THE INFLUENCE OF THE AUTOCHTHONOUS STARTER CULTURES IN THE PRODUCTION OF REGIONAL SAUSAGES - MECHANICAL PROPERTIES AND SENSORIAL EVALUATION

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Backgroung

The main goals of using starter cultures to control the fermentative process in the sausage production are: to improve sensoria characteristics; to promote higher homogeneity, a big challenge for regional production; to guarantee the health safety of thes products by the action of lactic acid bacteria that increase acidification and produce oxigen peroxid and also by the action of som lactic acid bacteria that produce bacteriocines. Some results can be achieved using techniques based on biologic antagonism amon some saprophytic microbial genera and pathogen microrganisms whose presence should be avoid (Rogriguez, 1996). Starter culture using *Micrococcaceae* could be use to shorter ripening time and cure process (Carrascosa-Santiago, 1989;) which will be a advantage for the industrial process.

Objectives

To know the influence of the autochthonous cultures of *Staphylococcus xylosus* and *Lactobacillus sake* on mechanical propertie and on sensorial characteristics of one typical kind of sausage "Paio de Barrancos" produced in the south-east of Portugal.

Methods

"Paio de Barrancos", is a regional and traditional Portuguese sausage with a cilindrical form (diameter: 4-5cm; length: 25-30cm) raw material is meat and fat from Alentejano pig bread. Two factories were studied. Factory A doesn't use smoke during the curin time. Factory B use smoke from holm-oak wood. At both factories the process conditions for the ripening period are the same (days; temperature: 3-5ºC; relative humidity: 90-95%). However the curing period conditions at factory A (30 days; temperature 1 12ºC; relative humidity 78-80%) are different from those of factory B (8 days, temperature 30-35ºC and smoking; 21 days temperature 17-18ºC).

Four 25Kg portions of meat and fat were prepared in each of those factories. Three out of them were inoculated, one with 1 cells/g of *Staphylococcus xylosus*, other with 10^8 cell/g of *Lactobacillus sake*, and other one with 10^8cells/g of *Staphylococc xylosus* and 10^8 cells/g of *Lactobacillus sake*. The fourth portion, the control, wasn't inoculated. Those portions are referee respectively as inoculation modality 1, 2, 3 and 4.

Mechanical evaluation was performed using a Texture Analyser Stable Micro System mod. TA-Hdi and respective software. Th tests performed were a Texture Profile Analysis (TPA) with a compressed platen (samples were cylindrical with 3,5cm of diamet and 3,5cm of height and were compressed twice to 10% of the initial height) and a cutting test with a blade knife (samples were slice with 4mm of height and the cutting was total; the maximum force was measured). 10 samples were used from each modality.

A trained panel composed by 14 persons performed a sensorial evaluation, using a descriptive and quantitative method with scale from 0 to 100. For the sensorial evaluation 5 samples of each modality were used.

The program STATISTICA was used to perform Anova analysis and for means comparison test (LSD).

Results and discussions

Significative differences were found in factory A in unsmocked sausages for hardness, cohesiveness, gumminess and chewimnes parameters (Table 1). The hardness was significantly lower in the modalities 1 and 2 than in the modality 4 (Table2). On the oth hand, gumminess and chewimness show values significantly lower in the modality 1 than in the modality 4, which could be relate with the lower hardness in the modality 1. In spite of none significant differences were found for the other mechanical parameters the factory A, we should point out the lowest value of fracturability in the modality 1, that can be related with the high values cohesiveness and adhesiveness in this modality. These facts can be related with lower value of shear force on cutting test inoculation modality 1 due to the lower hardness of the product inoculated with *Staphylococcus xylosus*. In factory B only the resul of shear force in cutting test show significative differences (Table 1). However lower values were found on the products belonging modality 1. All the other parameters didn't exhibit also significant differences. In a general approach we can conclude that the wo results were found in the sausages not inoculated from the control portion.

The sensorial evaluation of products from factory A revealed significant differences for juiciness and general appreciation (Tab 3) both with best values for modality 1 (inoculated with *S. xylosus*). The results from factory B didn't show any significa differences, maybe the action of smoke in the products inhibit the action of the microrganisms that were inoculated.

Conclusions

The sausages inoculated with *Staphylococcus xylosus* were those that exhibit best results for mechanical properties and also f sensorial evaluation, mainly those from factory A, that were not smoked.

On the other side, products from factory B didn't show any kind of difference for all the parameters studied what can be explaine by an inhibitory action of the smoke in the starter cultures used.

Pernitent literature

Carrascosa-Santiago, A. V. (1989). PhD Tesis.Complutense University of Madrid, Faculty of Biological Science.

