INFLUENCE OF ONION VARIETY IN THE AROMATIC PROFILE AND VOLATILE COMPOUNDS COMPOSITION IN BLOOD SAUSAGE “MORCILLA DE BURGOS”

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Introduction

“Morcilla de Burgos” is a popular cooked blood sausage produced in Burgos, in the north of Spain, consisting on a mixture of chopped onion, rice, animal fat, blood, salt and different spices such as black pepper, paprika, oregano and so on. According with the elaboration process, kind and amount of spices, and the proportion of ingredients different types of Morcilla de Burgos are produced.

One of the most characteristic ingredients, in Morcilla the Burgos elaboration, is onion. According to tradition the most suitable onion is a regional variety known as Horcal. This onion is white, with elliptical shape and bigger size compared with other types of onions. The horcal onion is a seasonal crop (harvest between September and November) with a short period of storage, but it gives to Morcilla de Burgos a better sensory quality. The draft of the PGI proposed for the protection of Morcilla de Burgos, establish this variety of onion as the unique one possible to use for producers.

The purpose of this study is the determination of the influence of this variety of onion in the elaboration of “Morcilla de Burgos” in the total volatile profile and in the sensory profile.

Materials and Methods

Sample preparation: Two batches of 60 morcillas were made with the same formulation with the only difference of the kind of onion added. One batch was made with horcal onion, and the other one batch was made with Grano de Oro onion from Valencia.

Two randomly chose morcillas, were minced in a lab blender, and 2 g were introduced in a 20 ml headspace vial, corresponding to days 1, 7 13, 21 and 28 after the elaboration of the batches.

Aromatic profile analysis was done by means of 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. The e-nose was controlled by AlphaSoft version 9.1 software and it tool readings each 0.5 s during 120 s of acquisition time and 600 s of acquisition delay. The sensor responses were performed with a statistical program Statgraphics plus to windows ver. 5.1.

Volatile compounds analysis was realized by SPDE sampling and GC-MS determination as it follows.

HS-SPDE sampling: All Solid Phase Dynamic Extraction (SPDE) (Chromtech, Idstein, Germany) sampling steps were automatically controlled by the CTC-Combi PAL software. The SPDE needle coated inside is a PDMS-AC. The vials were all equilibrated at 70ºC for 1 min, 50 Strokes, the plunger speed for extraction: 40 μl/s; helium volume for desorption: 0.5ml; plunger speed for desorption: 15 μl/s; pre-desorption time in the GC injection port: 30 s; desorption temperature: 250ºC. Each analysis was performed three times for each sampling.

GC-MS Conditions: Gas chromatographic analyses were performed with an Agilent Technologist 6890N Series GC System (Agilent Technologist, Palo Alto. CA. USA) coupled to a Agilent Technologist 5973i mass spectrometer (Agilent Technologist, Palo Alto. CA. USA). The SPDE syringe was injected automatically into the GC injection port, and thermally desorbed at 250ºC. Compounds were separated on a HP5 capillary column (50 m length x 0.32 mm I.D fused silica capillary column coated with 1.05 μm film thickness (Quadrex Corporation. New Haven. USA)). The temperature of the column was programmed starting at 40 ºC, after injection for 5 min, afterwards temperature was increased at a rate of 3 ºC/min from 40 to 240 ºC. Helium gas with a flow of 1ml/min was used as the GC carrier gas. The temperature of the transfer line was 280 ºC. During desorption of the SPDE syringe the injector split valve was closed. The effluent from the capillary column went directly into the mass spectrometer, operated in the electron impact (EI) mode with an ionisation voltage of 70 eV.

Compounds were identified by comparing their mass spectra with a NIST and Wiley spectrum libraries. These compounds were related to the different ingredients used in the elaboration of “Morcilla de Burgos”, by comparing them with previous published spectra obtained from different *Allium cepa* L. varieties, and spices, and also from onions analysed, in the same conditions mentioned above.

Results and Discussion

Figure 1 shows the Principal Component Analysis for the data obtained in the electronic nose (a) and in the Chromatographic analysis (b).

