

EFFECT OF FEEDING DANISH ACORN (*QUERCUS ROBUR* L.) ON MEAT AND EATING QUALITY IN PIGS – A PILOT STUDY

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Background

Fermented Iberian hams (*Isabel et al.*, 1999) are produced from Black Iberian pigs fed the last two months before slaughter with acorns from a local species of oak (*Cava et al.*, 1999). This results in a highly appreciated product. Acorns from the Danish oak species (*Quercus robur* L.) contain bitter compounds and possibly also antioxidants, it could therefore be expected that feeding acorn-rich diets over a defined period of time might affect the sensory quality of the meat. In addition it could be expected to affect the oxidative stability of the meat. As acorn-feeding seems suitable in organic pig production, a pilot study was performed with two diets: Five pigs fed a conventional diet composed of 70% concentrate and semi ad libitum clovergrass silage and five pigs fed 70% concentrate and semi ad libitum acorns.

Objectives

Combined with a so-called "acorn year" in Denmark in year 2000, the above mentioned knowledge offered the possibility to collect a reasonable amount of acorns of the oak species *Quercus robur* L. in order to conduct a pilot experiment on feeding organic acorns to pigs with the aim of obtaining a positive effect on meat and eating quality compared with "traditional" organic feeding of fattening pigs (*Danielsen et al.*, 2000; *Hansen et al.*, 2001).

Methods

The experiment was conducted at the organic research station Rugballegaard in the autumn of 2000. The ten fattening pigs included in this pilot study were distributed to two treatments according to start weight, sex (castrates and gilts) and litter. The five pigs on the two experimental treatments were placed in two neighbouring pens with access to an outdoor area according to the legislation for organic pig production. Start weight was the weight 4 weeks before slaughter. The 5 pigs on the control treatment were fed 70 percent organic concentrate according to scale plus semi ad libitum with clovergrass silage, while the acorn-fed pigs were fed 70 percent organic concentrate according to scale plus semi ad libitum with acorns (three kilo acorns per day per 5 pigs).

All ten pigs were slaughtered at the DIAS research abattoir. The average live weight at slaughter was 102 kg. During transport and during lairage at the abattoir, the two treatment groups were kept in separate pens. The pigs from the two treatment groups were alternately slaughtered. Chops and 30 cm loins (*M. long. dorsi*) were vacuum-packed, ripened for 2 days and frozen at minus 20°C.

Meat, carcass and fatty acid measurements as well as GC-MS-aroma profile of chops from *M. long. dorsi* were performed at DIAS. Sensory evaluation of the 10 loins of 30 cm (*M. long. dorsi*) was made at the Danish Meat Research Institute by a trained taste panel of 8 members. However, loins from eight of the pigs were used only as sensory results, as one loin from each treatment was used to train the 8 panel members. The sensory profile deals with the following sensory attributes: off odour, off flavour, pig odour, pig flavour, meat odour, meat flavour, acidic odour, acidic flavour, hardness at first bite, tenderness, juiciness, crumbles, stringiness, firmness of fat and crunch of the prepared meat. Meat quality measurements included the following attributes for all 10 pigs: drip loss, Minolta colour measurements (L^* , a^* , and b^* -values), meat percentage (Fat-O-Meter), pH-45-minutes, pH-24-h, vitamin E, fatty acid composition and TBARS.

Statistics were done on all variables by mixed models in SAS (SAS Proc Mixed): Variable = animal replicate (litter) + treatment + warm carcass weight. In the case of all the sensory attribute variables, each variable was calculated as an average of panel members and two sensory replicates. Furthermore principal component analyses (PCA) in Unscrambler version 7.5 were done on sensory attributes as well as GC-MS-profile data and fatty acids.

Results and discussion

With a small sample from 4 or 5 pigs per treatment in the case of sensory attributes, meat and carcass measurements as well as production results, no significant, statistic results could be expected except in cases with very large differences between treatments. Therefore this pilot study can only point at possible quality differences between acorn-fed pigs and pigs fed "conventional" organic diets.

Production results: There were no differences in start weight, live weight, daily gain and warm carcass weight at slaughter between the two treatments. **Sensory attributes:** In the case of sensory attributes there were no statistically significant differences between treatments (Table 1). However, the prepared meat of the acorn-fed pigs tended to be more crunchy and furthermore the meat of the acorn-fed pigs seemed to have less meat and pig flavour. **Meat quality and fatty acids:** In general no significant differences between treatments were found for meat quality attributes except in the case of meat redness, as the acorn-fed meat seemed to be more red/dark by Minolta colour measurement than the control meat (Table 2). Neither fatty acids nor GC-MS analysis of the meat demonstrated significant differences between treatments.

An experimental period of four weeks is probably sufficient to show a feed-induced change in the chemical composition of the meat, e.g. fatty acid distribution in membrane lipids against more unsaturated fatty acids. If a change in feed composition leads to significant changes in the chemical composition, the taste perception will change too. There may be several reasons for the found negligible differences. One might be that the pigs have eaten fairly small amounts of acorn kernels. If the pigs on average have eaten approx. 600 g acorn/day, the weight of the kernels is probably only 200 g, which is relatively low compared with the amount of clover grass silage eaten by the control treatment. However, it was impossible to get the pigs to eat more of the fed acorns. Therefore, a repetition of the experiment seems futile also considering the long interval between good acorn years. Unfortunately, this is also the case with beechnuts, which might be more acceptable to the pigs than the bitter acorns.

Conclusion

Even though no firm conclusion can be drawn from the present pilot study, feeding Danish acorns to pigs four weeks before slaughter seems to decrease meat and pig flavour of the cooked meat and tends to result in more crunchy meat compared with meat from clovergrass silage-fed organic pigs. Besides the acorn meat seemed to be more red/dark.

Reference List

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Table 1. Sensory attributes (avg.) on a scale from 0-15 from acorn- and clovergrass silage-fed pigs

Treatment:	Control organic	Acorn fed	P-value
Feeding	Organic control fed 70% concentrate plus clovergrass silage	5 kg acorn per 5 pigs plus 70% concentrate	
Sensory attributes			
No. of pigs	4	4	
Meat odour	8.0	7.9	0.44
Pig odour	1.0	1.0	0.91
Off odour	0.7	0.8	0.76
Acidic odour	1.1	1.1	0.77
Meat flavour	8.0	7.8	0.16
Acidic flavour	3.8	3.8	0.93
Pig flavour	2.3	1.9	0.18
Off flavour	1.2	1.3	0.99
Hardness at 1 st bite	6.2	6.0	0.87
juiciness	8.9	9.0	0.89
Stringy	5.6	5.4	0.79
Crunch	4.7	5.3	0.09
Crumbling	2.6	2.7	0.31
Tenderness	8.4	8.5	0.94
Fat firmness	6.8	7.2	0.40

Table 2. Meat quality attributes from acorn and clovergrass silage fed pigs (n=5).

Treatment	Control organic	Acorn fed	P-value
Feeding	70% concentrate plus clovergrass silage	5 kg acorn per 5pigs plus 70% concentrate	
Meat quality attributes	Lsmeans	Lsmeans	NS
pH1-45minute	6.41	6.41	NS
pHu-24hours	5.40	5.35	NS
Drip loss%	4.88	4.89	NS
Meat percentage	59.9	60.1	NS
L*-value	51.2	52.8	NS
a*-value	7.89	8.99	*
b*-value	5.57	6.04	NS
Tbars	0.159	0.168	NS

*): P<0.05;