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Aroma components in Sobrasada of Mallorca from black pig

M.P. Gianelli*, A. Olivares and M. Flores****

*Department Food Engineering, Universidad del Bío-Bío, PO Box 447, Chillán (Chile)
**Instituto de Agroquímica y Tecnología de Alimentos (CSIC), Burjassot, Valencia (Spain)

Abstract. Sobrassada of Mallorca from black pig was used to determine the key aroma components. Sobrassada had a high content of monounsaturated fatty acids. A specific liberation of polyunsaturated free fatty acids (FFA) was detected in the proportion of FFA in contrast to the total fatty acid composition that was higher in polyunsaturated FA and, in lower proportion, monounsaturated ones. The analysis of the headspace of sobrassada resulted in the identification of eighty four different volatile compounds and 3 of them were for the first time detected in dry sausages (methyl nonanoate, 1-methyl-1H-pyrrole and 2-acetyl pyrrole). The aroma of sobrassada was characterized by thirty five different aroma active zones. These aroma active zones corresponded to compounds already detected as essential aroma contributors in dry sausages (3-methyl butanoic acid, ethyl 3-methyl butanoate, 2,3-butanedione, and acetic acid) and in addition compounds such as ethyl octanoate, furfural, benzaldehyde, (Z)-2-nonenal, 4-methyl-phenol, delta-hexalactone, heptanoic acid, 2-pentylfuran and 2-acetyl-pyrrole gave specific aroma notes.

Keywords. Sobrassada – Dry fermented sausage – Aroma – Volatile – Fatty acids.

Composants de l'arôme dans la Sobrassada de Majorque à partir de porc noir

Résumé. *La Sobrassada de Majorque à partir de porc noir a été utilisée pour déterminer les composants aromatiques clés. La Sobrassada avait une teneur élevée en acides gras monoinsaturés. Une libération spécifique d'acides gras polyinsaturés libres (FFA) a été détectée dans la proportion des FFA, contrairement à la composition en acides gras totaux qui a été plus élevée en gras polyinsaturés FFA et, en moindre proportion, en monoinsaturés. L'analyse de l´espace libre pour la Sobrassada a abouti à l´identification de quatre-vingt-quatre différents composés volatils, dont 3 ont été pour la première fois détectés dans les saucissons secs (nonanoate de méthyle, 1-méthyl-1H-pyrrole et 2-acétyl pyrrole). L'arôme de la Sobrassada a été caractérisé par trente-cinq arômes différents. Ces arômes correspondent à des composés déjà détectés en tant que contributeurs essentiels à l'arôme des saucissons secs (3-méthyl butanoïque, éthyle butanoate 3-méthyl, 2,3-butanedione, et acide acétique) et des additifs tels que octanoate d'éthyle, furfural, benzaldéhyde, (Z)-2-nonenal, 4-méthyl-phénol, delta-hexalactone, acide heptanoïque, 2-pentylfuran et 2-acétyl-pyrrole ont donné des notes aromatiques spécifiques*

Mots-clés. *Sobrassada – Saucisson sec – Arôme – Volatils – Acides gras.*

I – Introduction

Sobrassada is a dry cured meat product from the island of Mallorca (Spain) characterised by a high percentage of white fat (40-70%) together with lean pork meat (30-60%), additives such as curing agents, salt, nitrate and nitrite, and spices (paprika, pepper, origanum, etc.). The process consist on grinding the raw materials to obtain a fine paste that its filled into casing and left to ripen for several weeks to develop the typical sensory characteristics. Sobrassada of Mallorca from black pig is defined as a sobrassada exclusively processed using meat from Mallorca black pig and filled into natural casings. The lipid composition of the meat product as well as the lipolysis process affect its final flavour that in the case of Sobrassada of Mallorca from black pig could be essential to explain its characteristic aroma.

The highest aroma quality of traditional foods with protected geographical indication (PGI) meets consumer demands for less processed foods. The knowledge of those compounds responsible for the aroma in sobrassada is important to optimise the processing. Therefore our objective was to determine the key aroma compounds in Sobrassada of Mallorca from black pig and to study the contribution of lipolysis to the generation of the key aroma compounds.

II – Materials and methods

1. Sobrassada samples

Traditional dry cured sausages "Sobrassada of Mallorca from black pig", PGI (El Zagal, Felanitx, Mallorca, Spain) were used as described Gianelli *et al*. (2010).

