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Effects of Partial Replacement of Soyabean Meal with Bread Fruit (*Artocarpus altilis*) Seed Meal in Broiler Finisher Diets on Their Performance, Water Consumption, Nitrogen Retention and Carcass Characteristics

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Abstract: The study was carried out to determine the effects of partial replacement of soyabean meal in broiler finisher chickens diets with breadfruit seed meal on their performances, nitrogen retention and carcass characteristics. 300, four weeks old broiler chickens were divided into 15 replicates of twenty birds each such that three replicates were allocated to a diet. The diet (2900kcalMEkg⁻¹ and 20%CP) were formulated such that 26.7% of soyabean meal in the control diet were partially replaced with breadfruit meal at 0, 10, 20, 30 and 40 percent (weight- for- weight). The birds were fed and watered *ad libitum*. Results emanating from the study indicated that final body weight, weight gain, feed intake, water intake, nitrogen retention, eviscerated carcass weights and head portion were significantly ($P<0.05$) affected by dietary treatments. Apart from the nitrogen retention and head portion, the control diet (diet 1) recorded the highest values and there were significant ($P<0.05$) decrease between diet 1 (0) and diet 5 (40%). The best feed per gain ratio, dressing percentage and nitrogen retention were recorded in diets 1 (0), 1(0) and 3(30) respectively. There were significant increases in nitrogen retention between diet 1 and 3, followed by significant decreasing order thereafter. Higher level of breadfruit seed meal replacement beyond 30% seems not to favour the broiler finisher chickens under the conditions of the study.

Key words: Soyabean meal, breadfruit seed meal, broiler diet

Introduction

The price of finished feed in our part of the world continues to be on the rise thereby removing the margin of profit accruing to poultry meat producers. This has majorly been attributed to the falling value of the countries currency against the dollar (US) and Euro making the purchasing price of feed ingredients relatively very high since a lot of them are imported. Thus, the bid to overcome the burden of feed ingredient base and reduce the high cost of feed, of livestock and livestock products has been the burden of numerous researchers in this part of the world (Ani and Okeke, 2003; Etuk *et al.*, 2003; Bamgbose *et al.*, 2000; Laseinde, 1999; Tewe, 1998, Olomu, 1995; Sansoucy, 1993). Consequently, the need for alternative feed resource in addition to information emanating from our earlier studies (Obasuyi and Nwokoro, 2005; Nwokoro and Obasuyi, 2005) necessitated this study.

Therefore, the experiment was undertaken to ascertain the effects of partial replacement of soyabean meal in broiler finisher's diets with breadfruit meal (*Artocarpus altilis*) on performance, water consumption, nitrogen retention and carcass characteristics.

Materials and Methods

Birds and Management: 300, 4-weeks old Anak broiler chickens were randomly subdivided into fifteen groups such that there were 20 birds per group. Three each of

these groups were allocated to a diet (Table 1). The birds were housed in open-sided poultry house with dwarf wall partitioned into equal-sized pens (2.2m x 1.2m) with wire mesh and wooden structures. Other management practices were as recommended by Oluyemi and Roberts (1979).

The experimental birds were fed and watered *ad libitum* and the experiment was terminated when the birds were eight weeks of age.

Experimental diets: The 2900 kcalMEkg⁻¹ and 20% CP diets were formulated such that 26.7% soyabean meal in the ration were gradually replaced (0, 10, 20, 30 and 40 percent) with breadfruit *Artocarpus altilis*) seed meal (Table 1). And the diets were fed to the birds from 5 to 8 weeks.

Measurements: The body weights of birds were taken at the beginning and weekly thereafter until the end of the study. Feed intake and water consumption were measured daily. The nitrogen retention and the carcass measurements were carried out in the last week of experimentation.

Nitrogen retention: Three birds per replicate of known weights were transferred to individual metabolism cages (15cm x 15cmx15cm). Feed and water were provided *ad libitum*.

