INFLUENCE OF INTRAMUSCULAR FAT CONTENT ON THE EATING QUALITY OF PORK.

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MARY

influence of intramuscular fat (IMF) content on the eating quality of 29 porcine *M. longissimus dorsi* (LD) muscles was investigated. IMF varied from 0.5 to 3.0 %, while other factors which might affect the eating quality, such as pH_1, carcass weight, percentage pH_{24} and internal light reflectance (FOP_{24}), were kept as constant and normal as possible. The eating quality was assessed four post-mortem by a 9-member taste panel. As the IMF level differs along the LD muscle, each muscle was assessed from two 8-cm ...s, one posterior (taken immediately ahead of the last rib) and one anterior (taken 16 cm ahead of the last rib). ...e the wide range in the IMF content, no positive relationship was obtained between the eating quality and IMF. Taking into ...t the effect of the assessors with analysis of variance, the IMF content was found to affect tenderness. A higher IMF content did, ... deteriorate the tenderness in the anterior sample, but only slightly. Juiciness, on the other hand, was only related to the IMF level ... posterior piece. Of the investigated parameters, pH_{24} had the greatest influence on tenderness, even though pH_{24} did not vary to ... great extent (5.36-5.50). A lower pH-value gave a more tender meat. A notable result is that the anterior piece was more tender and ... better than the posterior piece, whereas juiciness did not differ in the two pieces. In conclusion, good eating quality in pork, which ... case in this investigation, was maintained even at low IMF values.

RODUCTION

... researchers have concluded that 'about 2 % intramuscular fat is necessary for good taste characteristics' in pork cutlet (Bejerholm ...-Gade, 1986). This conclusion is similar to that of DeVol et al. (1988). They suggested that an IMF content below 2.5-3.0 % ... significantly tougher chops, whereas fat percentages above 3 % have little further effect on tenderness. Fjelkner-Modig (1985) ...ed the sensory properties of meat from pure-bred Hampshire, Swedish Landrace and Swedish Yorkshire in relation to the IMF ...nt. Fjelkner-Modig found that the breed having the lowest amount of IMF, i.e. the Landrace (1.4%), was the most dependent on ..., with regard to sensory properties, but the contribution to the relationship was rather low. Hampshire had the highest IMF content ...) and the best eating quality, but no relationship between the IMF and the sensory properties was noted. Several others have shown ... the IMF content has no effect at all on the eating quality (Rhodes, 1970 and Skelley et al, 1973).

ERIALS

...cine LD muscles with an IMF level ranging from 0.5 to 3.0 % were selected. Only commercially cross-bred pigs (Hampshire ...edish Yorkshire x Swedish Landrace)) with a slaughter weight around 80 kg were used. pH measurements were made 45 minutes ...) and 24 hours (pH_{24}) post-mortem with a portable pH meter. To ensure normal meat, only meat with $pH_1 > 6.0$ and pH_{24} between ... and 5.55 was chosen. Internal light scattering was measured with a Fibre Optic Probe (FOP) instrument 24 hours (FOP_{24}) post-...em. FOP_{24} was kept between 27 and 46 to ensure normal meat. The selected pigs were cooled in a normal commercial manner. To ...d warm- and cold-shortened meat, the lowering of the temperature was followed by thermocouples. After cutting, the meat was ...um-packed and stored at +4°C for three days.

...ical analysis: The chemical composition was determined in a 4-cm section of the LD muscle removed at the last rib. The content of ... (SBR-method, NMKL, 1974), protein (Kjeldahl as modified by Nilsson, 1968), connective tissue (Stegeman, 1958 as modified by ...er, 1973), and water (Nilsson, 1969) were analysed.

Sensory analysis: At four days post-mortem, the pork loins were assessed by a 9-member taste panel. The LD muscle was divided into two different samples, one 8-cm section taken immediately ahead of the last rib and one 8-cm section taken 16 cm ahead of the last rib. These two samples will henceforth be referred to as the posterior and anterior pieces, respectively. The anterior and posterior pieces w assessed as two different samples, since it is known that the IMF content differs along the LD. The IMF content was estimated in each piece in accordance with a quadratic equation describing the IMF content at different positions along the LD (von Seth, unpublished results). 1.5-cm slices were fried 2 x 3 minutes (180 °C) to an internal temperature of 68°C and served immediately to the assessors. Tenderness, flavour and juiciness were judged on a 9-point scale, where 1= very tough, weak flavour and dry and 9 = very tender, strong flavour and very juicy.

Statistical analysis: Data was analysed with the SYSTAT program (SYSTAT, 1987) using Pearson correlation matrix, t-test and analysis of variance.

RESULTS AND DISCUSSION

Carcass and meat quality traits and chemical composition: Carcass and meat quality properties and the chemical composition of the pork loins are shown in Table 1.

