INFLUENCE OF STARTER CULTURES ON THE VOLATILE PROFILE OF A SPANISH FERMENTED SAUSAGE (Fuet)

J. A. García Regueiro, M. A. Rius, M. Hortós, M. Hugas and I. Díaz
IRTA. Food Chemistry Unit. Centre de Tecnologia de la Carn. Granja Camps i Armet. 17121 Monells (Spain)

Background

The elaboration of fermented meat products requires the use of starter cultures to improve the technological and sensorial quality. Starter cultures can contribute to the proteolysis and lipolysis of meat products (Dainty and Blom, 1995). These processes are involved in the development of sensorial characteristics by the production of degradation products: fatty acids, aminoacids and peptides (Dierick et al. 1974, Debereve et al. 1976;). These compounds can be oxidized producing volatile compounds which are very important for the flavour of fermented meat products (Cantoni et al. 1966, Langer, 1969, Monteil, 1991). The evaluation of the effect of selected starter cultures on the flavour could be useful to produce fermented meat products with specific characteristics (Nieto et al. 1989, Edwards et al. 1991, Ordoñez et al. 1989). Berdague et al. (1992) showed that starter cultures had a strong influence on aroma of dry sausage of starter cultures; since, lipolytic cultures increased the formation of ketones, aldehydes and alkanes. In this work three starter cultures selected, in vitro, by their proteolytic activities have been evaluated in the production of a typical Spanish fermented sausage (fuet). Strains from the genus *Staphylococcus* have shown to present lipolytic and proteolytic activities in dry-cured meat products (Nielsen and Kamner 1989, Carrascosa and Cornejo 1991).

Objectives

Influence of starter cultures with different proteolytic activity on volatile compounds of a Spanish fermented sausage (fuet)

Methods

Samples

Four groups of sausages were manufactured: control group without starter culture and three groups with the following starter cultures: *Staphylococcus carnosus* LTH 2102 (standard starter culture) (**ST3**), *Staphylococcus xylosus* CTC 3037 (**ST2**) and *Staphylococcus xylosus* CTC 3050 (**ST1**) . These starter cultures were selected in basis to their proteolytic and lipolytic activities. Three samples of each group were analyzed at the end of the processing. The manufacturing conditions were described in Garriga et al. (1996).

Volatiles compounds analysis

4 g of sample previously homogenized were placed in a vessel that was closed. The vessel was coupled to a nitrogen stream flowing through the sample, the volatile compounds were collected with a trap of graphited charcoal during 60 minutes. The volatile compounds were desorbed in a Retorik desorption unit (Switzerland) by applying microwave energy. Gas chromatography-mass spectrometry: volatile compounds were separated in a capillary column 40 m x 180 µm and a film thickness of 0.4 µm coated with a stationary phase of 5% phenyl methylsilicone (J&W, USA), the temperature program applied was: 50°C- 2 minutes- 5°C/min-270°C-2 minutes, the head pressure was 140 kPa and the carrier gas helium; the temperature of GC-MS interface was 280°C, scans were acquired in the range 40-400 Da/e. Mass spectra were compared with the spectra of NBS library and Kovats index were used in the procedure for peak identification.

Results and Discussion

Staphylococcus xylosus spp. strains isolated from fermented sausages and some commercial cultures were evaluated for proteolytic and lipolytic activities *in vitro* (Hugas and Roca, 1997). The cultures showing a higher proteolytic activity were selected (see methods), *Staphylococcus xylosus* CTC 3037 showed lipolytic activity. Volatile profiles were characterized by four groups of main compounds: hydrocarbons, aldehydes, esters, and terpenes, these latter coming from the spices used in he manufacturing of sausages. Figure 1 shows the relative concentrations of terpenes in the four groups of sausages studied. The most proteolytic culture *Staphylococcus xylosus LTH 2102* showed a higher release of terpenes, probably due to a higher degradation of proteins that can reduce the interaction of terpenes and proteins. *Staphylococcus xylosus LTH 2102* showed higher concentrations of 3-methylbutanal that can be produced by the degradation of some aminoacids like Val, Leu and Ile. The amount of esters was considerable (figure 2), showing a probable contribution of microorganisms to the ester formation (Edwards et al. 1989). Sausages produced with *Staphylococcus xylosus CTC 3050* showed a lower concentration of methyl and ethyl esters, this agree with the highest lipolytic activity of this starter culture. Hexanal concentration was higher in control group which seemed to present more susceptibility to lipid oxidation. *Staphylococcus xylosus LTH 2102* presented the lowest concentration of hexanal. Since, the stability to lipid oxidation could be improved by the use of starter cultures in comparison with the control group without starter culture.

Conclusions

Staphylococcus xylosus LTH 2102 showed a higher releasing of terpenes that can be related with the higher proteolytic activity of this starter culture. *Staphylococcus xylosus CTC 3050* reduced the quantity of ester of short chain fatty acids. All the starter cultures used reduced the concentrations of hexanal.

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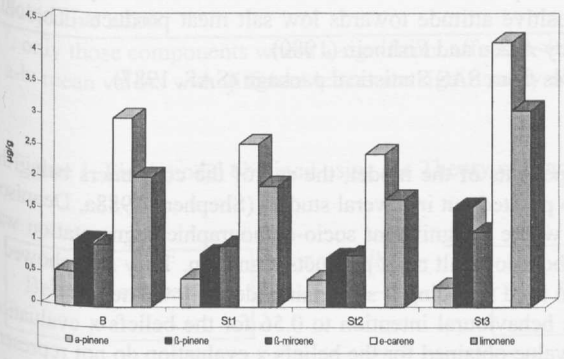

Fig. 1. Terpene concentrations (x 10). B, control group, ST1, *St. xylosus* CTC 3050, ST2, *St. xylosus* CTC 3037, ST3 *St. carnosus* LTH 2102

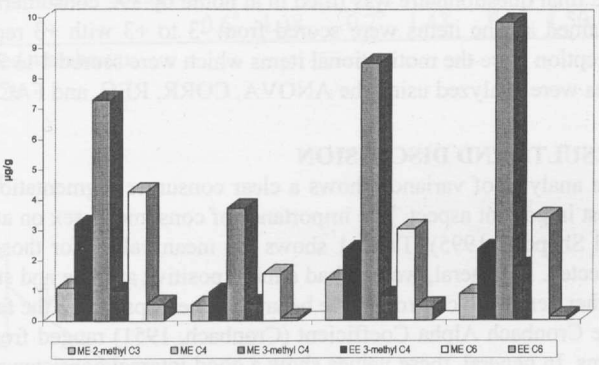

Fig. 2. Esters concentrations (x 10). ME, methyl ester; EE, ethyl ester. C3, propanoic acid; C4, butanoic acid; C6 hexanoic acid.B, control group, ST1, *St. xylosus* CTC 3050, ST2, *St. xylosus* CTC 3037, ST3, *St. carnosus* LTH 2102.