PERFORMANCE, INTERNAL EGG CHARACTERISTICS AND HAEMATOLOGY OF LAYING BIRDS FED SAFZYME® SUPPLEMENTED SOYBEANHULL DIET.

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Abstract: A twelve-week feeding trial was conducted to evaluate the effect of safzyme® (a cellulolytic enzyme) supplementation on performance, internal egg characteristics and haematology of laying birds fed soybean hull diets. Three experimental layer diets were formulated incorporating soybean hull meal at 0% (without safzyme® supplementation), 30% (without safzyme® supplementation) and 30% (with safzyme® supplementation). Thirty six Harco layers, 5 months into lay were divided into three treatment groups and randomly assigned to three treatment diets in a completely randomized design. Data were collected on feed intake, body weight gain, hen-day production, egg size and weight, internal indices of eggs, internal organ characteristics and haematological indices. Results from performance studies revealed that supplementing soybean hull diet with/without safzyme® significantly (P<0.05) affected performance, egg quality indices, carcass characteristics and haematology compared to the control. Also, hens fed soybean hull diet with/ without safzyme® supplementation had increased weight of gizzard and increased feed intake (P<0.05). The results of this trial suggest that 30% dietary level of soybean hull meal with/without safzyme® supplementation could be used in laying birds diets without any deleterious effects on birds. [Report and Opinion 2010;2(3):70-74]. (ISSN: 1553-9873).

Keywords: soybean hull meal, safzyme®, nutritive value, laying birds.

1.0 Introduction

As human population continues to grow, with the greatest growth expected in countries that are already suffering from chronic hunger and malnutrition, there will be need to ensure food safety for all and especially the more susceptible sector of human population (Adeola and Olukosi, 2009). Although commercial poultry production ranks among the highest source of animal protein in Nigeria, the biggest challenge that faces the industry is that of feed in terms of availability on a sustainable basis, quality and stable prices. Cereal grains is the conventional source of energy in poultry feeds but the increasing demand for cereal grains for human consumption, industrial use and poultry feed production has continued to put upward pressure on its market price, thus making it unaffordable, particularly for small poultry farmers. Frequent and sometimes sharp increases in the price of the cereal grains have contributed substantially to the difficulties expected by poultry farmers. Hence the search for alternative energy sources that could be of value and cheaper.

Soybean hull is a by – product of soybean mill industry. It is readily available in large quantities among soybean milling or oil producers and most often discarded as waste. Hibberd *et al.* (1987) reported that it contains high level of potentially digestible fibre and can replace some or all grains in the diet of beef, cattle. Esonu (1998) reported that soybean hull has estimated feeding value of 74 – 80% of that of maize when included in moderate to high quality of maize based finisher's diets. Soybean hull contains 22.75% crude protein, 18.15% crude fibre, 14.60% Ether Extract, 8.00% Ash and 20.90% NFE, (Esonu *et al.* 1997). Soybean hull appears to be a good source of carbohydrates but it has some drawbacks. The use of soybean hull is limited by it high fibre contents. In other to enhance its utilization and other high fibre non – conventional feed stuff nutritionists have resorted to using exogenous enzyme supplementation, (Annison and Choct., 1991; Scheiderier and Abudabos, 1998; Acamovic, 2001; Esonu *et al*, 2006; Aderolu *et al.* 2007; Ofongo *et al.* 2008). Enzyme activity is basic to digestion of feed components and release of nutrients in the gastrointestinal tract and the main rationale for the use of exogenous enzyme is to improve the nutritive value of feed stuffs (Adeola and Olukosi, 2009). Exogenous enzyme break- down anti-nutritional factors that is present in many feed ingredients. The study herein reported was designed to evaluate the performance of laying hens fed safzyme® supplemented soybean hull diets.

2.0 Materials and Methods.

2.1 Site of study: The experiment was conducted at the poultry unit of the Teaching and Research farm of the Federal University of Technology Owerri, Imo State, Nigeria. Owerri is located in the South – Eastern Agricultural zone of Nigeria. It is at the altitude of 90m; the mean annual rainfall, temperature and humidity are 250mm, 26.5-27.5% and 70-80% respectively. Federal University of Technology Owerri is located at latitude 5^{o} 27^{1}N and longitude 7^{o} 02^{1} E on elevation of 91.0m.

2.2 Source and Processing of soybean hulls: The soybean hulls used for this trial were obtained from individuals engaged in soybean flour mill business in Owerri. The hulls were produced by toasting soybean seed and passing it through a grinding machine to reduce the particle size producing soybean hull meal. Sample of the soybean hull meal was then subjected to proximate analysis according to AOAC, (2000). safzyme® (a cellulolytic enzyme) used was procured from a feed store in Owerri.

