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Study of some production techniques of ripened salami; preparation of traditional products ripened for long time, use of traditional and innovatory operations

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SUMMARY – In almost all countries of Mediterranean Europe, different types of meat products are sold under the generic name of cured sausages: Starting from the first decades of 1900 these productions ceased to be home-made to become handicraft and industrial. With the aid of new scientific achievements, different techniques were then developed for some unit operations such as meat cooling and thermal conditioning; grinding of muscle and fat components; mixing with different ingredients and additives; filling in natural or artificial casings; ripening, carried out at temperatures close to room temperature and separation into some stages: heating, fermentation, drying and curing. It is common opinion that handicraft salami was less acid, less gummy and had a more pronounced aroma although it was often fatter. In order to prepare more traditional salami, some technologies were evaluated at SSICA which, as far as possible and consistent with safety requirements, followed the more traditional ones.

Keywords: Techniques, salami, tradition, innovation.

RESUME – "Etude de certaines techniques de production pour le salami et sa maturation ; préparation de produits traditionnels à longue maturation, utilisation de processus traditionnels et innovants". Dans presque tous les pays de l'Europe méditerranéenne, plusieurs types de produits carnés sont indiqués par le nom générique de "salami" (embutidos, saucissons, raw sausages etc). Tous ces produits ont une origine très ancienne et fermière; à partir du début du XX^e siècle on a démarré des productions artisanales et/ou industrielles. Les nouvelles connaissances scientifiques ont permis la rationalisation et le développement des différentes techniques en général, et de certaines opérations unitaires telles que la réfrigération et le conditionnement thermique des viandes, le hachage des composants musculaires et adipeux, le mélange des ingrédients et des additifs, l'embossage en boyaux naturels et artificiels et la maturation des produits, qui comprend l'étuvage, la fermentation, le séchage et l'affinage. On considère communément que les produits traditionnels sont moins acides, avec une texture moins caoutchouteuse (plus plastique) et un arôme plus agréable et traditionnel que les produits de l'industrie. Pour préparer des "salamis" avec des caractéristiques organoleptiques traditionnelles on a étudié, dans les laboratoires pilotes de la SSICA, différentes techniques traditionnelles et innovantes de production.

Mots-clés : Saucissons, techniques, innovation, tradition.

Introduction

The technology of ripened salami production was developed starting from traditional techniques, pursuing priorities dictated from various needs; industrial technologies pursue products preparation with high alimentary safety standards, good perseverance production, not high ripening times and checked production costs prices. Even if undoubted advantages have been achieved, due to productive standardization, have been lost partly those due to traditional productions.

The grocer products market evolves to a greater complexity and traditional products, (more handicrafts and/or natural) are more required; in various Mediterranean Europe countries there are many productive experiences, which are inclined to satisfy these requirements through the use of high quality raw materials, coming from more traditional cattle-breeding types and/or from the use of autochthones breeds. (Franci *et al.*, 2001). Besides, in many meeting about Mediterranean swine, technologies influence has been taken into important consideration, considering that those used industrially can't conform to achievement of required results. Discovering again and/or revisiting the traditional techniques, more suitable for preparation of products above mentioned, requires a study about meat and/or meat mixtures transformation in dried products. (Baldini *et al.*, 2000). It is therefore important to know chemical, physic-chemical and microbial transformations, which happen during the various

processes, which influence inside and outside microbial growth and which permit to obtain products with desired characteristics (Baldini and Diaferia, 2000).

About Italian traditional salami these characteristics are: (i) typical taste come from long ripening; (ii) reduced acidification (not acid product); (iii) not salt product (sweet); (iv) accentuated and uniform red color; and (v) superficial microbial growth with moulds able to give agreeable and traditional aspect and aroma. The need to limit the fat's quantity in the fresh mixture determines a_w quite high which, together not acid pH, can promote the multiplication of alteration and/or pathogens micro-organisms.

