QUALITY EVALUATION OF DIFFERENT TYPES OF DRY CURED HAM BY AN ELECTRONIC NOSE

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Introduction

Nowadays, consumer trust is very important when you want to consolidate and situate a product into the market. For this reason, new techniques such as the Electronic Nose (e-nose) are available to safeguard the quality of food products. Dry cured ham is a product typically consumed in the Iberian Peninsula which has a high popular acceptability. For example, we understand "Serrano Ham" (a ham salted and dried for more than 210 days) can be displayed boned or deboned. In this type of product during storage rancidity and acid odours will increase significantly because of proteolysis and lipid oxidation (Monahan *et al.*, 1998). It is important to find easy, quick and cheap techniques to evaluate the quality of these products before consumer purchase.

In this paper an electronic nose is used to analyse volatile compounds of a wide variety of samples of "Serrano" Ham to assess if the odour profile provided by e-nose is a good approximation to the volatile sensation perceived by the nose, and if hams with different olfactory characteristics could be discriminated by e-nose.

Materials and Methods

Sample preparation:

Thirty batches of different Serrano ham with high quality and different origin were analysed. Samples of 1 g were placed in 10 ml headspace vials. The numbers of replicates were six for each ham.

It is important that the sampling was homogeneous and that the fat content of the samples was not too high, as samples with a high fat content inhibit volatile release into the headspace (Taylor *et al.*, 2000) and this can be an impediment for reproducibility.

Headspace sampling:

The analyses were performed by an electronic nose αFOX 4000 (AlfaMOS, Toulouse, France) with a sensor array of 18 metal oxide sensors. The vials are incubated in an oven at 50ºC for generating the equilibrated headspace agitation cycles (5 s on and 2 s off) and 500 rpm of agitation speed were applied.

The temperature of the syringe during injection was 60ºC and the injected volume was 1500 µl with a speed of 1500 µl/s and 120 s flushing time. The carrier gas was synthetic air with a flow of 150 ml/min.

Acquisition data:

The e-nose was controlled by AlphaSoft version 9.1 software and it took readings each 0.5s during 120s of acquisition time and 600s of acquisition delay. This software permit to execute a Principal Component Analysis (PCA). The sensor responses were performed with a statistical program STATGRAPHICS Plus to Windows ver.5.1.

Results and Discussion

In a sensory odour analysis of samples it was detected that some batches had an anomalous smell (acidity, rancidity and different types of taints).

Data from 172 samples obtained as sensor responses were statistically analysed. All analyses were performed with e-nose software and statistical program STATGRAPHICS Plus to Windows ver.5.1.

Principal Component Analysis of the results extracted by the e-nose separated three easily recognizable groups (Figure 1).

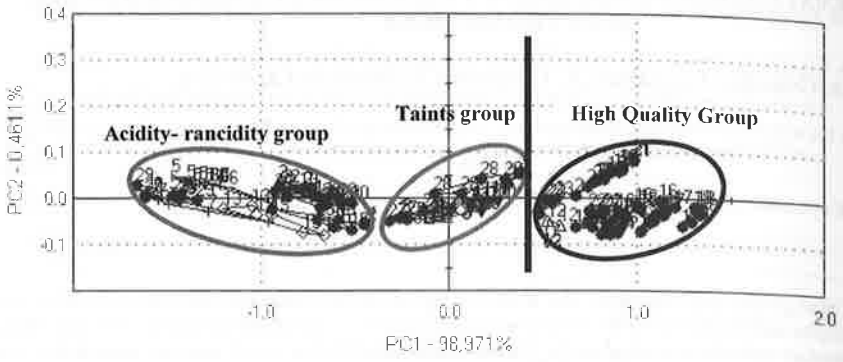

Figure 1: Distribution by PCA of 30 different samples of Serrano Ham with different quality.

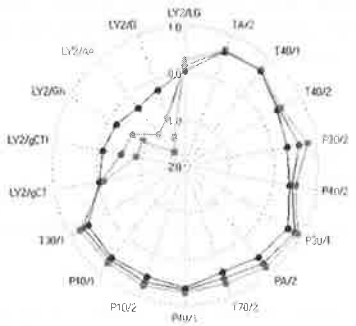

Figure 2: Average of sensor responses for each different group.

Analysis by STATGRAPHICS Plus indicated three groups (Figure 1). In this case the purpose was to obtain a small number of linear combinations of the 18 variables which account for most of the variability in the data. With this method, as shown in Figure 1, 98.97% of the variability in the original data is explained. The odour fingerprint of each detected group, resultant of the average for each sensor response group, is shown in Figure 2. It is remarkable that although most of sensors contribute to the discrimination of hams with defective and optimum odours, a small number of sensors seem to be more sensitive to the volatile compounds responsible of these odour differences (LY2/gCTI, LY2/Gh, LY2/AA, LY2/LG and P30/2)

In both figures the response for faulty hams with acidity and rancidity odours is pointed out in green; in red for faulty hams with different kind of taints; and finally, the hams with high quality sensorial properties are marked in black.

Conclusions

The electronic nose is a suitable tool to evaluate the quality and preservation of Spanish "Serrano" ham. It allows easy discrimination between hams with defective and optimum properties. Therefore, this instrument could be useful in deboned and sliced ham quality control. However, the sampling method must be optimized for application in boned hams.

References

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