UTILIZATION OF RUBBER SEED MEAL AS A PROTEIN SUPPLEMENT IN BROILER FINISHER RATIIONS.

I. O. A. ADELEYE and A. A. ODUNSI

Department of Animal Science

University of Ibadan, Nigeria

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ABSTRACT

A feeding trial was conducted to evaluate the performance of finisher broiler chicks fed diets containing different levels of partially defatted rubber seed meal as a replacement for groundnut cake. Four isocaloric and isonitrogenous diets (A, B, C and D) were formulated using groundnut cake (GNC) as the reference protein source; and 10, 15 and 20% of the GNC in the control diet (A) were replaced with rubber seed meal (RSM) in rations B, C and D, respectively. No significant differences ($P > 0.05$) were observed in feed intake, growth rate, feed efficiency and protein efficiency ratio among the birds on the different diets. However, the dressed weight and dressing percentage and total edible meat to bone ratio showed significant ($P < 0.05$) differences. The results indicated that replacement of GNC with RSM at levels studied, did not significantly depress the performance of broiler finishers but was quite beneficial in terms of economics of production.

Key words: rubber seed meal, protein, broiler.

INTRODUCTION

Two classes of animals whose production can contribute rapidly to the available meat supplies on the short run are pigs and poultry. It has been observed (Hodgson, 1971; Babatunde, 1980) that poultry holds unique position in bridging the animal protein supply gap in developing countries for the fact that poultry can be reproduced much quicker than any other livestock, they are highly prolific and are good feed converters. Feed accounts for about 55 per cent of egg production and 65 per cent of broiler production (Oluyemi and Roberts, 1979). The major feed ingredients (cereals and pulses) are very expensive because they are also needed by humans as staple. In order to reduce the cost of poultry production therefore, the nutritional potentials of unconventional feed sources need to be investigated. One of such feed sources is rubber seed meal. Various studies (Fetuga *et al.*, 1975; Panam *et al.*, 1978 and Nwokolo *et al.*, 1986) have suggested that rubber seed meal

could be a potential source of vegetable protein in poultry diets. The present study was undertaken to investigate the effect of graded levels of partially defatted rubber seed meal in the finisher ration of broilers on performance in terms of feed intake, growth rate, feed efficiency and dressing percentage.

MATERIALS AND METHODS

A total of 500 White Rose broiler-type day-old chicks were raised to the age of 5 weeks on a commercial ration in which groundnut meal was used as the reference vegetable protein source. All necessary vaccinations and other medications were administered at the appropriate periods. At 5 weeks of age, 120 birds were selected and randomly distributed into 4 treatment groups each with two replicates. Each replicate consisted of 15 birds (i.e. 30 birds per treatment). Four isonitrogenous and iso-caloric rations were formulated as shown in Table 1. The partially defatted rubber seed meal (RSM) used in this study was obtained from the Rubber Research Institute of Nigeria, Benin City. Ration A was the control and it consisted of groundnut cake (GNC) as the vegetable protein source. In rations B, C and D; 10, 15 and 20% of the GNC in ration A were replaced with the partially defatted RSM. In absolute values, the RSM constituted 0, 5.36, 8.04 and 10.77% of the experimental rations A, B, C and D respectively.

All birds were fed and watered *ad libitum* under identical environmental and management conditions on concrete-floored pens littered with wood shavings as the bedding material. The birds were weighed at the commencement of the experiment and subsequently at weekly intervals. A record of feed consumption was also kept. At nine weeks of age, 2 birds per replicate were selected and put in 3-tier metabolic cages with facilities for individual feeding, watering and collection of droppings. The birds were maintained on their respective rations. Three days were allowed for adjustment, followed by a 4-day collec-

TABLE 1: COMPOSITION OF EXPERIMENTAL DIETS

Ingredients (%)	Rations			
	A	B	C	D
Maize (Yellow)	59.75	56.79	55.31	53.78
Groundnut cake	24.00	21.60	20.40	19.20
Rubber seed meal	0	5.36	8.04	10.77
Fish meal	2.50	2.50	2.50	2.50
Dry brewers grains	10.00	10.00	10.00	10.00
Bone meal	2.00	2.00	2.00	2.00
Oyster shell	1.00	1.00	1.00	1.00
Vitamin/mineral mix*	0.50	0.50	0.50	0.50
Salt	0.25	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00
Calculated C.P. (%)	20.0	20.0	20.0	20.0
M.E. (Kcal/kg)	2.95	2.95	2.95	2.95

*Vitamin/mineral mix provided (per kg ration):

Vit. A, 9,000,000 IU; Vit D3, 1,250,000 IU; Vit E, 7,000 IU;

Riboflavin, 6,000 mg; Vit B3, 22,000 mg; Vit B5, 14,000 mg;

Lysine, 120,000 mg; Methionine, 65,000 mg; Choline Chlorine,

240,000 mg; Mn 60,000 mg; Fe 35,000 mg; Cu 5,000 mg; I2

1,100 mg; Se 100 mg; Antioxidant, 125,000 mg.

tiona period. Daily feed consumption was recorded, and droppings were collected daily, wrapped in tin foil and dried in the oven at 80°C for 48 hours. The total dried droppings collected for each treatment group was pooled, milled and stored for chemical analysis later. Proximate chemical composition of feeds and droppings, as well as the partially defatted RSM was carried out using AOAC (1980) procedures while the gross energy was determined using the Gallenkamp Ballistic Oxygen Bomb Calorimeter.

