

THE VARIATION OF SENSORIAL CHARACTERISTICS IN CHORIZO MADE WITH STARTER CULTURES

Monica Roman¹, Aurelia Ionescu², Cristina Roman³

¹Sanitary- veterinary and Food Safety Direction of Brasov, 20 A Feldioarei St.,
Brasov. Romania, e-mail: romanmona60@yahoo.com,

²University "Dunarea de Jos" St. Dumneasca, No 111, Galati, Romania,

³Lucian Blaga University, Bd. Victoriei, No. 5-7, 550 255, Sibiu, Romania.

Abstract

In the meat industry, especially in manufacturing the products that are submitted to the fermentation process(i.e. raw- dry salami and sausages), the use of selected microorganism cultures was introduced as a necessity for directing the fermentation stage only after the Second World War. The present study focused on the evaluation of the sensorial characteristics of the Chorizo sausages, products to which starter cultures were added. The method used was the point-scale method, values between 0 and 5 were attributed to each characteristic, according to STAS11061-88 and comparing them to samples with no starter culture addition. The sensorial analysis was made by a comission of 5 specialists on products declared as finite.

Keywords: *raw-dry products, microorganism starter cultures, sensorial characteristics*

Introduction

The starter cultures used in the composition of raw salami are usually lactic bacteria (lactobacilli, pediococi, streptococci, micrococi), moulds and rarely sediments/yeast, used for the controlling of the fermentation process, resulting in an even product that is safe for the consumer. Their addition is made in order to:

- direct some biochemical processes by which a certain degree of innocuousness is guaranteed for the product, thus negatively influencing the development of pathogenic and alteration microorganisms and by inhibiting the formation of some toxic substances (biogenic amines and carcinogenic nitrozamines);

- guarantee some sensorial characteristics: flavour, colour, consistence (Banu, 2000)

The microorganisms used for the biotechnology of the fermented meat products are very diverse but their roles are clearly defined for the different stages of the technological process, thus contributing to the end product's specificity;

Depending on the main action undertaken, starter cultures can be categorized as follows: acidic cultures, cultures that lead to the formation of colour and flavor, cultures for surface covering, cultures for bio-protection. For the present study we used cultures from the first two categories: acidic cultures made up of lactobacilli and pediococi, the *Lactobacillus*, *Pediococcus* types. Cultures leading to colour and flavor formation: consisting of the *Staphylococcus* type.

The ripening-drying process at 25°C and the addition of nitrites, nitrates and NaCl, individually or combined, inhibit the developing of the *Salmonella* and *Clostridium* (*Clostridium botulinum*) bacteria. The water activity reduction from 0.96 to 0.86 during this process also leads to the product's stabilization, by controlling the development of unwanted bacteria such as *Clostridium* and *Staphylococcus aureus*. In the case of the salami with long-term ripening and drying processes, the probability that these products contain enterohemorrhagic *Escherichia coli* is smaller than for the products with a short-lived ripening-drying process, because the water activity reduction has a lethal effect on these bacteria. (Dan, 1999; Barzoi,1999).

Experimental

In order to make the determinations we produced bulks (2 - 3 kg/bulk) of raw-dry Chorizo sausages, the composition's fermentation being made by means of three starter culture types, which are displayed in table 1. The starter cultures available on the market at the moment assure the addition of some quality-adequate microorganisms and in sufficient quantity in order to develop the wanted fermentation. During the fermentation process a drop of the pH value occurs as a result of sugar conversion into lactic acid. Thus a gradual degradation of the pathogenic flora and unwanted microorganisms takes place. The

acid medium also contributes to the nitrite's rapid reduction, which is initially added for the stability of the finite product's red colour.

The sausage formulations were made from basic components and adequate ingredients for 100kg composition, displayed in table 2.

