EFFECT OF SLAGUHTER WEIGHT AND BREED ON VOLATILE COMPOUNDS OF COOKED BEEF FROM SPANISH LOCAL BREEDS

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Background

Labels and quality marks have arisen around breeding of local breeds, that are well adapted to the environment and are a mean of preserving natural resources. However, little research has been done on the quality of meat from these animals.

From the sensory point of view, the effect of volatile compounds on the sensory acceptability of meat is very important, even before eating the product. Raw beef has weak and blood aroma but it contains a lot of precursors that during cooking will contribute to meat aroma and flavor (Mottram and Edwards, 1983).

One of the factors that could contribute to the volatile compound profile is the intramuscular fat content of meat. In this sense, it would be interesting to study the volatile compounds of beef from breeds of different rusticity and at different slaughter weights.

Objectives

The aim of this work was to study the volatile compounds of cooked beef from local Spanish cattle breeds at two slaughter weights, in order to find out the effect of breed and slaughter weight on the volatile compounds of cooked beef.

Materials and methods

Volatile compounds of cooked beef from Asturiana de los Valles (AS), Avileña (AV), Parda Alpina (PA), Pirenaica (PI), Retinta (RE), Rubia Gallega (RG) and Morucha (MO) slaughtered at 300 and 550 kg LW were tentatively identified in *L. Dorsi* samples (12th rib). Volatile compounds were extracted by purge-and-trap and they were tentatively identified by gas chromatography with mass spectrometry after ageing samples for 7 days under vacuum. Intramuscular fat percentages were obtained by Soxhlet (ISO-1443-1973).

Statistical analysis was performed using the SPSS 9.0 (1998) statistic program: analysis of variance, correlation analysis, factorial analysis (principal components extraction) and discriminant analysis were carried out. The factorial and the discriminant analysis were applied with those volatile compounds that were tentatively identified in all the studied samples.

Results and discussion

There were tentatively identified 53 volatile compounds of different chemical nature from the headspace of the *L. Dorsi* muscle of the studied beef samples: 49.0% aliphatic hydrocarbons, 7.5% alicyclic hydrocarbons, 9.4% aromatic hydrocarbons, 13.2% aldehydes, 5.6% ketones, 1.8% alcohols, 3.7% terpenoids, 5.6% sulfur compounds, 1.8% esters and 1.8% carbon dioxide.

The results showed that there are differences among local Spanish cattle breeds regarding the profile of volatile compounds. The higher area values of dimethyl sulfide in meat from PI might be related to cabbage odour (Vejaphan et al., 1988). Campo (1999) found that meat from AS had raw or blood flavour. This fact might be related to its low intramuscular fat content and to the subsequent low area values for volatile compounds.

Regarding slaughter weight, beef samples from 550 kg LW animals showed higher area values for all the volatile compounds, except for carbon disulfide, probably because the latter has been identified in meat lean rather than in fat (Liebich et al., 1972). At the discriminant analysis beef samples from heavy animals (550 kg LW) where plot in front of beef samples from light animals (300 kg LW) (91.1% classification accuracy) due to the higher carbondisulfide area values of the latter (Figure 1). Octane was the only compound that showed no significant interaction breed x slaughter weight ($p>0.05$), no significant breed effect ($p>0.05$) and significant slaughter weight effect ($p<0.05$), and it was higher in beef samples from 300 kg LW animals. For the rest of volatile compounds where slaughter weight effect was significant, there was also significant interaction breed x slaughter weight.

Regardless of slaughter weight, meat from animals with higher intramuscular fat percentages showed higher etanol area values, that might be related to sweet flavour, which was true for meat from RE (Campo, 1999). This fact was corroborated by the correlation analysis ($R^2=0.174$, $p<0.05$) and by the factorial analysis where factor 3 (11%) separated beef samples of animals from Avileña and Morucha (Figure 2) by means of their higher ethanol and intramuscular fat content (Figure 3).The percentage of variability that factor 3 accounted for was low. However, Insausti et al. (2002) also found higher ethanol area values with increasing intramuscular fat percentages in beef from the same breeds.

