GROWTH PERFORMANCE AND ECONOMIC TRAITS OF PIGS FED DIETS CONTAINING EITHER NORMAL MAIZE OR OBATANPA – A QUALITY PROTEIN MAIZE

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ABSTRACT

Three diets containing either normal maize (CONTROL) or Obatanpa (OBAT-I AND OBAT-II) – a quality protein maize – supplemented with decreasing amounts of fishmeal (14, 12 and 10% respectively) were fed ad libitum to a total of 15 individually-housed Large White pigs from a liveweight of 14 to 70kg. Mean feed intake and other growth performance data were similar (P>0.05) for pigs on all the 3 dietary treatments. However in terms of feed cost/kg liveweight gain, diets containing Obatanpa are to be preferred because of the tendency of lower costs due to lower levels of inclusion of fishmeal. The carcass traits of the pigs fed the 3 diets were also similar (P>0.05). It was concluded that Obatanpa is nutritionally superior to normal maize and would help to reduce the cost of feeding pigs.

Keywords: *Normal Maize, Obatanpa, Quality Protein Maize, Growth and Economic Performance, Carcass Traits.*

INTRODUCTION

The reduction of feeding cost is of utmost interest to pig farmers in Ghana and elsewhere. Cameron [1] estimated that feed cost represents about 80% of the total cost of pork production in Ghana. Usually the protein and energy sources are the major cost items in the feeding of pigs. In Ghana and other developing countries, maize (Zea mays), is not only a major energy source but it also provides a substantial part of the protein in pig diets since it constitutes between 50 and 70% of the diet.

AGRICULTURE

It is a fact though, that the quality of the protein in maize is poor because of a deficiency of several of the essential amino acids, especially lysine and tryptophan. Without adequate supplementation with proteins and/or essential amino acids, (e.g. synthetic lysine), normal maize is usually an inadequate source of protein for swine and poultry feeding. Fishmeal and soyabean meal are the two most common high-protein feedstuffs fed to swine due to their excellent amino acid patterns which complement the amino acid pattern of normal maize. However, these protein supplements esp-ecially the locally-produced fishmeal, also serve as major source of protein for humans. The resulting competition has often led to unwarranted increases in the prices of feedstuffs and consequently the costs of feeding pigs and poultry.

The discovery of the Opaque – 2 maize with its higher protein quality because of its higher lysine and tryptophan levels has always been regarded as a major nutritional breakthrough and an economic asset to swine producers. Despite the better nutritive value of Opaque – 2 maize, its soft endosperm makes it more susceptible to fungal and insect damage and this would tend to reduce its shelf life. A new maize variety known as Quality Protein Maize (QPM) which incorporates the Opaque – 2 gene but with improved agronomic and storage characteristics has been developed by Centro International de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico. Studies by Sproule et al [2] and Sullivan et al [3] have shown that QPM has a higher nutritive value than normal maize when fed in low protein diets containing the same level of supplemental protein. A locally developed variety of QPM called Obatanpa has aroused considerable interest among the scientific community in Ghana. In an 8-week feeding trial, Okai et al [4] observed that in diets where the sole source of protein was from maize, weanling pigs performed better on Obatanpa – containing diets than on a normal maize (e.g. Okomasa) diet. A second (16 wk) starter feeding trial also showed an improved performance in pigs fed the Obatanpa diets [5]. In the experiment herein reported, the growth performance as

well as the carcass characteristics of growing – finishing pigs fed a complete diet based on either Obatanpa or a normal maize were determined. The study was also meant to determine the extent to which the use of Obatanpa in a complete diet would influence the demand for fishmeal and to find out if the partial replacement of fishmeal with Obatanpa confers any economic advantages.

MATERIALS AND METHODS

The 15 - week experiment was conducted at the Livestock Section of the Department of Animal Science, KNUST, Kumasi. A total of 15 Large White weaner pigs consisting of 9 males and 6 females and with a mean initial weight of 14.8kg were equally and randomly allotted to 3 dietary treatments on the basis of weight, sex and age. The pigs were housed in individual concrete-floored welded mesh cages measuring 160 x 65 x 102cm. Each cage contained water and feed troughs measuring 46 x 23 x 14cm and 51 x 31 x 17cm respectively. The three dietary treatments designated as Control, OBAT-I and OBAT-II were replicated five times. The composition of the diets fed is shown in Table 1.