Table 1. The starter culture types

Bulk	Name of culture	Microorganisms/Culture	Use for 100g/kg
S1	Baktoferment 61	<i>S.carnosus</i>	50
S2	Rowu-Ferm	<i>S. carnosus</i> , <i>L. plantarum</i>	60
S3	Biobak Sal Plus	<i>L. plantarum</i> <i>P.acidilactici</i>	50

S = *Staphylococcus*; L.= *Lactobacillus*; P.= *Pediococcus*

The diagram of technological processing of Chorizo sausages shows the following stages: cooling, leaving in the drying, airing, smoking, drying and ripening.

Table 2. The raw-dry sausage formulations' components (Chorizo type)

Component/ ingredient	Quantity (Kg)			
	S1	S2	S3	Witness
Pork- Quality I:	66	66	66	66
Lard	34	34	34	34
Salt	2.9	2.9	2.9	2.9
Nitrite	0.015	0.015	0.015	0.015
Garlic	0.040	0.040	0.040	0.040
Red pepper	0.200	0.200	0.200	0.200
Chilli	0.150	0.150	0.150	0.150
Sugar	0.800	0.800	0.800	0.200
Starter culture	*	*	*	-

Starter culture from table 1.

Results and Discussions

The evaluation of sensorial characteristics in Chorizo sausages was made by using the hedonic scale with a starter culture addition of *Staphylococcus carnosus* (S1), *Staphylococcus carnosus* combined with *Lactobacillus plantarum* (S2) or *Lactobacillus plantarum*

associated with *Pediococcus acidilactici* (S3). This in turn was compared to samples with no starter culture addition.

The sensorial analysis was made by an expert commission (consisting of 5 experts: 2 veterinary surgeons and 3 food industry specialists) on products declared finite, by using a five-point scale for every palatable sensorial indicator of raw-dry sausages, flavor, smell, colour, consistency and general aspect. The statistic data obtained for each qualitative attribute are shown in table 3.

Table 3. The medium average of the analysed bulks

Bulk Sausages	Shape and aspect	Colour	Consistency	Smell	Flavour
Chorizo- Witness	3.8	3.8	3.6	3.8	3.8
Chorizo- S1	4.4	4.8	4.4	4.8	4.8
Chorizo- S2	4.4	4.4	4.6	4.6	4.6
Chorizo- S3	4.4	4.0	4.6	4.2	4.2

The exterior aspect of the Chorizo sausages was characterized by specific shape typical for products, even, with a clean surface, with no air holes or excessive fat or water content at the products' edges. The cover was adherent to the composition for each product.

On cutting the witness sausage sample recurrent fat amounts and small air holes were noticed, which led to its being ranked at an average 3.8 points.

The colour of the Chorizo sausages with starter culture addition developed much faster and was more intense than that of the samples with no starter culture addition. The strong and fast acidification of fermented sausages compositions accelerated the chemical reactions as well as the biochemical reactions for the degradation of the nitrite added into NO, a product involved in the making of the pink-reddish colour by forming the nitrozomioglobine components. For the Chorizo sausages with a *Staphylococcus carnosus* (S1) addition the group of experts noticed the development of a more pleasant colour and the products received the highest score (4.8 points). It is also possible that the bulks with an addition of *Staphylococcus carnosus* combined with *Lactobacillus plantarum* or *Lactobacillus plantarum* associated with *Pediococcus acidilactici* as a result of strong acidification, rapid drop of the pH level (below 5.6). The nitrite must be converted in high

proportions into NO and a part of this reactive product must disappear from the complex matrix of the products obtained by means of volatilization and the salami's colour must be pale red. With a pH value under 5.2 the NO formation is virtually inhibited (Banu, 1997). The colour's development for all experimental bulks had a positive correlation with lactic acid accumulation in the sausage matrix and with the pH drop, the bacteria growth and the nitrite's disappearance from the system. Basically, the colour formation took place during the initial production stages i.e. fermentation and smoking, when the medium conditions were favourable to the development of chemical and biochemical reactions that are involved in the meat pigments' conversion into salt pigments.

