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Comparison of the Acidification Activities of Commercial Starter Cultures on Camel and Cow Milk

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Introduction

- Haramaya Camel Dairy" is a project aiming at developing and improving dairy products from camel milk (*Camelus dromedarius*).
- The project focuses on properties, processing and product development of camel milk.
- Camel milk is composed of lactose, fat, and protein in roughly the same proportion as bovine milk. However, the relative composition of the proteins differs and β-lactoglobulin is absent in camel milk. (Hinz et al., 2012).
- The amino acid sequences of the camel caseins and whey proteins are homologous to the cow counterparts but also showing significant differences (Kappeler et al., 1998).
- Camel milk has been reported to be not easily fermentable because of its antibacterial and anti viral properties of the protective proteins (El Agamy et al., 1992)
- Through analysis of the chemical, physical and functional properties of the milk constituents we will be able to design and develop novel products from camel milk

Figure 1. Camels near Haramaya, Ethiopia

Materials and Methods

- Camel and cow milk samples were collected from Babile area and Haramaya University dairy farm in Ethiopia respectively.
- The milk samples were pasteurized at 65 °C for 30 minutes and inoculated with 0.1U/L of the starter cultures and incubated at 30 °C , 37 °C, and 42 °C.
- The 8 cultures were lyophilized cultures from the range of Chr Hansen A/S. R-704 and R-707 are mesophilic homofermentative cultures composed of strains of *Lactococcus lactis*.
- RST-743 is a homofermentative culture composed of strains of *Lactococcus lactis* and *Streptococcus thermophilus*.
- STI-12 is a homofermentative culture composed of strains of *Streptococcus thermophilus*
- XPL-2 is an aromatic LD culture composed of strains of *Lactococcus lactis* subsp. *cremoris*, *Lactococcus lactis* subsp. *lactis*, *Lactococcus lactis* subsp. *lactis* biovar *diacetylactis*, *Leuconostoc* species, and *Streptococcus thermophilus*.

Materials and Methods ....

- CHN-22 is a mesophilic aromatic LD culture containing strains of *Lactococcus lactis* subsp. *cremoris*, *Leuconostoc pseudomesenteroides*, *Lactococcus lactis* subsp. *lactis* biovar *diacetylactis*, *Lactococcus lactis* subsp. *lactis*, *Leuconostoc mesenteroides*.
- YoFlexR Mild 1.0 and YF-L904 are thermophilic yoghurt cultures containing strains of *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus*.
- The acidification of the cultures were followed using an iCinac instrument (Alliance Instruments, Frepillon, France) that measures the pH, oxidation reduction potential and temperature of the culture simultaneously.

Results

Table 1. Comparison of acidification activities of commercial starter cultures on camel and cow milk

		V_{max} (Max Acidification Rate) upH/min		
Temp °C	Culture	Camel milk	Cow milk	50:50 milk
30	R-704	-0.004	-0.0085	
	R-707	-0.0065	-0.009	-0.0095
	RST-743	-0.007	-0.0075	
	CHN-22	-0.004	-0.006	
	XPL-2	-0.005	-0.0075	
37	XPL-2	-0.005	-0.007	
	RST-743	-0.003	-0.0055	
42	XPL-2	-0.007	-0.0075	
	YF Mild 1.0	-0.0065	-0.015	-0.010
	YF-L904	-0.0085	-0.015	
	STI-12	-0.010	-0.015	

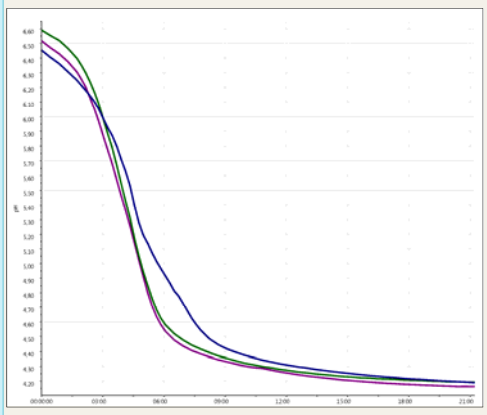

Figure 2.

Acidification curves of R-707 at 30 ^{0}C in camel milk, cow milk, and mixed camel and cow.

camel milk
cow milk
50:50 milk

Results.....

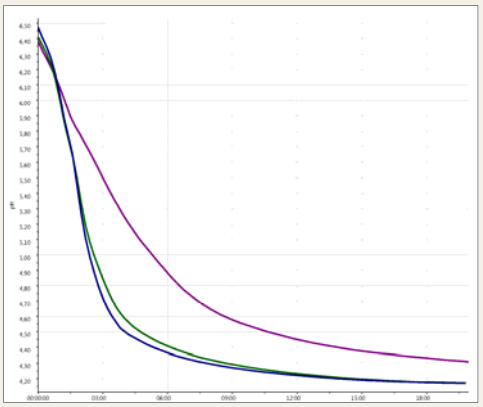

Figure 3.

Acidification curves of Yoflex ® mild 1.0 at 42 ^{0}C in camel milk, cow milk, and mixed camel and cow.

camel milk
50:50 milk
cow milk

Discussion and Conclusion

- Results in the table and graph indicate that all cultures were able to acidify camel milk and reached a final pH at a level similar to cow milk but the speed of acidification was generally lower in camel milk.
- The reduced activity could either be due to inhibitory substances in camel milk or due to reduced availability of nutrients.
- To distinguish between these possibilities we conducted mixing experiments where acidifications were conducted in a 50:50 mixture of cow and camel milk. The acidification in the mixed milk was almost identical to the acidification in cow milk.
- Based on this result we find the most likely explanation to be that the cultures have difficulties in satisfying their nutritional needs in pure camel milk. The proteolytic system of the LAB cultures might show reduced efficiency on camel milk proteins.

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