RESULTS ON TECHNOLOGICAL AND SENSORY MEAT QUALITY OF ONCE-BRED SOWS IN A SEASONAL PRODUCTION SYSTEM

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Background

Sustainable outdoor pig production gains on importance due to both the environmental requirements of the Swedish government and requests of the consumers. Limited by the cold climate in Sweden, only summer outdoor rearing of sows is feasible. In winter, the sows should be slaughtered, also to save housing and feed costs after the production season. Compared to slaughter pigs, the payment for sows is strongly reduced because of the assumed lower carcass value due to decreased meat quality and processing properties. To proliferate outdoor rearing systems, a higher contribution margin per sow could attract pig producers to commence this alternative seasonal pork production.

Objectives

The purpose of this study was the comparison of technological and sensory meat quality of once-bred sows and gilts of two different breed crosses.

Methods

Animals

The study was performed in two replicates during two years. Totally 8 Landrace x Yorkshire (LY) and 7 Duroc x Yorkshire (DY) gilts were raised indoors and slaughtered at an average live weight of 145 kg. Littermates to the gilts (in total 16 LY and 24 DY) were raised indoors, inseminated and housed outdoors from one month before farrowing until slaughter. Slaughter of sows occurred two to three weeks after weaning of the piglets. The initial feeding was given *ad libitum* for all pigs. After 2 months, a restricted diet (SLU norm) was given to the gilts until slaughter and to the sows until insemination. Thereafter, sows received adapted gestation and lactation diet. Weaning diet was given *ad libitum* in the first year, which was reduced to 4.0 kg feed per animal and day (48 MJ ME/kg DM) in the second year.

Carcass traits, technological and sensory meat quality

For carcass quality, slaughter weight and estimated lean meat percentage (% ham and back in carcass, % meat and bone in ham and back; Hansson, 1997), back fat thickness and proportion of ham and loin were measured. Technological meat quality was recorded as pH (Mettler Delta 340 pH-meter, equipped with a Xerolyte™ electrode), internal reflectance (FOP, 900 nm; TBL Fibre Optics Group, Ltd, Leeds, England) and surface reflectance (Minolta Chroma Meter CR 300, Osaka, Japan) in *M. longissimus dorsi* (LD). Water holding capacity was determined as thawing loss in *M. semimembranosus et adductor* (SMA) and drip loss (horizontal storing of a 2 cm thick slice of LD for 3 days at 4° C). Maximal force and total work (total area under the curve) of Warner-Bratzler (WB) shear-force was measured on cooked LD (internal temperature: 70 °C, TA-HDI texture Analyser; Stable Micro Systems, Surrey, England). In 27 animals, commercial processing yield of cured and warm smoked SMA (frozen and thawed, without tumbling) was studied. Intramuscular fat (IMF), protein, dry matter and ash were determined as described by Enfält at al. (1996). Sensory meat quality of oven-baked loin was investigated from animals of the first year and of cured smoked SMA from animals of the second year. The scale for the taste characteristics scored from 1=very low intensity of the character to 100 =very high intensity.

Statistics

Statistical analysis of carcass traits, technological and sensory meat quality was performed with the GLM procedure of SAS (Version 8e, SAS Institute Inc., Cary, NC, USA). The model included the status of maturity (gilt or once-bred sow) and breed cross (DxY or LxY). Model for sensory quality included taste panel member and individual pig as random effects.

Results and discussion

Carcass weight and thus proportion of whole ham in carcass, as well as percentage of meat and bone in loin and ham were significantly higher in sows due to higher age and weight at slaughter compared to gilts. In addition, lean meat content, intra muscular fat content and dry matter were higher in sows than in gilts. Commercial processing yield of cured and smoked ham was not significantly different between sows and gilts, whereas the thawing loss was significantly higher in gilts. Higher thawing loss in ham could be explained by the decreased proportion of muscle surface to muscle weight, but could not be explained by different pH values, FOP values or chemical composition of the meat. Percentage of crude protein, ash and drip loss did not differ significantly between sows and gilts. WB shear force measurement on cooked LD revealed that meat of sows required significantly greater total work than that of gilts, whereas the maximal shear force did not differ significantly between the groups. However, in the taste panel evaluation, oven-baked loin that is comparable to cooked loin, and cured smoked ham muscle were assessed to be equally tender. In other studies, meat from once-bred sows was generally judged to be tougher than meat from gilts (Elliot, 1982; Ellis et al., 1996). This could be verified in the present study by the total work of WB shear force measurement (206.9 Nmm vs 182.3 Nmm). However, no differences in tenderness were observed by the measurement of maximum needed WB shear force nor by the taste panel. Juiciness in cured ham muscle scored significantly higher in sows than in gilts. Also in the oven-baked loin, a tendency of juicier meat of sows compared to gilts was revealed. The higher juiciness of these processed products could be probably explained by the significantly higher IMF (2.4% in sows vs. 1.8% in gilts). No differences in flavour between the processed meat of sows and gilts could be detected by the taste panel. This is in accordance to Elliot et al. (1982), who proclaimed no differences in tenderness and flavour of cooked LD between once-bred sows and gilts.

