RESPONSE OF EARLY WEANED PIGS TO FULL-FAT SOYABEAN DIETS SUPPLEMENTED WITH DIFFERENT ANIMAL PROTEIN SOURCES

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ABSTRACT

24 Large White X Landrace pigs weaned at 28 days with initial liveweight of 5.27 ± 0.23 kg were fed four animal protein concentrates (fish meal (FM), Chicken offal meal (COM), fresh blood meal (FBM) and parboiled blood meal (PBM) in diets based on full-fat soyabean (FFSB) for 8 weeks to test different animal protein sources for early weaned pig. The diets contained 23% crude protein and 3100 Kcal ME/kg diet. Blood meal slightly reduced weight gain and feed intake but compared favourably with fish meal and chicken offal meal in efficiency of feed utilization. Parboiling of the blood slightly ($P > 0.05$) depressed the performance of the pigs even when the pigs had the same feed intake. Fish meal increased ($P < 0.05$) serum total protein and serum albumin levels. This study indicated that early weaned pigs fed soyabean based diets supplemented with chicken offal meal and blood meal gave similar performance to those fed diet supplemented with fish meal.

Key words: Early weaned pigs, animal protein concentrates, performance

INTRODUCTION

The arguments for and against early weaning of piglets provide an interesting paradox when physical and financial performances are compared in isolation. In a comparative analysis (Anonymous, 1989) it was found that early weaning attempts to improve the farrowing index and the number of piglets reared/sow/year. This also indicated that each reduction in weaning age brought an increase in number of litters/sow/year and in animal rearing average. It has been reported that savings of up to 20% in costs of feeds for early - weaned pigs can be achieved through the use of top quality fish meal to replace skimmed

milk powder (Anonymous, 1988). Apart from its amino acid content, fish meal included at about 10% of the total feed is said to offer valuable additional micro-nutrients such as iodine and iron. However, almost all the fish meal used in Nigeria are imported (Bello, 1988), consequently leading to high feed prices. This has led to researches into other sources of protein and energy, locally available and with less competition to alleviate production problems.

Chicken offal meal and blood meal are high protein concentrates with less competition. Chicken offal meal can be stored for several months (Ndifon, 1988). It has been used in diets for chickens (Escalona and Pesti, 1987; Bhargava and O'neil, 1975 and Narahari *et al.*, 1981) and pigs (Udedibie *et al.*, 1987). Fetuga (1972) and Njoku (1985) have worked on the utilization of blood meal as protein source. Mablestrom and George (1977) indicated that at low levels (4%) of substitution, blood meal would need methionine supplementation. The use of blood meal in monogastric animals feed however, has been limited because of poor palatability and low protein digestibility as a result of high processing temperature (Wahlstrom and Libal, 1977). Hamm and Search (1976) suggested cooking temperature not exceeding 135°C and reduced heating time. The move towards centralization of slaughtering by establishments of abattoir in major cities in Nigeria guarantees the availability of these protein concentrates which are relatively cheaper than fish meal. This work aimed at comparing the response of early-weaned pigs fed diets supplemented with fish meal, chicken offal meal and blood meal.

MATERIALS AND METHODS

Processing of Samples

Chicken Offal Meal: Broiler chicken intestines (gut content inclusive) were

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obtained from the slaughter house of Zartech Agricultural Industries, Ibadan, Nigeria. The intestines from the days processing, collected between 16.00 hours and 18.00 hours were cleaned of residues, and washed with water to remove dirt. These were then transferred into a half drum, where the "wet rendering" method of processing was applied. This entailed cooking the intestines at a temperature of about 150°C for 3 to 4 hours. The broth was left to cool, partially defatted by decanting the oil at the top layer and further pressed gently to expel more oil and water. The liquid in the residues was evaporated until the material became gluey. Two and half percent of the measured weight of the material was added as salt (NaCl) and worked in immediately as preservative. The sample was sun-dried to less than 10% moisture level and ground, ready for use.

Blood Meal: The fresh blood of broiler chicken collected from the slaughter house of Zartech Agricultural Industries, Ibadan was left in a closed basin for about 2 hours to clot, then divided into two halves. The first half was weighed and 2.5% of the measured weight was added as salt (NaCl) to serve as preservative. It was then sundried to less than 10% moisture

level. After drying, the meal was ground and bagged, ready for use as the blood meal sample 1 (fresh blood meal). The other half was parboiled in a closed basin for 5 minutes. This was allowed to cool and was weighed. Salt (NaCl) was added at 2.5% of the weight and it was then sundried to less than 10% moisture level. This was ground and bagged, ready for use as the blood meal sample 2 (parboiled blood meal).

Fish meal: The fish meal was obtained from pfizer Livestock Feeds Limited, Lagos, Nigeria.

Dietary treatments:

The dietary treatments were made up of the control diet, which contained 10% FM (C.P. 65%). Three other diets containing corresponding percentages of COM (C.P. 60%) and 2 samples (fresh, parboiled) of BM (C.P. 80%) were used to replace the FM on an equi-protein basis. The diets were isonitrogenous and isocaloric, with 23% crude protein and 3100 Kcal ME/kg.

