

Growth Performance and Nutrient Digestibility of Growing Pigs Fed Cassava Peel Meal Based Diets Treated with Exogenous Enzyme

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Abstract— A feeding trial was conducted to evaluate the growth performance and nutrient digestibility of grower-finisher pigs fed diets containing 0 %, 50 %, 75 % and 100 % levels of cassava peel meal treated with 0.035g Natuzyme[®]/100g CPM. Sixteen (16) pure bred male Landrace grower-finisher pigs, averaging 31.80kg were allotted to four dietary treatments in a completely randomized design such that each pig was housed and fed individually as a replicate. Four experimental diets T₁, T₂, T₃ and T₄ were formulated and 0 %, 50 %, 75% and 100% maize was replaced with Natuzyme[®] treated cassava peel meal and fed until the pigs reached 60kg ±2kg live weight. At the end of the feeding trial which lasted for 7, 7,8 and 9 weeks for treatment T₁, T₂, T₃ and T₄, respectively, two pigs from each dietary treatment were randomly selected and starved for 24hours; faecal samples were collected for seven days, oven dried, weighed and sampled for digestibility analysis. Feed intake and weight gain of pigs fed test diets decreased ($p>0.05$) while, feed conversion ratio increased ($p>0.05$) compared with the control. There was significant reduction ($p<0.05$) in the cost of feed per kilogram live weight gain as supplemented CPM increased in diets of finisher pigs. Nutrient digestibility of dry matter, crude fiber, crude protein, ash and nitrogen free extract decreased significantly ($p<0.05$) while ether extract digestibility decreased ($p>0.05$). 100% maize replacement with CPM treated with 0.035g of Natuzyme[®] in 100g of feed for grower finisher pigs proved cheaper though with a slower growth rate.

Keywords— cassava peel meal, Natuzyme[®], growth performance, nutrient digestibility, pigs.

Abbreviations—CPM- cassava peel meal

I. INTRODUCTION

The pig has been noted to compete with human beings for available cereal and grains (Adeshinwa *et al.*, 1998). In

view of this development animal researchers have shifted their attention to materials that are available but underutilized as feed ingredients for livestock. One of such materials is the cassava peel, which is underutilized in Nigeria because it is often burnt or left to rot away on farms and homesteads after harvesting and processing of the tubers (Akinfala and Tewe, 2001). Cassava peel meal contains up to 5% crude protein, 20% crude fiber depending on the variety (Aro *et al.*, 2010). The fibrous content of cassava peel meal has limited its use in monogastric nutrition. Hydrocyanic acid, an anti-nutritional factor is also present in cassava peel. However, sundrying appreciably reduces its level in the material (Aletor *et al.*, 1997). Dietary addition of exogenous enzyme like Natuzyme[®] has been reported to enhance the breaking down of fibre encapsulating the more soluble constituents so that digestion can be effective. Effects on performance of grower-finisher pigs fed varying levels of cassava peel meal without exogenous enzyme have been investigated (Ikurior *et al.*, 1996). This study was conducted to investigate the effects of varying levels of cassava peel meal diets supplemented with Natuzyme[®] on growth performance and nutrient digestibility of grower-finisher pigs.

II. MATERIALS AND METHODS

The experiment was carried out at the Pig production unit on the Livestock Teaching and Research Farm, University of Agriculture, Makurdi, Benue State of Nigeria. Cassava peels were obtained from garri processing agro-allied small-scale industries in Makurdi metropolis. The peels were washed and sun dried for seven (7) days to reduce the moisture content to about 10%. The peels were then crushed using a hammer mill to obtain cassava peel meal (CPM), sampled for analysis and stored in bags until included in the diets.

Experimental diets

Four isonitrogenous experimental diets T1, T2, T3, and T4 were formulated as presented in Table 1. T1 contained 0% cassava peel meal (CPM) without Natuzyme® and diets T2,

T3 and T4 contained CPM treated with 0.035g Natuzyme®/100g at 50%, 75% and 100%, respectively as replacement for dietary maize.

