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Expression of growing and slaughtering qualities of Swedish Landrace pigs according to sex

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ABSTRACT

Better slaughtering and fattening results have induced more frequent fattening of young uncastrated boars. While fattening boars, the problem of unpleasant odour from the boar meet, which is caused by endosteron, scatol and other testicular hormones, often occurs. There are some differences between genetic bases of swine in extracting of these hormones. Therefore, the aim of this paper was to pay more attention on legitimacy of slaughtering Swedish Landrace uncastrated boars. The experiment was carried out on a group of uncastrated boars and a group of uncastrated gilts. The groups were composed of 15 accidentally chosen pigs per group from 15 different litters (one male and one female pig from each litter). The experimental fattening lasted for 95 days (from 30 to 90 kg of body weight) and the pigs were fed ad libitum. The boars had significantly higher daily growth rate (660g vs. 640g, P<0.05), thinner back fat, higher meatiness of pork sides (56.92% vs. 54.53%), lower share of back part (14.83% vs. 18.94%) and higher share of shoulders (15.02% vs. 13.29%) than the gilts. Furthermore, the differences in meat quality according to sex were also determined. The boar meat had more unpleasant odour, significantly lower rate of water (72.91% vs. 73.72%) and ashes (1.05% vs. 1.08%) and higher rate of crude proteins (23.49% vs. 22.55%) than the gilt meat. The rate of crude fat in the boar meat was lower than in the gilt meat, but without significant differences (1.85% vs. 2.14%). Concerning pH_1 and pH_2 values, water fixation ability and meat colour, there were no significant differences determined according to sex (P>0.05). The pork sides were dissected according to the method by Weniger et al. (1963).
(Keywords: sex, boars, gilts, growth rate, slaughtering quality)

ZUSAMMENFASSUNG

Bewertung der Wachstumsfaktoren und der Schlachtkörperqualität bei Schweinen der Schwedischen Landrasse nach dem Geschlecht

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Bessere Schlacht- und Mastleistung haben dazu geführt, daß immer häufiger nichtkastrierte Schweine männlichen Geschlechts (Eber) gemästet werden. In diesem Fall steht man vor einem Problem: dem unangenehmen Geruch, dessen Intensität durch Androteron, Skatol und andere testikuläre Hormone bedingt ist. Mit Bezug auf das oben

Genannte gibt es genetische Varianten zwischen den Schweinen. Mit dieser Arbeit soll gezeigt werden, dass das Schlachten von Nicht-Kastraten der Schwedischen Landrasse von männlichem Geschlecht seinen Grund hat. Die Untersuchung wurde in zwei Gruppen durchgeführt: die erste Gruppe bestand aus männlichen nichtkastrierten Schweinen (Ebern), die zweite aus weiblichen nichtkastrierten Schweinen. In jeder Gruppe gab es 15 zufällig ausgewählte Tiere, je ein Tier männlichen und weiblichen Geschlechts aus 15 verschiedenen Würfen. Die Versuchs-Mastzeit dauerte 95 Tage. Die Schweine wurden ad libitum gefüttert. Während der Mastdauer (von 30 kg bis 90 kg Körpergewicht) wuchsen die Jungeber signifikant schneller als die Jungsauen (660 g:640 g), ihr Rückenspeck war dünner, die Fleischfülle der Schlachtkörper war besser (56,92%:54, 53%), der Rückenanteil war geringer und der Schulteranteil stärker im Vergleich zu den Jungsauen (15,02%:13,29%). Es wurde festgestellt, daß die Fleischfülle einen engen Zusammenhang zum Geschlecht der Tiere hat. Im Vergleich zu den Jungsauen hatte das Eberfleisch folgende Merkmale: was den Geruch betrifft, war die Intensität schwach, die Wasseranteil (72,91%:73,72%) und Ascheanteil (1,05%:1,08%) waren statistisch signifikant geringer (P<0,01), während der Anteil an Rohprotein (23,49%:22,55%) höher war als im Fleisch der Jungsauen. Der Anteil von Rohfett im Eberfleisch war geringer, aber nicht statistisch signifikant im Vergleich zum Jungsauenfleisch (1,85%:2,14%). Was die pH_1 und pH_2 Werte betrifft, stellte man keine statistisch signifikanten Unterschiede zwischen den Geschlechtern (P > 0,05) bezüglich des Wasserbindevermögens und der Fleischfarbe fest. Die Schlachtkörper wurden nach der Methode von WENIGER et al. (1963) zerlegt.
(Schlüsselwörter: Geschlecht, Eber, Jungsau, Schlachtqualität)

