

EFFECT OF DIETARY MULTI-ENZYME COMPLEX AND FIBRE SOURCES ON PERFORMANCE AND NUTRIENT DIGESTIBILITY OF GROWING PIGS

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ABSTRACT

Six dietary treatments were formulated. Diet 1, 2 and 3 contained 200g kg⁻¹ soya bean meal (SBM), wheat bran (WB) and rice bran (RB), respectively. Diets 4, 5 and 6 were the same as 1,2 and 3 but contained a multi-enzyme complex supplemented at the rate of 4g kg⁻¹ diet. Each dietary treatment was fed to three weaner pigs and each pig served as a replicate for 42 days with daily performance measurement. Faecal sample were collected and analysed for nutrient digestibility calculations using standard procedures. Data were analysed using descriptive statistics and ANOVA at $\alpha 0.05$. Irrespective of enzyme addition or not, FI and feed efficiency of pigs on the SBM and WB diets were similar ($P > 0.05$). Pigs on the RB diet had significantly higher FI than those on the SBM and WB diets. Enzyme supplementation had no effect on FI and feed efficiency. Daily weight gain was similar in pigs on the 3 diets without enzyme. Enzyme supplementation resulted in significantly higher daily weight gain in pigs on the RB diets compared to those on the SBM and WB diets. Crude fibre digestibility was significantly higher in pigs on the RB diet with or without enzyme supplementation. SBM resulted in significantly higher digestibility of ether extract with or without enzyme supplementation while similar results were obtained for CP and ash digestibility in RB diet. The use of exogenous multi-enzyme supplementation in rice bran diet can be recommended as alternative to soya bean meal diet.

Key words: Enzyme, Fibre sources, Growth, Nutrient Digestibility, Swine

INTRODUCTION

Pork production is a major segment of animal husbandry which involves the raising and breeding of pigs principally for food and sometimes for their skin. Pigs have short generation interval with rapid fecundity and good carcass yield of about 70% as compared to other livestock such as cattle, sheep and goats. Pigs have 15000 taste buds as against 9000 in humans (Ikani *et al.*, 1976) enabling them to eat everything edible including higher levels of dietary fibre diets. This has greatly expanded the range of feed resources for pigs (Ikani *et al.*, 1976). This new development also poses a new challenge in the level of nutrient availability to pigs as these dietary fibre contain antinutritional factors known as Non-starch polysaccharides (NSPs).

Soluble non- starch polysaccharides (NSP) have been reported to have antinutritional effect and cannot be degraded by young pigs due to their inability to synthesize NSP enzymes (Omogbenigun *et al.*, 2004). These NSPs are prevalent in most of the conventional feed stuffs such as wheat, barley, rye, corn and soybean used in pig feed. Non-starch polysaccharides such as α -galactomanans and α -1,6-galactosides are antinutritional compounds in soya bean meal, which are still present even after heat processing. Arabinoxylan is the antinutritional compound found in maize while hemicellulose and hexosane are present in wheat, barley bran, cereals and legumes. Owing to decreased fibre content and high nutrient digestibility, it has been more challenging to obtain beneficial effect for corn and soya bean meal diets through the use of exogenous enzyme supplementation. Graham *et al.* (1988) suggested that a combination of different enzyme activities is required for the degradation of complex NSP and improve nutrient utilization. The objective of this study was to investigate the effect of an exogenous multi- enzyme supplementation in the diet of grower pigs containing soya bean meal (SBM), wheat bran (WB) and rice bran (RB).

