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GROWTH PERFORMANCE AND CARCASS QUALITY OF ENTIRE MALES, SURGICAL CASTRATES AND GILTS

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ABSTRACT

The present study evaluates the growth performance and carcass traits of entire male pigs, castrates and gilts. Pigs were crosses of Landrace sows and YxL boars. Entire males (EM), surgical castrates (SC) and gilts (G) were housed in pens (each of 2 pigs) according to sex. Entire males grew faster (EM: 974 vs. SC: 890 and G: 854 $g.day^{-1}$) and had better feed conversion ratio (EM: 2.71 vs. SC: 2.86 and G: 2.93 $kg.kg^{-1}$) than castrates and gilts, as differences compared to gilts were significant ($P < 0.01$ and $P < 0.05$, resp.). Slaughter and carcass weights of the three groups of pigs were not significantly different. Compared to SC and G, entire males had lower backfat thickness (SC: 26.71, G: 25.38 vs. EM: 20.90 mm, $P < 0.001$). Percentage of valuable meat cuts and lean meat content measured using TP (Two Point) method were the highest in EM (53.11 and 59.03 %) and were statistically significant (50.92 and 55.67 %, $P < 0.05$) in relation to C. The values of G were intermediate (52.80 and 57.87 %) and non-significant in comparison to EM ($P > 0.05$). Percentage of fatty cuts was the lowest in EM and significantly different to that of SC (EM: 11.27 vs. SC: 13.84 and G: 12.55 %, $P < 0.001$). Gilts achieved the lowest percentage of less valuable cuts than other two groups (G: 13.94 vs. EM: 15.41 and SC: 14.64 %, $P < 0.001$ and $P < 0.05$, resp.).

Key words: pigs; entire males; growth performance; carcass

INTRODUCTION

Surgical castration of male piglets is a common practice in the pig breeding industry used to prevent a development of unpleasure odour – boar taint occurring in meat of sexually mature boars. This smell is perceived negatively and such meat is rejected by most of the consumers (Font i Furnols *et al.*, 2003; Bonneau and Squires, 2004). In recent years, surgical castration without anaesthesia has been criticised from the animal welfare point of view (EFSA, 2004; Prunier *et al.*, 2006). Several european countries have already prohibited surgical castration without anaesthesia and EU envisages to stop surgical castration of piglets in the member states by the year 2018 (EC declaration, 2010). In the view of these changes, stakeholders involved in piglets castration have been looking for the alternatives to surgical castration. At present, one of them is rearing of entire male pigs.

The aim of this study was to evaluate the growth performance and carcass yield of entire males, surgical castrates and gilts of commercially produced hybrid pigs in Slovakia.

MATERIAL AND METHODS

Forty-two pigs, entire males (EM), surgical castrates (SC, castrated until 7 days after birth) and gilts (G), each of 14, was randomly selected for the experiment. Pigs were crosses of Landrace sows and YxL boars. From seven litters 6 sibs were selected each time

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(2 EM, 2 SC and 2 G). They were housed in a test station at 22-26 kg live weight because of acclimation to new space and feed. Pigs were housed in pairs in pens according to gender. They were fed by commercial diet (Table 1) according to nutrient requirements for growing-finishing pigs (Šimeček *et al*., 1995) and had free access to water.

Table 1: Composition and nutrient content of the diet

Item	%
Ingredient	
Barley	33.0
Corn	15.0
Wheat	12.0
Wheat bran	8.0
Rapeseed meal	6.0
Soybean meal	8.0
Animal fat	0.5
Premix VUL	1.0
Ground limestone	1.2
Feed salt	0.4
Monocalcium phosphate	0.8
Analyzed composition	
DM	89.92
CP	14.98
Crude fibre	4.77
Crude fat	2.35
Ash	4.17
Lysine (in DM)	7.03
Methionine + Cysteine (in DM)	5.34

DM = dry matter, CP = crude protein

Experiment started at 30 kg live weight. Pigs were weighed at the beginning, then once a month and at the end of the experiment once a week for information on growth intensity – average daily gain (ADG). Feed conversion ratio (FCR) per 1 kg of body gain was calculated per pen. After reaching the average slaughter weight of 105 kg*, pigs were slaughtered at the experimental slaughter house of the Research Institute for Animal Production situated approximately 200 m from the test stable. Age of pigs at slaughter was calculated. During the experiment, two pigs (1 EM and 1 G) were excluded because of health reasons.

