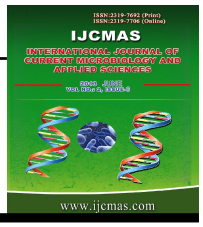
*International Journal of Current Microbiology and Applied Sciences*
***ISSN: 2319-7706*** **Volume 2 Number 6 (2013) pp. 324-327**
**http://www.ijcmas.com**




**Original Research Article**

# Relation between goat pigmentary types and daily milking kinetic for some caprine genotypes in Tunisian arid zone

**Amor Gaddour*, Sghaier Najari and Mouldi Abdennebi**

Arid Land Institute, 4119 Medenine, Tunisia
University of Gabes livestock and wildlife Laboratory, Tunisia
*****Corresponding author*

**A B S T R A C T**

The Wood function was used to fit lactation curve of local goat population per pigment types under southern Tunisian conditions. Data of 20 years of 800 adult dairy milk goats was analyzed to adjust individual milking curver per pigment types. Wood models parameters were estimated by non linear regression iterative procedure. The fastest convergence was led for "Pinto" with only 23 iterations. Among pure breeds, the "No pattern" had the highest production at peak with 1039g. The starting production, the milking peak and date, the persistence coefficient illustrated differences between studied local goat population per pigment types. Lactation curve shape and parameters highlighted milking differences and merits of studied genotypes and offer precious tools to optimise the local goat population regarding the improvement objectives.

**K e y w o r d s**

Goat;
Lactation Curve;
Wood model;
pigment types;
Tunisia.

## Introduction

The goat is considered being the oldest domesticated animal among livestock species. Its husbandry goes back to more than 10000 years before Jesus Christ (Gaddour et *al.*, 2008a). During this long period, goat has varied its breeds and products explaining, thus, its actual large distribution in the major environments and production systems in the world (Gaddour et *al.*, 2007; Gaddour and Najari, 2008c). Several caprine breeds were raised essentially for milk production. Rather than pastoral breeding mode, goat's were traditionally raised in oasis to produce milk and dairy products, in this case reduced herds were fed intensively and goat were milked after early weaning.

The mathematical models used to asses lactation curves were regular functions y = f(t), defined for positive values of daily milk production (y) and time from parturition (t), used in the dairy livestock for breeding and herd management purposes (Rekik *et al.*, 2003; Macciotta *et al.*, 2005). These models represent an essential research tool for developing and validating mechanistic models, aimed at explaining the main features of the milk production pattern in terms of the known

biology of the mammary gland during pregnancy and lactation (Macciotta *et al.,* 2005). Milking kinetic curve after parturition is characterized by a first ascending phase to a peak followed by a decreasing phase (Rekik *et al.,* 2003; Macciotta *et al.,* 2005). Among many mathematical functions performed to describe lactation curve, the usual model used is Wood's Model, which generally uses a logarithmic transformation of an incomplete gamma curve to obtain least squares estimates of constants (Najari, 2005).

The present study aims at estimating the lactation curve parameters of local goat population, per pigment types as a step to characterize the milk production potentialities for each genotype.

## Materials and Methods

The local goat population is characterised by its small size, the ability to walk long distances, the water shortage resistance and good kidding indexes (Gaddour *et al.,* 2007; Najari *et al.,* 2007b). A total of 993 goat's annual dairy data files are used as the data for this study.

To fit the lactation curve, we opted to use non-linear regression. The curve parameters were estimated by iterative procedure (Najari *et al.,* 2007d). As with most iterative processes of solving systems of equations (Najari *et al.,* 2007a; c), it usually give an initial estimate parameter as a starting value to induce convergence process.

Evaluation criteria used to compare adjustment convergence accuracy were computing difficulty and fitting goodness. Computing difficulty was defined as the number of iterations needed to converge (Gaddour *et al.,* 2008b). SPSS was the statistical software used.

Lactation curve adjusted by the Wood function becomes (Rekik *et al.,* 2003):

$$\mathbf{Y_t = At^b\ Exp^{-ct}}$$

Where $\mathbf{Y_t}$**:** Dairy production (kg), **t:** Days after parturition (days).

