6 weeks using diets supplemented with GNM and various levels

TABLE 1

Composition of diets (percentage) used in experiment 1

Ingredients	*24% protein diets*						*26% protein diets*					
	1	2	3	4	5	6	1	2	3	4	5	6
Maize	54.3	53.3	52.2	51.6	51.1	50.5	49.3	48.3	47.1	46.5	45.9	45.2
GNM	36.0	40.0	32.0	28.0	24.0	20.0	41.0	45.0	36.0	31.5	27.0	22.5
CSM	—	—	9.1	13.7	18.2	22.8	—	—	10.2	15.3	20.4	25.6
FM	3.0	—	—	—	—	—	3.0	—	—	—	—	—
DCP	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Minovit*	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Bone meal	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lys	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Met	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% Protein (calculated)	24.2	24.1	24.0	24.0	24.0	24.9	26.1	26.1	24.9	25.9	25.9	25.9
% Fibre (calculated)	3.66	3.83	4.21	4.38	4.56	4.82	3.83	4.01	4.41	4.61	4.82	5.03

*Minovit is a vitamin — mineral mixture containing all the vitamins, trace minerals, amprolium and antibiotic required for optimum performance of broiler chicks.

TABLE 2

Composition of diets (percentage) used in experiment 2

	Rations							
	1	2	3	4	5	6	7	8
Maize	63.3	62.5	61.9	60.3	60.4	58.0	59.6	58.3
GNM	30.3	24.0	17.8	12.5	9.0	8.0	3.0	—
CSM	—	6.8	13.6	20.5	23.9	27.3	30.7	35.0
DCP	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Minovit*	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Bone Meal	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lys	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Met	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
% Protein (calculated)	20.2	20.1	19.9	20.1	19.9	19.8	19.7	20.1
% Fibre (calculated)	3.48	3.75	4.0	4.32	4.44	4.64	4.31	4.91

*Minovit is a vitamin — mineral mixture containing all the vitamins, trace minerals amprolium and antibiotics required for optimum performance of broiler growers

of CSM in combination with GNM are shown in Table 3. The first control diet was suplemented with fishmeal (FM) to test whether this animal protein source is necessary in broiler starters. Data showed that chicks performed better on FM supplemented diets but the differences were small and not statistically significant ($P > 0.05$). All the GNM in combination with CSM as the protein supplement produced weights nearly equal to those on control diet supplemented with GNM. Chicks on 26% protein level grew better than those on 24% protein diets. Again these differences were small and not statistically significant. Mortality in the various groups ranged from 0 to 8.5% but there was no apparent relationship between the rations and the death losses.

A very high efficiency of feed utilization was shown by the chicks on GNM control diets; these figures are lower than those reported by Olomu (1976). The feed efficiency on rations supplemented with the various CSM concentrations would be considered equally satisfactory. There is

no explanation for high feed efficiency recorded for FM supplemented diet.

Experiment 2: The result of the experiment is set out in Table 4. Increasing the concentration of CSM in the diet led to depression in liveweight of the birds. The depression with 80% of CSM and above was significant ($P < 0.05$). The depression in growth rate is probably due to poor feed utilization at higher levels of CSM. Increasing the level of CSM in the diet did not significantly influence food consumption. Feed efficiency increased with increasing concentration of CSM. The increase was significant for all levels of CSM supplementation. Similar to starter ration, mortality was not influenced by the level of CSM supplementation. West (1955, 1956) reported complementary relationship between soyabean meal

TABLE 3

Summary of average body weights, weight gains and feed intake at 6 weeks and feed/gain ratio of broilers fed GNM and CSM protein mixtures