A slaughter was done according to standard procedure e.g. electrical stunning, vertical exsanguination, vapour scalding and evisceration. Carcasses were measured for information on carcass length, backfat thickness and lean meat content using TP (Two Point) method. After that, carcasses were chilled 24 hours at air temperature of 2 ºC to 4 ºC, air velocity 0.5 to 1.0 m/s started approximately 60 min post mortem. The second day after slaughter, the dissection of the right half of carcass was done. Weight of shoulder, neck, loin, and ham (meat with bone) was recorded and percentages of ham, valuable meat cuts, fatty- and less valuable cuts were calculated.

Statistical package SAS (2009) was employed in the analyses. Basic statistics was done using MEANS procedure. The differences between sexes were analysed using ANOVA:

$$y_i = \mu + B_i + e_i$$

where y_i – characteristics of trait selected
μ – intercept
B_i – effect of sex (i = EM, SC, G)
e_i – random error

**A note: Entire males were slaughtered at two different slaughter weights – 105 kg and 80 kg, respectively. For this study, the results of growth performance and carcass yield of „lighter“ entire males (n = 6) slaughtered at 80 kg live weight were not be taken into account.*

RESULTS

Growth performance of tested pigs is shown in Table 2. Entire males had the highest growth rates when difference compared to gilts was significant (P < 0.01). Similarly, boars had improved feed conversion ratio (FCR) when difference between them and gilts was also significant (P < 0.05). The values of castrates were intermediate. Higher growth performance of entire male pigs resulted in lower age at slaughter by 12 – 13 days compared to castrates and gilts, respectively (P < 0.05).

Carcass traits of entire males, castrates and gilts are presented in Table 3. Pigs were slaughtered at average slaughter weight of 104.62 to 106.07 kg. Differences between sexes were not significant. Also, any effect of sex was not observed in carcass weight and carcass length. However, entire males had significantly lower backfat thickness than gilts and castrates (P < 0.001). Carcasses from boars had the highest lean meat content measured by TP-method while castrates reached the lowest value. Difference between these two groups was significant (P < 0.05). Lean meat content of gilts had intermediate value. Weights of shoulder, neck, loin and ham did not show any effect of sex.

Table 2: Growth performance of entire males, castrates and gilts

Item	EM	SC	G
ADG in test, g	974.00 ± 40.0[a]	890.00 ± 86.0	854.00 ± 80.0[b]
FCR, kg.kg^{-1}	2.71 ± 0.22[a]	2.86 ± 0.24	2.93 ± 0.31[b]
Age at slaughter, day	159.00 ± 5.00[a]	171.31 ± 10.70[b]	172.38 ± 9.62[b]

EM = entire males, SC = surgical castrates, G = gilts, ADG = average daily gain, FCR = Feed conversion ratio
Values with different letters within rows are significantly different (min P < 0.05)

Also, percentage of ham between three groups of pigs was not statistically significant. On the other hand, entire males and gilts had significantly higher percentage of valuable meat cuts (P < 0.05) and lower percentage of fatty cuts than castrates (P < 0.001 and P < 0.05, respectively.). Percentage of less valuable cuts of gilts was significantly lower than that of entire males (P < 0.001) and castrates (P < 0.05).

DISCUSSION

Entire males in this study grew faster than castrates and gilts. It is in agreement with Blanchard *et al.* (1999) reporting higher daily live-weight gain in boars than gilts. Higher ADG in entire males than gilts, gilts and castrated or castrated males is presented also in other studies (Sather *et al*., 1991; Weatherup *et al.*, 1998; Dostálová and Koucký, 2008; Škrlep *et al*., 2012). On the other hand, some studies on growth performance of boars relative to castrates did not observe a difference between both groups (Knudson *et al*., 1985; Friend *et al.,* 1989) or some observed better growth intensity in castrates than entire males (Squires *et al*., 1993; Xue *et al*., 1995; Dunshea *et al*., 2001; D´Souza and Mullan, 2002; Pauly *et al*., 2008). The discrepancy in these findings in the literature may be due to several factors such as dietary levels of proteins and amino acids, energy intake, age at castration, conditions of housing, slaughter weight etc. Several authors (Giersing *et al*., 2000;

