PE8.22 Microbiological changes during the ripening of 'androlla', a spanish traditional dry fermented sausage. Efect of the time smoked 218.00

Maria del Camino García Fontán (1) caminogarcia@ceteca.net, José M. Lorenzo(1), Gloria Garcia (1)
(1)Meat Technology Center of Galicia

Abstract - Counts of total aerobic mesophilic microflora, lactic acid bacteria, moulds and yeasts, Enterobacteriaceae, total coliforms and Staphylococcus aureus, and some physico-chemical parameters (pH and aw values) were determinated during the ripening of Androlla, a spanish traditional dry fermented sausage made in the NW of Spain. We also have investigated the effect that days of smoked has in counts of the principal microbial groups. Lactic acid bacteria were the most prevalent microorganisms, with enhaced growth during the ripening and smoking process and a consequent decreased of pH. In general, few significant differents were found in counts of different gropups of microorganism between the three batches of sausages. A reduction in pH values was observed during ripening and presented similar results to those found un different Spanish sausages and other European dry fermented products. Smoked days had no significant effect on counts of different microorganism groups. This study demonstrated that when highly contaminated raw ingredients are used indicator organisms might not be eliminated during processing. Therefore, it is important to that to produce safe Androlla following traditional recipes and methodologies it is necessary to work under hygienic conditions using raw materials of good microbiological quality.

Keywords – Androlla, Dry fermented sausage, Microbiological profile, Ripening.

*Meat Technology Center of Galicia, 32900 Ourense, Spain (corresponding autthor to provide phone: 0034 988 548 277; fax: 0034 988 548 276; email: caminogarcia@ceteca.net)

I. INTRODUCTION

During the manufacture of dry-fermented sausages, chemical and physico-chemical, modifications occur, especially dehydration, fermentation of carbohydrates and acidification, development of a typical colour, lipolysis and oxidation of lipids, and proteolysis. These changes, which are responsible for the organoleptic characteristics of the final products are, in part, due to the activity of the different microbial groups wich develop in sausages during the fermentation/ripening stage. The microbiology of dry smoked sausages is variable and complex and the rate of spoilage of these meat products can reduce the shelf life and cause substantial financial losses to manufacturing companies. The spoilage ecology is affected by a combination of intrinsic and extrinsic factors. Factors such as ripening technique [1], use of natural intestines of pork and beef to stuff meat batters [2], bacterial population of raw meat material [3,4], introduction of spices as formulation ingredients [5] and smoke [6], all have significant influence on the microflora of these types of meat products and also on the growth and survival of spoilage microorganisms during shelf-life period. Androlla is a traditional raw-cured sausage elaborated in the NW of Spain that has a good appreciation among the consumers abd a great installation in the local markets. At the present,this sausage is elaborated in a hnad made or semi-industrial way, following absolutely empiric raditional procedures; due to this the obtained final product possesses a quite heterogeneous quality and in many occasions does not offer a total sanitary guarantee. The studies carried out on androlla until now only refer to the microbiological [7] and the biochemical [8] characteristics of the final product and to the biochemical changes during the manufacture [9]. There is a lack information about the microbiological changes that occur throughout the manufacturing process of this sausage. The aim of this study is to know the counts of the different microbial groups of technological and hygienic interest and to study the effect that produces the intensity of the smoked one.

II. MATERIAL AND METHODS

1. Samples In order to carry out this study, three batches of Androlla were industrially produced in one factory using traditional technologies. From each batch of sausage, samples at 0 days (mix before stuffing) and after 7, 14, 28 and 35 days of ripening were taken. The pieces were smoked during the first 2, 3 and 5 days of ripening using oak wood. Each sample consisted of one entire androlla piece. The average quantities of the

