COLOR AND TENDERNESS RELATIONSHIP IN BEEF FROM PIREINAICA BREED.

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Background

Consumers perceive meat quality through different attributes, and tenderness has been identified as one of the most important. Thus, non-destructive measurement for segregating beef carcasses into tough and tender groups would be extremely benefitial to the industry because it was demonstrated that consumers are agree on paying for tender beef (Boleman et al., 1995).Various authors have been evaluating the correlation between objective measurements of meat color and tenderness trying to find a predictive variable that can be used to classify beef carcasses by tenderness (Wulf and Page, 2000; Picallo et al., 2000; Wulf et al., 1997; Watanabe et al., 1995; Jeremiah et al., 1991; Purchas, 1990).

Objectives

The aim of the present work is to study the relationship between objective color measurements of *Longissimus dorsi* and tenderness (Warner Bratzler) at 1,7 and 14 days of ageing in beef from Pirenaica males.

Methods

The study was carried out on 11 Pirenaica entire males slaughted at one year old. *Longissimus dorsi* (LD) of the left side was removed after 24 hours *postmortem.*

To assess objective color CIELab parameters (L*, a*, b*) were determined with a Spectrocolorimeter (MINOLTA CM2002) using iluminant D_{65} and 10º observer on the exposed longissimus at 6th rib 1h after blooming.

For Warner Bratzler analysis (WBS) 3 portions of LD muscle of 3,5cm thick at 9th-11th ribs were vacuum packaged. One portion (1 day aged) was immediately frozen an the rest were kept at 4ºC until achieve the different ageing times (7 and 14 days) and then were frozen and stored at -20ºC until analyse. For tenderness essay, samples were thawed at 2ºC for 24 h , boiled at 70ºC during 40min. The cooked samples were allowed to fridge for 24 h and then ten cores of 1x1cm^2 were obtained from each cooked sample in the direction of muscle fibers. Shear force, max. stress and toghness measurements were obtained for each core using a texturometer (TA-XT2i de Stable Micro Systems). Data were analysed by linear regression analysis using the program SPSS 8.0 (1999).

Results and discussion

In Table 1 can be observed the results for color and tenderness (WBS) and of beef LD at 1,7 and 14 days of ageing. The regression analyses between color (L*, a* and b* parameters) and tenderness (shear force, maximum stress and toughness) at 1 day of ageing were not significant ($p>0.05$) which are agree with the results of Picallo et al. (2000). However, at 7 and 14 days of ageing there were a significant relationship between color and tenderness. In general, at 7 days of ageing, beef with low values of L* had also low values of shear force, max. stress and touhgness which are indicating that beef was more tender (fig. 1 and 2). These results are disagree with the results obtained by Wulf et al. (2000) which observed that a descending in beef tender was correlated with an increasing in L* values. Moreover, beef with high values of b* parameter color had lower touhgness (fig.3), which are agree with the results of Wulf et al. (2000). In order to 14 days of ageing, there were a significant relation between beef a* values and tenderness (WBS) (fig. 4 and 5), beef less red was more tender.

Despite the fact that there are significant relations, the multiple regression analysis (table 2) gives no very accurate models and measurements of color can not be used as a simple and on-line predictor for tenderness.

Conclusions

Despite of the low sample number we have obtained statistically significant relations between tenderness with seven days of ageing and L* and b* parameters color and between tenderness with 14 days of ageing and a* parameter color in beef LD from Pirenaica breed. Even though, further researches about objective meat color would be necessary to find a simple and on-line predictor for tenderness.

Acknowledgements

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Table 1. Descriptive statistics (mean, SD) for beef tenderness (Shear force, max. stress and toughness) at 1,7 and 14 days of ageing and color (L*, a*, b*)

Ageing	**1 day**		**7 days**		**14 days**			**1 day**	
	Mean	*SD*	Mean	*SD*	Mean	*SD*		Mean	*SD*
Shear force (kg)	6,44	*1,58*	5,80	*1,37*	5,12	*1,23*	**L***	37,73	*3,28*
Max. stress (N/cm²)	6,44	*1,34*	5,81	*1,42*	5,29	*1,28*	**a***	18,85	*3,89*
Toughness (N/cm²)	1,86	*0,38*	1,46	*0,46*	1,52	*0,50*	**b***	14,83	*2,70*

Table 2. Multiple regression analyses (R^2) for muscle tenderness 1, 7 and 14 days of ageing (Shear force, max. stress and toughness) and color (L*,a*,b*).

R^2	**1 day**	**7 days**	**14 days**
Shear force (kg)	0,00	0,38	0,65
Max. stress (N/cm2)	0,00	0,49	0,74
Toughness (N/cm2)	0,25	0,60	0,62

Figures 1-5. Regression analyses (R^2) for muscle tenderness 7 and 14 days of ageing (Shear force and toughness) and color (L*,a*,b*).

Figure 1

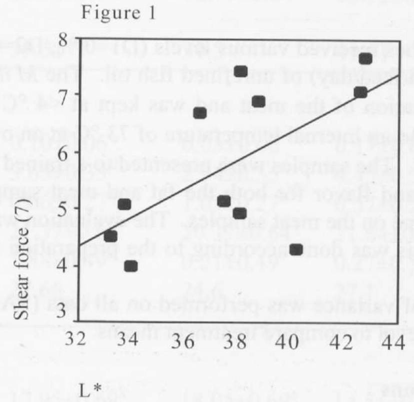

Figure 2

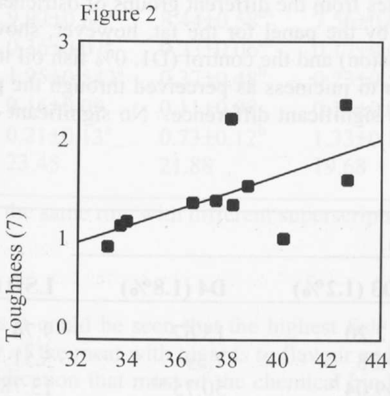

Figure 3

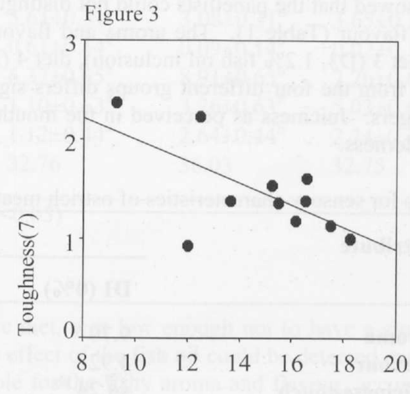

Figure 4

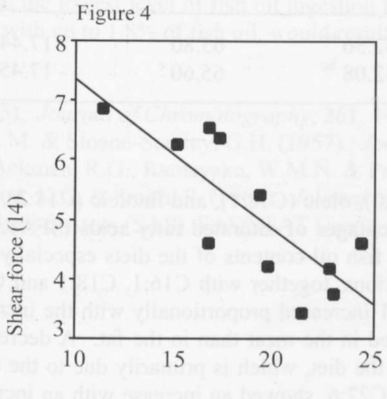

Figure 5