The experiment was terminated when the birds were 10 weeks sold. At termination, 2 birds per replicate were selected for carcass evaluation. The birds were fasted overnight but had access to water. They were weighed the following morning and then slaughtered by the external cut throat method and thoroughly bled. The carcasses were defeathered, eviscerated and cleaned. The organs were carefully removed and weighed. The carcass was then cut into different parts: thigh, drumstick, breast, neck, wing and back and weighed separately. Weight of raw

edible meat was obtained by careful removal of all muscles from the bones.

Calculations of metabolizable energy (M.E.), protein efficiency ratio (P.E.R.) and economics of production were made and all data were analyzed using the Completely Randomized Design procedure Steel and Torrie, 1960) while significant differences between treatment means were determined using Duncan (1955) multiple range test.

RESULTS

The chemical composition of the experimental diets and the partially defatted RSM are shown in Table 2. The crude protein content of the control diet (22.66%) was slightly higher than those of diets containing RSM (22.62, 21.09 and 21.09 for diets B, C and D respectively). There was a progressive decrease in the CP and ash content as the level of RSM increased. The other extract and the crude fibre contents on the other hand increased as the level of RSM increased.

TABLE 2: CHEMICAL COMPOSITION OF EXPERIMENTAL DIETS AND RUBBER SEED MEAL (DM BASIS)

Constituents	Rations				Rubber seed meal
	A	B	C	D	
Dry Matter (%)	92.71	92.90	93.00	93.00	92.94
Crude Protein (%)	22.66	22.62	21.09	21.09	18.05
Ether Extract (%)	9.25	9.61	9.60	9.82	32.19
Ash (%)	4.67	4.17	3.54	3.34	2.81
Crude Fibre (%)	3.25	3.52	3.68	4.31	3.89
N.F.E. (%)	60.17	60.08	62.09	61.44	33.06
G.E. (Kcal/g)	4.24	4.18	4.18	4.24	5.33

Data on performance characteristics of the experimental birds are presented in Table 3. The average daily feed intake per bird was highest for treatment A (93.62 g/day) while the average daily feed intake was 92.65, 91.41 and 91.97g/day for treatments B, C and D respectively. The differences were not significant ($P > 0.05$). The average daily weight gains were 34.66, 33.97, 31.37 and 32.24g/day for treatments A, B, C and D respectively. At 10 weeks of age, the birds on treatment A were the heaviest (1825.5g) followed by those on diet B (1814.5g) diet D (1756.5g) and diet C (1731.5g). The dif-

ferences in weight gain and final liveweight were not significant ($P > 0.05$). Birds on treatment A had the best feed efficiency (2.70g feed/g gain) followed by treatments B (2.73), D (2.85) and C (2.91). The protein efficiency ratio was best for diet D (3.11) followed by diet B (3.09), diet A (3.02) and diet C (2.93). The differences were not significant ($P > 0.05$). No mortality was recorded throughout the experimental period.

The data on carcass characteristics are presented in Table 4. The average dressed weight of birds on the control diet was 1393.05g which was significantly ($P < 0.05$) higher than

TABLE 3: PERFORMANCE CHARACTERISTICS OF BROILER FINISHERS FED THE EXPERIMENTAL DIETS

Parameters	Rations			
	A	B	C	D
Number of birds	30	30	30	30
Experimental period (days)	35	35	35	35
Avg. Initial liveweight (g)	612.5	625.5	633.5	628.5
Avg. Final liveweight (g)	1825.5	1814.5	1731.5	1756.5
Avg. Daily weight gain (g)	34.66	33.97	31.3	32.24
Avg. Daily feed intake (g)	93.62	92.65	91.4	91.97
Feed efficiency	2.70	2.73	2.9	2.85
P.E.R.	1.79	1.76	1.76	1.80
Mortality	0	0	0	0
M.E. (Kcal/g)	3.02	3.09	2.93	3.11
N ₂ retention (%)	85.45	85.78	84.85	85.74

those of diets B (1280.25g), C (1225.28g) and D (1217.97g). Similarly, the dressing percentage of birds on diet A was significantly ($P < 0.05$) higher than those of diets B, C and D. However, both the dressed weight and dressing percentage of birds on diets B, C and D were not significantly ($P > 0.05$) different from one another. The average total edible meat was higher for diet A (1060.8g) followed by diets B (977.2g), D (943.6g) and C (938.7g) while the average total bone was highest for diet D (310.1g) followed by diets B (306.4g), C (298.5g) and A (272.2g). The differences were not significant ($P > 0.05$). The ratio of edible meat to bone was highest for birds on diet A ($P < 0.05$), while those of diets B, C and

D were not significantly ($P > 0.05$) different from on another.