The Wood curve parameters (**A, b and c**) allow the estimation of dairy parameters such as:

Initial dairy production ($\mathbf{Y_0}$) = **A** ;

Date of peak (days) = **b/c,**

Production of peak (kg) = $\mathbf{(A*(b/c)^b)*Exp^{-b}}$**,**

Coefficient of persistence (%) = **100- (-b+1) Ln c**

## Results and Discussion

The model Wood was adopted for adjustment of the lactation curve and estimates the performance of goat population per pigment types. In addition, Gaddour et al. (2008c) used this model to adjust the lactation curve of pure goat breeds and crosses.

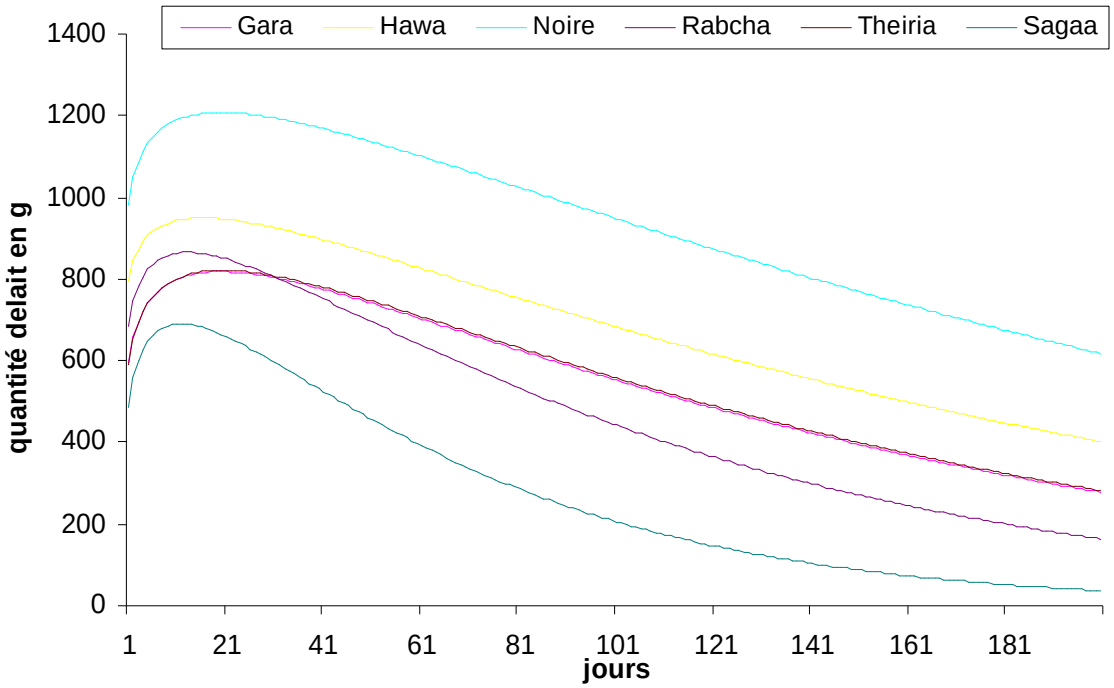
The converging behaviour of the lactation curve fitting seems to be dependent to the data corresponding to dairy production which varies with the pigment types. The lowest iteration number corresponded to the "pinto" (Table 1). While the estimation of the "no pattern", "gelé" and "head spotted" needed about 23 iterations. The "no pattern" had the highest and the worst initial production where the value was