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Table 1 – Texture Profile Analysis and Cutting Test – Variance analysis for inoculation modality factor in two factories

	Hardness	Fractura bility	Adhesive ness	Springi ness	Cohesive ness	Gummi ness	Chewi Ness	Shear force	Hardness	Fractura bility	Adhesive ness	Springi ness	Cohesive ness	Gummi ness	Chewi ness	Shear force
	FACTORY A								FACTORY B							
F value	6,044	1,503	1,330	0,663	3,660	5,503	4,279	2,373	0,231	0,819	0,856	0,776	1,070	0,199	0,270	3,371
P value	0,011	0,268	0,314	0,592	0,048	0,015	0,031	0,087	0,873	0,503	0,485	0,525	0,392	0,895	0,846	0,029
Sig.level	*	N.S.	N.S.	N.S.	*	*	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	*

Significant level: * for $p < 0,05$; N.S. – non significant

Table 2 –Texture Profile Analysis and Cutting Test – Means and Standard Deviation for different inoculation modality and two factories

Inoculation Modality	Hardness (N)	Fracturability	Adhesiviness (N)	Springiness	Cohesiveness	Gumminess (N)	Chewiness (N)	Shear force (N)
	FACTORY A							
1	2332 **a** ± 440	16,2 ±2,7	-34,0 ±16,4	0,766 ± 0,087	0,738 **a** ± 0,024	1721 **a** ± 325	1336 **a** ± 350	5721 ± 1181
2	6806 **a** ± 5369	19,4 ± 4,9	-22,2 ± 23,2	0,774 ± 0,039	0,724 **a** ± 0,017	4912 **ab** ± 3817	3863 **ab** ± 3023	8055 ± 4402
3	6997 **ab** ± 3393	16,9 ± 5,0	-17,3 ±10,5	0,786 ± 0,050	0,712 **ab** ± 0,030	5048 **ab** ± 2565	4047 **ab** ± 2210	8437 ± 2600
4	12566 **b** ± 2431	25,7 ± 11,4	-12,6 ± 5,1	0,731 ± 0,032	0,69 **b** ± 0,013	8649 **b** ± 1517	6355 **b** ± 1382	9570 ± 3468
	FACTORY B							
1	4845 ± 3888	19,5 ± 5,1	-81,3 ± 59,0	0,798 ± 0,137	0,720 ± 0,051	3593 ± 3037	3112 ± 2963	5832 **a** ± 2721
2	3866 ± 1615	15,3 ± 2,4	-106,7 ± 93,0	0,727 ± 0,050	0,692 ± 0,023	2697 ± 1185	1966 ± 908	9548 **b** ± 3628
3	5133 ± 1627	16,6 ± 4,9	-58,0 ± 6,7	0,736 ± 0,109	0,702 ± 0,039	3632 ± 1318	2770 ± 1462	7282 **abc** ± 2830
4	5354 ± 2591	17,6 ± 4,0	-46,7 ± 52,1	0,703 ± 0,101	0,680 ± 0,022	3636 ± 1721	2586 ± 1312	6216 **ac** ± 1450

At the same factory and in the same column, different letters represent means significant different

Table 3 – Sensorial Evaluation - Variance analysis for inoculation modality factor in two factories

	Color Intensity	Aroma Intensity	Taste Intensity	Tender ness	Juiciness	General Apprecia tion
Factory A						
F value	1,263	2,285	0,973	0,859	2,675	3,435
P value	0,288	0,080	0,406	0,463	0,048	0,018
Sig. level	N.S.	N.S.	N.S.	N.S.	*	*
Factory B						
F value	0,531	0,783	0,473	0,028	0,300	0,128
P value	0,662	0,505	0,701	0,994	0,826	0,944
Sign. level	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Significant level : * for $p < 0,05$; N.S. – non significant

Table 4 – Sensorial Evaluation – Means and Standard Deviation for inoculation modality factor in two factories

Inoculation Modality	Color Intensity	Aroma Intensity	Taste Intensity	Tender ness	Juiciness	General Appreciat ion
Factory A						
1	75 ± 10	70 ±16	74 ±11	70 ±14	72**a** ±13	72**a** ±12
2	76 ± 12	66 ± 17	71 ±12	67 ±14	65**b** ±16	65**b** ±15
3	77 ± 10	71 ± 13	73 ±12	66 ±17	70 **ab** ±14	68 **ab** ±14
4	79 ± 10	73 ± 13	74 ±10	66 ±16	67 **ab** ±16	65**b** ±13
Factory B						
1	75 ± 13	66 ± 15	70 ±14	69 ±19	69 ±18	66 ±17
2	73 ± 13	69 ± 14	71 ±14	68 ±20	69 ±20	65 ±18
3	73 ± 16	67 ± 15	68 ±15	68 ±17	67 ±19	66 ±15
4	76 ± 15	65 ± 15	71 ±13	68 ±17	67 ±17	66 ±15

At the same factory and in the same column, different letters represent means significant different