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Effect of organic pig production systems on performance and meat quality

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Abstract

The present study was carried out to establish knowledge of consequence for setting up guidelines of importance for production of competitive organic pork of high quality. Performance and meat quality characteristics were compared between three organic pig production systems based on indoor housing with access to an outdoor area and a Danish conventional indoor system including 100% concentrate during the finishing feeding stage.

The three organic systems used the following three feeding regimes: 100% organic concentrate according to Danish recommendations, 70% organic concentrate (restricted) plus ad libitum organic barley/pea silage and 70% organic concentrate (restricted) plus ad libitum organic clover grass silage, respectively.

With exception of a slightly lower daily gain in organic pigs fed 100% concentrate, no significant difference was found in performance and meat quality characteristics compared with results obtained in the conventional system. In contrast and independent of roughage used, organic pigs raised on 70% concentrate had a significant reduction in daily gain ($P < 0.001$) compared with pigs raised on 100% concentrate, despite the fact that no difference in feed conversion rate was seen between the tested production systems. However, the percentage of leanness increased significantly in meat from organic pigs raised on 70% concentrate plus roughage compared with meat from pigs given 100% concentrate. This was reflected in higher yield (weight) of lean cuts and lower yield of cuts with high fat content from pigs fed 70% concentrate plus roughage. In general, organic feeding resulted in a significantly higher content of polyunsaturated fatty acids in the back fat (1.8%), which increased further when restricted feeding plus roughage (4%) was used. Restricted concentrate feeding gave rise to a decrease in tenderness compared with pork from pigs fed 100% concentrate.

Keywords: Organic; Pig; Production systems; Performance; Pork; Quality; Yield

1. Introduction

Extensive pig production systems, e.g., free-range production or other forms of enriched production, have gained increasing interest in Europe and North America (Bridi, Müller, & Ribeiro, 1998; Dworschak et al., 1995; Enfält, Lundstrom, Hansson, Lundeheim, & Nystrom, 1997; Lebret et al., 1998; Sather, Jones, Schaefer, Colyn, & Robertson, 1997).

Beside a few traditional pig production systems, e.g., Iberian pig production in La Dehesa (Lopez-Bote, Diestre, & Monfort, 1998), a change from confinement to enriched systems including aspects of free-range will be a challenge in a pig production, which is being constantly modernised, as pointed out in several papers (Jakobsen and Hermansen, 2001; Lopez-Bote and Rey, 2001; Lopez-Bote et al., 1998; Nilzen et al., 2001).

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Organic pig production is one of the enriched systems, which has attracted most attention in Denmark. Subsidized change from confinement to organic pig production during the last years of the past century has established a certain potential in Denmark. However, throughout the period 2001–2004, the market share of organic pork was only around 0.5–0.6% without any tendency to increase much further. Consequently, the recent demand for high quality organic pork in the UK and at the German market (Hamm & Gronefeld, 2004) has been followed with great interest in Denmark.

Previous Danish studies have shown that conventional pork is often more tender than pork from organic pork production systems (Danielsen, Hansen, Møller, Bejrholm, & Nielsen, 2000). This has been suggested to be due to lower daily gain in organic production (Danielsen et al., 2000), which is known to decrease the proteolytic potential of the muscle at the time of slaughter (Therkildsen, Melchior Larsen, Bang, & Vestergaard, 2002). Moreover, the amount of intramuscular fat in organic pork has been reported to be higher (Sundrum, Butfering, Henning, & Hoppenbrock, 2000), and the fatty acid composition to be more unsaturated compared with meat from traditionally reared pigs (Claudi-Magnussen, 1999; Hansen, Bejerholm, Claudi, & Andersen, 2000; Nilzen et al., 2001). This may result in inferior technological meat quality due to enhanced lipid oxidation and presence of soft fat (Lopez-Bote et al., 1998; Nilzen et al., 2001; Warnants, Oeckel, Boucque, & van-Oeckel, 1996; Warnants, Van Oeckel, & Boucque, 1998). The vitamin E content has been shown to be higher in pork from outdoor-reared organic pigs with access to grass compared with indoor-reared pigs (Hansen et al., 2000; Nilzen et al., 2001). However, the difference is not expected to be high enough to compensate for the higher level of polyunsaturated fatty acids in relation to the oxidative stability of the meat. In contrast to these non-superior quality traits, meat from organically reared pigs has been reported to have an increased lean yield (Sather et al., 1997; Sundrum et al., 2000) and higher wholesale carcass value due to heavier loins and hams compared with pork from pigs in a confinement system (Sather et al., 1997).

Above data clearly support that differences in carcasses and pork from "new" production systems like organic pig production are not due to the rearing system alone; genetic factors, feeding and pre-slaughter handling have all to be considered as stated by Jaturasitha, Scheeder, and Kreuzer (1998).

Consequently, introduction of organic pig production systems calls for establishment of quality assurance programs that ensure production of high quality pork, as demanded by the organic consumer segment.

The present study was carried out to establish initial guidelines for organic pig producers in the production of high quality pork considering that pen systems with access to out-door area are going to be the most cost effective systems, and that roughage based on either barley/pea silage or clover/grass silage will be the most dominating in Denmark. The effect of the tested organic feeding strategies on production results and overall pork quality is compared with equal data from a typical conventional pig production system known to give rise to high quality pork.

Therefore, the objective of this project is to contribute to the development of economically profitable farming systems for production of high quality organic pork.

2. Materials and methods

2.1. Animals and experimental design

The experiment (Table 1) comprised four trials with two experimental pen replicates of each of the four treatments: Treatment A (conventionally reared Danish pigs fed 100% concentrate according to Danish recommendations (without roughage and outdoor area)) was compared with three different organic pig production systems with access to outdoor area, where the pigs were fed either Treatment B (100% organic concentrate according to Danish recommendations (without roughage)), C (70% organic concentrate according to Danish recommendations (restrictedly) plus ad libitum organic barley/pea silage) or D (70% organic concentrate according to Danish recommendations (restrictedly) plus organic ad libitum clover grass silage, where the relative levels of concentrate feeding refer to an

Table 1
The experimental treatments

Treatment	A	B	C	D
Concentrate type	Conventional	Organic[a]	Organic	Organic
Concentrate feeding level according to scale	100% ad libitum	100% ad libitum	70%	70%
Roughage type ad libitum	None	None	Barley/pea silage	Clover grass sil.
Straw in the laying area	+	+	+	+
Outdoor area	−	+	+	+
No. of pigs per treatment	40	40	40	40
No. of summer trials	2	2	2	2
No. of winter trials	2	2	2	2
No. of pen replicates per trial	2	2	2	2
No. of pen replicates per treatment totally	8	8	8	8

[a] Organic treatment, but without roughage.