The influence of genotype and feeding system in meat quality parameters of pure Retinto, Charolais*Retinto and Limusin *Retinto male calves.

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Background

In Extremadura, the Mediterranean Forest (Dehesa) supports Retinto cow herds during almost the whole year with the exception of summer when animals need supplement. Traditionally, calves produced in this region were sold at weaning to be finished in other areas. Therefore, only 11% of the calves produced are finished in Extremadura. Meat quality depends on many factors, an important factor in the animal genotype, as stated by Albertí and Sañudo (1997) and Dios et al. (1997). It is also important the feeding system (López et al., 1981; Benito et al., 1979; Consigli, 1994). The study performed by Albertí and Sañudo (1997) on the meat quality attributes of local breeds concluded that calves from extensive production systems such us, Retinta, Avileña y Morucha resulted in carcasses worst conformated but in a better meat quality than other studied breeds. There is not many information relating meat quality to genotype and feeding system in these breeds from extensive systems.

Objectives

The objectives of this study were the comparison of several meat quality traits of three different genotypes (Retinto, Limusin*Retinto and Charolés*Retinto) in two feeding systems (standard feedlot and natural pastures from the dehesa).

Methods

42 animals were slaughtered distributed in 6 lots: 7 Retinto calves fed concentrate, 8 Retinto calves fed pasture, 6 CharolaisxRetinto calves fed concentrate, 8 CharolaisxRetinto calves fed pasture, 6 LimusinxRetinto calves fed concentrate and 7 LimusinxRetinto calves fed pasture. The animals fed with pasture, were supplemented with barley and alfalfa in the period when pasture was limited. All the animals started the test with an average weight of about 200kg per lot under the feeding conditions indicated above. The Retinto animals were conducted to a mean slaughter weight of 480-490 kg per lot and the crossed calves of 500-520 Kg per lot. Animals were slaughtered and carcasses were stored for a 24 hr. period at a temperature of +4° C. After this period, a portion of the longissimus dorsi (LD) muscle corresponding with rib 10 was aged for 6 days and used to calculate meat quality parameters such as, pH, instrumental color parameters, (***L *a *b**) (CIE, 1976); water holding capacity (WHC) in %, with pressure method as defined by Grau and Hamm, (1953) and modified by Sañudo et al. (1986), quantity of heminic pigments (HP) (µgrams hematine/g) with the Hornsey method (1956) (Boccard et al., 1981); dry matter in % (DM), conservation loses (CL) in %, the load at maximum load (LOAD) in Newton and displacement at maximum load (DISS) in mm. (INSTRON with Warner Blaztler); and the water holding capacity (WHC) in %. Data were analyzed by using the procedures GLM in SAS based on a factorial design with three genotypes and two feeding system.

Results and discussion

Table 1, shows the results obtained from the variance analysis. There were genotype significant differences for CL, WHC, DISS, HEMA and feeding system significant differences for color parameters (L*, a*, b*), DM, and DISS. Genotype and feeding system interactions were significant for CL, DM and DISS. The mean values, standard deviation (SD) and significance level presented in Table 1 are all calculated after an aging period of six days as indicated in the methodology. The pH mean value 5.58, was similar to the value of 5.61 obtained by Albertí and Sañudo (1997) using also Retinto calves under similar system and methodology.
Feeding system effect was significant for color attributes. the L value was larger for animals fed concentrate than for those fed pasture (40.25 vs 35.0) indicating that animals fed concentrate are lighter than those fed pasture. Similar L mean value of 38.9 was obtained by Albertí and Sañudo (1997) for Retinto genotypes. Osoro et al. (1997) studying the Asturiana breed, obtained values of 40.4 for animals in feedlot and 41.0 for animals fed with pasture for meat aged only five days. Color value means were 17.1 (a) y 7..3 (b). These mean values were different than those obtained by Albertí and Sañudo (1997) of 15.1 (a) and of (9.7) and smaller than those obtained by Osoro et al. (1997) for the Asturiana breed of 20.0 (a) and 9.8 (b). In this study, as depicted in Table 2, there were significant differences in a and b values for feeding type (17.5 and 8.4 respectively, for animals fed concentrate, and 16.0 and 5.0 for animals fed pasture).

