INFLUENCE OF THE DUROC BREED ON PIGMEAT QUALITY

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SUMMARY

Two studies were done to assess the value of the Duroc breed in the UK in terms of carcass and meat quality. In the first, pure Duroc entire males of 76 kg live weight had thicker backfat than Landrace and D x L, higher concentrations of androstenone in backfat and higher concentrations of extractable lipid (EL) in *M.longissimus*. There was no consistent breed effect on eating quality. In the second study, Duroc crossbred pigs were fatter than Large White crossbreds and had higher concentrations of EL and total lipid (TL) in *M.longissimus* of thoracic and lumbar chops (e.g. in thoracic part: EL 1.4% in D, 1.0% in LW; TL 1.8% in D, 1.4% in LW). In both studies, Durocs had higher concentrations of intramuscular lipid at the same P2 as Large Whites although this did not result in more tender or juicy meat.

INTRODUCTION

Early American studies (e.g. Hiner et al. 1965) showed that pigs of the Duroc breed had higher concentrations of muscle lipid ('marbling fat') than other breeds which resulted in juicier, more tender meat. More recently, Durocs have been introduced in large numbers into Europe for reasons of performance and productivity, and there has been speculation that their propensity to deposit lipid preferentially in muscle might raise eating quality at the low backfat levels now found. A strong association between marbling fat and eating quality was found by Bejerholm and Barton-Gade (1986).

Two studies were therefore done to evaluate meat quality in purebred and crossbred Durocs in comparison with white breeds.

MATERIALS AND METHODS

Experiment 1

Twenty-one pure Duroc, 21 pure Landrace and 21 Duroc x Landrace entire males weighing 86 kg live weight were slaughtered at the IFR abattoir following *ad libitum* consumption of a ration containing 13.8 MJDE and 200 g crude protein per kg. The Durocs were from a selected Nucleus line, originally established from a Canadian importation in 1968 and subsequently expanded and improved using frozen semen from the USA during the period 1980-85. Routine measurements were made of carcass and meat quality. Muscle lipid was assessed in cores of *M.longissimus* and loin steaks (including *M.multifidi*) using diethyl ether extraction. The concentration of 5α-androstenone in backfat from the loin was measured using an ELISA technique. Finally chops from the hindloin were used for eating quality tests following grilling to a central temperature of 80°C.

Experiment 2

Loin chops, equal numbers of thoracic and lumbar, were taken from 128 carcasses in the following experimental design: 2 breeds (Duroc, Large White) x 8 sires (Durocs representing same importations as Experiment 1) x 2 diets (2% and 4% fat) x 2 litters (from Large White x Landrace sows) x 4 pigs per litter (2 entire males and 2 females). The pigs were fed *ad libitum* at Terrington EHF from 38 kg to 80 kg live weight and slaughtered in a commercial abattoir. A range of meat quality measurements was made on chops transported to IFR including *M.longissimus* lipid concentration determined by extraction with diethyl ether (extractable lipid) and diethyl ether with acid hydrolysis (total lipid). Fat firmness was measured with the penetrometer developed by Dransfield at IFR.

Table 1. Results of Experiment 1

	Duroc	Landrace	DXL	Signif.
P2 fat thickness (mm)	14.8	10.9	12.6	**
Carcass length (mm)	737	801	780	***
pH45	6.5	6.2	6.2	*
pHULT	5.6	5.6	5.7	NS
Lipid in m. longissimus (%) a	1.6	0.8	0.9	***
Lipid in steak (%) b	4.0	2.2	2.8	***
5α-androstenone (µg/g)	2.0	0.5	1.5	**
Tenderness c	0.6	1.6	0.2	*
Juiciness d	1.0	0.8	0.7	*
Flavour c	2.3	2.4	1.9	NS
Overall acceptability c	1.5	1.7	0.7	NS

a Core from centre of muscle. b Whole of 'eye muscle' including m. longissimus, mm multifidi and associated intermuscular fat. c Scale -7 to +7. d Score 0 to 4.

Table 2. Results of Experiment 2

		Duroc	Large White	Signif.
Lifetime liveweight gain (g/d)		555	539	*
P2 fat thickness (mm)		14.1	13.0	**
pH45		6.5	6.4	**
Fat firmness	- thoracic a	738	792	***
	- lumbar a	721	752	*
Extractable lipid (%)	- thoracic b	1.4	1.0	***
	- lumbar b	1.4	0.9	***
Total lipid (%)	- thoracic b	1.8	1.4	***
	- lumbar b	1.8	1.3	***
Tenderness c		-0.3	-0.0	NS
Juiciness c		1.3	1.3	NS
Flavour c		2.1	2.0	NS
Overall Acceptability		1.0	1.1	NS

a Scale 0 - 1000, corrected to 4°C. b In cores of m. longissimus. c As Table 1.

RESULTS

Experiment 1

The main results are given in Table 1. Durocs had thicker backfat and shorter carcasses than Landrace with D x L intermediate. pH45 was slightly higher in Durocs. The concentration of ether-extractable lipid in Durocs was almost double that in the other breed types, the concentration in the 'loin steak' being double that in the *M.longissimus* core. Androstenone concentration was higher in Durocs although this did not adversely affect the taste panel's evaluation of flavour in grilled chops. Tenderness was rated more highly in Landrace and juiciness in Duroc but there were no consistent breed effects on eating quality.

Experiment 2

The main results are given in Table 2. Durocs had a faster growth rate, thicker fat and higher pH45 values than Large Whites. Fat firmness was lower in Durocs in both thoracic and lumbar chops. *M.longissimus* lipid concentrations were higher in Durocs, values for total lipid (which includes phospholipids) being some 30% higher than for extractable lipid. There were no differences between the breeds for any aspect of eating quality.

DISCUSSION

The results show that UK Durocs have slightly fatter carcasses than UK Landraces and Large Whites. The values for intramuscular lipid are higher in Durocs, both pure and crossbred, than in the white breeds and this effect is independent of carcass fatness as shown by the following regressions involving extractable lipid in the thoracic part of *M.longissimus* for entire males.

Experiment 1:

$$\%\ \text{lipid} = 0.05\ P2 + 0.223\ \text{Landrace} + 0.861\ \text{Duroc}$$

Experiment 2:

$$\%\ \text{lipid} = 0.02\ P2 + 0.894\ \text{Large White} + 1.082\ \text{Duroc}$$

The values for *M.longissimus* lipid for the crossbred pigs in Experiment 2 are similar to those for Duroc and Large White sired pigs (on Large White x Landrace sows) reported by Barton-Gade (1987). For pigs of all sexes weighing 70 kg carcass weight, total lipid in *M.longissimus* in that study was 1.31 (Large White), 1.73 (Duroc) and 1.31 (Hampshire). These levels are lower than the figure of 2.5% suggested by Bejerholm and Barton-Gade (1986) as being optimum for tenderness and juiciness in cooked pigmeat.

The levels of extractable lipid in *M.longissimus* (marbling fat) found currently in commercial pigs in Europe are considerably lower than those reported in the American literature in the 1960s (e.g. 7.4% in Durocs, Hiner et al. 1965) and currently (e.g. 3.2% in a random sample of pork carcasses, DeVol et al. 1988). The main explanation is higher average levels of carcass fat generally in American pigs.

At the levels found in this study, higher concentrations of marbling fat in Durocs and Duroc crosses did not result in consistently better eating quality, a result also found by McGoughlin et al. (1988). Improvements in the eating quality of lean pigmeat can occur if several production and processing factors are combined in an optimum way. Substituting Durocs for white sires is unlikely to make a large difference.

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