Level of GNM protein (½) replaced	*Parameters measured*											
	Body weights (g)		*Weight gains (g)*		*Feed consumed (g)*		*Feed/Gain ratios*		*Mortality (%)*		*Feed Costs N/metric ton*	
	24%	*26%*	*24%*	*26%*	*24%*	*26%*	*24%*	*26%*	*24%*	*26%*	*24%*	*26%*
[1]Groundnut meal (control)	879.6	918.0	834.8	880.6	1895.0	1919.7	2.29	2.18	3.2	2.2	269.5	274.2
[2]Groundnut meal (control)	866.9	871.5	822.2	831.4	1841.7	1870.7	2.24	2.25	0.0	1.5	251.7	256.4
20	871.5	889.4	832.7	853.7	1865.2	1861.1	2.24	2.18	5.4	4.0	233.6	235.1
30	868.6	874.8	829.5	840.0	1891.3	1873.2	2.28	2.23	2.1	1.0	224.5	226.0
40	860.6	875.4	812.9	832.9	1885.9	1882.4	2.32	2.26	8.5	0.0	215.7	215.9
50	848.7	863.6	800.4	814.6	1880.9	1881.7	2.35	2.31	3.1	0.0	206.5	205.6
LSD (0.5)	34.8	37.7	48.3	29.6	77.2	47.2	0.13	0.12	—	—	—	—

Average starting weight 38.3g; SD 1.3

[1]Contains 3? FM but without CSM

[2]Without both FM and CSM

Naira = $1.81 (US).

TABLE 4

Summary of average body weights, weight gains and feed intake at 12 weeks and feed/gain ratios of broilers fed GNM and CSM protein mixtures

Level of GNM protein (%) replaced	*Parameters measured*					
	Body weights (g)	*Weight gains (g)*	*Feed consumed (g)*	*Feed/gain ratios*	*Mortality (%)*	*Feed costs N/metric ton*
Groundnut meal (control)	2544.9*	1723.5^{a}	4912.0^{b}	2.85^{f}	4.5	242.2
20	2483.4^{ab}	1651.5^{ab}	5383.9^{ab}	3.26^{e}	2.1	228.7
40	2431.5^{b}	1595.4^{abc}	5479.2^{ab}	3.43^{de}	0.0	215.0
60	2454.4^{ab}	1543.9^{abc}	5372.3^{ab}	3.48^{d}	1.5	202.0
70	2384.0^{bc}	1511.1^{abc}	5409.7^{ab}	3.58^{cd}	2.4	172.5
80	2294.4^{cd}	1419.6^{bc}	5266.7^{ab}	3.71^{bc}	5.3	170.1
90	2284.4^{d}	1414.8^{c}	5489.4^{ab}	3.88^{b}	0.0	173.8
100	2334.4^{d}	1389.4^{c}	5793.8^{a}	4.17^{a}	1.3	173.4

Average starting weight 857.8g; SD. 36.3g

*Treatment means not followed by the same superscripts are significantly different (P 0.05).

Naira = $1.81 (U.S.)

and CSM since combinations of the two proteins produced better growth and feed efficiency than either meals. Complementary relationship between GNM and CSM is not evident in the present trial. This is probably due to common amino acid deficiency in two meals, namely, lysine and methionine (Grau, 1946); CSM is also known to be limiting in threonine, leucine and isoleucine (Fisher, 1965).

The economic performance (Tables 3 and 4) shows large differences in feed cost. The feed costs (₦/metric ton of feed) were computed according to the prevailing prices of the ingredients used for formulating the rations. Data showed that feed cost decreased with increasing concentration of CSM in the ration for the two experiments. This is due to price differential between CSM and GNM. The CSM costs about ₦65.00 per metric ton while GNM costs ₦275.00 per metric ton. Feed cost accounts for 70% of the recurrent cost in poultry industry and recently the prices of most poultry feed ingredients have doubled. This has forced many farmers out of poultry business. Cottonseed meal is much cheaper than GNM. Use of CSM therefore at levels up to 40% in the broiler starters and as much as 70% in the broiler finishers will greatly reduce the price of poultry feeds and this in turn will lower the prices of eggs and poultry meat.

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