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Performance and Tenderness of Meat-type Chicken Fed Soybean and Benniseed Based Diets Supplemented with Microbial Phytase.

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Abstract

This experiment was designed to investigate the performance and shear-force (tenderness) of meat-type chicken (broiler) fed Soybean Meal (SBM) and Benniseed based diets supplemented with microbial phytase. 168 Arbor acre strain of broiler chicks were used with Phytase activity of 5000 units/ g, two levels of phytase inclusion were used in the study (300 and 600 FTU/kg) in a completely randomized design.Birds were allotted into six treatments, with four replicates of 7 birds per replicate. Parameters measured include Body Weight Gain (BWG), Feed Intake (FI) and Feed Conversion Ratio (FCR) which were measured weekly. 2 birds/ replicate were sacrificed at the end of 56days trial and birds were eviscerated and split into primal cuts (thigh, breast and drumstick). The boiled primal cuts were used for the Shear-force assessment. At the end of the 56 days, the FI revealed a significant increase in birds fed Benniseed based diet with 300FTU (101.98g/bird/day) compared to birds on SBM (93.23g/bird/day) and birds fed Benniseed based diet also had the best BWG of 2212.50 g compared to SBM based diet with 1557.50g both with 300FTU phytase activity. The birds on Benniseed based diets also had a more tender muscle.

Introduction

The animal protein deficit in the diets of Nigerians and people of most developing countries is now a matter of urgent concern and measures to save people from imminent protein malnutrition are imperative. However, poultry products have high potentials for bridging the animal protein gap considering the fact that high yielding exotic poultry adapt easily to our environment and the technology of production is relatively simple with high returns to investment (Madubuike, 1992).

Oluyemi and Roberts (2000) stated that poultry meat used to be derived predominantly from spent layers in the developing countries but there is an increasing shift to broilers. Majority of the phosphorus (P) in plants is contained in chemical structures called Phytate. Phytate-P is relatively unavailable to monogastric animals. In order to increase phytate phosphorus availability present in vegetal ingredients and to reduce the quantity of inorganic phosphorus added to diets, 'phytase' an enzyme that hydrolyses phytic acid to inositol and phosphoric acid has been used in monogastric diets, obtaining positive effects on mineral availability (Broz *et al.*, 1994).

Materials and method

Management of experimental birds:

The birds were mass brooded on the deep litter for two weeks before they were randomly distributed into treatments. A common starter ration of (130 caloric-protein ratio) 23% crude protein and 3000 kcal/kg metabolizable energy was fed to the birds. Fresh cool water and feed were provided *ad libitum* to the birds throughout the period of the experiment and routine medication was administered.

Data collection:

The distribution of the birds into treatments at the third week marked the beginning of the experiment. The weights of the broiler chicks were taken at the commencement of the experiment and subsequently on a weekly basis. Feed intake (FI), body weight gain(BWG) and feed conversion ratio(FCR) were taken. The data obtained were subjected to one-way analysis of variance using the general linear modelling procedure.

Shear force:

Cooked chicken samples were cooled to 20 °C and two cores were removed parallel to longitudinal orientation of muscle fibres for mechanical assessment of tenderness. The tenderness was evaluated by using a Warner-Bratzler shear-force machine according to the method from Honikel, 1998. All samples were sheared perpendicular to the fibre direction.

Results and discussion

Performance characteristics of birds

The performance of broiler finishers fed soybean and beniseed-based diets supplemented with microbial phytase shown in Table 1 revealed that birds on treatment 5 had the highest FI and BWG of 101.98g/day and 48.60g/day respectively which were not significantly different (P>0.05) from treatments: 6 with (97.53g/day and 44.23g) for FI and BWG and 3,4, both with (96.95g/day FI). These values support the report of Den bow *et al.* 1995; that microbial phytase increased FI, BWG and FCR in broiler chicken. However, there was a significant difference (P<0.05) between treatment 5 with (101.98g and 48.60g/day) and treatment 2 (93.23g/day and 33.50g/day) for FI and BWG respectively both with 300FTU phytase activity.

The mean values of 33.50 and 38.33 obtained from treatments 2 and 3 of 300FTU and 600FTU phytase activity were in agreement with Omojola, 2007 that the inclusion of exogenous enzyme did not significantly (P>0.05) improve the FI, BWG, FCR and dry matter digestibility of broiler chickens fed diets supplemented with graded levels of Roxazyme G~A,A®. The high values recorded in treatments 4, 5 and 6 could therefore be attributed to the presence of benniseed in the diets.

