# Genetic Parameters Of Resistance And Growth Traits For A Breeding Programme In Creole Goats

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## Introduction

The Creole goat of Guadeloupe is a local meat breed well adapted to its tropical environment. Farmers want to improve its growth and the maternal qualities of does, while maintaining its fitness qualities. The estimation of the genetic parameters was needed for the implementation of a breeding programme. The following criteria were studied: live weight at 11 months (LW), average daily gain from 10 to 30 days (ADG) and faecal egg counts at 11 months (FEC). Males were usually sold and slaughtered around 11 months old, so this trait was of direct interest for farmers. ADG was chosen as an estimation of the maternal ability. This trait is related to the milk production of the mother for sheep (Menissier et al., 1992). The faecal egg count is a practicable and valuable way to evaluate the genetic resistance to gastrointestinal parasites (Woolaston and Piper, 1996).

## Material and methods

**Localisation and herd management.** The performances were collected in the Creole goat flock of INRA-Gardel in Guadeloupe from the past 30 years. Climate is tropical humid with a marked dry season. Goats grazed all year round and were naturally infected by nematodes. Only does were supplemented during lactation. The reproduction rhythm was of 3 kidding in 2 years. There were 12 201 litters born of 1 755 does and 305 sires.

**Data**. The FEC were not normally distributed. The skewed distribution was normalised (Mandonnet et al. 2006) using a natural logarithm transformation *LFEC = ln (FEC +15).* Adjusted body weights at 10, 30 and 335 days of age were calculated using linear interpolation and extrapolation (Naves et al., 2001). Average daily gain from 10 to 30 days was then computed.

**Statistical Analyses.** A multivariate animal model was used to analyse the genetic variances and correlations of ADG, LW, LFEC using ASREML software developed by Gilmour et al. (2002). Random effects were additive direct and residual for all traits. Additive maternal and maternal permanent environment effects were added for ADG. The significant fixed effects were identified and the Pearson correlation coefficients for phenotypic values were calculated using SAS software (2000). A combined effect of cohort-sex was found to be significant for all traits. Parity of the doe and a combined effect of birth-rearing rank effect were significant for ADG and LW.

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## Results and discussion

The number of animal recorded for each trait, the phenotypic means and standard deviations are presented in table 1.

**Table 1: Number of records, mean and standard deviation of ADG 10-30, FEC, log FEC and live weight at 11 months for Creole goats**

| Traits | Number of records | Means |
|---|---|---|
| ADG 10-30 days (g/days) | 11000 | 88.60 ± 29.42 |
| FEC at 11 months | 2383 | 6.13 ± 1.44 |
| LFEC at 11 months | 2383 | 329.94 ± 10.78 |
| LW at 11 months (kg) | 5696 | 17.91 ± 4.12 |

The genetic parameters for ADG, LFEC and LW are shown in table2. Heritabilities were low to moderate. Maternal heritability of ADG was very low. It was however higher than the estimation made by Mandonnet et al. (1998) using a model with sire, maternal grandsire and dam random effect. There was no significant correlation between direct and maternal effect for ADG. The genetic maternal influence on early growth was weak. With the same model for the ADG from 0 to 30 days for Emirati goats, Al-Shorepy et al. (2002) found the same values for direct heritabilitiy (0.11), a null value for maternal heritiability and a higher permanent environmental effect (0.28). Heritabilities of LW and LFEC were moderate. Bosso et al. (2007) found a similar heritability (0.30) for the live weight at 360 days for West African Dwarf goat. Heritability of LFEC is very similar to the estimation of de la Mandonnet (2006) for Creole goats.

**Table 2: Genetic parameters of Creole goat for ADG, LFEC and LW**

| (Co)variance components | | | | | | |
|---|---|---|---|---|---|---|
| | $\sigma^2_d$ | $\sigma^2_m$ | $\sigma_{dm}$ | $\sigma^2_c$ | $\sigma^2_e$ | $\sigma^2_p$ |
| ADG | 81.76 | 18.52 | 0.63 | 0.07 | 564.7 | 720.2 |
| LFEC | 0.15 | | | | 0.64 | 0.79 |
| LW | 309 | | | | 814.3 | 1123 |
| **Genetic and environmental parameters** | | | | | | |
| | $h^2_d$ | $h^2_m$ | $r_{dm}$ | $c^2$ | | |
| ADG | 0.11 ± 0.02 | 0.03 ± 0.01 | 0.02 ± 0.22 | 0.08 ± 0.01 | | |
| LFEC | 0.19 ± 0.04 | | | | | |
| LW | 0.28 ± 0.03 | | | | | |

$\sigma^2_d$ = direct additive genetic variance; $\sigma^2_m$ = maternal additive genetic variance; $\sigma_{dm}$ = covariance between direct and maternal additive variance; $\sigma^2c$ = permanent environmental variance; $\sigma^2_e$ = residual variance; $\sigma^2_p$ = phenotypic variance; $h^2_d$ = direct heritability; $h^2_m$ = maternal heritability; $r_{dm}$ = genetic correlation between direct and maternal effects; $c^2$ = permanent environmental effect; ± standard error.

Correlations are reported in table 3. Genetic correlation between ADG (direct and maternal) and LW were high and significant. There was a small negative phenotypic correlation between LFEC and ADG and between LFEC and LW. This means that if LW or ADG increased, then the number of excreted nematodes eggs in the faeces decreased. The animal contaminates less its pasture and shows more resistance characteristic. However, the genetic correlations between LFEC and ADG or LW on the other hand were not significant.

**Table 3. Genetic correlations with their standard errors (above diagonal) and Pearson correlation coefficients for phenotypic values (below diagonal) for LFEC, LW and the direct and maternal effects of ADG**

| | ADG direct | ADG maternal | LFEC | LW |
|---|---|---|---|---|
| ADG direct | | 0.02 ± 0.22 | 0.10 ± 0.16 | 0.68 ± 0.08 |
| ADG maternal | - | | -0.04 ± 0.24 | 0.61 ± 0.17 |
| LFEC | -0.07* | - | | 0.11 ± 0.13 |
| LW | 0.38** | - | -0.18** | |

* Significant at P<0.01; ** Significant at P < 0.0001

## Conclusions

ADG was more a growth trait of the kid than an indication of the milk production of the mother. The maternal influence on this trait was indeed very small. LFEC was not correlated with ADG or LW. These originals results are encouraging for selection on growth and resistance. Improving growth traits will not deteriorate gastro-intestinal resistance traits.

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