The dietary composition is shown in table 1.

Experimental Design and Management

Twenty-four Large 'White' X Landrace pigs weaned at 28 days with initial weight of 5.27±

TABLE 1 INGREDIENT AND PROXIMATE CHEMICAL COMPOSITIONS OF EXPERIMENTAL DIETS (%)

Ingredients	1	2	3	4
Maize	57.03	56.00	58.04	58.04
Maize offal	0.44	0.88	1.50	1.50
Soyabean	30.03	30.03	30.03	30.03
Fish meal	10.00	-	-	-
Blood meal (Fresh)	-	-	8.13	-
Blood meal (Parboiled)	-	-	-	8.13
Chicken offal meal	-	10.84	-	-
Bone meal	1.25	1.25	1.25	1.25
Oyster shell	0.75	0.75	0.75	0.75
Premix*	0.25	0.25	0.25	0.25
Salt	0.25	+	0.05 ⁺	0.05 ⁺
Chemical analysis (dry matter basis)				
Dry matter	85.47	84.51	85.51	87.98
Crude protein	23.06	23.56	23.20	23.69
Ether extract	7.88	7.58	7.73	7.73
Crude fibre	3.76	5.97	4.10	3.32
Calcium	0.72	0.29	0.23	0.23
Phosphorus	0.49	0.24	0.22	0.22
Calculated Values				
Lysine	1.41	1.22	1.63	1.63
Methionine	0.47	0.39	0.37	0.37

+ Salt was added during processing of the products i.e. chicken offal meal and blood meal.

* Supplied per kg of diet: 5,000 iu vit. A; 1,000,000 iu vit. D₃ 800mg vit. E; 400mg vit K; 1200mg vit. B₂ 1000mg vit B₃; 4mg vit. B₁₂; 3000mg Niacin; 4000mg Vit C; 112000mg choline; 24000mg Mn; 8000mg Fe; 16000mg Cu; 18000mg Zn; 500mg iodine; 48mg selenium; Antioxidant (BHT)

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TABLE 2: PROXIMATE CHEMICAL COMPOSITION OF THE ANIMAL PROTEIN CONCENTRATES AND OTHER MAJOR INGREDIENTS (%)

Constituents	Protein Concentrates						
	FM ⁺	COM	FBM	PBM	FFSB	MO	MAIZE
Dry matter	92.00	89.72	91.00	91.20	91.23	81.00	87.0
Crude Protein	50.00	60.00	80.00	79.90	38.00	11.78	9.04
Crude fibre	0.96	4.60	1.00	1.00	6.65	8.00	2.00
Ether Extract	7.70	11.46	1.60	1.80	18.60	1.50	4.00
Ash	9.60	9.76	5.60	5.65	4.54	4.60	1.2

⁺FM = Fish meal; COM = Chicken offal meal; FBM = Fresh blood meal; PBM = parboiled blood meal, FFSB = full fat soyabean; MO - Maize offal

0.23 kg and 12 of each sex were randomly allotted in groups of 3 to each of 4 dietary treatments on the basis of weight with two replicates per treatment. Litter mates were distributed across treatments. All the pigs were housed in concrete floored pens measuring 6.60m x 3.10m equipped with feeding and watering troughs during the 8 wk trial. The pigs had feed and water *ad-libitum*. Pigs were weighed weekly and weekly feed consumption was also recorded.

Blood Collection

Two (1male and 1 female) out of the six experimental pigs per treatment (i.e. one animal per replicate) were randomly selected for bleeding on the last day of the experiment. The animals were given only water in the evening preceeding the bleeding. Bleeding was done in the morning before feeding and about 10ml of blood was obtained from the jugular vein using a sterilized special needle into a sample bottle. The samples were allowed to clot by putting them into a refrigerator at 4⁰c for 3 hours. They were then centrifuged at 3000 rpm for ten minutes and the serum separated and stored frozen at -18⁰c until analysed.

Analytical Techniques

Diets were analysed for their proximate constituents using the methods of the Association of Official Analytical Chemist (A.O.A.C., 1984). Determination of total serum protein was by the biuret method as described by Weichelbaun (1946). Serum creatinine and uric acid were obtained by the method of Slot (1965) and Caraway (1955), respectively. Cholesterol levels were determined according to method of Roschlan *et al* (1974). Serum albumin was assessed by the method of Doumas and Briggs (1972). Globulin was obtained by the method of Rodkey (1965).