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Table 1: Composition of experimental diets fed to broiler finisher chickens Diets (% replacement)

Ingredients	1 (0)	2 (10)	3 (20)	4 (30)	5 (40)
Yellow maize	41.00	41.00	41.00	41.00	41.00
Soyabean meal	26.70	24.00	21.30	18.60	15.90
Breadfruit seed meal	-	2.70	5.40	8.10	10.80
Fish meal	5.00	5.00	5.00	5.00	5.00
Wheat Offal	19.80	15.60	10.30	5.20	0.100
Brewers dried grain	3.10	7.30	12.60	17.70	22.80
Bone meal	2.50	2.50	2.50	2.50	2.50
Limestone	1.30	1.30	1.30	1.30	1.30
Common salt (NaCl)	0.35	0.35	0.35	0.35	0.35
Premix*	0.25	0.25	0.25	0.25	0.25
Calculated composition					
Crude protein (%)	20.00	20.00	20.00	20.00	20.00
ME (Kcalkg ⁻¹)	2900	2900	2000	2900	2900
Crude fibre (%)	5.23	5.23	6.51	7.70	7.89
Ether extract (%)	8.38	7.95	7.56	7.17	6.78
Lysine (%)	1.52	1.52	1.74	1.84	1.96
Methionine+ cystine(%)	0.80	0.88	0.95	1.03	1.49

*Composition of vitamin – mineral premix per kg of diet: Vit. A, 5,000 IU; Vit. D₃, 800 IU; Vit. E, 12mg; Vit. B₁, 1 mg; Vit. B₆, 1.5mg; Niacin, 12mg; Pantothenic acid, 5mg; Biotin, 0.02mg; Vit. B₁₂, 0.01mg; folic acid, 0.3mg; C. chloride, 150mg; manganese, 60mg; iron, 10mg; zinc, 15mg; copper, 0.8mg; iodine, 0.4mg; cobalt, 0.08mg; selenium, 0.04mg; Anti-oxidants, 40mg.

Four days were allowed for adjustments while data was subsequently collected 3 days thereafter. The collection of droppings and processing before analysis were as recommend by Okosun (1987). The feed and faecal samples were analyzed (AOAC,1990) for DM, CP and this was followed by the usual computation for nitrogen retention.

Water consumption: Water intakes of the broiler finisher chickens were taken daily. A correction factor of measure of water evaporation in the poultry house during the period of measurement was subtracted from the total consumption per group.

Carcass characteristics: The procedures utilized in the carcass measurements including partitioning into wholesale cuts and separations of relevant organs were a described by Nwokolo (1985), and Oluyemi and Roberts (1979).

Data analysis: Data collected during the experiment were subjected to analysis of variance (Steel and Torrie, 1980). The significance between means was separated using Duncan's Multiple range tests.

Results

The study was carried out to determine the effects of feeding diets containing breadfruit seed meals as a partial replacement for soyabean meal (weight-for - weight) in a 2900 kcal ME kg⁻¹ and 20%CP diet for broiler finisher chickens. The weekly maximum and minimum temperature ranges during the period of experimentation were (30 – 35°C), and (23 – 25°C) respectively, while the

weekly rainfall for the period ranged between 14mm and 76.9mm. Results of the performances of the birds (Table 2) revealed that final body weight, weight gain, feed intake, water intake and nitrogen retention were significantly ($P<0.05$) affected by treatments. The indices show that broiler chickens fed control diet (0%) had significantly ($P<0.05$) higher final body weight, weight gain and feed intake than those fed diets containing breadfruit seed meals (BRM). There were no significant ($P>0.05$) differences among treatments for feed to gain ratio, water to feed ratio, protein efficiency ratio and mortality.

The results for the weights indices (final weight and weight gain), feed consumption and feed per gain ratio indicated that the highest weights and feed intake were obtained in the control (Diet 1) followed by consistent decrease between diets 1 and 5 for the parameters. Trends for the feed per gain ratio revealed that the best was also obtained in the control followed by diet 2 with the least recorded in diet 5 in consistently decreasing order.

Although similar pattern of feed consumption was obtained for the water intake, the only significant differences were recorded between diet 5 and diets 1, 2 and 3.

The values for the nitrogen retention showed that birds on 20% breadfruit seed meal diet (diet 5) recorded significantly ($P<0.05$) higher retention than other diets. The least was obtained in diet 5.