Table 1. Mean, maximum, minimum and standard deviation (std) for carcass and meat quality traits and the chemical composition of l

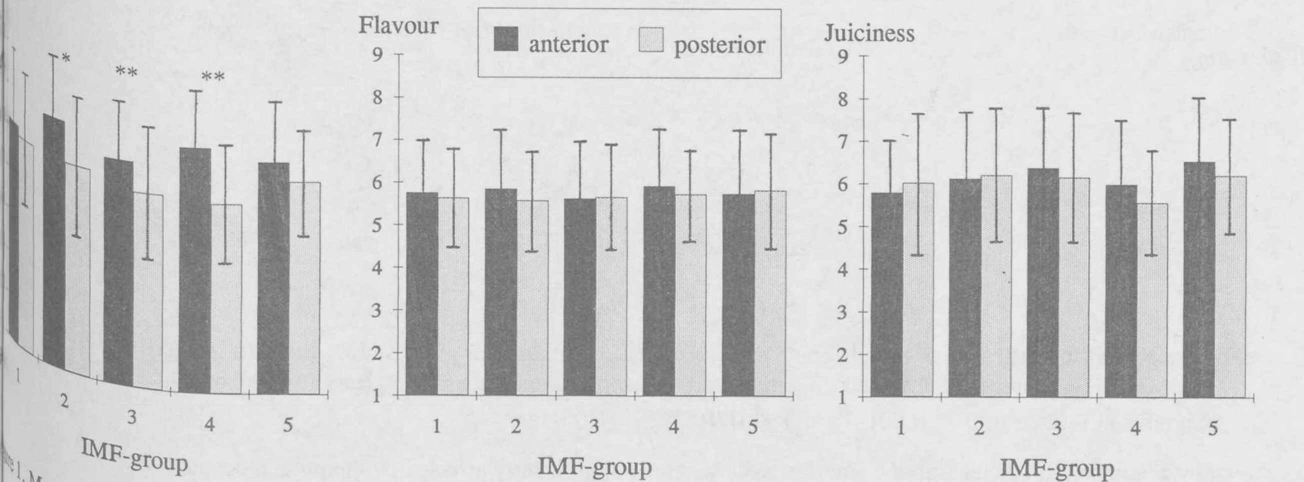
	Lean %	Slaughter weight (kg)	pH_1	pH_{24}	FOP_{24}	IMF % last rib	IMF % anterior	IMF % posterior	Conn. tissue %	protein %	water %
Mean	58.97	79.53	6.27	5.42	36.41	1.62	1.81	1.48	0.49	21.90	75.39
Maximum	64.00	86.70	6.44	5.52	46.00	2.94	3.08	2.74	0.61	23.30	76.60
Minimum	53.00	73.40	6.04	5.36	27.00	0.76	0.98	0.65	0.32	20.70	73.10
Std	1.68	3.17	0.11	0.04	4.56	0.59	0.57	0.57	0.08	0.82	0.83

The IMF measured at last rib varied from 0.76 to 2.94 % while other factors were kept as constant and normal as possible. The material was divided into 5 groups depending on the estimated IMF content, as shown in Table 2.

Table 2. The material divided into 5 different IMF-groups.

IMF-group	IMF % last rib	Anterior piece IMF % (mean)	Anterior piece nr of loins	Posterior piece IMF % (mean)	Posterior piece nr of loins
1	$\leq$ 0.99	0.98	2	0.77	7
2	1.00 - 1.49	1.30	10	1.18	7
3	1.50 - 1.99	1.88	5	1.76	11
4	2.00 - 2.49	2.17	9	2.22	2
5	$\geq$2.50	2.89	3	2.62	2

Sensory traits: Figure 1 shows the results of the sensory evaluation for the anterior and posterior pieces of the LD for the 5 different IMF-groups. The mean assessment of the tenderness, flavour and juiciness of the pork loins was more or less independent of IMF-groups. The pork loins used in this investigation were of good quality, the mean values for tenderness, flavour and juiciness lying in the upper half of the scale. But, as shown by the large standard deviation, wide variations were noted between the assessors in the sensory evaluation (Figure 1). The anterior piece was significantly more tender than the posterior sample in IMF-groups 2, 3 and 4 and this did not depend on the variation in IMF content, which has often been argued to be the reason for variation in tenderness along the LD muscle. The flavour and juiciness were about the same in the anterior and posterior pieces. Considering the whole material, the anterior piece obtained significantly higher scores in tenderness and flavour compared to the posterior sample. But this was not the case for juiciness.



