GROWTH PERFORMANCE AND ECONOMIC EVALUATION OF GROWER PIGS FED DIFFERENT LEVELS OF MAIZE PROCESSING RESIDUE

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ABSTRACT
The study was conducted to evaluate the growth performance and economic were pigs fed Maize Processing Residue (MPR) as replacement for maize. A total 12 large white × Duroc grower pigs were randomly allotted to four treatment diets in a Completely Randomized Design (CRD). The diets contain 0% (control and T_1), 30% (T_2), 35% (T_3) and 40% (T_4) MPR as replacement for maize. Data were collected on feed intake, body weight gain and feed conversion ratio. Also, the costs of experimental diets were evaluated. Data obtained was subjected to ANOVA statistics. Result revealed that there were no significant ($P>0.05$) differences among the parameters tested. Economic evaluation shows that as the level of MPR increased in the feed, the cost of the feed decreased; and the cheapest cost was recorded in T_4 (40%).
Keywords: Economic, Growth, Performance, Maize, Residue

INTRODUCTION

Nutritionists have over the years repeatedly drawn attention the gross imbalances between animal protein availability and human need. The inherent structural differences between animal and plant proteins hamper direct substitution in many products including major impact on sensory properties (Li Day *et al*., 2022). Protein of animal origin is not just preferred because of its palatability but also because it is essential for normal physical and mental development of both man and animals. Most animal-sourced protein foods contain all the required essential amino acids in proportions that are suitable for meeting human requirements and are considered complete proteins (Sydney *et al.*; 2024). Animal-sourced protein foods provide crucial nutrients that support the growth and development in children, maintenance of muscle mass and function in adults, gain in muscle mass and strength in exercising individuals, and mitigation of sarcopenia in the elderly (Sydney *et al*.; 20240). Pigs contribute in no small measure to animal protein intake in Nigeria (Solomon *et al.;* 2024). Furthermore, pigs are good source of income to many rural and urban dwellers (Onyekuru *et al*.; 2020). Swine production in Nigeria is still at a very low level, though it has been gaining attention especially in the South Western Nigeria. Furthermore, being monogastric in nature, the cost of feeding in pig enterprise is enormous and could be as high as 75-80% in the breeding herd. Onyekuru *et al*., (2020) submitted that high cost of feed among other factors was a major constraint faced by the farmers in the piggery enterprise in Udi local government area of Enugu State, Nigeria. Cereal grain forms the major source of energy in the swine feed. For many years in Nigeria, maize has an important position in pig feeding among the cereal grains which is cheaper than barley. It is also a good substitute for barley in all classes of rations. However, to cut high cost of feeding that is associated with intensive pig production system, more attention should be directed to unused resources that are regarded as wastes or unfit for human consumption but can server as good substitutes. These resources are considered to be nutritious and non-competitive. According to Elanchezhian and Ally (2020), lower availability and increasing price of maize, necessitate an alternative energy source for incorporation in the swine feed.

Some agro-industrial by-products like MPR has made substantial contributions toward a better and more economic feeding sources for high energy cereals (Adesehinwa, 2009). The MPR as by-product of maize is relatively available in large quantities in areas where production and processing are being carried out and it constitute a mixture of the aleurone layer of whole maize. Improved feed resources and pig feeding practices are key interventions that could empower pig farmers to increase farm returns. A pig's diet should contain adequate amounts of carbohydrates, proteins, minerals and vitamins (Opadoyin, 2018).

MATERIALS AND METHODS

Source and preparation of test materials

Maize processing residue was purchased from mill operator and locals involved in processing maize into flour and pap (Akamu) at Angwar Gwari, Angwar Kajin and Frin Gida within Kaduna metropolis, Kaduna State. The material was dried under the sun until a product of 7.03% moisture content was obtained.

Experimental animal and diet.

A total of 12 large White × Duroc grower pigs with average body weight of 5.107kg at the average age of 8 weeks were used for the study. The pigs were randomly separated into four groups of three each in a Completely Randomized Design (CRD). The four groups represented the treatments used for the study. Then each group was replicated three times with one pig standing as a replicate in the group. Four experimental diets were formulated

to contain 0% (T_1), 30% (T_2), 35% (T_3) and 40% T_4) and MPR served as a replacement for whole maize in the diets. The pigs were randomly assigned to these four diets. The pigs were housed in a cleaned and disinfected concrete pig to one pen equipped with drinking and feeding troughs. Feed and drinking water were administered *ad libitum*. Before the commencement of the study, the pigs were acclimatized, washed with acaricides dewormed. Data collected covered, the initial weight, final weight, weight change, daily feed intake, feed conversion ratio and the feeding cost. The data was subjected to Analysis of Variance (ANOVA) and the treatment means compared using Least Significant Difference (LSD).

RESULTS AND DISCUSSION

Table 1 shows the proximate composition of whole Maize and MPR. The crude protein content of MPR was (11.00 % DM) and it had higher numerical value than that of the whole maize which stood at (9.50 % DM). The difference could be as a result of oil content in the whole maize which tends to dissolve its crude protein, whereas the oil has been removed in the MPR. The metabolizable energy was higher in the whole maize (3895) as against 2500 in MPR. This is because the energy storage which is the starch has been removed in MPR.

Table 1: Proximate composition of whole Maize and MPR

Nutrients	Whole Maize	MPR
Dry matter (%)	88	100
Moisture (%)	10.5	7.30
Crude Protein (%DM)	9.50	11.00
Crude fibre (%DM)	3.22	12.00
Ether Extract (%DM)	4.12	2.80
Ash (%DM)	3.36	2.80
NFE (%DM)	72.66	49.82
Calcium (%)	0.20	1.00
Phosphorus (%)	0.23	0.90
ME (Kcal/Kg)	3895	2500

Computed from experimental study 2024

Table 2 shows the different levels at which MPR replaced whole maize, and the calculated chemical composition of the diets. In experimental diets T1, T2, T3 and T4; the MPR stood at 0.00%,16.20%, 18.90 and 21.60% respectively representing 30%, 35% and 40% MPR replacement for whole maize.