Materials and methods

Techniques of preparation

To get to objectives and in accordance with know-how in other previous researches have been planned some researches which foresaw: (i) a good dry for 2-3 days low temperature $T < 0^\circ\text{C}$; (ii) use of less one quantity of salt (2-2,2%); (iii) not fat mixtures (lipids in fresh mixture=15-20%); (iv) traditional grinding (mincer plate 12 mm); (v) not long mixture times; (vi) mixture stop in refrigeration conditions ($T=2-4^\circ\text{C}$) for some days (2-3); (vii) put the mixtures in natural casings; (viii) technique to slow down acid fermentation: salamis drying for some days (3-4) at refrigeration temperatures ($T=2-5^\circ\text{C}$); and (ix) thermo hygrometric conditions during the drying which permit xerophilic moulds growth.

The various experiences have been planed to verify the influence of some technologic variables: (i) temperature and times drying; (ii) variation of temperature modes during drying (dropping and ascending); (iii) technique to slow down fermentation/putrefaction: first ripening at refrigeration temperatures with times in function of products characteristics; and (iv) ripening cycles characterised by minimum RH low values to control superficial microbial proliferation.

Physicochemical parameters

The mixtures and the salami, during and at the end of ripening, have been subjected to chemical and physic-chemical analysis to check the state of principal parameters (a_w , %moisture, pH), in according to the methods of the AOAC (1990); the activity of the water (a_w) has been measured with a hygrometer of the Novasina company Eeja-3 model. The controls have been made on product dissected in three fractions: (i) diameter outside fraction=5 mm; (ii) diameter median fraction=10 mm; and (iii) diameter inside fraction=12,5 mm.

Moulds analysis

The moulds count in salami was evaluated in plates containing the media reported as follows: Malt extract agar (OXOID), modified with the addition of 0.01% chlorotetracycline (Sigma). The tests were carried out on the total casing. This work was made under a Faster Dasi vertical laminar flow hood and the casing was washed with sterile water containing Tween 80 at 0.1% to obtain a dilution factor of 0.25 (w/w). The plates were incubated at 25°C for 4-7 days, the concentrations relating to individual species are expressed in cfu/cm². (Pitt *et al.*, 1997).

Microbial analysis

The raw mixture was examined after preparation and the salamis were examined after air drying and at the end of ripening. Enumeration and identification of lactic acid bacteria: in MRS agar (HIMEDIA). The plates were incubated at 30°C for 2 days. Enterococci enumeration: using Slanetz and Bartley medium at 42°C for 48 h. Total coliforms enumeration: on violet-red bile agar (OXOID) incubated at 37°C for 24 h; fecal coliforms enumeration. on violet-red bile agar (OXOID) incubated at 42°C for 24 h.

Results and discussion

In Figs. 1, 2 and 3, to example, are showed the results of one test. The results put in evidence: (i) a_w values very high in fresh mixture and in different fractions at drying end; (ii) a modest, but significant a_w reduction, during refrigeration ripening in all fractions, also in that more inside fraction; (iii) a reduction of moisture content very high during first phases only in the outside fraction; and (iv) a correct acidification, more accentuated in mixture with starter cultures, and characterised by accentuated increase during the last ripening phase.

The control of surface microbial flora represents a particularly important aspect of long ripening salamis production techniques, because moulds surface growth: (i) protects fat portion from oxidation, avoing rancidity, in fact metabolises and uses the peroxides; (ii) reduces superficially available oxygen, avoing even oxidation and improving the product color; (iii) contributes to the aroma, especially when there are natural casings; and (iv) can demolish fats, proteins, lactic acid (promotes the pH raising).

