ISSN 1330-7142
UDK = 636.087.26:636.5

THE EFFECT OF BREWERS DRIED GRAINS SUPPLEMENTED BY ENZYME ON PERFORMANCE OF ISA-BROWN LAYING HENS

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Original scientific paper
Izvorni znanstveni članak

SUMMARY

This study investigated the effect of dietary inclusion of Brewers Dried Grains (BDG) supplemented with Grandizyme® enzyme as a partial substitute for maize in layers diets. One hundred and twenty Isa-Brown laying hens were randomly allotted to three diets formulated with 0 (control), 10% and 20% BDG, and fed for 12 weeks. There were 4 replicates of 10 birds each in a dietary treatment. Feed intake, hen day production and net profit generated from the sales of eggs were significantly ($p<0.05$) highest for diet 3. Cost of feed /kg significantly ($p<0.05$) reduced from ₦35.50 (€0.17) for diet 1 to ₦33.69 (€0.16) and ₦31.38 (€0.15) respectively for diets 2 and 3. Substitution of maize with 20% BDG supplemented with Grandizyme® enzyme resulted in better performance and gave a higher net profit compared with other treatments; and could be adopted to alleviate the problem of high cost of maize.

Key-words: laying hen, brewers dried grains, enzyme supplementation, performance, profitability

INTRODUCTION

Feed represents the major cost in animal production. Even with sheep which typically consume more forage than other domestic species, feed may represent 55 percent or higher of the total production costs (Ologhobo, 2004). This has been identified as the biggest factor militating against the industry in Nigeria. Akinyosoye and Pingpoh, (1992) observed that poultry production in Nigeria was not economically profitable due to prevailing high cost of imported feed. In countries where cereal production is not a problem, the cereal component is always cheaper than protein ingredients (Longe, 2006). The increasing cost of feed ingredients demands concerted research efforts directed towards alternative sources of feed ingredients in order to reduce the dependence on the expensive conventional ingredients.

Maize has a higher metabolisable energy (14.37 MJ/kg) value compared to brewer's dried grains (8.29 MJ/kg), the proximate chemical composition of the latter reveals its higher crude protein - CP (18%), lysine (0.90%), methionine (0.40%), ether extract (6.0%), calcium (0.20%) and available phosphorus (0.16%) values than maize (Pfizer Nutrient Plan and Nutrient Levels of Feed Ingredients). Brewers dried grains is the material remaining after grains have been fermented during the beer producing process. It is known for its high nutritional value and stable price. It has to be admitted, however, that its nutrient content varies in a certain range from plant to plant and depend upon the type of grain used (barley, wheat, corn etc.) in the initial brewing process, the proportion being fermented and fermentative process being used. It has been used in feeding both ruminant and monogastric animals. The materials are considered to be good sources of un-degradable protein (having one of the highest values of bypass protein in commonly available feed stock) and water-soluble vitamins. Gomwell et al. (1993) reported that its dietary inclusion was normally limited to 5-10% in swine and poultry diets. The presence of very high crude fiber - CF (20%) with non-starch polysaccharide (NSP) limits its desirability in poultry diets.

Dietary enzymes can be used to aid the digestive process in the animal's gut (Oldale, 1996; Iyayi, 2002).

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Its use in poultry feeds has predominantly been related to the hydrolysis of fibre or NSP fractions in cereal grains which cannot be digested by the endogenous enzyme secretions of poultry. Exogenous enzymes added to the feed or used during feedstuffs processing have the potential to improve feed efficiency, reduce pollution associated with poultry manure and increase the use of low cost feed ingredients. With increasing knowledge of the structure cell walls of grain, specific enzyme activities can be tailored towards the substrates of interest in commercial supplements (Iyayi, 2002). This study therefore, examines the effects of feeding brewers dried grains supplemented with Grandizyme® enzyme at the expense of maize to layers on performance and cost of production.

MATERIAL AND METHODS

The study was carried out at the Zartech Unit of the University of Ibadan Teaching and Research Farm. The birds were housed in an open sided building in a previously cleaned, washed and disinfected two tier cage system. One hundred and twenty three-week old Isa Brown pullets were used for this study. The birds were placed individually in a cage of 32 x 38 x 42 cm and raised to fifty percent Hen Day Production (HDP) on commercial diets. The birds were fed the experimental diets shown in Table 1.