Table 1: Percentage Composition of the Diets

	Control	Obat -1	Obat - II
Maize	65.50	-	-
Obatanpa	-	65.50	65.50
Fishmeal	14.00	12.00	10.00
Wheat bran	19.55	21.45	23.35
$CaCO_3$	0.50	0.60	0.70
Salt	0.20	0.20	0.20
Vit.-Trace Mineral Premix*	0.25	0.25	0.25
Chemical Composition, % (Calculated)			
CP	17.40	16.50	15.60
Lysine	1.03	1.02	0.92
Ca	0.88	0.83	0.78
P	0.81	0.77	0.74
Chemical Composition, % (Analysed)			
DM	89.80	88.80	89.30
CP (As-fed)	20.10	17.60	15.96
CP (DM)	22.40	19.80	17.90

* Vitamin Trace Mineral Premix (Inclusion rate is 2.5kg/tonne), supplies the following (/tonne of feed) Vit. A., 10,000,000IU; Vit. D_3, 3,000,000IU; Vit. E; 4mg; Vit. K3, 2mg; Vit.B_1, 500mg; Vit.B_2, 3mg; Nicotinic acid, 8mg; Pantothenic acid, 3.26mg; Vit.B_6 1mg; Vit. B_{12}- 3mg; Iron, 10mg; Manganese, 40mg; Copper, 3mg; Zinc, 30mg; Iodine, 500mg; Selenium, 100mg and Zinc bacitracin, 5mg.

The Control diet contained 65.5% normal maize and 14% fishmeal with a calculated CP and lysine contents of 17.4 and 1.03% respectively. The 2 Obatanpa-based diets, OBAT-I and OBAT-II, both contained 65.5% of the new maize variety but had 12 and 10% fishmeal respectively. The corresponding calculated CP and lysine levels were 16.5, 1.02 and 15.6, 0.92%. Feed and water were provided ad libitum throughout the experimental period. All pigs were weighed at weekly intervals and pigs that attained a liveweight of 70 ± 0.5kg during the weekly weighings were taken off the experiment and slaughtered. Weekly feed intakes were recorded in addition to liveweight changes and, after slaughter, chilled carcass dressing percentage, length, mean backfat thickness and loin eye muscle (Longissimus dorsi) area were determined. Feed cost and feed cost per kg. liveweight gain were calculated using the prevailing market prices for the ingredients. Feed samples were analysed for some proximate components using the analytical methods described by AOAC [6]. Data collected were subjected to analysis of variance [7].

RESULTS AND DISCUSSION

Growth Performance and Economic Consideration:

The analysed composition of the diets is shown in Table 1. On dry matter basis, the crude protein level in the diets decreased from 22.4% (Control) to 17.9% (OBAT-II). The decrease paralleled the decrease in the inclusion rates of fishmeal from 14, 12 to 10% in the Control, OBAT-I and OBAT-II diets respectively. The calculated lysine levels were 1.03, 1.02 and 0.92% for the Control, OBAT-I and OBAT-II diets respectively.

Table 2: Performance of Pigs Fed Either Normal Maize or Obatanpa Diets

	Dietary Treatments			
Item	**Control**	**Obat - I**	**Obat- II**	**Sig.**
Initial wt., kg.	14.2	14.1	14.2	NS
Final wt., kg.	71.3	71.2	71.6	"
ADG, kg.	0.69	0.69	0.69	"
Duration on Expt., days	82.6	82.6	84.0	"
Total Feed, kg/pig	163.5	158.0	167.2	"
ADF, kg/pig	1.98	1.92	2.00	"
FCE	2.86	2.77	2.91	"
Feed Cost (¢/kg)	766.51	724.68	671.15	"
Feed Cost/ kg gain (¢)	2192.22	2007.36	1953.05	"

Sig - Level of Significance
NS - Not significant (P>0.05)
ADG - Mean Daily Gain
ADF - Mean Daily Feed Intake
FCE - Feed Conversion Efficiency

Table 2 shows the performance of the pigs fed the three diets. The mean initial liveweights were 14.2, 14.1 and 14.2kg. while the mean final liveweights were 71.3, 71.2 and 71.6kg for the Control, OBAT-I and OBAT-II pigs respectively. There were no significant (P>0.05) differences between the treatment means for the final liveweight data since the feeding experiment was terminated when each pig attained a liveweight of 70 ± 0.5kg. The daily feed intakes (ADF) recorded were 1.98, 1.92 and 2.00kg with corresponding total feed intakes of 163.5, 158.0 and 167.2kg for the Control, OBAT-I and OBAT-II diets respectively. There were no significant (P>0.05) differences in the ADF and total feed intake for the 3 dietary treatments. Burgoon et al [8] obtained intakes of 3.31 and 3.37kg for growing-finishing pigs fed a normal maize and QPM diets containing 0.66% lysine and 0.74% lysine respectively.