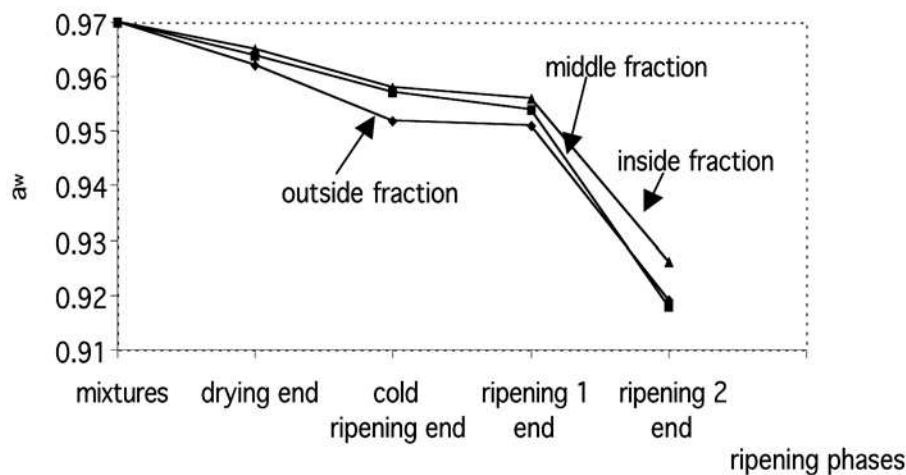


Fig. 1. a_w trend in the different fractions.

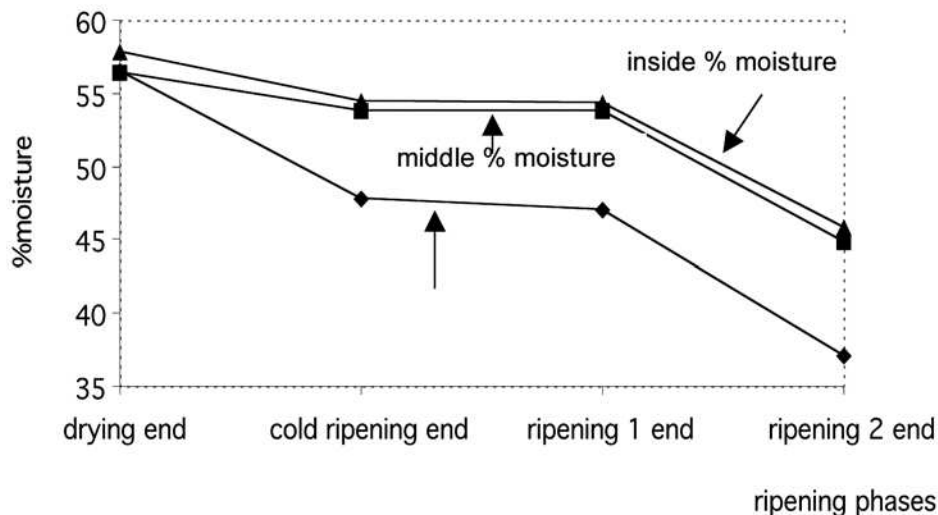


Fig. 2. % moisture trend in the different fractions.

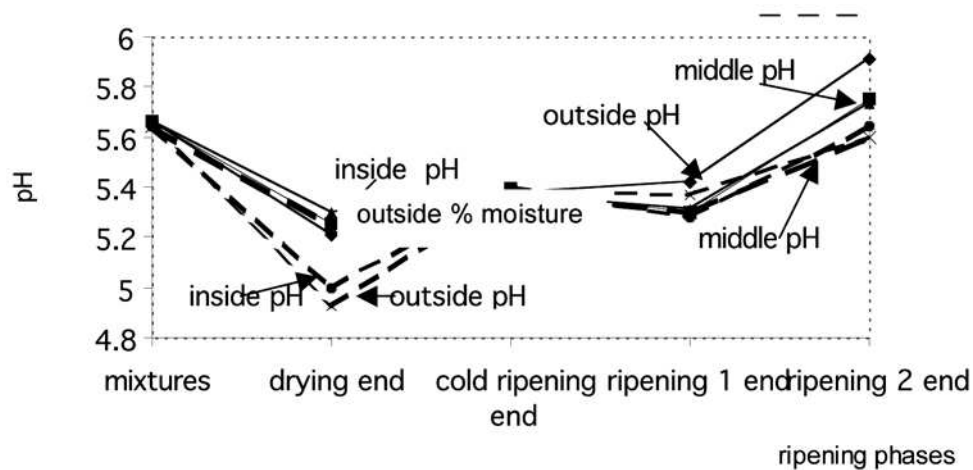


Fig. 3. pH trend in the different fractions, in mixtures with starter (---) and in mixtures without starter (—).

