The Distribution Phenotypic of the Dairy Production at Birth and 3 Months of Age in Oases of Southern Tunisia

Amor Gaddour and Sghaier Najari
Arid Land Institute, 4119 Medenine, Tunisia

Abstract: To identify some genetic specificities of goat meat production in southern Tunisia, 16 years data monitoring of 1687 kids' growth were analysed. Data distribution was studied to establish the performances regrouping pattern toward oasian breeding conditions depending on the kid's age. The average kid's weight was 3.11 and 13.14 kg, respectively at birth and at 90 days age. The standard deviation of those phenotypic varied largely between 0.78 and 3.25 kg, respectively at birth and at 3 months age. Thus, caprine data variation changes in relation to the phenotype. Environmental harsh conditions prevent the complete expression of the better animal genotypes.

Key words: Goat, kids' growth, phenotypic distribution, environmental condition, expression, Tunisia

INTRODUCTION

During the last century, the application of quantitative genetic methodologies has increased the animal production with great success mainly in rainy and favourable zones and under intensified breeding systems (Najari *et al.*, 2007; Gaddour *et al.*, 2007; Gaddour and Najari, 2008). Under harsh conditions, the complexity of the ambiantal factors controlling upon animal production does not allow a suitable phenotype modelling difficult. Such numeric situations can prevent the application of the common genetic improvement methodologies. In fact, one of the quantitative genetic hypotheses is that animal phenotypic has generally a normal bell distribution. Such hypothesis can not be respected when animals are raised under harsh conditions and hiding therefore, this which prevent complete genotype expression (Najari *et al.*, 2007).

Since, the first genetic indices, the evolution of the genetic value prediction is mainly related to the modality and the quality of the non-genetic factors correction (Gaddour *et al.*, 2007). Each genetic methodology is characterized by an additive contribution in this special stage with a direct impact on the efficiency and accuracy of genetic value predicted or genetic parameters estimated.

In the arid regions, the action of non genetic factors on the genotype expression can interfere with the checking on the quantitative genetic hypothesis and the methodologies application (Najari *et al.*, 2007). In this study, researchers aim to discuss the impacts of breeding conditions on phenotypic distributions of kids'

performances in the oases of the southern Tunisia arid zone. The kids' weight variability, their distribution, parameters and the phenotypic modelling have been used to illustrate the typical animal genotypes responses towards the restraining action of ambiantal factors. The study pretends to identify the qualitative impact of these factors to optimise the livestock selection program in arid land. Infact handling animal genotypes to build improvement plans need to establish the typically producing behaviour of kids at different ages and their variation under restrictive breeding conditions.

MATERIALS AND METHODS

The studied livestock is a caprine herd issued from a cross breeding program implemented by the Arid Land Institute (Southern Tunisia) for the improvement of local goat genetic potentialities. The local goat population is characterised by its small size, the ability to walk long distances, the water shortage resistance and good kidding indices (Gaddour *et al.*, 2009). Three breeds viz; Alpine, Damascus and Murciana were used. They were imported respectively from France, Cyprus and Spain.

During the 16 years, the individual body weights were taken between the birth and weaning (90 days) at early. Thus, about 1687 kid's data were used for this study. For each kid the data included; kids and mother identification, birth data, sex, birth mode, genotype and subsequent weights. The data set was checked and individual kid's weight at standard ages was estimated by extra or intra population. Statistical analysis was done by SPSS program and Stat box.

Corresponding Author: Amor Gaddour, Arid Land Institute, 4119 Medenine, Tunisia

RESULTS AND DISCUSSION

Kid's weights variations were analyzed at birth and 90 days to establish the average and the distribution parameters and tests (Table 1).

Dairy production variations were analyzed at production and daily lactation to establish the average and the distribution parameters and tests (Table 2).

The normality tests were applied in order to assess the statistical distribution pattern of the studied kids' performances. Such features are in close relation with quantitative genetics and animal selection (Najari *et al.*, 2007). The data variation seems to be related to the weights' averages and the kids' age. In fact, the standard deviation and the coefficient of variation were higher for the three months aged kids' performances. Moreover, the kurtosis and the skewness coefficients remain still negative at birth. The normality hypothesis was verified only at the 90 days age (Table 1).

Studies of growth distributions for local population kids indicated that their weight did not follow a bell-shaped distribution when the kids came from extensively reared herds (Najari *et al.*, 2007). It seems therefore, that the husbandry intensification gives better conditions for genotypic expression by the satisfaction of the animal feeding needs. Furthermore, the analyzed performances issued from improved genotypes whose genetic expression, towards the environment were not necessarily the same of the local breed due to genotype* environment interactions (Chapuis *et al.*, 1995).

At birth (Fig. 1), weights of kids presented a particular distribution shape and the bell curve lost its right tail which represented the highest records. The best kids' genotypes were unable to express their superiority and its records underestimated its real potential; the feeding resources essentially the goat milk were scarce and not enough to allow a full concurrence between individual genotypes (Shrestha and Fahmy, 2007).

The shape of the performances distribution changed considerably according to the kids' age. These changes reflect a different expression of genotypes under different conditions. At 90 days' age (Fig. 2), the recorded performances followed a normal distribution according to the statistical tests of normality. Each kid could have expressed its true genetic potential. With the age, kids' became more independent towards their mother reduced dairy production and thus able to satisfy their nutritive needs in pasture. So, their growth expresses essentially their genetic potential.