2. Chemical analyses

The chemical parameters, pH, water activity (Aw), moisture and nitrogen content were determined as described Gianelli *et al*. (2010). Total lipids were extracted by the Folch method (Folch *et al*., 1957). The chemical analyses of each sobrassada sample were done in triplicate and results expressed as the mean in dry matter. Fatty acid methyl esters (FAME) of total lipids and free fatty acid analyses are described in Gianelli *et al*. (2010).

Extraction of headspace volatile compounds was done using a solid phase microextraction (SPME) device as described Gianelli *et al*. (2010). The extraction was done using a 85 µm CAR/PDMS stableflex fibre. For the identification and quantification of the volatile compounds, a gas chromatograph HP 7890A equipped with an HP 5975C mass selective detector (Hewlett Packard, Palo Alto, CA) was used. The compounds were separated on a DB-624 capillary column J & W Scientific (Agilent Technologies, USA) and analyzed as described Marco *et al*. (2007).

The gas chromatrography-olfactometry was done by analyzing the compounds adsorbed by the SPME fibre. The desorption of volatile compounds was done in a gas chromatograph (Agilent 6890, USA) with a FID detector and a sniffing port (split 2:1, respectively) (ODP3, Gerstel, Mülheim an der Ruhr, Germany) as described Gianelli *et al*. (2010). The detection frequency method was used to estimate the aromatic impact of each volatile compound. Three trained assessors evaluated the odors from the GC-effluent. Aroma compounds were identified by three different ways; comparison with mass spectra; comparison with the retention times of authentic standards injected in the GC-FID; and by coincidence of the assessors descriptors with those in the *Fenaroli's handbook of flavour ingredients.*

III – Results and discussion

1. Sobrassada composition

Sobrassada of Mallorca from black pig have a protein and fat contents of 15.3 % and 57.6 % respectively. The pH value was 4.6 and Aw was 0.81 which are in accordance with the values recommended by the PGI. Total fatty acid composition in Sobrassada of Mallorca from black pig is shown in Fig. 1. Total saturated fatty acids were about 34-35 %, monounsaturated 54-55 % and polyunsaturated 10 %. The free fatty acids (FFA) detected in Sobrassada had different proportions than the obtained for the total fatty acid concentration (Fig. 1). The proportion of FFA in contrast to the total fatty acid composition was higher in polyunsaturated FFA and, in lower proportion, monounsaturated ones.

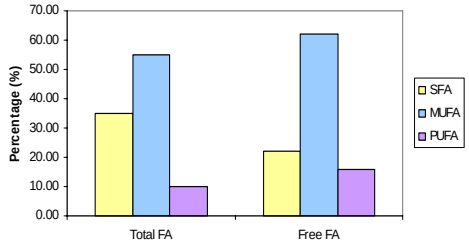

Fig 1. Total fatty acid and free fatty acid composition of sobrassada.

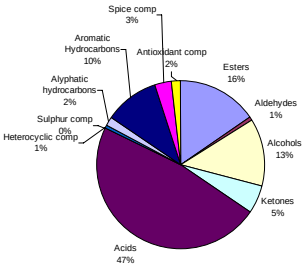

Fig. 2. Volatile compounds by chemical classes extracted from sobrassada using SPME.

2. Aroma analysis

The extraction of volatile compounds from the headspace of Sobrassada of Mallorca from black pig using SPME indicated the presence of high number of volatile compounds (Fig. 2).

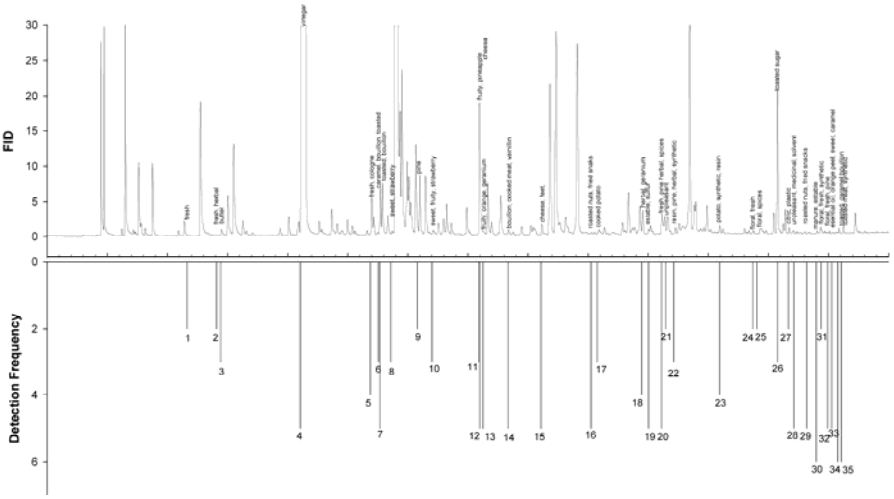

Fig. 3. Chromatogram and olfactogram of sobrassada from Mallorca of black pig.

