PORK FLAVOUR: CORRELATION BETWEEN SENSORY PROFILE AND VOLATILE FLAVOUR COMPONENTS OF COOKED PORK

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Background

Knowledge of consumer preference for pork is of great importance to the meat industry in order to produce pork products that satisfy consumers' demand. To consumers, the sensory experience imparted during consumption is a very important aspect of food quality (Agerhem & Tornberg, 1993). Consumers consider flavour to be one of the most important sensory traits of pork (Bryhni et al., 2002). Meat quality of pork is dependent on pre- and post-mortem treatment. Different treatments have been found to influence sensory quality of pork detected by trained panels, but the chemical components responsible for the sensory quality of cooked pork are not well described.

Objectives

The purpose of the present study was to investigate the relationship between the sensory profile and the volatile flavour components of cooked pork varying in sensory properties due to a) pre-slaughter stress resulting in elevated ultimate pH_{24h}, b) meat ageing, c) core temperature and d) reheating (warm-over).

Methods

A total of 8 different treatments (Table 1) including 12 animals for each treatment (totally 96 animals, Danish Duroc boars mated with Danish Large White-Danish Landrace sows) were used for sensory profiling and HSGC-FID/MS analysis. Slices (20 mm) from *M. longissimus dorsi* (LD) were fried without salt and spice. Sensory profiling was carried out according to the international ISO standards. 8 assessors used 17 attributes to describe the 8 different treatments. The samples were evaluated in duplicates in a randomised order. The samples for HSGC-FID/MS analysis were immediately after cooking minced and a 30 g sample was placed in a 500 ml conical flask with a Dreschel head, which was placed in a 50°C water bath for 10 minutes and then purged to a Tenax tube by 60 ml N_2 for 10 minutes. Headspace gas chromatography was performed as described by Hinrichsen and Pedersen (1995).

Results and discussions

The sensory profile was clearly affected by the 8 treatments (Table 2). Higher than normal pH_{24h} causes lower intensity of meat odour and flavour and acidic odour and taste but higher intensity of sweet taste and also higher tenderness. Ageing causes higher tenderness but flavour and odour are unaffected. Higher core temperature (80°C versus 60°C) causes more meat flavour and odour but less piggy odour and lower tenderness and juiciness. Reheating causes lower intensity of meat odour and flavour and lower juiciness but higher intensity of metal odour and flavour, sweet odour and taste, stale odour, acidic odour and taste and - not surprisingly - warmed over flavour (WOF) and odour. Reheating also gives more bitter taste.

Figure 1 shows a PLSR plot of the relationship between sensory and HSGC-FID data with names described in Table 3. The detected volatile flavour components are mainly positively correlated to "negative" sensory attributes like warmed over flavour and odour, off/bad odour, metallic taste and odour and pig odour and flavour. On the other hand most flavour components are negatively correlated to meat odour and flavour (and also tenderness).

Conclusions

The present study shows that the sensory quality of cooked pork is highly affected by the pre- and post-mortem treatment. The sensory quality correlates to volatile flavour components, but one must be careful in concluding that certain components are responsible for a given sensory attribute, since many components in the cooked pork are correlated. Further studies of flavour components (including non-volatile) are necessary.

Acknowledgements

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References

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Table 1. Description of the 8 treatment groups

Treatment	B1	B2	B3	B4	B5	B6	B7	B8
Ultimate pH_{24h} [1]	5.5^a	5.6^a	5.5^a	5.5^a	5.5^a	5.6^a	5.9^b	6.0^b
Ageing time (days)	0	0	6	6	6	6	0	0
Core temperature °C	65	80	65	65	80	80	65	80
Reheating [2]	-	-	-	+	-	+	-	-

[1] Pigs in group B7 and B8 were given adrenaline (0.3 mg/kg body weight) 15 hours prior to stunning. Different letters differ ($P<0.05$).
[2] The reheated samples (B4 and B6) were roasted to either 65°C or 80°C, then chill-stored at 4°C for 2 days and reheated before being served for sensory analyses.

Table 2. Effect of treatment on sensory attributes.