Table 1. Composition of the experimental diets

Table 1. Sastav pokusnih obroka

Ingredients *Sastojci*	Diet 1 (none BGD) *Obrok 1 (bez BGD)*	Diet 2 (10% of BGD) *Obrok 2 (10% BGD)*	Diet 3 (20% of BGD) *Obrok 3 (20% BGD)*
Maize (white)	50.00	40.00	30.00
Maize offals	8.00	8.00	8.00
Groundnut cake (GNC)	10.00	8.50	8.00
Wheat offals	10.00	10.00	10.00
Cassava flour	3.75	5.25	6.75
Fish meal (65% CP)	2.50	2.50	2.50
Brewer's dried grains	0.00	10.00	20.00
Soya bean meal (SBM)	8.00	8.00	7.00
Bone meal	4.00	4.00	4.00
Oyster shell	2.80	2.80	2.80
Salt	0.30	0.30	0.30
**Mineral vitamin premix	0.25	0.25	0.25
Methionine	0.20	0.20	0.20
Lysine	0.20	0.20	0.20
*Enzyme	-	+	+
Total	100.00	100.00	100.00
Calculated nutrient composition			
Crude protein (%)	17.16	17.33	17.52
Crude fibre (%)	3.99	5.74	7.54
Calcium (%)	2.68	2.69	2.70
Phosphorus (%)	0.84	0.85	0.84
Lysine (%)	0.93	0.97	1.01
Methionine (%)	0.45	0.47	0.47
Ether extract (%)	3.58	3.70	3.84
Metabolisable energy (MJ/kg)	11.62	11.05	10.47

*100 g Grandizyme® enzyme/ton feed; ** Composition of Mineral Vitamin Premix/kg (Layers): vitamin A 1000000 iu, biotin 40 g, vitamin B12 10 mg, folic acid 500 mg, nicotinic acid 280 mg, riboflavin 500 mg, vitamin K 1500 mg, copper 700 mg, manganese 4800 mg, zinc 58 mg, iron 5800 mg, selenium 120 mg, iodine 60 mg, cobalt 300 mg

Three experimental layer diets were formulated so that diet 1 contained no brewers' dried grains and served as the control. Diets 2 and 3 contained 10 and 20% brewers' dried grains respectively, partially replacing maize. The Grandizyme® enzyme was thoroughly mixed with the test ingredient at the recommended rate of 100 g per ton before it was eventually mixed with other ingredients in the diets. Each diet was offered to 4 replicates comprising 10 birds each in a completely randomized design (CRD) experiment. The birds were weighed individually both at the beginning and the completion of the experiment. All other daily routine management practices required were provided. Feed and water were supplied *ad libitum.* Data were collected on performance characteristics like feed intake, feed efficiency, HDP, egg weight, mortality, production cost, total revenue and gross profit for 12 weeks. The eggs were collected twice a day. Egg shape index was calculated as egg width (maximum) divided by the maximum egg length. Feed intake was determined as the difference between feed supplied and those remaining at the beginning and end of the week respectively. This was taken for 12 weeks (84 days) and subsequently calculated on daily basis as grams per bird per day. Cost per kg feed was calculated based on the prevailing price of feed ingredients as at the time of the study. Difference between the total cost of feed consumed per bird and total revenue from sales of eggs during this period was taken as the profit.

Means of data were subjected to statistical analysis of variance procedure (ANOVA) of SAS (1999) and treatment means were separated using the Duncan's option.

RESULTS AND DISCUSSION

The nutrient content of the experimental diets (Table 1) met the levels recommended for laying hens (Fetuga, 1984; NAERLS, 1990; Olomu, 1995). Results of the dietary effects on performance characteristics of experimental birds are presented in Table 2. Body weight gain and feed conversion ratio were not affected ($p>0.05$) by diets. Average daily feed intake (ADFI) of birds fed diet 1 (81.88 g) and diet 2 (82.26 g) were significantly ($p< 0.05$) lower than that of birds on diet 3 (95.06 g). This could be explained by lower metabolisable energy (MJ/kg) and higher fibre levels of diets 3 compared with those of diet 2 and the control. Since birds eat to meet their energy requirements (Harms et al., 2000; Leeson et al. 2001; Oluyemi and Roberts, 2002), birds ate more of diet 3 whose energy content (10.47 MJ/kg diet) has been diluted with dietary fibre from BDG. The fibre contents of these diet was highest in diet 3 followed by diet 2 and least for diet 1 (control). Fibre has been proved to affect the physical texture of diet and increase feed intake of birds to meet energy needs (Longe, 1984). McDonald et al. (1995) reported that laying hens adjust their feed intake on the energy concentration of their diets so that if the ME content of the diet is increased, they tend to eat less whereas they eat more when the ME of the diet is decreased. Although the differences in ether extract levels appear very insignificant, however, the highest EE content of diet 3, followed by diet 2 and least for the control diet also account for the relative increases in the ADFI with increased levels of substitution. Fats and oils are known to increase palatability and prevent dustiness (Khajarern and Khajarern, 1979). Afolabi et al. (2007) confirmed that added fat enhanced palm kernel cake consumption in Nigerian local hens.

