Nig. J. Anim. Prod. 2006, 33(2): 216-221
©2006 Nigerian Society for Animal Production

Short Communication

Evaluation and economics of enzyme supplementation on the performance of broiler finishers fed soybean hull meal based diets

B.O. Esonu[1], R. Izukanne[1], O.O. Emenalom[1], E.B. Etuk[1], O.A. Inyang[2], S. Samuel[1], F. Ezeoke[1], and B. Mere[1]

[1]*Department of Animal Science and Technology, Federal University of Technology, P.M.B. 1526, Owerri, Nigeria.*
[2]*Depatrtment of Animal Production, Michael Okpara College of Agriculture, Umuagwo, Imo State, Nigeria*

Abstract

Twenty-eight day feeding trial was conducted to evaluate the performance of broiler finisher fed soybean hull meal based diets supplemented with "Safzyme®", an exogenous cellulolytic enzyme. Soybean hull also referred to as soyhull, soybean millrun or soybean flakes are by-products of the soybean milling industry. Five (5) broiler finisher diets were formulated such that the diets contained soybean hull meal at 0%, 10% and 20% dietary levels (without enzyme supplementation) and 10%, and 20% dietary levels (with 1.0% enzyme supplementation) respectively. One-hundred and fifty (150) four-week-old Hubbard broiler chicks were divided into five groups of thirty (30) birds each and randomly assigned to the five treatment diets in a completely randomized design (CRD). Data were collected on feed intake, body weight gain, feed conversion ratio and economics of production was also computed. Feed intake increased progressively as dietary inclusion of soybean hull increased with or without enzyme supplementation. This increase became significant ($P<0.05$) at 20% dietary level of soybean hull. Daily body weight gain of birds on soybean hull meal diets with enzyme supplementation did not significantly differ ($P>0.05$) from birds on soybean hull meal diets without enzyme supplementation. Feed conversion ratio and feed efficiency were both significant ($P<0.05$) at 20% dietary levels of soybean hulls with or without enzyme supplementation. Dietary inclusion of soybean hull without enzyme supplementation reduced cost of feed and production of 1kg of meat while enzyme supplementation negatively affected percent feed cost savings. The results of this trial suggest that supplementation of diets containing soybean hull meal at 20% dietary levels with Safztme®, an exogenous cellulolytic enzyme, at 10% dietary level could not improve the nutritive value of the hulls for broiler finisher birds and also affected negatively percent feed cost savings.

Key words: Soybean hull, enzyme supplementation, broiler finisher performance.

Introduction

Increased poultry production is the solution to the increasing demand for animal protein in Nigeria (Obioha, 1992). Poultry show the most comparative performance between the temperate and tropical environment than any other class of livestock. Although poultry production represents one of the quickest means of correcting the anomaly of protein inadequacy, the rising cost of compound feed (70 – 80%) of the cost of production among others is a major set back (Esonu et al., 2004; Esonu *et al.*, 1997; Udedibie and Igwe, 1989; Emenalom, 2004). The prices of such convectional protein and energy feed ingredients such as maize rice, sorghum, groundnut, soybean and fish meal have soared in recent times that it is becoming uneconomical to use them in poultry feeds (Esonu *et al.*, 2001; Oduguwa *et al.*, 2004 and Esonu *et al.*, 2004).

There is an urgent need therefore to look inwards for alternative cheap and available feed ingredients that do not attract competition between man and animals to formulate balanced rations for non-ruminants. One of such alternative materials that met the above criteria is soybean hull. Soybean hull referred to as soyhull, soybean millrun or soybean flakes are by-products of soybean milling industry. Soybean hull has estimated feeding value of 74 – 80% of that of maize when included in moderate to high quantity in maize based diets (Esonu, 1998). It contains high levels of potentially digestible fibre (van Soest, 1985) and can replace some or all grains in the diets of ruminants. Soybean hull contains 22.75% crude protein, 18.15% crude fibre, 14.60%, Ether extract, 8.0%, Ash and 20.90% NFE (Esonu et al., 1997; Esonu, 1998; Preston, 1989). The study herein reported was designed to evaluate the efficacy and economics of the exogenous cellulolytic enzyme supplementation on the performance of broiler finisher birds fed diets containing soybean hull meals.

