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Drivers of (dis)liking: Systematic pairwise preference tests to reveal the relationship between boar taint and consumer acceptance (#345)

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Introduction

To improve animal welfare, in 2010 a European Declaration proposed a total ban on castration. Entire male pigs, however, can develop an off-odour, called boar taint. To prevent consumers complaints, a quantitative relationship of boar taint compounds (or intensity) with consumer dissatisfaction needs to be established. Pairwise preference tests (Prescott et al, 2005) were deemed a more straightforward approach than sequential monadic testing to establish rejection thresholds.

Methods

Being part of the EU project CAMPIG, a consumer test was conducted with n=383 female consumers in Germany. The study comprised (i) the assessment of consumers' preference (odour and flavour) of castrate over boar meat, (ii) the assessment of consumers' acceptance (overall liking) of castrate and boar meat, and (iii) smell tests to assess olfactory acuity to androstenone and skatole.

Standardized pork patties made of either castrate (21% fat) or boar meat (15 to 21% fat) were served. Each consumer evaluated four pairs of meat patties following a balanced design for the serving order. While the castrate sample was always of the same batch, the boar patties varied with respect to androstenone (0.41 to 2.17 µg/g fat tissue in neckfat) and skatole (0.07 to 0.48 µg/g fat tissue). In total, 16 combinations of various androstenone and skatole levels (see Fig. 1) were tested both, by consumers and by a trained panel. Consumers' sensitivity to androstenone (non-sensitive, sensitive, highly sensitive) and skatole (non-sensitive, sensitive) were assessed using smell strips (Meier-Dinkel et al., 2013).

Dimensionality of panel ratings, scaled to unit variance, was reduced by principal component analysis. Association of those ratings and consumer preferences was analyzed using a generalized linear mixed model, also taking consumers' sensitivity to androstenone and skatole into account.

Results

The design of experiment was successful in that the sensory characteristics were significantly affected by the product, i.e. boar type. Principal component analysis of the trained panel data revealed that attributes related to boar taint were mainly responsible for the differentiation of the samples. The first principal component PC 1 (75% explained variance) can be interpreted as the intensity of boar taint with samples scoring low (left) vs. high (right) (Fig. 2). Androstenone and skatole highly correlate with PC 1 whereas fat content does not.

According to the smell tests, 72% and 47% of consumers were classified as sensitive towards skatole and androstenone at the tested levels, respectively; 18% were even very sensitive to androstenone. Consumers' preference of castrate over boar was significantly affected ($p < .1$) by their sensitivity towards androstenone and skatole; also the order of tasting affected the consumer preference (Fig. 3), i.e. when boar was evaluated first in a pair the chance of the castrate patty being preferred is higher. With increasing skatole and androstenone levels the sensory perception of boar taint (= scores of PC 1) increased (Fig 2). Hence, consumer preference of castrate over boar increased.

Consumers often preferred the castrate sample even when the levels of androstenone and skatole in the boar patties were low which is most likely due to the lower fat content in the boar shoulders used to make patties.

Conclusion

The herein established quantitative relationship between trained panel ratings and consumer preferences -also taking into account their sensitivity- can be used to sort carcasses at slaughter. As consumer dissatisfaction is gradually increasing with the level of boar taint, sorting limits depend on the extent of acceptable dissatisfaction (Christensen et al., 2019).

References

Christensen, R., Nielsen, D.B., Aaslyng, M.D. (2019). Food Quality and Preference, 71, 209-216.

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Walstra, P., Claudi-Magnussen, C., Chevillon, P., von Seth, G., Diestre, A., Matthews, K. R., et al. (1999). Livestock Production Science, 62,15–28.

