EFFECT OF FAT SCORE ON THE QUALITY OF VARIOUS MEAT PRODUCTS

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Introduction

During the last decades, breeding strategies aimed to increase lean tissue and to decrease adipose tissue deposition in pig carcasses. Because of the close relationship between the intake and the concentration of polyunsaturated fatty acids (PUFA) in porcine adipose tissue, both factors, lower fat deposition and dietary PUFA-intake, are often followed by increased PUFA concentrations in the body fat. Increased PUFA tissue levels are associated with higher incidence towards oxidation (→ rancid) and impaired texture (→ soft, greasy, oily fat). Both quality traits are of great importance for the meat processing industry (Prabucki, 1991). In larger Swiss slaughter houses, fat quality is determined by fat score (FS), which is similar to the iodine number and related to the degree of unsaturation of the fat (Scheeder *et al.*, 1999). The carcass fat quality requested by the abattoirs is a FS of < 62. Pig producers not meeting those requirements experience marked price reductions.

The aim of this work was to investigate possible effects of FS on different quality traits (nutrient composition, fatty-acid profile, sensory characteristics, texture and fat oxidation parameters) of four different meat products (salami, raw-cured bacon, pork hamburger, Vienna sausage). Correlations were tested on a level of significance of $P \leq 0.05$.

Materials and Methods

The meat and fat tissue of 47 Large White gilts were used. The pigs were from the trial of Bee (2005), in which the effects of four different feeding regimes on the FS during the last weeks prior to slaughter were tested (one animal died during the trial). The pigs were slaughtered at the ALP-slaughter house in two series within 6 weeks.

According to the procedure of Proviande (2003), a fat sample from each pig was collected from the back fat close to the hips and the FS was determined the same day at UFAG laboratories (Sursee, Switzerland) using the method described earlier (Scheeder *et al.*, 1999). The following day, the carcasses were dissected according to Rebsamen *et al.*, (1985) and then prepared for the production of four different meat products. At the Education Centre of the Swiss Meat Industry (ABZ, Spiez, Switzerland), salami (SAL), raw-cured bacon (RCB), pork hamburger (PHB) and Vienna sausage (VIS) were produced following traditional recipes. With the exception of RCB (n = 47), raw material was pooled by FS-classes for each series (SAL: n = 20) or over both series (PHB and VIS, n = 14 each), respectively (Table 1). Raw-material quality was also described by the ABZ-specialists.

The investigated parameters include main nutrients, fatty acid profile (Bee *et al.*, 2004), fat oxidation by GC-MS (aroma components as markers) and texture (sliceability, fat firmness) by a Warner-Bratzler-apparatus (WB). The four meat products were also assessed for their sensory profile (14 to 17 product-dependent odour, flavour and texture criteria on a 10-point intensity scale) by ten trained panelists. Half of the PHB were heated twice in order to detect potential flavour defaults. Additionally, the meat to fat ratio was assessed in the RCB at the 8 and 11 rib by planimetry and the a_w-value for SAL.

Results and Discussion

A good FS-variation resulted from the trial of Bee (2005), whereas the number of pigs within the individual FS-classes was not uneven (Table 1).

Table 1: Distribution of animals in the individual fat-score classes.

Fat-score class	series		Fat-score class	series		Fat-score class	series	
	1	2		1	2		1	2
< 58.0	-	1	62.1 – 62.5	2	1	64.6 – 65.0	-	3
58.1 – 59.0	1	-	62.6 – 63.0	3	3	65.1 – 65.5	1	1
59.1 – 60.0	5	2	63.1 – 63.5	1	-	65.6 – 66.0	3	-
60.1 – 61.0	5	1	63.6 – 64.0	-	-	66.1 – 67.0	-	1
61.1 – 62.0	2	7	64.1 – 64.5	1	1	> 67.0	-	2

Raw material for SAL- and RCB-production were characterized by the ABZ-specialists as wet and greasy when FS-values were above 65, whereas no FS-related differences were observed for VIS- and PHB-raw materials. Except for RCB ($r^2 = 0.11$ to 0.17), no significant correlations were found between FS and dry matter, protein, total fat and ash content, respectively. FS was correlated with the saturated-fatty acid content of the RCB (r = -0.55), SAL (r = -0.68)

and VIS (r = -0.70). Only a few sensory characteristics of the RCB like spicy (r = 0.40), smoky (r = 0.33) and fibrous (r = 0.41) were linked to the FS whereas no significant sensory correlations were observed for the other meat products. Regardless of the FS, reheating of cooled PHB was followed by negative effects on the attributes rancid, juicy, tender and animal-like. Only the 1-octen-3-ol signal (peak height) in RCB (r = 0.51) and in SAL (r = 0.46), but not in the other meat products was correlated with the FS. Reheating of PHB was followed by significantly increased signals for pentanal, 1-pentanol and 1-octen-3-ol. Texture of SAL (WB-total work: r = -0.66, Figure 1; max. WB-force: r = -0.60) and RCB-fat firmness (needle penetration force, 10-15mm: r = -0.31) were negatively correlated with FS. The FS-related differences in texture were similar to the ones, which were seen between the two series. The a_w-values of SAL were positively correlated with the FS (Figure 2). Interestingly, a significant positive correlation between FS and meat:fat-ratio occurred in the RCB (Figure 3), which was mainly due to changes in the fat area (r = -0.46) and may be related to the occurrence of fatty breasts.

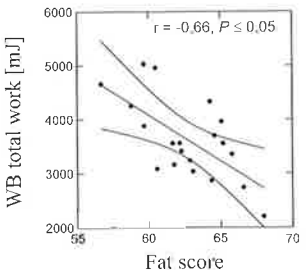

Figure 1: Correlation between the FS and WB total work in the SAL.

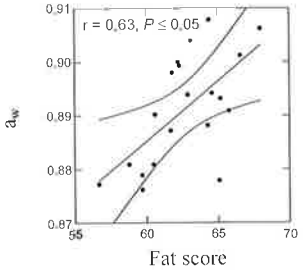

Figure 2: Correlation between FS and a_w-value in the SAL.

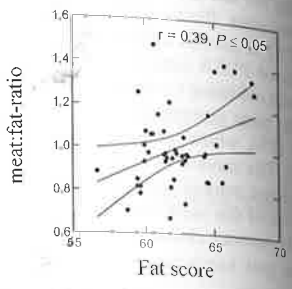

Figure 3: Correlation between FS and meat:fat-ratio in the RCB.

Conclusions

Several FS-related effects were observed for the cured and air-dried products like SAL and RCB, but not for the VIS and PHB. The FS was related to raw material characteristics, texture and shelf life (a_w-value) for SAL, and to raw material characteristics, meat:fat-ratio, fat oxidation and fat firmness for RCB.

Due to the relevance of the FS to the profitability of pig production the threshold of 62 is always questioned by pig producers and feeding manufacturers. However, it is not possible to redefine the actual FS-limit based on the present data. Thus, redefining the FS-limit should be a matter of market-related considerations between stakeholders.

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