

GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS FED SOY-SESAME BASED DIET SUPPLEMENTED WITH PHYTASE

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Abstract

A 56-day study was conducted to investigate the performance and carcass characteristics of broiler chickens fed soy-sesame based diet supplemented with phytase. Five experimental diets were formulated in which sesame seed meal was replaced at 0, 25, 50, 75 and 100% inclusion level with enzyme supplementation. One hundred and fifty (150) broiler chicks were allotted to five dietary treatments in a completely randomized design (CRD) with three replicates containing ten birds each. Diets were formulated to meet standard requirements. Water and the various treatment diets were offered to the birds *ad libitum* for 8 weeks. Results showed that chicks fed 50% inclusion of sesame seed meal with phytase had significantly ($P < 0.05$) higher final weight gain and feed intake at both phases while the lowest values were recorded for feed/gain ratio varied significantly ($P < 0.05$) during the starter phase (2.58-3.10). The carcass characteristics showed a significant difference ($P < 0.05$) in some of the parameters measured. It can therefore be concluded that sesame seed meal can be included up to 50% in the diet of broiler chickens without any negative effect.

Introduction

Legumes containing anti-nutritional factors in seeds are a major factor limiting the exploitation of alternative grain legumes as protein source for poultry (D'mello, 1994). Anti-nutritional factors have negative effects on digestion and performance of birds (Beric Z *et al.*, 1997). Soya bean meal (SBM) has long been considered the best source of supplement protein in diets for poultry. In fact, it is often referred to as the "gold standard" among intact protein sources used in the animal feed industry (Cromwell GL, 1999). However, soybean meal is becoming extremely expensive in the last decade especially in developing countries, and also the non-availability of this soybean meal at an economically viable price, make the use of alternative protein source in poultry diets necessary. Therefore, search for alternative vegetable protein source, which are cheap and locally available, has become an urgent subject to poultry nutritionist (EL-Husseiny OM *et al.*, 2001) and one of these available alternate protein source is sesame (*sesamum indicum*). It has been demonstrated that the supplementation of poultry diets with exogenous phytases improves mineral retention, bone strength, feed conversion ratio, amino acid digestibility co-efficient and other performance parameter (Rutherford *et al.*, 2002). Phytase enzyme utilization as an additive supplementation in poultry diet is extensive due to public concern surrounding phosphorus pollution and its ability to increase non phytate phosphorus utilization. Phytic acid also reduces the activity of pepsin, trypsin and amylase (Hirose, 1991.,

Kanekol, 2002., Sing *et al.*, 1982). Phytase enzyme supplementation has shown to reduce phosphorus and nitrogen excretion and it can use full for increase digestibility an availability of phytate bound some minerals such as phosphorus calcium copper and zinc (Gordon, 1998., John, 1996). Phytase an enzyme is capable of breaking down phytates in feed to release inorganic phosphorus and inositol as well as protein, amino acid, trace minerals and other nutrients chelated with phytase.

Materials And Methods

150 day-old, unsexed, Marshall broiler chicks were randomly allotted into five treatment groups in a completely randomized design. Each group was replicated three times with ten birds per replicate. Sesame seed meal was toasted and replaced with soybean meal at different inclusion levels (0%, 25%, 50%, 75%, and 100%) respectively and then supplemented with phytase. Body weights and feed intake were determined weekly while FCR was estimated. Mortality was recorded as it occurred. At the expiration of the feeding trial, one bird per replicate with weight closest to the average of the group was selected, weighed, slaughtered and allow to bleed thoroughly. The carcass was defeathered, cleaned, eviscerated and dissected. The cut part (thigh, drumsticks, breast, back and wings) and organs such as liver, kidney, heart, gizzard, spleen, lungs were weighed using sensitive scale. Organs weight were expressed in relative to percentage live weight. The length in absolute values of some

part of the gastro-intestinal tract (GIT) were measured using a metre rule. The carcass and internal organs (liver, heart, gizzard and intestines) were removed, weighed and expressed as a percentage of live weight according to modified kosher method as prescribed by Abe *et al* (1996). All data collected were subjected to Analysis of Variance technique in a completely randomized design using general linear model procedure of SAS (2007). Means of significant result was compared by Duncan's multiple range test.

