Bioefficacy and economics of RonozymeTM P as a substitute for bone meal in turkey poult ration

G.S. Ojewola, E.N. Nwachukwu, S.F. Abasiokong, A.H. Akinmutimi and O.A. Oluwafisayo.

Michael Okpara University of Agriculture, Umudike, College of Animal Science and Animal Health, P.M.B 7267 Umuahia Abia State Nigeria.

Abstract

The biological and economic efficiencies of RonozymeTM P as a substitute for bone meal in female Turkey poults was investigated. A total of eighty local female poults were brooded and fed commercial broiler starter diet containing 23% CP and 2800kcal/kg ME from day-old to four weeks of age. Sixty (60) female poults were thereafter randomly selected and allotted to each of the four experimental groups of fifteen (15) birds each. Each diet was fed to triplicate groups of five poults for 8 weeks in a completely randomized design. A total of four isocaloric and isonitrogenous diets containing 25 CP and 2932kcal/kg ME were formulated. Each of the diets was supplemented with RonozymeTM P while inclusion level of bone meal was varied from diet 1 to 4 respectively. Of all the production and economic parameters considered only the mean daily feed intake was significantly ($P < 0.05$) influenced. Diet 2 proved to be the best, by having the best feed to gain ratio (2.55), and higher gross margin (N1,356.35). The difference in the mean total body weight gain for the two diets (2,323.33 (D2) and 2,380.00g (D3)). It was concluded that 2% level of bone meal inclusion in poults diets proved better than diets having 3%, 1% and 0% respectively, especially when supplemented with 30g of RonozymeTM P as recommended. This will cut-down cost and also probably improve calcium and phosphorous availability and absorption.

Keywords: Bioefficacy, RonozymeTM P, bone meal, turkey poult ration

Introduction

The use of bone meal and oyster shell as an animal feed ingredient is a common knowledge. According to Oluwemi and Roberts (1979), Calcium is derived from oyster shells, sea shells and limestone, and phosphorous from bone or defluorinated rock phosphate. Both calcium and phosphorous are supplied in the diet as dicalcium phosphate. Mineral, especially calcium and phosphorous have many functions in the animal body. Skeletal development is dependent on adequate and proper ratio of calcium and phosphorous supply in the presence of vitamin D (Sastry and Thomas, 1981; Bertechini and Hossan, 1992). According to Oluwemi and Roberts (1979), calcium and

phosphorous account for 25 percent, and 12 percent respectively of the bone. Phosphorous in adenosine di-and tri- phosphate and photo creatinine takes part in the energy transfer reactions of the body (Hill, 1992), calcium and phosphorous play significant roles in the synthesis of structural proteins (Rajhan, 1980). Calcium in blood plays an important role in blood clotting, osmoregulation, and proper nerves and muscle functioning (Lovell, 1976; Sastry and Thomas, 1981).

Olomu (1995), recommended 1.50 and 1.20% calcium respectively for turkey poults at 0-8 and 8-16 weeks of age, while 1.00 and 0.80%

RonozymeTMP as substitute for bone meal in turkey poult ration

phosphorous were respectively recommended for the two phases of life. Bone, a reservoir for both elements (Miller, 1982; Roland and Farmer, 1986; Hill, 1992) can suffer deficiency, resulting in bone debility and or fractures (Samoklin, *et al.*, 1982), reduced growth rate, loss of appetite and apparent dysfunction of ovaries (McDonald *et al.*, 1995). The implication of these to a poultry farmer is therefore, enormous.

The price of bone meal and oyster shell which constitute the major sources of these minerals over the years has been on the increase. The availability and bulkiness of these materials are becoming issues of concern in recent times considering the increasing cost of transportation. Kaufmann and Kleinberg, (1971) and Simmons *et al.*, (1990) suggested that the addition of microbial phytase will increase the phytate-P degradation in broilers. Today, many fungi, bacteria and yeasts can be used to produce phytate (Vranjse and Wenk 1995; Roche, 2000; Apata and Ojo, 2002). With the industrial production of microbial phytase there had been an increasing interest in the use of phytase to improve animal performance and phytate phosphorous utilization (Ohwota, 2001 and Igbanan, 2002).

Therefore, it was thought necessary to investigate the economic and biological

feasibility of using dietary enzyme as a substitute for bone meal in turkey diets.

