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in

De Pedro E.J. (ed.), Cabezas A.B. (ed.).
7th International Symposium on the Mediterranean Pig

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 101

2012
pages 329-333

Article available online / Article disponible en ligne à l’adresse :

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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.

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 chromatography-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.
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).

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-butyanoic 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, dimethyl disulfide, and 1-methyl-1H-pyrrole.

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

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

†Number of the aroma active zones as represented in Fig. 3.

**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**

Financial support from AGL 2009-08787 from MCINN (Spain) and FEDER funds and FONDECYT for the 11070128 (Chile) are fully acknowledged. The predoctoral scholarshop from GVA (Generalitat Valenciana, Spain) to A. Olivares is also acknowledged.
References

