Influence of sex on meat quality of Celta pig breed

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SUMMARY

The aim of this work was to study the effect of sex on the chemical composition, color parameters and textural analysis of meat of Celta pig breed. For this purpose, 27 pigs (16 castrated barrows and 11 gilts) were used. Animals were fed ad libitum with a commercial concentrate suited to their nutritional needs and they were slaughtered when they reached a live weight of 102.49±8.23 and 100.72±9.74 kg (P>0.05) for barrows and gilts, respectively. The muscle longissimus dorsi (LD) was extracted from each carcass, between the fourth and the tenth rib. For the investigation of the effect of sex on the different parameters of quality studied, an analysis of variance (ANOVA) was performed for all variables, using the SPSS 21.0 software package for Windows. Color parameters were not significantly affected by gender, although meat from barrows was darker. On the other hand, the pH values did not display significant (P>0.05) differences between sexes with a mean value of 5.94. Regarding chemical composition, the highest moisture and protein contents were observed in barrow samples, whereas the highest intramuscular fat percentages were found in gilts samples. There were no significant differences in cooking loss between sexes with mean values of 15.7%. Finally, no significant differences (P>0.05) between genders on textural parameters measured by WB and TPA test were found.

INFORMATION

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INTRODUCTION

The use of local breeds as an alternative pig production system has important advantages since these breeds are well adapted to the environment and they help to maintain biodiversity and sustainable agricultural production, especially in depressed areas. Celta pig is the unique autochthonous pig breed of Galicia (NW Spain). It is included in the Official Catalogue of Pig Breeds of Spain as being in danger of extinction (Franco et al. 2014, p. 195). The traditional livestock production system of the Celta pig is closed to an extensive or semi-free system than to an intensive system, but nowadays it is commonly farmed intensively.
The Celta pig breed is highly appreciated by consumers for its succulent meat that derives from the profuse infiltration of fat into the lean meat (Franco et al. 2014, p. 195), and production of these pigs mainly focuses on the manufacture of dry-cured meat products such as ham (Bermúdez et al. 2014, p. 263), “lacón” (Lorenzo et al. 2014, p. 211), dry-cured loin (Pateiro et al. 2015, p.4808) and sausages (Gomez & Lorenzo 2013, p. 658). Pig meat production is commonly evaluated according to growth curve performance, carcass composition and meat quality. It is crucial to provide well characterized, high quality, labelled meats to consumers. Factors that affect pig meat composition and quality include genotype, sex, diet, production system, and slaughtering weight and age (Pugliese et al. 2004, p. 523; Pugliese et al. 2005, p. 459). Scarce information about the effect of gender on meat quality of Celta pig breed have been reported until now (Franco & Lorenzo 2013, p. 727), making necessary to study more deeply for the correct characterization of the breed and its products. Under such a scenario, the aim of this study was to assess the influence of sex on chemical composition (moisture, intramuscular fat (IMF), protein and ash content), color parameters and textural properties of meat from Celta pig breed.

MATERIAL AND METHODS

Twenty-seven pigs (16 castrated barrows and 11 gilts) from the Celta breed were used. Animals were fed ad libitum with a commercial concentrate suited to their nutritional needs and they were slaughtered when they reached a live weight of 102.49±8.23 and 100.72±9.74 kg (P>0.05) for barrows and gilts, respectively. At 48 h post-mortem a portion of the loin, M. longissimus dorsi (LD), between the fourth and tenth rib, was taken for meat quality assessment. The LD piece was cut into three steaks of 2.5 cm thickness. The first two steaks were used to assess pH, color parameters and proximate composition, whereas the third steak was used to determine the water-holding capacity and texture parameters. The pH was measured using a digital pH-meter (Thermo Orion 710, Cambridge, USA) was performed. All statistical tests of LSM were performed with a confidence interval of 95% (P<0.05).