Materials and Methods

RonozymeTMP and Dietary composition

RonozymeTMP is a highly active phytase derived from *Peniophora lycii*. It is formulated as a multi-coated granulate (CT) with superior heat stability. This means that at pelleting temperatures above 80°C, when competitor products start to become denatured, RonozymeTMP (CT) can be used in pelleting with steam conditioning up to 90°C and outperforms any competitive phytase at temperatures above 80°C (Roche, 1999). The enzyme was purchased at the cost of one thousand two hundred naira (₦1,200) per kg in Lagos, Nigeria. A total of four isocaloric and isonitrogenous diets containing 25%CP and 2932.00kcal/kg ME were formulated. Each of the diets (1-4) was supplemented with RonozymeTMP while inclusion level of bone meal was 3.00%, 2.00%, 1.00% and 0.00% respectively for Diets 1,2,3 and 4 in a completely randomized design (CRD) experiment. Sand was included at various levels in the ration to balance the ration formula at the reduction in levels of the bone meal. The bone meal was purchased at the cost of sixteen naira (₦16.00) per kg. The composition of the diet is as shown in Table 1.

Table 1: Composition of diets containing RonozymeTMP as a substitute of bone meal in female turkey poult's ration (4-12 weeks)

Ingredients (%)	Diet 1	Diet 2	Diet 3	Diet 4
Yellow maize	50.47	50.47	50.47	50.47
Soybean meal	35.90	35.90	35.90	35.90
Fish meal	8.00	8.00	8.00	8.00
Bone meal	3.00	2.00	1.00	0.00
Washed sand	0.00	1.00	2.00	3.00
Oyster shell	2.00	2.00	2.00	2.00
Vitamin mineral premix ¹	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10
Ronozyme TM P	0.03	0.03	0.03	0.03
Total (%)	100.00	100.00	100.00	100.00
Calculated analysis	25.00	25.00	25.00	25.00
ME (kcal/kg)	2932.00	2932.00	2932.00	2932.00

Vitamin/Mineral Premix (optimal)¹: Premix provided per 2.5kg per tonne of diet: Vit. A 10,000,000 I.U; Vit D3 2,000,000 I.U; Vit. E 2,000 I.U; Vit. K 2,250 Mg; Thiamine B1 1,750mg; Riboflavin B2 mg; Pyridoxine B6 270 mg; Niacin 27,500 mg; Vitamin B12 11 mg; Pantothenic acid 7,500 mg; Folic acid 7,500 mg; Biotin 50 mg; Choline Chloride 400g; Antioxidant 125g; Copper 5g; Iodine 1.2g; Selenium 200 mg; Cobalt 200 mg.

Experimental: Birds and Design

A total and eighty local female poult's were brooded and fed conventional commercial broiler starter diet containing 23%CP, and 2800kcal/kg ME from day-old to four weeks of age. Sixty (60) female poult's were thereafter randomly selected and allotted to each of the four experimental groups of fifteen (15) birds each. Each treatment was subjected into 3 replicates having five poult's each. All the poult's were fed ad-libitum and allowed free access to water throughout the eight week duration of the experiment. Other routine management practices such as vaccination, drug administration and maintenance of cleanliness in and out of the poultry house were observed.

Mean weekly feed intake and mean weekly liveweight were recorded while the mean daily weight gain, mean daily feed intake and feed-to-gain ratio were calculated from the data. The experiment lasted 8 weeks.

Economic Analysis

The cost of dietary ingredients (N/kg) was noted and used in calculating cost of production of each of the four experimental diets. Feed intake per poult for the period was used to multiply the cost/kg. Weight gain was calculated according to procedure described by Sonaiya *et al* (1986) and Ukachukwu and Anugwa (1995) which involves taking the product of cost/kg feed and feed conversion ratio of birds consuming such diets.

- (a) Cost of production = cost/kg weight gain x mean weight gain.
- (b) Revenue = Price (N/kg) x mean weight gain
- (c.) Gross margin (N) = Revenue - Cost of production.

Statistical Analysis

All data were subjected to analysis of variance according to the procedure described by Steel and Torrie (1980). Duncan New Multiple Range Test (Duncan, 1995) was employed to compare treatment means found to be statistically significant at 0.05 level of probability.

RonozymeTMP as substitute for bone meal in turkey poult ration

Results and Discussion

The feed intake, body weight gain and feed-to-gain ratio as affected by RonozymeTM P supplementation is presented in table 2. Mean initial body weight ranged from 520.00 to 526.67g, while mean daily weight gain ranged from 37.50 to 42.50g. Mean total feed intake

ranged from 5916.67 to 7180.00g with birds fed diet 3 having the highest feed intake while birds placed on diet 2 had the least value. Birds fed diet 3 also had the highest mean final body weight, mean total weight gain and mean daily weight gain. Diet 2 gave the best feed-to-gain ratio (2.55).

