INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Response of Finisher Broilers to Graded Levels of Soyabean Hull and Supplementary Enzyme

Dr. Geoffrey Nkwocha A.
Senior Lecturer, Department of Animal Production and Health Technology,
Animal Nutrition and Biochemistry, Imo State Polytechnic, Umuagwo-Ohaji, Owerri, Imo State, Nigeria
Dr. Anukam, K. U.
Chief Lecturer, Department of Animal Production and Health Technology, Veterinary Medicine,
Animal Management, Imo State Polytechnic, Umuagwo-Ohaji, Owerri, Imo State, Nigeria

Abstract:
The aim of this 28-day feeding trial was to examine the possibilities of effective utilization of soya bean hull (SBH) by supplementing with liptozyme enzyme in broiler rations so as to enhance performance and carcass yields. One hundred and twenty unsexed day-old broiler chicks of the Anak breed were purchased from a Commercial hatchery in Owerri, Imo State. 4 broilers finisher diets were formulated to contain soyabean hull at 0%, 5%, 10%, and 15% dietary levels designated SBH_0, SBH_5, SBH_{10}, and SBH_{15} respectively and were used to feed 120 broiler finishers. The birds were divided into 4 groups of 30 broilers per treatment and replicated 3 times with 10 birds per replicate: The treatments were randomly assigned to the birds in a Completely Randomized Design (CRD). Result indicates significant differences ($P<0.05$) in daily weight gain, feed conversion ratio and cost of feed between the control group and those fed SBH based diets especially beyond 10% inclusion level. There were significant differences ($P<0.05$) between the control diet (SBH_0) and SBH based diets in dressed weight, breast muscle, drumsticks weight and dressing percentage decreasing with increasing dietary level of SBH except the gut content (organ weights) such as intestine and liver which significantly increased ($P<0.05$) with increasing dietary level of SBH. Broiler finishers can tolerate upto 15% level of soyabean hull for profit maximization and reduction of the cost of production hence a booster to animal protein intake among the Sub-Saharan African countries.

1. Introduction

The Supply and demand deficit gap in animal protein requirement of the Nigeria Populace is a critical issue of serious concern considering the degree of malnutrition, infant mortality rate, food insecurity amidst geometrical increase in human population (Nkwocha *et al.*, 2010).

Nigeria's per capita daily protein intake is estimated to be 45.4g and Nigeria's greatest problem is that of inadequate animal protein (hyacinth and Kwabena, 2015).

It is against this back drop back drop that the utilization of industrial by-products such as soyabean hull should be embraced to remedy the ongoing animal protein starvation among Nigerian population (Madubuike, 2012).

Soyabeans are grown primarily for the production o f vegetable oil for human consumption but the byproduct after oil extraction is of great importance as feed ingredients (soystat, 2012). Soyabeans is used in feed formulation for monogastric animals mainly due to the high protein content and the superior amino acid profile compared with other plant protein products used as diet ingredients (Sauvant, *et al.*, 2004).

The outrageous price of whole soyabeans is due to competition between man and monogastrics for this product. The use of the hull (by-product) in the livestock industry is a step in the right direction to cushion the total cost of production. Soya bean hulls are a by-product of the extraction of oil from soyabean seeds. (Tetgemeyer, 2000). The hull from its nutritional view point contains fibre and some ant-nutritive factors (ANF) which may impact on digestibility and feed utilization. (Anuradha and Roy, 2015).

This constraint can be eliminated by the incorporation of dietary exogenous enzymes capable of degrading or disruption of intact cell walls and releasing of entrapped nutrients (O' Connell *et al.*, 2005; mateo *et al.*, 2008). Although soyabean hull has long been used in the feeding of domestic animals, but there is dearth of information on optimal dietary level when treated with multi-enzyme for use in broiler finisher. This study was aimed at addressing this problem as well as x-raying the economic benefits of using this test ingredient as alternative feed resource for broiler finisher birds.

2. Materials and Methods

2.1. Location of the Experiment

The experiment was carried out at the poultry section of the Imo State Polytechnic Research and Teaching farm, Umuagwo, Ohaji, Imo State, Nigeria. The climatic data obtained from NIMET, 2015 has it that the annual rainfall ranges from 2000-3000mm per annual, temperature is between 26.5-27^{0}C and humidity 70% - 80% while latitude is 50^{0}N and longitude 74^{0}E.

