Elaboration of a fermented meat product with *L. plantarum* using bovine plasma as a culture medium

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Background

Starter cultures are used in the meat industry to shorten the time of fermentation and to assure the quality and acceptability of the fi product. Most culture used are lactic acid bacteria stumps, Actinobacteria, Staphyloccocus, Halomonas elongata, Aeromonas spec. and so molds and yeast (Hammes et al., 1988).

For isolation and propagation of these microorganisms several media broth and agar have been proposed APT (All Purpose Medium Tween) suggested by Evans and Niven (1951), MRS (Man, Rogosa and Sharpe 1960), S.L. *Lactobacillus* selection) by Rogosa, Mitchell Wiseman (1951). In 1997, Barboza et al., developed a medium for Lactobacillus using bovine blood plasma (**BPM**) and demonstrated that it is efficient as the MRS.

Objectives

To elaborate a fermented meat product using **BPM** to spread a cultivation of *Lactobacillus plantarum* and to measure efficiency in reduction , weight loss, as well as moisture content and *Lactobacillus* count.

Methods

L. *plantarum* isolation was done of an initial sample obtained from a commercial salami sampled from a supermarket of the town, wh was homogenized with peptone water (0,1%), then plated in agar **BPM** was carried out. The microorganism was characterized using differential properties of the gram positive non forming spores bacillus and by means of the carbohydrates fermentation pattern of *Lactobacil genus* (manual Bergey´s). 2 ml of the starter culture for each kg of elaborated product was added..

For formulation and preparation of the Salamis, pork meat was used from a meat house of the city, corresponding to the cut denomina ham, which represents the muscles located in the rear leg of the carcass. Salami was formulated to have 15% fat, 2,5% salt, 3,0% sugar, 0,00 nitrite, 0,04 ascorbic acid, 0,2% pepper, 0,1% garlic, 0,05% nutmeg and 0,1% artificial flavor.

Ten salamis were elaborated, 6 were used to determine every parameter during 28 days of the assay and the rest were used for senso evaluation tests. Once the product was prepared, pH were done by using a pH-meter (Orion model 420 A), moisture content (dehydrating stove) at 100°C for 16 hours, weight loss by weighing the products once per week four times during the assay and Standard Plate Coun *Lactobacillus* (**SPC**) by using the agar **MBP**. Fermentation of salamis was made in a IVM chamber (at 25°C and relative humidity of 85% dur 5 days). Later on, temperature was reduced to 15°C and relative humidity from 60 to 65% approximately, for starting the maturation sta Salamis remained under these conditions for 14 days, then temperature was increased to 25°C during the third week until reaching 35°C by end of the fourth week and relative humidity remaining in the range 60–65%. The maturation process was ended under these conditio Salamis were retired from the maturation chamber and placed into a refrigerator at 10°C.

Sensorial evaluations of the salamis were tested by an untrained panel constituted by students of the Faculty of Veterinary Sciences of University of Zulia. To each student a slice of salami was given to assign punctuation according to a predetermined range of acceptance, wh consisted of 7 points (1 = like extremely and 7 = dislike extremely). Data were analyzed using a completely randomized design for GLM of S (1987). In addition, Pearson correlation coefficients were estimated.

Results and Discussion

Table I shows the results for pH, moisture and SPC analyses. During fermentation process that comprised the first 5 days of the study, decreased significantly ($P < 0.05$) from 5.5 to 4.8 as a result of the Lactobacillus growth with production of lactic acid as a product of metabolism on the sugar. Finally pH lowered up to 4.3 during the maturation phase (23 days) of the product.

Table II shows the correlation of pH with other variables in study. A high association was found between pH and moisture ($r = 0.$ $P<0.01$) and negatively between pH and the weight loss ($r = -0.78$, $P < 0.01$).

Figure 1 depicts that weight loss was significantly affected by process time ($p < 0.01$), increasing from 17.23% at day 7 up to 53.45% day 28. Similar results were reported by Bloukas et al., 1997 and Díaz et al., 1997. Weight loss increased as the processing time lapsed and smaller during the first week, differing statistically from percentages of weight losses obtained on days 21 and 28 ($P < 0.01$), but it did not dif from that obtained on day 14.

Moisture content of the fermented products decreased significantly during the 28 day processing, from 61.02% to 30.27%. When the was reduced closer to the isoelectrical point of the meat proteins (pH = 5.1) resulted in a reduction of water holding capacity the proteins (R R. 1997), causing loss of moisture and consequently increasing the total solids of the product.