Table 2: Feed intake, bodyweight gain and Feed efficiency of Local Turkey (female) fed diets containing varying levels of bone meal supplemented with RonozymeTMP (4-12 weeks).

Parameter	Diet 1	Diet 2	Diet 3	Diet 4	SEM
Mean daily feed intake (g/bird/day)	111.99 ^a	105.65 ^a	128.21 ^b	116.40 ^b	4.86*
Mean total feed intake (56 days)	6,271.33	5,916.67	7,180.00	6,519.33	272.30 ^{ab}
Mean initial body weight (g) (at 4 week)	520.00	520.00	526.67	526.67	22.31 ^{ab}
Mean final body weight (g)	2,643.33	2,843.33	2,906.67	2,626.67	192.34 ^{ab}
Mean total weight gain (g/bird/56 days)	2132.33	2,323.33	2,380.00	2,100.00	179.54 ^{ab}
Mean daily weight gain (g/bird)	37.92	41.49	42.50	37.50	3.21 ^{ab}
Feed-to-gain ratio	2.95	2.55	3.10	3.10	0.52 ^{ab}

a,b values with different superscripts on same row are significantly different (P < 0.05)

S.E.M Standard Error Mean.

The result of the growth performance indicated that the use of RonozymeTM P supplementation in a practical maize-soyabean meal based diet having varying levels of bone-meal in a turkey diet would improve performance up to a certain level. In this case, supplementing the diets with RonozymeTM P in the complete absence of bone meal may not give the best result. In other words, there is a limit. These findings are in agreement with previous studies by Kornegoy *et al.* (1996); Rao *et al.*, (1999) and Igbanan, (2002). The improvement in performance of turkey poult could be attributed to the improvement in P and Ca digestibility as more P and Ca are made available by enzymatic action of microbial phytate supplied by the RonozymeTM P to support growth of turkey. This observation had been reported in many studies by Kornegay *et al.*, (1996); Waldroup *et al.* (2002) and Rao *et al.*, (1999). Based on this study, bonemeal level of inclusion can be reduced to as low as 2.0% has the best feed-to-gain ratio to allow for supplementation with

0.3% RonozymeTM P. This is because from 3.0% to 2.0% performance improved. Supplementation of completely deficient bone meal diets depressed mean daily weight gain.

Table 3 shows the economic effect of supplementing turkey poult diet with RonozymeTMP. Cost of feed consumed/bird ranged from N269.90 to N327.05 with birds fed diet 3 having the highest cost. This could be due to high feed intake while diet 1 and 2 cost less than the others, which would be as a result of lower feed intake. Revenue generated ranged between N1470 to N1666 with birds fed diet 3 giving the highest revenue. It could be due to higher body weight gain while diet 2 gave the highest gross margin (N1356.35). Since, the desire of every investor is to make good profit, productivity at the least cost therefore, should be his preoccupation. 2% level of bone meal inclusion in poults diets, proved to be better than diets 1, 3 and 4 even though they were all supplemented with RonozymeTM P.

Table 3: Economy of Supplementing local turkey poult (female) diets with RonozymeTM P where bone meal inclusion reduced at ratio 3:2:1:0.

Parameter	Diet 1	Diet 2	Diet 3	Diet 4	SEM
Cost/kg feed (N)	45.72	45.63	45.55	45.46	0.08 ^{ns}
Cost of mean total feed consumed/bird (N)	286.72	269.90	327.05	296.37	49.68 ^{ns}
Cost/kg weight gain (N)	138.74	118.55	137.23	141.74	28.03 ^{ns}
Cost of production (N)	286.72	269.98	327.05	296.37	37.13 ^{ns}
Revenue (N)	1486.33	1626.33	1666.00	1470.00	365.89 ^{ns}
Gross margin (N)	1199.61	1356.35	1338.95	1173.63	389.69 ^{ns}

The result obtained in this trial therefore lend support to the need for RonozymeTM P supplementation but with a moderate drop in the dietary bonemeal fed to poults. This will in no doubt cut-down cost and also probably improve calcium and phosphorous availability and absorption.

In conclusion, supplementing turkey diet with RonozymeTM P when dietary inclusion of bonemeal stands at 2% enhanced growth performance at least cost, thus increasing the producer's revenue. RonozymeTM P has practical advantage, though not significant enough for it to be strongly recommended for use. More research is therefore required.

