

RESPONSE OF GROWER PIGS FED DIETS CONTAINING HIGH FIBRE SUPPLEMENTED WITH COCKTAIL OF ENZYMES

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Abstract

The study was conducted to evaluate the effect of cocktail of enzymes (Avemix XG 10) which comprised xylanase and glucanase on the performance of grower pigs fed a basal diet containing corn bran, wheat bran and palm kernel cake. A total of 48 grower pigs with an average initial body weight (BW) of 27.81±0.84 kg were randomly allocated to three treatments based on BW and sex (16 replicate pens with one pig) were used in this 56-day trial. Dietary treatments were: (T1) control: basal diet plus 0% Avemix XG 10; (T2) basal diet plus 0.01% Avemix XG 10 and (T3) basal diet plus 0.03% Avemix XG 10. The enzyme (Avemix XG 10) supplementation did not have significant ($P>0.05$) effect on final body weight, daily weight gain, average daily feed intake and feed conversion ratio. The pigs fed the control diet without Avemix XG 10 had the highest final body weight (43.882 Kg), daily weight gain (0.374 Kg) and average daily feed intake (1.544 Kg) while the lowest values for the aforementioned parameters were observed in the pigs fed diet supplemented with 0.01% Avemix XG 10. The pigs fed diet with 0.03% Avemix XG 10 (T3) had the best feed conversion ratio. The enzyme supplementation increased ($P<0.05$) the cost of feed/kg diet and also increased the feed cost/kg live weight by 2.64 and 7.92% at 0.01 and 0.03% respectively when compared to the control. In conclusion, dietary supplementation of Avemix XG 10 in the diet containing high dietary fibre did not improve the performance of grower pigs.

INTRODUCTION

Animal nutritionists continuously search for a cost-effective optimum between ever changing dietary formula and increasing demands on performance. This has led to inclusion of Non-starch polysaccharides rich ingredients in the diets of animals, which often reduces feed cost. However, this hinders a proper digestion due to high fibre and presence of anti-nutritional factors (De Keyser *et al.*, 2016). Non-ruminants are physiologically unable to hydrolyze NSP in their small intestine. Dietary fiber is one of the most significant factors that affect gut physiology and health in livestock (Viladomiu *et al.*, 2013; Lindberg, 2014). Non-starch polysaccharide (NSP)-degrading enzymes have been indicated to increase the utilization of fibre with a consequent increase in energy and other nutrients. Again, it has been reported that the addition of non-starch polysaccharides degrading enzymes improve animal growth performance, nutrient digestibility and responses to infectious diseases (Lan *et al.*, 2017). Cocktail of enzymes (AveMix[®] XG 10) is a multi-enzyme concept with high glucanase and high xylanase activity, designed for monogastric feeds. The enzyme activities work synergistically to break down fibre structures. Through the capability of AveMix[®] XG 10 to break down also soluble fibres into smaller particles, intestinal viscosity will be reduced. This lower viscosity will enhance intake of nutrients in the small intestine, this effect is important in poultry (AVEVE Biochem, 2010). Therefore, the potency of cocktail of enzymes (Avemix XG 10) was assessed to upgrade dietary energy, total protein and amino acid digestibility as well as fibre utilization in growing pigs.

MATERIALS AND METHODS

Experimental location and duration

The feeding trial which lasted for a period of 56 days was carried out at AK farms located at Eleyele, Ibadan, Oyo state, Nigeria. A basal diet deficient in energy, crude protein and high in crude fibre was formulated using the nutrient requirement recommendations for growing pigs

by National Research Council (1998) as a guide (Table 1) for other nutrients. The basal diet was in pellet form, consisting of maize bran, wheat bran and palm kernel cake and other micronutrients. The basal diet served as control (T1) had no Avemix XG 10 while the enzyme (Avemix XG 10) was added to the basal diet at 0.01% (T2) and 0.03% (T3). The control diet (T1) contained 11.05 % crude protein (CP) and 2166 Kcal/ Kg metabolizable energy. All the treatments contained the same percentage of crude fibre (14.17%). Forty-eight growing pigs with average initial live weight of 27.81 ± 0.84 kg were randomly allocated according to body weight and sex to the three experimental treatments with sixteen replicates and each animal represented a replicate in a completely randomized design. The pigs were kept in Pens with area (234 cm $\times$ 216 cm) which had concrete floors without litter. Each pen had a concrete feeder (97 cm $\times$ 33 cm) and a concrete drinker (97 cm $\times$ 33 cm). All the pigs were fed with the experimental diets throughout the experimental period. The experimental diets and water were given to the animals unrestrictedly for the period of the experiment. Standard management practices were duly observed. Data were collected on daily feed intake and body weight gain. Daily weight gain, feed conversion ratio and indices for economic analysis were evaluated. All the data were subjected to analysis of variance using General Linear Model of SAS (2002) and the means were separated using Duncan Multiple Range test.