For all quantitative characters such as animal meat production and performances often follow a normal or bell curve distribution (Chapuis *et al.*, 1995). This aspect is one of the most important hypotheses for the genetic

Table 1: Statistical analysis of the kid's weight at birth and 3 months

Statistical parameters	Kids weight at birth	Kids weight at 90 days
Average	3.33	13.18
Standard deviation	0.78	3.25
Coefficient of variation	0.23	0.25
Coefficient of skewness	-4.87	6.03
Coefficient of kurtosis	-7.43	1.56
Coefficient of dispersion	0.19	0.2
Normality test		
Skewness	Rejected	Rejected
Kurtosis	Rejected	Accepted

Table 2: Statistical analysis of the dairy production

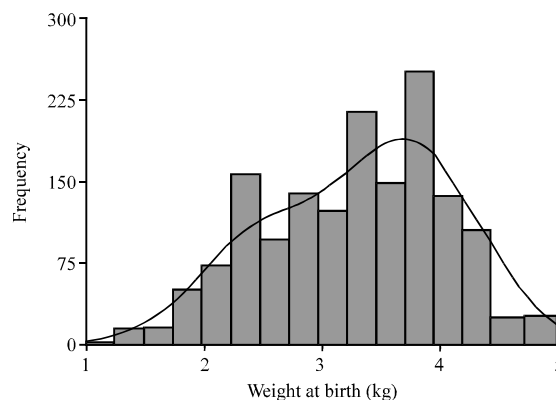| Statistical parametrs	Production by lactation (kg)	Daily lactation (days)
Oservations	993.00	993.00
Average	216.19	151.52
Ecart type	107.21	38.31
Minimum	33.20	60.00
Maximum	551.00	215.00
Coefficient of variation	0.50	0.25
Coefficient of Skewness	7.26	-3.03
Coefficient of Kurtosis	-1.02	-11.95
Coefficient of dispersion	0.43	0.21
Normality test		
Skewness	Rejeted	Rejeted
Kurtosis	Accepted	Rejeted

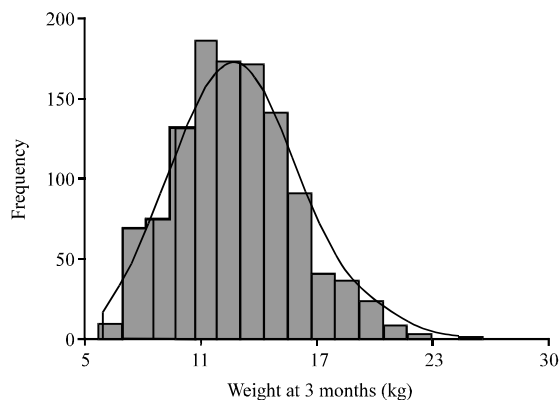Fig. 1: Distribution of kids' weight (kg) at birth

Fig. 2: Distribution of kids weight (kg) at 3 months

evaluation and the estimation of the genetic parameters for genetic improvement. However, such phenotypic distribution is not guaranteed under oasian breeding conditions. Due to environmental factors, the genotypic superiority can not be illustrated as a major phenotypic production. In such circumstances, performances of the genetically superior animals were constrained by non genetic factors and could be similar to phenotypes of other animals of minor genetic capacities (Najari *et al.*, 2007).

CONCLUSION

The study shows that this numerical specificity can affect some statistical parameters such as the means or the variance of kids' performances. These parameters have key role in the animal genetic values' prediction and on the genetic methodologies. So, the numeric and statistical role of these parameters in the genetic evaluation or the genetic parameters estimation is seriously affected in restrictive conditions with regards to the hypothetical case. Assuming for numerous non genetic factors, the intrinsic levels as homogenous, risk to overestimate the prediction error variance and disturb the convergence of the iterative resolution of the mixed model equation system (Najari *et al.*, 2007).

Some kid's performances distribution can not verify the normality hypothesis because the arid conditions can affect genotypes expression (Najari *et al.*, 2007; Chapuis *et al.*, 1995). This problem occurs especially with the best performing genotypes under drastic conditions. Hence, the hypotheses and several selection methodologies of the quantitative genetics have been elaborated and successes only under favourable breeding conditions. The specificity of the arid environment action upon the genotypes' expression seems to have a direct effect on genetic methodologies application. The mixed model building for evaluation could not correctly estimate and correct some factors and interactions effects.

RECOMMENDATIONS

The genetic behaviour of rustic animals in the oases of arid zone should be analyzed as complex characters having various effects. They need therefore, to be computed as not fixed factors. Quantitative genetic methodologies must be adapted to such conditions of genotypic expression mode (Shrestha and Fahmy, 2007).

REFERENCES

Chapuis, H., M. Tixier-Boichard, Y. Delabrosse and V. Ducrocq, 1995. Multivariate restricted maximum likelihood estimation of genetic parameters for production traits in three selected turkey strains. Genet. Selection Evol., 28: 299-317.

Gaddour, A. and S. Najari, 2008. Adjustment of the kid's growth curve in pure goat breeds and crosses under Southern Tunisian conditions. J. Applied Anim. Res., 32: 117-120.

Gaddour, A., S. Najari and A. Ferchichi, 2009. Lactation curve of local goat, pure breeds and Crosses Genotypes in Southern Tunisia. J. Applied Anim. Res., 34: 151-155.

Gaddour, A., S. Najari and M. Ouni, 2007. Kid's growth and dairy performances of pure breeds and crossed caprine genotypes in the coastal oases of Southern Tunisia. Pak. J. Biol. Sci., 10: 2874-2879.

Najari, S., A. Gaddour, M. Ben Hamouda, M. Djemali and G. Khaldi, 2007. Growth model adjustment of local goat population under pastoral conditions in Tunisian arid zone. J. Agron., 6: 61-67.

Shrestha, J.N.B. and M.H. Fahmy, 2007. Breeding goats for meat production: 2. Crossbreeding and formation of composite population. Small Rumin. Res., 67: 93-112.