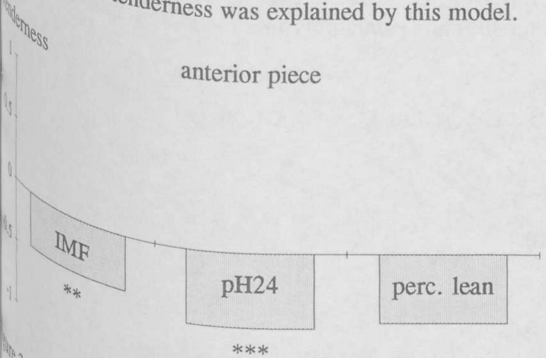
re 1. Mean values and standard deviations from the sensory evaluation of the anterior and posterior pieces of porcine LD. Significant differences between the anterior and posterior pieces are given in the figure, $p \leq 0.001$: ***; $p \leq 0.01$: **; $p \leq 0.05$: *.

relationships between sensory, carcass, meat quality and chemical traits: The effects of assessors, sex, IMF, pH_{24}, protein content, ntage lean and slaughter weight on the sensory properties were estimated by analysis of variance for the anterior and posterior s. The model used to describe the recorded sensory traits was:

CONSTANT + ASSESSOR + SEX + IMF + pH_{24} + PROTEIN + PERC. LEAN + SLAUGHTER WEIGHT

re: Y = dependent variable (tenderness, flavour or juiciness), constant = general mean and IMF = the estimated IMF (anterior or erior piece).

parameters were normalised to vary between -1 to +1, in order to be able to compare the degree of influence of each parameter on sensory properties. It turned out to be the assessors who explained most of the variation in tenderness, flavour and juiciness. ghter weight or sex did not affect any of the sensory properties, neither in the anterior nor in the posterior piece. There was an ous difference for the anterior and the posterior sample with regard to the models that best described tenderness and juiciness. derness for the posterior sample was only affected significantly by the assessors and the model explained just 45 % of the total ation. The tenderness in the anterior piece, on the other hand, was affected significantly by pH_{24}, IMF and percentage lean. This is trated in Figure 3, where the degree of influence on tenderness for the normalised parameters can easily be compared. A notable lt is that a higher IMF deteriorates tenderness, not as was previously believed improve it (Bejerholm & Barton-Gade, 1986). 55 % of total variation in tenderness was explained by this model.



re 3. The normalised influence of IMF, pH_{24} and percentage lean on tenderness (mean (min-max)=6.43 (3.50-9.00)) in the anterior sample of LD. Significant influence, $p \leq 0.001$: ***; $p \leq 0.01$: **; $p \leq 0.05$: *.

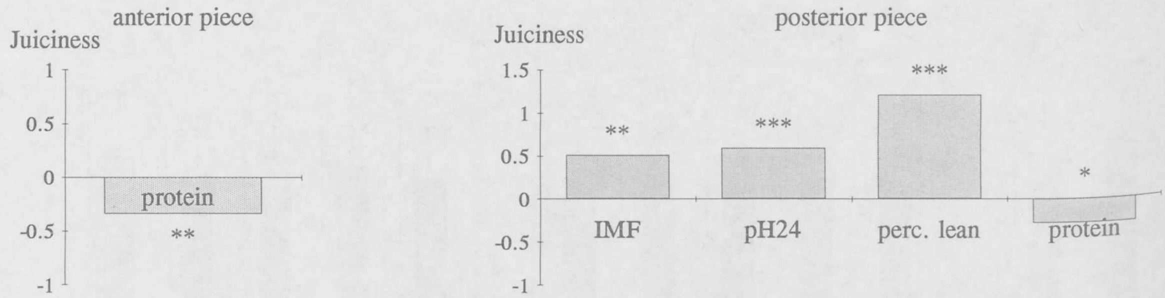


Figure 4. The normalised influence of protein content on juiciness for the anterior piece of LD, (mean(min-max)=6.14(2.40-9.00)) and of IMF, pH_{24}, percentage lean and protein content in the posterior piece of LD, (mean(min-max)=6.21(2.30-9.00)). Significant influence, $p \leq 0.001$: ***; $p \leq 0.01$: **; $p \leq 0.05$: *.

As shown by Figure 4, the juiciness in the anterior piece was only significantly affected by the protein content, and in a negative way. The model explained 55 % of the total variation in juiciness. In the posterior piece, the percentage lean contributed much more to the variation in juiciness. A higher percentage lean gave a more juicy meat. Furthermore, pH_{24} and IMF contributed to a more juicy meat, whereas a higher protein content gave a less juicy meat. 57 % of the total variation in juiciness in the posterior piece was explained by this model. The flavour was not explained significantly by any of the factors in the model, except for the assessors.

CONCLUSIONS

- The anterior piece of the LD was significantly more tender and had a significantly better flavour than the posterior piece of the same muscle. The difference did not depend on the variation in IMF, since the samples were compared at the same IMF content.
- Of the investigated parameters, pH_{24} had the greatest influence on tenderness. A lower pH gave a more tender meat. IMF was found to deteriorate the tenderness in the anterior piece.
- Juiciness was affected negatively by the protein content. Moreover, percentage lean, pH_{24} and IMF were found to affect juiciness positively in the posterior piece, where the percentage lean affected most.
- The good eating quality of the pork used in this investigation, was maintained even at low IMF values, when cooked to 68 °C.

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