Effect of Feeding Frequency on Performance and Blood Profile of Weaned Pigs in A Humid Hot Environment

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Abstract

This study aimed to evaluate the effect of twice or once daily feeding on performance and blood profile of weaned pigs. Twenty weaned pigs were randomly allotted to the two treatments with ten animals (replicates) each in a completely randomized design. The same quantity of feed (3 Kg/pig/day) was fed to the pigs in the two treatments but was fed twice (1.5 Kg/pig/day each) to animals on twice daily feeding. The experiment lasted for six weeks. The weight of each animal and feed intake was measured weekly. Blood samples (5 ml) were collected at the end of the experiment for haematology and serum biochemical evaluation. Means of data obtained were separated using T-Test. Pigs fed twice daily with an average feed intake of 19.46 kg/pig/week gained more (P≤0.05) weight (2.1 kg/pig) compared to those fed once daily with an average feed intake 15.94 kg/pig/week and weight of 0.53 kg/pig. However, there was no significant variation in their feed conversion ratio. Haematology and serum parameters indicated no significant difference between the two treatments except for the White Blood Cells which differed significantly (P≤ 0.05) with $13.87x10^3$/µL and $18.07x10^6$/µL in twice and once fed pigs respectively. Based on findings from this study it is concluded that for efficient feed utilization, feeding twice daily should be adopted as this improves the performance of pigs than once daily feeding.

Keywords: Feeding regime, Haematology, Performance, Serum biochemical indices, Weaned pig.

Introduction

Improvement of growth rate and efficiency of nutrient utilization are ultimate goals of swine producers and animal nutritionists (Cho *et al.,* 2006).The natural feeding behaviour of pigs is searching for feed by rooting activities throughout the day but self-feeding pigs randomly space their eating and drinking periods throughout the day consuming ten to twelve meals per day (Persson *et al.,* 2008). In contrast, pigs in conventional indoor fattening pig production are normally fed 2–3 times daily whereby the feed is consumed within 15 minutes after feed presentation.

In Nigeria, most farmers feed their pigs once daily while others allow the animal's free access to agro-by-products throughout the day. However, in conventional pig feeding management, more variable feeding systems are applied (Fanimo *et al.,* 2003). Once a day feeding for animals implies that the required quantity and quality of feed by an animal is given at once either in the morning, afternoon or evening depending on the choice of the farmer. On the other hand, split feeding or restricted feeding involves a fixed amount of feed distributed to each pen or to each animal, in two or three meals daily (Serres, 1992).

Wood *et al.* (1996) reported that, twice daily feeding of a high-fibre diet fed to pigs was found to increase the digestibility of dry

matter, crude protein and crude fibre and this led to better growth and feed utilization, compared with once daily feeding of the same daily allowance.

Monitoring herd health via haematological indicators may reveal adverse conditions, when the animals may not be displaying clinical sign of diseases. According to Madubuike and Ekenyem (2006), haematological and serum biochemical assay of livestock indicate the physiological disposition of the animal to their nutrients. Consequently, the physiological responsiveness of the animal to its internal and external environments is the function of the haematological constituents.

Most animals can transfer internal heat to the outside of the body by sweating and panting; these are the two most important tools for the maintenance of body temperature and form their inbuilt evaporative cooling system. However, pigs do not sweat and have relatively small lungs (Kim, 2015). Due to these physiological limitations and their relatively thick subcutaneous fat, pigs are prone to heat stress.For pigs having heat stress, feed intake contributes to further heat production by energy metabolism and the animal may stop eating. Thus, Sudduth (2002) suggested increasing the frequencies of animal feeding as a managerial practice to reduce the effects of heat stress on the animals.

A study by Fanimo *et al.* (2003) on the effect of once, twice or thrice daily feeding on performance and nutrient digestibility parameters of growing pigs was without any regard to the physiological state of the animal being subjected to this feeding strategy. Therefore, this study was carried out to evaluate the effect of feeding regimes on performance and blood profile of weaned pigs acknowledging that the physiological states of domestic animals determine the level of productivity.

Materials and Methods

The experiment was carried out at the Teaching and Research Farm, University of Ibadan, Nigeria for a period of six weeks. Twenty weaned pigs of about 4.90 kg average weight were randomly allotted to two treatments in a completely randomized design with 10 animals per treatment, with each animal representing a replicate. The pigs were fed once daily (9am) and twice daily (9:00am and 4:00pm) with a basal ration of BDG, PKC and cassava peels and concentrates in the ratio 40:60 respectively.

Feed intake and body weight of pigs were recorded weekly and weight changes and feed conversion ratio were calculated at the end of the experiment. Rectal temperature was measured in the morning weekly with clinical thermometer. At the end of the experiment 5 mLs of blood sample were collected from five animals per treatment, these pigs were placed in a dorsal recumbent position and blood was drawn from the arterio-vena cava into two different sample bottles; a plain sample bottle and an EDTA (ethylene di amine tetra acetic acid) bottle for serum and haematological analysis respectively. The samples were placed on ice, and the serum was separated by centrifugation for 20 min. at 3000 rpm.

Data were subjected to statistical analysis software (SAS, 1999) and significant means were separated using T-Test.

Results

The performance of pigs fed twice and once daily is as shown in Table 1. Significant ($P \leq 0.05$) variations in the final weight, feed intake and weight changes of pigs in the two

Table 1: Performance of Weaned pigs fed twice and once daily

Parameters	Twice feeding	Once feeding	SEM
Initial weight (kg/pig)	4.90	4.80	0.11
Final weight (kg/pig)	7.00[a]	5.33[b]	0.24
Weight change (kg/pig)	2.10[a]	0.53$_b$	0.24
Feed intake (kg/pig/week)	19.46[a]	15.94[b]	0.04
Feed Conversion Ratio (FCR)	2.28	2.34	0.02

[ab]Means with different superscript in the same row differ significantly (P≤0.05)
SEM- standard error of means

treatments were observed. Pigs fed twice daily gained more weight (P≤0.05) compared to those fed once daily. However, feed conversion ratio of pigs fed twice daily (2.28) did not vary significantly when compared with 2.34 obtained for the pigs fed once daily.