The effect of genotype significantly influenced WHC as indicated in Table 3. This parameter (21.14) was larger for Charolais*Retinto genotype than for calves (Limusin*Retinto, 16.4 and pure Retinto 17.7). No differences were observed between these former genotypes. The Retinto WHC parameter of 17.8 was smaller than results presented by Albertí and Sañudo (1997) of 18.9. It is important to remark that this parameter was computed by the pressure method and this methodology is highly influenced by the technician. Genotype also affects HEMA values been larger for Retinto genotype (155.1) and smaller for Charolais*Retinto (128.7), the remaining genotype showed intermediate HEMO levels (139.3). It is expected that HEMO levels are correlated to a* values measured with the Minolta colorimeter, however, in this study a* do not agree with HEMO values, this disagreement between HEMO and a* values was found by Consigli (1994).

Results presented in Table 4, indicated an interaction in CL, DM and DISS. DM has an interaction in magnitude since differences in DM between concentrate feeding system and pasture were larger in Charolais*Retinto aprox 2% versus differences in Limusin*Retinto aprox 1% and vs Retinto were not differences were observed. Therefore, for crossbred genotypes animals fed with concentrate have more DM than animals fed pastures. Similar interaction was observed for DISS, but in this case, crossbred genotypes

Conclusion

Animals fed concentrate presented more lighter and tender meat than those animals fed pastures. Meat from Crossbred animals was more tender than pure Retinto meat when feed a concentrate.

Table 1. Significance levels, means, standard deviations and F values of difference meat quality parameters

				F		
VARIABLE	N	MEAN	S.D.	BREED (B)	FEEDING (F)	BxF
pH	42	5.58	0.12	ns	ns	ns
L*	27	38.7	3.3	ns	***	ns
a*	27	17.07	1.69	ns	*	ns
b*	27	7.3	2.19	ns	***	ns
LC	39	2.3	2.00	*	ns	**
WHC	41	18.5	4.54	*	ns	ns
DM	41	24.02	1.35	ns	*	*
LOAD	41	66.02	21.26	ns	ns	ns
DISS	41	32.50	5.41	***	***	***
HEMA	38	143.29	26.49	*	ns	ns

LC: Loses conservation
DM: Dry matter
DISS: Displacement at maximum load (mm)
WHC: Water holding capacity
LOAD: Load at maximum load (N)
HEMA: µg hematin/g meat

Table 2. The effect feeding system on the meat color

VARIABLE	L*	a*	b*
Concentrate	40.25±2.5	17.5±1.4	8.38±1.59
Pasture	35.02±1.8	15.97±1.73	4.96±1.38

Table 3. The effect genotypes on WHC and HEMA parameters

	WHC	HEMA
R	17.86±1.76	155.05±6.18
ChxR	21.14±5.48	128.70±7.23
LixR	16.41±4.65	139.27±6.99

WHC: Water holding capacity. HEMA: µg hematin/g

Table 4. Interactions feeding and genotypes on the some parameters

		LC	DM	DISS
R	Concentrate	1.7±0.63	23.57±0.46	35.92±0.96
	Pasture	4.4±0.59	23.87±0.43	34.89±0.9
ChxR	Concentrate	3.35±0.68	25.16±0.49	24.35±1.01
	Pasture	1.26±0.74	23.12±0.43	34.57±0.9
LixR	Concentrate	1.41±0.68	25±0.54	25.01±1.14
	Pasture	1.38±0.63	24±0.46	36.3±0.96

LC: Loses conservation. DM: Dry matter. DISPL: Displacement at maximum load (mm)

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