



Growth curves in Dorper sheep crossed with the local Brazilian breeds, Morada Nova, Rabo Largo, and Santa Inês

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ABSTRACT

The goal of the present work was to analyze the Brody, Von Bertalanffy, Richards, Logistic and Gompertz functions in order to describe the growth in crossbred sheep Dorper × Morada Nova (DMN), Dorper × Rabo Largo (DRL) and Dorper × Santa Inês (DSI). After defining the best adjusted model, the absolute growth rate was calculated and the influence of both environmental and genetic features on curve parameters was evaluated. The data were based on 156 F1 animals (36 DMN, 61 DRL and 59 DSI), weighed quarterly from birth up to 210 days of age. Both Gompertz and Logistic functions presented the best adjustment, being the latter slightly superior. The mature weight was statistically similar among the three genetic groups. However, the DSI group presented a faster growth during the pre-weaning period, with a remarkable fall from the inflection point on. The weight gain within such group was lower to those from DRL and DMN groups from 150 days of age on. Only the birth month has significantly influenced the asymptotic weight (*A*). The growth rate (*k*) was affected by birth month, type of parturition, sex, genetic group and parturition type vs. genetic group interaction. The estimated correlation between the parameters *A* and *k* were negative (−0.58 for DMN, −0.39 for DSI and −0.38 for DRL), indicating that more precocious animals are less likely to reach higher weights when adults.

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1. Introduction

Analysis of the animal growth performance through their life span is helpful to establish proper feeding strategies and the best slaughter age. Nonlinear mathematical functions, empirically developed by plotting body weight against age, have been suitable to describe the growth curve in different animal groups. The use of mathematical growth models provides a good way of condensing the information contained in such a data series into a few parameters with biological meaning, in order to facilitate both the interpretation and the understanding of the phenomenon (Fitzhugh, 1976).

Growth curves present several applications to animal production, such as (1) evaluation of the response to distinct treatments over time; (2) analysis of the interaction between subpopulations (or treatments) and time; and (3) identification of heavier animals at younger ages within a population (Bathaei and Leroy, 1996; Freitas, 2005).

The most commonly used functions to estimate animal growth are the biologic models, like Brody (1945), Von Bertalanffy (1957), Richards (1959), Logistic (Nelder, 1961) and Gompertz (Laird, 1965). Nonetheless, the selection of the best function to describe the body growth in sheep remains controversial (Sarmiento et al., 2006). McManus et al. (2003) and Malhado et al. (2008) verified that the Logistic function would be more suitable than Richards and Brody ones to adjust the growth curves in Bergamasca sheep from Central Brazil and in crossbred Santa Inês × Texel lambs from Northeastern Brazil, respectively.

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This function has also shown a good fit for describing the growth of scrotal circumference in Awassi male lambs (Bilgin et al., 2004). On the other hand, Sarmiento et al. (2006), comparing previous functions on growth curve studies in Santa Inês sheep, observed that Gompertz function provided the more reliable results.

After the best adjusted function of growth curve had been selected, the parameters that describe it should be studied, in order to identify the features that are likely to affect them, such as breed, sex, parturition mode, birth season and year, and mother's age at parturition, thus assuring that adjustments on the growth rate can be achieved (Sarmiento et al., 2006).

Brazil presents several domestic sheep breeds deeply related to other breeds brought mainly from West Africa by the Europeans right after the discovery. Over the last five centuries, these breeds have been naturally selected to particular and distinct environments, leading to the fixation of specific adaptive traits to the "new" conditions (Fitzhugh and Bradford, 1983). Then, these breeds began to compose the so-called local or naturalized breeds (Egito et al., 2002).

Because of social-cultural reasons, sheep breeding in Brazil has been regarded as a second-rate activity, and most breeds have been raised on family-run farms along the northeastern region. By withholding the production potential of local breeds, Brazilian sheep-derived products (wool, meat, leather) have lost their competitive force in the international market, while the genetic improvement of commercial traits have been increasingly developed in foreign breeds, reassuring their conservation (Ponzoni, 1992).

