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Effect of Dietary Inclusion Levels of Blood Meal on Performance of Weaner Piglets

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Abstract

Conflicting results of the nutritional qualities of different processed blood meal has been established in animal nutrition. Therefore, an experiment was conducted to investigate the effect of graded dietary levels of blood meal (BM) on the growth performance of growing pigs in 112 days. 24 weaned pigs (Large white x Landrace) with an average body weight of 10.3±3kg were randomly assigned to four dietary treatments (D1, D2, D3 and D4) containing blood meal at 0, 2.7, 5.4 and 8.1% levels respectively. Each treatment was replicated thrice (2 piglets per replicate) in a Completely Randomized Design. Results showed that the feed intake of grower pigs fed diets containing 2.7 and 5.4% BM was similar (p>0.05) and significantly higher than in other treatments. Final and daily weight gain (27.00±0 and 0.30±0) kg were significantly highest in piglets offered dietary treatment D4 (8.1% BM inclusion) than other treatment groups. Feed conversion ratio was lowest in piglets fed diet of 2.7% BM inclusion. The feed cost(₦)/kg gain for growing pigs on 0 and 8.1% diets were similar (P>0.05) but significantly lower than those on 5.4% diet. It's concluded that blood meal could be incorporated in the diets of weaner piglets at 8.1% for effective growth performance and significant reduction in production cost.

Introduction

The increasing population growth, economic instability, high rate of inflation, climate change and food security are national and global issues of governance. The problem of protein malnutrition in most developing countries where the level of animal protein intake represents only about one-tenth of that of the developed countries is real (FSC, 2015). A 2009 report by the International Food Policy Research Institute, anticipated that within the absence of resolute government motion, the availability of food inside the sub-Saharan African region will average 500 calories less per person in 2050, which indicates a 21% decline (CFSC, 2016). Despite the shortfall in protein intake and the imminent need to elevate production of pigs in Nigeria has remained low (Osondu *et al*., 2014). A study by Agunbiade *et al.* (2011) revealed that the neglect or slow growth of the swine industry can be attributed to acceptability and management issues. The management problems include disease outbreaks, poor feed efficiency, and high cost of feedstuffs. In developing countries like Nigeria and Kenya, conventional protein feedstuffs like soya bean, groundnut cake and fish meal are scarce and expensive (Rekwot *et al*., 2012).

The alternative protein sources of animal origin include; feather meal, hair meal, meat and bone meal, tannery waste, skim milk powder, earthworms, maggots, crickets, locusts/grasshoppers and blood meal (Rhule *et al*., 2007). The interest of animal nutritionist has been directed towards the evaluation and use of alternative protein sources such as blood meal. Blood products have been observed to be effective protein sources which enhance growth rate and feed intake during the post-weaning phase of pigs. Libal *et al.* (1975) reported the use of blood meal in place of soya

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bean meal at 4% level. Therefore, the pre sent study was conducted to discover the impact of various nutritional inclusion levels of blood meal on overall performance of weaned piglets.

Materials and Methods

Experimental site, collection and processing of blood meal

The study was carried out at the piggery unit of the College of Agriculture and Animal Science, Mando, Kaduna (11º 10' N, 07º 38'E), located in the Northern Guinea savannah Zone of Nigeria. Mando area has an elevation of 632m above sea level and an average rainfall of 1200mm with about 95% rainfall between April and October. The ambient temperature and relative humidity ranged from 26 to 35ºC and31 to 37%, respectively (Google Maps, 2023). Blood (40 litres) was collected from slaughtered cattle at the Zango Abattoir, Tudun Wada, Kaduna, into a clean plastic container. The blood was subjected to heat treatment by boiling for 30 minutes in a clean metal drum. The blood meal was sun-dried for 3-days (Derouchey *et al*.2002) and later stored in a clean air-tight plastic container for incorporation in the experimental diets.

Experimental diets and management of animals

Twenty-four (24) crossbred (Large White x Hampshire) weaned piglets were procured from the College farm for the experiment. The piglets were randomly assigned to four experimental diets in a Complete Randomized Design (CRD). Each dietary group was replicated three times with two pigs per replicate. The feed intake and weight gain of the pigs were determined in an 8-week feeding trial by feeding diets incorporated with blood meal at graded levels of 0, 2.7, 5.4, and 8.1%, represented as Diet 1 (D1): Control (0%) without blood meal; Diet 2 (D2): Contained 2.7% blood meal; Diet 3 (D3): Contained 5.4% blood meal and Diet 4 (D4): Contained 8.1% blood meal. All the diets were iso-nitrogenous and iso-caloric and were formulated to contain 15% crude protein (CP). The gross composition of the experimental diets and calculated nutrient analysis is shown in Table 1 (a and b).