**Table.1** Wood model convergence performances and curves parmeters per pigment types

| Pigment types | Nit | a | b | c | Initial production (g) | Production of peak (g) | Date of peak (days) | Coefficient of persistence (%) |
|---|---|---|---|---|---|---|---|---|
| **Lada** | 25 | 599,928 | 0,157 | 0,008 | 595,2 | 818,3 | 19,6 | 94,4 |
| **Light belly** | 26 | 798,994 | 0,054 | 0,006 | 794,2 | 852,4 | 9,0 | 94,6 |
| **No pattern** | 22 | 1040 | 0,01 | 0,004 | 1035,8 | 1039,1 | 2,5 | 94,4 |
| **Pinto** | 20 | 689,883 | 0,144 | 0,011 | 682,3 | 865,2 | 13,1 | 94,8 |
| **Head spotte** | 23 | 495,578 | 0,251 | 0,009 | 491,1 | 889,0 | 27,9 | 94,1 |
| **Gelé** | 23 | 655,856 | 0,158 | 0,007 | 651,3 | 916,3 | 22,6 | 94,2 |

Nit: Iteration number to convergence, a, b and c: Wood curve parameters.

**Figure.1** Lactation curve adjusted by the Gamma function, for local goat population per pigment types.



1035g; the reduced observation number can explain such result. All curve's parameters were positive, so, all lactation curves could be considered regular (Rekik *et al.,* 2003).

Among studied genotype curves, the lactation curves of the local goat per pigment types (Fig. 1) looked much better with a production peak quite high and of good persistence. During the first lactation phase, the performances of local goat population "Gelé" and "Pinto" were quite comparable in shape and magnitude, however, after the peak phase, the "Gelé" dairy performances became increasingly higher than the "Pinto".

The shape of the lactation curve and milking parameters provide valuable information about the biological and economic efficiency of the studied goats' genotype under oasian conditions. Such results seem useful for genetic improvement and herd monitoring of caprine livestock.

## References


Gaddour A., Najari S. et Ouni, M., 2008a. Amélioration de la production laitière par le croisement d'absorption de la chèvre locale dans les oasis du sud Tunisien. Improvement of the goat dairy production by the grading-up in the littoral oasis of South Tunisia. Revue d'Elevage et de Médecine Vétérinaire des Pays Tropicaux, 61 : 57-62.

Gaddour A., Najari S. and Ouni, M. 2008b. Genotype effect upon crossed goats' performances in the oases of southern Tunisia. "Sustainable Mediterranean grasslands and their multi-functions. Options Mediterrannennes, Series A, N° 234-238.

Gaddour A. and Najari S. 2008c. Adjustment of the kid's growth curve in pure goat breeds and crosses under southern Tunisian conditions. J. Appl. Anim. Res., 34: 117-120.

Gaddour A., Najari S. and Ouni, M. 2007. Dairy performances of the goat genetic groups in the southern Tunisian. Agricultural J. 2: 248-253.

Macciotta, N. P. P., Vicario, D. and Cappio-Borlino, A., 2005. Detection of Different Shapes of Lactation Curve for Milk Yield in Dairy Cattle by Empirical Mathematical Models. J. Dairy Sci., 88:1178-1191.

Najari, S. 2005. Caractérisation zootechnique et génétique d'une population caprine. Cas de la population caprine locale des régions arides tunisiennes. « Zootechnic and genetic characterisation of a caprine population. Case of the Tunisian local goat ». PhD thesis. Tunisian National Institute of Agronomy, 214 p.

Najari S., Gaddour A., Abdennebi M. and Ouni, M. 2007a. Specificities of the local kid's genotypes expression towards arid conditions in southern Tunisia. J. Appl. Sci. 2: 301-306.

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

Najari S., Gaddour A., Ouni M., Abdennebi M. and Ben Hammouda, M. 2007c. Indigenous kids weight variation with respect to non genetic factors under pastoral mode in Tunisian arid region. J. Animal. Veterinary Adv. 3: 441-450.

Najari S., Gaddour A., Ouni M., Abdennebi M. and Ben Hammouda, M. 2007d. Non genetic factors affecting local kids' growth curve under pastoral mode in Tunisian arid region. J. Biol. Sci. 7: 1005-1016.

Rekik B., Ben Garra A., Ben Hammouda M. and Hammami H. 2003. Fitting lactation curves of dairy cattle in different types of herds in Tunisia. Livest. Prod. Sci., 83: 309-315.