THE SUBSTITUTION OF PIGEON PEA SEED (*CAJANUS CAJAN*) FOR GROUNDNUT CAKE AND MAIZE IN BROILER FINISHER RATION

AMAEFULE K.U.¹ AND OBIOHA F.C.²

1. College of Animal Science, Federal University of Agriculture, Umudike P.M.B. 7267, Umuahia, Abia State, Nigeria.

2. Department of Animal Science, University of Nigeria, Nsukka Enugu State.

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ABSTRACT

One hundred and twenty 4 - week old broilers were used to study the effect of substituting pigeon pea seed meal (PPSM) for groundnut cake and maize in broiler finisher rations. The 4 diet groups contained 0, 30, 40, and 50% PPSM and measurements taken in the 3 week study were weight gain, feed intake feed conversion ratio and protein efficiency ratio. Results showed that body weight gain of the birds increased as the proportion of PPSM in the diets increased. The final body weights were 1.47, 1.64, 1.71 and 1.73kg for 0, 30, 40, and 50% respectively. Feed and protein intake significantly increased as a result of replacing groundnut cake and maize with PPSM up to 40%, but did not show significant difference between 40 and 50%. Feed intake figures were 96.80, 129.90, 144.30 and 142.60g and corresponding protein intake figures were 20.67, 27.64, 30.72 and 30.57g for 0, 30, 40 and 50% inclusion of PPSM respectively. Feed conversion ratio and protein efficiency ratio did not significantly differ among the diets.

Key words: Pigeon-pea, Broiler, Groundnut cake, Finisher ration.

INTRODUCTION:

The present high cost of animal protein feedstuff such as fishmeal and conventional plant protein sources like soybean meal and groundnut cake (GNC) suggests that alternative high quality plant protein sources be sought for broiler feed. Pigeon-pea seeds (PPS) have very low human food preference unlike soyabean and groundnut seeds and its value in animal or poultry feeding has not been fully investigated. A wide variability exists in the chemical composition of pigeon-pea seeds

which according to Salunkhe *et al*; (1985) depends on the geographical location, cultivar and growth conditions. The crude protein content which ranges from 17.90 to 30% (Siegel and Fawcett, 1976, Geervani, 1981; Salunkhe *et al*, 1985; Obioha, 1992) is mainly deficient in sulfur amino acids and tryptophan but rich in lysine (Fetuga *et al*; 1973, Church and Pond, 1974). As with other grain legumes, the seeds contain antinutritional factors like trypsin inhibitors which tend to limit their use in poultry feeding especially the raw seeds (Grimaud, 1988; Ologhobo, 1992; D'Mello, 1992).

Available literature on feeding pigeon-pea seeds to poultry suggest that it is a satisfactory protein ingredient when incorporated up to 30% of the ration with growth depression resulting at 40% level (Springhall *et al*, 1974; Grimaud, 1988).

According to Tangtaweewipat and Elliott (1989), liveweight gains of broilers fed 0, 10, 20 and 30% pigeon-pea seed meal (PPSM) were the same while on the contrary, Ologhobo (1992) indicated that 25% PPSM adversely affected feed conversion efficiency of broilers. Some of the reports indicated that raw PPS were used in the studies. The objective of this work was to investigate the replacement value of boiled PPSM for GNC and maize in broiler finisher rations.

MATERIALS AND METHODS

The experiment was conducted at the experimental block of Animal Science Poultry Farm, University of Nigeria, Nsukka. Pigeon-pea seeds and other feedstuffs were purchased from Oba Market, Isi- uzo L.G.A., Enugu State.

One hundred and twenty 4-week old cob broilers were used in the study. They were

brooded with kerosine stoves under a metal hover in a brooder pen measuring 5.2m x 3m. They were fed on a commercial broiler starter ration with chemical composition as indicated in Table 1 for the 4 weeks of brooding. The broilers were then randomly allotted to 4 dietary treatments with each treatment having 3 replicates of 10 birds per replicate.

The experimental diets were isoenergetic and isonitrogenous with stepwise replacement of GNC (groundnut cake) and maize with pigeon-pea seed that was boiled for 30 minutes, dried and milled. The boiling condition, recommended by Siegel and Fawcett (1976) and Salunkhe et al; (1985), helps in eliminating or reducing the level of

TABLE 1: PROXIMATE COMPOSITION OF SOME FEEDSTUFFS AND COMMERCIAL BROILER STARTER USED (%DM BASIS)

Constituent (%)	FISHMEAL	YELLOW MAIZE	PPSM	GNC	SORGHUM MALT	STARTER FEED
Dry Matter	98.80	88.30	90.77	88.83	96.74	89.05
Crude Protein	57.15	9.17	25.31	45.75	14.50	21.76
Ether Extract	14.35	4.80	2.70	9.08	7.86	2.79
Crude Fibre	1.35	1.53	6.50	4.48	7.18	3.48
Ash	22.65	1.70	2.90	5.68	4.33	9.59
N-Free Extract	3.12	71.28	53.36	23.84	62.87	51.43

*Local Fishmeal.

