

BEHAVIOURAL RESPONSE OF GROWING PIGS REARED IN HOT HUMID ENVIRONMENT TO FEED WITHDRAWAL PERIODS

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Abstract

This study was carried out with the aim of investigating the behavioural response of growing pigs to feed withdrawal periods during the hot periods of the day. Twenty Seven, 8 weeks old pigs of mixed breeds with average body weight of 5.5 ± 0.2 kg were randomly assigned to three treatments (0, 2 and 4 hours feed withdrawal periods) with each treatment consisting of three replicates of three pigs each. Behavioural activities of the pigs (standing, sitting and lying) were monitored with the aid of digital video cameras mounted 3 m above the pen house. Eight hours recordings of the pigs' behaviours for 4 consecutive days in a week for 3 weeks duration were obtained. Data collected were subjected to one-way analysis of variance. Behavioural activities of rooting (3.69 times/frequency), walking (5.57 times/frequency) and drinking (1.67 times/frequency) behaviours increased significantly ($P < 0.05$) with increase in level of feed withdrawal periods. Pigs on 4 hours feed withdrawal period had higher docile behaviours; hence, 4 hours feed withdrawal period can be adopted as management tool to improve the behaviours of growing pigs.

Key words: huddling, recumbency, rooting, wallowing and walking

Introduction

Feed restriction as a management tool has been reported to improve feed efficiency, reduce feed cost and mortality rate in fast growing domestic farm animals leading to production of more economically high quality animal protein (Etalem *et al.*, 2011; Njoku *et al.*, 2013). It can also be used to prevent feed wastages; accumulation of excess body fat, as well as metabolic disorders such as ascotes syndrome (Mahmood *et al.*, 2007). However, severe feed restriction for longer duration has been criticized because it infringes the welfare of domestic animals; reduce the final weight, resulting to stunted growth and eventual death due to starvation. Mild feed restriction or short duration of restriction can be utilized to achieve the beneficial effects of feed restriction without compromising the welfare of the animal. Denial of feed during hot hours of the day may be helpful to reduce the metabolic heat production and thus may be an animal welfare promoting strategy by improving the heat tolerance of the pigs especially those raised under hot humid condition. Despite the abundant information on the beneficial effects of feed restriction in terms of compensatory growth and carcass quality, only a handful of information exist in literature pertaining to behavioural changes in pigs subjected to mild feed restriction especially those raised in hot humid environment in Africa. To this effect, this study was carried out to determine the behavioural response of growing pigs to feed withdrawal periods.

Materials and Methods

Experimental Animals and Management

The experiment was carried out at the Piggery Unit of the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. Twenty seven mixed breed weaner pigs with body weight of 5.0-5.2 kg were bought from a commercial farm within Abeokuta metropolis. The pigs were grouped based on their body weight into 3 treatment groups with 3 replicates of 3 pigs per replicate. Three pigs in a replicate were housed together in a naturally ventilated pen with floor dimension of 4 m by 3 m, equipped with concrete feeding and drinking troughs. Routine management practices were done on daily basis, with fresh water supplied *ad libitum* throughout the experimental period. Pigs on treatment one were fed *ad libitum* throughout the period, while those on experiment two and three were offered daily ration at 07:00 hrs. Feeders were withdrawn at 12:00 hrs and later returned at 14:00 and 16:00 hrs of same day. The pigs were fed concentrate diet that contained 18% crude protein, 4.30% ether extract, and 8.59% crude fibre and 2474.39 KJ/Kg metabolizable energy as indicated in Table 1

Data Collection

Determination of Behavioural Activities

Behavioural activities of the pigs which include standing, lying (sterna or lateral), sleeping, wallowing, eating, drinking, sniffing threat of attack (fight), attempts to escape, mounting one another, huddling, and rooting the floor were observed with the aid of a CCTV digital camera mounted 3 m above the pen to capture the

behaviours as described by Knowles *et al.* (1999). Eight hours recordings of the pigs' behaviours for 4 consecutive days in a week for 3 weeks duration were obtained. The number of pigs exhibiting a particular activity within 1 hour of direct observation were counted and noted.

Statistical Analysis

Data were processed by one-way analysis of variance using SAS (2000) package. Significantly ($P < 0.05$) different means among variables were separated using New Duncan's Multiple Range Test as contained in the same package.

Results

Effect of Feed Withdrawal Periods on Behavioural Characteristics of Growing Pigs

Effect of feed withdrawal periods on behavioural characteristics of growing pigs is presented in Table 2. Significant ($P < 0.05$) differences were noted for sleeping, wallowing, walking, rooting and drinking behaviours during feed withdrawal periods. Sleeping behaviour decrease significantly ($P < 0.05$) with increase in level of feed withdrawal periods. Four hours withdrawal period had the lowest mean value of 0.13 times/frequency when compared to the values 0.24 times/frequency and 0.26 times/frequency obtained for pigs on 4 hours and 0 hour feed withdrawal periods respectively. Wallowing behaviour of pigs decreased significantly (0.58, 0.38 and 0.25 times/frequency) with increasing in level of feed withdrawal periods. Walking behaviour during withdrawal periods was significantly ($P < 0.05$) higher in pigs on 4 hours feed withdrawal period 5.57 times/frequency than values (4.63 and 4.35 times/frequency) recorded for those on 2 and 0 hours feed withdrawal periods. Rooting behaviour of growing pigs increased significantly ($P < 0.05$) with increasing level of feed withdrawal periods. Pigs on 4 hours feed withdrawal period had the highest mean value of 3.69 times/frequency compared to 2.68 times/frequency and 2.40 times/frequency observed in 2 hours and 0 hour feed withdrawal periods respectively. Significant ($P < 0.05$) differences were noted in drinking behaviour of pigs ($P < 0.05$) with increase in level of feed withdrawal periods. Pigs restricted for 4 hours had average mean value of 1.67 times/frequency, compared to those on 2 hours and 0 hour feed withdrawal periods (1.08 and 1.32 times/frequency) respectively.