The compounds identified corresponded to different chemical classes that represented a percentage of the total extracted area (Fig. 2). Thirty five different aroma active zones were detected (Fig. 3, Table 1), but 5 of them were not identified. Many of these compounds were also detected as aroma active compounds in dry sausages (Marco *et al*., 2007). The contribution of the compounds to the aroma of sobrassada can be evaluated by their detection frequency values (DF in Fig. 3). The compounds that showed the highest DF values in sobrassada were ethyl 3-methylbutanoate, ethyl octanoate, furfural, benzaldehyde, (Z)-2-nonenal, 4-methyl-phenol, delta-hexalactone, acetic, 3-methyl-butanoic and heptanoic acids, 2-pentylfuran, and 2-acetyl-pyrrole. In addition, 5 compounds contribute to the aroma with meaty

notes such as ethyl octanoate, furfural, (Z)-2-nonenal, dimethyldisulfide, and 1-methyl-1H-pyrrole.

Table 1. Aroma active zones detected in sobrassada of Mallorca from black pig and chemical compound identified

N†	LRI [b]	Chemical Compound	GCO Descriptor	N†	LRI††	Chemical Compound	GCO Descriptor
1	602	2-methyl-propanal	fresh	19	1008	2-pentyl-furan	stable, sulfur
2	628	1-propanol	fresh, herbal	20	1021	benzaldehyde	fresh, pine, herbal, spices
3	631	2, 3 -butanodione	butter	21	1025	3-carene	unpleasant
4	701	Acetic acid	vinegar	22	1032	6-methyl-5-hepten-2-one	resin, pine, herbal, synthetic
5	766	Unknown	fresh, cologne	23	1076	hexanoic acid + alfa-terpinene	potato, synthetic, resin
6	773	dimethyl disulfide	caramel, Bouillon	24	1110	benzeneacetadehyde	floral, fresh
7	777	1-methyl-1H-pyrrole	toasted, Bouillon	25	1115	trans-2-octenal	floral, spices
8	785	Unknown	sweet, strawberry	26	1141	tetramethyl-pyrazine	toasted sugar
9	810	1-pentanol	pine	27	1155	nonanal	citric, plastic
10	825	ethyl butyrate	sweet, fruity, stawberry	28	1162	heptanoic acid	medicinal, solvent, rancid
11	871	ethyl 2-methyl-butanoate	fruit, pineapple	29	1178	2-acetyl pyrrol	roasted nuts, fried snacks
12	872	Unknown	cheese	30	1190	4-methyl-phenol	manure, stable
13	875	ethyl 3-methylbutanoate	fruity, orange, geranium	31	1196	phenylethyl alcohol	floral, fresh, synthetic
14	900	furfural	bouillon, cooked meat	32	1206	Unknown	floral, fresh, pine
15	925	3-methyl-butanoic acid	cheese, feet	33	1213	delta-hexalactona	essential oil, orange peel
16	963	Unknown	roasted nuts, snacks	34	1223	(Z)- 2-nonenal	toasted caramel bouillon
17	968	3- (methylthio)-propanal	cooked potato	35	1229	ethyl octanoate	toasted meat synthetic.
18	1002	beta-myrcene	herbal, geranium				

†Number of the aroma active zones as represented in Fig. 3.
††Linear retention indices of the aroma detected in the sniffer port.

IV – Conclusions

The aroma of sobrassada of Mallorca from black pig was not only due to compounds already reported as essential contributors to the aroma of dry sausages (3-methyl butanoic acid, ethyl 3-methyl butanoate, 2,3-butanedione, and acetic acid) but also to the presence of other compounds such as ethyl octanoate, furfural, benzaldehyde, (Z)-2-nonenal, 4-methyl-phenol, delta-hexalactone, heptanoic acid, 2-pentylfuran and 2-acetyl-pyrrole which gave specific aroma notes. Many of these compounds are derived from the lipid autooxidation process.

Acknowledgments

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