GROWTH EVALUATION OF CROSSBRED HOLSTEIN×GYR CALVES AND HEIFERS RAISED IN TROPICAL CONDITIONS

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ABSTRACT

The objective of this study was to evaluate growth and body development of crossbred Holstein×Gyr calves and heifers raised in tropical conditions. Thirty-two crossbred heifers (Holstein×Gyr) aged between 1 and 1314 days were used. For assessing the animals' body weight, the heifers were weighed once a week with a chest tape for weighing cattle, using the specification for medium breeds recorded on the tape itself. The experiment was conducted in a completely randomized design. Body weight data were analyzed using linear regression as a function of age, using the R software. We could observe that animals less than 200 days old had a performance estimate of approximately 0.517 kg day^{-1}, while after at 200 days of life, the estimated weight gain was 0.237 kg day^{-1}. Heifers had a higher growth rate before 200 days of age than after this age, which can affect the age at the first calving of the herd. Thus, as the age for the first breeding is linked to the weight of the live animals, the delay in the growth of the calves becomes detrimental to the breeding.

Palavras-chave:	AVALIAÇÃO DO CRESCIMENTO DE BEZERRAS E NOVILHAS MESTIÇAS HOLANDÊS×GIR CRIADAS EM CONDIÇÕES TROPICAIS
Criação Desempenho Inseminação	

AVALIAÇÃO DO CRESCIMENTO DE BEZERRAS E NOVILHAS MESTIÇAS HOLANDÊS×GIR CRIADAS EM CONDIÇÕES TROPICAIS

RESUMO

O objetivo foi avaliar o crescimento e desenvolvimento corporal de bezerras e novilhas mestiças criadas em condições tropicais. Foram utilizadas 32 novilhas mestiças (Holandês×Gir) com idade entre 1 e 1314 dias de vida. Com o propósito de avaliar o peso corporal dos animais, as novilhas foram pesadas uma vez por semana com uma fita torácica para pesagem de bovinos, utilizando a especificação para raças média gravada na própria fita. O experimento foi conduzido em delineamento experimental inteiramente casualizado. Os dados de peso corporal foram analisados através de regressão linear em função da idade, utilizando-se o software R. Observou-se que os animais com menos de 200 dias de vida tiveram uma estimativa de desempenho de aproximadamente 0,517 kg dia^{-1}, enquanto após os 200 dias de vida o ganho de peso estimado era de 0,237 kg dia^{-1}. As novilhas apresentam uma taxa de crescimento maior antes dos 200 dias de vida do que após esta idade, o que pode afetar a idade ao primeiro parto do rebanho. Desta forma, como a idade para a primeira inseminação está ligada ao peso vivo dos animais, o atraso do crescimento das bezerras acaba sendo prejudicial para a criação.

INTRODUCTION

In milk production, raising heifers and calves is considered an important factor, since they are the ones that will replace the older cows that will be discarded in the future (SANTOS; LOPES, 2014). However, the creation of these animals is generally neglected, because this category is considered the second largest in expenses for a farm (SANTOS; LOPES, 2014) and its financial return is obtained in the medium to long term (NETO, 2007).

Animals that gain weight more quickly have advanced puberty, since the entry of animals into reproduction has a high relationship with body weight (GASSER *et al*., 2006). When the age at first calving becomes reduced, the productivity of the herd increases, the cows have an extended lifetime, the interval between the calving reduces and they generate more calves during their productive life. Therefore, there will be a better selection of animals, and consequently a genetic improvement and increased profitability in the production system (YOKOO *et al*., 2012).

One of the ways to assess the development of animals, as well as understand how environmental factors can influence their growth, is by monitoring body weight according to the age of the animals. Through these measurements, growth curves can be constructed, which are used to understand the dynamics of weight gain and, thus, infer about the development and the factors that affect it in certain phases of the animals' life (SILVA *et al*., 2020).

Thus, the objective of this study was to evaluate growth and body development of crossbred Holstein×Gyr calves and heifers raised in tropical conditions, through the variation in body weight according to the age of the animals.