Figure 1a shows the PCA with the data obtained with the electronic nose analysis. Principal component 1 accounted for the 89.5% of the total variability.

The PCA easily separates two aromatic profiles that match with the two types of morcillas manufactured, with both types of onion, and also according to sampling day.

The first component separates due to the kind of onion used in the elaboration of Morcilla de Burgos, in this way, in the right side of the figure 1a is situated the Morcilla elaborated with Grano de Oro onion, and in the left side of the figure is the group for the Morcilla with Horcal onion.

The second component separates the samples due to the day of the analysis. Morcilla de Burgos is a product that changes with the storage in a fast way and its evolution it's possible to appreciate in the figure 1a. In this figure, the first day of analyses is placed in the upper side of the figure for both batches, and the last day of analysis is placed in the bottom of the figure.

The results obtained in GC-MS showed 115 different volatile compounds found in "Morcilla de Burgos", taking into account the entire compounds that appear in all the samples analysed. Ninety three of these compounds have been tentatively identified using the NIST and WILEY libraries. Forty four of these compounds were terpenics, 25 were oxygenated aliphatic, 11 sulphur compounds, 8 hydrocarbons, 3 oxygenated aromatics compounds and 1 was a nitrogen compound.

As it was expected, all two samples of Morcilla presented the same volatile profile except for the compounds related to the presence of onion. These compounds were the 11 sulphur compounds and two of the oxygenated aliphatic compounds, the aldehyde 2-methyl 2-pentenal and the alcohol, 1-(1-propynyl)cyclopropanol. The compounds related with the onion have more intensity in 9 of the 13 peaks identified, in the morcilla elaborated with Grano de Oro onion than in those elaborated with Horcal onion.

Figure 1b shows the Principal Component Analysis with the data of the eight compounds more relevant related with the presence of onion, obtained in the five days of analysis for both batches of Morcilla. One component was extracted that accounted for the 74.4% of the total variability.

The PCA clearly separates morcilla samples into two groups that match again with the two types of morcillas manufactured.

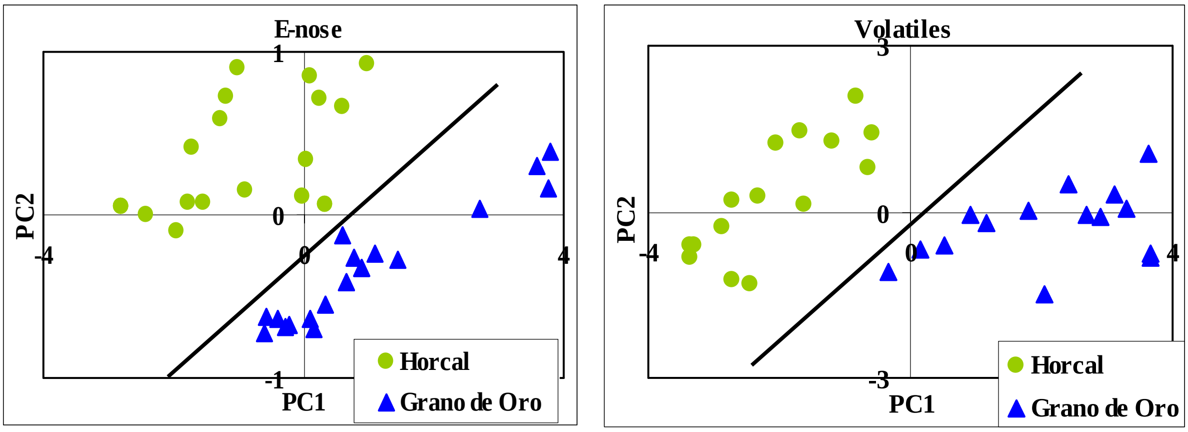

Figure 1. Principal Component Analysis for (a) the e-nose and for (b) the GC-MS of the aromatic profile.

Conclusions

According to the results obtained in this study, it can be conclude that there are differences in the aromatic profile of the samples analysed due to the kind of onion used in the elaboration of Morcilla. These differences are related with the different intensity of the volatile compounds of both types of onion, which contribute to the volatile profile of the final product. There is also an evolution with the time of these compounds during the storage.

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