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DISTRIBUTION OF INTRAMUSCULAR FAT CONTENT IN M. LONGISSIMUS OF PIGS

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Background

Stress resistance and high meat quality with a considerable content of intramuscular fat were positive performance characteristics of the East German pigbreeds.
Results of several authors show the supporting influence of an optimal intramuscular fat content on tenderness, juiciness and palatability of meat.
For determining an optimal amount of intramuscular fat, the high variability within the carcass has an unfavourable effect (Davies and Pryor, 1977; Fischer, 1992). In spite of the wide range in fat content of different muscles, investigations by Fischer (1992) show only low to moderate relations between the fat content of muscles. In addition, M.longissimus being the usual muscle to predict meat quality varies in its distribution of intramuscular fat depending on the region examined. Especially for including intramuscular fat content of M.longissimus in quality assessment and selection, detailed knowledge about differences in local distribution and their reasons needs to be acquired. Differences in structure of tissue, especially muscle tissue, could be a reason for the non-uniform variation in distribution of intramuscular fat in M.longissimus mentioned by Fischer (1992). Beecher tried to describe muscles of different locations by characteristics of muscle structure. In the following the results from a survey on the intramuscular fat content and the first results of a local distribution study are given.

Material and methods

Animals

For determination of intramuscular fat content 552 animals (male and female) with the following genotypes were available:

98 German Large White (GLW), 164 German Landrace (GL), 45 Leicoma (LC), 26 Pietrain (PI), 38 GLW x GL, 105 (Ha x PI) x (GL x GLW),
46 Pi x (GL x GLW)

To investigate the relation between microstructural traits in M.longissimus and the content of intramuscular fat depending on localization, field data from pigs (21 animals) with percentages lean meat of 53.71 ± 4,33 % and slaughter weights of 81.64 kg ± 11.54 kg were used.

Methodology

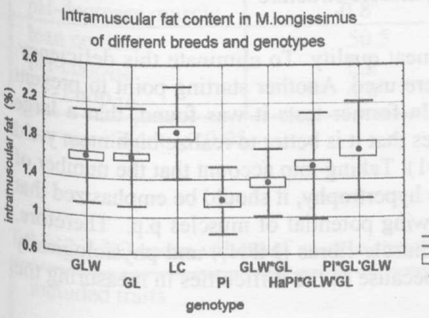
- intramuscular fat:
  - without acid digestion, Soxtec HT2
  - extraction with n-Hexan
  - values related to fresh matter

- muscle structure:
  - autopsy samples approx. 45min.p.m. from 3 locations of M.longissimus
    - * 9th rib = 1
    - * 2/3 last rib = 2
    - * 4th lumbar vertebra = 3
  - storing in fluid nitrogen
  - 12 µm cuts of frozen samples at right angle to fibrelines
  - histological verification of diaphorase and ATPase

Results

Fig.1 shows that no genotype achieved the optimal value of 2.5% mentioned in literature. Noticable is the high variation of intramuscular fat content. For female line of breeding `Leicoma´ favourable values were found due to a considerable share of Duroc genes.

Fig. 1:



Tab.1: Significant relations between representative traits of fattening and slaughter performance and intramuscular fat content (p< .05)

parameter	intramuscular fat content to (r =)	
fattening performance	feed conversion	.18
	net gain	.15
slaughter performance	slaughter weight	.17
	lean meat percentage	-. 36
meat quality	conductivity 24 h p.m. M.long.	*-. 16*
	conductivity 24 h p.m. M.semimembranosus	*-. 16*

As shown in Table 1 the single phenotypical correlation coefficient of all samples shows the significant antagonism of intramuscular fat content and lean meat percentage in carcass (-.36). However, pigs with a high content of intramuscular fat will at least obtain better meat quality (*-. 16*).

Within M.longissimus, regional differences in the content of intramuscular fat as well as in meat quality charcteristics were found (Fig.2). The unexpectedly low meat quality, characterized by small muscle diameter, in the region of the 9th rib (first measuring point) can be explained by the effect of high voltage electric stunning.

Fig. 2

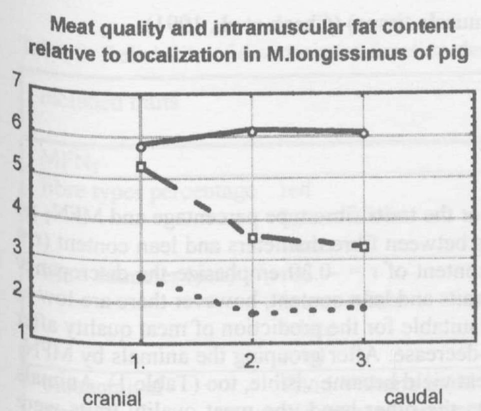
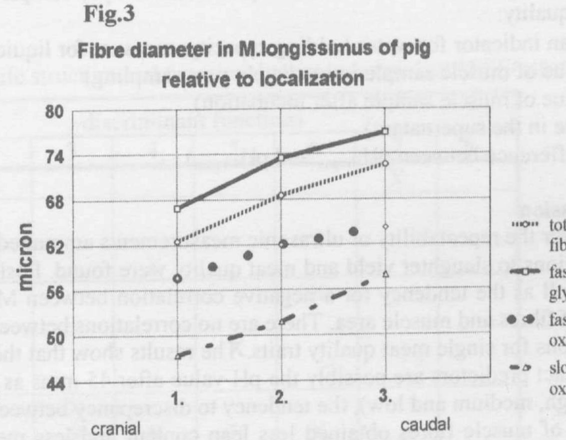


Fig.3



According to observed differences in meat quality and intramuscular fat content, regional differences in muscle structure characteristics are shown in Fig.3.

Muscle fibres found from the cranial to the caudal measuring point tended to have bigger diameters, independent of fibretype.

Conclusions

1. Increase in lean meat percentage results in decline in intramuscular fat content ⇒ to be included as selection criterion
2. There are important differences in local distribution of fat within the homogeneously appearing M. longissimus ⇒ defined location in taking samples
3. Depending on localization in M.longissimus differences in meat quality are noticed ⇒ defined location of measuring
4. Partially significant differences in micro structure of M.longissimus supply evidence for relative non-uniformity ⇒ (innervation, function)