Table 2: Composition of Experimental Diets

Ingredients	0% (T_1)	30% (T_2)	35% (T_3)	40% (T_4)
Maize	54.00	37.80	35.10	32.60
MPR	0.00	16.20	18.90	21.60
GNC	10.25	10.25	10.25	10.25
Soya bean meal	11.25	11.25	11.25	11.25
PKC	20.00	20.00	20.00	20.00
Bone meal	4.00	4.00	4.00	4.00
Salt	0.25	0.25	0.25	0.25
Pre-mix (Vit-min)	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Chemical Composition				
Crude protein (%)	18.34	18.34	18.34	18.34
ME (K Cal/Kg)	2863.71	2863.71	2863.71	2863.71
Lysine (%)	0.74	0.74	0.74	0.74
Methionine (%)	0.29	0.29	0.29	0.29
Phosphorus (%)	0.77	0.77	0.77	0.77
Calcium (%)	0.77	0.77	0.77	0.77

Computed from experimental study 2024

Table 3 shows the parameters tested and the performance of grower pigs at each treatment level.

Results on feed intake show that there was no significant difference between control experimental feeds (T_1) with 0% whole maize replacement and T_3 with 35% whole maize replacement. This is in alignment with the result of Elanchezhian and Ally (2020) there was no significant difference between control and 50 per cent maize replacement. Also, this is in agreement with Bhar *et al.* (2000) who observed similar feed intake in crossbred pigs fed diet with 0 and 50 per cent replacement of maize by wheat bran. There were no significant differences among the treatments with regard to final weight of the grower pigs, though the highest average final weight was recorded

in T_3 (13.13), while T_4 recorded the least final weight of (11.57). This is in line with work of Sorunke *et al*.; (2021) on performance and economic analysis of growing pigs fed diets supplemented with different multi-enzymes complexes, where was reported that there was no significant ($p>0.05$) effect of the treatment on the growth performance indices of the animals. The result also reflected in the records obtained from weight change and daily weight gain. This indicated that grower pigs can perform best on 35% replacement level. On feed intake, the highest recorded was in T_3 and followed by the control T_1. There were significant differences at $p<0.05$ among the treatments. This implied that performance and efficiency of weight gain are closely correlated to the intake level of nutrients, especially protein and energy. Statistically, there were no significant difference at $p<0.05$ level in the average daily weight gain among the different treatments.

Table 3: Growth Performance of grower pigs fed different levels of MPR

	Different Replacement Levels of MPR					
Parameter	**0% (T_1)**	**30% (T_2)**	**35% (T_3)**	**40% (T_4)**	**SEM**	**p-value**
AIW (Kg)	5.167	5.990	5.000	4.270	0.390	0.7601
AFW (Kg)	12.437	11.920	13.130	11.570	0.80	0.8011
AWC (Kg)	7.27	5.93	8.13	7.30	0.71	0.7460
ADWG (Kg)	0.13	0.11	0.14	0.13	0.012	0.7460
ADFI (Kg)	0.53^{ab}	0.49^{a}	0.54^{a}	0.51^{c}	0.0058	0.5014
FCR	5.10	5.25	4.00	4.19	0.57	0.7812
Mortality	0	0	0	0	0	

Computed from experimental study 2024; SEM = Standard Error of Means

a, b, c, - Means within the row with different superscript differ significantly ($p<0.05$)

AIW =Average Initial Weight; AFW = Average Final Weight; AWC = Average Weight Change; ADWG = Average Daily Weight Gain; ADFI = Average Daily Feed Intake and FCR = Feed Conversion Ratio

Table 4 revealed the economic evaluation of MPR based on diets at different levels. Cost of feed in naira per kg was found to be decreasing as the level of MPR was increasing. This imply that there was an inverse relationship between the cost of feed and the level of MPR. Furthermore, feed cost per kg live weight gain decreased as the level of MPR increased. Also, the result indicated that feed cost per kg live weight gain was better at 40%, 35% than at the control (0%) and 30% of MPR diets. The results in T_3 and T_4 shows that reducing cost of feed was not only to obtain cheaper feed but was also dependent on the production result obtained with this cheap feed.

On the whole, total costs of feeding throughout the experiment were not significantly ($p>0.05$) different from one another. This result is in line with the finding of Sorunke et al.;(2021) where it was reported that the total cost of feeding the animals was not significantly different at $p>0.05$ in a similar study using growing pigs fed diets supplemented with different multi-enzymes complexes.

Table 4: Economic evaluation of MPR diets at different levels.

Parameter	**0% (T_1)**	**30% (T_2)**	**35% (T_3)**	**40% (T_4)**	**SEM**	**p-value**
Cost/Kg of feed (N)	34.99	30.61	29.90	29.15	-	-
Total feed cost (N)	3138.60	2525.33	2711.93	2474.84	254.24	0.8121
Cost of feed per Kg	12.65	136.35	115.33	114.36	5.654	0.8005
Live weight gain (N)	12.430	11.830	13.130	11.570	7.532	0.8425

SEM = Standard Error of Means

CONCLUSION

The result obtained from the study indicated that replacement of whole maize with MPR up to 35% can give satisfactory result in terms of growth performance. For locations where MPR is produced in large quantities, it is recommended that it should be used to replace whole maize given that its satisfactory performance in the diets of grower pigs, economically cheaper and less competitive compared to whole maize.

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