Attribute	Normal pH_{24h} → high pH_{24h}	0 days → 6 days ageing	65°C → 80°C	Non-reheating → reheating
Meat odour	↓*	ns	↑	↓
Meat flavour	↓	ns	↑	↓
Piggy odour	ns	ns	↓	↓
Piggy flavour	ns	ns	(↓)	(↑)
Metallic odour	ns	ns	ns	↑
Metallic flavour	(↓)	ns	ns	↑
Sweet odour	(↑)	ns	ns	↑
Sweet taste	↑	(↑)	(↑)	↑
Stale odour	ns	ns	ns	↑
Acidic odour	↓	ns	ns	↑
Acidic taste	↓	ns	ns	ns
Warmed over odour	ns	ns	ns	↑
Warmed over flavour	ns	ns	ns	↑
Bitter taste	ns	ns	ns	↑
Tenderness	↑	↑	↓	(↑)
Juiciness	ns	ns	↓	↓
Brown surface	↓	ns	↑	ns

*↑, ↓: Indicates that the intensity of the attribute goes up or down ($p<0.05$).
(↑), (↓): Indicates that the there is a tendency that the intensity of the attribute goes up or down ($p>0.1$). ns: No significant effect.

Table 3. Kovats index and names of volatile flavour components.
UI: unidentified

Kovats	Compound
2,084	Acetaldehyde
2,337	UI
503	short chain alcohol
527	1,3-pentanediene
560+6	Propanal
574	acetone (2-propanone)
590	UI
600	UI
620	UI
628	2-methylpropanal
634+40	2,3-butanedione (diacetyl)
672	Butanal
690	2-butanone
701	2-butenal
717	Methylbutenal
736	3-methylbutanal
739	2-methylbutanal
768	UI
780	Pentanal
793	pentane-2,3-dione
799	2-methylhexane
808	Dimethyldisulfide
882	Pentanol
887	Hexanal
968	UI
983	2-heptanon
988	Heptanal
1033	2-pentylfuran
1048	Dimethyltrisulfide
1078	2,3-octenedione
1081	1-octene-3-ol el.7-octene-4-ol
1087	Benzaldehyd
1093	Octanal
1197	Nonanal
1299	Decanal

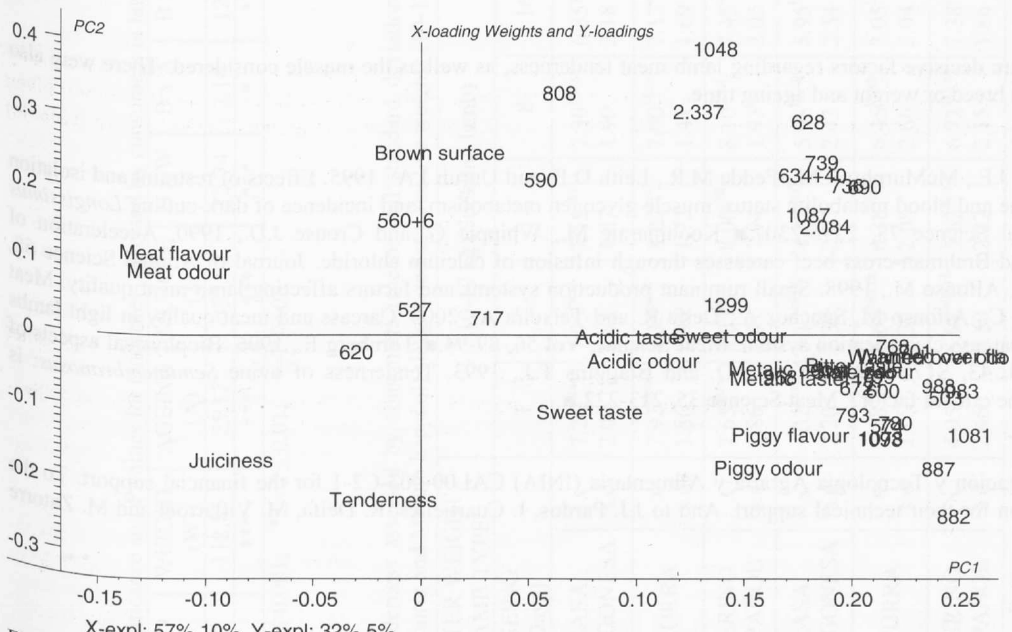

Figure 1. PLSR plot of HSGC-FID data (x) and sensory data (y). HSGC-FID data is normalized. Numbers are Kovats index (see table 3). Sensory data is mean over animal and assessor.