From this study, it can be concluded that technological and sensory quality of meat from once-bred sows was adequate with regard to meat percentage and processing yield; pH and FOP values did not differ and colour measurements revealed no differences. Assumed tougher meat was not confirmed by the trained taste panel nor by measurement of maximal shear force, even if the larger total work of the WB measurements provided an indication of tougher meat. In addition, stringiness was significantly higher in cured smoked ham from sows. The somewhat tougher meat of once-bred sows could be a slightly unfavourable aspect against the use of sows for pork production. Apart from that, once-bred sows produced a carcass with otherwise adequate technological and sensory meat quality that should receive a reasonable payment.

Pertinent literature

Elliot, J. I., G. A. Lodge and A. Fortin (1982). Reproductive performance, growth and carcass characteristics of gilts mated at puberty, restricted in food intake during gestation and slaughtered post-partum. Animal Production, 34: 17-29.

Ellis, M., V. R. Fowler, M. F. Franklin, J. D. Wood and M. A. Varley (1996). The influence of feeding regimen and lactation length on growth, carcass characteristics and meat quality of once-bred gilts. Animal Science, 62: 561-571.

Enfält, A. C., K. Lundström, I. Hansson, N. Lundeheim and P. E. Nyström (1996). Effects of outdoor rearing and sire breed (Duroc or Yorkshire) on carcass composition and sensory and technological meat quality. Meat Science, 45: 1-15.

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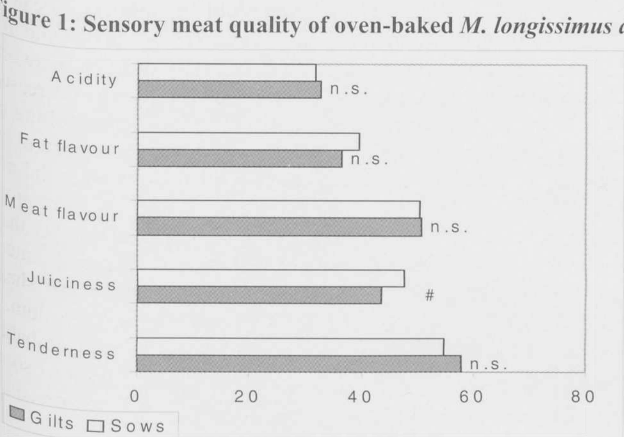
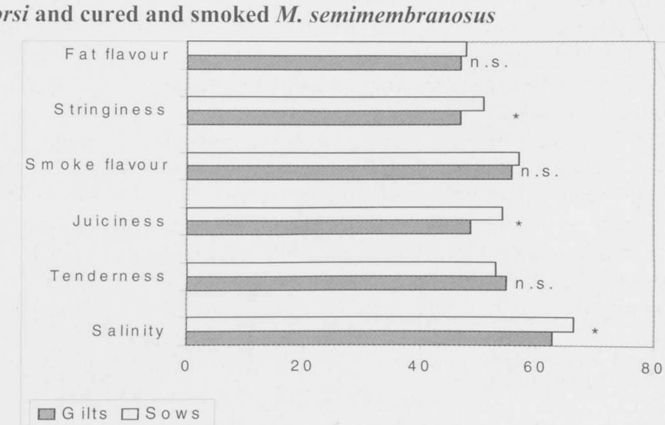
Table 1: Carcass traits and technological meat quality of gilts and once-bred sows, least squares means and standard error

	Gilts		Sows		p-value
	Mean	SE	Mean	SE	
Carcass weight, kg	119.8	4.03	146.6	2.50	**0.001**
Estimated meat percentage, %	51.6	0.66	55.2	0.40	**0.001**
Whole ham in carcass, %	29.1	0.32	30.3	0.20	**0.003**
Meat and bone in ham, %	75.3	0.69	77.9	0.42	**0.002**
Meat and bone in loin, %	70.7	1.09	74.0	0.66	**0.012**
Back fat thickness, mm	22.9	1.50	19.4	0.94	0.059
IMF, %	1.8	0.18	2.4	0.11	**0.012**
Crude protein, %	24.2	0.49	23.4	0.30	0.168
Ash, %	1.1	0.05	1.0	0.03	0.098
Dry substance, %	73.9	0.20	75.0	0.12	**0.001**
Drip loss, %	5.9	0.50	5.3	0.31	0.354
pH_{LD}	5.44	0.02	5.46	0.01	0.365
FOP_{LD}	34.9	1.78	36.8	1.06	0.377
L*	48.2	1.06	47.9	0.42	0.808
a*	7.36	0.60	8.33	0.24	0.142
b*	4.15	0.52	3.61	0.21	0.351
Ham yield, %	98.2	0.97	98.6	0.69	0.743
Thawing loss, %	10.7	0.73	7.7	0.52	**0.003**
WB, max shear force, N_{LD}	36.5	2.57	40.5	1.56	0.191
WB, total work, Nmm_{LD}	182.3	9.77	206.9	5.92	**0.037**

Figure 1: Sensory meat quality of oven-baked *M. longissimus dorsi* and cured and smoked *M. semimembranosus*





Levels of significance: n.s. p>0.10, # p<0.10, **p<0.05, **p<0.01, ***p<0.001;

M. longissimus dorsi. M. semimembranosus