

# Effect of $\alpha_{S1}$ -casein variants on yield and physicochemical properties of Sarda goat milk

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## 1. Message

Sarda goat (figure 1) is an important dairy breed of the Mediterranean area (over 180.000 goats).

This study aims to investigate the polymorphism of the  $\alpha_{S1}$ -casein fraction and the relationship between  $\alpha_{S1}$ -casein variants and yield and milk composition.

## 2. Introduction

The  $\alpha_{S1}$ -casein fraction of caprine milk is remarkable for its high degree of genetic variability and quantitative polymorphism due to different level of protein expression among the alleles. In fact, up to fifteen alleles associated with a different amount of  $\alpha_{S1}$ -casein have been identified and separated in four quantitative classes: "strong" alleles (A, B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>4</sub>, C, H, L and M) with 3.5 g/l of  $\alpha_{S1}$ -CN for allele; "intermediate" (I and E), with 1.1 g/l of  $\alpha_{S1}$ -CN for allele, "weak" (D, F and G) with 0.45 g/l and "null" alleles (O<sub>1</sub> and O<sub>2</sub>), with 0 g/l or traces of  $\alpha_{S1}$ -CN for allele.

Milk physico-chemical properties are positively related with the casein content:

- milk with strong alleles could be utilised for cheesemaking;
- weak and intermediate alleles for direct consumption;
- null alleles in infant diet.



Figure 1 - Sarda goat

## 3. Methods

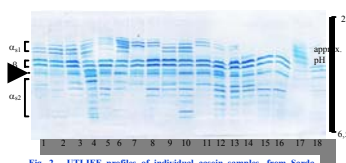
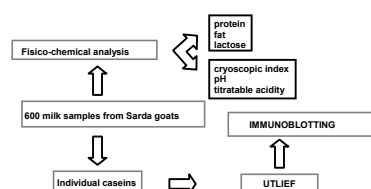


Fig. 2 - UTLIEF profiles of individual casein samples, from Sarda breed goats, containing different  $\alpha_{S1}$ -casein phenotypes



Fig. 3 - UTLIEF profiles of caprine casein samples, shown in Fig. 2, immunostained with polyclonal antibodies against  $\alpha_{S1}$ -casein

## 4. Results

In table 1 the allelic frequencies of  $\alpha_{S1}$ -CN variants and the milk yield and milk composition for each variant are shown. Null allele is lacking and strong alleles A and B are the most frequent phenotypes (AA 9.0%, BB 63.3% and AB 20.0%). The presence of weak and intermediate alleles allows the selection of subjects for alimentary milk production. The subjects with AB phenotype show the highest yield and EF phenotypes the lowest ( $P < 0.01$ ). Fat and protein content are higher in the AB and BB phenotypes, while the AA, BF and EF phenotypes display the lowest content of fat and protein ( $P < 0.01$ ). pH values also showed variations between phenotypes.

Phenotypes	AA	AB	AE	BB	BF	EE	EF	EI	FF	IF
Frequencies	9.0	20.0	0.3	63.3	2.2	0.3	3.2	0.3	0.7	0.7
Yield (g/d)	909	1016 <sup>b</sup>	943	879	687 <sup>a</sup>	780	902	760	621	825
Fat (%)	5.1 <sup>A</sup>	5.5 <sup>B</sup>	4.8	5.5 <sup>B</sup>	4.8 <sup>A</sup>	4.0	4.7 <sup>A</sup>	4.0	5.1	5.0
Protein (%)	4.2 <sup>A</sup>	4.6 <sup>B</sup>	4.0	4.5 <sup>B</sup>	4.2 <sup>A</sup>	4.7	4.1 <sup>A</sup>	4.0	3.7	3.8
Lactose (%)	5.0	5.0	4.6	4.9	4.9	5.0	5.0	5.0	5.0	5.0
pH	6.71	6.72 <sup>a</sup>	6.69	6.70 <sup>a</sup>	6.74 <sup>b</sup>	6.59	6.75 <sup>b</sup>	6.75	6.73	6.72
Ac. titratable (SH/100ml)	6.4	6.2	5.9	6.1	6.0	6.1	6.0	6.1	6.1	6.2
Cryoscopic index (°H)	-0.567	-0.568	-0.561	-0.569	-0.568	-0.568	-0.569	-0.576	-0.566	-0.569

<sup>a</sup>, <sup>b</sup> =  $P < 0.01$ ; <sup>A</sup>, <sup>B</sup> =  $P < 0.05$

## 5. Conclusions

The high frequency of strong alleles related to the high contents of fat and protein shows an aptitude to cheesemaking of Sarda goat's milk.