

EFFECT OF MELANOCORTIN-4 RECEPTOR (MC4R) GENOTYPE ON FAT COMPOSITION OF DUROC-CROSSED SLAUGHTER PIGS.

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Background

Raw material is a decisive factor in dry cured ham quality. Some studies show that the most important attributes related to ham quality are fat cover and intramuscular fat (IMF) (Gou et al., 1995). For all these reasons, together with the high heritability of IMF, Duroc-crossed animals are widely used for this market (Soriano-Pérez, 2001). Guerrero et al., 1996, studied the sensory characteristics and physicochemical parameters of cured ham from three genetic lines and those from Duroc obtained high marbling score and better acceptability compared to the others. Also, consumers prefer dry cured ham from carcasses of barrows (Diestre et al., 1990) to avoid boar taint detected in ham from entire males. Marker assisted selection (MAS) could be used together with quantitative genetics to select the right boars for pyramids dedicated to cured ham production in Spain. To explore this possibility we have investigated the use of a polymorphism in melanocortin-4 receptor which influences back fat, growth rate and feed intake in pigs under *ad libitum* feeding conditions (Kim et al, 2000).

Objectives

Research was conducted to evaluate the effect of MC4R status on the level of subcutaneous and IMF content in ham and loin of Duroc-crossed slaughter pigs produced under a program orientated through high quality raw material for cured products.

Methods

Slaughter pigs (26 barrows and 20 gilts) from Duroc boars x [Duroc x (Landrace x Large White)] sows were raised under a specially designed nutritional program from 75 kg to slaughter weight (3200 Kcal/kg ME and 4.3 gr Lysine/kg). Feed and water were provided *ad libitum*. Selection of animals for this trial was based on MC4R status (homozygous -22- and heterozygous -12- for the high feed intake allele), and they were slaughtered at 83.7 +/- 8.74 kg carcass weight after a 12 hour fasting period.

The back fat cover between the last 3/4 last ribs level was recorded for each carcass after slaughter using Fat-o-meter equipment (Gispert and Diestre, 1994). Subcutaneous fat just over the *Gluteus Medius* in the trimmed ham was measured by ruler. Samples of *Semimembranosus Muscle* (SM) and *Longissimus Thoracis* (LT) were collected and stored at -20°C till further analysis for IMF content using a Near Infrared Transmittance (Infratec 1265) apparatus (Gispert et al., 1997). These results are related to ether extract only and without acid hydrolysis. The results are given in percentage of fat in the meat and represent the extraction of triglycerides. To obtain the total lipid content, it is necessary to multiply by 1.2 (Wood, 1990). Subjective score of marbling in the loin, at the level of the last rib, were estimated using a pattern of NPPC-1999. Data were evaluated by SAS (SAS for windows v. 8.1, 1999-2000) where the genotype and sex were analysed by least squared procedure, using the General Linear Models. There was no interaction between genotype x Sex effects. The model used carcass weight as a covariate.

Results and discussion

Table 1 shows the least squares means and standard errors for the different fat measurements of Duroc crossed pigs.

Animals with two copy of the allele 2 had significantly greater back fat depth (24.6 vs 19.0 mm) and subcutaneous fat cover in the ham (22.13 vs 18.67 mm) when compared to heterozygous pigs. Kim et al, 2000 found similar results on fat depths. On the other hand, only a tendency ($p < 0.1$) for greater IMF in the LT (3.79 vs 2.71%) and for the subjective marbling score (4.3 vs 3.5) were observed in pigs with two copies of the obese allele (2). Those results are very promising regarding the potential use of such a marker (MC4R) for tailored boar production targeting the Spanish cure ham segment. Further studies are needed to confirm tendencies observed in this work.

Regarding sex effect, barrows had greater back fat depths (24.1 vs 19.5 mm) and subjective marbling score (4.5 vs 3.2) when compared to gilts. These results are in agreement with Gou et al., 1995. On the other hand, the IMF content of both studied muscles (LT and SM) analyzed did not follow the subjective marbling score pattern observed in this trial. The IMF showed high variation, partially explaining why no differences are observed despite of the mean values.

Conclusions

Duroc boars can be selected for high quality Serrano ham production systems in Spain by utilizing the MC4R marker technology in addition to classical quantitative genetic means. Hams from barrows have some advantages over those of the gilts in relation to the high marbling and greater subcutaneous fat depths. This work illustrates new opportunities for the use of Marker Assisted Selection (MAS) in pure Duroc lines.

Pertinent Literature

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Acknowledgments

The research was funded by P.I.C. España and Sociedad Cooperativa Ltda de Artesa de Segre.

Table 1. Effect of MC4R genotype and sex on lipid component of Duroc crossed pigs (LS mean above SE of the mean).

	MC4R Genotype		Sex		Effect	
	22	12	Gilts	Barrows	MC4R	Sex
Back Fat (mm)	24.6 1.32	19.0 1.81	19.49 0.95	24.10 1.21	**	**
Ham Fat Cover (mm)	22.13 1.34	18.67 0.83	19.9 0.97	20.8 1.24	*	NS
IMF LT (%)	3.79 0.40	2.71 0.26	3.12 0.31	3.38 0.34	+	NS
IMF SM (%)	4.27 0.74	3.43 0.49	4.01 0.58	3.68 0.64	NS	NS
MARBLING	4.3 0.34	3.5 0.23	3.2 0.27	4.5 0.29	+	**

P<0.01: **; P<0.05: *; P<0.1: +; NS: no significant.

LT: Longissimus Thoracis; SM: Semimembranosus;