TABLE 2: COMPOSITION OF EXPERIMENTAL DIETS (%)

INGREDIENTS	CONTROL (T1)	T2	T3	T4
Yellow Maize	45.00	40.00	35.00	30.00
GNC	25.00	15.00	10.00	0.00
PPSM	0.00	30.00	40.00	50.00
Fishmeal	5.00	5.00	5.00	7.00
Sorghum Malt	20.00	3.00	5.00	10.00
Rice bran ⁺	0.00	2.00	0.00	0.00
Bone meal	4.00	4.00	4.00	2.50
Vitamin Premix*	0.50	0.50	0.50	0.25
Salt	0.50	0.50	0.50	0.25
	100.00	100.00	100.00	100.00

CALCULATED ANALYSIS

CP(%)	21.32	21.42	21.49	20.86
CF(%)	3.31	3.72	4.01	4.52
LYSINE (%)	1.00	1.60	1.82	2.07
Methionine (%)	0.40	0.43	0.44	0.49
Ca (%)	1.49	1.64	1.70	1.43
P(%)	1.04	1.09	1.12	1.00
ME (cal/kg)	2.83	2.90	2.89	2.88

DETERMINED ANALYSIS

Dry Matter (%)	92.65	92.65	91.45	93.00
Crude Protein (%)	21.36	21.28	21.29	21.04
Ether Extract (%)	6.25	1.15	4.15	5.00
Crude Fibre (%)	3.06	3.35	3.98	4.15
Ash (%)	11.60	10.70	9.80	12.35
N-Free Extract (%)	50.38	56.17	52.23	50.46
Gross Energy (cal/kg)	3.34	3.39	3.39	3.41

+ Rice bran Husk

*Composition per kg (Univit. 15 Roche) Premix. Vitamin A. 15000iu. D, 1500iu. E 3000iu. K 3.0g, B₂ 2.5g, B₆ 0.3g, B₁₂ 8.00mg. Nicotinic Acid 8.0g, Ca- Pantothenate 3.0g, Fe 5.00mg Mn 10.00g. Cu 0.2g, Zn 4.5mg, I₂ 0.15mg, Co, 0.02g, Se 0.01.

PIGEON PEA SEED MEAL IN BROILER FINISHER RATION

TABLE 3: MEAN VALUES FOR GROWTH AND PERFORMANCE CHARACTERISTICS OF BROILER FINISHERS FED ON THREE LEVELS OF PIGEON PEA SEED MEAL

Measurements*	Control (T1)	T2	T3	T4	SE
Initial Weight (kg)	0.765	0.769	0.813	0.784	.018
Final Body Weight(kg)	1.466 ^c	1.639 ^{ab}	1.709 ^{ab}	1.734 ^a	.029
Daily Feed Intake (g)	96.786 ^c	129.786 ^b	144.269 ^a	142.568 ^a	.012
Daily Weight gain (g)	33.381 ^c	41.429 ^{ab}	42.667 ^{ab}	45.238 ^a	.005
Feed Conversion Ratio (FCR)	2.899	3.135	3.381	3.152	.018
Daily Protein Intake (g)	20.673 ^c	27.639 ^b	30.715 ^a	30.510 ^a	.003
Protein Efficiency Ratio (PER)	1.615	1.499	1.389	1.483	.085

*Means with different letters are significantly different ($P < 0.05$)
SE = Standard Error.

antinutritional factors in the seeds. Treatment 1 (T1) was the control diet containing 45% maize, 25% GNC and 0% pigeonpea seed. Treatment 2 (T2) diet contained 40% maize, 15% GNC and 30% PPS. Treatment 3 (T3) had 35% maize, 10% GNC and 40% PPS; while Treatment 4 (T4) diet contained 30% maize, 0% GNC and 50% PPS. These are shown in Table 2. The broilers were housed and reared on wood-shavings deep litter pens each measuring 2.6x3m. They were fed the corresponding diets and given water *ad libitum* for 3 weeks with the quantity of feed consumed each day recorded. Weighing of birds was on individual basis and took place in the morning hours each week.

Sample of feed and feedstuffs were analysed for proximate composition according to the methods of AOAC (1980) and data collected were analyzed statistically using analysis of variance (ANOVA) according to Steel and Torrie (1980). Differences between treatment means were determined by Duncan's New Multiple Range Test (Duncan 1955).

RESULTS AND DISCUSSION

The results in Table 3 showed that there were significant increases in daily weight gain and final body weight of the birds that received pigeon-pea seed meal (PPSM) over the control. The inclusion of PPSM at 30, 40 and 50% of the ration replacing

40, 60, and 100% GNC and 11.10, 22.20 and 33.30% maize respectively did not produce any significant weight differences ($P > 0.05$) among birds fed the pigeonpea containing diets. However, birds fed on 50% PPSM outgained others by having a daily weight gain of 45.2g. The increased daily weight gain and consequent higher final body weight may be attributed to increasing inclusion of boiled PPSM which may have resulted in the diets having higher lysine and methionine contents (Fetuga *et al* 1973) over the control. Pigeonpea seeds effectively replaced maize up to 33.30% at 50% inclusion level and therefore may have served as an alternative source of energy to the diets. These results which are in agreement with the report of Grimaud (1988), showed an improvement over those of Ologhobo (1992) and Tangtaweewipat and Elliott (1989) and this may have been due to the effect of boiling the seeds. Feed intake at 40 and 50% inclusion of pigeon-pea were significantly higher ($P < 0.05$) than at 30% inclusion which was also significantly higher ($P < 0.05$) than at 0% inclusion of pigeonpea seed meal (PPSM). Protein intake equally followed this trend. Feed conversion ratio (FCR) and protein efficiency ratio (PER) were however not significantly affected ($P > 0.05$) although birds fed on the control diet had slightly higher values in both cases.

The results of this work show that 50% Pigeon-pea seed diet gave the best result in terms of body weight gain. On the basis of the above, it is concluded that boiled pigeonpea

seed meal can replace GNC and maize up to 100 and 33.33% respectively in broiler finisher rations.

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