Conclusions

The differences in the profile of volatile compounds of beef from the different local Spanish cattle breeds were made in evidence and they might contribute to differences in flavor.

Regarding weight slaughter, it was influenced by breed.

Finally, higher intramuscular fat contents might be related to higher ethanol and lower octane and carbondisulfide area values.

Pertinent literature

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Campo MM. 1999. Influencia de la raza sobre la textura y las características sensoriales de la carne bovina a lo largo de la amduración. PhD Thesis. Universidad de Zaragoza, Zaragoza, Spain.
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Vejaphan W, Hsieh TCY, Williams SS. 1988. Volatile flavor components from boiled crayfish tail meat. J Food Sci, 53, 1669.
Liebich HM, Douglas DR, Zlatkis A, Mügler-Chavan F, Donzel A. 1972. Volatile components in roast beef. J Agric Food Chem, 20, 96.
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Figure 1: Separation of "slaughter weight" groups applying discrimant analysis to volatile compounds of cooked beef.

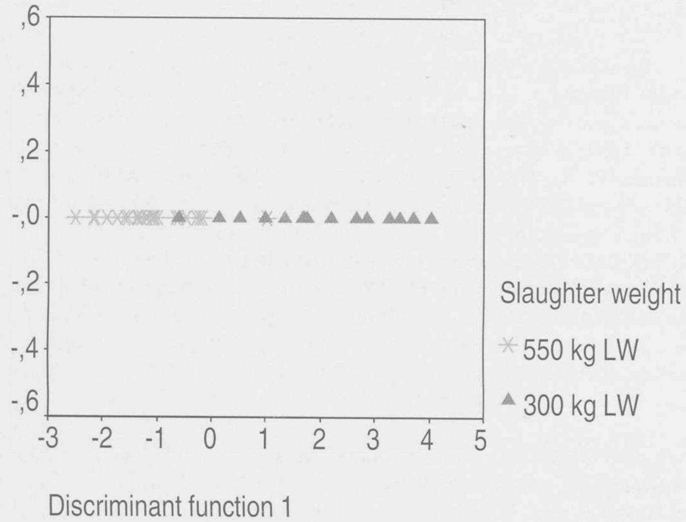

Figure 2: Plot of "breeds" on the bidimensional space formed by factors 1 and 3 obtained by principal component analysis of volatile compounds and intramuscular fat in cooked beef.

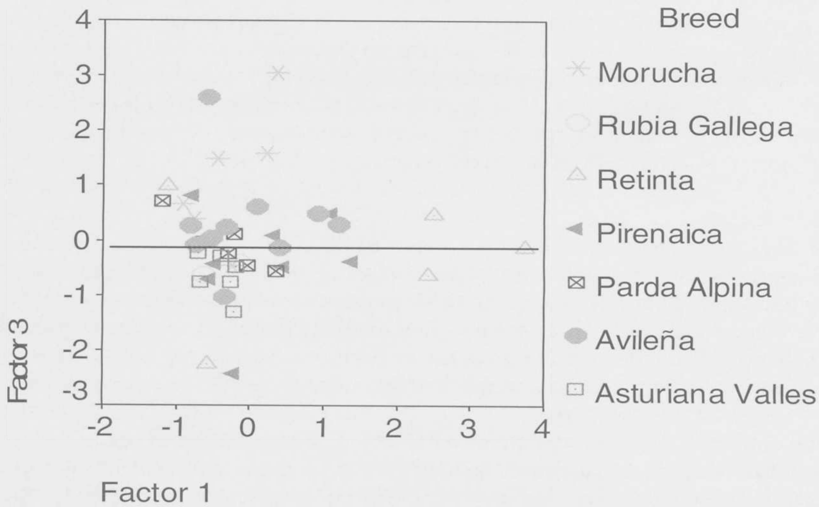

Figure 3: Plot of volatile compounds and intramuscular fat content on the bidimensional space formed by factors 1 and 3 obtained at the principal component analysis.