2.2. Experimental Birds Design

One hundred and twenty (120), 4-week old Anak broilers used for the study were obtained from Sunchris farms, Enugu State certified to be of good health and physical stability. The birds were divided into 4 treatment groups of 30 birds each in a Completely Randomized Design. Each treatment was replicated three times (i.e. ten birds per replicate) in a deep litter system each measuring 4.8 x 3m. Optimum routine management practices were obtained and birds were fed *ad libitum.*

2.3. Experimental Diets and Feed Formulation

The soyabean hull and supplementary enzyme (liptozyme) used for the experiment were obtained from Fidelity Agro Service, (Nig.), Owerri, Imo State. The sample of the milled soyabean hull was analyzed for proximate composition (AOAC, 2000) and used in the formulation of four isonitrogenous (CP-20±0.162) and isocaloric (2808.90±89.15Kcal/kg) treatment diets (Table 2). Liptozyme enzyme was injected at the same rate except the control diet with zero level of inclusion. Four experimental diets were formulated and designated as SBH_0, SBH_5, SBH_{10} and SBH_{15}, respectively. Initial weights of birds were taken at the beginning of the experiment and body weight changes taken thereafter on weekly basis for 28 days. Daily feed intake was determined by obtaining the difference between the quantity of feed given and the quantity left over. Feed conversion ratio and feed cost/kg live weight were computed accordingly.

FRACTION	Percentage
Moisture content	9.56
Ether extract	12.45
Crude fibre	19.25
Ash	8.43
Crude protein	19.27
Nitrogen free extract	31.08
ME/CAL/KG	2824.78KJ/G

Table 1: Proximate Analysis of Soyabean hull (% dry matter)

ME = Metabolizable energy calculated: ME (Kcal/kg) =37x%CP +81 X %EE +35.5 X% NFE (Pauzenga, 1985).

INGREDIENTS	SBH_0	SBH_5	SBH_{10}	SBH_{15}
Maize	52	55	48	44
Wheat offal	8	3	5	4
Groundnut cake	27	25	25	25
Soyabean Hull	0	5	10	15
Palm kernel cake	6	5	5	5
Fish meal	3	3	3	3
Salt	0.25	0.25	0.25	0.25
Bone meal	3.20	3.00	3.00	3.00
Vitamin premix	0.30	0.30	0.30	0.30
Lysine	0.25	0.25	0.25	0.25
Liptozyme	-	0.20	0.20	0.20
Total	100	100	100	100
Crude Protein	20.76	20.66	20.64	20.60
ME (Kcal/kg)	2808.90	2896.05	2848.35	2847.45
Crude fibre	5.62	5.78	6.13	6.41
Ether Extract	5.53	5.25	5.00	4.78
Ash	1.92	1.84	1.75	1.69
Lysine	0.65	0.61	0.59	0.58
Methionine	0.23	0.22	0.21	0.20
Phosphorus	0.38	0.38	0.36	0.33

Table 2: Percentage Composition of the Experimental Diet

To provide the following per kilogram diet
Vit. A: 100iu: Vit. E: iuVit K: 2.5mg; Riboflavin. 5.5mg; Vitamin 12. 0.01mg; Vitamin 6, 0.01; Pathothenic acid. 6mg. Niacin. 5mg: Chlorine. 3mg; Folic acid, 4mg mn. 8mg; Zinc. 0.5mg. Iodine. 1.0mg; Cu. 10mg Fe. 20mg

2.4. Carcass Evaluation

At the end of the 28 days feeding trials, 2 birds from each of the treatments were randomly selected and starved of food but not water for 8 hours overnight, weighed and immobilized by stunning, slaughtered by severing the jugular vein. The dressed weights and the respective characteristic carcass/organ weights were obtained in line with Nwoche *et al.*, (2006). The relative weights of each carcass were expressed as percentage of dressed carcass weight.

Linear body parameters such as the wing length, body length, thigh circumference, shank length, head circumference, wing length, heart girth/breast muscle were measured in centimeters (CM) using a measuring tape and the weight of feather, head, breast, drumstick, thighs, shanks and wings were also determined in grams (g) using weighing balance.