Haematological indices revealed that there were no significant differences in the haematological profiles of weaned pigs fed twice and once daily. However, the white blood cells parameters indicated a significant variation within the treatments with once daily having a higher value of 18.07 x10^3/µl when compared with 13.87 x10^3/µl for those fed twice.

The serum biochemical results are presented in Table 3. This revealed that there were no significant variations in all the parameters measured. These parameters which included serum glucose, creatinine and albumin followed the same trend with pigs fed twice daily recording higher values.

Table 2: Haematology of weaned pigs fed twice daily and once daily

Parameters	Twice feeding	Once feeding	Standard value	SEM
Packed Cell Volume (%)	33.17	33.67	[1]32.00- 50.00	1.63
Red Blood Cells (x10^6/µl)	7.80	8.20	[2]5.00- 10.00	0.53
White Blood Cells (x10^3/µl)	13.87[b]	18.07[a]	[2]6.00- 25.00	0.33
Lymphocyte (%)	44.00	43.67	[1]40.00- 60.00	2.98
Neutrophil (%)	51.33	50.00	[1]28.00- 51.00	3.20
Monocytes (%)	2.33	2.33	[1]2.00- 10.00	0.88
Eosinophil (%)	3.00	4.00	[1]0.00- 10.00	0.82

[ab]Means with the same superscript in the same row has no significant difference
[1]Research Animal Resources (RAR) (2009), [2]Mitruka and Rawnsley, (1977)
SEM- standard error of means

Table 3: Serum biochemistry of weaned pigs fed twice and once daily

Parameters	Twice feeding	Once feeding	*Standard value	SEM
Glucose(mg/dL)	48.00	45.00	60.00- 136.00	0.07
Cholesterol(mg/dL)	106.00	116.00	90.00- 156.00	0.06
Creatinine (mg/dL)	1.35	1.27	1.00- 3.00	0.12
Albumin(g/dL)	4.32	3.70	1.80- 5.60	0.32
Total Protein(g/dL)	5.90	6.40	4.80- 10.30	0.73

*Mitruka and Rawnsley, (1977)
SEM- standard error of means

The rectal temperature of weaned pigs fed twice daily increased from 36.5^{0}C at week 1 to 37.55^{0}C in week 2 and finally declined to 37.2^{o}C in week 5 (Fig. 1). However, the rectal temperature of weaned pigs fed once daily increased from 36.1^{0}C at week 1 to 37.55^{0}C in week2,itthendeclinedto37.1^{0}Cinweek5.

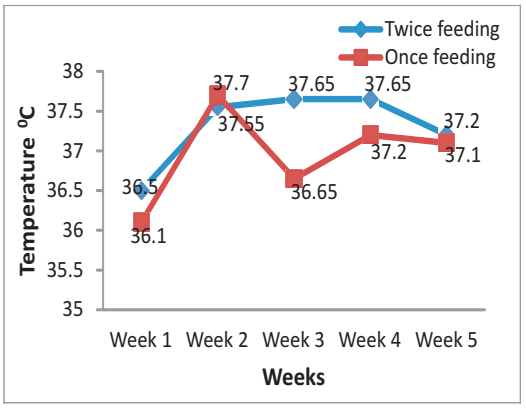

Figure 1: Rectal temperature of pigs fed on twice feeding and once feeding

Discussion

The result obtained for the performance parameters in this study suggest that twice daily feeding when compared with once daily feeding improved the weight gain of pigs and this corresponds to the results of Fanimo *et al*.(2003) who examined the response of weaned pigs to feed rationing and frequency of feeding. Although the feed conversion ratio of the two treatments does not differ statistically, pigs fed twice daily utilized the feed better with higher final weight than those fed once. This might be due to the reduced feed intake observed with pigs fed once as a result of feed rejection. Pigs lose interest in stale feed and thus reject feed that are presented for a long time. Pigs digest and utilises the feed that were presented in bit better than same quantity of feed giving at once which get staled and became unacceptable.

Haematological studies have been found useful for disease prognosis and for therapeutic and feed stress monitoring (Togun and Oseni, 2005). All the haematological parameters measured in this study fell within the normal range values for pigs (RAR, 2009; Mitruka and Rawnsley, 1977). The white blood cell (WBC) vary significantly in the two treatments with the higher value in pigs fed once. An elevated WBC count may be due to nutritional stress as a result of low feed intake observed for pigs under once feeding. However, this is negligible since the value is within the normal range values.

The result of the serum biochemical parameters measured in this study indicated that most were within the normal range for pigs except the serum glucose that is below the range in both treatments. The result revealed that pigs fed once daily had lowered glucose level and this may be due to longer period of time without feed. Decreased blood glucose levels have also been observed in fasted pigs by Omotosho and Olufemi (2013).

The rectal temperature in the two treatments did not vary significantly from each other. However, the twice daily fed animals were able to gain weight and had better growth rates because they were also fed in the evening when the imposed stress was minimal compared to the once fed which were fed only in the morning and this supports Sudduth (2002) suggestion of increasing the frequencies of animal feeding as a managerial practice to reduce the effects of heat stress on animals.

The findings of this study therefore, concludes that for efficient feed utilization, twice feeding should be adopted as this improved performance and health of pigs compared with once daily feeding.

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