Discussion

Feed withdrawal periods caused different changes in behavioural activities of growing pigs in the

present study. The significant decrease in sleeping behaviour could be attributed to high feeding motivation in the pigs whose feeders have been withdrawn. This must have affected their feed intake leading to decrease in sleeping behaviour since they have to engage in activities relating to scavenging. This scavenging tendency in the pigs on limited feed offered must have resulted to the development of stereotypic behaviour which is strongly related to the persistence of a high feeding motivation in the post-feeding period (Lawrence *et al.*, 1988). Brouns *et al.* (1994) enthused that the development of stereotypic behaviour in pigs is related to a combination of a lack of sufficient amount of food which promote satiety and frustration of foraging behaviour in restrictively fed pigs. The reduction in wallowing behaviour with increasing level of feed withdrawal period of pigs could be linked to the amount of metabolic heat production which has been reported to reduce with decrease in meal size (Njoku *et al.*, 2012 and 2013). Lower metabolic heat production must have increased heat tolerance of pigs resulting in minimal wallowing activity in order to maintain body homeostasis level. Walking and rooting behaviours were influenced by feed withdrawal periods, the positive influence in walking and rooting behaviours could be attributed to high locomotion activities which can be associated with increasing foraging behaviour (Stolba and Wood-Gush, 1989). Feed withdrawal periods reduced the amount of time pigs spent at the feeder, and increased the proportion of time pigs engaged in pen-directed foraging behaviour. Day *et al.* (1995) reported that pigs on 20% of *ad libitum* feed offered increased the time spent in rooting substrate. Also, Lawrence *et al.* (1993) enthused that any condition that limit the performance of normal feeding behaviour in pigs will result to alternative stimuli. In this present study, drinking behaviour increased with increase in level of feed withdrawal periods. Excessive drinking has been considered as a form of stereotypic behaviour and food restriction has been reported to increase its incidence (Njoku *et al.*, 2015). Terlouw *et al.* (1991) found that pigs on high plane of nutrition, performed significant amounts of drinking activity immediately after the meal. However, in the longer term following the meal, high-fed pigs ceased to drink and increased lying behaviour while pigs on low plane of nutrition persisted in drinking. This sustained drinking activity in pigs on feed withdrawal period is likely to reflect metabolic requirement in order to compensate for low abdominal fill. This is in consonance with the findings of Silanikove and Tadmor (1989) that reported 6-fold increase in water intake of pigs

whose total daily ration was halved or completely withheld for a period.

Conclusion

Feed withdrawal periods increased sleeping, wallowing, walking, rooting and drinking behaviours of pigs. Hence, it can be used as management tool to induce acceptable behaviours in pigs.

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Table 1: Percentage composition of the experimental diet

Ingredients	Percentage
Maize	50
GNC	11.5
PKC	20.6
Wheat Offal	15
Bone Meal	2.6
Salt	0.05
Lysine	0.05
Methionine	0.05
*Pig premix	0.05
Total	100
Determined Analysis	
Crude protein	18
Metabolizable energy	2474.39
Fat	4.3
Fibre	8.59
Calcium	0.79

*Contained the following per kg diet vit A 10000000 IU; Vit D3 2500000 IU ; Vit E 40000 IU ; Vit K3 4000 mg, Vit B1 750 mg, Vit B2 2000 mg, Vit B6 2000 mg, Vit B12 10 mcg, Niacin 13000 mg, Pantothenic Acid 5000 mg, Folic Acid 1000 mg, Biotin 10 mcg, Choline Chloride 50000 mg, Manganese 50000 mg, Zinc 100000 mg, Iron 80000 mg, Copper 50000 mg, Iodine 1000 mg, Selenium 200 mg, Cobalt 500 mg, Antioxidant 120000 mg

Table 2: Effect of feed withdrawal periods on behavioural characteristics of growing pigs

Parameters/(Times/frequency)	Feed 0 Hour	Withdrawal 2 Hours	Periods 4 Hours	S E M
Standing	4.51	4.31	4.76	0.29
Sitting	0.44	0.42	0.47	0.07
Sleeping	0.26 ^a	0.24 ^a	0.13 ^b	0.03
Fighting	0.53	0.62	1.01	0.19
Lying down	0.80	0.71	0.72	0.09
Huddling	0.17	0.24	0.23	0.06
Wallowing	0.58 ^a	0.38 ^{ab}	0.25 ^b	0.07
Walking	4.35 ^b	4.63 ^{ab}	5.57 ^a	0.32
Rooting	2.40 ^b	2.68 ^b	3.69 ^a	0.24
Eating	2.12	1.92	1.99	0.14
Drinking	1.08 ^b	1.32 ^{ab}	1.67 ^a	0.10
Recumbency	1.67	1.36	1.41	0.13
*PINT	1.22	1.11	1.61	0.34
Snout rubbing	3.22	3.17	2.17	0.54
Jumping	0.56	0.22	0.89	0.27
Running	1.11	1.00	1.11	0.41

^{a, b} means in the same row not sharing common superscript are significantly different (P< 0.05)

*PINT means Persistent Inguinal Nose Thrusting