

ANIMAL WELFARE

P47

The effect of inulin-feed and improved housing conditions on boar taint reduction

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Introduction

The potential ban on surgical castration in Europe is turning a major advantage of this practice, the elimination of boar taint, into a big challenge for pig industry (Meinert et al., 2017). Raising entire male pigs has some economic advantages as boars possess the advantage of superior growth over castrates, generally leaner carcasses, and compared to castrates less feed is needed in order to achieve the same final weight (Morlein et al., 2015; Wauters et al., 2017). Boar taint is described as an unpleasant odour which becomes especially intense when pork is cooked (Mathur et al., 2012), and is mainly associated with the presence of skatole and androstenone. Skatole (3-methylindole) is a metabolite derived from the amino acid tryptophan produced in the lower gut by intestinal bacterial flora, and androstenone (5 α androst-16-en-3-one) is a steroid produced in the testis (Aldal et al., 2005). Introduction of functional ingredients in feed can reduce boar taint. Aluwe et al., (2013), Backus et al., (2016), Byrne et al., (2008) reported that inulin was effective in the reduction of the skatole’s concentration in the hindgut Housing conditions and genetic selection can also have a favourable effect on boar taint reduction (Backus et al., 2016).

Methods

Sixty entire male pigs (progeny of Large White x Landrace gilts sired by Pietrain boars) were raised under controlled housing and feeding conditions in order to determine its effects on boar taint content. Inulin was added to feed 48 days prior to slaughter in three different levels, combined with two housing conditions - normal and improved housing, which consisted in a larger area, easier access to water and environmental enrichment accessories, making a total of 6 sampling groups (Table 1). A quantitative descriptive sensory analysis was performed by 11 trained panellists in two sessions, assessing odour and flavour of skatole and androstenone, on a 1 to 10 scale. A total of eight coded samples, with the six conditions and two replicates to evaluate repeatability. Hardness (Texture analyser), pH, moisture content and intramuscular fat (Soxhlet method) were determined in ham samples. An HPLC method for the simultaneous quantification of skatole and androstenone, adapted from Hansen-Moller, (1994), was performed using the liquid fat extracted from belly’s adipose tissue. ANOVA with a post hoc Tukey’s test was used to investigate the significance of observed differences.

Results

Results showed that improved housing conditions led to higher hardness and lower pH values ($p < 0.05$). Intramuscular fat was significantly higher for this condition, specifically in group C6%. There were no observed significant differences in moisture content. HPLC results showed that androstenone average levels tended to be lower with higher percentages of added inulin, however without significant statistical differences. Skatole levels were significantly higher ($p < 0.05$) in the groups where no inulin was added (N0% and C0%),

Table 1: Housing conditions, inulin feed composition and number of pigs for each trial

Pen	Housing	Added inulin in feed	Number of pigs	Group code
A	Normal	0%	10	N0%
B	Normal	3%	10	N3%
C	Normal	6%	10	N6%
D	Improved (+Care)	0%	10	C0%
E	Improved (+Care)	3%	10	C3%
F	Improved (+Care)	6%	10	C6%

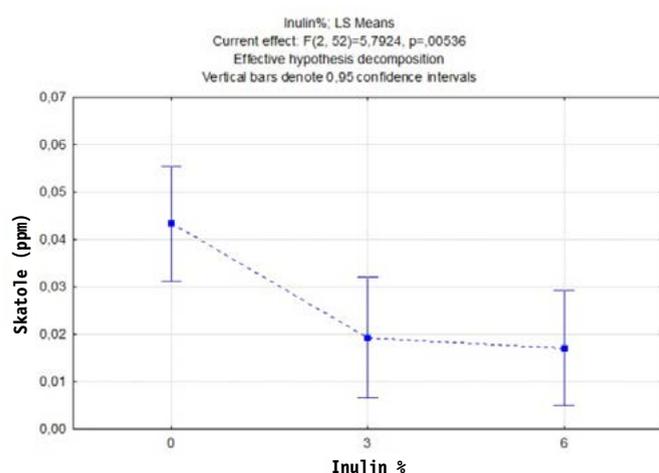


Figure 1: Skatole values (ppm) in belly fat in the feeding groups

and no differences were found between 3% and 6% of added inulin, as shown in Figure 1. Similar results were found by Byrne et al., (2008) and Aluwe et al., (2013), where the addition of inulin led to the reduction of skatole concentration in fat.

In the sensory analysis, panellists attributed belly samples the highest scores in skatole odour, compared to ham. Samples from 0% group were considered higher in skatole flavour and androstenone odour ($p < 0.05$). Concerning to ham's meat samples, panellists found no differences in odour and flavour between groups. This difference of sensitivity between belly and ham can be explained by the amount of fat in the two meat cuts: due to the lipophilic characteristics of skatole and androstenone, redistribution from blood to fat tissue is easily occurring with prolonged accumulation in fat tissues (Aldal et al., 2005; Wauters et al., 2016).

Conclusion

It can be concluded that housing conditions mostly led to changes in the meat overall quality whereas feed conditions had an extended effect on boar taint reduction. Inclusion of inulin in commercial feeds reduced the skatole concentration, which led to a lower boar taint perception by panellists. Meanwhile, studies on changing feed formulations are being carried out.

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