The cost of production are presented in Table 5. The feed cost per kilogram of control diet (A) was highest (N1.06). There was a progressive decrease in the feed cost as the level of RSM in the diets increased. Calculation of cost of feed per kilogram weight gain showed that diet B was the cheapest (N2.80). This was followed by diet D (N2.83), diet A (N2.86) and diet C (N2.94) in that order. The differences were however not significant ($P > 0.05$).

TABLE 4: CARCASS CHARACTERISTICS OF BROILER FINISHERS FED THE EXPERIMENTAL DIETS

Parameters	Rations			
	A	B	C	D
Liveweight (g)	1825.5	1814.5	1731.5	1756.5
Dressed weight (g)	1393.05 ^a	1280.25 ^b	1225.28 ^b	1217.97 ^b
Dressed wt. (% of live wt.)	76.31 ^a	70.56 ^b	70.76 ^b	69.34 ^b
Breast (g)	335.2	305.4	311.2	297.8
Nec (g)	84.7	81.0	80.1	83.2
Wing (g)	140.1	145.2	132.6	134.7
Back (g)	255.4	277.1	270.4	260.5
Thigh (g)	201.4	188.5	180.6	185.1
Drumstic (g)	198.2	180.5	175.9	176.4
Abdominal fat pad (g)	38.2	42.8	44.2	48.3
Total edible meat (g)	1060.8	977.2	938.5	943.6
Total bone (g)	272.2	306.4	298.5	310.0
Meat: bone ratio	3.90 ^a	3.19 ^b	3.14 ^b	3.04 ^b
Organs: Spleen (g)	2.25	2.08	2.14	2.05
Gizzard (g)	35.79	36.56	38.76	39.68
Liver (g)	37.75	35.24	35.01	33.91
Lung (g)	14.19	11.03	13.34	10.77
Heart (g)	9.25	9.98	9.50	9.22
Kidney (g)	14.14	14.29	14.48	15.09

a, b Means with different superscript letters on the same row differ significantly ($P < 0.05$).

ABLE 5: COST OF PRODUCTION AND EFFICIENCY OF THE EXPERIMENTAL DIETS

Parameters	Rations			
	A	B	C	D
Feed cost (N/kg)	1.06	1.03	1.01	0.99
Total feed intake/bird (kg)	3.28	3.24	3.20	3.22
Cost of feed consumed/bird (N)	3.47	3.32	3.23	3.19
Total weight gain/bird (kg)	1.21	1.19	1.10	1.13
Cost of feed/kg gain (N)	2.86	2.80	2.94	2.83

DISCUSSION

The crude protein content of 28.05% obtained for the partially defatted RSM in this study is similar to 28.63% reported by Nwokolo (1986) but slightly higher than 26.6% reported by Panam *et al.* (1978) and 26.7% by Toh and Chia (1986). The different crude protein values reported by various workers are due to the efficiency of oil extraction. The higher the amount of oil extracted, the higher the crude protein content of the meal. Although the crude protein contents of the diets vary slightly, the levels (21.09-22.62%) were within the range recommended by various workers NRC, 1971; Olomu, 1976; Babatunde and Fetuga, 1976).

Feed intake results showed that birds on the control diet (A) consumed more feed than those on other diets. Perhaps, the levels of RSM used in the present study were not enough to significantly depress feed intake. Nwokolo *et al.* (1986) observed a significant reduction in feed intake when 50% of the dietary protein was supplied by RSM. In the present study, birds on diet A exhibited the best growth rate, followed by birds on diets containing 10, 20 and 15% RSM (diets B, D and C respectively). The observed differences were not significant, indicating that the levels of RSM in the present study were not too high to cause significant growth rate depressions. The best feed efficiency was observed in birds on diet B (10% RSM) followed by birds on diets A, D and C in that order. The differences were not significant and the results agree with those of Panam *et al.* (1978) and Nwokolo and Akpakunam (1986). There was no mortality throughout the experimental period, suggesting that the birds were able to tolerate the levels of RSM used in this study.

Although, the control diet (A) gave the best meat to bone ratio, it is noteworthy that the RSM-containing diets (B and D) gave the best results in terms of cost of feed per kilogram liveweight gain. The results have indicated that RSM was efficiently utilized as GNC and where GNC is not easily available, comparable growth rate at cheaper production costs could be attained by its substitution with RSM at the levels studied. With about 200,000 ha of rubber plantation in Nigeria, and with estimated seed yield of about 100kg/ha, the rubber estates in Nigeria have a potential to produce over 15,000 metric tonnes of seed per year. The defatted meal obtained from these seeds (Oluyemi *et al.*, 1975) is capable of meeting up to 20% of Nigeria's need for protein concentrates in poultry nutrition.

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