Table 3: Carcass traits of entire males, castrates and gilts

Item	EM	SC	G
Slaughter weight, kg	105.57 ± 1.90	106.07 ± 2.59	104.62 ± 2.40
Carcass weight, kg	84.71 ± 1.78	86.96 ± 3.48	85.96 ± 2.85
Carcass length, cm	85.29 ± 2.87	83.29 ± 2.84	84.31 ± 1.65
Backfat thickness, mm	20.90 ± 2.21[a]	26.71 ± 1.18[b]	25.38 ± 2.30[b]
Lean meat – TP, %	59.03 ± 1.83[a]	55.67 ± 2.82[b]	57.87 ± 1.85
Weight of			
shoulder, kg	5.08 ± 0.28	4.98 ± 0.24	4.92 ± 0.18
neck, kg	3.08 ± 0.28	3.04 ± 0.18	3.03 ± 0.22
loin, kg	5.10 ± 0.44	4.81 ± 0.31	5.08 ± 0.33
ham, kg	8.80 ± 0.68	8.88 ± 0.55	9.24 ± 0.69
Percentage of			
valuable meat cuts, %	53.11 ± 1.74[a]	50.92 ± 1.13[b]	52.80 ± 2.03[a]
ham, %	21.20 ± 1.37	20.83 ± 0.96	21.89 ± 1.56
fatty cuts, %	11.27 ± 1.33[a]	13.84 ± 0.78[b]	12.55 ± 1.68[a]
less valuable cuts, %	15.41 ± 0.80[a]	14.64 ± 0.54[a]	13.94 ± 0.62[b]

EM = entire males, SC = surgical castrates, G = gilts
Values with different letters within rows are significantly different (min P < 0.05)

Cronin *et al*., 2003; Rydhmer *et al*., 2006; Pauly *et al*., 2008) reported that entire males (group-housed) spent less time eating and more time mounting and other sexual activity. Such behaviour can induce social stress (Suster *et al*., 2006) which stimulates production of cortisol. It has been documented that higher cortisol level reduces feed intake, production of growth hormone and IGF-1 (Black *et al*., 2001). In our study, EM were housed by pairs in pens and grew up together from birth (litters were not mixed). These facts could reduce sexual behaviour and consequently the stress level and contributed to better growth rate of EM than castrates.

Feed efficiency of EM in our study was better than those of castrates and gilts. This fact is, generally, observed in all studies including those when castrates had higher growth intensity than entire males (Squires *et al*., 1993; Xue *et al*., 1995; Weatherup *et al*., 1998; Blanchard *et al*., 1999; Pauly *et al*., 2008; Dostálová and Koucký, 2008; Škrlep *et al*., 2011). It has been documented (Xue *et al*., 1995; Pauly *et al*., 2008; Škrlep *et al*., 2011) that castrates had greater appetite and different metabolism (mainly by the time of 55 kg) than boars. This difference is probably due to anabolic effect of gonadal steroids in uncastrated boars since castrates treated with testosterone or estradiol had reduced daily feed intake (Claus and Weiler, 1994). The improved feed efficiency of EM in this study is apparently related to their carcass composition. Higher lean meat content and less fat tissue (*e.g.* backfat thickness) of boars compared to castrates has been observed. While 75 % of lean tissue is water, content of water in fat tissue is only 25 %. It means that production of fat is much more energy (feed) requiring than lean tissue. Thus, entire males having more lean and less fat tissue have better FCR than castrates (Xue *et al*., 1997).

A higher ADG of entire males than castrates and gilts in our study resulted in earlier age at slaughter. However, Pauly *et al.* (2008) suggested higher age at slaughter in entire males than castrates. It has most likely been due to group-penned system of EM in the experiment.

Boars in our study had lower backfat thickness than castrates and gilts. The same results have been found in several studies (Sather *et al*., 1991; Xue *et al*., 1997; Nold *et al*., 1997; Pauly *et al*., 2008). Significantly lower deposition of subcutaneous fat tissue in EM with comparison to castrates resulted in reducing percentage of fatty cuts which corresponds with findings of Squires *et al*. (1993), Dostálová and Koucký (2008) and Pauly *et al*. (2008). No effect of sex observed in carcass length and percentage of ham is in agreement with results of Sather *et al*. (1991) and Škrlep *et al*. (2012) as well. However, another study showed significantly greater percentage of ham of entire males than castrates (Pauly *et al*., 2008).

Several studies showed an advantage of entire males in lean meat deposition related to castrates (Squires *et al*., 1993; Xue *et al*., 1997; Dostálová and Koucký, 2008; Pauly *et al*., 2008; Škrlep *et al*., 2012), gilts (Sather *et al*., 1991) or both (Nold *et al*., 1997). As mentioned above, higher lean meat content and less fat tissue in the carcasses of entire males compared to castrates (and partly to gilts) are due to differences in metabolism of energy and nutrients between boars and two other groups of pigs.

CONCLUSION

Entire male pigs have presented several advantages as compared to surgical castrates. They grew faster and improved feed efficiency than castrated male pigs. Moreover, entire males had higher proportion of lean meat and less fatty tissue in carcasses than barrows. All these findings may bring a higher financial benefit for pig producers from rearing entire males than from castrates provided they both will sell at the same price.

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