INTERACTION BETWEEN PAN TEMPERATURE AND END POINT TEMPERATURE ON THE EATING QUALITY OF PORK WITH VARIOUS RAW MEAT QUALITIES

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Introduction

It is well known that different cooking techniques and end point temperatures result in different eating qualities (Bejerholm *et al.*, 2003) just as variations in raw meat quality can result in variation in the eating quality (Candek-Potokar et al., 1998; Candek-Potokar *et al.*, 1999). Furthermore, recent studies have shown that an interaction exist between the cooking procedure and the raw meat quality, where the effect of the cooking technique depends on the raw meat quality (Bejerholm *et al.*, 2003). Frying meat on a pan is a common cooking technique. The effect of end point temperatures (Wood *et al.*, 1993) as well as pan temperatures (Lauridsen *et al.*, 2006) has been investigated. The interaction between pan temperature and end point temperature on the eating quality of various raw meat qualities has, however, not been investigated.

The aim of the current study was to investigate the interaction between pan temperature (PT) (150°C versus 220°C) and end point temperature (EPT) (65-68°C versus 85-88°C) depending on the raw meat quality (MQ) (normal versus low carbohydrate content in the meat, heavy versus light carcass weight and castrates versus females).

Materials and Methods

Shoulder clod and blade roll were excised from 80 DLY slaughter pigs the day after slaughter, vacuum-packed and frozen at -18°C. The 80 pigs were divided equally between castrates and females, heavy (120 kg live weight) and light (90 kg live weight), and fed to a normal carbohydrate content or strategically fed to a low carbohydrate content (Rosenvold *et al.*, 2001) combined with 48 hours fasting before slaughter, resulting in 10 pigs per group. The meat was defrosted and minced through a 3mm hole size. The meat from 10 pigs of the same group was mixed, portioned and frozen again (-18°C).

Before sensory analysis, the meat was defrosted overnight and formed into patties of 95 ± 0.3g each, 9.1cm in diameter and 1.4cm high. The patties were fried at either 220°C or 150°C PT measured by a surface thermometer (Digitron, 2038T, Sifram Instruments Limited, Torquay, England) to either 65-68°C or 85-88°C EPT measured by a handheld probe (Testo 926, Testoterm, Buhl and Boendsoe, Virum, Denmark). A small amount of grape seed oil was used on the pans before frying. The patties were first fried 30 seconds on each side and then turned every second minute until the aimed EPT was reached. The sensory quality was evaluated by 8 trained assessors. The following attributes were assessed on an unstructured 15cm scale going from nothing (0) to very high intensity (15): Odour: Fried pork (surface), burnt/bitter (surface), piggy (internal), sour (internal). Appearance: Uneven fried surface, degree of fried surface, wet surface, internal colour (from pink to grey). Texture: Firmness when pressing in the middle of the patty, crispiness of the crust when cutting, juiciness after 5 chews. Flavour/Taste: Fried pork, burnt/bitter, sweet, sour, piggy. After taste: Sour, burnt/bitter. An APLS regression was performed; using the cooking methods and the 8 MQs as a design matrix (X-matrix) and the sensory score as Y-matrix. The MQ was regarded as 8 treatments in the first statistical analysis of variance.

Results and Discussion

The main variation in the data set was between the 4 cooking methods (Figure 1, 55% Y-variation explained). Cooking to 85°C EPT resulted in higher firmness and less juiciness compared to 65°C EPT, but also in a tendency to a more fried pork flavour and crispy crust. A PT of 220°C gave more burnt/bitter taste and after taste, but also more fried pork odour and flavour compared to the more intensive piggy odour and flavour than that cooked at 150°C. A high PT seemed to have increased the Maillard reaction to a higher degree than the high EPT, while the high EPT especially decreased the juiciness. In this case, the high PT was so high, that the fried flavour changed to a more burnt/bitter flavour. Therefore, an intermediate PT might be preferred. The MQs were described by PC3 explaining only 2% of the Y-variance. The main distinction was between the two feedings. The normal feeding had a more intensive burnt/bitter odour, but also a more intense piggy odour and flavour, while the low carbohydrate feeding had a more intensive sour flavour and after taste. The expected higher carbohydrate content in normal fed pigs therefore seems to have resulted in a higher degree of Maillard reaction, leading to more burnt/bitter flavours.

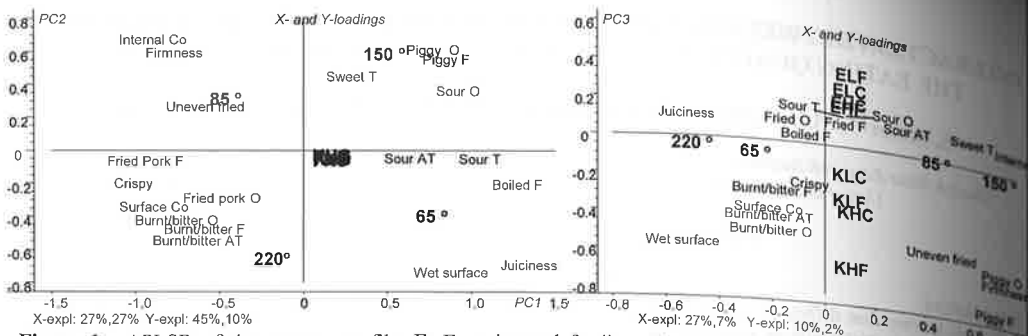

Figure 1: APLSR of the sensory profile. E: Experimental feeding, K: Control feeding, L: Light, H: Heavy, C: Castrates, F: Female, O: Odour, F: Flavour, AT: After taste, Co: Colour

The analysis of variance showed a significant effect of PT, EPT or MQ on all sensory attributes. A significant interaction between PT and EPT, PT and MQ or EPT and MQ was furthermore seen for all odours, after taste and appearance attributes as well as for burnt/bitter taste, piggy flavour, crispiness of the crust and juiciness.

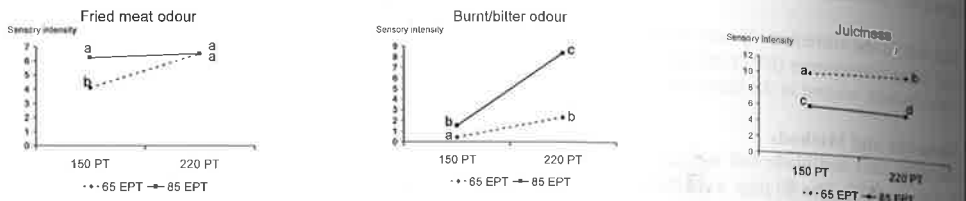

Figure 2: Sensory intensity of fried meat odour, burnt/bitter odour and juiciness.

When the patties were fried at 150°C PT, 85°C EPT resulted in a higher intensity of fried odour than at 65°C. When fried at 220°C PT no difference between EPTs was seen. Burnt/bitter odour showed the opposite pattern - the difference between EPTs was largest at 220°C PT. There was no difference between 65°C EPT/220°C PT and 85°C EPT/150°C PT, showing that the burnt/bitter odour at the high PT could be reduced by choosing a low EPT while the EPT did not mean so much for the burnt/bitter odour at the low PT. The main difference in juiciness was between EPTs, 65°C being the juiciest.

Conclusions

Feeding influenced the flavour of pork, but to a lesser degree than cooking conditions. PT had a large effect on the fried and burnt/bitter odours, whereas juiciness was more influenced by EPT. At low EPT, a high fried odour can be gained when using high PT, but be careful not to develop burnt flavours.

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