SCREENING OF PROBIOTIC BACTERIA FOR THE FERMENTATION OF GOAT'S MILK

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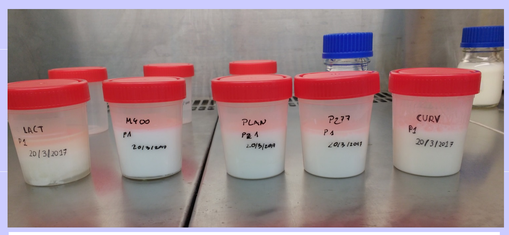
1 OBJECTIVE

A proper choice of starter cultures for fermented milks may enhance their functional properties. In this scenario, the objective of this study was to evaluate ten cultures, including mixed cultures and individual probiotic lactic acid bacteria, for the fermentation of Murciano-Granadina goat's milk.

2 MATERIALS AND METHODS

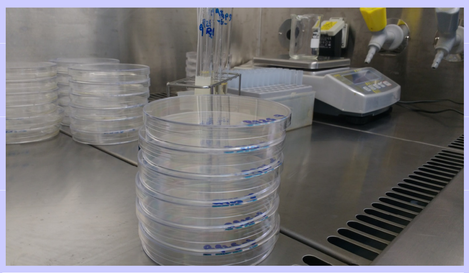
MILK PASTEURIZATION AND FERMENTATION

- Bulk milk from the UMH experimental goat herd
- Pasteurization at 80ºC during 30 min



- Milk fermentation with ten cultures

MICROBIOLOGICAL ANALYSIS, pH AND DRAINING OF WHEY (48h after fermentation ended)



- Microbial counts in fermented milk

- Gel stabilty by draining of whey assessment

EXTRACTION, SEPARATION AND ANALYSIS OF FATTY ACIDS

- Extraction of milk fat: Method Romeu-Nadal et al. (2004).
- Methylation of fatty acids: Method Trigueros et al. (2015)
- Analysis fatty acid with GC-FID, Shimadzu GC-17A

ANÁLISIS ESTADÍSTICOS

- One way ANOVA (SPSS 24, IBM): factor starter culture. Four replicate experiments were run on consecutive milking days. All determinations were run in duplicate.

3 RESULTS

- Regarding microbial populations, all cultures reached counts over 6 log CFU/g, *Lactobacillus helveticus* CECT 541 and *Lactobacillus dekbrueckii* sb. *bulgaricus* CECT 4005 showed the lowest counts.
- Regarding gel stability, measured as the percentage of syneresis after centrifugation, no differences were detected among fermented milks and values ranged from 65 to 70 %.
- CLA content slightly increased due to fermentation, with no differences due to the used culture so it could not be a decisive factor to select the culture.

Table 1. Means (± SD) of bacterial count, pH of whey at 48h post-fermentation and degree of whey draining..

Microorganism/culture	Bact.count (Log_{10} cfu/g)	48h pH	Draining (%)
Lactobacilllus casei CECT 475	8.54±0.41^{bcd}	4.59±0.36^{abc}	67.88±8.74^{ab}
Lactobacillus curvatus CECT 5786	9.11±0.25^{cd}	4.33±0.27^{ab}	62.67±4.06^{ab}
Lactobacillus delbrueckii subsp. bulgaricus CECT 4005	5.60±0.47^{a}	4.24±0.14^{a}	66.75±1.69^{ab}
Lactobacillus helveticus CECT 541	7.77±0.77^{b}	4.20±0.12^{a}	60.90±2.49^{a}
Lactococcus lactis subsp. Lactis CECT 4042	9.47±0.35^{d}	4.10±0.03^{a}	64.82±2.66^{ab}
Lactobacillus paracasei subsp. paracasei CECT 277	9.56±0.22^{d}	4.35±0.06^{ab}	63.83±2.95^{ab}
Lactobacillus plantarum CECT 5785	8.74±0.20^{bcd}	4.79±0.18^{bc}	63.28±2.79^{ab}
Lactobacillus reuteri CECT 925	8.19±1.48^{bc}	4.95±0.36^{c}	69.33±5.47^{b}
Lactobacillus sakei subsp. carnosus CECT 5964	8.99±0.58^{cd}	4.21±0.18^{a}	66.71±1.57^{ab}
MA-400[1]	9.42±0.32^{d}	4.49±0.08^{abc}	67.80±1.11^{ab}
SL[2]	***	***	*

[1] *Lactococcus lactis subsp. lactis, Lactococcus lactis subsp. cremoris,Lactococcus lactis subsp. lactis biovar diacetylactis, Streptococcus thermophiles*
[2] Significance level: ***$P < 0.001$; *$P < 0.05$
[a,b,c,d] Means within a column with different superscripts differ

Table 2. Means (± SD) of Saturated, Monounsaturated, Polyunsaturated fatty acids (SFA, MUFA, PUFA) and total Conjugated Linoleic Acid (CLA) of milk and fermented milk (percentage of total fatty acids).

Microorganism/culture	SFA	MUFA	PUFA	CLA
Milk	64.23±1.05	30.12±1.20	5.65±0.18	1.31±0.08
Lactobacilllus casei CECT 475	64.46±0.96	29.75±1.06	5.79±0.18	1.34±0.11
Lactobacillus curvatus CECT 5786	64.47±0.88	29.68±0.97	5.84±0.18	1.37±0.07
Lactobacillus delbrueckii subsp. bulgaricus CECT 4005	64.37±0.84	29.66±0.99	5.80±0.18	1.36±0.07
Lactobacillus helveticus CECT 541	64.19±0.69	29.94±0.72	5.74±0.09	1.33±0.04
Lactococcus lactis subsp. Lactis CECT 4042	64.06±0.90	30.15±0.89	5.79±0.15	1.38±0.09
Lactobacillus paracasei subsp. paracasei CECT 277	64.66±0.81	26.53±5.22	8.80±6.01	1.35±0.06
Lactobacillus plantarum CECT 5785	64.49±0.81	29.73±0.97	5.78±0.17	1.36±0.07
Lactobacillus reuteri CECT 925	64.84±0.61	29.39±0.73	5.77±0.13	1.38±0.06
Lactobacillus sakei subsp. carnosus CECT 5964	64.40±1.09	29.75±1.11	5.84±0.20	1.37±0.05
MA-400	65.32±0.24	29.64±1.33	4.95±1.64	1.35±0.11

4 CONCLUSIONS

Most stable fermented milks were those obtained by fermentation with *L. lactis* CECT 4042 *and L. paracasei* CECT 277, as they presented highest microbial counts and good acidification rates. Further research is still needed in order to assess relevant characteristics of fermented milks as volatile profile and fermentation characteristics.

Funded by Ministerio de Economía y Competitividad y el Fondo Europeo de Desarrollo Regional AGL2015-64518, *MINECO/FEDER, UE*