

## SENSORY EVALUATION OF BOAR TAIN COMPOUNDS

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**Abstract**—Boar taint is a very unpleasant odour released by the heating of fat of carcasses from male pigs. It is mainly associated with androstenone, skatole and indole, but other compounds are also involved. Sensory evaluation of samples from 16 DanBred boars age 121 to 136 days and the slaughter weight of 80 to 120 kg was performed by sensory profiling method. The samples were thermally heated and 6 descriptors were evaluated by 30 panellists using linear graphical oriented unstructured scale. The results showed that pleasantness of odour and pleasantness of taste were evaluated on the same level (45%), as well as the overall intensity of odour and flavour (53%). The intensity of boar odour was slightly higher (43%) comparing to the intensity of boar taste (40%). Stronger correlations were calculated between olfactometric descriptors than between taste descriptors. The pleasantness of taste and smell negatively related with the intensity of boar taste, odour and overall intensity of odour. The age was more important factor influencing the level of boar taint than the slaughter weight of animals. Meat from boars at the age of 135 and 136 days, significantly differed from the meat of younger animals, no matter on their carcass weights.

**Keywords:** sensory analysis; boar taint; DanBred; boar age, slaughter weight

### 1. INTRODUCTION

#### 1.1. Boar taint compounds

Boar taint in entire male pigs remains a problem for pork production. It is a very unpleasant odour released by the heating of fat of carcasses from male pigs. The main contributors responsible for boar taint are lipophilic compounds androstenone

(5 $\alpha$ -androst-16-ene-3-one) and skatole (3-methylindole) [1]. Both of these compounds are important in boar taint perception [2], although there is a stronger negative reaction towards skatole [3]. Concentrations of androstenone and skatole above 0.5–1.0 and 0.1–0.25  $\mu\text{g}\cdot\text{g}^{-1}$  respectively are generally considered as levels causing unacceptable odour and flavour in cooked meat [4].

Androstenone is a steroid with a urine or perspiration like sweaty odour [5]. Its content depends on many factors including sexual development, age and body weight of the animal, genetic factors, feeding and keeping males and females together [6].

Skatole is a degradation product of tryptophan produced by special bacteria in the large intestine. It has a bitter taste [7] and gives a faecal-like, naphthalene, sweet, warm and fruity odour to the meat samples [8, 9]. The most important factors affecting skatole's level in meat are feeding [10] and rearing which includes environmental factors like temperature, ventilation, water supply and accumulation of faeces in the pens [11, 12].

As skatole and androstenone are not able to completely explain sensory boar taint, other compounds like indole, other 16-androstenone steroids, 4-phenyl-3-buten-2-one, p-cresol, 4-ethylphenol and short chain fatty acids are also involved [13, 14].

#### 1.2. Boar taint and slaughter weight

Boar smell does not appear in all male animals. It is detected in only 1-30% of boars aged 20-24 weeks when pigs usually reach carcass weight [15]. In the EU conventional agricultural production boars are castrated in 80-100% of cases. In some countries, boars are slaughtered at the beginning of their sexual maturity (up to 110 kg of their weight),

and castration is not necessary in these cases. However, in most European countries pigs are fattened to a higher weight (about 120 kg) and in the case of animals intended for the production of specialties they are fattened up to 140 kg. In these cases castration is necessary [16].

The aim of the study was to evaluate the effect of age of boars and their slaughter weights on the pleasantness and intensity of pork meat.

## 2. EXPERIMENTAL

### 2.1. Sensory analysis

Sensory evaluation of 652 samples from 16 DanBred boars age 121 to 136 days and the slaughter weight of 80 to 120 kg was performed by sensory profiling method. The samples of loin (*musculus longissimus lumborum et thoracis*) were cut into pieces (10±0.5 g) placed into glass closed bottles and thermally heated in water bath to 73 °C for 15 minutes. Sensory evaluation of samples was carried out according to the ISO 8589:2007 by 30 trained panellists (ISO 8586:2012) using linear graphical oriented unstructured scale. Six descriptors (pleasantness of odour, overall intensity of odour, intensity of boar odour, pleasantness of taste, overall intensity of taste and intensity of boar taste) were evaluated by sensory profiling method (ISO 13299:2016) according to Font i Furnols [17].

### 2.2. Statistical evaluation

The data obtained were analysed using statistical software Statistica 12.0 (StatSoft Inc.). Analysis of variance (two-way ANOVA) was performed and the significant differences in the means were separated using the Scheffé's test. For all statistical tests, a 5% level of significance was used.

