GENETIC ASSOCIATION BETWEEN MILKING SPEED AND MILK PRODUCTION.

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SUMMARY

Milking speed of dairy goats is a candidate trait for selection. Before including this trait in a selection programme it is necesary to know its genetic variation and its relationship to other economically important traits. Genetic parameters estimated on Station indicated that milking speed, defined as the quantity collected during the first minute of milking, exhibits high heritability (0.62) and repeatability (0.82). The genetic correlations between milking speed and milk yield, fat content and protein content on a total lactation basis were low thus suggesting that direct selection of milking speed could be efficient. Perspectives for research include the association between milking speed, udder characteristics and udder health.

Keywords: dairy goat, dairy traits, milking speed, genetics

INTRODUCTION

Milking may represent up to 50 % of labour time in dairy goat herds (Le Mens, 1974). In farms where milk is processed into cheese, labour is also necesary for cheese manufacturing and sales. Moreover, the average herd size moved from 60 to 110 goats during the last 10 years in France (Sigwald, 1996) and breeders are interested in improving milking speed. Selection for milking speed would be facilitated by taking profit of an unknown major gene as reported by an univariate segregation analysis (Leroy *et al.*, 1995). Before recommending to include this trait in a selection program, it is necesary to study the relationship between milking speed and other economically important traits. Here we assumed a polygenic multiple trait model in order to study global (major genes+polygenes) genetic association between this trait and milk yield, fat content and protein content.

MATERIAL AND METHODS

Data. Alpine goats of the Experimental Station of Moissac have been measured since 1985 for milking speed. The measure used for characterizing milking speed is the quantity collected during the first minute of milking. Thus, the measure includes a « latency time », between the set up of teat cups and the beginning of the milk emission towards the milking jar, and a «milking time » between the beginning of the milk emission and one minute. Ricordeau *et al.* (1990) indicated that this measure was highly repeatable and strongly correlated to both milk flow rate and total milking time. Measurements were practised on the morning milking. The milking machine parameters were kept as : vacuum level of 40 k Pa, pulsation ratio of 2:1 and pulsation rate of 90 pulse/min.

Milking speed measurements of 2598 lactations practised between 1985 and 1996 and corresponding to 1457 Alpine goats born between 1984 and 1995 were matched to milk yield, protein content and fat content, on a total lactation basis corrected to 250 days, registered under an A4 milk recording method. The overall means and standard deviations were 1094 ± 339 g, 721 ± 186 kg, , 32.4 ± 4.2 g/kg and 29.5 ± 2.5 g/kg for milking speed, milk yield, fat content and protein content, respectively.

Preliminar analyses using the GLM procedure of SAS, showed significant effects of the year-season of kidding and the lacation number (1st, 2nd or later lactations) on both milking speed and milk yield. Milk production was higher for adult goats but milking speed was higher in second lactations.

Genetic parameters. Heritabilities and genetic correlations among milking speed, milk yield, fat content and protein content were estimated with the VCE programme (Groneveld, 1994). The model included the combined fixed effect of year-month of kidding-lactation number, the random additive genetic value of the animals and the random permanent environment effect. Defining the fixed effect in this way allows for an indirect adjustement of lactation stage for milking speed which was measured at a fixed date for all animals each year. Lactation number was grouped into 1st, 2nd and later lactations. The total number of animals was 2480, including animals with records and parents without records.

RESULTS AND DISCUSSION

Table I shows the heritabilities, repeatabilities and genetic and phenotypic correlations. Classical values were obtained for milk production traits : a moderate heritability for milk yield (0.32), high heritabilities and repeatabilities for contents (0.73 for protein and 0.72 for fat), negative correlations between milk yield and contents (-0.48 and -0.27, for

protein and fat, respectively) and a high correlation (0.59) between contents.

The high estimate of heritability of milking speed (0.62) is coherent with the hypothesis of mixed inheritance proposed by Leroy et al (1995) for this trait. The repeatability of 0.82, is also coherent with a previous estimate reported by Ricordeau et al (1990).

The correlations between milking speed and milk traits on a total lactation basis were very low, positive for milk yield but negative for contents. So, no strong antagonisms exist between dairy traits and milking speed. Moreover, the low genetic correlations indicate that direct selection for milking speed could be efficient. It is concluded that research on milking speed of goats should be continued in the following directions:

-use of automatic devices (Barillet et al., 1994) in order to measure milk flow rates along lactation

-study the association between milking speed, udder characteristics and udder health. Udder characteristics are probably associated to milking speed (Bruckmaier et al., 1994). Conflicting information exists on the association between milking speed and udder health between cattle and goat reports (Montaldo and Martinez-Lozano, 1992).

-search of molecular markers for the unknown major gene

Table 1. Heritabilities, repeatabilities, genetic correlations (above diagonal) and phenotypic correlations (below diagonal) among milking speed, milk yield, protein content and fat content in goats

Traits	Heritabilities	Repeatabilities	Genetic (above) and phenotypic correlations			
			Milking speed	Milk yield	Protein content	Fat content
Milking speed	0.62	0.82		0.01	-0.08	-0.07
Milk yield	0.32	0.53	0.06		-0.48	-0.27
Protein content	0.73	0.83	-0.06	-0.41		0.59
Fat content	0.72	0.80	-0.01	-0.18	0.48	

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