2.3 Experimental diets: Three layer diets were formulated such that soybean hull meal was incorporated into the experimental diet at 0%, 30% (without enzyme supplementation) and 30% (with 0.30% enzyme supplementation) (Table 1).

Table 1: Ingredient Composition of Experimental Diets.

Ingredients	0% SBHM without safzyme®	30% SBHM without safzyme®	30% SBHM with safzyme®.
Maize(yellow)	50.00	20.00	20.00
Soybean meal	20.00	20.00	20.00
Soybean hull meal	0.00	30.00	30.00
Palm kernel cake	8.00	8.00	7.70
Fish meal	5.00	5.00	5.00
Brewers dry grain	6.50	6.50	6.50
Oyster shell	5.50	5.50	5.50
Bone meal	4.00	4.00	4.00
Lysine	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Enzyme	0.00	0.00	0.30
Vitamin premix*	0.50	0.50	0.50
Total	**100.00**	**100.00**	**100.00**
Calculated chemical composition			
Crude protein	18.02	17.08	17.18
Crude fiber	4.36	6.06	6.06
Calcium	3.77	3.94	3.92
Phosphorus	1.16	1.12	1.10
Methionine	0.41	0.34	0.33
Lysine	1.00	0.92	0.90
Ether extract	4.12	5.30	5.09
Metabolizable Energy(kcal/kg)	2824.50	2798.85	2788.80

*To provide the following per kg of feed: Vitamin A-10,000,000iu; Vitamin D_3 – 2000,000iu; Vitamin B_1-0.75g;Vitamin B_2 – 5g; Nicotinic acid – 25g; Calcium pantothenate – 12.5g; Vitamin B_{12} - 0.015; Vitamin K_3 - 2.5g; Vitamin E – 25g; Biotin – 0.05g; Folic acid – 1g; Choline chloride – 250g; Cobalt – 0.4g; Copper – 8g; Manganese – 64; Iron – 32g; Zinc – 40g; Iodine – 0.8g; Flavomycine – 100g; Spriamycine – 5g; 3 – Nitro 50g; DL – Methionine – 50g; Selenium – 0.16; Lysine – 120g; BHT - 5g.

2.4 Experimental design, birds and management: Thirty six Harco layers, 5 months into lay were divided into three treatment groups of twelve birds each and randomly assigned to the three treatment diets in a completely randomized design. Each treatment was further subdivided into four replicates of three birds each and housed in a battery cage unit arranged linearly. Feed and water were provided ad-libitum and other poultry management practices were maintained. At the end of the feeding trail, two birds were randomly selected from each treatment for determination of internal organ weights and haematological indices. The birds were starved of feed and not water for 24 hours before slaughtering, dressing weight, dressing percentage, weight of liver, heart, gizzard and kidney were taken. During slaughter time, blood samples from the birds were collected from two birds per treatment into sets of sterilized bottle containing ethylene diamine tetracetic acid (EDTA) for determination of haematological indices; RBC, WBC, basophiles etc. a second set of bottle without coagulant were also used to collect blood samples from the birds for the serum separation of biochemical parameters. The trial lasted for 12 weeks.

2.5 Data collection and statistical analysis: Data were collected on feed intake, body weight changes, egg production, egg weight, feed conversion ratio and egg quality indices. Data generated were subjected to analysis of variance (ANOVA) according to Snedecor and Cochran (1979). Where analysis of variance indicated significant treatment effects, means were compared using Duncan New Multiple Range Test (DNMRT) as outlined by Obi (1990).

3.0 Results and Discussion.

The results of the feeding of soybean hulls with or without safzyme® supplementation on performance, egg quality indices, carcass characteristics and haematology indices are presented in tables 2 and 3. From all indications, the inclusion of soybean hull in the diet of laying birds up to 30% with or without safzyme® supplementation did not adversely affect performance, egg quality indices, carcass characteristics and haematology ($p<0.05$). The increased feed intake of birds on diets containing soybean hulls (with/without safzyme®) is not a surprise, since soybean hull is high in fiber content which tend to increase the total fiber content of the diet and dilute other nutrients. The birds on soybean hull diet developed significantly ($p<0.05$) heavier gizzards, possibly due to the work of grinding the high fiber contained in the diet. The results of the trial in terms of feed intake and hen-day egg production agrees with earlier reports from Esonu *et al.*, (1997); Esonu (1998); Esonu *et al.*,(2004); Ash *et al* (1992). The values recorded for internal characteristics of the egg were in line with that reported for normal fresh eggs (Emmenalom, 2001; Esonu *et al*., (2004); Dongmo and Fomunyam, 2005). Soybean hull meal did not increase the intensity of the egg yolk; this probably could be due to lack of pigmenting xanthophylls in soybean hull. The values of the haematological indices appear similar to those earlier reported as normal for poultry. The inclusion of soybean hull (with/without supplementation) at 30% dietary level had no significant effect ($P>0.05$) on the internal physiology of the layers.