MATERIAL AND METHODS

The study was conducted in the Dairy Cattle Production sector of the Federal Rural University of Rio de Janeiro (UFRRJ), located in Seropédica-RJ (latitude: -22.7616871º, longitude:

-43.7026957º), Brazil. All procedures involving animal management practices were approved by the Animal Use Ethics Committee (CEUA / IZ / UFRRJ) under protocol 0013-08-2018. The experiment took place between the months of September and December 2019 (end of winter and spring), where the amplitude of the air temperature presented a maximum of 39 °C and a minimum of 18 °C.

Sixty-six crossbred heifers (Holstein×Gyr) aged between 1 and 1314 days were used for the study. Stratifying the data collection according to age, measurements of 21 animals were taken for those aged less than 100 days of life (suckling phase). Measurements from 11 animals were taken for animals between 100 and 200 days old. Measurements from 42 animals were taken for animals older than 200 days of age.

Briefly, the feeding management of the animals during the suckling phase (0 to 100 days of life) was in a step-down scheme, with a gradual reduction in the amount of milk offered according to advancing age. In addition, the animals had *ad libitum* access to starter feed (Dry Matter ~ 89%, Crude Protein ~ 20%), Tifton hay (Dry Matter ~ 87%, Crude Protein ~ 9%) and water up to 100 days of life, when they were weaned. The environment where the animals were raised at this stage had individual stalls, with individualized access to water and feed, as well as artificial shade with a ceramic type roof.

Between 100 and 200 days old, the animals were raised in small homogeneous groups (~ 8 to 12 animals / group). They were kept in paddocks of *Panicum maximum* Cv Tanzania grass, provided with trough to supply concentrate and supplementary forage, when necessary. The animals had free access to water and a large area of natural shade, consisting of dense canopy trees, with an area of approximately 4 m²/animal. After 200 days of life, the animals were handled less intensively, without receiving supplementary food. The animals were kept in paddocks of *Panicum maximum* Cv. Tanzania grass or native pasture, with free access to water and natural shade, consisting of sparse canopy trees, with an area of

approximately 2 m²/animal.

With the purpose of evaluating the animals' body weight, heifers were weighed once a week with a chest tape, specific for cattle weighing, using the indication for medium breeds recorded on the tape itself. The tape was positioned at the height of the withers, making sure that the animals were in the correct position for weighing to obtain the thoracic measurement. Two people were needed for weighing animals up to 90 days old, one person to contain the animal and another one to perform the measurement. Animals over 90 days old were taken to the containment trunk, where measurements were performed (Table 1).

The experiment was performed in a completely randomized design. Data on body weight as a function of age were analyzed using linear regression, using the "lme" command contained in the "nlme" package of R software. A level of 5% significance was considered for the estimated parameters. The variation of the effect of each animal was inserted as a random effect in the statistical model, being tested on the intercept and slope of the models.

RESULTS AND DISCUSSION

The data referring to animals aged less than 200 days old behaved differently (Equation 1) from those older than this value (Equation 2). Then, two equations predictive of the animals' body development were generated.

$$BW_{<200} = 34.8 + 0.517 \times age \qquad (1)$$

$$BW_{>200} = 101.9 + 0.237 \times age \qquad (2)$$

Where:
$BW_{<200}$ = body weight prediction model for animals less than 200 days old;
$BW_{>200}$ = body weight prediction model for animals over 200 days old, kg; and
Age is given in days.

The intercept in Equation 1 reflects the mean body weight of animals at birth, which in the case of the herd analyzed was 34.8 kg. On the other hand, the slope of the generated models can be interpreted as the rate of average daily gain of the animals. Therefore, when analyzing the slopes of these models, we can observe that animals less than 200 days old had a mean average daily gain of approximately 0.517 kg day⁻¹, while those over 200 days old had an average daily gain of 0.237 kg/day (Figure 1).

In the young phase of life (<200 days of age) there was a greater care for food and the environment for raising animals. As milk was the main food at this stage and as it represents a great source of nutrients due to its nutrition composition, the animals obtained greater average daily gain in this phase.