2.5. Statistical Analysis

At the end of the experiment, data were subjected to statistical analysis determine statistically whether there is significant difference between the treatments. All the data collected at the end of the experiment were subjected to one-way Analysis of variance (Steel and Torie, 1980), while differences in treatment means were compared with Least Significance Difference (LSD) as described by Snedecor and Cochran (1980).

3. Results and Discussion

Nutrient assay of SBH revealed that the ingredient contained 19.27%CP and 2824.78kcal/kg ME. The other fractions notably ether extract, crude fibre, ash, nitrogen free extracts (NFE) recorded 12.45, 19.25, 8.43 and 31.08% respectively (table 1). The crude protein and ether extract concentration obtained in this study was slightly lower than the values recorded by Esonu *et al.*, (1997), while the crude fibre, nitrogen free extract (NFE) and Caloric values are comparatively similar. The differences in nutrient composition may be due to varieties, soil type, genetics and harvesting conditions of the plant (Atta, 2003).

The performance characteristics of finisher broilers on graded levels of SBH supplemented with enzyme are shown in table 3. The birds on T_4 (SBH_{15}) recorded the highest daily Feed intake of 111g followed by T_3 (SBH_{10}) with the value of 110g while T_2 (SBH_5) and T1 (SBH_0) recorded 110g and 102g respectively. Treatment one(SBH_0) was least consumed but however, recorded the highest weight gain while T_4 (SBH_{15}) which consumed the highest feed but conversely recorded the lowest weight gain of 26.07g/day. T_3 (SBH_{10}) and T_4 (SBH_{15}) significantly different (P<0.05) from T_1 (SBH_0) and T_2 (SBH_{10}) in feed consumption rates probably due to the dietary energy in the treatment diets, hence birds will continue to eat until the energy requirement is satisfied (Fetufe *et al*., 2007; Ranjhan, 2000; Augenstein, 1997).

The decreased weight gain recorded by birds on soyabean hull may be attributed to the higher level of fibre content that often dilute nutrients and impairs absorption/assimilation (Noblet and Le Goff, 2001) hence the inability of birds to meet their production and metabolic requirements. Moreover, the decreased weight gain may be due to anti-nutritive factors inherent in the soyabean hull. According to clavijo and manner, (2004), wavenham *et al*., (2004) and luiz, (2008), the anti-nutrient factors notably protease inhibitors, lactins, tannins, phytic acid, trypsin and hemoglutinins can reduce the availability, absorption and utilization of nutrients for productive purposes as SBH increased in the diets. Feed conversion which is a function of nutrient absorption was highest in the control diet (SBH_0) (3.10) and poorest in (SBH_{15}) (4.26). From all indications, it appears that the application of liptozyme did not enhance nutritional value and utilization of soyabean hull based diets as feed conversion significantly (P<0.05) reduce with increase in dietary SBH.

The cost of producing 50kg feed reduced significantly (P< 0.05) with increase in the dietary SBH across the treatment diets, an indication of cost effectiveness of the test ingredient. Cost reduction using unorthodox/unconventional feed ingredient is a very big challenge in the poultry industry and the incorporation of SBH may increase profitability (Maynard *et al*, 1979).

The data on carcass/organ weight expressed in percentage of dressed weight are shown in table 4. Broiler birds on the control diet significantly (P<0.05) promoted better dressed weight, breast weight and dressing percentage than SBH based diet. The organ weight of birds in the control diet were significantly (P<0.05) small an indication of superior prime cuts and carcass meatiness (Agunbiade, 2000). The liver and intestine obtained from birds on the SBH based diets were significantly (P<0.05) heavier than that of the control diet while the decreased dressed weight and enlargement of the gastro-intestinal tract (liver and intestine) was attributed to the effect of the fibre in the diets that favours the growth of these organs instead of muscle and bone development. Similar reports were obtained when high fibre feeds stuffs such as spent grain, sesame and tiger nut meals (cyperus esculentis) were feed to finisher broilers (Agbabiaka *et al*., 2012). T_2 (SBH_5) was significantly (P<0.05) higher in anthropometric traits such as body length, shank length, head circumference and wing length (CM) but the values however, aligns with the work of Ogbonna *et al*., (2000) and Madubuike *et al*, (2003) in similar studies carried out on broiler chickens.