Table 2: Effects of soybean hull meal and safzyme® on performance of laying birds.

Parameters	0% SBHM without safzyme®	30% SBHM without safzyme®	30% SBHM with safzyme®.	SEM
Av. initial body weight (g)	1530.00^{a}	1520.00^{b}	1530.00^{a}	3.34
Average final Body weight (g)	1550.00^{a}	1530.00^{b}	1525.00^{b}	7.64
Average feed Intake g/day	111.11^{a}	136.13^{b}	136.05^{b}	8.33
Feed conversion ratio (g. feed/ g .egg)	1.70^{b}	2.26^{a}	1.27^{c}	0.22
Average hen day-egg production (%)	62.06^{a}	60.16^{b}	60.06^{b}	0.66
Average egg weight (g)	57.96^{a}	60.29^{b}	61.35^{b}	1.00
Egg Quality Indices				
Haugh Units (HU)	68.50^{b}	69.30^{a}	68.62^{b}	0.25
Shell thickness (mm)	0.39^{b}	0.40^{a}	0.40^{a}	0.004
Yolk index	0.41^{a}	0.38^{c}	0.40^{b}	0.009
Albumen index	0.07^{b}	0.08^{a}	0.07^{b}	0.004
Egg yolk colour	4.38^{a}	4.21^{b}	4.08^{c}	0.09
Horizontal circumference (cm)	13.70^{a}	13.50^{b}	13.66^{a}	0.06
Oblong circumference (cm)	15.89^{b}	15.92^{b}	16.04^{a}	0.045

^{ab} Means within a row with different superscripts arte significantly different ($p < 0.05$)

Table 3: Interactive effects of soybean hull meal and safzyme® on carcass characteristics of laying birds.

Parameters	0% SBHM without safzyme®	30% SBHM without safzyme®	30% SBHM with safzyme®.	SEM
Live weight (g)	1500.00^{a}	1500.00^{a}	1510.00^{b}	3.34
Dressing percent	58.15^{a}	57.33^{b}	58.14^{a}	0.39
Liver (% live weight)	2.56^{a}	2.50^{a}	2.91^{b}	0.13
Heart (% live weight)	0.33^{a}	0.36^{a}	0.34^{a}	0.01

Kidney (% live weight)	0.12[a]	0.09[b]	0.13[a]	0.01
Gizzard (% live weight)	2.66[b]	3.33[a]	3.63[a]	0.29
Heamatological Indices				
Haemoglobin (g/dl)	10.10[b]	9.00[a]	9.20[a]	0.34
WBC ($X10^3$/ul)	3.15[b]	2.97[a]	3.00[a]	0.05
RBC ($X10^{12}$/ul)	3.85[b]	3.48[a]	3.55[a]	0.11
PCV (%)	29.12[b]	28.33[a]	28.53[a]	0.24
MCV (fl)	80.10[a]	82.36[b]	81.30[c]	0.65
MCHC (g/100ml)	33.41[b]	33.35[a]	33.40[b]	0.02
Neutrophils (%)	54.60[a]	55.16[b]	55.10[b]	0.18
Lymphocytes (%)	48.50[c]	46.62[a]	47.50[b]	0.54

[ab] Means within a row with different superscripts arte significantly different ($p<0.05$).
WBC – Total White Blood Cell Counts, RBC – Total Red Blood Cell Counts; MCV – Mean Corpuscular Volumes; MCHC – Mean Corpuscular Haemoglobin Concentration; PCV – Packed Cell Volume.

4.0 Conclusion

The result obtained from this trial suggests that soybean hull meal which is an affordable and suitable alternative for maize as energy source is a very good feed ingredient for laying birds. Exogenous enzymes increases the availability of starches, proteins and minerals that are either bound within fiber-rich cell walls and, therefore, not accessible to the animal's own digestive enzyme or bound up in a chemical form that the animal is unable to digest. Addition of exogenous enzyme to animal feed (especially unconventional feedstuffs) break down specific chemical bonds in raw materials that are usually, not broken down by endogenous enzymes, thus releasing more nutrients and hence improve animal performance.

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