INTRODUCTION

Many investigations (*Metz et al*., 1980; *Champbell et al*., 1985; *Zhang et al.*, 1993; *Chaad et al*., 1993; *Koucky et al*., 1994) point out more efficient production of the meat with higher share of muscle tissue than fatty tissue from uncastrated boars. High anabolic effect in uncastrated boars is caused by the interaction of growth hormones, sexual hormones and IGF (Insulin Growth Factor). Castrating boars causes increased gathering of fatty tissue in a carcass, which has a negative influence on the efficiency of food conversion and quality of a swine carcass.

The important problem while fattening uncastrated boars can be unpleasant odour and taste of meat caused by scatol, androsterone and other testicular hormones. Regarding high variability in concentration of andosterone between different breeds (*Willeke et al*., 1987; *Landstrom et al*., 1988), its high hereditability (*Willeke et al*., 1987) and the fact that a level of scatol can be reduced by changing the way of holding and feeding before slaughtering (*Ekklundh-Larsen et al*., 1993), the presence of andosterone does not have to be an obstacle in fattening of uncastrated boars.

The aim of this paper was to pay more attention on legitimacy of slaughtering Swedish Landrace uncastrated boars with regard to daily growth rate and slaughtering quality of pork sides and meat.

MATERIALS AND METHODS

The experiment was carried out on a group of uncastrated boars and a group of uncastrated gilts. The groups were composed of 15 accidentally chosen pigs per group from 15 different litters (one male and one female pig from each litter). The

experimental fattening lasted for 95 days (from 30 to 90 kg of body weight). While fattening, the pigs were accommodated in-groups, but separated by sex. Housing conditions were the same and optimal for both groups.

From 30 to 60 kg of body weight the pigs were fattened ad libitum by a feed mixture with 17% of crude proteins and 13167 kJ of ME/kg, and from 60 kg to the and of fattening period with 15% of crude proteins and 13251 kJ of ME/kg.

Back fat thickness with belonged skin and MLD area were measured on live pigs on two positions (1 and 2), at the end of fattening period. The measuring was carried out by Scanner 480 VET with a linear sound with dual frequency between 3.5 and 5.0 MHz.

The position of the first measurement (position 1) was about 50 mm from the medial line of the last rib and the position of the second measurement was about 50 mm from the medial line between 11^{th} and 10^{th} rib.

Pork sides were dissected according to the method by *Weniger et al.* (1963). Muscle tissue from less valuable parts (head, knuckles and tail) was not taken into the account of total quantity of muscle tissue.

pH meat values were determined on the 45^{th} minute and on the 24^{th} hour of post mortem period on the sample of MLD taken between 13^{th} and 14^{th} rib (position 2), which was cooled on +4°C.

Five examiners estimated the smell of the boar meet after baking. The meat without boar smell was graded with mark 3, the meat with weak boar smell with mark 2 and the meat with expressive boar smell with mark 1.

The colour of the meat was estimated according to the American NPPC (National Pork Producers Council) method with marks from 1 to 6.

The water fixation ability was determined according to the compression method by Grauhamm.

The chemical analysis of the meat (MLD) was carried out by the following methods:

- the content of water was determined by pulling down to 105°C to a permanent mass;
- the content of proteins was determined according to the method by Kjeldahl;
- the content of fat was determined according to the method by Soxleth;
- the content of ash was determined by a direct burning on the temperature of 550°C.
- The results of the investigation were elaborated with the statistical program SPSS (*Nie et al.,* 1975).