Table.1: Ingredient Composition of Grower-Finisher Pig Diets (g/100g)

Ingredients	Dietary Treatments			
	T1	T2	T3	T4
	Levels of Cassava Peel Meal Replacement			
	0 %	50 %	75 %	100 %
Maize	52.00	26.00	13.00	0.00
Cassava peel meal	0.00	26.00	39.00	52.00
Full fat soya bean	25.00	26.00	28.00	30.00
Maize offal	19.75	18.75	16.75	14.75
Bone meal	2.50	2.50	2.50	2.50
Common salt	0.50	0.50	0.50	0.50
Vitamins/Minerals premix ^a	0.25	0.25	0.25	0.25
Natuzyme®	-	+	+	+
Zinc oxide ^b	++	++	++	++
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Metabolizable energy (Kcal/Kg)	3,169.64	2,817.54	2,656.11	2,495.70
Crude protein (%)	16.81	16.04	16.06	16.09
Dietary cost (₦/kg)	77.68	62.43	55.54	48.65

^aBiomix premix supplied the following per kg of diet: Vitamin A 12,000,000 I.U, Vitamin D33,000,000 I.U , Vitamin B6 3,500 mg, Biotin 80 mg, Antioxidant 125,000 mg, Cobalt 250 mg, Selenium 250 mg, Iron 40,000 mg, Manganese 70,000 mg, Copper 8,000 mg, Zinc 80,000 mg, Choline chloride 200,000 mg , Calpan 10,000 mg, Vitamin B2 5,000 mg, Vitamin B1 2,000 mg, Iodine 1, 200 mg, Niacin 40,000 mg.

Vitamin E 30,000 mg, Vitamin K3 2,500 mg, Folic acid 1,000 mg ,

^b zinc oxide 0.0125 g/100 g, added to supply 100 ppm Zn, ++ = zinc oxide

- = Natuzyme® not added, + = 0.035/g Natuzyme®/100g diet.

Experimental design and management

Sixteen (16) male grower pigs were randomly allotted to four dietary treatments each of which had four replicates. Each pig was served drinking water *ad libitum*. Daily routine management activities were cleaning of pens, provision of experimental diets and drinking water, observation of each animal to know their health status. Each experimental animal was housed in a 183x75x106cm welded iron pipe, wire mesh, individual concrete floored pens while each pen housed four individual crates provided with concrete feeding and watering troughs measuring 52x29x21cm and 47x37x26cm, respectively. The experiment was a completely randomized design.

Data collection

The mean weekly body weights and feed intake were recorded throughout the experimental period of 63days. Feed conversion ratio was calculated from feed intake and body weight gain. Feed cost/kg gain and feed cost/kg diet were calculated from prevailing local market price of feed materials.

Nutrient digestibility was determined by the use of two (2) pigs from each dietary treatment which were randomly selected and starved for 24 hours. A weighed amount of feed was offered daily and fecal samples collected for seven days, oven dried, milled and analyzed for dry matter, crude fibre, crude protein, ether extract, ash and nitrogen free extract using standard methods (AOAC, 1995) The

proximate analysis of the experimental diets was also carried out using the same standard methods.

All data collected were subjected to analysis of variance using the procedure of Steel and Torrie (1980) and where significant differences were observed treatment means were separated using Duncan multiple range test (Duncan, 1955)

The experimental diets contained between 16-17 % crude protein (Table 1) in order to meet the protein requirement of grower pigs recommended by NRC (1997). Similarly, the metabolizable energy of the diets (2,495.70 - 3,169.64 kcal/kg) though reducing as the level of supplemented CPM increased in diet, were also within the energy requirement of growing pigs.

III. RESULTS AND DISCUSSION

Table.2: Effect of Diets containing CPM treated Natuzyme® on Performance of Grower-Finisher Pigs

Performance indices	Dietary Treatments				SEM	LOS
	T1	T 2	T3	T4		
	Levels of cassava peel meal replacement					
	0 %	50 %	75 %	100 %		
Number of pigs	4	4	4	4		
Average initial live weight (kg)	31.45	31.75	31.88	32.50	0.89	NS
Average final weight (kg)	61.38	60.50	61.25	60.75	0.94	NS
Average daily weight gain (kg)	0.65	0.62	0.52	0.45	0.06	NS
Average daily feed intake (kg)	1.63	1.77	1.53	1.35	0.16	NS
Feed conversion ratio	2.55	2.85	2.93	3.03	0.15	NS
Feed cost/ kg live weight gain(₦)	198.84 ^a	177.93 ^b	162.73 ^{bc}	147.41 ^c	9.51	*
Average number of days fed	49.00	49.25	56.00	63.00	8.29	NS