Results And Discussion

Growth Performance of broiler chicks fed soy-sesame based diet

The growth performance of the starter and finisher broilers fed soy-sesame based diets supplemented with phytase are presented in Table 3 and 4 respectively. At the starter and finisher phases, the results shows that all parameters varied significantly ($p < 0.05$) across the dietary treatment. At the starter phase, the highest value of 454.67, 17.55, and 50.60 respectively were recorded for birds fed 50% inclusion of sesame seed meal supplemented with phytase while the lowest value of 329.67, 13.24 and 34.42 were recorded for final weight, weight gain and feed intake respectively for birds fed 100% inclusion of sesame seed meal with phytase supplementation. The statement implies that there was a significant ($p < 0.05$) interaction effect of enzyme on soy-sesame based diet fed broiler chickens at 50% inclusion. At the finisher phase, It was recorded that birds fed 50% inclusion of sesame seed meal had the highest value of 1943.33, and the trend was also the same for weight gain and feed intake as birds fed 50% of sesame seed meal with enzyme had the highest value of 61.17 and 76.19 respectively. The lowest value of 1800.00 was recorded for birds fed 100% with inclusion of phytase and follows the same trend with the weight gain and the feed intake. This agrees with feed intake and weight gain reported by (adetola *et al.*, 2012) for broilers fed toasted sesame seed, as a result of the bitter taste and high phytate content of the sesame seed. It also agrees with (olomu, 1980) that sesame seed meal which has a higher content of methionine than most plant protein supplement when used in the right proportion together with soy-bean which also has a higher content of lysine, will result in a balanced diet of lysine and methionine. Besides, the feed conversion ratio varied significantly ($p < 0.05$) across the dietary treatment at both phases, though at the starter phase, the lowest value 2.60 was recorded for birds fed 100% inclusion of sesame seed meal followed by 2.88

which was recorded for birds fed 50% inclusion of sesame seed meal with enzyme phytase supplementation, this may be due to the fact that birds fed 100% inclusion of sesame seed meal had the lowest feed intake which in turn enable birds to utilize the little ingested feed very fast and efficiently. Generally, birds eat to satisfy energy requirement and will reduce intake drastically as soon as this is satisfied (Ngi; 1999).

Similarly exogenous enzyme supplementation enhances nutrient bioavailability through elimination of anti-nutritive value of certain dietary component, hydrolysis and solubilization of bound nutrient, ultimately resulting in improved performance (Sloniski, 2011). This study has also revealed the high capacity of broiler chickens and their gut microbiota to hydrolyze phytate. In Addition, the result observed could probably be due to the fact that the birds were able to utilize the feed effectively up to 50% inclusion of sesame seed meal which is evidence that a positive correlation existed among dietary treatment with enzyme inclusion.

Carcass characteristics of broiler chicks fed soy-sesame based diet supplemented with phytase

The result of carcass characteristics of broiler chickens fed experimental diets for 56 days are presented in table 5. There were significant ($P < 0.05$) differences for live weight and eviscerated weight but the dressing percentage was not significantly ($P < 0.05$) different. The weight of thigh, wings drumsticks and breast compared favourably with the report of Oluyemi and Robert (1988) but were higher than the values reported by Diarra *et al* (2007). These differences may be due to the breed of the birds used for the study, variety of sesame seed used and the climatic factor of the experimental site. For the organs and weight, there were no significant ($P > 0.05$) differences in the parameters measured. The fact that all the internal organs measured showed no significant ($P > 0.05$) difference in size means that the test did not contain any appreciable anti-nutritional factors (ANF's) that could be detrimental to the organs.

Conclusion

Based on the findings of this study, it can be concluded that Sesame seed meal has a very high potential as a feed resource in poultry nutrition. Its contents of phytic acid still possess some limitations to its use as a feed resource. Supplementing it with enzyme phytase has a significant effect on growth traits. Birds fed 50% inclusion level of SSM supplemented with phytase had the best performance in all parameters measured. Carcass characteristics of birds fed soy

sesame based diet supplemented with phytase significantly affected some parameters.

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Table 1: Gross composition of experimental diet (starter phase)

Ingredients (%)	T1	T2	T3	T4	T5
Maize	51.00	51.00	51.00	51.00	51.00
Soybean meal	24.00	18.00	12.00	6.00	-
Sesame seed meal	-	6.00	12.00	18.00	24.00
* Others	25.00	25.00	25.00	25.00	25.00
Total	100.00	100.00	100.00	100.00	100.00
Calculated composition					
Crude protein (%)	22.79	21.99	21.59	21.89	21.50
Metabolizable energy (kcal/kgME)	2887.85	2854.55	2820.50	2843.55	2860.36

* Others fixed ingredient: GNC – 4.00; Wheat Offal – 6.30; Fish meal – 1.5; Bone Meal – 3.00; Oyster Shell – 1.0; Premix – 0.3; Lysine – 0.3; Methionine 0.3; Salt – 0.3.

Table 2: Gross composition of experimental diet (finisher phase)

Ingredients (%)	T1	T2	T3	T4	T5
Maize	59.00	59.00	59.00	59.00	59.00
Soybean meal	24.00	18.00	12.00	6.00	-
Sesame seed meal	-	6.00	12.00	18.00	24.00
* Others	17.00	17.00	17.00	17.00	17.00
Total	100.00	100.00	100.00	100.00	100.00
Calculated composition					
Crude protein (%)	21.00	20.23	20.18	20.13	20.25
Metabolizable energy (kcal/kgME)	2980.66	2975.55	2977.18	2903.93	2961.37

* Others fixed ingredient: GNC – 4.00; Wheat Offal – 6.30; Fish meal – 1.5; Bone Meal – 3.00; Oyster Shell – 1.0; Premix – 0.3; Lysine – 0.3; Methionine 0.3; Salt – 0.3.