RESULTS AND DISCUSSION

The boars were growing slightly faster than the gilts (*Table 1*), and because of that they had significantly higher daily growth rate ($P<0.05$). However, there were no significant differences between the body weights at the end of fattening period, which was connected with expressed variability between the groups.

The boars had significantly thinner back fat at the position 2 than the gilts, while there were no significant differences regarding MLD area between the analysed groups ($P>0.05$). *Chaad et al.* (1993) found out that boars fattened to 120 kg of body weight have significantly higher daily growth rate (974 g vs. 806 g) and smaller MLD area (43.3 cm^2 vs. 45.0 cm^2) than gilts. Contrary to this, *Siegel et al*. (1990) point out larger MLD area and thinner back fat in gilts than in boars. Higher daily growing rate and thinner back fat in uncastrated boars were the results of investigations of *Metz et al*. (1980), *Campbell et al*. (1985), *Zhang et al*. (1993), *Koucky et al*. (1994) and others.

Table 1

Some indicators of growing parameters and slaughtering qualities of swine before slaughtering according to sex

Indicators (1)	*BOARS* (2)		*GILTS* (3)	
	$\bar{x}$	s	$\bar{x}$	S
Initial body weight, kg (4)	29.83	2.89	31.00	4.04
Final body weight, kg (5)	93.00	6.54	92.25	6.45
Daily growing rate, kg (6)	0.660*	0.05	0.640	0.05
Back fat thickness, cm:				
- position 1	1.10	0.25	1.20	0.29
- position 2 (7)	0.81*	0.18	0.99	0.19
MLD area, $cm^{2:}$				
- position 1	36.68	3.47	34.86	3.85
- position 2 (8)	39.67	4.29	40.62	3.51

*P<0.05

1. Tabelle: Wachstumsfaktoren und Schlachtqualitätsmerkmale der Schweine vor dem Schlachten (nach Geschlecht)

Merkmale(1), Eber(2), Jungsauen(3), Lebendgewicht zu Mastbeginn, kg(4), Lebendgewicht zu Mastende, kg(5), tägliche Zunahme(6), Speckdicke, cm: Stelle 1, Stelle 2(7), MLD-Fläche, cm^2: Stelle 1, Stelle 2(8)

Table 2

Quality indicators of pork sides according to sex

Indicators (1)	*BOARS* (2)		*GILTS* (3)	
	$\bar{x}$	*S*	$\bar{x}$	*S*
Mass of right cooled pork sides, kg (4)	34.97	2.59	34.15	1.75
Meatiness[1], kg (5)	19.91**	1.74	18.65	1.75
Meatiness[1], % (6)	56.92*	2.00	54.53	3.00
Ham share, % (7)	29.63	1.45	29.09	0.89
Back part share, % (8)	14.83**	1.25	18.94	1.29
Shoulder share, % (9)	15.02**	0.95	13.29	0.96

*P<0.05

**P<0.01

[1]Without muscle tissue of less valuable parts *(ohne Muskelfleischanteil weniger wertvoller Teile)*

2. Tabelle: Qualitätsmerkmale der Schlachthälften bei Schweinen (nach dem Geschlecht)

Merkmale(1), Eber(2), Jungsauen(3), Kaltgewicht des rechten Schlachtkörpers, kg(4), Fleischfülle[1], kg(5), relative Fleischfülle, %[1](6), Anteil der Keule, %(7), Anteil des Rückens, %(8), Anteil der Schulter, %(9)

The results in *Table 2* show that the boars had significantly higher absolute and relative meatiness (P<0.05) than gilts. However, there are some contradictory results in literature about that. For instance, *Chaad et al*. (1993), experimenting on Danish Landrace and Large White swine, once have found higher meatiness in boars and another time in gilts (58.7% vs. 57.2% and 59.8% vs. 60.4%, respectively).

