

GROWTH PERFORMANCE AND BEHAVIOUR OF WEANLING PIGS RAISED IN MAIZE STRAW ENRICHED PEN

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ABSTRACT

Straw used as bedding materials serves both as recreational and nutritional substrates for pigs and has been reported to improve swine welfare. The aim of this study was to investigate the influence of maize straw on the growth performance and behaviour of weaner pigs. Thirty-six (large white x Landrace) weaner pigs were randomly distributed into four treatments (concrete floor, maize straw at 0.1m, 0.2m and 0.3m depth) with each treatment having three replicates and three pigs per replicate. Data were collected on growth parameters and behavioural indices. There was significant ($p < 0.05$) difference in interaction effect on feed conversion ratio (FCR) across the bedding types and depth. Pigs on concrete floor had FCR of 4.72 that was significantly ($p < 0.05$) greater than 3.83, 3.53 and 3.49 found in pigs on 0.1, 0.2 and 0.3m depth of maize straw bedding, respectively. There were significant ($p < 0.05$) differences between pigs on concrete flooring and those on maize straw enriched bedding for final body weight (FBW), weight gain and feed conversion ratio (FCR). Overall levels of measured behavioural activity differed between the treatments; where animals on maize straw spent significantly higher time on exploratory behaviours, while they spent considerably lower time on manipulative oral behaviours. It can be concluded that pigs reared on maize straw bedding, particularly at 0.3m depth performed more exploratory behaviour, less aggressive behaviour, and had better welfare.

Keywords: Behaviour, Enrichment, Growth Performance, Maize Straw, pigs.

INTRODUCTION

Animal welfare jointly with environmental and food safety are the major challenges of agriculture (Hotzel *et al.*, 2005). Intensive indoor-systems are often made up of barren slatted concrete floors with no rooting material. These systems promote boredom and frustration for pigs by precluding the expression of behaviours, which are exhibited, by pigs under normal circumstances (Studnitz *et al.*, 2007). In pig farming, welfare conditions should be especially observed at critical stages such as weaning, when piglet performance may be affected by behavioural, physiological, immunological and microbiological changes (Molino and Balbino, 2010). Environmental enrichment by provision of objects or substrates capable of satisfying the behavioural needs of pigs is a major method to combat animal welfare problems. These objects or materials have the ability to reduce the amount of time pigs spend on harmful social behaviours. The effects of enrichment can be examined in different approaches such as behaviour and performance of pigs in enriched environments compared to those in barren environments. These aspects all offer insights on how environmental enrichment improves pig welfare. This study therefore explored existing knowledge concerning environmental enrichment and its effect on behaviour and growth performance of weaner pigs housed in maize straw enriched pen.

MATERIALS AND METHODS

The experiment was carried out at the Piggery Unit of the Teaching and Research Farm, University of Ibadan, Ibadan, Oyo State. Thirty-six (Land race X Large white) weaner pigs were used for a 35-day research. Pigs were randomly distributed into four treatments (concrete floor, maize straw at 0.1, 0.2 and 0.3m depth) with each treatment having three replicates and three pigs per replicate. Data were collected on the growth performance of the pigs. Behavioural activities of pigs in each pen were also recorded at day 2 and 34 using direct observation method. Time spent on different activities was observed 3 times for 2 hours, starting from 1000h and ending at 1200h. In each pen, 1 focal pig was selected. The same focal pig

was observed throughout the trial. Data obtained were analyzed using descriptive statistics and analysis of variance (ANOVA) as described by (SAS, 1990), while means were separated using Duncan Multiple Range Test of the same statistical package.

