The Performance and Carcass Characteristics of Pigs Fed Diets containing discarded Biscuits (DB) a Bakery by-product

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SUMMARY

The performance and carcass characteristics of young pigs fed diets containing 0, 15, 30 and 45% discarded biscuits (DB) were determined in this experiment. The DB consisted of broken, mishapend and stale biscuits and also a small amount of partially burnt biscuits. All diets were isonitrogenous and the DB used contained 10.2% crude protein. Both feed and water were provided ad libitum but on a daily basis during the 9-week feeding trial. There were no significant differences ($P>0.05$) in mean feed intake, daily weight gain and feed conversion efficiency. There was a slight linear decrease in feed cost as the level of DB increased in the diet, and the cost of gain also followed a similar trend. Carcass characteristics were similar ($P>0.05$) even though small numerical differences were observed. It was concluded that DB could constitute as much as 45% of the diet and replace nearly 70% of the maize in a growing pig's diet without any adverse effect on growth performance and carcass characteristics.

Keywords: pigs, performance, carcass characteristics, discarded biscuits.

INTRODUCTION

In most developing countries, there may be a shortage of some of the major feed ingredients used in poultry and pig diets. A typical example is maize which, in the past, had to be imported into some of these countries in order to ensure the survival of the livestock industry. In view of this shortfall, there has been considerable interest in the search for alternative feed resources and several of these have been identified and evaluated. Information abounds on the feeding value of cassava roots, oil palm slurry, wheat bran, rice bran, copra cake and palm kernel cake, (Babatunde et al,[1] and Gohl,[2]). However, despite the fact that most developing countries have wheat or other cereal-based flour industries and therefore by-products from the bakery industry, very little information is available on the nutritive value of these bakery by-products in these countries. Indeed, Champe and Church[3] have noted that even though bakery products have often been fed to farm animals, there is a death of information on its usefulness.

There are several bakery by-products; stale buns and cakes, stale bread, flour sweepings, caked flour and dough, burnt or broken biscuits are a few examples. Bakery by-products are by nature high energy, low protein materials since they contain mainly flour and varying proportions of sucrose, oil and milk. Arrington et al[4] have shown that bakery by-products could be of use in livestock diets. Its suitability as a feed ingredient in developing countries where it could help to reduce the overdependence on maize and other energy-rich feed ingredients, which are also to a large extent required by humans, has not been clearly established.

The objective of this experiment therefore was to determine the effects of diets containing varying levels of discarded biscuits (DB) on the performance and carcass characteristics of growing pigs.

MATERIALS AND METHODS

Forty Large White pigs consisting of 24 castrates and 16 gilts and with an average liveweight of 13kg were used in the experiment. The Completely Randomised Design was used and pigs were allotted on the basis of sex, litter origin and weight to 4 dietary treatments. There were 2 replications for each treatment with 3 castrates and 2 gilts per replicate. Pigs were housed in 8 concrete-floored pens each with dimensions of 3.5 x 3.2m, in a well-ventilated pig barn. There were 2 movable water troughs (1.83 x 3.18 x 3m) in each pen.

The 4 diets contained 0 (T_0), 15 (T_1), 30 (T_2) and 45% (T_3) DB and the various levels of DB specified above replaced corresponding amounts of the maize in the control (T_0) diet (Tab 1). The DB used in this experiment consisted mainly of broken, misshapend and stale biscuits with a small amount (10% approx.) of partially burnt biscuits. The DB was obtained from a local biscuit factory and its average crude protein, on analysis, was 10.2%. However, lack of facilities did not permit the determination of the energy content of the DB. All diets were formulated to contain about 18% CP and the calculated energy level ranged from 13.0 (T_0) to 13.10 MJ/kg DE (T_3). Feed and water were provided ad libitum but on a daily basis, such that there was some feed in the trough at all times. This daily ad libitum feeding regime was done in order to avoid feed spillage. Routine management practices such as deworming and control of ectoparasites were undertaken before the experiment started.

Feed intake and liveweight changes were recorded weekly and from these values, average daily gain, daily feed intake and feed conversion efficiency were calculated. The weekly feed intake values were obtained after deducting the weight of any remaining feed at the end of each week from the total feed supplied during the particular week. At the end of the 9-week trial, all the 24 castrates used were slaughtered after a 24-hr fast, the gilts having been reserved for breeding purposes. Data collected on the carcasses were dressed weight, dressing percentage, carcass length, loin eye area and mean backfat thickness as well as the weights of the liver, kidney and empty gastro-intestinal tract (GIT). The loin eye muscle area was calculated from tracings of the Longissimus dorsi muscle taken between the 12th and 13th ribs, and the mean backfat thickness value were the averages for the backfat measurements at the first and last thoracic and the last lumbar verterbrae.

The 4 diets were analysed using procedures recommended by the AOAC[5]. The data collected were analysed using the analysis of variance technique (Steel and Torrie,[6]).

