

GROWTH CURVE OF DUAL PURPOSE BULL CALVES IN THE TROPICS OF MEXICO

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INTRODUCTION

Growth functions have been used extensively to represent changes in size with age, so that the genetic potential of animal for growth can be evaluated and nutrition matched to possible growth. In models of animal production systems, growth curves are used to provide estimates of daily feed requirements for growth. Sire selection is the fine-tuning mechanism for developing optimal breeding programs (Brinks and Winder, 1996) associated with the broad distribution of sires of high genetic merit. Since the early production of semen by a bull depends on the growth of the animal, Salisbury *et al.*, (1976) published that growth of the A.I. sires fit best a Gompertz curve. Gompertz and Richards functions have been compared (Lopez *et al.*, 2000) with a generalized Michelis-Menten equation for the analysis of growth of fish and several farm and laboratory animals.

The objective of this study was to characterize the growth curve of dual-purpose calves in the tropics of México.

MATERIAL AND METHODS

Growth data of 15 bull calves from birth to 5 yrs of age and 17 bull calves from birth to 3.5 yrs of age were studied. Calves from Bull Dams of a Dual Purpose Genetic Improvement Project in the Tropics of Mexico, were sons of proven bulls of American Holstein Friesian or Brown Swiss breeds. Calf rearing adapted to dual purpose cattle management up to 7- 9 months of age were carried out at Paso del Toro, Playa Vicente and Pichucalco Livestock Research Stations located in the humid tropics. Selection of bull calves potential sires, monthly weighed and properly cared from growing up stage to full sexual maturity were carried out at Paso del Toro in the State of Veracruz, Mexico.

Statistical analysis. Data sets were statistically analyzed using a sigmoid model (Table Curve, Jandel Scientific) The model used was equal to $y = a + b / (1 + \exp(-(x - c) / d))$ where: y = body growth at time x, kg; a=birth weight, kg; b=mature weight, kg; c=rate of growth, kg/month and d = lag, months. Regression of weight on age were computed for the breed types available. All the parameters from the equation were estimated with ordinary least squares.

RESULTS AND DISCUSSION

The estimates of the four parameters equation and the standard errors of those estimates are presented in table 1. Exponential curves for dual purpose growing potential sires and mature sires maintained in the humid tropics are shown in Figure 1 and 2.

Table 1. Estimates of parameters obtained by fitting the sigmoid equation and standard errors

Parameter	Mean	Std Error	t-value
a	42.5	20.74	2.05
b	825.4	27.57	29.93
c	24.4	0.57	42.61
d	9.2	0.55	16.74

Sigmoid pattern of curves were similar to that obtained with a double exponential Gompertz curve for Holstein A.I. sires in temperate climate (Salisbury *et al*, 1978). However, Holstein sires reached mature weight at 48 months of age (1000 kg) while the dual purpose ones (figure 1) reached this weight at 51 months of age (825 kg). The second figure shows a set of data where mature weight was not reached yet because the bulls were still immature (40 months old), but their weight at 34 months was similar (650 kg) to those of Figure 1. It is expected that they will reach the mature weight at approximately 51 months of age. In order to shorten the time of maximum growth in dual-purpose bulls, it is necessary to improve management and nutrition practices.

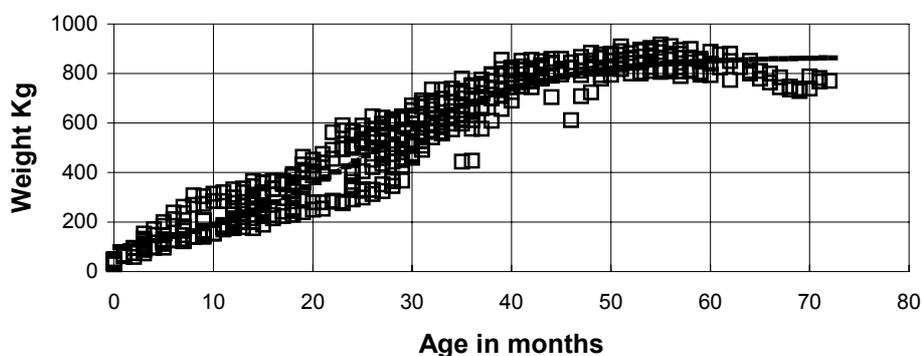


Figure 1. Exponential curves for dual purpose growing potential sires and mature sires maintained in the humid tropics

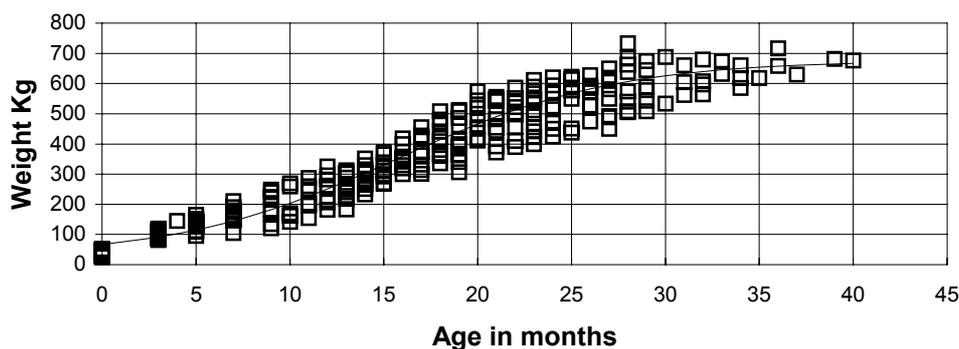


Figure 2. Exponential curves for dual purpose growing potential, for immature sires maintained in the humid tropics

Mature weight of the present study was higher than 738 kg and 812 kg, values found for 24 and 30 bulls (62 % Holstein x Zebu) respectively, maintained in Cuba (Barba and Fuentes, 1979ab) and 609 kg for 14 crossbred bulls in India (Rao, 1994) because they stopped their studies at 48 months of age, not letting the bulls reach their maximum growth.

CONCLUSION

The sigmoid exponential equation can be used as a friendly easy-to-use equation that explains the growth curve of calves, candidates for sires in dual-purpose systems. Dual-purpose sires reach their maximum growth (825 kg) at 51 months of age. The results obtained from the nonlinear regression on the male growth data indicated a similar relation pattern for the breed types. Improvements in management and nutrition have to be done to shorten the time for maximum growth under tropical conditions.

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