Birds in treatments 5 and 6 had the least FCR values of 2.08 and 2.21 respectively which is in agreement with the report of Shirley and Edwards (2003), Marsman *et al.*1997 and Zanella *et al.*1999; that enzyme products improved weight gain in broiler birds fed a maize-soya diet. Birds in treatment 2 had the highest value of 2.79.This report disagreed with the reports of Marsman *et al.*1997 and Zanella *et al.*1999.

Shear Force

The treatment means of breast-cut (Table 2) for diet 5 significantly differed (P<0.05) from all others with a mean value of 5.30, followed closely by treatments 6 of 4.59, 4, 3 and 1 respectively. There was no significant difference (P>0.05) between treatments for the thigh. There was a significant difference (P<0.05) between treatments 4 of 3.87 and 5 of 2.39 for the drumstick.

Conclusion

The results of this experiment indicated at 56 days, that birds fed Benniseed based diet with 300FTU microbial phytase supplementation had the best performance compared to those on SBM based diets without benniseed inclusion. The birds on Benniseed based diets also had a more tender muscle.

It can be concluded that benniseed could be incorporated into broiler diets with 300FTU microbial phytase supplementation for efficient production of broiler chickens as these together improve the weight and tenderness of the carcass.

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Table:1 Performance Of Exerimental Birds

PARAMETERS	T1	T2	T3	T4	T5	T6	SEM	P-Value
Final weight (g)	1670.00^{de}	1557.50^{e}	1767.50^{cd}	1862.50^{bc}	2212.50^{a}	2020.00^{b}	56.06	<.0001
Initial weight (g)	170.00	150.00	157.50	160.00	170.00	162.50	7.95	0.4811
Average weight gain (g/day)	37.13^{cd}	33.50^{d}	38.33^{c}	40.83^{bc}	48.60^{a}	44.23^{b}	1.30	<.0001
Average feed intake (g/day)	92.65^{b}	93.23^{b}	96.95^{ab}	96.95^{ab}	101.98^{a}	97.53^{ab}	1.77	0.0188
Feed Conversion Ratio (FCR)	2.52^{b}	2.79^{a}	2.50^{b}	2.38^{bc}	2.08^{d}	2.21^{cd}	0.07	s <.0001

^{a,b,c} Means along the same row with similar superscripts are not significantly (P>0.05) different from each other.

Table 2: Shear Force Assessment Of Primal Cut

PARAMETERS	T1	T2	T3	T4	T5	T6	SEM	P-Value
Breast	3.59^{bc}	3.25^{c}	4.17^{abc}	4.49^{abc}	5.30^{a}	4.59^{ab}	0.40	0.02
Thigh	3.50	3.30	3.19	3.51	3.45	3.87	0.23	0.42
Drumstick	2.56^{ab}	2.98^{ab}	3.13^{ab}	3.87^{a}	2.39^{b}	3.06^{ab}	0.44	0.27

T1 & T4 (0 FTU), T2 & T5 (300FTU), T3 & T6 (600FTU)

Means along the same row with similar superscript are not significantly different (P>0.05) from each other.

Table 3: Gross Composition Of Finisher Diets (G/Kg)

INGREDIENTS	T1	T2	T3	T4	T5	T6
Maize	59.30	59.30	59.30	54.20	54.20	54.20
Soybean meal	28.40	28.40	28.40	22.40	22.40	22.40
Benni-seed	-	-	-	13.10	13.10	13.10
Wheat offal	3.00	3.00	3.00	3.00	3.00	3.00
Fish 72%	2.50	2.50	2.50	2.50	2.50	2.50
Palm oil	3.00	3.00	3.00	1.00	1.00	1.00
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.15	0.15	0.15	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Oyster	1.05	1.05	1.05	1.10	1.10	1.10
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Phytase (FTU) (g)	-	0.06	0.12	-	0.06	0.12
TOTAL	100	100	100	100	100	100
ME Kcal/Kg (DM)	3061.2	3061.2	3061.2	3363.44	3363.44	3363.44
Crude protein (%)	21.02	21.02	21.02	21.09	21.09	21.09
% Phosphorus	0.75	0.75	0.75	0.77	0.77	0.77
% Calcium	1.52	1.52	1.52	1.57	1.57	1.57

T1 and T4- Diets of soybean and benniseed without phytase supplementation.
T2 and T3- Diets of Soybean with 300 and 600 phytase units respectively.
T5 and T6-Diets of soybean and benniseed with 300 and 600 phytase units respectively.
Phytase: 300unit = (0.06g) 600unit = (0.12g)