Local or regional breeds from Brazilian northeast are usually well adapted to the severe and semi-arid climate conditions along this region, but they still lack improvements on precocity and final carcass quality (FAO, 2001; Barros et al., 2005). These breeds are seasonal with a prolonged breeding season depending on the food resources available.

Nowadays, few public institutions in Brazil keep local sheep herds. On private farms, these animals are used in crosses with exotic breeds specialized to meat production. The utilization of local genetic resources is essential to the conservation of such naturalized breeds (Egito et al., 2002).

Morada Nova sheep represent one of the main local hair sheep breeds from Northeastern Brazil. They have been exploited for both meat and skin, being the latter highly appreciated in international markets (Silva-Mariante, 1990). Since they present small size and high rusticity to semi-arid conditions, this breed is relevant as a main protein source for rural populations and smallholders.

The effective size of a local fat-tailed sheep breed – Rabo Largo – is quite reduced. These sheep are easily recognized

by a thick fat layer in the tail and they are considered the most resistant sheep breed of Northeastern Brazil (Carneiro et al., 2007).

Because Rabo Largo and Morada Nova breeds compose small herds and present significantly different genetic variability (Paiva et al., 2005), they have been included in the Brazilian Genetic Resources Conservation Program (Egito et al., 2002).

Santa Inês, in turn, is the local sheep breed that presents the largest herd along the Brazilian territory, being found throughout the entire Northeastern region, as well as in several states along Southeastern, Center-Western and Northern regions. Due to their higher rusticity and prolificacy, lower reproductive seasonability and small size when compared to other specialized breeds, Santa Inês ewes have often been used for prime production of lambs, whether pure or crossbred with meat sheep breeds (Costa, 2003).

The Dorper breed, original from South Africa, is a composed breed derived from crosses between Dorset and Black Head Persian sheep (Milne, 2000). This breed presents a high development rate and a fast high-quality carcass growth (Cloete et al., 2000). Dorper rams, or occasionally ewes, are commonly used as terminal meat sires in crosses with hair or wool indigenous sheep breeds in several countries (Schoeman et al., 1995; Snowden and Duckett, 2003; Cloete et al., 2007).

One of the ways to increase the productivity of sheep herds and match the market needs is to use specialized breeds in crosses with local hair sheep breeds. Such strategy would benefit from the complementarities between breeds, by coupling desirable traits of each breed and taking advantages of heterosis (Carneiro et al., 2007). However, there is a lack of information on the performance of the Dorper in cross-breeding systems (Schoeman, 2000). Similarly, little information is available about the performance of these crossbred groups involving both local breeds and specialized ones throughout Northeastern Brazil.

In order to increase the data about the ponderal development of crossbred animals involving Brazilian local breeds and exotic breeds, the goal of the present study was to analyze distinct nonlinear models to describe the growth in Dorper sheep crossed with the following local breeds: Morada Nova, Rabo Largo and Santa Inês. Moreover, after defining the best adjusted function, the absolute growth rate and the influence of both environmental and genetic features on curve parameters were also evaluated.

2. Material and methods

The experiment was carried out in the Jaguaquara Experimental Station, owned by Empresa Baiana de Desenvolvimento Agrícola S.A., located in the city of Jaguaquara, Jequié county, Bahia state, from 2003 to 2005.

Table 1

Percentage of birth per month in the genetic groups Dorper × Morada Nova (DMN), Dorper × Rabo Largo (DRL) and Dorper × Santa Inês (DSI) from 2003 to 2005.

Genetic group	November	December	January	February	March	April	May
DMN	11.11	55.56	11.11	–	5.56	13.89	2.78
DRL	6.56	37.70	24.59	1.64	1.64	26.23	1.64
DSI	10.00	30.00	21.67	6.67	8.33	18.33	5.00
Mean (%)	8.92	38.85	20.38	3.18	5.10	20.38	3.18

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