

**INFLUENCE OF CSN3 MARKER ON MILK COMPOSITION  
IN ROMANIAN BROWN AND ROMANIAN SIMMENTAL  
CATTLE FROM S.C.D.C.B. ARAD**

**INFLUENȚA MARKERULUI CSN3 ASUPRA COMPOZIȚIEI  
LAPTELUI LA VACILE DE RASĂ BĂLȚATĂ ROMÂNEASCĂ  
ȘI BRUNĂ DE LA S.C.D.C.B. ARAD**

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*Milk yield and composition in cattle are typical quantitative traits which are influenced by environmental factors and allelic variations. K-casein is a protein expressed in milk and, due to its polymorphism, may serve as a molecular marker for yield, composition and technological properties of milk. The objective of this study was to compare the relation between the genetic marker CSN3 (k-casein) and the observed milk traits in selected cattle groups. In our study we analyzed the milk traits of 32 Romanian Brown dairy cows and 54 Romanian Simmental dairy cows. The experiments described in this paper show clear evidence that -CSN3 genotype is involved in milk protein enrichment. The CSN3 gene of BB genotype showed a great influence on protein yield. The relation between CSN3 genotype and milk protein was found to be significant in both cattle breed.*

**Keywords:** milk protein, K-casein, genotypes frequencies

### **Introduction**

Milk protein polymorphisms have been studied intensively because of their effect on the yield and processing properties of milk and its products. K-casein constitutes about 25% of the casein fraction of milk and several polymorphisms have been found for this protein. K-casein variants A and B differ by two amino acid substitutions, Thr136/Ile and Asp148/Ala (Lin, 1992). The B variant of CSN3 is associated with an increase in milk protein as well as cheese production because plays an important role in preserving the other caseins from precipitation, with superior coagulation proprieties that give the milk higher proprieties for cheese production (Van, 1991). Many studies demonstrate that these specific genetic variants affect the manufacturing properties of milk, especially those of importance in cheese technology.

At the moment genetic markers for milk production became common part of breeding and rearing of milk race cattle (Renaville, 2005). There are many studies which evaluate the influence of CSN3 gene on milk performance traits (Manga, 2006). CSN3 genotype AA is mostly associated with higher yield of milk comparative with BB genotype which is associated with higher percentage of proteins and fat content in milk production. Aim of our work was to compare the found relation between CSN3 marker and observed milk performance traits in selected cattle groups from the Research and Development Station for Bovine Raising Arad.

### Material and Methods

The analyzed groups of dairy cattle consisted in 32 Romanian Brown dairy cows and 54 Romanian Simmental dairy cows from Research and Development Station for Bovine Raising - Arad. In our study the dairy cows were tested for milk performance traits as milk yield, percentage of protein and percentage of fat. During the lactation period animals were milked twice a day in a milking parlor type Bradulet 2 x 14. Analyze of milk quality was performed every month by official production control. The average production of investigated population in first lactation was 6662 kg milk/305 days with 4.00% fat and 3.15% protein and in third lactation was a 7807 kg milk/305 day with 3.82% fat and 3.33% protein.

Isolation of DNA from blood sample was done using Wizard Genomic DNA Purification Kit (Promega). Polymorphism at the CSN3 gene was detected by PCR-RFLP method described by Medrano and Cordoba (Medrano, 1990). Detection of allelic variant of CSN3 gene were done by electrophoresis in 3.5% agarose gel stained with ethidium bromide, in a horizontal electrophoresis system. All gels were photographed for analysis of data using gel doc equipment.

### Results and Discussions

The results of CSN3 alleles and genotypes frequencies are shown in table 1.

Table 1

**The frequency of CSN3 alleles and genotypes in the investigated population**

Cattle breed	Genotype	Number of animals (frequency)	Allele frequency
Romanian Simmental	AA	26 (0.481)	
	AB	26 (0.481)	A-0.723
	BB	2 (0.038)	B-0.277
Romanian Brown	AA	4 (0.125)	
	AB	18 (0.562)	A-0.406
	BB	10 (0.313)	B-0.594

In our study, three populations of cows were distinguished as regards polymorphism, AA, AB and BB. The highest frequencies for the B allele of CSN3 were observed in Romanian Brown cattle (0.594). In the Romanian Simmental breed the frequencies of the A and B alleles were 0.723 and 0.277, respectively. Acquired frequency values are consistent with studies of different authors.

Average values of particular milk performance traits of the Romanian Simmental cows and Romanian Brown cows at first and third lactation depending upon CSN3 genotype are notice in table 2 and 3. For first lactation is typical to feature lower performance value for milk, fat and protein production. Unfortunately we had not the possibility to work out on a sufficiently individuals.

Table 2

Analysis of milk characteristics depending on genetic variant of CSN3 into the Romanian Simmental investigated population in first and third lactation

CSN3	Genotype	Milk yield (kg)	Fat yield (kg)	Fat content (%)	Protein yield (kg)	Protein content (%)
		x				
First lactation	AA	6517	272	4.17	194	2.97
	AB	7791	302	3.87	250	3.20
	BB	7944	308	3.87	263	3.31
Third lactation	AA	8533	311	3.64	278	3.25
	AB	8787	338	3.84	292	3.32
	BB	8146	312	3.93	273	3.35

Table 3

Analysis of milk characteristics depending on genetic variant of CSN3 into the Romanian Brown investigated population in first and third lactation

CSN3	Genotype	Milk yield (kg)	Fat yield (kg)	Fat content (%)	Protein yield (kg)	Protein content (%)
		x				
First lactation	AA	5886	242	4.11	167	2.83
	AB	6047	243	4,01	193	3.19
	BB	6339	248	3.91	207	3.26
Third lactation	AA	5842	219	3.74	181	3.09
	AB	6897	267	3.87	223	3.23
	BB	7851	300	3.82	285	3.63

From presented data we found out that the average of milk production per lactation (305 days) is highest at BB genotype of CSN3 comparing with AA genotype in Romanian Brown cattle.

Regarding the fat percent we found out a significant difference between lactation according to CSN3 genotypes. In both breed we observed a high fat percent at AA genotype at first lactation vs. third lactation (4.17 vs. 3.64 in Romanian Simmental and 4.11 vs. 3.74 in Romanian Brown).

The protein percent in AA, AB and BB CSN3 genotype variants in Romanian Simmental were 2.97, 3.20 and 3.31 in first lactation and 3.25, 3.32 and 3.35 in third lactation, respectively. The AA animals had a lower protein percent compared to those with genotypes AB and BB. We observed similar results in Romanian Brown at first and third lactation regarding protein percent where BB genotype (3.26 and 3.63) had the high value compared with AA genotype (2.83 and 3.09).

### Conclusions

We concluded that the genotype frequency of AA was higher than that of BB in Romanian Simmental investigated population and the frequency of allele A was also higher. The highest frequencies for the B allele of CSN3 were observed in Romanian Brown cattle.

The CSN3 gene BB genotype showed a grate influence on protein percentage. The relation between CSN3 genotype and milk protein percent was found to be significant in both cattle breed.

The present study was an aid in the selection of superior animals, those with genotype BB, in order to increase the production of milk and its constituents in Research and Development Station for Bovine Raising Arad.

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