For the colour formation in the Chorizo Witness sausages, only the following were used: the enzymatic meat equipment and the one secreted from the microflora of the raw-dry salami components prone to spontaneous contamination. The microflora consists of lactic bacteria, micrococci, staphylococci, pediococci, yeast, enterobacteria and other microorganisms.

The consistency - the main physical-chemical change that occurs during the ripening process of the raw salami and sausages is the composition's tying up i.e. the raw formula's transformation into a bound, firm, elastic structure, typical for a finite product. To the restructuring of the raw-dry salami and sausage components the following contributed: the formula's acidification, salt concentration, water evaporation, especially throughout the last drying phase.

The texture characteristics of the Chorizo sausages were conditioned by the presence of the starter culture product matrix and their nature. The texture had a better development as a result of the addition of starter cultures with a great acidification capacity such as *Lactobacillus plantarum* and *Pediococcus acidilactici*. The averages for the consistency indicator were the highest in the case of all bulks where these starter cultures were included in the formulations (4.6 points). The samples for both product types had a lower consistency compared to those with a starter culture addition (3.6 points for the Chorizo sausages, reference sample). The development of the texture in the salami and sausages had a positive correlation with the multiplying of the acidolactic bacteria, the formula's acidification, with the salt concentration growth in the medium, with product's

humidity drop and concentration of some substances (proteins and lipids). The obtained average on sensorial consistency testing are tantamount to the results obtained by appreciation of the texture formation by calculating the protein/water coefficients and the protein/(water+fat). These coefficients evolved positively as the products ripened and dried. The sausage firmness growth and the improvement the slicing capacity had progressed throughout the entire fabrication process but differently, all depending on the starter culture used.

Flavor and Smell -the chemical and biochemical changes, that occur during the ripening phase of the fermented and dry salami, which determine the development of the flavour and smell in finite products, refer to the composites' acidification determined by the glucid's turning into lactic acid by lactic bacteria and the nitrite's reduction to NO by micrococcus, as well as the change of most of components (protein, lipids).

The micro-organisms' development in salami combined with the endogenous enzyme activity are responsible for the development of an important number of aroma components and for sapidity.

Salt, added to the initial composition ontributes largely to the raw-dry sausage aroma. This ingredient's level rose progressively, most notably during last stage of drying and ripening while the water was evaporated.

According to our results the sausages with a starter culture addition had an equally general acceptability degree (4.4 points), superior to the witness sample (3.8 points). The final score set on the basis of the total medium score, is compared to a scale from 0 to 20 points, displayed in table 4.

The Chorizo sausages with a starter culture addition had modified flavour profiles compared to the samples. The Chorizo sausage bulk with a *Staphylococcus carnosus* starter culture addition (4.8 points for both indicators) with a slightly picante flavour was the most appreciated from the taste and flavour viewpoints. This is followed by the Chorizo sausages with a *Staphylococcus carnosus* combined with *Lactobacillus plantarum* (4.6). The combination of *Lactobacillus plantarum* and *Pediococcus acidilactici* (4.2) led to the development of a predominantly acid aroma.

Table 4. Qualitative attribute by the medium total average

Experimental Bulk Sausages	The medium total average	Qualitative attribute
Chorizo- Witness	15.04	Good
Chorizo- S1	18.72	Very good
Chorizo- S2	18.24	Very good
Chorizo- S3	17.12	Good

According to the results displayed in table 4, the Chorizo sausage bulk with a singulary starter culture addition or in mixeded were qualified on a scale from good to very good, the last one being given to the bulks of raw sausages with *Staphylococcus carnosus* addition and to the bulk with a mixture of *Staphylococcus carnosus* and *Lactobacillus plantarum*.

Conclusion

The analysed raw-dry salami had a firm and elastic texture, an adequate colour for every section, acid aroma and little noticeable ripening smell, typical characteristics for short-term ripening products. An important component for the product's flavor is *the lactic acid*, obtained during the fermentation process. The sensorial analysis confirms the obtaining results of physical-chemical and microbiological analyses during the stages of technological processing of the experimental bulk raw-dry sausages made with starter cultures.

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