Table 3: Growth Performance of broiler chickens fed soy -sesame based diets supplemented with phytase (0-4wks)

Parameters	SBM:SSM 100:0 (-Phytase)	SBM:SSM 75:25 (+Phytase)	SBM:SSM 50:50 (+Phytase)	SBM:SSM 25:75 (+Phytase)	SBM:SSM 0:100 (-Phytase)	SEM
Initial weight(g/bird)	39.88	39.90	39.82	39.83	39.82	0.04
Final weight (g/bird)	423.33 ^b	412.00 ^b	454.67 ^a	433.33 ^{ab}	329.67 ^c	1.96
Weight gain(g/bird)	16.15 ^{bc}	15.57 ^c	17.55 ^a	16.75 ^{ab}	13.24 ^d	1.85
Feed intake(g/bird)	49.56 ^{ab}	48.30 ^b	50.60 ^a	48.99 ^{ab}	34.42 ^c	1.62
FCR	3.08 ^b	3.10 ^c	2.58 ^{ab}	2.92 ^{ab}	2.60 ^{ab}	0.05

^{abcd} indicate in the same row with different superscript are significantly different (P<0.05)**Table 4:** Performance Characteristics of broiler chickens fed soy -sesame based diets supplemented with phytase (5-8wks)

Parameters	SBM:SSM 100:0 (-Phytase)	SBM:SSM 75:25 (+Phytase)	SBM:SSM 50:50 (+Phytase)	SBM:SSM 25:75 (+Phytase)	SBM:SSM 0:100 (-Phytase)	SEM
Initial weight(g/bird)	553.25	556.35	550.66	540.36	500.15	4.66
Final weight (g/bird)	1891.67 ^{ab}	1800.00 ^b	1943.33 ^a	1835.00 ^b	1850.00	17.00
Weight gain (g/bird)	57.25 ^{abc}	53.83 ^{bc}	61.17 ^a	58.56 ^b	51.18 ^c	1.22
Feed intake (g/bird)	79.64 ^a	76.37 ^{ab}	79.99 ^a	73.29 ^{ab}	72.20 ^b	1.01
FCR	1.39	1.42	1.22	1.23	1.41	0.03

^{abcd} indicate in the same row with different superscript are significantly different (P<0.05)**Table 5:** Carcass Characteristics of broiler chickens fed soy -sesame based diets supplemented with phytase

Parameters	SBM:SSM 100:0 (-Phytase) PC	SBM:SSM 75:25 (+Phytase)	SBM:SSM 50:50 (+Phytase)	SBM:SSM 25:75 (+Phytase)	SBM:SSM 0:100 (-Phytase) NC	SEM
Live weight(g)	2100.00 ^{ab}	2066.70 ^b	2333.30 ^a	2066.70 ^b	1866.70 ^c	74.24
Pluck weight(g)	1883.30 ^{ab}	1850.00 ^b	1966.70 ^a	1783.30 ^b	1583.30 ^c	66.81
Eviscerated weight(g)	1566.70 ^{ab}	1533.30 ^b	1633.30 ^a	1450.00 ^b	1300.00 ^c	61.81
Dressed weight(g)	1383.30 ^{ab}	1400.00 ^b	1466.70 ^a	1300.00 ^b	1166.70 ^c	57.29
Dressing percentage (%)	65.66	67.74	62.67	62.81	62.29	0.98
Primal cuts (%)						
Breast	17.41 ^{ab}	19.33 ^a	16.04 ^{ab}	15.98 ^{ab}	14.33 ^b	0.68
Back	11.10	11.31	11.34	9.58	10.79	0.35
Thigh	10.58	9.61	9.42	9.96	9.59	0.23
Spleen	0.05 ^b	0.05 ^b	0.04 ^b	0.05 ^b	0.09 ^a	0.00
Drumsticks	10.95	10.09	10.21	10.26	10.77	0.20
	8.81 ^a	7.78 ^b	7.76 ^{ab}	7.71 ^a	8.06 ^b	0.14
Neck	4.61	4.39	4.79	4.47	4.04	0.17
Shank	4.38 ^a	3.50 ^b	3.88 ^{ab}	4.38 ^a	4.45 ^a	0.14
Relative organ (%)						
Heart	0.47	0.38	0.44	0.34	0.44	0.03
Liver	2.17	1.85	2.06	1.85	1.82	0.08
Lung	0.64	0.45	0.51	0.45	0.57	0.02