



EFFECT OF WEIGHT ASYMMETRY ON GROWTH INDICES AND COST BENEFITS OF GROWING PIGS

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Abstract

Twenty seven, ten weeks old Large White pigs with average body weight of 15.33 ± 0.2 kg were randomly assigned to three treatments (heterogeneous, homogenous light and heavy weight groups) in order to investigate the impacts of weight asymmetry on growth indices and cost benefits of growing pigs. Each treatment consisting of three replicates of three pigs each. Growth parameters and cost indices data were obtained on weekly basis throughout the experimental period. Data generated were subjected to a 1- way analysis of variance using SAS (2000). The results showed that homogenous light weight pigs had higher feed intake and total feed cost per pigs compared to other values noted for pigs on other treatment groups. Heterogeneous weight pigs recorded better feed conversion ratio, lower feed cost per kilogram weight gain and higher gross margin values compared to their homogenous counterparts. Hence, unevenly weight growing pigs can be managed together in order to obtain higher production efficiency.

Key words: Asymmetry, growth, homogenous, heterogeneous, pig

Introduction

Welfare issues pertaining to pig production and management are essential factors to be looked into since pigs indicate a suffering level especially when their fundamental needs and freedoms are not met. At weaning and growing phases, pigs of different weight groups from different pens are pooled together and managed collectively in order to maximize floor spaces and labour. This practice of mixing unfamiliar and uneven weight groups of pigs may result in high incidence of aggressive behaviour which may affect the growth rate and compromise carcass yield and quality due to physiological stress and pathological responses to the stimuli that may reduce the immunity of the pigs (Arey and Edward, 1998; Nakanishi *et al.*, 1993; Mench *et al.*, 1990). The magnitude of the aggressive behaviour exhibited between the individuals could be determined by the degree of familiarity and weight differences among the pigs (Bostami *et al.*, 2015). Studies have been conducted in order to establish practical approaches in the management of this aggressive behaviour in pigs. The suggested approaches include the use of sedative drugs or other chemicals, putting them in neutral pens or masking their body odours (Bostami *et al.*, 2015). Most of these measures prove abortive as aggression resumes at full peak when the acute effects of the agents disappears (Bostami *et al.*, 2015). It can be hypothesized that homogenous weight pigs reared on weight group basis promotes welfare, improved management, reduces aggressive behaviours, and enhances growth rate, nutrient digestibility and carcass quality. To this, the present study was aimed at investigating the effects of weight asymmetry on growth parameters and economy of production of growing pigs.

Materials and Methods

Experimental Pigs 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 Large White pigs with body weight range of 14.44-16.22 kg were bought from a commercial farm within Abeokuta metropolis. The pigs were grouped based on their body weight into 3 treatment groups (homogeneous heavy weight group, homogenous light weight group and heterogeneous weight group) with three replicates of three pigs per replicate. Heavy weight group can be defined as a group of pigs at a certain age had weight which is significantly above the weight of the mean group. While light weight group is a class of pigs at a certain age have a body weight which is significantly below the weight of the mean group. 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. The pigs were fed formulated ration that contained 18% crude protein, 4.30% ether extract, and 8.59% crude fibre and 2474.39 KJ/Kg metabolizable energy.

Data Collection

Growth performance

Data were collected on daily feed intake and weekly weight gain of the growing pigs while feed conversion ratio was calculated. The initial weight of the animals was taken at the commencement of the experiment and subsequently on weekly basis to determine change in their body weight. Weight gain (kg) = Final weight – Initial weight. Feed intake was determined by taking the difference between the quantities of feed offered to the animals and feed leftover. Feed Intake (kg) = Feed offered – Feed leftover. While Feed conversion ratio was determined by relating the feed intake to the weight gained of the animals.

Economic Benefit Analysis

The prevailing market price of the ingredients at the time of study was used to calculate:

$$\text{Cost per kg feed} = \frac{\text{Summation of price per kg of feed ingredients} \times \text{their proportion in the ration}}{100}$$

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 weight asymmetry on growth performance and cost benefits of growing pigs

The effect of weight asymmetry on growth performance and cost benefits of growing pigs is shown in Table 1. The results obtained from the study indicated that weight asymmetry had significant ($p < 0.05$) influence on initial weight, total feed intake, daily feed intake, feed conversion ratio, feed cost per pig, feed cost per kilogram weight gain and gross margin of the growing pigs. The initial weight was higher in homogenous heavy weight group compared to the statistically similar values documented for homogenous light weight and heterogeneous weight groups. The feed intake of homogenous heavy weight pigs and their heterogeneous weight counterparts was statistically similar but differed significantly ($p < 0.05$) from the value noted for homogenous light weight grouped pigs. The homogenous weight groups (heavy and light weights) had similar feed conversion ratio values which was significantly ($p < 0.05$) higher than the value documented for the heterogeneous weight group. Significantly higher cost of feed per pig was recorded for homogenous light weight pigs compared with the values obtained for homogenous heavy weight and heterogeneous weight groups that did not differ ($p > 0.05$) significantly. Homogenous heavy and light weights pigs had comparable feed cost per kilogram weight gain values that differed significantly ($p < 0.05$) compared to the heterogeneous group. Homogenous heavy weight pigs and heterogeneous weight group had comparable gross margin mean values that were significantly ($p < 0.05$) higher than homogenous light weight pigs. Other growth performance and cost benefit parameters considered were not significantly influenced by weight asymmetry.