Average egg weights (AEW) did not show any significant ($p>0.05$) dietary treatment differences with both levels of substitution. The AEW obtained in this study, however, fell within the standard recommended for the tropics (Oluyemi and Roberts 2002), but were lower than that recommended by McDonald et al. (1995). Egg width and egg shape index were not significantly ($p>0.05$) affected by dietary treatments. However, egg length increased ($p<0.05$) with increasing contents of BDG in the diets. Narushin and Romanov (2002) identified egg weight and shape index (maximum breadth to length ratio) as influential egg physical parameters in the processes of embryo development and successful hatching.

The HDP obtained in this study was higher than 50.59 to 56.88% reported by Fombad and Mafeni, (1989) in birds fed 0, 10, 20 and 30% brewers' dried grains; and 57.62 to 62.02%) reported by Onifade et al. (1999) in layers fed maize offal, cassava peel and reject cashew nut meal. The significantly ($p<0.05$) higher HDP (73.04%) obtained from birds fed diet 3 compared to those fed diet 1 (61.79%) and diet 2 (56.97%) might have resulted from better utilization of the locked up nutrients released by the action of Grandizyme® enzyme on adequate substrate provided by BDG to act upon compared to those on diet 2. Thus, the 20% BDG increased both the feed intake and the HDP value. The higher feed intake and therefore a better nutrient supply (protein, amino acids, Ca and probably P) as well as compensated energy intake resulted in a higher rate of performance. Kilogram of feed per kg of egg of 2.57 obtained from birds fed diet 3 compared to 2.69 and 2.90 for layers fed diet 1 and 2 might be the result of the enzyme's ability to act adequately on the cell walls of the BDG releasing the locked nutrients for utilization thus lowering feed required to give a better HDP and AEW. Feed per dozen egg obtained in this study was lower than the values recorded by Idowu et al. (2006) for layers fed cassava root wastes. There was no mortality throughout the 12 weeks of the study.

Table 2. Performance characteristics of Isa-Brown layers fed BDG-based diets

Tablica 2. Proizvodne karakteristike Isa-Brown nesilica hranjenih obrokom na bazi BDG

Parameters *Pokazatelji*	Diet 1 *Obrok 1*	Diet 2 *Obrok 2*	Diet 3 *Obrok 3*	SEM
Average initial body weight (kg)	1.44	1.45	1.42	0.01
Average final body weight (kg)	1.47	1.48	1.45	0.01
Body weight gain (g)	35.00	35.00	32.50	2.76
Average daily feed intake /bird (g)	81.88^{b}	82.26^{b}	95.06^{a}	2.43
Average egg weight (g)	49.42	50.08	50.79	0.54
Hen-day production, HDP (%)	61.79^{b}	56.97^{b}	73.04^{a}	2.69
Feed conversion ratio:				
Kg feed/kg egg	2.69^{ab}	2.90^{a}	2.57^{b}	0.11
Kg feed/dozen egg	1.59	1.74	1.57	0.06
Egg length (cm)	5.27^{c}	5.34^{b}	5.40^{a}	0.02
Egg width (cm)	4.11	4.10	4.11	0.01
Egg shape index	0.78	0.77	0.76	0.09
Mortality	0.00	0.00	0.00	0.00

^{ab} Means with different superscript along the same row are significant ($p<0.05$) different

Table 3 shows the economy of production of Isa-Brown layers fed brewers' dried grains–based diets supplemented with Grandizyme® enzyme. Total feed intake per bird was the highest for birds fed diet 3 followed by those fed diet 2 whereas birds fed diet 1 consumed the lowest quantity. The number of trays of eggs laid per bird fed diet 3 (2.04) was significantly ($p<0.05$) higher than 1.73 and 1.60 trays recorded by birds fed diets 1 and 2, respectively. Cost of a kilogram of feed significantly ($p<0.05$) reduced from ₦ 35.50 (€0.17) for the control diet to ₦ 33.69 (€0.16) and ₦ 31.38 (€0.15) for diets 2 and 3 respectively. Total cost of feed per bird and price of an egg were not significantly ($p>0.05$) different for all the dietary treatments. Cost of feed per egg produced by birds fed diets 1 and 2 were significantly ($p<0.05$) higher than that of the birds fed diet 3. This agrees with the report of Olomu (1995) that lower energy levels in the diets of layers resulted in cheaper cost of production in spite of higher consumption recorded.

