



# Meat quality and boar taint of pig carcasses from entire male with body weight 90-100 kg in Bulgarian slaughterhouses



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## Introduction

The alternative to surgical castration in pigs evaluated in a sustainable network activities between science and industry addressing the challenges of farming management, reliable methods of reducing and detecting unpleasant boar taint, and pork meat quality grading for national requirements for high quality meat products and DOOR listed products (Bonneau et al., 2017; Zamaratskaia & Squires, 2009; Aluwe et al., 2015). In Bulgaria for 2017 are slaughtered 973,000 pigs for meat. Surgical castration is in nearly all cases the only used method. Uncastrated pigs (entire males) often have lower fat quantity and quality and low changes in the technological qualities of the meat (Pauly et al., 2012). Lack of knowledge and sustainable field models resulted in very low interest of slaughterhouses and farmers to Entire male and immunocastrated male pigs instead of rising consumer attitudes supporting welfare concept (Borrisser-Pairó et al., 2016; Tacken et al., 2011).

## Material and methods



### Experimental design

The study involved 50 carcasses from entire males breeds Landrace (n=22) and Danube white sow (n=28) at a slaughterhouse in the region of Stara Zagora, Bulgaria. All the pigs were grown under the same nutrition and rearing conditions until a body weight of 90 - 100 kg. *Musculus longissimus thoracis et lumborum* and *M. Semimembranosus* were selected for sampling and measurement of chemical composition, technological and sensory properties of the meat.

### Analytical methods

The values of pH were measured at 45 minutes (pH<sub>1</sub>) and 24 hours (pH<sub>2</sub>) post mortem by a digital pH-meter "Testo 205" (Testo Inc, United States). Boar taint detection was estimated on the slaughter line, by the trained person and by the "hot knife" technique described by Aluwé et al., 2012. The odour was scored in the points from 0 to 3 as 0 defined as neutral undetectable and 3 as strong boar taint.

On the 24-th hour after slaughter processing the chemical composition (water, protein, lipids, ash), water-holding capacity (WHC), cooking losses (during baking) and intra muscle fat dissemination were determined in laboratory conditions at Department of Meat and Meat Products (Trakia University, Faculty of Agriculture). Briefly, moisture content by oven-drying a wet sample at 105°C, until constant weight, crude protein by the Kjeldahl method, lipid content by conventional Soxhlet apparatus.

The water-holding capacity on the both muscles was determined by the compression method (Zahariev and Pinkas, 1979). Cooking losses were assayed by cooking at 150°C for 20 minutes. Marbling was scored on a 1 to 10 scale based on the standards set by the National Pork Producers Council (NPPC, 1999).

## Results

Table 1. Entire male and meat quality

	Landrace (n=12)	Danube White (n=9)
<b>M. Longissimus thoracis et lumborum</b>		
Water, %	74,97±0,25	74,21±0,39
Protein, %	22,79±0,23	23,10±0,33
Lipids, %	1,16±0,12	1,46±0,12
Ash, %	1,09±0,08	1,24±0,05
<b>M. Semimembranosus</b>		
Water, %	75,33±0,21***	74,27±0,19***
Protein, %	22,53±0,15	22,99±0,30
Lipids, %	1,18±0,11	1,51±0,15
Ash, %	0,97±0,09	1,22±0,14

Significance: \*P<0,05; \*\* P<0,01; \*\*\* P<0,001;

Table 2. Technological quality of meat from EM pigs

	Landrace (n=22)	Danube White (n=28)
<b>M. longissimus thoracis et lumborum</b>		
WHC, %	24,03±1,80	25,31±1,31
Cooking loss, %	34,52±1,46	36,51±0,78
Marbling fat	1,17±0,12***	2,07±0,16***
pH <sub>1</sub>	6,24±0,08	6,19±0,07
pH <sub>2</sub>	5,42±0,04	5,49±0,06
PSE meat, %	14,29	17,86
DFD meat %	0,00	0,00
<b>M. Semimembranosus</b>		
WHC, %	25,69±2,01	24,66±1,23
Cooking loss, %	34,76±1,03	33,61±1,20

Significance: \*P<0,05; \*\* P<0,01; \*\*\* P<0,001;

Chemical composition traits of the meat samples from entire male (EM) Landrace (L) and Danube White (DW) pigs were not significantly different (Table 1). A statistically significant difference was observed only in the water content of *M. Semimembranosus* (P <0.001). Technological quality assay of meat showed cooking losses from 34 to 36% and WHC from 24 to 25%, but with no significant differences between the two breeds (Table 2). Reliable differences were estimated in the presence of an unpleasant boar taint, where for Landrace and Danube White the positive samples were 0% and 14,3%, 4,5% and 0% for score 2 and 3, respectively (Table 3).

The pH values measured in the two breeds are minimal and not significant. Higher marbling of *M. Longissimus thoracis et lumborum* in the Danube White as intramuscular lipid content was 1,17% and 2,07%, respectively. Of the total 21 EM pigs of the L breed, 14.29% of them have pH values typical of PSE meat as for the 28 EM pigs of the breed DW this percentage is 17.86%. None of the carcasses was with Dark Firm and Dry meat (Table 2).

Table 3. Boar taint in EM carcasses 45 min post mortem

	Landrace (n=22)	Danube White (n=28)
Score 0 (neutral)	16 (72,3%)	21 (75,0%)
Total boar taint (1-3)	6 (27,3%)	7 (25,0%)
Score 1	5 (22,7%)	3 (10,7%)
Score 2	0	4 (14,3%)
Score 3	1 (4,5%)	0

Significance: \*P<0,05; \*\* P<0,01; \*\*\* P<0,001;

pH values determined at 45 min post mortem could be elective criteria (at pH=5.8) for quality of pork meat and detection of undesirable pale, soft and exudative meat (PSE meat). Accelerated glycolysis in muscles in the first hours post mortem leads to accumulation of large amounts of lactic acid resulting in lower pH. Also, rapid glycolysis leads to the formation of a large amount of heat, which increases the temperature of the carcass. The combination of low pH and high temperature causes partial denaturation of muscle proteins, resulting in the appearance of the main signs of pale red color and low water-holding capacity. Meat marbling was a significantly higher (P <0.001) in the Danube White pigs (2.07) than to Landrace (1.17). Other researchers also published data for low intramuscular fat and low marbling rates in uncastrated male. More stringent breed selection often leads in lower fat content in lean meat and better consumer acceptance.

## Conclusion

Entire male pigs with a live body weight of 90 - 100 kg could be a good alternative to surgical castration as the obtained meat showed insignificant chemical trait differences between the two investigated breeds. The results could support and shift the pig meat industry in Bulgaria towards the Entire male production and more precise collaboration between science and business for expected ban of surgical castration realized from the beginning of 2018. Further more precised evaluation is needed for entire male, immunocastrated and surgically castrated in the most commonly used Bulgarian pig situations. More data are needed for cannibalism and mounting behavior and total carcass quality and yield.

## References

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