The pork sides from the boars had significantly higher shares of shoulders (P<0.01) and lower shares of back part than those from the gilts. Despite of slightly more developed hams in the boars, there were no significant differences for ham share according to sex.

The quality indicators of the meat are showen in *Table 3*. pH_1 and pH_2 values were in normal ranges and there were no significant differences according to sex.

The water fiksation ability was in optimal range and about equal in the both groups of swine.

The smell of the meat, which had been determined by a panel-group degustation after baking, was slightly worse in the meat from the boars. It was determined that the meat from three boars (20% of the group) had a strong boar smell, and the meat from one boar had a weak boar smell.

The colour of the meat, which had been estimated subjectively by marks from 1 to 5, was optimal in the both groups of swine and without variabilities.

The boar meat had significantly lower water and ash content (P<0.01) and higher cotent of crude proteins than the gilt meat. The content of crude fat in the boar meat was lower than in the gilt meat, but without significant differences.

Table 3

Quality indicators of pork according to sex

Indicators (1)	*BOARS* (2)		*GILTS* (3)	
	$\bar{x}$	s	$\bar{x}$	s
- pH_1 (4)	6.40	0.15	6.31	0.17
- pH_2 (5)	5.70	0.15	5.82	0.16
- water fiksation ability, cm^2 (6)	4.00	0.38	4.50	0.37
- smell (1-3)[1] (7)	2.25	0.96	3.00	0.00
- colour (1- 6)[2] (8)	4.00	0.00	4.00	0.00
Chemical structure, %: (9)				
-water (10)	72.91**	0.43	73.72	0.55
- proteins (11)	23.49**	0.40	22.55	0.56
- fat (12)	1.85	0.40	2.14	0.75
- ash (13)	1.05**	0.03	1.08	0.04
- NFE[3] (14)	0.70	0.32	0.51	0.46

**P<0.01

[1]Mark 1 – strong smell. *(Note 1 – starker Geruch.),* Mark 2 – weak smell. *(Note 2 – schwacher Geruch.),* Mark 3 – normal smell. *(Note 3 – normale Geruchsintensität.)*

[2]Mark 1 and 2 – bright color. *(Note 1 und 2 – helle Farbe.),* Mark 3 and 4 – normal color. *(Note 3 und 4 – normale Farbe.)* Mark 5 and 6 – dark color. *(Note 5 und 6 – dunkle Farbe.)*

[3]Nitrogen-free extract. *(N-freier Extrakt.)*

3. Tabelle: Schlachtkörperqualität (nach dem Geschlecht)

Merkmale(1), Eber(2), Jungsauen(3), pH_1(4), pH_2(5), Wasserbindevermögen, cm^3(6), Geruch(7), Farbe(8), Chemische Zusammensetzung(9), Wasser(10), Proteine(11), Fette(12), Asche(13), Nitrogenfreier Extrakt(14)

CONCLUSIONS

In the experimental fattening of the pigs that lasted for 95 days (from 30 to 90 kg of body weight), the boars had significantly higher daily growth rate (660g vs. 640g, $P<0.05$), thinner back fat, higher meatiness of pork sides (56.92% vs. 54.53%), lower share of back part (14.83% vs. 18.94%) and higher share of shoulders (15.02% vs. 13.29%) than the gilts.

Furthermore, the differences in meat quality according to sex were also determined. The boar meat had more unpleasant odour, significantly lower rate of water (72.91% vs. 73.72%) and ashes (1.05% vs. 1.08%) and higher rate of crude proteins (23.49% vs. 22.55%) than the gilt meat. The rate of crude fat in the boar meat was lower than in the gilt meat, but without significant differences (1.85% vs. 2.14%).

Concerning pH_1 and pH_2 values, the water fixation ability and the colour of the meat, there were no significant differences determined according to sex ($P>0.05$).

Generally saying, boars fattened to 90 kg of body weight are superior in growing characteristics and pork sides qualities, but on the other side, they are inferior in smell of the meat. Because of high variability and hereditability of boar smell in meat, this can be reduced by proper selection.

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