Coagulation properties and *Nostrano di Primiero* cheese yield of milk from Brown grazing cows of different k-casein genotype

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RIASSUNTO – Proprietà di coagulazione e resa in *Nostrano di Primiero* del latte di vacche Brune al pascolo con differente genotipo per la k-caseina – *Il latte prodotto in alpeggio da 16 bovine di razza Bruna Italiana con diverso genotipo per la k-caseina, 8 AA e 8 BB, è stato analizzato per composizione e caratteristiche reologiche. Lo stesso latte è stato trasformato in formaggio del tipo* Nostrano di Primiero. *La composizione del latte e il tempo di coagulazione (r) sono risultati simili tra i due tipi genetici, così come la composizione del siero e la resa in formaggio. Il tempo di rassodamento del coagulo (k_{20}) e la sua consistenza (a_{30}) sono risultati invece migliori per il tipo genetico BB rispetto all'AA (4,2 min* vs *7,9 min e 32,9 mm* vs *25,2 mm).*

KEY WORDS: milk coagulation properties, Italian Brown cows, k-casein genotype, pasture.

INTRODUCTION – Genetic variants of milk proteins affect composition, technological characteristics and, as a consequence, cheesemaking properties of milk (Jakob and Puhan, 1992; Mariani and Summer, 1999). The effects of α_{S1}, β and k-caseins variants, on milk coagulation properties are well known (Grosclaude, 1988). Cheesemaking involving many cheese varieties showed shorter clotting and curd firming times, higher curd firmness and cheese yields with the k-casein BB variant (Van Den Berg *et al.*, 1992; Walsh *et al.*, 1998). During an experiment concerning the performances of Italian Brown cows grazing on alpine pasture, the effect of k-casein AA and BB genetic variants on rennet coagulation properties of milk and on typical local cheese yield was investigate.

MATERIAL AND METHODS – Eight Brown cows with k-casein AA genotype and 8 with BB genotype were chosen, from a herd of 150 animals on alpine pasture, according to: milk production, genetic merit (EVM), stage and number of lactation, body condition score (BCS; Edmonson *et al.*, 1989), and somatic cells count (SCC). Individual milk was weighted and analysed for its composition in fat, protein, lactose (infrared Milk-o-scan apparatus), for titratable acidity and rheological traits: rennet clotting time (r), curd firming time (k_{20}), and gel firmness (a_{30}; McMahon and Brown, 1982). Milk was processed, separately for each genetic type, in three consecutive days, for the production of *Nostrano di Primiero* cheese (from raw milk, lightly skimmed, with medium-long ripening). The whey obtained from each vats of cheese was analysed for its composition in fat, protein, and total solids (infrared Dairylab apparatus). Each whole cheese was weighted 24 hrs after production and, subsequently, at 1 and 4 months of ripening. Both animal and cheesemaking data were processed by one way ANOVA.

RESULTS AND CONCLUSIONS – All the animals were in the final stage of lactation (Table 1); the BB group had an EVM and a milk production higher than AA group, although differences were not statistically significative.

Table 1. Characteristics of experimental animals.

	Genetic variant		SE	Sign.
	AA	BB		
Milk production (kg)	12.8	13.6	1.31	ns
Genetic merit (EVM, kg)	6131	6745	751.5	ns
Lactation number	2.4	2.1	0.55	ns
Days of lactation	262	268	36.9	ns
Body Condition Score (BCS, p.ts)	2.65	2.89	0.21	ns
Somatic Cell Count (.000/ml)	278	296	191.5	ns

The composition of individual milk (Table 2) and the titratable acidity were similar between the two genetic types. Concerning the rheological properties, r was statistically the same between AA and BB type, while k_{20} e a_{30} were significantly different between the two experimental thesis; similarly to other Authors (Mariani and Battistotti, 1999), milk from k-casein BB genetic type gave firmer curds (32.9 mm *vs* 25.2 mm) and shorter firming time (4.2 min *vs* 7.9 min) in comparison with the AA type.

Table 2. Composition and coagulation properties of individual milk.

	Genetic variant		SE	Sign.
	AA	BB		
Fat (%)	4.15	4.03	0.33	ns
Protein (%)	3.64	3.71	0.19	ns
Lactose (%)	4.94	4.82	0.14	ns
Titratable acidity (°SH/50ml)	3.54	3.49	0.24	ns
Rennet clotting time (r, min)	17.0	14.8	2.25	ns
Curd firming time (k_{20}, min)	7.9	4.2	1.55	**
Curd firmness (a_{30}, mm)	25.2	32.9	3.37	**

***: P< 0.01.*

In particular, the value of k_{20} for the BB type was very low in comparison with known values for Brown breed (Mariani *et al.*, 1997). Whey composition (Table 3) was equivalent between the two variants. Cheese yield, in the different moments of ripening, was always higher for the BB type, according to what is known for other cheese varieties (Russo *et al.*, 1985), but with no statistical difference.

Table 3. Whey composition and cheese yield (means of three replicate cheesemaking trials).

	Genetic variant		SE	Sign.
	AA	BB		
Whey composition (%):				
Fat	0.89	0.87	0.0711	ns
Protein	0.94	0.91	0.0376	ns
Total solids	7.11	6.94	0.2475	ns
Cheese yield (%):				
24 hours	12.0	12.5	0.33	ns
1 month	11.3	11.7	0.36	ns
4 months	10.9	11.2	0.35	ns

Generally speaking, also in our operative conditions the k-casein BB variant confirmed better rheological properties and cheese yield, although statistical differences were observed only for k_{20} and a_{30} parameters. Due to the small animal number and data variability the differences between groups did not reach the threshold of significance. Moreover, in late lactation, milk has not the best characteristics for cheesemaking (Lucey and Kelly, 1994), and this might have produced the flattening of the data.

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