Table 1 a. Ingredient composition (%) of growing pig diets containing graded levels of blood meal (8-16 weeks)

	Levels of blood meal (%)			
Ingredient (%)	D1 (0)	D2(2.7)	D3(5.4)	D4(8.1)
Maize	66.00	71.00	73.00	73.00
Maize offal	3.00	3.00	3.00	3.00
Rice offal	3.00	3.00	3.00	3.00
BDG	3.00	5.00	5.00	5.00
Blood meal	0.00	2.70	5.40	8.10
GNC	18.00	10.00	5.00	2.00
Fishmeal (65%)	1.00	1.00	1.00	1.00
Bone meal	1.00	1.00	1.00	1.00
Limestone	0.20	0.20	0.20	0.20
Palm oil	3.80	2.00	2.00	2.00
Lysine	0.20	0.20	0.20	0.20
Methionine	0.10	0.10	0.10	0.10
Vit/Min Premix	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50
Total	100	100	100	100

Table 1 b. Ingred ient composition (%) of growing pig diets containing graded Levels of blood meal (8-16weeks)

Calculated Analysis

	Levels of blood meal (%)			
Ingredients	D1 (0)	D2(2.7)	D3(5.4)	D4(8.1)
Crude protein (%)	15.78	15.46	15.52	15.98
ME. (Kcal/kg)	3195	3155	3085	3069
Ether Extract (%)	4.67	4.23	3.85	3.57
Crude fibre (%)	4.30	4.49	4.39	4.29
Calcium (%)	5.50	5.50	5.50	4.60
Phosphorus (%)	7.30	8.50	10.10	11.90
Lysine (%)	0.53	0.60	1.05	1.17
Met.+ Cys. (%)	5.20	4.90	5.60	5.90
Cost/kg feed (₦)	142.08	137.18	136.18	136.93

Premix1 vitamin premix (Animal Care Optimix^{R}) supplied per kg of feed: Vit A 5,000 I.U; D3 3500 I.U; Vit.K 2.5mg; B1 2mg, B2 6mg; B6 4g;Niacin 40mgm; B12 0.02mg; Pantothenic acid 10mg; Folic acid 1mg; Biotin 88mg; Choline chloride 0.5gm; Anti-oxidant 0.125mg; Manganese 0.096gm; Iron 0.24gm; Copper 6x103mg; Iodine 1.4x103mg; Selenium 0.240mg; Cobalt 0.240mg. Met. = Methionine; Cys, = cysteine.

The pigs were housed in twelve standard pens; each having well-ventilated open sided walls with slated concrete floor measuring 165 x 180cm^2. The pens have concrete watering troughs measuring 65 x 30 x 25cm^3 and concrete feeding troughs measuring 48 x 30 x 20cm^3. The pigs were quarantined for one week before the commencement of the experiment during which time they were de-wormed, and treated for ectoparasites using Ivomectin® injection (0.5 mls) and ear-notched for identification. All the pigs were fed experimental diets at 6% of their body weight and water *ad libitum*. The pigs were fed twice daily (8:00am and 4:00pm) throughout the experimental period. Feed refused were removed, dried, weighed and recorded daily. Pigs were weighed at the beginning of the trial to determine the initial body weight and at weekly intervals for weight changes. The experiment lasted for 56 days. At the end of the experiment, average daily feed intake, average daily weight gain, feed conversion, feed cost per kg live weight and mortality were calculated. The feed cost/kg live weight gain was computed as the product of feed cost (per kg) and the feed conversion ratio.

Statistical analysis

Data obtained were analyzed using the General Linear Model Procedure of Statistical Analysis software package (SAS, 2002) and significant differences were stated at P<0.05.

Results

Table 2 shows the performance of grower pigs fed experimental diets containing varying inclusion levels of blood meal. The daily feed intake of pigs fed Diets 2 and 3 were similar (P>0.05) and significantly (P<0.05) higher than other treatments. Daily weight gain (kg) of the pigs ranged from 0.22 to 0.35 kg across the treatments, with values being significantly higher in pigs fed Diet 2 (0.35kg) and lower in those fed Diet 3 (0.22 kg).