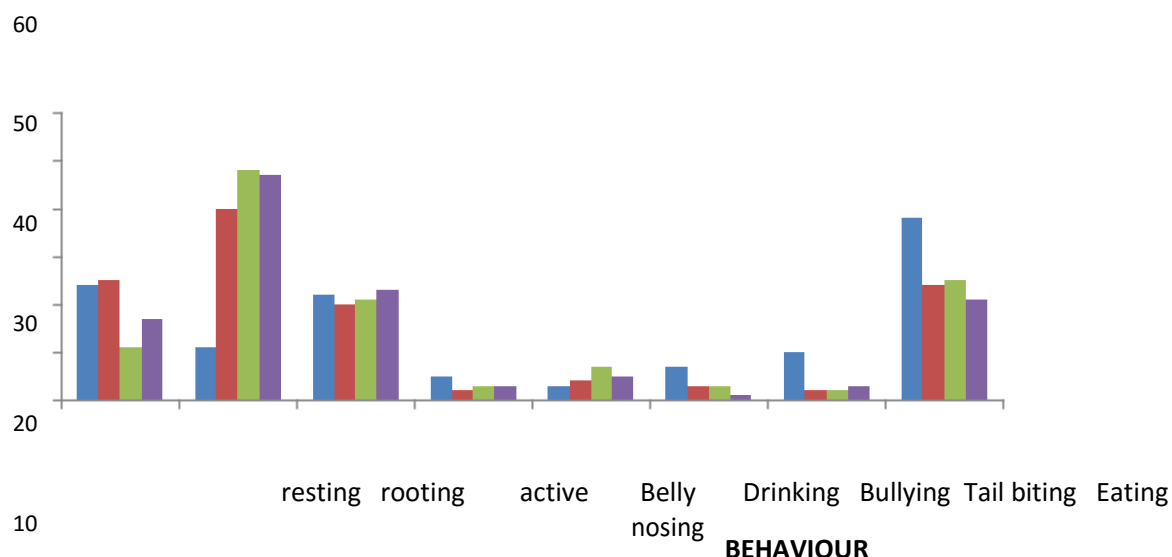
RESULTS

Table 1: Effect of floor type and depth on growth performance of weaned pigs raised on concrete and maize straw enriched floor

Floor type	Depth	Initial weight(kg)	Final weight (kg)	Weight gain (kg)	Feed intake (kg)	FCR
Concrete	0	5.21	8.55	3.34	15.73	4.72 ^a
Maize	0.1	5.30	9.43	4.13	15.71	3.83 ^b
	0.2	5.33	9.58	4.25	14.97	3.53 ^b
	0.3	5.25	9.41	4.16	14.51	3.49 ^b
SEM		0.43	0.33	0.21	0.49	0.17

^{a,b} Means of treatments along a column with different superscript differed significantly ($P < 0.05$). SEM- standard error of mean, FCR- Feed Conversion Ratio

The performance characteristics of growing weaners housed in maize straw bedded pens are as shown in Table 1. There was significant ($p < 0.05$) difference in feed conversion ratio (FCR) of weaned pigs. Pigs on concrete floor had FCR of 4.72 that was significantly ($p < 0.05$) greater than 3.83, 3.53 and 3.49 found in pig on 0.1m, 0.2m and 0.3m maize straw bedding depth, respectively. There was no significant ($p > 0.05$) different among the FCR of pigs on maize straw bedding.



■ crete
Con ■ maize 0.1
■ maize 0.2
■ maize 0.3

Figure 1: Behavioural activities of weaned pigs on concrete floor and maize straw bedding at 0.1, 0.2 and 0.3m depth at Day 2.

Figure 1 shows behavioural activities of newly weaned pigs on concrete floor and enriched floor with maize straw at 0.1, 0.2 and 0.3m depth at day 2. There was a variation in behavioural activity across the treatments.

Resting time of 24mins, 25mins, 11mins and 17mins was noted for pigs on concrete floor and enriched floor with maize straw at 0.1, 0.2 and 0.3m depth respectively. Pigs on concrete floor spent 11mins rooting which was considerably lower in comparison with pigs on maize straw bedding of 0.1m, 0.2m, 0.3m which spent 40mins, 48mins and 47mins respectively. Belly nosing frequency of 5mins, 2mins, 3mins and 3mins were noted for weaned pigs on concrete floor, and 0.1m, 0.2m and 0.3m, maize straw bedding depth, respectively.