^{a,b,c} Means within same row with different superscripts differed significantly ($p < 0.05$)

LOS= Level of significance.; NS = Not significant ($p > 0.05$) ; * = Significant SEM= Standard error of mean

The effect of the experimental diets on the growth response of grower- finisher pigs is presented in Table 2. It was observed that the diets had no significant effect ($p > 0.05$) on the live body weight, weight gain, feed intake and feed conversion ratio. Significant effect ($p < 0.05$) was observed for the feed cost/ kg live weight gain. These performance indices decreased as percent dietary maize replaced by CPM increased. This probably was due to CPM effect which increased the bulk of the feed thereby lowering the energy density of the diets and causing decrease in weight gain, feed intake and feed conversion ratio. This observed performance can be attributed to a synergy between the digestive system of the pig and the enhanced utilization of Natuzyme® treated CPM diets by the grower finisher pigs. This is in agreement with findings of Ikurior *et al.* (1996) who reported that as animals grow older they tend to handle fibre more efficiently and Chesson (2001) that enzymes are a rich source of high quality protein (amino acids) making up for the short fall in the low quality of crude protein in CPM. It has been reported by Beachemin *et al.* (2003) that

high producing/ growing animals require high level of available energy to meet the demand for lactation or meat production over and above maintenance needs, thus enzymes fed to low energy/ high fibre diets would help bridge the gap between potential and actual performance of the animal by assisting to release more digestible energy from fibrous fractions for use by the animal. The significant difference ($p < 0.05$) in feed cost/kg live weight gain showed that it decreased at higher levels of CPM in the diets. Therefore, it was cheaper to feed pigs on Natuzyme® treated CPM diets than the control diet. This agrees with the finding of Adesehinwa *et al.* (2008) who reported significant reduction in feed cost per kilogram live weight gain as a result of replacing maize in control diet with cassava peel supplemented with exogenous enzyme. Table 3 presents the digestibility coefficient of grower-finisher pigs. Significant decrease ($p < 0.05$) in nutrient digestibility occurred as CPM replacement of maize increased in diets of finisher pigs. However, digestibility of all nutrients: CP, CF, EE, NFE and overall dry matter

digestibility was high, ranging from 60-90 percent despite the fibrous nature of CPM. This is traceable to the interactive effect between the pig's digestive system and Natuzyme® multi- activity. This was capable of breaking

down the fibre encapsulating the more soluble constituent for easy digestion by the pigs, thereby enhancing the digestibility of other nutrients as reported by Irekhore *et al.* (2006).

Table.3: Effect of Diets Containing CPM treated with Natuzyme® on Apparent Nutrient Digestibility Coefficients of Grower-Finisher Pigs.

Nutrients	Dietary Treatments				SEM	LOS
	T1	T2	T3	T4		
	Levels of Cassava peel meal replacement					
	0 %	50 %	75 %	100 %		
Dry matter (%)	91.67 ^a	88.92 ^{ab}	84.76 ^b	77.69 ^c	2.06	*
Crude fibre (%)	87.13 ^a	80.92 ^{ab}	72.33 ^b	63.32 ^c	3.49	*
Crude protein (%)	94.75 ^a	92.77 ^a	90.49 ^{ab}	87.40 ^b	1.14	*
Ash (%)	76.85 ^a	74.47 ^{ab}	70.71 ^{ab}	61.57 ^b	2.60	*
Ether extract (%)	87.40	89.17	84.02	86.77	1.22	NS
NFE (%)	93.48 ^a	89.87 ^a	88.16 ^a	80.73 ^b	1.87	*

^{a,b,c}Means on the same row with different superscripts are statistically different ($p < 0.05$),

NS=not significant ($p > 0.05$) ; * = significant ($p < 0.05$) ; LOS= level of significance

SEM= standard error of mean

Conclusion and Recommendation

In conclusion, the study revealed that the nutritive value of cassava peel meal as a feedstuff can be improved by treating it with Natuzyme® an exogenous enzyme at the rate of 0.035g Natuzyme® per 100g diet. The test diets compared favorably with the control diets in growth parameters. Cassava peel meal with 0.035g Natuzyme®/100g of feed at 100% CPM replacement of maize for grower-finisher pigs gave the least cost of feed per kilogram live weight gain though with a slower growth rate and is hereby recommended for finisher pigs.

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