RESULTS

The effect of sex on chemical composition and color parameters of LD muscle from Celta pig breed is shown in Table I. The pH values were not significantly (P>0.05) affected by gender, although higher pH values were observed in barrows (5.96 vs. 5.91, for barrows and gilts, respectively). Regarding chemical composition, the highest moisture and protein contents were observed in barrow samples, whereas the highest intramuscular fat percentages were found in gilt samples (2.13 vs. 3.56%, P<0.05, for barrows and gilts, respectively). On the other hand, color parameters were not significantly affected by gender, although meat from

<table>
<thead>
<tr>
<th>Table I. Effect of sex on pH, color parameters and chemical composition of longissimus dorsi muscle from Celta pig breed. Values are means ± standard deviations</th>
<th>Barrows (n=16)</th>
<th>Gilts (n=11)</th>
<th>SEM</th>
<th>SIG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH</strong></td>
<td>5.96 ± 0.16</td>
<td>5.91 ± 0.32</td>
<td>0.05</td>
<td>n.s.</td>
</tr>
<tr>
<td><strong>Color parameters</strong></td>
<td></td>
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<tr>
<td>Luminosity (L*)</td>
<td>49.26 ± 2.62</td>
<td>50.72 ± 3.54</td>
<td>0.59</td>
<td>n.s.</td>
</tr>
<tr>
<td>Redness (a*)</td>
<td>2.10 ± 1.28</td>
<td>2.71 ± 1.36</td>
<td>0.26</td>
<td>n.s.</td>
</tr>
<tr>
<td>Yellowness (b*)</td>
<td>11.17 ± 0.98</td>
<td>11.22 ± 2.07</td>
<td>0.29</td>
<td>n.s.</td>
</tr>
<tr>
<td><strong>Chemical composition (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture</td>
<td>73.33 ± 0.99</td>
<td>72.27 ± 1.93</td>
<td>0.29</td>
<td>n.s.</td>
</tr>
<tr>
<td>Intramuscular fat</td>
<td>2.13 ± 0.70</td>
<td>3.56 ± 2.33</td>
<td>0.33</td>
<td>n.s.</td>
</tr>
<tr>
<td>Protein</td>
<td>23.82 ± 0.91</td>
<td>23.08 ± 0.63</td>
<td>0.17</td>
<td>*</td>
</tr>
<tr>
<td>Ashes</td>
<td>1.12 ± 0.09</td>
<td>1.16 ± 0.07</td>
<td>0.02</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

SEM: standard error of the mean. SIG: Significance: *** (P<0.001), ** (P<0.01), *P<0.05), n.s. (not significant).
barrows was darker (Table I). Table II shows the effect of sex on cooking loss, WB shear force and TPA analysis of LD from Celta pig breed. There were no significant differences in cooking loss between sexes with mean values of 15.7%. Finally, no significant effect of gender (P>0.05) on the textural parameters measured by WB test and TPA test was found.

DISCUSSION

The mean pH value (5.94) is considered within the normal range for pigs which do not produce PSE meat. Values in the same range were reported by other authors (Franco, & Lorenzo 2013, p. 727; Pugliese et al. 2004, p. 523; Pugliese et al. 2005, p. 459) in autochthonous pig breeds. On the other hand, our outcomes obtained from chemical composition are in disagreement with those reported by other authors (Pugliese et al. 2004, p. 523; Franco & Lorenzo 2013, p. 727; Franci et al. 2005, p. 545) who did not find any significant differences on IMF between sexes. Overall, the values of IMF content in this study (2.13-3.56%) are comparable with those recorded in other local breeds: 3.19% in Cinta Senese (Franci et al. 2005, p. 545), 2.28% in Celta (Temperán et al. 2014, p. 694), 3.81 in Nero Siciliano (Pugliese et al. 2004, p. 523) and 3.34% in Iberian (Estévez et al. 2003, p. 499) pigs. Although color parameters were not significantly affected by gender, gilts produced lighter and more yellow meat, probably due to its higher intramuscular fat content. This result is in agreement with data reported by Pugliese et al. (2004, p. 523) who noticed that sex did not significantly affect any color parameters in Nero Siciliano pig breed. The CL has a great importance in the properties of meat, because it affects consumer acceptance. Our finding is in agreement with data reported by Franci et al. (2005, p.545) who did not observe significant differences on CL between sexes. However, Franco and Lorenzo (2013, p. 727) found significantly (P<0.01) higher CL values in meat from gilts than from barrows. Finally, WB test was not affected by sex, which agrees with the results reported by Pugliese et al. (2004, p. 523). On the other hand, we found lower hardness values in gilts, which may be due to the different amount of collagen or marbling degree (Huff-Lonergan et al. 2000, pp. 1-4; Maiorano et al. 2013, p. 346; Stoller et al. 2003, p.1513). Contrary, Franco and Lorenzo (2013, p. 727) noticed significantly (P<0.01) higher hardness values in meat from gilts than from barrows. From the results, we can conclude that sex did not have great influence on meat quality of Celta pig breed.

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