MATERIALS AND METHODS

The experiment was carried out in the piggery unit of the Teaching and Research farm of the University of Ibadan, Ibadan, Nigeria. Eighteen large white weaner pigs of approximately 6kg initial weight were sourced from the farm. The pigs were de-wormed and other routine vaccination given to them. They were weighed and randomly distributed into pens with three pigs per treatment and one pig per pen serving as replicate in a completely randomized design

The experimental diets comprised of 6 treatments. Diet 1 was a corn soyabean meal (SBM)-based diet which served as the control and without enzyme supplementation. Diets 2 and 3 contained wheat bran (WB) and rice bran (RB) respectively also without enzyme supplementation. Diets 4, 5 and 6 contained SBM, WB and RB as in the first 3 diets but with a multi-enzyme (α Amylase 800,000 UA/Kg, Protease 8,000,000 U.P/Kg, Xylase 500,000 U.X/Kg, β -Glucanase 300,000 BG/Kg, Cellulase 700,000 U.C/Kg, Lipase 20,000 U.C/Kg, Fructo oligosaccharides (FOS) 1,000g and Moisture 5%) which was added at the rate of 4 g/kg diet. The nutrient composition of the experimental diets is shown in Table 1. Clean water and feed were provided *ad libitum* for 42 days.

Table 1: Nutrient composition of experimental diets (g/Kg DM) fed to weaner pigs for 42 days

Nutrient	Without Enzyme			With Enzyme		
	Soya bean meal	Wheat bran	Rice bran	Soya bean meal	Wheat bran	Rice bran
Metabolisable Energy, kcal/kg	2907.55	2587.15	2889.55	2906.21	2585.81	2888.21
Crude Protein, g/kg	172.82	158.82	163.57	172.78	158.78	163.83
Calcium (Ca), g/kg	6.89	6.92	6.86	6.89	6.92	6.86
Total Phosphorus (P), g/kg	5.18	6.62	7.43	5.18	6.62	7.43
Non-Phytate (NPP)	2.43	2.52	2.62	2.43	2.52	2.62
Ca:P	1.33	1.04	0.92	1.33	1.05	0.92
Ca:NPP	2.83	2.74	2.62	2.83	2.74	2.62
Crude Fibre	24.38	40.62	41.93	24.37	40.61	41.92

One kilogram of feed was measured to each pig across treatments daily. For daily feed intake determination, the left over per day was subtracted from the one kilogram of feed fed. Average daily weight gain was obtained by dividing the average final weight of the pigs by the duration of the trial (42 days). The feed efficiency was calculated by dividing the total weight gain by the total feed intake. During the last 5 days, faeces were collected from each pig kept individually in metabolic cages for proximate analysis and calculation of nutrient digestibility.

Data obtained were analysed using the General Linear Model (GLM) procedures of SAS (2008) and means were compared using Duncan's multiple range test of the same package at α 0.05.

RESULTS AND DISCUSSION

Growth performance of weaner pigs fed soya bean meal, wheat bran and rice bran diets with or without multi-enzyme

The results of the performance of the pigs are presented in Table 2. For both the group with and without enzyme inclusion, similar trend was recorded as feed intake of pigs fed rice bran (RB) diets was observed to be significantly higher than in those on the soyabean meal (SBM) diets though both were statistically similar to the feed intake of pigs fed wheat bran (WB) diets. The feed efficiency of pigs fed SBM diet with enzyme inclusion was significantly higher than those fed WB diet with enzyme inclusion. but both were similar to the feed efficiency recorded for pigs on other four diets. Similar observation was noted for the average daily weight gains of the pigs fed the experimental diets. The weight gains of pigs fed RB diet with enzyme, SBM diet with enzyme, RB diet without enzyme and WB diet without enzyme were observed to be significantly higher than those fed SBM diet without enzyme and WB diet with enzyme. The results showed that there was no significant difference in feed intake among the treatments but only in the fibre source. Rice bran among the three fibre sources was significantly consumed above SBM but there was no significant difference between RB and WB. This might be due to the desire of the pigs to meet their energy demand. The results also showed that there was no significant difference in the weight gain of the pigs in the six dietary treatments for the six-week trial. This is in line with the findings of Shyama *et al.* (2011) who found no significant difference in weaner pigs fed phytase- supplemented diets. Morcherla (2013), also observed no significant weight gain of grower pigs after substituting xylanase and phytase in their diet. Increased average daily weight gain as a result of enzyme supplementation has been reported by Omogbenigun *et al.* (2004). Conversely, Cervantes *et al.* (2004) reported no significant difference

between SBM diet and WB diet supplemented with enzyme on average daily weight gain of weaner pigs.

