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# Growth performance, linear body measurements and carcass characteristics of intact and castrated growing pigs

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ABSTRACT

A study was conducted to determine the growth performance, linear body measurements and carcass characteristics of intact and castrated growing pigs. A total of forty-eight Large White male pigs of eight weeks old with initial average weight of 7.16±0.45 were randomly assigned to two treatments with each treatment consisting of three replicates of eight pigs each. Twentyfour of the experimental animals were castrated while the remaining twenty four were left intact. Data were collected weekly and carcass evaluation was carried out at the end of the experiment. The experiment was arranged in a Completely Randomised Design. Castrated boars recorded better values for final body weight (68.46 kg) and daily feed intake (1.70 kg) when compared to 60.04 kg and 1.37 kg, respectively for the intact boar. The intact boar had better values on feed conversion ratio (4.55), daily feed cost (N97.34) and cost/kg weight gain (N319.25). Height at wither and chest girth had higher values (1.14 and 1.12 cm) recorded by the castrated boar when compared to 0.87 and 0.94 cm of the intact boar. Castrated boar had higher values (73.67, 51.00, 25.50 kg) for final body weight, eviscerated weight and left carcass weight respectively compared to the values (67.00, 43.67, 21.67 kg) respectively obtained by intact boars. Intact boar recorded better value (49.02) for fat free index when compared to 43.46 obtained by the castrated boar. It was concluded that state of boar had effect on growth performance, linear body measurements and carcass parameters of growing pigs.

**Key words**: Intact, Castrated boars, Growth performance, Carcass

Inadequate animal protein remains a serious problem in the developing countries with about 36 million people dying yearly from causes directly or indirectly related to nutritional problems (UNIS 2004). Hence, the need to promote and enhance livestock production cannot be over emphasized in order that cheap animal protein can be made available at affordable price, thereby promoting healthy living by solving the problem of malnutrition.

Pigs are known for high fecundity and ability to survive on wide range of feed resources (agricultural by-products, kitchen wastes, crop residues etc) which have limited alternative uses. These are some comparative advantages that pigs had over other meat producing livestock which can be tapped into to increase availability of animal protein (Dafwang *et al*. 2011).

Castration is one of the management practices done over the years for several reasons including control breeding, removal of boar taint (unpleasant odour that emanate from the fat when the pork is heated), increased docility (making them easier to handle and less likely to injure pen-mate) and increasing utility in pork consumption by meeting up with consumer preference. Some researchers reported better performance in intact boar (Allen *et al*. 1981, Wood and Riley 1982, Nicholls and Price 1986). Others did not observe a difference in growth performance between intact and castrated boars (Fortin *et al*. 1983, Castell and Strain 1985, Knudson *et al*. 1985, Friend *et al*. 1989) and some observed higher growth performance in castrates over intact (Castell *et al*. 1985, Squires *et al*. 1993, Xue *et al*. 1995). The inconsistency in literature brought about this study. The study is aimed at determining the effect of state of boar on growth performance, linear body measurements and carcass characteristics of growing pigs.

## MATERIALS AND METHODS

*Experimental animals and their management:* This study was conducted at the Piggery unit of the Teaching and Research Farm Directorate of the Federal University of Agriculture, Abeokuta. Weaner Large White male pigs (48) of 8-week-old with mean body weight of 7.16±45 kg were randomly assigned to 2 treatments in a completely randomized design. The pigs were grouped based on weight equalization to 2 treatments (castrated and intact) of 24 pigs

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Table 1. Composition of experimental diet (%)

| Ingredients | Grower ration |
|---|---|
| Maize | 45.00 |
| Groundnut cake | 20.00 |
| Wheat offal | 20.00 |
| Palm kernel cake | 12.50 |
| Bone meal | 2.00 |
| Premix* | 0.35 |
| Common salt | 0.30 |
| Lysine | 0.05 |
| Methionine | 0.05 |
| Total | 100.00 |
| Calculated analysis | |
| Crude protein (%) | 18.06 |
| Crude fibre (%) | 5.84 |
| Calcium (%) | 0.72 |
| Phosphorus (%) | 0.34 |
| ME (Kcal DE kg) | 2906.00 |

*To supply the following per kg diet: Vit. A 12600 IU; vit. $D_3$ 2800 IU; vit. E 49 IU; vit.$K_3$ 2.8 mg; vit. $B_1$ 1.4 mg; vit. $B_2$ 5.6 mg; vit. $B_6$ 1.4 mg; vit. $B_{12}$ 0.014 mcg; niacin 21 mg; pantothenic acid 14 mg; folic acid 1.4 mg; biotin 0.028 mcg; choline chloride 70 mg; manganese 70 mg; zinc 140 mg; iron 140 mg; copper 140 mg; iodine 1.4 mg; selenium 0.28 mg; cobalt 0.7 mg; antioxidant 168 mg.

