

The impact of sodium chloride reduction on Grana-like cheese production and quality

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SUPPLEMENTARY FILE

Table S1. Physical-chemical properties of milk and whey starter and technological parameters monitored during cheesemaking.

Technological parameters		K1	K2	K3	Na
Milk	pH of milk in the vat	6.69 ± 0.09	6.67 ± 0.04	6.76 ± 0.03	6.70 ± 0.04
	Titrateable acidity of milk (°SH/50ml)	3.73 ± 0.12	3.85 ± 0.07	3.63 ± 0.06	3.80 ± 0.30
Whey starter	pH of whey starter	3.38 ± 0.04	3.40 ± 0.06	3.40 ± 0.04	3.40 ± 0.01
	Titrateable acidity of whey starter (°SH/50ml)	30.03 ± 0.47	31.65 ± 2.76	29.60 ± 2.09	29.50 ± 0.10
	Whey starter addition (kg/100 l)	3.22 ± 0.11	3.73 ± 0.13	4.19 ± 0.57	3.71 ± 0.17
Cheese-making steps	pH of milk at coagulation	6.43 ± 0.02	6.44 ± 0.00	6.43 ± 0.01	6.42 ± 0.01
	Titrateable acidity of milk at coagulation (°SH/50ml)	4.60 ± 0.36	4.75 ± 0.49	4.72 ± 0.03	4.70 ± 0.10
	Temperature of milk at coagulation (°C)	32.30 ± 0.36	32.00 ± 0.00	32.13 ± 0.12	32.10 ± 0.30
	Renneting time (min)	11.65 ± 1.52	11.23 ± 1.45	10.28 ± 0.03	10.40 ± 0.20
	Temperature at cooking (°C)	53.17 ± 0.15	53.10 ± 0.14	53.10 ± 0.17	53.15 ± 0.21
	Cooking time (min)	5.77 ± 0.98	5.24 ± 0.03	5.29 ± 0.06	5.15 ± 0.03
	Hardening under whey (min)	43.33 ± 5.47	40.00 ± 0.00	44.67 ± 8.08	39.50 ± 0.70
	Titrateable acidity of milk at molding (°SH/50ml)	3.20 ± 0.02	3.05 ± 0.21	3.40 ± 0.10	3.40 ± 0.14
	pH at molding	6.17 ± 0.26	6.22 ± 0.08	6.14 ± 0.06	6.16 ± 0.04

K1 = cheeses to be salted in brine with NaCl/KCl ratio 1/0.89 (w/w).

K2 = cheeses to be salted in brine with NaCl/KCl ratio 1/0.67 (w/w).

K3 = cheeses to be salted in brine with NaCl/KCl ratio 1/0.32 (w/w).

Na = cheeses to be salted in brine with only NaCl.

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Table S2. Content of Na, K, the ratio between the two cations and ash of the freshly prepared brines.

Brine	Na g/100g	K g/100g	K/Na	K / (KNa) %	Ash g/100g
K1	5.09 ± 0.05	5.92 ± 0.07	1.16	53.8	24.24 ± 0.19
K2	6.49 ± 0.07	4.18 ± 0.06	0.64	39.2	24.43 ± 0.22
K3	7.37 ± 0.08	2.99 ± 0.04	0.41	28.9	24.31 ± 0.13
Na	9.74 ± 0.08	0.06 ± 0.02	0.01	0.01	24.67 ± 0.25

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19 **Table S3.** Content of free aminoacids (g/100g of proteins) and the total sum, with the relative standard deviation (s.d.), determined in the K-salted
 20 and controls cheeses at the end of ripening (T₉).
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	Asp	Thr	Ser	Asn	Glu	Gln	Gly	Ala	Cit	Val	Met	Ile	Leu	Tyr	Phe	Gaba	Orn	Lys	His	Arg	Pro	Sum
K1	3.99 ^a	2.94	4.39	3.75	16.19 ^a	1.36	2.66	2.74	2.46 ^a	7.25	2.28	6.17	8.79	3.04	5.03	0.47	1.57	11.33	3.25	0.39	9.93	20.66
s.d.	0.47	0.41	0.21	0.59	0.31	0.12	0.20	0.11	0.34	0.17	0.03	0.13	0.14	0.03	0.25	0.25	0.76	0.02	0.07	0.68	0.05	1.52
K2	4.38 ^b	3.09	4.53	3.42	16.94 ^b	1.28	2.53	2.76	2.80 ^a	7.29	2.42	6.12	8.64	2.75	4.92	0.37	1.51	11.26	3.02	0.14	9.85	21.40
s.d.	0.11	0.38	0.09	0.46	0.90	0.22	0.20	0.19	0.39	0.18	0.09	0.04	0.10	0.64	0.35	0.12	0.26	0.18	0.22	0.24	0.38	0.53
K3	3.53 ^a	2.96	4.55	4.29	15.73 ^a	1.38	2.56	2.80	2.10 ^b	7.35	2.39	6.35	8.79	3.21	4.98	0.86	2.14	11.46	2.53	0.00	10.05	20.29
s.d.	0.19	0.15	0.09	0.19	0.14	0.10	0.00	0.09	0.38	0.09	0.04	0.16	0.27	0.10	0.05	0.20	0.39	0.21	0.85	0.00	0.19	1.90
Na	3.84 ^a	3.02	4.41	3.80	15.86 ^a	1.27	2.59	2.83	2.87 ^a	7.19	2.39	6.27	8.73	2.98	5.06	0.67	1.49	11.37	3.13	0.11	10.13	20.98
s.d.	0.51	0.44	0.23	0.57	0.23	0.23	0.26	0.06	0.66	0.19	0.12	0.13	0.11	0.05	0.24	0.22	0.57	0.18	0.06	0.19	0.32	0.90