	Dietary levels of SBH (%)				
Parameters	SBH_0	SBH_5	SBH_{10}	SBH_{15}	SEM
Initial body weight(g)	540^a	500^a	510^a	520^a	0.005
Final body weight (g)	1460^a	1300^b	1320^b	1250^b	0.02
Average daily feed intake (g)	102^a	108^b	110^a	111^b	0.001
Average daily weight gain (g)	32.86^a	28.57^b	28.93^b	26.07^a	0.34
Average weight gain (g)	920^a	800^b	810^b	730^c	0.005
Feed conversion ratio	3.10^d	3.78^c	3.80^b	4.26^a	0.09
Cost / 50kg feed	5544^a	4536^b	4032^c	3528^d	231.0

Table 3: Performance of broiler finisher fed diets containing graded levels of SBH

Mean along the rows having differed superscript of letter differed significantly at P = 0.05 level

PARAMETERS	Dietary levels of SBH				
	SBH_0	SBH_5	SBH_{10}	SBH_{15}	SEM
Starved Live Weight (g)	1.47^a	1.32^a	1.35^a	1.30^a	0.01
Dressed Weight (kg)	1.02^a	0.87^b	0.87^b	0.85^b	0.006
Dressing %	69^a	66^b	64^b	65^b	1.25
Gizzard % Live Weight	2.42^{bc}	3.90^a	2.33^c	2.50^b	0.05
Liver % Live Weight	0.81^c	0.98^{ab}	0.95^b	1.00^a	0.02
Intestine % Live Weight	3.42^d	4.37^c	4.71^b	5.90^a	0.17
Body Length (cm)	23.19^b	24.24^a	23.11^b	23.05^b	0.03
Shank Length (cm)	9.26^c	10.44^a	10.00^b	9.23^c	0.02
Head circumference (cm)	12.82^c	13.56^a	13.46^{ab}	13.30^b	0.08
Thigh circumference (cm)	16.85^a	14.82^c	16.00^b	16.85^a	0.43
Wing Length (cm)	16.04^c	19.56^a	19.43^a	18.40^b	0.07
Feather weight (g)	100.51^a	90.56^b	90.00^b	65.00^c	0.28
Eviscerated weight (g)	175.90^c	207.06^a	192.86^b	162.50^d	6.70
Head weight (g)	29.13^b	45.29^a	29.71^b	16.25^c	0.29
Neck weight (g)	60.85^b	64.71^a	64.29^a	45.50^c	0.21
Breast muscle (g)	213.59^a	181.18^c	192.86^b	195.00^b	1.07
Drumstick weight (g)	154.29^d	148.82^b	130.00^a	120.23^c	7.41
Thighs weight (g)	94.23^c	103.53^b	96.43^c	130.00^a	1.10
Shanks weight (g)	43.97^d	51.12^b	54.43^a	45.50^c	1.70
Wings weight (g)	100.51^b	103.53^b	115.71^a	78.00^c	1.51
Back weight (g)	226.15^a	226.47^a	199.29^b	182.00^c	0.16
Mean along the rows having different superscript of letter differed significantly at P = 0.05 level (FLSD).					

Table 4: Carcass Characteristics of broiler finishers fed graded levels of Soyabean Hull

4. Conclusion

The study has shown that soya bean hull is a potential alternative protein source for broiler finishers. Broiler finisher birds can tolerate upto 15% level of soyabean hull for profit maximization and reduction of cost of production hence a booster to animal protein intake in the Sub-Saharan African countries.

5. References

i. Agbabiaka L.A (2012). Evaluation of Tigernut meal (Cyperus esculentus) as replacement for maize in African catfish and Broiler Diets Ph. D Thesis, Department of Animal Science and Fisheries, Imo State University, Owerri. Nigeria. 172p.
ii. Agunbiade J.A., (2000). Utilization of two varieties of full fat and simulated soyabean in meal and pelleted diets by broiler chickens. Polym. Int. 49:1529-1537.
iii. Anuradha, P. and Roy, B. (2015). Effect of supplementation of fibre degrading enzymes on performance of broiler chicks fed diets containing deoiled rice bran – Asian Journal of Animal and Veterinary Advances, 10: 179 – 184.
iv. Augenstein, M.L.; L.J., Johnston, G.C., Shurson, J.D., Hawton and J.E., Pettigrew. (1997). Formulating farm-specific swine diet. Regents of the university of Minnesota Extension Service, America (pp 6-10).