ingredients used in the preparation of the mix used in the manufacture of the androlla units used in this study (expressed as kg/100 kg of mix) were: ribs with their fleshy parts, 60.0; pork jowl, 8.0; lean pork, 22.0; pork back fat, 5.0; salt, 2.0; sweet paprika, 2.4; spicy paprika, 0.4; garlic, 0.1; marjoram, 0.1. Sugars and LAB starter cultures were not added. Meat was ground, ribs were cut into pieces of approximately 3–4 cm length, and the ingredients were minced for 15 min. The resulting mix was left standing for 12 h at 20 °C and was then stuffed into natural casing of 6.5 cm in diameter in units of 20–25 cm length. Ripening was carried out in storerooms at 12 °C and 75% of relative humidity. Samples were transported to the laboratory under refrigeration (below 4 °C). 2.- Microbiological analysis In each androlla unit, after aseptically removing and discarding the outer casing and the bones, 22 g of the edible part were aseptically taken and homogenized with 200 mL of sterile 0.1% peptone water also containing 0.85% NaCl and 1% Tween 80 as emulsifier, at 40–45 °C for 2 min in a Masticator blender (IUL Instruments, Barcelona, Spain), thus making a 1/10 dilution. Successive decimal dilutions were prepared by mixing 1 mL of the previous dilution with 9 mL sterile 0.1% peptone water. Total aerobic mesophilic microflora was enumerated in Standard Plate Count Agar (Merck), after incubation at 30 °C for 48 h; lactic acid bacteria in De Man, Rogosa, Sharpe (MRS) agar (Merck) acidified until pH 5.6 with acetic acid after incubation at 30 °C for 5 days; Enterobacteriaceae in violet red bile dextrose (VRBD) agar (Merck) after incubation at 37 °C for 24 h; total coliforms in violet red bile (VRB) agar after incubation at 30 ºC for 24 h; moulds and yeasts in Oxitetracicline Glucose Yeast Extract agar (Merck) incubated at 25 °C for 5 days and staphylococci in Baird Parker agar (Merck) + Egg Yolñ Tellutite Emulsion (Biokar Diagnostics) incubated at 37 °C for 24 h. From each sample and on each culture medium, 1 mL of each dilution was inoculated in duplicate on plates and mixed before solidification. Plates of MRS agar, VRB agar and VRBD agar were covered with a layer of the same culture medium before incubation. After incubation, plates with 30–300 colonies were counted. 3.- pH determination The pH was measured during the different processing stages (mix before stuffing and after 7, 14, 28 and 35 days of ripening) with a pH meter micro pH 2002 (Crison Instruments, S.A.) after mixing 10 g of sample with 90 mL of distilled water for 2 min in a Sorvall Omnimixer homogeniser (Omni International).

III. RESULTS AND DISCUSSION

Table 1 shows the evolution of microbial counts during the ripening process of Androlla and with differents days of smoked. The total viable mesophilic counts were similar to those observed by [10] in Galician chorizo and by [11] at the end of the ripening process of the chorizo of Leon, around a log unit higher than those observed by [12] in chorizo and around two log units higher than those observed by [13] in salchichon at the end of the ripening process. The counts of different microbial groups obtained at the end of the ripening process were in agreement with those obtained by other authors in other traditional fermented sausages [13,14]; and showed that the lactic acid bacteria constitued the major flora of the sausages. Due to the good adaptation of lactic acid bacteria to the meat environment and their faster growth rates during fermentation and sausage ripening, they become the dominant microflora. Table 1.- Microbiological profile of Androlla (mean ±standard deviation) Legend: N.D. - Not Determinated Lactic acid bacteria present in low numbers at the beginning of fermentation increased during the process and became the predominant flora in final products, in agreement with results previously reported for similar fermented sausages [15,16]. A study performed by [17] on traditional fermented sausages from countries of west and south-east Europe, revealed numbers of LAB in pork meat ranged from 4 to 5 log cfu g-1. These microorganisms ferment sugars that result in production of acids and a decrease of pH, which are responsible for the sensory quality and correct texture of the final products, as well as its preservation. A good indicator of the development of this microflora was the pH values observed in the final products, ranging from 5.3–5.4. Moulds and yeasts were present with a slight increase during the fermentation process, except to 14 days of ripening where moulds and yeast were at low levels. Their contribution to the development of sensorial qualities of dry fermented sausages has been described previously [18,19]. Results concerning the indicator organisms are presented in Table 1. According to the Food Safety Authoriy of Ireland Guidelines (2001), Androlla would be classified as Unsatisfactory as Enterobacteriaceae and total coliforms counts were higher than log 3 cfu g-1 and 2 cfu g-1, respectively. These organisms were

present at high leveles in all processing stages. The high levels observed can be related to the availability of nutrients and with the values of pH and aw being still compatible with the growth of these organisms and indicates that they are not eliminated at the processing conditions. On the basis of these results it can be inferred that these products were produced under deficient hygienic conditions and/or using raw material of poor microbiological quality. St. aureus was present in all samples at levels not considered hazardous but still unsatisfactory.

IV. CONCLUSIONS

In general, few significant differents were found in counts of different gropups of microorganism between the three batches of sausages. A reduction in pH values was observed during ripening and presented similar results to those found un different Spanish sausages and other European dry fermented products. Even with lactic acid bacteria being the most prevalent microorganism, with enhanced growth during the smoking process resulting in a decrease of pH, the microbiological safety of Androlla cannot assured if highly contaminated raw materials are used. Smoked days had no significant effect on counts of different microorganism groups.

ACKNOWLEDGEMENT

This research was supported by Xunta de Galicia (the Regional Government), Grant FEADER 2007-17.

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