Table 2. Effect of state of boar on performance of growing pigs

| Parameters | State of boar | | |
|---|---|---|---|
| | Intact boar | Castrated boar | SEM |
| Initial body weight (kg) | 7.50 | 6.81 | 0.45 |
| Final body weight (kg) | 60.04[b] | 68.46[a] | 1.90 |
| Weight gain (kg) | 52.79[b] | 60.68[a] | 0.96 |
| Average daily gain (kg) | 0.308[b] | 0.348[a] | 0.02 |
| Total feed intake (kg) | 120.40[b] | 136.77[a] | 4.07 |
| Daily feed intake (kg) | 1.37[b] | 1.70[a] | 0.11 |
| Feed conversion ratio | 4.55[b] | 4.91[a] | 0.12 |
| Daily feed cost (₦) | 97.34[b] | 108.30[a] | 3.45 |
| Cost/kg weight (₦) | 319.25[b] | 338.48[a] | 8.50 |

[ab]-means within rows followed by different superscripts are significantly (P<0.05) different.

each. Each treatment was replicated thrice to consist of 8 pigs / replicate. The initial weight of the animals by treatment and replicate was homogenised as much as possible. The experimental animals (24) were castrated by surgical method while the other twenty four were left intact. The pigs were housed in a naturally ventilated individual pen with floor size area of 2 $m^2$ and were individually fed. Fresh water was supplied daily *ad lib*.

*Dietary treatment:* Feeding was carried out at 07:00 and 13:00 h each day for 6 months. The carcass analysis was carried out when the pigs attained the average slaughtering weight of 70 kg and above. Diets were formulated to meet the body requirements of growing pigs. The ration contained 18% crude protein and metabolisable energy of 2906.00 kcal DE/kg as shown in Table 1.

*Data collection:* Feed intake was determined daily by subtracting the feed left-over from the feed supplied. Initial body weight of weaner pigs were determined using weighing scale with a 0.05 g precision and documented when the pigs arrived at the experimental site and weekly records of change in body weight were subsequently taking and documented. The linear body measurements data were also obtained weekly using a graduated ruler and tape while feed conversion ratio was calculated as ratio of feed intake/body weight gain.

*Carcass characteristics:* Pigs (24) consisting of 12 pigs per treatment were randomly selected, slaughtered and analysed for carcass characteristics and fat composition at the end of the experiment. The pigs were weighed and fasted for 16 h, and the fasted weight of each pig meant for slaughtering was taken before they were stunned by percussion method. The carcass was divided longitudinally. The left half of the carcass was dissected as described by FAO (1991). Back-fat depth was taken at the last rib using vernier calliper. The fat-free index was estimated using the formulae postulated by National Pork Producers Council (1994).

Fat-free index = 50.767 + (0.035 × hot carcass weight in kg) – (8.979 × last rib midline backfat on hot carcass in cm).

*Cost estimation:* The prevailing market prices of the ingredients at the time of study were used to calculate the unit cost of feed (₦/kg) and the cost of feed to produce a unit weight (₦/kg weight gain).

*Statistical analysis:* Data were processed by one-way analysis of variance using SAS (1999). Significantly (P<0.05) different means among variables were separated using New Duncans multiple range test (1955).

## RESULTS AND DISCUSSION

Final body weight, weight gain and average daily weight gain were significantly (P<0.05) influenced by state of boar (Table 2). Castrated boars had higher final body weight (68.46 kg), weight gain (60.68 kg) and average daily weight gain (0.348 kg) when compared to the values (60.04, 52.79 and 0.308 kg, respectively) documented for intact boars. These significant differences could be attributed to better protein accretion in castrated boars due to growth hormones suppression in intact boars nearing sexual maturity or nutrient diversion towards reproductive needs (Niba *et al*. 2005) or due to difference in feed intake (Pauly *et al*. 2008), which can be linked to the high energy requirements for fat accretion in castrates (Balaji *et al*. 2006 and Dunshea 2010). This study contradicted the observation of Quiniou *et al*. (2010) who reported no significant differences in daily weight gain and final weight between castrated and intact boars. The difference in these results could be attributed to different environmental conditions under which the studies were

Table 3. Effect of state of boar on linear body measurements of growing pigs

| Parameters | Boar type | | SEM |
|---|---|---|---|
| | Intact boar | Castrated boar | |
| Weekly body length gain (cm) | 1.26 | 1.30 | 0.07 |
| Weekly height at wither gain (cm) | 0.87[b] | 1.14[a] | 0.04 |
| Weekly chest girth gain (cm) | 0.94[b] | 1.12[a] | 0.04 |
| Weekly loin girth gain (cm) | 1.01 | 1.05 | 0.05 |

ab- means within rows followed by different superscripts are significantly (P<0.05) different

carried out. State of boar significantly (P<0.05) influenced total feed intake and daily feed intake of pigs, the castrated boars had higher recorded values (136.77 versus 120.40 kg, and 136.77 versus 120.40 kg, respectively) in these parameters. The lower values in feed intake of the intact boars could be as a result of increase in the level of sexual hormones production in intact boars. This promotes agnostic and mounting behaviours in the intact boars (Cronin *et al*. 2003), which can affect their feed intake because more time is spent on sexual related activities, resulting to decrease in time spent on activities relating to feeding. This observation is in line with the work of Quiniou *et al*. (2010) who noted significant difference in daily feed intake between castrated and intact boars. Feed conversion ratio of intact boars (4.55) was significantly (P<0.05) lower than that of castrated boars (4.99). The poor feed conversion ratio recorded by the castrates is an indication that they consumed more feed in order to produce a unit body weight. Increase in both average daily feed intake and feed conversion ratio have been documented for castrated boars (Quinious *et al*. 2010). Castrated boars had higher significant (P<0.05) values in daily feed cost (₦108.30) and cost/kg body weight gain (₦338.48) in comparison with the values (₦97.34 and ₦319.25, respectively) obtained for intact boars. These