RESULTS AND DISCUSSION

There were no health-related problems due to the inclusion of DB in the diets. The summary of the growth performance data is shown in Tab 2. Mean daily feed intake values were quite similar ($P>0.05$) ie., 1.13, 1.11, 1.14 and 1.09kg for dietary treatments T_0, T_1, T_2 and T_3 respectively. The inclusion of DB up to the level of 45% of the diet did not have any significant ($P>0.05$) adverse effect on either the liveweight gain or the feed conversion efficiency. Davidson[7] had suggested that bakery by-products could form a ball and become doughy in the

TABLE 1: PERCENTAGE COMPOSITION OF DIETS

Ingredients	Diets			
	T_0	T_1	T_2	T_3
Maize	65.65	50.65	35.65	20.65
Discarded Biscuits	-	15	30	45
Dried Brewers' Spent Grains	20	21	22	23
Dried Brewers' Spent Yeast	4	3	2	1
Fishmeal	9	9	9	9
Dicalcium Phosphate	0.75	0.75	0.75	0.75
Salt	0.25	0.25	0.25	0.25
Oyster Shell	0.25	0.25	0.25	0.25
Vitamin-Trace Mineral Premix*	0.1	0.1	0.1	0.1
	100	100	100	100
Chemical Composition (Calculated)				
Crude Protein, %	18.2	18.2	18.3	18.3
Digestible Energy, MJ/kg	13.0	13.0	13.1	13.1
Chemical Composition (Analysed)				
Crude Protein, %	18.2	18.4	18.7	18.5
Ether Extract, %	6.2	8.3	7.3	7.6

*Supplied the following per kg of diet:
Vit. A: 7500 iu; Vit.D: 1500 iu, Vit.B_1: 1mg; Vit. B_2: 2.75mg; Vit. B_{12}: .005mg; Vit.E.; 2.5mg; Vit.K.; 1.5mg; Niacin: .0125mg; Calcium pantothenate: 5mg; Choline chloride; 60mg; Ethoxyquine; 5mg; Manganese chloride: 16.3mg. Potassium Iodide: 353mg; Cobalt Sulphate: 286mg; Zinc oxide: .0125mg; Copper oxide; 1.283mg and Ferrocarbonate: .020mg.

TABLE 2: PIG PERFORMANCE ON DIETS CONTAINING 0-45% DISCARDED BISCUITS

	Dietary Treatments				
	T_0	T_1	T_2	T_3	Significance[a]
Level of DB, %	0	15	30	45	-
Item					
No. of Pigs	10	10	10	10	-
Mean Initial wt., kg	13.2	13.2	13.2	13.5	NS
Mean Final wt., kg	45.4	44.5	45.1	43.2	NS
Mean Daily feed intake, kg	1.17	1.11	1.14	1.09	NS
Mean Daily gain, kg	.51	.5	.51	.49	NS
Mean Feed Conversion Efficiency	2.22	2.22	2.23	2.22	NS
Feed Cost, Cedis/kg	113.87	113.77	113.68	113.59	-
Feed cost/kg liveweight, gain	252.79	252.57	253.51	252.17	

[a] NS = not significant (P>0.05).

stomach, and therefore affect nutrient utilization and growth rate. In this experiment however there was no indication that this happened. It is possible that the presence of considerable quantities of brewers's spent grains in the diets (Table 1) might have, as stated by Davidson[7], opened up the feed. Feed cost and economy of gain (ie. feed cost/kg liveweight gain) were lower for the diets containing DB mainly because the DB was cheaper than maize. Even though the FCE values obtained were similar, Pond and Maner[8], referring to a dried bakery product which was apparently high in fat, noted that an increasing level of it in the diet, led to a reduction in the amount of feed per unit gain.

The criteria for estimating carcass characteristics and the values obtained are shown in Tab 3. The mean liveweight at slaughter, mean dressed weight and mean dressing percentage were similar (P>0.05) for all treatments even though numerical differences were observed. Abnormal weight increases of certain organs may be indicative of attempts being made by the organism to adapt either to the presence of antinutritional factors in the diet such as tannins and aflatoxins or to increases in the fibre content of some ingredients (Ravindran et al.[9]). In this experiment, no significant differences (P>0.05) were obtained for the mean values for liver, kidney and empty GIT weights. The mean backfat thickness and loin eye

TABLE 3: CARCASS CHARACTERISTICS OF PIGS FED DIETS CONTAINING VARYING LEVELS OF DB

	Dietary Treatment				
	T_0	T_1	T_2	T_3	Significance[a]
Level of DB, %	0	15	30	45	-
Item					
No. of Pigs	6	6	6	6	-
Mean slaughter wt, kg	43.5	40.9	43	39.4	NS
Mean dressed wt. kg	29.4	27.4	29.6	27.4	NS
Mean dressing %	67.6	67	68.8	69.5	NS
Mean % empty G.I.T.[+]	5.74	6.36	6	5.28	NS
Mean % liver[+]	3.74	3.83	3.72	3.40	NS
Mean % kidney[+]	0.61	0.58	0.61	0.55	NS
Mean backfat thickness cm	2.12	2.15	2.15	2.10	NS
Mean loin eye muscle area, cm^2	14.0	13.4	13.3	13.7	NS

[a] NS = not significant (P>0.05)

[+] Values shown were actual weights expressed as % of slaughter wt.

muscle area values were statistically ($P > 0.05$) not significant, as indicated in Table 3; however the mean loin eye muscle area of pigs fed the control diet (T_0) tended to be slightly high ie. 14.0cm² compared to 13.4, 13.3 and 13.7cm² recorded for T_1, T_2 and T_3 respectively. There is a dearth of information on the effects of diets containing bakery by-products on pig carcass characteristics. Kornegay[10] had observed a slight but not statistically ($P > 0.05$) significant increase in the backfat thickness of pigs fed with a blended dried bakery product. The information obtained here would however suggest that the carcass characteristics of pigs fed up to a mean liveweight of about 45kg on DB-containing diets were similar to those of pigs fed on a normal maize-based diet.

Discarded biscuits and perhaps other bakery-products could therefore prove very useful as a source of energy for pigs in developing countries. In addition to the good performance obtained, DB which is a potential environmental pollutant because it is not eaten for aesthetic or human health reasons but was rather being burnt in Ghana, has been conveniently recycled and has replaced nearly 70% of the maize in a typical growing pig diet.

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