Statistical Analysis

All experimental data were subjected to analysis of variance and where statistical significance was indicated, means were compared using the Duncan's New Multiple Range Test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The summary of the performance characteristics as affected by the different sources of protein is given in Table 3

Differences (P>0.05) existed among the treatment means but pigs on FM and COM

TABLE 3: PERFORMANCE OF EARLY WEANED PIGS FED DIFFERENT ANIMAL PROTEIN SOURCES IN DIETS

Diet Protein source ⁺ Parameters	1 FM	2 COM	3 FBM	4 PBM	S.E. $\pm$
Average Initial liveweight (kg)	4.73	4.87	5.73	5.77	0.23
Average final liveweight (kg)	3 ⁰ .21	29.86	28.29	27.82	-
Average daily weight gain (kg)	0.46	0.45	0.40	0.39	0.11 NS
Average daily feed intake (kg)	0.84	0.80	0.74	0.74	0.01 NS
Efficiency of feed utilization (kg feed/kg gain)	1.83	1.78	1.85	1.90	0.40 NS

⁺FM = Fish meal; COM = Chicken offal meal;
FBM = fresh blood meal; PBM = parboiled blood meal
NS = Not significant (P>0.05)

diets had somewhat higher growth rates. The BM marginally lowered the feed intake while animals on the FM and COM had somewhat better ($P > 0.05$) feed/gain ratio compared with those on BM. Table 4 shows the serum metabolites level of the pigs. Pigs on FM diet had higher ($P < 0.05$) serum total protein and serum albumin.

The performance of the pigs showed that there were no significant differences in the

promoting properties similar to those of FM.

Kokatnur *et al* (1958) reported an increased linear relationship between serum cholesterol

the result of this study showed no significant differences in the cholesterol level, it may then mean that the absolute intake of protein by the pigs from the protein sources did not differ significantly. The marginal decrease in the cholesterol level of pigs on the PBM may be

TABLE 4: SERUM METABOLITES OF EARLY WEANED PIGS FED DIFFERENT ANIMAL PROTEIN SOURCES IN DIETS

DIETS Protein source [†] Parameter	1 FM	2 COM	3 FBM	4 PBM	S.E. ±
Total protein (g/l)	8.49 ^a	7.70 ^b	6.76 ^b	7.04 ^b	0.11
Albumin (g/l)	7.75 ^a	5.63 ^b	4.29 ^b	4.4 ^b	0.07
Globulin (g/l)	0.75 ^b	2.07 ^a	2.47 ^a	2.64 ^a	0.05
Creatinine (mg/dl)	3.28	3.12	3.02	2.98	0.11
Uric acid (mg/dl)	1.66	1.57	1.65	1.60	0.07
Cholesterol (mg/dl)	45.37	43.99	42.64	41.16	1.38

[†]FM = Fish meal; COM = Chicken offal meal; FBM = fresh Blood meal;
PBM = parboiled Blood meal

a,b,c, Means in the same column not followed by the same letter are significantly different ($P < 0.05$)

performance of pigs fed the protein concentrates, although pigs fed the FM diet ate somewhat more than those fed the others diets. A similar trend was recorded in terms of daily weight gain. This is contrary to the earlier observations by Fetuga (1972), Njoku (1985) and Becket *et al* (1963) who reported poor feed intake and poor performance of animal fed BM as compared with other protein sources. The difference in results may be because soyabean supplied the major portion of protein to the test diets in this present study and therefore appeared as though the supplementary ability of the blood meal met the growth needs of the pigs. The young pig is very sensitive to dietary amino acid deficiencies and imbalance. The lower performance of pigs on BM as compared with FM and COM may be due to the amino acid imbalance in the BM as reported by Fetuga (1972) and Odukwe (1985). Feed efficiency was lowest in the order of COM, FM, FBM and PBM. This observed performance agrees with the findings of ElAmin and Musharaf (1987), Wiseman *et al* (1958) and Fuller (1956) who have established that COM is a valuable ingredient in broiler diets, with growth

linked with the findings of Odukwe (1985) that high temperature cooking of blood during preparation leads to formation of lysine reducing sugar complex, thereby reducing the digestibility of lysine. As pointed out by Allison (1955), total protein or serum albumin is an indication of the protein reserves in an animal. Therefore the increase in the serum albumin (normal range 4.0 to 5.5 g/dl) and consequently total serum protein (normal range 6 to 8g/dl) of pigs on the FM and COM diets, reflected the ability of the pigs on these diets to store "reserve" proteins, when the animal has reached its maximum capacity for depositing tissue or less "labile" protein. The higher albumin levels measured for FM could therefore mean an excess (or wasted) dietary protein. The inverse relationship reported by this experiment between albumin and globulin is expected as serum protein is made up mainly of these two fractions. Eggum (1970) has reported that the serum creatinine indicates extent of muscle wastage and subsequent degradation of muscle phospho-creatinine to form creatinine. The low values recorded for creatinine therefore signified no observable muscular wastage

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brought about by inadequacy of protein.

In conclusion this study has consistently shown no significant differences between the animal protein concentrates tested. Blood meal and chicken offal meal can be used effectively by early weaned pigs in a full-fat soyabean based diets, thereby reducing the dependence on the expensive fish meal. Also, parboiling of blood during the processing of blood meal may not be necessary as reflected in this study, thereby reducing the energy cost for the processing of the concentrate.

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