In the examined tests, studied, have been explored the possibilities to favour *Penicillium gladioli* proliferation which is among the species more frequently fined on ripened salami and which, in precedent tests, has proved to favour the positive organoleptic characteristics formation in salami. The choice of thermo hygrometric conditions during ripening has been done in accordance with general knowledge about the prevalence of xerophilic *Penicillium* against mould (*Aspergillum* or *Eurotium*), equally, if not more, xerophilic (faster untying of many *Penicillium* species, which adapt their self better in the stuffy rooms with RH included between 85% and 90% and temperature between 14° and 18°C) and in accordance with specific studies about growing of *Penicillium gladioli* and the other xerophilic types (typical and not) isolated from traditional swine products to various a_w values. These studies have permitted to put in evidence how *P. gladioli* multiplies more quickly than other xerophilic species at values of a_w higher (0.92). Fig. 4.

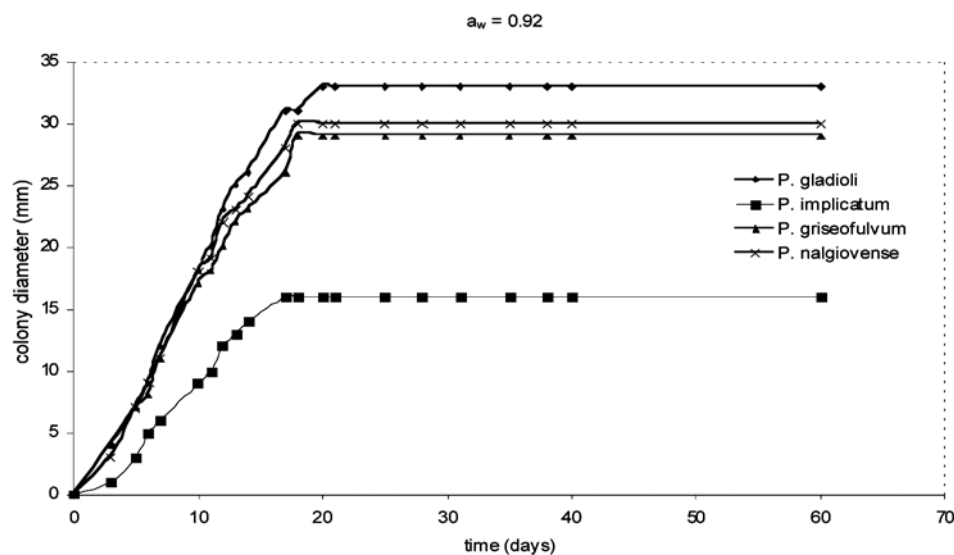


Fig. 4. Multiplication comparison between P.Gladioli and other xerophilic species.

Therefore have been imposed ripened cycles with products stops at high RH interrupted by fast and marked dryings, these methods have been used to prevent xerophilic species (*Mucor*) proliferation, which are able to multiply at high RH values and to give disagreeable appearances at finished product. Cold ripening has also favoured *P.Gladioli* multiplication against others examined xerophilic contaminants. The evolution of microbial flora has been characterised, during the ripening, by an increase of all examined germs, also those potentially harmful, and, during various drying phases by not significant variations of characteristic germs, do not multiply and in the last phase of preparation their number is significantly reduced. In particular it has been seen that the refrigeration ripening, characteristic aspect of these technologies: (i) does not change significantly microbial population characteristic (staphylococci and lactobacilli); (ii) slows down or stops the multiplication of undesired germs (coliforms and enterococci) which should multiply significantly owing to high a_w and pH values at the end of drying; and (iii) permits undesired flora control, which, later, will be inactivated by a_w reduction.

Conclusions

Ripened products valuation has permitted to put in evidence the formation of desired organoleptic characteristics (and such to permit to include the salami in traditional products category); use of period at low temperature, after drying, can besides, slowing down all processes, included some with microbial character, assure a greater qualitative constancy, an always missed aspect in many domestic and/or high quality handicraft productions.

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