Drinking and bullying activities frequency varied across the treatments from concrete floor, and 0.1m, 0.2m and 0.3m, maize straw bedding depth with 3mins and 7mins; 4mins and 3mins; 7mins and 3mins; and 5mins and 1mins, respectively.

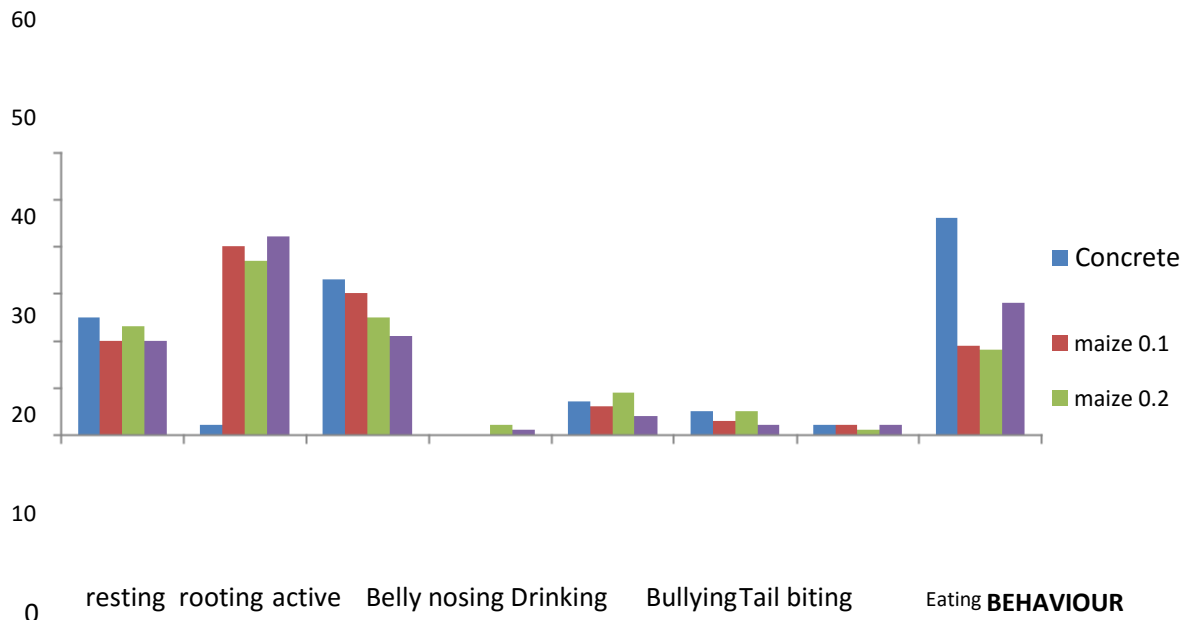


Figure 2: Behavioural activities of weaned pigs on concrete floor and maize straw bedding at 0.1, 0.2 and 0.3m depth on day 34.

Shown in figure 2 is the behavioural activities of weaned pigs on concrete floor and enriched floor with maize straw at 0.1, 0.2 and 0.3m depth for day 34. There was variation in the frequency of time spent on behaviour of weaned pigs on concrete floor and 0.1m, 0.2m and 0.3m depth of maize straw bedding.

Weaned pigs on concrete floor spent 25mins resting, while those on 0.1m and 0.3m maize straw bedding spent 20mins resting and pigs on 0.2m maize straw bedding spent 23mins. Less than 10mins was observed to have been spent by pigs on concrete floor to engaging in rooting activity, while those on 0.3m, 0.2m and 0.1m depth of maize straw bedding spent 42mins, 37mins and 40mins, respectively on rooting activity.