Table 1: Effect of weight asymmetry on growth indices and cost benefits of growing pigs

Parameters	Heterogeneous weight	Homogeneous light weight	Homogeneous heavy weight
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Initial weight (kg)	13.83 ± 0.57 ^b	11.00 ± 1.08 ^c	18.22 ± 1.02 ^a
Final weight (kg)	47.00 ± 2.23	41.22 ± 1.79	45.11 ± 3.04
Total weight gain (kg)	33.61 ± 2.21	30.21 ± 2.65	26.90 ± 3.74
Daily weight gain (g)	480.16 ± 31.54	442.06 ± 37.84	384.13 ± 53.37
Total feed intake (kg)	113.23 ± 5.90 ^b	130.89 ± 4.62 ^a	109.53 ± 6.53 ^b
Daily feed intake (kg)	1.62 ± 0.08 ^b	1.87 ± 0.07 ^a	1.57 ± 0.10 ^b
Feed conversion ratio	3.41 ± 0.13 ^b	4.39 ± 0.23 ^a	4.59 ± 0.52 ^a
Total feed cost per pig (₦)	17030.97 ± 967.10 ^b	19685.43 ± 857.38 ^a	16468.87 ± 1042.19 ^b
Feed cost per kg weight gain (₦)	509.76 ± 14.12 ^b	658.60 ± 39.95 ^a	683.63 ± 71.66 ^a
Revenue per pig (₦)	22560 ± 1521.70	19785 ± 892.79	21652.8 ± 1139.57
Gross margin (₦)	5525.00 ± 351.83 ^a	100.70 ± 253.21 ^b	5183.13 ± 665.85 ^a

^{abc} Means on the same row with different superscripts are significantly ($p < 0.05$) different

Discussion

In pig production venture, selection of beneficial behaviours is essential for successful management, performance, profit maximization and overall pig welfare. Pig behaviour is the aggregate of pig actions and reactions in response to internal and external stimuli. In this study, the growth performance data indicated that weight asymmetry influenced the initial weight, feed intake and feed conversion ratio of growing pigs. The significant difference noted in the initial weight of the growing pigs used in this present study resulted from the grouping method adopted, since individual pig to be selected as heavy weight must possess weight that should be significantly above the mean weight of the pigs at a certain age. The significant initial weight values with the homogenous heavy weight pigs commanding the highest value and the homogenous light weight pigs with the least value were cancelled out at final weight of the pigs which indicated that heterogeneous weight pigs had the highest numerical value compared to the values noted for pigs with uniform weights (heavy and light). The non-significant final weight values could be linked to less aggressive behaviours (homogenous light and heterogeneous weight groups) that could have induced stress in the pigs leading to poor growth performance. The less aggression must have initiated better nutrient utilization in this set of pigs as observed in this present study. This present observation disagreed with earlier assertion of Arey and Edward (1998) who concluded that the management of pigs with different weight together led to increased aggression that resulted to poor growth and reproductive performances of the pigs. Likewise, it is in variance with the observation of Bostami *et al.* (2015) and Francis *et al.* (1996) that showed that weight gain of uniformly weight grouped pigs tends to be higher than their heterogeneous weight counterparts. Data from this present study indicated that homogeneous light weight pigs consumed more feed than homogenous heavy and heterogeneous weight pigs. The observed higher feed intake in the homogenous light weight pig that did not translate to better feed conversion ratio points to the facts that higher social and behavioural stresses occurred in this set of pigs as they could not evaluate the relative fighting ability of each other. Game theory model states that evenly matched opponents have difficulties in evaluating relative strength or fighting ability unlike with large weight differences (Anderson *et al.*, 2000). The significantly better feed conversion ratio observed in heterogeneous weight pigs over the homogenous weight pigs is in variance with the study of Francis *et al.* (1996) that observed significantly lower feed conversion ratio in pigs with homogenous weight compared to the value obtained for their heterogeneous weight counterparts. The fight to ascertain a dominance hierarchy in the heterogeneous weight pigs must have been brief as the subordinate pigs easily appreciate the superiority of the pigs with higher body dimensions, leading to the better feed conversion ratio as less energy is invested in establishing this social order in the heterogeneous groups unlike the amount of energy investment in the homogeneous weight groups where prolonged fighting may have occurred. Bostami *et al.* (2015) observed that the process in which social ranking occurs in group housed pigs is essential process since it has long run effect on productivity of the pigs. Economic analysis indicated that weight asymmetry had positive impact on total feed cost per pig, feed cost per weight gain, gross margin. English *et al.* (1988) found out that large group sizes of livestock resulted to high difficulty in management, increased aggression, potential loss of animal performance and impaired animal welfare. Heterogeneous weight group in this study had relatively lower feed cost, better feed cost per kilogram weight gain and higher gross margin; these must have resulted from



improved productivity gotten from less agonistic behaviours. Although behavioural observation was not part of this study, there must have been an increase in the fighting behaviour in homogenous weight groups as the process of establishing ranking order must have been prolonged due to inability of the pigs to evaluate the fighting ability or strength of each other. Thereby, resulting to physiological stress that has detrimental effect on productivity and the amount of energy invested (Bostami *et al.*, 2015; Cornea *et al.*, 2006). Homogenous light weight pigs despite the fact that it consumed more feed than other groups had the least gross margin. The pigs must have utilized the extra energy intake in maintaining the level of physical activities involved in establishing social hierarchy rather than converting it into muscle.

Conclusion

The results of this study revealed that weight asymmetry had positive impact on feed intake, feed conversion ratio, feed cost per kg weight gain and gross margin. Hence, application of weight asymmetry as a management tool in pigs raised in tropical environment can serve as a means of obtaining uniform slaughter weight rather than improving the productivity of growing pigs.

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