References

- Apata and Ojo. 2002. Efficiency of the Trichoderma Viride Complex in broilers starter fed cowpea testa-based diets. Proc. 25th An. NSAP Conf. Umudike. P.
- Bertechini A. G. and Hossain S. M. 1995. Effect of levels of vitamin D3 and phosphorous in the diets of commercial layers in the hot tropical climate. Proc. World's Poultry Congress Amsterdam. The Netherlands. Vol. 2 p. 104-105.
- Duncan D. B. 1955. Multiple range and Multiple F. test. Biometrics 11: 1-42.
- Hill, Desmond. 1992. Cattle and Buffalo meat production in the tropics. Education Low-priced Books scheme. Longman. P. 86-87.
- Igbasan F. A. 2002. Influence of microbial phytate supplementation of broiler on performance and availabilities of phosphorous and calcium. Proc. 27th Ann. NSAP Conf. Akure. P. 1-22.
- Kaufmann H. W. and Kleinberg I. 1971. Effect of pH on calcium binding by phytic acid and its inositol phosphoric acid derivatives and on the solubility of their calcium salts. Arch. Oral Biol. 16:445-460.
- Kornevoy E. T; Denbow. D. W; and Ravindra V. 1996. Response of broiler to graded levels of microbial phytate added to maize-soybean meal based diets containing three levels of non-phytate phosphorous. Brit. J. Nat. 75 : 839 - 852.
- Lovell R. T. 1976. Fish feed and nutrition. Commercial fish farming and aquaculture. Vol. 2(4): 39-45.
- McDonald P. R. A; Edwards, J. F. D; Greehalgh and M. C. Morgan. 1995. Animal Nutrition. 5th Edn. Longman, United Kingdom. 170-282.

Ronozyme™ P as substitute for bone meal in turkey poult ration

- Miller M. G.** 1982. Alternative Phosphorous Sources. Feed International, A watt. Publication. P. 47-52.
- Ohwota K. S.** 2001. Alternative Energy Sources in Poultry Feed Production: The role of enzyme. Workshop-Poultry Association of Nigeria , Lagos.
- Olomu J. M.** 1995. Monogastric Animal Nutrition: Principles and Practice. P. 197-198.
- Oluyemi J. A and Roberts F. A.** 1979. Poultry Production In Warm Wet Climate Spectrum Books. P. 147-168.
- Rao R.S.V; Ravindran. V; Reddy. V. K.** 1999. Enhancement of phytate phosphorous availability in the diets for commercial broilers and layer. *Anim. Feed Sci. Techno.* 7a:211-222.
- Roche,** 1999. Ronozyme™ P: A new phytate for animal feeds. Novo Nordisk 2-6.
- Roland D. A Sr. and Farmer. M.** 1986. Studies concerning the possible mechanism for varying response of different phosphorous levels on egg shell quality. *Poultry Sci.* 61: 1393.
- Rajhan S. K.** 1980. Animal Nutrition in the tropics (2nd Rev. Edn.) Vikas Publ. House Ltd. New York. P. 362.
- Samoklin V. I; Georgievskini, V. I; Annekore B. N.** 1982. Mineral Nutrition of Animal Butterworths London P. 450.
- Simmons. P.C.M; Verstegh, H.A.J; Jongbloed A. W; Kemme, P.A; Slump P; Bos. K. D; Wolfers, M.G.E; Beudeker, R.F and Verschoar, G. J.** 1990. Improvement of P. availability of microbial phytate in broiler and pigs. *Br. J. Nutr.* 64:525-540.
- Sonaiya E. B; Wilhams, A. R; and Oni S. A.** 1986. A biological and economic appraisal of broiler production up to 16 weeks. *J. Anim. Sci. Res.* 6(2): 115-125.
- Steel R.C.G and Torrie J.H.** 1980. Principles and Procedures of Statistics 2nd Edn. McGraw Hill Book Company. New York.
- Sastry N.S.R and Thomas C.K.** 1981. Farm Animal Management. Vikas Publishing House PVT Ltd. New Delhi 121-122.
- Ukachekwu. S. N and Anugwa F. O.** 1995. Bioeconomics of feeding raw or heat treated soybean to broilers *Nig. J. Anim. Prod.* 22(2): 137-147.
- Vranjse M. V and Wenk C.** 1995. The influence of extruded untreated barley in the feed, with or without dietary enzyme supplement on broiler performance. *Anim. Feed Sci. Technol.* 54:21-32.
- Waldroup P. W; Michel , R. J; Daune J. R and Hazen K. R.** 2002. Performance of chicks fed diets formulated to minimize excess levels of essential amino acids. *Poultry Sci.* 77: 225-243.

(Received 17 February 2003; Accepted 13 August 2003)