Other indices of performances were carcass characteristics (Table 3). For these carcass characteristics, the treatment means for broiler chickens fed diet 1 (0) gave significantly ($P<0.05$) higher back cut

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Table 2: Performances of broiler finisher chickens fed graded levels of breadfruit Seed meal between 5 and 8 weeks of age

Parameters	Diets (% replacement)					SEM
	1 (0)	2(10)	3 (20)	4 (30)	5 (40)	
Initial weight (g/bird)	478.7	479.4	478.9	479.2	478.7	0.960
Final weight (g/bird)	1559.9 ^a	1462.2 ^a	1346.6 ^{ab}	1159.4 ^{bc}	1018.6 ^c	67.14
Weight gain (g/bird)	38.70 ^a	35.10 ^a	29.40 ^{ab}	24.30 ^{ab}	19.30 ^b	3.01
Feed intake(g/bird/day)	99.60 ^a	96.90 ^a	87.40 ^b	86.90 ^b	79.30 ^c	1.94
Feed/gain ratio	2.60	2.80	3.10	3.60	4.10	0.470
Water intake(g/bird/day)	227.40 ^a	220.30 ^a	233.10 ^a	197.80 ^{ab}	168.40 ^b	10.3
Water / feed ratio	2.30	2.30	2.70	2.30	2.10	0.06
Protein efficiency ratio	1.90	1.90	1.90	1.40	1.40	0.49
Daily nitrogen retention (%)	66.00 ^b	64.90 ^b	79.60 ^a	59.90 ^d	52.80 ^d	0.38
Mortality	3.10	0.00	6.30	3.10	3.10	0.42

abcd Means on the same row with different superscript are significantly (P<0.05) different.

Table 3: Carcass characteristics of broiler finisher chickens fed graded levels of Bread fruit seed meal between 5 and 8 weeks of age diets (% replacement)

Parameters	1 (0)	2(10)	3 (20)	4 (30)	5 (40)	SEM
Dressing percentage	78.20	70.70	74.30	69.50	72.30	3.41
Eviscerated weight (g)	1423.50 ^a	1421.30 ^a	1408.20 ²	1088.40 ^b	1083.10 ^b	28.00
Leg (*PLW)	5.00	5.10	5.30	4.70	4.10	0.270
Head (PLW)	2.60 ^{ab}	2.40 ^a	2.70 ^{ab}	3.20 ^b	3.10 ^b	0.140
Neck (PLW)	4.70	4.20	5.10	5.10	4.60	0.390
Wing (PLW)	8.00	6.70	8.00	8.00	8.00	0.380
Breast (PLW)	17.20	14.10	16.60	16.30	14.60	1.320
Back (PLW)	17.00	15.80	18.10	16.50	16.00	1.10
Drumstick (PLW)	11.30	9.70	11.50	11.30	10.20	1.45
Thigh (PLW)	10.80	9.20	10.90	9.70	10.20	0.860
Giblets (PLW)	5.30	4.50	5.50	5.60	5.10	0.200

*PLW = percentage of liveweight. ab Means on the same row with different superscript are significantly (P<0.05) different.

(percentage of live weight) than those of broilers fed diets 2(10), 3(20) and 5(40) except for those on 20% replacement (diet 3). There were no significant (P<0.05) differences among treatments for eviscerated weight, dressing percentages as well as wholesale cuts (leg, head, neck, wing, breast, drumstick, thigh), and giblets. The highest mortality was recorded in diet 3 and no bird died in diet 2. Also, no bird was observed to have shown nutrient deficiency during the study.

Discussion

Results of the study indicated that finisher broiler chickens performance improved (in terms of body weight, weight gain, feed intake, feed per gain ratio, water consumption) when soyabean (SBM) in control diet (Diet 1) was replaced with breadfruit seed meal (BSM). That is up to 20 percent (final weight and weight gain), 10 percent (feed intake), feed per gain (40 percent) and 30 percent (for water consumption). This may be due to improved performance in BSM utilization by broiler chickens but this is in contrast to what have been reported earlier on for broiler starter chickens (Nwokoro and Obasuyi, 2005) but in line with that stated

by Olomu (1995) that broiler chickens at 5 to 8 weeks of age have the ability to adjust feed intake in order to meet the requirements for optimum performance. Beyond these levels, results indicated that performance characteristics of broiler chickens fed BSM diets was inferior to that of broiler fed SBM diets (Table 2).

The reduction in feed intake of birds on BSM supplemented diets may be due to high fibre (Offiong, 1984), growth rate (Sekoni *et al.*, 1991), or imbalance in some nutrients (Ochetim, 1987; Bamgbose *et al.*, 2000) among others. These may also be contributory to observe performance differences.

There were no readily available information on previous works carried out on the evaluation of BSM in Nigeria. The nitrogen retentions were similar and not significantly (P>0.05) different from each other up to the 10% level of BSM inclusion in the diets. However, as indicated in Table 2, the proportion of absorbed nitrogen that was retained by broilers tended to be higher when BSM was increased to the 20% level. Similar trend but not consistent trend was observed for the dressing percentage, eviscerated weight and head measurements.

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