PE1.21 Effect of the use of chestnuts in the finishing diet on the meat quality of the Celta pig breed (NW Spain) 184.00

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***Abstract* – The effect of the use of chestnuts in the finishing diet on the meat quality of the Celta pig breed (an autochthonous breed from the NW of Spain) was studied. Thirty six pigs (males and females) were castrated and fed in three different groups: A) Fed during all their life (16 months) with commercial compound feed, B) Fed with commercial compound feed the first 12 months and with a mixed (commercial compound feed/chestnuts) diet in the last four months before slaughtering, and C) Fed with commercial compound feed the first 12 months, with a mixed (commercial compound feed/chestnuts) diet the 13th month, and receiving only a chestnut diet in the last three months before slaughtering. In each carcass the left *Longissimus dorsi* and *Semimembranosus* muscles were obtained and, in each muscle the meat quality was studied (pH; colour; myoglobin, hematin, and haem iron contents; water-holding capacity; intramuscular fat content; and shear force).**

According to the data obtained, the finishing diet does not influence the parameters studied. There was, however, a significant (P<0.05) difference in colour (L*, a*, Chroma), hematin, haem iron, and shear force between the two muscles in each feeding group.

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***Index Terms* – Celta pig breed, Chestnuts, Finishing diet, Meat quality.**

I. INTROUCTION

The NW region is the main area of chestnut (*Castanea sativa* Miller) production in Spain. At the present time, the chestnuts are underutilized, a situation that contrasts with the high current prices of the animal commercial compound feeds. On the other hand, in the northwest of Spain there is an autochthonous swinish breed (Celta) that is characterized by its rusticity and its adaptation to the environment, and that provides a meat of great quality.

The use of the chestnuts in the feeding of the autochthonous swinish breeds, in a extensive management system, would allow to reduce the production costs and to put in the market products of quality, differentiated, with a high added value and with a healthier fat (rich in unsaturated fatty acids).

Now then, given the special incidence of the feeding on the quality of the meat in the swinish livestock, before exploiting this possibility it is necessary to determine with accuracy the effect of the inclusion of the chestnuts in the diet on the characteristics of the produced meat, with the purpose of offering to the consumers and the pork processors a product with absolutely well-known and constant characteristics.

The present work aims to study the effect of the inclusion of the chestnuts, at different proportions, in the finishing diet on the quality of the meat of the Celta pig breed. The final purpose of this research is to establish some feeding rules that allow the obtaining of uniform products and with a maximum quality.

II. MATERIALS AND METHODS

A. Pigs and samples

In order to carry out this study, 36 castrated Celta pigs (males and females) were fed in three different groups: A) Fed during all their life (16 months) with commercial compound feed, B) Fed with commercial compound feed the first 12 months and with a mixed (commercial compound feed/chestnuts) diet in the last four months before slaughtering, and C) Fed with commercial compound feed the first 12 months, with a mixed (commercial compound feed/chestnuts) diet the 13th

month, and receiving only a chestnut diet in the last three months before slaughtering. After slaughtering, and after 24 hours of refrigeration, the left *Longissimus dorsi* and *Semimembranosus* muscles were obtained in each carcass and analysed the same day.

B. Analytical methods

The pH of the muscles was determined following the Spanish official method [1]. A portable colorimeter CE-XTH (Gretagmacbeth LLC, New Windsor, NY, USA) was used to measure meat colour in the CIELAB space (Lightness, L*; redness, a*; yellowness, b*) [2]. Chroma values were calculated as described in [3]. The intramuscular fat content was measured according to the ISO 1443:1973 standard [4]. Myoglobin content was determined following the method descried by Hornsey [5]; hematin and haem iron contents were calculated as described in [3].

To measure properties of texture (shear force), the meat was cooked in a water bath until reached 80 ºC "*in quore*". Then, samples were cooled to room temperature by placing the vacuum package bags in a circulatory water bath set at 18 ºC for a period of 30 minutes. The samples for WB shear test were obtained by cutting pieces of approximately 1x1x2.5 cm. A texture analyser TA.XT2 (Stable Micro Systems Ltd., Surrey, UK) was used and all the samples were cut perpendicular to the muscle fibre direction at a crosshead speed of 1 mm/s. The average value for each sample was recorded between six and eight times.

The water-holding capacity (WHC) was measured by cooking loss (CL); CL was evaluated by cooking a portion of the corresponding muscle as described in the texture analysis and by measuring the difference in weight between the cooked and raw samples [6].

