Identification of established genetic variants associated with milk traits

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THE MESSAGE

- The presence of *β-lactoglobulin* (*β-LG*) genotypes and single nucleotide polymorphisms (SNPs) known to affect bovine milk traits was examined in small ruminant breeds of Cyprus
- Major intra-species genotypic differences were found between the Cyprus fat-tailed and Chios sheep breeds at the *β-LG* locus
- The *β-LG* genotype seems fixed in Cyprus caprine breeds

INTRODUCTION

- Dissecting the genetic basis of milk production traits would be of great benefit to the small ruminant dairy industry
- Genetic variants at several loci that associate with milk production traits have been mainly identified in dairy cattle populations

AIM:

Investigate the presence of *β-lactoglobulin* (*β-LG*) variants, growth hormone receptor (GHR) and DGAT1 single nucleotide polymorphisms (SNPs) in the four major purebred Cyprus sheep and goat breeds

METHODS

Sample: Genomic DNA from a total of 366 animals
-246 Chios and 40 Cyprus fat-tailed sheep
-40 Damascus and 40 Machaeras Goats

The animals were bred at the Agricultural Research Institute experimental station and at private farms

Genotyping (PCR, gel electrophoresis and DNA sequencing):

A) *β-lactoglobulin* most common variants (A & B)

B) Growth Hormone Receptor (GHR) variant F279Y

C) *DGAT1* K232A SNP

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RESULTS

Significant differences in *β-LG* allele frequencies detected for the Chios and Cyprus fat-tailed sheep

Table 1. *β-LG* allele and genotype frequencies in Chios and Cyprus fat-tailed sheep breeds

Breed	No. of animals	*β-lactoglobulin* Genotype (%)			Allelic Frequency	
		AA	AB	BB	A-allele	B-allele
Chios sheep	246	56.9	38.6	4.5	0.76	0.23
Cyprus Fat-tailed sheep	40	12.8	48.7	38.5	0.37	0.63
Chi-square (χ^2) test (2 d.f.)*	56.4 (P<0.001)					

*Chi square test of independence between genotype frequency and sheep breed

The *β-LG* A allele appears to be fixed in the two Cyprus goat breeds

Table 2. *β-LG* allele and genotype frequencies in Damascus and Machaeras goat breeds

Breed	No. of animals	*β-lactoglobulin* genotype			Allelic frequency	
		AA	AB	BB	A-allele	B-allele
Damascus Goat	40	40	0	0	1	0
Machaeras Goat	40	40	0	0	1	0

The GHR F279Y and DGAT1 K232A polymorphisms were not detected in samples from the four Cyprus sheep and goat breeds studied

KEY POINTS

- Two genetic variants (A and B) at the *β-LG locus* were identified in animals from the two purebred Cyprus sheep breeds
- Only the *β-LG* variant A was detected in the Cyprus Damascus and Machaeras goat breeds
- The Cyprus fat-tailed sheep was predominantly of the *β-LG* B type, with an unusually high frequency of the *β-LG* BB genotype compared to the Chios or other Mediterranean sheep breeds
- Polymorphisms GHR F279Y and DGAT1 K232A appear not to be present in the four major purebred sheep and goat breeds of Cyprus