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Meat quality traits of commercial hybrid pigs in Argentina

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Abstract

This report describes the meat quality of two INTA hybrids (hybrid females) sired by Duroc (D) or Yorkshire (Y) boars and a third one from PIC (S), a cross of females C22 to 412 boars. Starting at 30 kg live weight, 18 barrows and 18 gilts of each genotype were kept in identical conditions until slaughtered at 110 kg. *Longissimus dorsi* muscles were analyzed. Means differed significantly ($P < 0.05$) for drip loss (higher in S); tenderness (more tender in D), water holding capacity (higher in Y); cooking loss (higher in Y); colour parameter L^* (lower in D) and b^* (higher in S) and intramuscular fat content (higher in D). As a result of sensory analysis, it was found that D was the most tender and juicy. There were few sex effects and no genotype–sex interactions. Distinct differences in meat quality between hybrids do exist, with D superior, S the worst, and Y intermediate.

Keywords: Pig; Pork; Meat quality; Genotypes; Argentina

1. Introduction

Pig production in Argentina is becoming more intensified. There are concerns about sustainability of this trend (Boyazoglu, 1998; Hodges, 2003; Honeyman, 1996) and the loss of genetic diversity. It is important to monitor meat quality as rates of pig production are increased. There is evidence of a progressive deterioration of meat quality if breeding is based solely on performance traits, particularly on lean content and feeding efficiency (Brewer, Jensen, Sosnicki, Fields, Wilson, & McKeith, 2002; Fabian, Chiba, Kuhlers, Frobish, Nadarajah & McElhenney, 2003; Hermesch, Luxfordb, & Grasera, 2000; Hovenier, Kanis, van Asseldonk, & Westerink, 1992; Rosenvold & Andersen, 2003; Van Wijk, Arts, Matthews, Webster, Ducro & Know, 2005).

Within this context it was considered crucial for the development of the pig production sector of the country to compare meat quality traits in some of well diffused commercial hybrid pigs, two of them belonging to the genetic program of INTA and the third one coming from a reputable breeding company.

2. Material and methods

2.1. Animals

The experiment was carried out Pergamino Agricultural Experimental Station of INTA. Sires from Duroc and Yorkshire lines that were used to produce hybrid progeny for this study came from the Program of Pig Genetic Improvement (*Mejoramiento Genético de Cerdos*; MGC) conducted by INTA. The sires from the synthetic genotype were from the boar line 412 from PIC (Pig Improvement Company). An effort was made to select several sires (between 5 and 8) from unrelated family within the pure

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lines. Though the hybrid genotypes coming from INTA were the progeny of Duroc (D) and Yorkshire (Y) pure breed boars mated to three breed way crossbred sows (50% Landrace, 25% Yorkshire and 25% Duroc); both of them were free of the RYR1 gene. The PIC 412 boar line was mated to C 22 sows (S). A total of one hundred and eight pigs from those three hybrids of different contemporary litters were used, thirty six of each genotype (18 castrated males and 18 females).

2.2. Experimental design

The experimental design was a full factorial design 3×2 factors (hybrids, sex). Three animals of the same sex and genotype, from an initial weight of approximately 30 kg, up to slaughter at about 110 kg of live weight were kept in identical pens (2.5 m × 2.5 m) in a barn with nipple drinkers and single space dry feeders which were always kept with fresh ration and in a low excess. The pigs were all placed on standard corn–soybean meal diets fed in two growing phases: up to 60 kg and from this weight to 110 kg, when the test was finished.

2.3. Meat samples

At approximately 100 kg live weight, an aliquot of 5 cm^3 of blood was extracted to determine the ryanodine receptor gene (Franco, Brunori, & Vanzetti, 2006). At 110 kg pigs were transported around 140 km in the afternoon and were slaughtered early in the following morning. At 45 min post mortem, pH was measured in the left side of each carcass.

A block of loin comprising between ribs 9 and 11 was taken from the left side of each carcass, samples were identified, refrigerated and transported to Instituto Tecnologia de Alimentos (ITA) where meat quality traits determinations were made.

pH determinations were done in fresh samples. After that, samples were frozen at -20 ± 1 °C until analysis. Before being measured, samples were thawed at room temperature overnight.

2.4. Meat quality traits

2.4.1. Drip loss

Percentage drip loss was determined by dividing the weight loss during thawing by the frozen weight of each sample.

2.4.2. Colour and pH

Colour measurements were carried out using a ByK Gardner Colour View Spectrophotometer (model 9000, USA) following the recommendations of AMSA (1991). CIE Lab system provides the values of three colour components; L^* (luminosity), and the chromaticness coordinates, a^* (redness) and b^* (yellowness). The instrumental conditions were large area aperture (5 cm diameter), D65 – artificial and 10° standard angle observer. The measuring aperture was covered with a glass plate (ByK Gardner Inc., USA), and the instrument was calibrated against a white plate. Each sample was allowed to blood for 45 min prior to the first measurement, and four scans from each steak were averaged for statistical analysis.

pH 45 min and pHu (45 min and 24 h after the slaughter) at the *L. dorsi* was measured using pH meter (Hanna Instruments model HI8314). The data set for pH at 45 min is incomplete because of technical problems.

2.4.3. Water holding capacity (WHC)

The WHC was determined following the filter paper press methodology used by Zamorano (1996). Briefly, this technique implies the compression of the sample over a reticular filter paper and measures the liquid impregnation area on it. This procedure assumes that the area of ring of expressed juice absorbed by the filter paper is related to the amount of the meat free water.

2.4.4. Instrumental tenderness

Warner–Bratzler shear force (WBSF) was determined following the general guidelines established by AMSA (1995) on eight cores (2.0 cm height; 1.27 cm diameter) obtained from a 2.0 cm-thick stick from the medial portion of the muscle using a Warner–Bratzler meat shear machine (model 3000; G-R Manufacturing CO., Manhattan, Kansas, USA).

2.4.5. Cooking loss

After the samples were thawed and boned, they were weighed and cooked in a Philips electric grill until they reached a final internal temperature of 71.5 ± 0.5 °C. Percentage cooking loss was determined by dividing the weight loss during cooking by the pre-cooked weight.

2.4.6. Sensory evaluation

An 8-member trained panel evaluated two random cubes of each steak. The samples were evaluated using a nine-point scale for odor, juiciness, initial and sustained tenderness, flavor intensity and amount of connective tissue (1 = extremely bland, extremely dry, extremely tough, extremely bland and very much to 9 = extremely intense, extremely juicy, extremely tender, extremely intense and nothing, respectively). Panel members were also asked to report description and intensity of off-odors and off-flavors, if present, in separate scales.

2.4.7. Intramuscular fat

Steaks of *L. dorsi* muscles were taken at random from each treatment, carefully dissected and used for chemical analysis. All samples were frozen and stored at −20 °C until analysis were performed. Aliquot samples of 10 g each, trimmed of external fat, minced carefully, dried and extracted in a Tekator apparatus using hexane as the extraction solvent according to official methods (AOAC Official methods of analysis 15th edition 3er supplement, 1992), were used to determine total intramuscular fat (IMF).