Materials and Methods

Soybean hulls used for this trial were obtained from individuals engaged in soybean flour mill business in Owerri and Umuahia towns in the Eastern States of Nigeria. The hulls were produced by toasting soybean seed and passing it through cracking machine and separated by blowing with a fan or winnowing against air current. The hulls were subsequently passed through a grinding machine to reduce the particle size. Sample of the hulls was analyzed for proximate chemical composition (A.O.A.C, 1980) (Table 1). Safzyme®, the exogenous cellulolytic enzyme was procured from a feed store in Owerri. Five (5) experimental diets were formulated such that the diets contained soybean hull meal at 0%, 10% and 20% soybean hull meal with 1.0% enzyme supplementation (Table 2).

Table 1: *Proximate chemical composition of soybean hull meal*

Nutrients	%DM
Dry matter (air-dry basis)	84.40
Crude protein	22.75
Ether extract	14.60
Crude fibre	18.15
Ash	8.00
NFE	20.90

Table 2: *Percentage composition of the experimental diets*

	Dietary levels of soybean hull meal (%)				
	No Enzyme Supplementation			Enzyme Supplementation	
	0	10	20	10	20
Maize	52.00	52.00	52.00	52.00	52.00
Soybean meal	20.00	20.00	12.50	20.00	12.50
Groundnut meal	10.00	5.00	5.00	5.00	4.00
Soybean hull	0.00	10.00	20.00	10.00	20.00
Fish meal	5.00	5.00	4.00	4.00	4.00
Brewers' dried gr.	3.50	1.00	1.00	1.00	1.00
Enzyme	0.00	0.00	0.00	1.00	1.00
Palm kernel meal	5.00	2.50	1.00	2.50	1.00
Bone meal	3.50	3.50	3.50	3.50	3.50
Salt	0.25	0.25	0.25	0.25	0.25
Vit/Tm Premix*	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated chemical composition					
Crude protein	22.02	21.97	20.59	21.95	20.61
Crude fibre	3.64	4.11	5.11	4.13	5.23
Ether extract	3.36	4.64	4.81	4.64	4.81
Calcium	1.42	1.62	1.86	1.63	1.85
Phosphorous	0.58	0.59	0.61	0.59	0.60
ME (Kcal/kg)	3120.00	3005.00	2985.00	3005.00	2983.00

*To provide the following per kg of diet: Vit. A, 10,000 iu; Vit. D_3, 2,000 iu; Vitamin E, 5ui, Vitamin K, 2 mg; riboflavin, 4.20mg; nicotinic acid, 20mg, folic acid, 0.5mg, choline, 3mg; Mg, 56mg; Fe, 20mg; Cu, 10mg; CO, 125mg, Iodine, 0.8mg.

One hundred and fifty (150), 4 week old Hubbard broiler chicks were divided into five groups of thirty (30) birds each and randomly assigned to the five treatment diets in a completely randomized design (CRD). Each treatment was further divided into three replicates of ten birds each. Feed and water were provided ad libitum. The birds were weighed at the beginning of the experiment and thereafter on a weekly basis. Feed intake was recorded daily, other routine poultry management procedures were maintained. The feeding trial lasted for 28 days. Data collected were subjected to Analysis of Variance (Snedecor and Cochran, 1978) where significant treatment effects were detected from the Analysis of Variance; means were compared using Duncan's New Multiple Range Test as outlined by Obi (1990).

Results

The chemical composition of soybean hull meal is shown in Table 1 while the ingredient and nutrient composition of the experimental diets is shown in Table 2. data on the performance and economics of production of broiler finisher birds on the various dietary levels of soybean hull meal are presented in Table 3.