The average daily weight gains (ADG) for the Control, OBAT-I and OBAT-II diets were 0.69, 0.69 and 0.69kg respectively. These values are comparable to those obtained in growing-finishing pigs fed either a QPM-based diet with low soybean meal supplementation or a normal maize diet with high soybean meal supple-mentation (0.96% lysine in each diet) as reported by Sullivan et al [3]. However, Burgoon et al [8] had reported lower ADG, for pigs fed either normal maize or QPM. In finishing pigs, it is expected that less protein supplementation would be needed in QPM-based diets than in normal maize-based diet to maximise performance since finishing pigs have lower essential amino acid requirements.

The mean duration of the experiment for the pigs fed the Control, OBAT-I and OBAT-II diets were 82.6, 82.6 and 84.0 days respectively (Table 2). There were no significant (P>0.05) differences among the treatment means. However, the pigs fed the diet with the lowest CP and lysine level (OBAT-II) took on the average, 2 days longer to get to the specified slaughter weight. The values for the mean feed conversion efficiency (Table 2) were similar (P>0.05). Burgoon et al [8] found no significant differences in the FCE of pigs fed normal maize and QPM–diets cont-aining 1.05 and 1.11% lysine respectively. The feed costs were 766.51, 724.68 and 671.15 cedis/kg for the Control, OBAT-I and OBAT-II diets respectively and the corresponding feed cost/kg live-weight gains were 2192.22, 2007.36 and 1953.05. For the total feeding period therefore the reduction in feed costs per pig were ¢10,825.00 and ¢13,108.00 for the OBAT-I and OBAT-II diets respectively. These decreases in the costs of OBAT-I and II diets were due to the fact that the fishmeal levels were progressively reduced from the Control to the OBAT-II diet. Since the Obatanpa was providing more lysine and tryptophan than the normal maize less fishmeal was required in such diets in order to meet the pig's requirement. The importance of the lowering of the feed cost and the consequent improvement in the economy of gain i.e. feed cost/kg liveweight gain, cannot be overemphasised since the need to cut down on the cost of pork production is perhaps of major importance to Ghanaian pig producers who are finding it difficult to produce pork cheaply enough for most consumers.

Carcass Traits

There were no significant (P>0.05) differences in the means for the various carcass traits measured during the experiment (Table 3) and this suggests that the diets did not influence the carcass traits measured. There was however a trend towards a reduction in the backfat thickness as the level of fishmeal in

the diet was reduced from 14 to 10% and the level of wheat bran increased from 19.55% (Control) to 23.35% (OBAT-II).

Table 3: Carcass Characteristics of Pigs Fed Either Normal Maize or Obatanpa Diets

	Dietary Ttreatments			
	Control	Obat- I	Obat -II	Sig*
Wt. at Slaughter, kg	71.3	71.2	71.6	NS
Dressed Wt., kg.	50.9	49.9	51.0	"
Dressing Percentage	71.4	70.0	71.3	"
Carcass length, cm	71.6	72.3	72.1	"
Viscera, kg	9.80	9.40	9.20	"
Heart, kg	0.25	0.24	0.23	"
Liver, kg	1.38	1.33	1.19	"
Kidney, kg	0.13	0.12	0.12	"
Loin eye area, cm^2	32.8	33.0	31.10	"
Head, kg	4.57	4.50	4.54	"
Trotters, kg	1.28	1.29	1.36	"
Intestine-full, kg	6.24	6.39	6.48	"
Intestine-empty, kg	2.95	2.88	2 .96	"
Spleen, kg	0.14	0.13	0.12	"
Primal cuts, kg				
- Shoulder	5.99	6.15	6.03	"
- Loin	4.56	4.48	4.45	"
- Belly	4.26	4.37	4.61	"
- Ham	7.22	7.05	7.19	"
Mean Backfat thickness, cm	2. 78	2.49	2.41	"

*Sig - Level of Significance
NS - Not significant (P>0.05)

CONCLUSION

The earlier experiment [5] clearly showed that when maize is the sole source of amino acids in the diet of starter pigs, Obatanpa (QPM) is of higher nutritional value than normal maize. This present experiment has confirmed that Obatanpa – containing diets are good for pig growth performance and carcass characteristics. Such diets were cheaper because smaller quantities of the more expensive protein-rich ingredients e.g. fishmeal would be needed for inclusion in pig diets. Furthermore, Obatanpa-based diets tend to provide some savings on the cost of producing pork and it is likely that such savings may ultimately benefit the consumer. The lower amounts of fishmeal that would be used by pig and poultry producers would mean that there may be more of it for human consumption.

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