Returns from the sales of eggs laid per bird fed diet 3 (₦ 612.75/ €2.98) was significantly ($p<0.05$) higher than ₦ 519.00 (€2.52) and ₦ 478.50 (€2.33) recorded for birds on diets 1 and 2, respectively. Net profit of ₦ 274.85 (€1.34) and ₦ 245.70 (€1.19) recorded for birds on diets 1 and 2, respectively were significantly ($p < 0.05$) lower than ₦ 362.18 (€1.76) recorded for birds on diet 3.

Table 3. Economy of production of Isa-brown layers fed by Grandizyme enzyme supplemented BDG-based diets

Tablica 3. Ekonomski pokazatelji proizvodnje Isa-Brown nesilica hranjenih obrokom na bazi BGD s dodatkom enzima Grandizyme

Parameters *Pokazatelji*	Diet 1 *Obrok 1*	Diet 2 *Obrok 2*	Diet 3 Obrok 3	SEM
Total feed intake/bird/12 wks (kg)	6.88[b]	6.91[b]	7.99[a]	0.20
Trays of eggs laid/bird (Nos)	1.73[b]	1.60[b]	2.04[a]	0.08
Cost per kg feed (Naira) (Euro)	35.50[a] (0.17)	33.69[b] (0.16)	31.38[c] (0.15)	1.00
Total cost of feed/bird (Naira) (Euro)	244.15 (1.19)	232.80 (1.13)	250.57 (1.22)	6.49
Cost of feed/egg (Naira) (Euro)	4.71[a] (0.02)	4.89[a] (0.02)	4.10[b] (0.02)	0.15
Price per egg (Naira) (Euro)	10.00 (0.05)	(10.00) (0.05)	10.00 (0.05)	0.00
Returns from sales of eggs (Naira) (Euro)	519.00[b] (2.52)	478.50[b] (2.33)	612.75[a] (2.98)	22.84
Net profit (Naira) (Euro)	274.85[b] (1.34)	245.70[b] (1.19)	362.18[a] (1.76)	19.57

[abc*] Means along the same row with different superscript are significantly *($p < 0.05$)* different

CONCLUSION

It can be concluded that supplementation of diets containing up to 20% brewers' dried grains with an exogenous enzyme, Grandizyme® produced better performance and higher net profit compared with the control diet. According to the lower feed price and higher rate of egg production the competitiveness can be increased by using BDG in layer feeds.

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UTJECAJ SUŠENOGA PIVSKOGA JEČMA S DODATKOM ENZIMA NA PRODUKTIVNOST ISA-BROWN NESILICA

SAŽETAK

U radu se istražuje utjecaj sušenoga pivarskoga ječma (BDG) s dodatkom Grandizyme® enzima kao djelomičnom zamjenom za kukuruz u hranidbi nesilica. Stotinu i dvadeset Isa-Brown nesilica nasumično su podijeljene u tri hranidbena tretmana: 0 (kontrola), 10% i 20% BDG i hranjene 12 tjedana. U svakom hranidbenom tretmanu bilo je 10 nesilica u četiri ponavljanja. Unos hrane, dnevna proizvodnja i neto dobit od prodaje jaja bili su značajno najviši (p<0,05) kod 3. hranidbenog tretmana. Troškovi hrane/kg značajno su smanjeni (p<0,05) s ₦35.50 (0,17 €), koliko su iznosili u 1. tretmanu, na ₦ 33.69 (0,16 €) u 2. i 31.38 ₦ (0,15 €) u 3. tretmanu. Zamjenom kukuruza s 20% BDG s dodatkom Grandizyme® enzima postignuta je bolja produktivnost i veća neto dobit u usporedbi s drugim tretmanima. Na taj način bi se problem visoke cijene kukuruza mogao riješiti.

Ključne riječi: kokoš nesilica, sušeni pivarski ječam, dodatak enzima, performansa, profitabilnost

(Received on 12 October 2012; accepted on 27 March 2013 - *Primljeno 12. listopada 2012.; prihvaćeno 27. ožujka 2013.*)