Table 2: Growth performance of weaner pigs fed soya bean meal, wheat bran and rice bran diets with or without multi-enzyme

Parameters (Kg)	Without enzyme			With enzyme			SEM
	Soya bean meal	Wheat bran	Rice bran	Soya bean meal	Wheat bran	Rice bran	
Initial body weight	6.33	6.67	6.67	6.00	6.00	5.67	0.52
Feed intake	33.6 ^b	36.3 ^{ab}	39.4 ^a	32.9 ^b	33.0 ^{ab}	38.6 ^a	1.44
Feed efficiency	0.41 ^{ab}	0.43 ^{ab}	0.39 ^{ab}	0.48 ^a	0.37 ^b	0.42 ^{ab}	0.02
Average daily weight gain	0.33 ^b	0.37 ^a	0.37 ^a	0.38 ^a	0.30 ^b	0.42 ^a	0.03

Nutrient Digestibility of weaner pigs fed soya bean, wheat bran and rice bran with or without enzyme supplementation

The results of nutrient digestibility are presented in Table 3. There was a significant difference ($P < 0.05$) in crude protein (CP) digestibility among the treatments. Rice bran had the highest CP digestibility which was significantly higher than values for the other diets. Crude fibre digestibility of rice bran diet without enzyme was significantly higher when compared to other diets. Digestibility of ether extract in soyabean meal with or without enzyme was higher than in rice bran but similar to that of wheat bran. The ash result also showed a significant difference in digestibility of mineral among the treatments without enzyme supplementation over the enzyme supplemented diets. Energy digestibility was neither affected by diet type nor enzyme supplementation.

Table 3: Nutrient Digestibility of weaner pigs fed soya bean, wheat bran and rice bran with or without enzyme supplementation

	Without enzyme			With enzyme			SEM
	Soya bean meal	Wheat bran	Rice bran	Soya bean meal	Wheat bran	Rice bran	
Crude Protein	69.4 ^b	70.6 ^b	72.9 ^a	67.8 ^c	59.8 ^d	74.0 ^a	0.83
Crude Fibre	24.4 ^b	12.7 ^c	41.9 ^a	11.2 ^c	10.0 ^c	25.3 ^b	2.63
Ether Extract	76.3 ^a	72.9 ^{ab}	71.6 ^b	81.9 ^a	78.3 ^{ab}	70.4 ^b	1.52
Ash	36.9 ^{ab}	29.3 ^b	42.0 ^a	10.0 ^c	11.0 ^c	14.2 ^c	2.75
Energy	92.1	91.9	92.0	91.6	91.9	91.9	0.09

The result of CP digestibility is in line with Traylor *et al.* (2001) and Cervantes *et al.* (2004) who found no significant difference in crude protein digestibility after substituting the diet with enzymes. Crude fibre (CF) digestibility also did not follow a regular pattern across the treatment but CF digestibility was significant in diets without enzyme supplementation above each alternative diet with enzyme supplementation. This may be due to incompatibility of the enzyme to the fibre sources thereby resulting in a negative digestibility of CF. Soyabean meal showed a significant ether digestibility above RB. This may be due to a more soluble ether from SBM above RB. Energy digestibility was high and not significant across the treatments. This might be attributed to the high soluble energy diet used.

CONCLUSION

From the present study, exogenous multi-enzyme supplementation has succeeded in increasing the average daily weight gain of the weaner pigs but has also not succeeded in making any significant increase in the nutrient digestibility of the conventional feedstuff used in this experiment. Considering the result of this study and alternative fibre source for low cost production, the use of exogenous multi-enzyme supplementation in rice bran diet can be recommended.

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