MEAT COLOUR FROM PIRENAICA STEERS AND HEIFERS AFTER VACUUM PACKAGING

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BACKGROUND

The colour of fresh meat is one of the most important meat quality characteristics taken into account by the beef-buying public (Clydesdale, 1991). Meat colour is determined by the relative amounts of the pigments derivates of myoglobin present at the surface. On the exposure to the air, myoglobin quickly combines with oxygen to form bright red oxymioglobin which gives fresh meat its desired colour. When extending this exposure the oxidized metmyoglobin appears. This pigment is responsible for discoloration, characterized by a general darkening and browning of the meat surface. When this pigment reaches 20% at the meat surface one of every two consumers will reject this meat (Hood and Riordan, 1973; Renerre and Mazuel, 1985).

Development of conservation procedures to increase the shelf-life period of meat, such as vacuum packaging, can produce economic profits whenever they assure maintain a fresh meat appearance.

OBJECTIVE:

The purpose of this study has been to investigate the effect of vacuum-packaging in the meat colour from Pirenaica steers and heifers.

MATERIAL AND METHODS

Fifteen Pirenaica steers (average carcass weight 335.4 $\pm$ 6.21 Kg) and fifteen Pirenaica heifers (average carcass weight 251.93 $\pm$ 5.02 Kg) were used in this work. Both groups were fed mother milk and concentrates until weaning and concentrated commercial fodder and barley straw "ad libitum" until slaughtering (12.8 $\pm$ 0.2 mo old).

Two steaks (2.5 cm thick) were cut from *Longissimus dorsi* (LD) muscle, removed from the left carcass side at 48h postmortem. The control was put on a plastic foam packaging tray, overwrapped in oxygen-permeable film and placed in the dark in a refrigerator at 2ºC for 7 days. The test was vacuum packaged and stored in the dark at 2ºC. The 7th day postmortem the vacuum bag was removed and the sample was put on a plastic foam packaging tray in the same conditions of the control.

Measures were taken on the control ant test samples at three different moments during the meat's exposure to air: after 24h (1), the 5th (5) and 7th (7) day. A spectrophotometer MINOLTA CM2002 (D65 type light source and a 10 position of standard observer) was used. CIE L*, a*, b* parameters, Hue (H*) and Chroma (C*) were obtained. The relative concentration of metmyoglobin (MMb) at the meat surface was determined following the method described by Krzywicki (1979). Spectra were recorded from 400 to 700 nm; the reflectance at 730nm was obtained by extrapolation.

pH values at 24h postmortem in LD muscle and total myoglobin pigment (Mb) (Hornsey, 1956) were also determined.

RESULTS AND DISCUSSION

The pH values (5.47 $\pm$ 0.03) were similar to those reported for Pirenaica breed (Alberti at al, 1992). The total pigment (3.98 $\pm$ 0.15 mg Mb /g fresh meat) was higher than the one reported for Friesian breed (2.57$\pm$0.49mg/g, Touraille *et al.*, 1983) and lower than that one reported for Limousin breed (5$\pm$1 mg/g, Renerre and Valin, 1979). There were no statistical differences neither the pH nor the total pigment content between heifers and steers ($p>0.05$).

There are three factors to take into account when analysing the Pirenaica meat colour results: sex (steers and heifers), vacuum packaging (control, test) and time of air exposure (1, 5 and 7 days).

None of these factors showed any significant effect on the L* and H* values. The analysis of variance for a*, b* and C* indicated a highly significant vacuum packaging x air exposure time interaction ($p<0.01$). a*, b* and C* values were higher for the test samples at 24h of air exposure. These results agree with those reported by Tuma *et al.* (1963). While increasing air exposure time, all of the three parameters decreased reaching a similar value at the 7th day (Table 1). The sex effect was significant ($p<0.001$) for these three parameters, being heifers slightly redder and brighter than steers (fig. 1).

MMb relative concentration at the meat surface was only affected by the air exposure time; there was no sex or vacuum packaging effect. So, the later can be viewed as a way of increasing the commercial life of meat by means of avoiding the pigment oxidation during packaging. In this study, consumers would reject both meat samples, test and control, after 5 days of air exposure because of their reaching the 20% MMb concentration, considered as the limit value for the meat acceptability (fig.2).

CONCLUSIONS

Vacuum package in meat produces a redder and brighter surface than unconditioned meat. The vacuum packaging method does not affect the relative metmyoglobin concentration at meat surface; it is only influenced by the air exposure time.

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Table 1. Colour parameters values during the air exposure time in pre-vacuum packaged (test) and unconditioned (control) meat

	L*		a*		b*		C*		H*	
Time	control	test	control	test	control	test	control	test	control	test
1st day	37,94	38,01	$16,10^{a,1}$	$18,82^{a,2}$	$9,57^{1}$	$11,15^{a,2}$	$18,78^{a,1}$	$21,98^{a,2}$	30,71	30,70
5th day	37,55	37,20	$15,12^{1}$	$17,23^{b,2}$	$9,14^{1}$	$10,34^{b,2}$	$17,76^{1}$	$20,14^{b,2}$	31,22	31,05
7th day	37,65	37,33	$14,31^{b,1}$	$15,25^{c,2}$	9.02	$9,01^{c}$	$16,98^{b}$	$17,79^{c}$	32,13	30,53

Different superscripts mean statistical differences ($p<0.05$), letters compare among days of time exposure, numbers between control and test meat

Fig 1.- Color parameters for Pirenaica steers and heifers

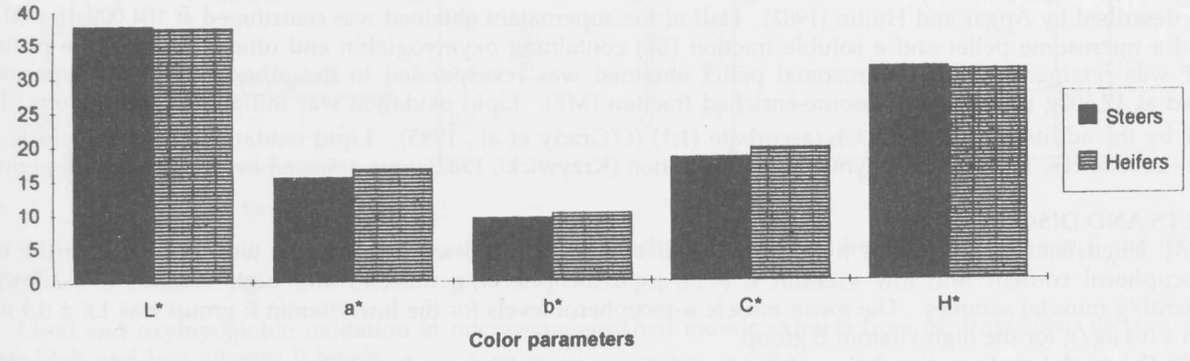

Fig 2.- MMb relative concentration at meat surface in pre-vacuum packaged (control) and no pre-vacuum packaging (test) meat during air exposure