SPC was affected by processing time ($P < 0.01$), in Table I it is observed that **SPC** increased from $1.98x10^6$ in the day 0 to $7.1x10^9$ the third week, corresponding this value to the maximum growth of the microorganisms. In the fourth week there was a decrease in the values **SPC**, reaching $3.9x10^7$ cfu/g. Samelis et al., 1994 and Bloukas et al.,1997 reported that count in agar MRS was affected significantly processing time, reaching the highest value at day 26. Table II presents the correlation of **SPC** with other variables. There was not signific correlation among them.

Figure 2 depicts the curve of microbial growth of *Lactobacillus plantarum* in the fermented meat product and also the effect processing time on the SPC. The curve of growth does not show the adaptation phase, perhaps due to the fact that cfu/g determinations w carried out weekly or because this period can be eliminated if cells are taken from a system that has already reached the exponential gro phase or when cells are transferred to a culture medium with the same characteristics, both explanations are valid in our study. Nevertheless, stages corresponding to phases of quick, exponential growth and death were observed. Sensorial evaluation data is shown in Table III, out of tests carried out, 28 panelists responded liked it a lot, which represented 44.44% and 25 responded like it moderately which corresponded to

39.68% by adding up these categories, they represented 4.12% of the total tests. General mean was 2.6, right between like a lot and like moderately levels.

Conclusions

MBP suggested to be an excellent media for the *Lactobacillus plantarum*. process time affected pH, moisture, loss weight and **SPC** agar of *L.* plantarum in the fermented meat product. The elaborated meat product using L. *plantarum*, isolated and spread using the agar **MBP** developed a value of acceptance in the sensorial evaluation among like a lot and like moderately.

Literature

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Table I. Determinations of pH, moisture and SPC of the fermented meat product.

Time (days)	pH	Moisture	SPC
0	5.55	61.02	$1.98x10^6$
1	5.36	-	-
2	5.20	-	-
3	5.01	-	
4	4.9		-
5	4.84	-	-
6	4.80	-	-
7	4.78	57.84	$3.9x10^7$
Adjusted mean	5.08 [a]	59.43 [a]	
14	4.64 [b]	52.26 [b]	$7.05x10^9$
21	4.64 [b]	45.06 [c]	$7.1x10^9$
28	4.30 [b]	30.27 [d]	3.9×10^7

[A,b,c,d] different letters in one column differ ($P < 0.05$)

Table II. Pearson correlation among variables

Variables / Corr/Sig	PT	pH	Moist	SPC	LW
PT	.....	-0.848	-0.965	0.054	0.889
		0.0001	0.0001	0.917	0.0001
PH	.....	.....	0.813	-0.200	-0.783
			0.0042	0.703	0.0026
Moist	.....	.....	.....	0.078	-0.827
				0.882	0.0059
SPC	.....	.....	.....	.....	-0.444
					0.377
LW	.....	.....	.....	.....	.....

PT = Time Processing; Moist = Moisture; SPC = Standard Plate Count and LW= Loss Weight.

Table III. Sensorial Evaluation of the fermented meat products

Acceptance Grade	Frequency	Percentage
1. Like it extremely	4	6.35
2. Like it a lot	28	44.44
3. Like it moderately	25	39.68
4. Neither like neither I dislike	3	4.76
5. Dislike it moderately	3	4.76
6. Dislike it a lot	0	0
7. Dislike it extremely	0	0
General mean = 2.6		

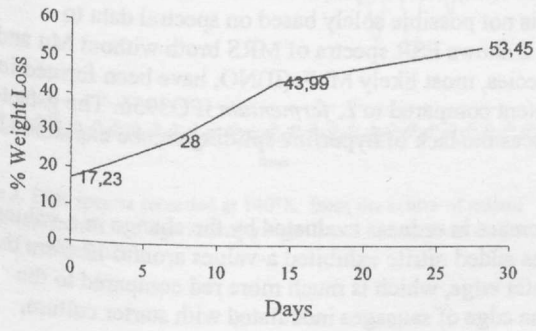

Figure 1. Percentage of weight loss of meat product

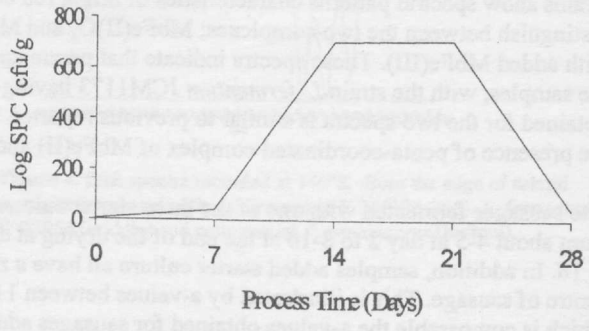

Figura 2. Curve of Microbial Growth of Lactobacillus plantarum in fermented meat product