Table 3: *Evaluation of soybean hull and enzyme supplementation on the performance of broiler finisher birds*

Parameters	Dietary levels of soybean hull meal (%)					SEM
	Non Enzyme Supplementation			Enzyme Supplementation		
	0	10	20	10	20	
Initial body wt (g)	520.0	500.0	510.0	520.00	510.0	5.58
Final body wt (g)	21000.0	2005.0	1998.0	2015.0	1995.72	27.5
Body wt. Gain (g)	1580.0	1505.0	1488.0	1495.01	1485.72	-
Daily body wt. gain	56.43	53.75	53.14	53.39	53.06	0.6
Daily feed intake (g)	115.88[a]	120.70[a]	159.20[b]	121.80[a]	160.05[b]	5.72
Feed Efficiency	0.49[a]	0.45[a]	0.33[b]	0.44[a]	0.33[b]	0.08
Economic Analysis						
Cost of feed (₦/kg)	39.6	34.0	30.0	48.0	46.0	-
Meat produced (₦/kg)	81.18	76.50	80.10	109.44	138.46	-
Feed Cost Savings (%)	-	14.14	24.24	-21.21	-16.16	-
Mortality (%)	0.00	0.00	3.33	3.33	0.00	-

[ab]Means within rows with different superscripts are significantly (P<0.05) different
SEM- Standard error of mean.

Feed intake increased with increasing dietary levels of soybean hull meal, this increase became significant (P<0.05) at 20% dietary level. Daily body weight gain of birds on soybean hull meal diet with enzyme supplementation did not significantly differ (P>0.05) from birds on soybean hull meal diets without enzyme supplementation. Feed efficiency was significant (P<0.05) at 20% dietary level of soybean hull meal with or without enzyme supplementation. The dietary inclusion of soybean hull meal (without enzyme supplementation) significantly (P<0.05) reduced the cost of production of 1.0kg of feed as compared to the control (0%) diet. This invariably reflected in the production of 1kg of meat. Again the cost of the enzyme increased the cost of 1 kg of the diets containing it, this also affected the cost of production of those diets.

Discussion

The increased feed intake of the birds on the diets containing soybean hull meal is quite understood, soybean hull meals contain high fibre, which tend to increase the total fibre content of the diets and dilute other nutrients. Birds must therefore eat to meet their energy requirement to sustain rapid growth and development hence the increased feed intake. This result agrees with earlier reports from Esonu et al., (1997); Esonu, (1998); Anyanwu et al., (2003); Esonu et al., (2004).

The comparable body weight gain of the groups on soybean hull meal diets (both enzyme supplemented and non-enzyme supplemented) is interesting. It could probably be that the enzyme. Safzyme®, did not enhance the digestibility and utilization of cellulose and other nutrients in the soybean hull meal as anticipated. It would also appear that utilization of soybean hull meal by birds is relatively high at the level offered in this study in view of the comparable body weight of birds in the control (0.0%) and birds in soybean hull meal without enzyme supplementation. This observation disagrees with earlier reports by Ash and Akoh Petia (1992) Cheeke *et al.*, (1983) Udedibie and Igwe (1989).

Crude fibre activates the intestine and greater peristaltic movement, more enzyme production, resulting in efficient digestion of nutrients (Kekeocha, 1984; Esonu *et al.*, 1997; Ohwota, 2001). It has been reported that adult birds digest substantial amount of fibre than young chicks (Olomu, 1995; Esonu, 1998). This could also be the reason behind the improved performance of the finisher broiler birds on soybean hull meal diets.

However, the efficiency of utilization is lower for diets with soybean hull meal, as the control diet (0%) recorded the highest body weight gain. Dietary inclusion of soybean hull meal reduced cost of production of one kilogramme of feed and subsequently the production of one kilogramme of broiler meat. These observations were in line with Anyanwu *et al.*, (2003) and Esonu *et al.*, (1997). However, with enzyme supplementation, feed and meat cost increased, affecting negatively percent feed cost savings. The results of this trial suggest that soybean hull meal at 20% dietary level with exogenous enzyme safzyme® at 1.0% could not improve the nutritive value of soybean hull meal for broiler finisher and affects percent feed cost savings negatively.