T**able 2: Effect of dietary levels of blood meal on growth performance of weaner piglets**

	Levels of blood meal (%) inclusion				
Parameters	D1 (0)	D2 (2.7)	D3 (5.4)	D4 (8.1)	SEM$^{@}$
Initial weight (kg/pig)	10.33	10.16	10.16	10.16	1.16
Daily feed intake (kg/pig)	1.12^{c}	1.25^{a}	1.23^{a}	1.21^{b}	0.01
Final weight (kg/pig)	26.16^{a}	20.16^{c}	22.83^{b}	27.00^{a}	1.18
Weight gain (kg/pig)	15.83^{a}	10.00^{c}	12.66^{b}	16.83^{a}	0.78
Daily weight gain (kg/pig)	0.28^{a}	0.13^{c}	0.22^{b}	0.30^{a}	0.01
Feed conversion ratio	4.00^{b}	3.50^{a}	5.45^{c}	4.04^{b}	0.34
Feed cost (₦/kg gain)	545.32^{b}	464.17^{a}	798.67^{c}	560.00^{b}	15.09

^{abcd}= Means within rows with different superscripts differ significantly (P<0.05) $^{@}$SEM= Standard Error of Mean.

The feed conversion ratio of pigs fed Diet 2was lower and better compared to other dietary treatment groups. Feed cost (₦) per kg gain during the grower phase for pigs fed 0 and 8.1% BM diets were similar ($p>0.05$). The feed cost (₦) per kg gain (₦789.67) for pigs fed a 5.4% BM inclusion diet was significantly ($p<0.05$) higher than those on other diets (₦464.17, ₦545.32 and ₦560.00) while those fed a 2.7% BM inclusion diet were lower compared to that of pigs fed other diets. There was no mortality during the experimental period.

Discussion

Reduced feed intake by the piglets fed the control diet (without blood meal inclusion) compared to other treatment groups was not expected. A major limitation of blood meal is the poor taste/palatability (Owen *et al*., 1995; Coffey *et al*., 2001; Hans, 2023) and its inclusion in the diets of monogastric might negatively impact feed intake. The highest value of daily feed intake in piglets fed diet 2 (2.7% BM)is contrary to the findings of Hans *et al*.(2023) who reported the highest feed intake value in grower pigs at 6.0% BM inclusion in diet. The range of values for daily weight gain (280 to 350g) observed in this study was lower than the range of 509 to 524g reported by Chen *et al.* (2005) and Oscar *et al*.(2012) in the Large white x Landrace breed. However, it fell within the range (290 to 347g) in grower pigs fed blood meal-incorporated diets (Stein *et al*., 2023). The differences in the values could be attributed to differences in the processing methods, animal species used, blood collection time and probably drying methods employed (Derouchey *et al*., 2002; Cromwell, 2009).

The pigs fed 8.1% blood meal diet had the highest average daily weight gain and attained the highest live weight than those on other diets. This indicates the superiority of the diet and suggests that the inclusion level of BM at 8.1% in the grower diet will enhance daily weight gain. The lower feed conversion ratio in pigs fed a diet of 2.7% BM inclusion compared to those fed other diets showed the superiority of the diet to support better performance. This might be attributed to a better complementary role of nutrients at2.7% BM inclusion, which resulted in improved growth (Isikwenu *et al.,* 2008). However, the performance of pigs fed diet of 8.1% blood meal inclusion differed from the findings of Fombad and Bryant (2004), who recommended that 3.0 to 4.0% of blood meal inclusion increased the feed for better performance in grower pigs. The cost of feed per kg gain was lowest for pigs fed 2.7% BM diet due to a slightly better feed conversion ratio. No mortality was recorded during the experimental period. This is in agreement with the findings of Onifade *et al*. (1999) who reported that blood meal in the diets of grower pigs had no detrimental effect.

Conclusion and recommendations

Findings from this study show that the daily feed intake were similar with growing piglets on 2.7 and 5.4% BM diets and significantly highest compared to others while daily gains were observed to be significantly highest with pigs on 8.1 % BM which was similar to the control (0% BM).The feed conversion and feed cost ₦/kg gain was better and lower respectively for growing piglets on a 2.7% BM diet compared to piglets on other BM diets. There was no deleterious effect on the growth performance of growing pigs fed varying dietary inclusion levels of BM. For improved growth performance the inclusion of blood meal at 8.10 % in the diet of growing pigs is recommended.

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