Active time was observed to be on the decline from 33mins, 30mins, 25mins to 21mins for pigs on concrete floor, maize straw enriched bedding of 0.3m, 0.2m and 0.1 depth, respectively.

Pigs on 0.2m maize straw enriched bedding spent 9mins of the observation time drinking and those on concrete floor spent 7mins, while those on 0.1m and 0.3m depth of maize straw bedding had 6mins and 4mins of the observation time drinking.

Pigs on concrete floor and 0.2m depth of maize straw bedding had 5mins of their observation time on bullying activity while those on 0.1m and 0.3m depth of maize straw bedding had 3mins and 2mins spent on bullying activity respectively.

Pigs on concrete floor had 46mins spent on eating activity while those on 0.1m, 0.2m and 0.3m had 19mins, 18mins and 28mins, respectively on eating activity.

DISCUSSION

The lack and absence of manipulation materials with the lack of space is a unique source of poor welfare and low production in intensive system of pig rearing (Studnitz *et al.*, 2007). This reflects high frequency of behaviour redirected to objects and other animals in the pen causing pigs severe problem like skin lesion (Turner *et al.*, 2006), cannibalism (van de weerd *et al.*, 2005), physiological stress (Chaloupkova *et al.*, 2007) and lower product quality (Beattie *et al.*, 2000). Maize straw as environmental enrichment substrate seems to comply with several of the characteristics necessary to maintain the interest of pigs for a relatively long period, such as being ingestible, chewable, odorous and rootable (van de Weerd *et al.*, 2003). The choice of maize straw for this study was due to its availability and easy access as crop residues due to maize being an important and staple food in the country.

Feed conversion ratio (FCR) was found to be better than in pigs reared on maize straw beddings compared to those on concrete floor. Some differences, though, were found in the behaviour of the animals reared on concrete floor and the three different maize straw depths. Pigs kept on maize straw enriched bedded pens were found to have better weight changes compared to those on concrete floors. The performance of pigs is crucial as it reflects their response particularly to feed given and their living environment. Beattie *et al.* (2000) observed that pigs in enriched environments had higher growth rates, which was attributed to higher average daily feed intake. Furthermore, pigs in an enriched environment had a better feed conversion ratio (FCR) than their counterparts from barren environments. The predisposition to increase stress levels on concrete floor could be the reason why these pigs had lower performance rates than pigs in enriched environments. Barnett *et al.* (1992) reported that higher levels of stress adversely affected FCR. At high temperature, pigs reduce their feeding time (Collin *et al.*, 2001). Feeding behaviour differ between pigs on concrete floor and those on maize straw bedding. Furthermore, there were differences in the time spent resting as influenced by temperature differences between floor types and bedding depth as this would be expected to influence the animals' thermal comfort (Hyun *et al.*, 2005). Fraser (1985) found that while under cool conditions growing pigs prefer to lie on straw, at higher temperatures they prefer bare floors. Thus because of the tropical condition of the study, pig exhibit higher frequency of resting on concrete floor while lesser time resting on maize straw bedding that raise thermal stress in the animal as a result of heat of fermentation from the decomposing maize straw. Excessive temperature, as a result of fermentation of the substrate, could result in heat stress, reducing voluntary feed intake and weight gain of pigs (Quiniou *et al.*, 2000)

CONCLUSION AND RECOMMENDATION

Maize straw helped in manipulating the behaviour of weaned pig which is important in welfare improvement of the pigs. It was revealed that the maize straw is a good rooting and welfare-friendly material that has a larger capacity to stimulate explorative behaviour of pigs. Also, it is a good absorbent material providing dry surface for pigs. Better pig production performance with improved weight changes and feed conversion ratio was noted with pigs on maize straw enriched pens. It can be recommended that pigs should be reared on 0.3m depth maize straw enriched pen as it improves exploratory behaviour of pigs and promotes better welfare of the pigs by reducing or eliminating aggressive behaviour.

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