22 * Within a column, values indicated with a superscript differ significantly at $P < 0.05$ (no superscripts mean that values are not statistically different).
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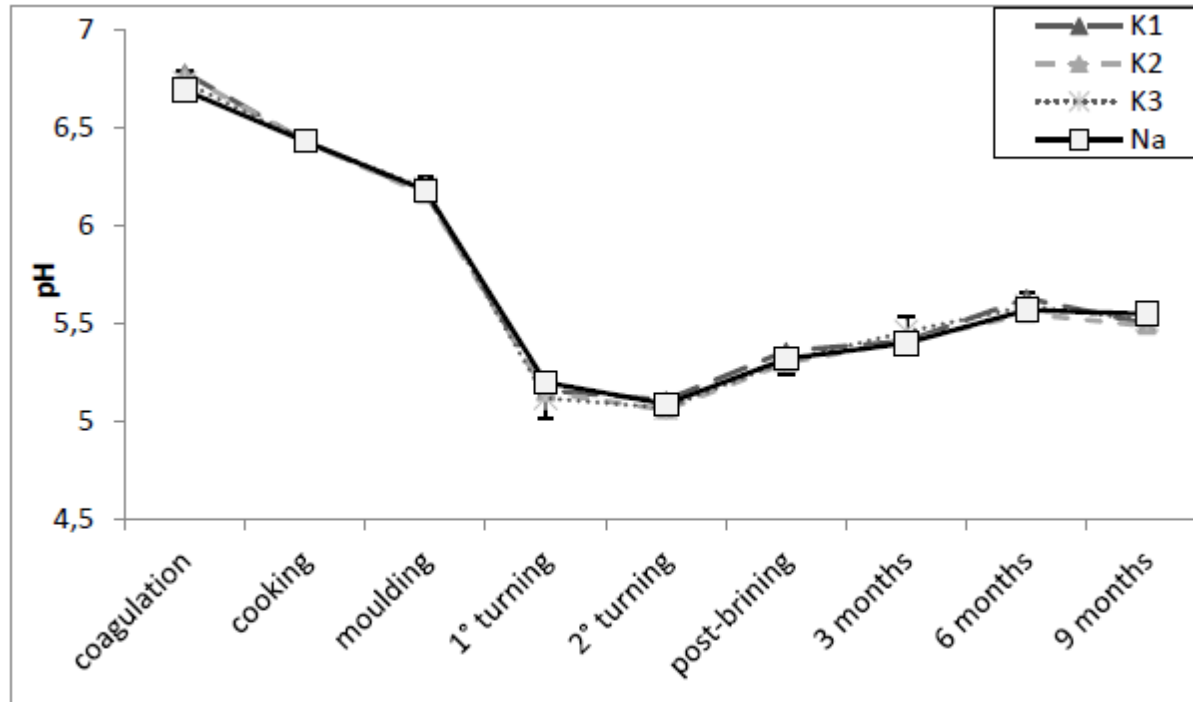
24 K1 = cheeses salted in brine with NaCl/KCl ratio 1/0.89 (w/w).
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26 K2 = cheeses salted in brine with NaCl/KCl with ratio 1/0.67 (w/w).
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28 K3 = cheeses salted in brine with NaCl/KCl ratio 1/0.32 (w/w).
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30 Na = cheeses salted in brine with only NaCl.
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42 **Figure S1 Changes in pH during ripening of control and K-brined cheeses**
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Figure S2:

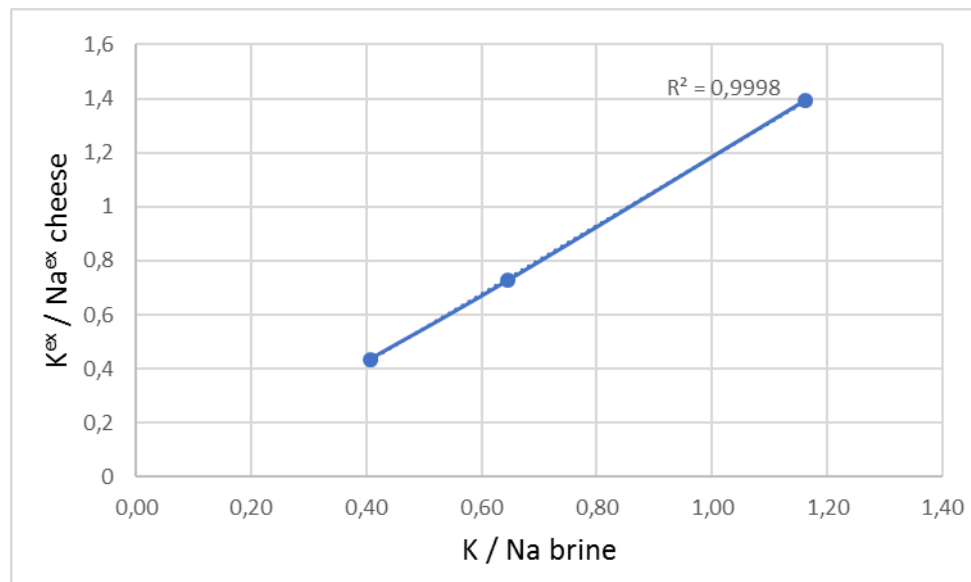
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Correlation between the exogenous K^{ex}/Na^{ex} ratio found in the cheeses and the K/Na ratio of the relative brine.

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