## 3. RESULTS AND DISCUSSION

The results from sensory evaluation (mean and standard deviations) are given in Table 1. It could be seen that the pleasantness of odour and taste was assessed at the same level, as well as the overall intensity of odour and taste. The intensity of boar odour was slightly stronger compared to the intensity of boar taste. Odour is more strongly linked with skatole than with androstenone, whereas flavour correlates equally with skatole and androstenone [18]. According to Matthews et al.

[18] consumers were better able to differentiate in odour than in flavour.

Table 1. Descriptive characteristics of results from sensory evaluation of meat samples (n = 652).

Descriptor	Mean (%)	SD (%)
Pleasantness of odour	45	18
Overall intensity of odour	53	20
Intensity of boar odour	43	25
Pleasantness of taste	45	18
Overall intensity of taste	53	16
Intensity of boar taste	40	24

SD = standard deviation.

Pleasantness: 0% = rejectable, 100% = excellent.

Intensity: 0% = imperceptible, 100% = very strong.

The correlations between the variables are shown in Table 2. The statistically significant correlations between the evaluated descriptors were the highest between overall intensity of odour and intensity of boar odour, intensity of boar odour and intensity of boar taste and pleasantness of odour and intensity of boar odour (negative correlation). Intensity of boar odour correlated with the age of the animal more significantly than the slaughter weight. The age of the animal also correlated with the pleasantness of taste, which was not significant in the case of slaughter weight.

Table 2. Correlations between sensory variables.

	PO	OIO	IBO	PT	OIT	IBT
PO	X	-0.380	-0.595	0.391	-0.001	-0.368
OIO	-0.380	X	0.635	-0.152	0.276	0.368
IBO	-0.594	0.635	X	-0.254	0.120	0.627
PT	0.391	-0.152	-0.254	X	-0.126	-0.487
OIT	-0.001	0.276	0.120	-0.126	X	0.422
IBT	-0.368	0.368	0.627	-0.487	0.422	X

Statistically significant correlations are in bold.

PO = pleasantness of odour, OIO = overall intensity of odour, IBO = intensity of boar odour, PT = pleasantness of taste, OIT = overall intensity of taste, IBT = intensity of boar taste.

### 3.1. Sensory evaluation of different age and weight categories

The evaluated animals were divided into three slaughter weight categories: 80 kg (S = small), 100-108 kg (M = medium) and 115-120 kg (L = large). They were also divided into groups by their age: 121 days (Y = young), 128 days (A = adults) and 135-136 days (O = old).

Taking into account the weight classification there were high correlations between the intensity of the boar odour and the intensity of the boar taste ( $r_S = 0.6771$ ,  $r_M = 0.6422$ ,  $r_L = 0.5908$ ) and between the overall intensity of odour and intensity of boar odour ( $r_S = 0.6244$ ,  $r_M = 0.5841$ ,  $r_L = 0.6799$ ). By the analysis of variance significant differences were found in the intensity of boar odour between M and L categories ( $P = 0.0044$ ). The effect of the weight on the boar taint is in line with Moore et al. [19].

When dividing samples into age groups, the correlation coefficients were, in each category, mostly higher than in weight distribution. Very high correlation coefficients were again between the intensity of the boar odour and the intensity of the boar taste ( $r_Y = 0.6916$ ,  $r_A = 0.6341$ ,  $r_O = 0.6159$ ) and between the total smell intensity and the boar smell intensity ( $r_Y = 0.6025$ ,  $r_A = 0.5976$ ,  $r_O = 0.6488$ ). ANOVA results showed significant differences in the intensity of boar odour between both categories Y and O ( $P = 0.0473$ ) and between categories A and O ( $P = 0.0194$ ). The effect of age on androstenone, skatole and indole levels was confirmed by Rostellato et al. [20]. Also, Zamaratskaia et al. [21] stated that the sexual maturation and age have the greatest impact on the concentration of androstenone and skatole in pork.

### 4. CONCLUSIONS

Sensory evaluation of meat from entire boars showed that stronger correlations were calculated between olfactometric descriptors than between taste descriptors. The age of animals was more important factor influencing the level of boar taint than their slaughter weight. Meat from boars at the age of 135 and 136 days, significantly differed from the meat of younger animals, no matter on their carcass weights.

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