According to Maciel *et al*. (2012) the inadequate feeding of heifers of milk production is the most common cause of delayed first calving. Pastures undergo changes in nutritional value in tropical countries. In the rainy season there is a significant increase in the quality of this food, while in periods of drought occurs a drop in nutritional value. Therefore, herds that consume exclusively

Table 1. Descriptive statistics of the data used to assess the growth and development of dairy heifers

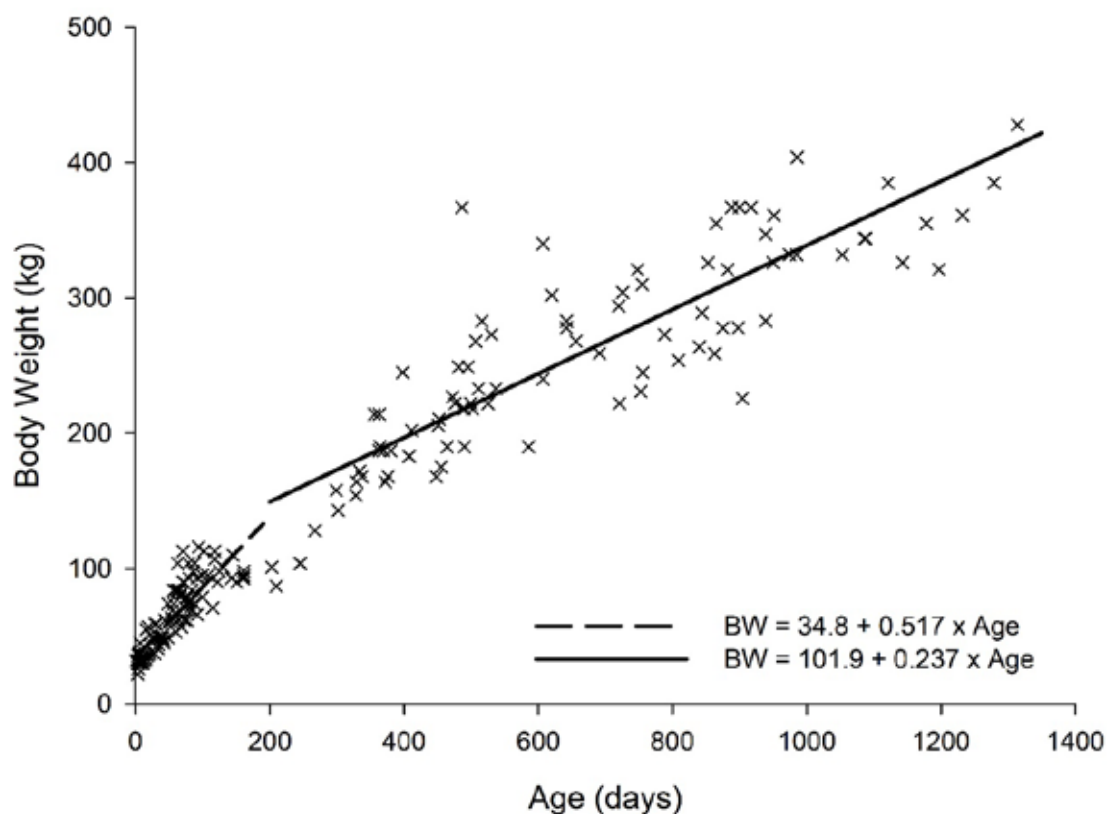| Item	< 200 days of life	>200 days of life
Number of observations	207	148
Mean, kg	65.6	254.7
Maximum. kg	116.0	428.0
Minimum. kg	22.0	87.0
Standard deviation. kg	26.33	77.44

Figure 1. Fitted regression for body weight according to the age of heifers less than or more than 200 days old

pasture suffer from this variation in food quality and their performance is compromised (GARCIA *et al.*, 2011). In addition, animals raised in high temperature environments, which do not have sufficient modifications to provide good thermal comfort (suitable natural or artificial shadows) may have their performance compromised (TORQUATO *et al.*, 2012). Thus, heifers that were kept only on pasture, with little intensive management, presented a reduction in weight gain throughout life.

CONCLUSION

Based on the results obtained, we can conclude that:

- Heifers have a higher growth rate before 200 days of age than after this age, which can affect the age at the first calving of the herd.

- Feeding and the raising environment are crucial for improving animal performance.

- If, after 200 days of life, the animals had a similar performance to the previous period, the age at first breeding would be anticipated.

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