Results and Discussion

The indices used to measure the performance of the growing pigs fed the experimental diets are shown in Table 2. These indices include the final body weight, body weight gain, daily weight gain, average daily feed intake and feed conversion ratio. The differences in all the parameters across the treatments were not significant ($P > 0.05$). The pigs fed the control diet without Avemix XG 10 had the highest final body weight (43.882 Kg), body weight gain (15.721 Kg), daily weight gain (0.374 Kg) and average daily feed intake (1.544 Kg) while the lowest values for the aforementioned parameters were observed in the pigs fed diet supplemented with 0.01% Avemix XG 10. The pigs fed diet with 0.03% Avemix XG 10 (T3) had the best feed conversion ratio while the worst feed conversion ratio was observed in the pigs fed 0.01% Avemix XG 10 (T2), though, these variations were not significantly ($P > 0.05$) different. The use of enzyme (Avemix XG 10) did not show any beneficial effect on the performance of the pigs. This may be as a result of high fibre content in the diets (14.17%) as revealed by the proximate analysis. The enzyme (Avemix XG 10) whose primary function is to break the non-starch polysaccharides in the diets could not make the nutrients encapsulated by the high fibre available to the animals. This has resulted in low bioavailable of several nutrients. The results of this study indicate that pigs fed diets supplemented with the Avemix XG 10 (xylanase and glucanase) had similar performance with those fed the control diet (T1). These results are in disagreement with earlier findings of Fang *et al.* (2007), who reported xylanase supplementation improved the average daily gain and feed efficiency in growing pigs fed corn, soybean and rapeseed based diets. The lack of significant effect of the cocktail of enzymes used in this study (Avemix XG 10) on average daily gain and feed conversion ratio is also in contrary to the report of Nortey *et al.* (2007) who indicated that xylanase supplementation to wheat-based diets improved the average daily gain and feed efficiency. However, the results are inconsistent. The results of this study corroborate the earlier findings of Passos *et al.* (2015) who reported that dietary supplementation of xylanase had no effect on average daily gain, average daily feed intake or feed efficiency in grower pigs fed a corn-soybean meal based diet. The seeming contradictions in the effectiveness of enzyme supplementation among studies may be due mainly to differences in pig age and the compositions of the experimental diets (Lan *et al.*, 2017). There was a significant ($P < 0.05$) difference in the costs of a kilogram of the diets across the treatments. The significant

difference that exists in the cost of feed per kilogram was ascribed to the inclusion of the enzyme (Avemix XG 10). At 0.01 and 0.03% inclusion levels, enzyme supplementation significantly ($P < 0.05$) increased the cost of the feed per kilogram by 2.64 (T2) and 7.92 % (T3) respectively when compared with that of the control (T1).

Conclusion

It could be concluded that Avemix XG 10 (Xylanase and glucanase) supplementation did not improve the performance of grower pigs fed diets marginal in crude protein, metabolisable energy but high in crude fibre.

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Table 1. Gross composition and calculated analysis of the experimental diets

Ingredients (%)	T1	T2	T3
Maize bran	45.50	45.50	45.50
Wheat bran	20.30	20.30	20.30
Palm kernel cake	30.00	30.00	30.00
Bone meal	2.00	2.00	2.00
Limestone	1.00	1.00	1.00
Salt	0.40	0.40	0.40
Premix Broiler	0.30	0.30	0.30
Lysine	0.10	0.10	0.10
BIOAD	0.30	0.30	0.30
NITROTRIM2	0.10	0.10	0.10
Larvacide	0.03	0.03	0.03
AVEMIX XG 10	-	0.01	0.03
Total	100.03	100.04	100.06
Calculated Analysis			
Crude protein (%)	11.05	11.28	11.74
Metabolisable energy (Kcal/Kg)	2166	2256	2435
Crude fibre (%)	14.17	14.17	14.17
Lysine (%)	0.53	0.54	0.57
Methionine (%)	0.23	0.23	0.23

Table 2. Growth performance and economic analysis of pigs fed diets containing high fibre supplemented with cocktail of enzymes

Parameters	T1	T2	T3	SEM	Pvalue
Initial body weight (Kg)	28.161	27.955	27.300	0.8441	0.9230
Final body weight (Kg)	43.882	41.564	42.070	1.0538	0.6511
Body weight gain (Kg)	15.721	13.610	14.770	0.7318	0.4894
Daily weight gain (Kg)	0.374	0.324	0.352	0.0174	0.4894
Average daily feed intake (Kg)	1.544	1.506	1.513	0.0369	0.9090
Feed conversion ratio	4.612	4.981	4.500	0.2458	0.7028
Economic analysis					
Feed cost/Kg diet (₦)	55.836 ^c	57.309 ^b	60.256 ^a	0.2961	<0.0001
Total cost of feeding (₦)	4827.9	4832.6	5106.4	120.650	0.6004
Feed cost /Kg live weight gain ((₦/Kg)	257.50	285.48	271.15	14.0238	0.7153

^{abc} Means within the same row with different superscripts are significantly different (p<0.05)

SEM; standard error of mean