References

Anyanwu, G.A.; Esonu, B.O.; Iwuala, E.; Okorie, K. and Etuk, C.B. 2003. Bambara Groundnut (Voandzea suberranea (L) thours Offal as partial substitute for maize in broiler diets. *Trop. Anim. Prod. Invest.* 6:55 – 61.

Association of Official Analytical Chemists (AOAC) 1980. Official Method of Analysis. Washington D.C

Ash, A.J. and L. Akoh Petaia. 1992. Nutritional value of Sesbania grandiflora leaves for mongastric and ruminants. *Trop. Agric. Trinidad)* 69: 223 – 228.

Cheeke, P.R.; M.P. geoger and G.H. Arseotti. 1983. Utilization of black locust (Rodina pseudoacacia) leaf meal by chicks. *Nitrogen Fixing Tree Research Report.* 1, 41.

Emenalom, O.O. 2004. Comparative performance of broiler chicks fed diets containing differently processed Mucuna pruriens seed meals. *Nig. J. Anim. Prod.* 31 (1): 12 – 16.

Esonu, B.O.; Etuk, E.B anfd Ezeigbo, O.C. 1997. Determination of optional dietary level of soybean hulls for broilers. JOTEN 2 (1 & 2): 76 – 84.

Esonu, B.O. 1998. Performance and internal organ characteristics of weaned rabbits fed graded levels of dietary soybean hulls. JOTEN 3 (1): 28 – 33.

Esonu, B.O.; F.C. Iheukwumere, T.C. Iwuji, N. Akanu and O.H. Nwugo. 2001. Evaluation of Microdesmis puberula leaf meal as feed ingredients in broiler starter diets. *Nig. J. Anim. Prod.* 30:3 – 8.

Esonu, B.O. ; Azubuike; Emenalom, O.O; Etuk, E.B.; Okoli, I.C.; Ukwu, H. and Nneji,C.S. 2004. Effect of enzyme supplemntation on the performance of broiler finisher fed Microdesmis puberula leaf meal. *Int. J. Poultry Sci.* 3(2): 112 – 114.

Kekeocha, C.C. 1984. Pfizer Poultry Production Handbook. Pfizer Corporation. Nairobi in Association with Macmillan Publishers, London.

Obi, I.U.1990. Statistical methods of detecting differences between treatment means. Snaap Press. Enugu-Nigeria.

Obioha, F.C. 1992. *A guide to poultry production in the tropics.* Acena Publishers Ltd. (ed). Snaap Press, Enugu-Nigeria.

Oduguwa, O.O.; Fanimo, A.O. and Jegede, A.V. 2004. Effect of enzyme supplementation on the utilization of shrimp waste meal based diets by broiler chicken. *Nig. J. Anim. Prod.* 31 (2): 168 - 173.

Ohwota, K.S. 2001. Alternative energy sources in poultry feed production. The role of enzyme. Workshop organized by Poultry Association of Nigeria, Lagos.

Olomu, J.M. 1995. *Monogastic Animal Nutrition.* Principles and practice. Pp 197 – 198.

Preston, R.L. 1989. Typical composition of feed of cattle and sheep. 1989 – 90. *Feedstuff* 61:19 – 33.

Snedecor, G.W. and Cochran 1978. *Statistical methods*. 6th Edn. Iowa State University Press, Ames. Iowa.

Udedibie, A.B.I. and Igwe, F.O. 1989. Dry matter yield and chemical composition of pigeon pea (C. cajan leaf meal and the nbutritive value of pigeon pea leaf meal for laying hens. *Anim. Feed Sci. Tech.* 4:111 – 119.

Van Soest, P.J. 1985. Definition of fibre in Animal feeds. In recent advances in Animal Nutrition. Studies in the Agricultural and Food Sciences. Haresign, W. Cole, D.J.A (ed) Butterworth and Co (Publishers) Ltd. Pp 55 – 70.

(Received 21 August 2004; Accepted 29 April 2005)