C. Statistical analysis

Analysis of variance (ANOVA) with an interval of reliability of 95% (P<0.05) was carried out for the comparison of the value of each parameter in the three feeding groups. Means were compared by the least-square difference (LSD) test, using the computer programme Statistica© 5.1 for Windows (Statsoft Inc., Tulsa, OK, USA).

Statistical correlations between the parameters determined were carried out by Pearson's correlation coefficient, also using the computer programme Statistica© 5.1.

III. RESULTS AND DISCUSSION

Table 1 shows the weights of the carcasses of the pigs used in this study and the values of the different parameters in the *Longissimus dorsi* muscle in the three feeding groups. The values of the same physical and chemical parameters in the muscle *Semimembranosus* are shown in Table 2.

Table 1.- Weight of the carcasses and physical and chemical parameters in the *Longissimus dorsi* muscle of the Celta pig breed fed with different finishing diets (average ± standard deviation)

	A (n=12)	B (n=12)	C (n=12)
Weight of the carcass (kg)	**140.39±22.13**	**151.66±15.32**	**140.52±29.15**
pH	**5.60±0.12**	**5.60±0.17**	**5.52±0.10**
Myoglobin (mg/100g)	**1.75±0.17**	**1.72±0.18**	**1.64±0.18**
Hematin (ppm)	**20.00±3.83***	**20.31±3.74***	**17.70±4.97***
Haem iron (ppm)	**5.98±0.60***	**5.90±0.61***	**5.60±0.62***
L*	**49.70±4.11***	**49.46±4.45***	**50.72±5.00***
a*	**11.13±1.56**	**11.00±1.94**	**10.99±1.45**
b*	**4.12±1.22***	**4.07±0.99***	**3.48±0.95***
Chroma	**11.89±1.38***	**11.75±2.06***	**11.57±1.42***
WHC (%)	**17.03±3.28**	**17.21±2.60**	**16.91±2.48**
Intramuscular fat (%)	**2.33±1.18**	**1.91±0.84**	**2.59±1.72**
Shear force (Newtons)	**100.41±23.89***	**104.79±10.75***	**108.53±26.65***

A= commercial compound feed diet; B= mixed (commercial compound feed/chestnuts) diet; C= chestnuts diet

* Values that differed significantly (P<0.05) when compared the values of the two muscles in the same feeding group.

No significant differences (P>0.05) were observed in the studied parameters, associated to the type of finishing diet. In colour (L* and b* parameters and Chroma values), hematin and haem iron contents, and shear force, within the same feeding group significant differences (P<0.05) were observed between the two muscles studied.

Regarding the correlations between parameters, when the 36 pigs were considered globally a significant positive correlation (r=0.36; P<0.05) was observed between the weight of the

carcass and the intramuscular fat content in the *Longissimus dorsi* muscle. When each feeding group was considered individually, this correlation was only significant (r=0.41; $P<0.05$) in the group feed with a mixed (commercial compound feed/chestnuts) diet. This correlation was not significant in the case of the *Semimembranosus* muscle.

Table 2.- Physical and chemical parameters in the *Semimembranosus* muscle of the Celta pig breed fed with different finishing diets (average ± standard deviation)

	A (n=12)	B (n=12)	C (n=12)
pH	**5.66±0.18**	**5.62±0.11**	**5.59±0.11**
Myoglobin (mg/100g)	**2.10±0.57**	**2.30±0.46**	**2.15±0.49**
Hematin (ppm)	**32.91±5.95**	**33.93±3.92**	**31.76±4.25**
Haem iron (ppm)	**7.21±1.96**	**7.86±1.58**	**7.38±1.68**
L*	**43.83±3.21**	**45.86±4.70**	**45.95±4.11**
a*	**11.59±1.10**	**12.49±1.68**	**12.27±2.04**
b*	**7.61±1.78**	**8.43±1.47**	**7.62±1.65**
Chroma	**13.93±1.57**	**15.10±1.99**	**14.48±2.40**
WHC (%)	**16.87±4.73**	**17.68±3.36**	**18.60±3.80**
Intramuscular fat (%)	**2.22±1.32**	**1.82±0.86**	**2.76±1.95**
Shear force (Newtons)	**135.28±22.60**	**122.66±20.54**	**127.92±36.12**

A= commercial compound feed diet; B= mixed (commercial compound feed/chestnuts) diet; C= chestnuts diet

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