v. Clavijo, H and J. Manner, (2004). The use of waste banana forswine fed TPI Conf. Proc. PP 99-106.

vi. Fetufe, A. A., Akanbi, I. O., Saba, G. A., Olowofeso, O. and Tewe, O.O. (2007): Growth performance and nutrient digestibility of growing pigs fed a mixture of palm kernel meal and cassava peel meal. Livestock Res. Rural Dev, 19: 180.

vii. Hyacinth, O. E. and Kwabena, G. B. (2015). Determinants of change and household responses to food insecurity: Empirical evidence from Nigeria. Academic Journal, 10: (5): pp 423 – 433.

viii. Luiz, L. (2008). Reduce feed costs with energy- releasing enzymes. In feed International, Watt magazine, Rockford, Illinois, USA. 29(5): 5-7. www.feedindustryNetwork.com.

ix. Madubuike, F.N.; E.A., Agiang, B.U., Ekenyem and E.O., Ahaotu (2003). Replacement value of rubber seed cake for groundnut cake on performance of starter broilers. J. of Agric & food SC. Vol. (1) pp 21-27

x. Madubuike, F.N (2012). Bridging the animal protein supply and demand gap in Nigeria. 7th Inaugural lecture of the Imo State University, Owerri, Nigeria, 79p.

xi. Mateo, R., Hwang, S., Ryu, D. and Chu, P. (2008). Multi-enzymes can maximize swine diet nutrients. In feed International, 29 (1): 24 – 26.

xii. Maynard, L.A.; J.A., Loosli, H.F., Hints and H.S., Warner (1987). Animal Nutrition, 7th edition. Taba Mcgraw Hill, Bombay, India.

xiii. Nigeria meteorological Agency (NIMET), (2015). Seasonal weather prediction. (NIMET Govt.ng/content/nimet-weather).

xiv. Nkwocha, G.A.; B.U., Ekenyem, K.U., Anukam and F.N., Madubuike (2010). Performance and carcass characteristics of broiler finisher birds fed varying dietary levels of pineapple wine sediment meal. Anim. Prod. Res. Advances, 6(2):92-95.

xv. Noblet J., Le Goff GI. Effect of dietary fibre on the energy value of feeds for pigs. Anim Feed Sci. Technol. 2001; 90:35 - 52

xvi. Nwoche, B.M.; E.C., Ndubuisi and F.C., Iheukwumere (2006). Performance of finisher broilers and cost implications of feeding palm oil as an energy supplement. Nig. Agric. J., 27:44-49.

xvii. O' Connel J. M., Sweeney T., Callan, J.J. and O' Doherty, J. V. (2005). The effect of cereal type and exogenous enzyme supplementation in pig diet on nutrient digestibility, intestinal microflora, volatile fatty acid concentration and manure ammonia emissions from finisher pigs. Anim. Sci. (81):357 – 364.

xviii. Ogbonna, J.U., A.O. Oredein and A.K. Ige (2000). Effects of varying dietary levels of cassava leaf meal in broiler gyt morphology. Proc.25 Annual conf. NSAP, Umudike PP. 143-146.

xix. Pauzenga, U. (1985). Feeding Parent Stock. J. Zoo Tech Int'l, 22-24.

xx. Ranjhan, S.L. (2000). Animal Nutrition in the Tropics. 2nd edition, Vikas pub. House, PvT Ltd. India.

xxi. Soystat (2012) http://www. Soystat. Com/2011/accessed 6).

xxii. Titgemeyer, E. C. (2000). Soy byproducts as energy sources for beef and dairy cattle. In: Soy in Animal Nutrition; J. R. Drackley, Ed. Federation of Animal Science Societies, Savoy, 11

xxiii. Wavencham, C.N; Wiseman, J; and Cole, D. J.A. (2004). Processing and anti-nutritive factors in feed stuff. In: Cole DJA, Wiseman J. Varley MA. (eds) principles of pig science Nottingham: Nottingham Press, 1,141-167.

xxiv. Snedecor, G.W., and W.G. Cochram (1980). Statistical Analysis. The Iowa, University Press, Ames Iowa, U.S.A. pp 259.

xxv. Steel, R.G.D. and Torrie, J.H. (1980). Principles and procedures of Statistics. 2nd edition. McGraw-Hill, New York.