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Notes

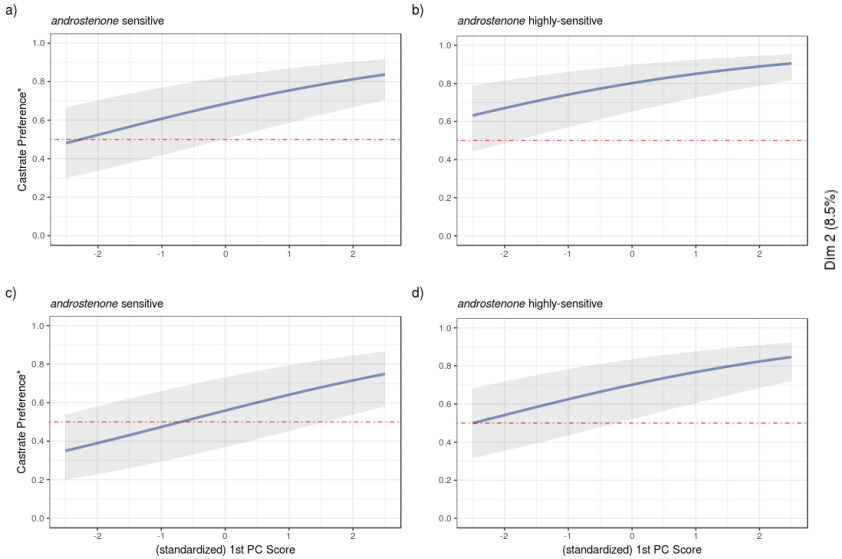

Figure 3 Predicted probability that the castrate sample is preferred over the respective boar sample as dependent on standardized PC1 scores (obtained through trained panellists), the consumers' sensitivity towards androstenone (and), and the position of the boar sample within the pairwise test set. Panels a + b: boar sample was served first within a pair, c + d: boar sample was served second within a pair. The red line indicates the chance level. The shadows indicate the variability of consumer responses, i.e. +/- 1 standard deviationof the random consumer effect.

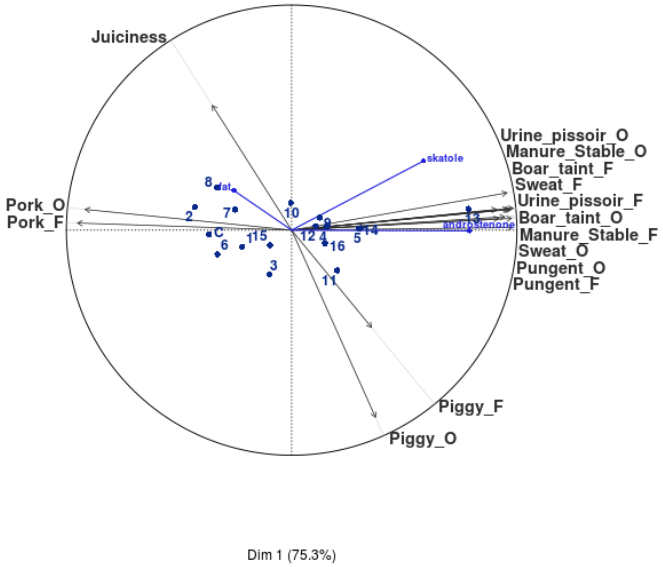

Figure 2 PCA bi-plot based on sensory attributes for odour (O), flavour (F) and juiciness rated by trained panellists. Numbers represent the boar types, C represents the castrate sample. Chemical attributes (androstenone, skatole, fat) were passively correlated with the principal components.

Notes

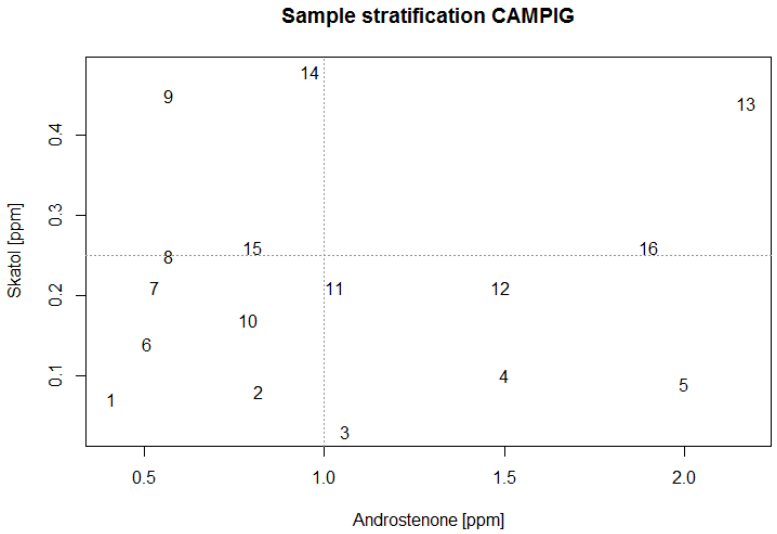

Figure 1 Androstenone and skatole levels in the backfat (µg/g tissue) of the boar carcasses used to produce the minced meat for the CAMPIG pilot study. Numbers indicate the boar meat types (1 to 16). Dotted lines indicate tentative rejection thresholds for androstenone (1 µg/g fat) and skatole (0.25 µg/g fat) as suggested by Walstra et al., 1999

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