Table 4. Effect of boar type on carcass of finishing pigs

| Parameters | State of boar | | SEM |
|---|---|---|---|
| | Intact boar | Castrated boar | |
| Live weight (kg) | 69.33 | 76.17 | 2.07 |
| Fasted weight (kg) | 67.00[b] | 73.67[a] | 1.91 |
| Bled weight (kg) | 63.32 | 69.32 | 2.41 |
| Hot carcass weight (kg) | 54.58 | 59.55 | 2.16 |
| Dress Percentage (%) | 78.06 | 78.77 | 0.92 |
| Eviscerated weight (kg) | 43.67[b] | 51.00[a] | 1.50 |
| Left carcass weight (kg) | 21.67[b] | 25.50[a] | 0.84 |
| Hot carcass length (cm) | 65.67 | 67.00 | 0.97 |
| Back-fat depth (cm) | 1.54[b] | 2.55[a] | 0.10 |
| Fat-free index | 49.07[a] | 43.46[a] | 0.49 |

ab- means within rows followed by different superscripts are significantly (P<0.05) different.

significant (P<0.05) differences in daily feed cost and cost of feed per kilogram weight gain may be linked to the difference noted in feed consumption pattern of castrated and intact boars. Also, it could be due to better feed efficiency as observed in the intact boar than that of castrated boars. This is in agreement with the findings of Ravi *et al*. (1999) and Balaji *et al*. (2006) who observed lower feed cost in intact pigs than castrated pigs.

Height at wither and chest girth were the linear body measurements influenced by state of boar, as showed in table 3. The height at wither had values ranging from 1.14 cm to 0.87 cm with the higher recorded value noted for castrated boars. The lower value (0.94 cm) of chest girth was recorded for the intact boars while the higher corresponding value (1.12 cm) was documented for the castrated boars. The significant (P<0.05) differences in these parameters could be ascribed to the final body weight of castrated boars which was significantly different from intact boars. This is in close agreement with the findings of Singh and Dhir (1986) who chorused high correlation values in linear body measurements and body weight in pigs.

The effect of state of boar on carcass characteristics of growing pigs is presented in Table 4. Fasted weight, eviscerated weight and left carcass were significantly (P<0.05) affected by the state of boar. The higher fasted weight (73.67 kg) was recorded for the castrated boar while the intact boar had 67.00 kg. Eviscerated and left carcass weights had better values (51.00 and 25.50 kg), respectively recorded for the castrated boar when compared the corresponding values (43.67 and 21.67 kg), respectively, obtained by the intact boars. The similarity in live weight is in line with the findings of Suster *et al*. (2006) who reported similarities in growth pattern of intact and castrated boar under group-housed condition. Eviscerated and left carcass weights were significantly different, the variation in live weight could have induced these differences. It has been reported that carcass parameters increased with increase in slaughter weight (Weatherup *et al*. 1998, Ellis *et al*. 1996). The similarity in carcass length is in line with the observations of Lattore *et al*. (2004) and Hamilton *et al*. (2000) but contradicted the observation of Knudson *et al*. (1985) who reported a longer carcass length in boar. The subcutaneous fat depth was significantly (P<0.05) influenced by state of boars, with the mean values ranging from 1.54 cm (intact boars) to 2.55 cm (castrated boars). The intact boars had a better significant (P<0.05) value (49.07) for fat free index when compared to 43.46 documented for castrated boars. It has been chronicled that castrated boar has inherent lower capacity for protein deposition and a higher rate of fat accretion, and require less dietary protein and amino acids to support maximum growth than intact boars (Xue *et al*. 1997, Yen *et al*. 1986). The result obtained from this study is in agreement with these findings. Several other authors (Lattore *et al*. 2004, Hamilton *et al*. 2000, Ellis *et al*. 1996,

Leach *et al*. 1996) reported that carcasses from castrated boar were fatter when compared to the carcasses from gilts. Xue *et al*. (1997) enunciates that amino acid requirements for lean accretion are higher in boars than barrow littermates. Since, boars and barrows were fed the same diet; the boars must have utilized the protein and energy components of the diet more efficiently for lean accretion than the barrow. This attests for the significant value obtained in fat free index. Xue *et al*. (1997) enunciates that the improvements in growth and carcass characteristics of boars are primarily due to anabolic effects of androgens and estrogens produced in the testis.

Based on the result obtained from this experiment, it was concluded that state of boar influenced feed intake and growth rate of grower pigs but deposits more fat during finishing stage. Hence, pigs should be slaughtered at lighter body weight for leaner carcass.

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