

Impact of ripening time and addition of *Lactobacillus helveticus* on the maturity of Swiss Raclette cheese

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Introduction

Proteolysis is a complex biochemical process that occurs during ripening of Raclette cheese and influences flavour and texture formation. Proteinases and peptidases from starter and non-starter lactic acid bacteria greatly affect proteolysis during ripening. Here, protease and peptidase activity of 91 strains of *L. helveticus* were determined by using artificial substrates *in vitro*. Accordingly, a mixture of three *L. helveticus* strains with complementary enzymatic activity was chosen for a cheese trial.

Cheese trial

Swiss Raclette cheeses were produced with and without addition of the mixture of *L. helveticus* strains. The degree of proteolysis in the cheeses was evaluated by analyzing the nitrogen content of different fractions, the amount of free amino acids and enzymatic activity. Additionally, water, NaCl and pH were measured after 80, 100 and 120 days of ripening. Selected flavour and texture attributes of the melted cheese samples were evaluated by a trained sensory panel.

Table 1: Mean values and ANOVA of Raclette cheese analysis with and without *L. helveticus* (*L. helv*)

		n	NaCl	pH	Water	TN	pH4.6-SN	WSN	TCA-SN	FFA	LAP	PepX (Ala-Pro)	PepX (Gly-Pro)
			g/kg	[-]	g/kg	g/kg	% of TN	% of TN	% of TN	mmol/kg	IU/kg	[μmol/mg*min*kg cheese]	
Ripening time	80 d	8	17.1 ^a	5.59	438.1 ^b	39.6 ^a	20.5 ^a	30.1	14.4 ^a	142.2 ^a	5.3	2.4	2.0
	100 d	8	19.5 ^b	5.61	423.4 ^a	40.5 ^b	22.1 ^b	31.0	15.7 ^b	170.5 ^b	6.3	3.0	2.0
	120 d	8	20.2 ^b	5.63	419.2 ^a	41.0 ^b	23.3 ^c	31.1	17.4 ^c	194.9 ^c	6.8	2.6	2.0
<i>L. helv.</i>	without	12	18.8	5.61	425.3	40.4	21.8	28.2 ^x	15.3 ^x	154.8 ^x	4.5 ^x	2.0 ^x	1.7
	with	12	19.0	5.61	428.6	40.3	22.1	33.2 ^y	16.4 ^y	183.6 ^y	7.8 ^y	3.3 ^y	2.3
ANOVA	Age		***		***	***	***		***	***			
	<i>L. helv.</i>							**	**	***	***	**	

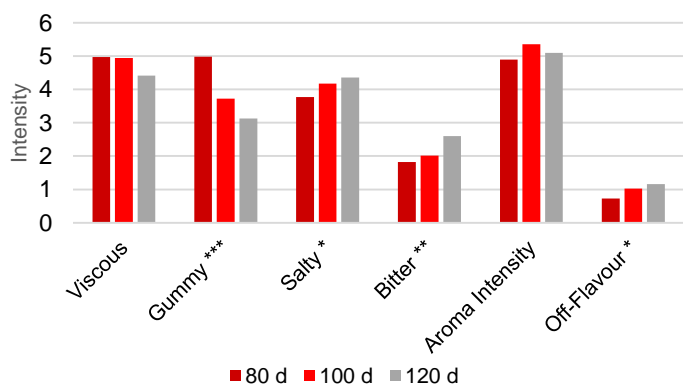
^{a-c} Means in each column with different letters are significantly different at different ripening time

^{x-y} Means in each column with different letters are significantly different with or without *L. helveticus*

* p < 0.05; ** p < 0.01 *** p < 0.001

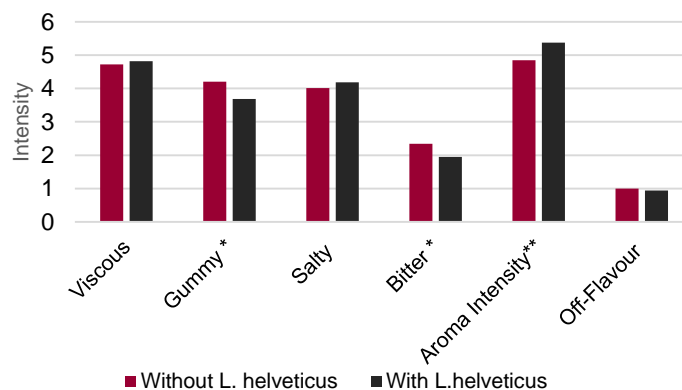
TN: total nitrogen; pH4.6-SN: pH4.6 soluble nitrogen; TCA-SN: 12% trichloroacetic acid soluble nitrogen; WSN: water-soluble nitrogen; FAA: total free amino acids; PepX: X-prolyldipeptidyl aminopeptidase; LAP: L-leucine aminopeptidase

Figure 1: Rating (mean values) of selected sensory attributes of Raclette cheese after 80, 100 and 120 days of ripening



* p < 0.05; ** p < 0.01 *** p < 0.001

Figure 2: Rating (mean values) of selected sensory attributes of Raclette cheese with and without addition of *L. helveticus*



* p < 0.05; ** p < 0.01 *** p < 0.001

Conclusion: The degree of proteolysis was higher in cheese samples with addition of *L. helveticus* and the melted samples were perceived significantly less gummy and less bitter and showed a higher aroma intensity. The addition of a combination of specific strains of *L. helveticus* could reduce the necessary ripening time of Swiss Raclette cheese without impairing flavour or texture.

Acknowledgements

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