

## Phenotypic and Genetic Trends for Growth and Milk Traits of Guzera Breed in Dual Purpose Herds

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**ABSTRACT:** Breeding programs of dairy breeds in Brazil have focused their goals on milk production, where Guzerá is considered as dual purpose breed and is widely used for milk and beef production. The breeding programs for beef and dairy traits have been conducted separately, and so are genetic evaluations. Despite that data banks are genetically connected. Selection decisions are taken based on the results published in the summaries. This study aimed to verify the phenotypic and genetic trends for cows' milk and beef performance in the selected herds. Records of milk production and weight traits were used to estimate predicted transmitting ability (PTA) for 305-d milk, fat and protein production, as well as for weaning and yearling weight, and post-weaning daily gain. PTA were regressed on birth year for obtaining genetic trends. Despite low, positive genetic trends were found for both traits.

**Keywords:** Animal breeding; Live weight; Milk yield; Production systems

### Introduction

The identification of genetically superior animals for selection purposes is based on their performance in economically important traits for the production systems. Moreover, in any breeding program, monitoring of genetic gain per unit of time (genetic progress) is extremely important to proceed to the necessary adjustments to their optimization (Rendel and Robertson (1950)). With respect to the number of traits included in breeding goals, traits to be included should be carefully established to ensure the maximization of genetic progress in each trait (Falconer and Mackay (1996)). Therefore it is crucial to choose selection criteria easily measured, and genetically and favorably related with the selection objectives of the herds.

Breeding programs of dairy breeds in Brazil have focused their goals on increasing milk production, especially in those herds responsible for providing sires and dams to the whole population. However, only in recent years, the dairy sector has undergone major changes attending to the government guidelines and market demands. Several industries initiated the payment for milk composition and quality.

Due to the importance of Guzerá breed for pure or crossbred dairy cattle in Brazil, breeding programs for beef and milk traits were independently implemented in 1993 and 1994, respectively. Dual-purpose production systems allow profits from the sale of milk and calves,

increasing revenue (Madalena (2001)). Although this breed had been initially selected for the improvement of beef traits, the number of farmers who adopt selection for milk traits have increased. However, beef and milk programs are conducted independently, data banks are genetically connected.

Therefore, this study aimed to verify the phenotypic and genetic trends for milk and beef traits in the herds participating of the National Breeding Programs of Guzerá Cattle.

### Materials and Methods

**Source of Data.** Records of 7,636 multiple lactations and weight at consecutive ages from 55 herds were used to estimate the predicted transmitting ability (PTA) for milk, fat and protein. Records were truncated to 305 days. For the weaning and yearling weight, and post-weaning daily gain (GPD) a total of 172,924 records of ponderal development at, respectively, 205, 365 and 550 days old were used. Guzerá cows were born from 1992 to 2009.

**Statistical models.** PTA for cows' weight performance and milk production were calculated using the algorithms of the Multiple Trait Derivative Free Restricted Maximum Likelihood (MTDFREML, Boldman et al (1995)), with an animal model for repeated measures.

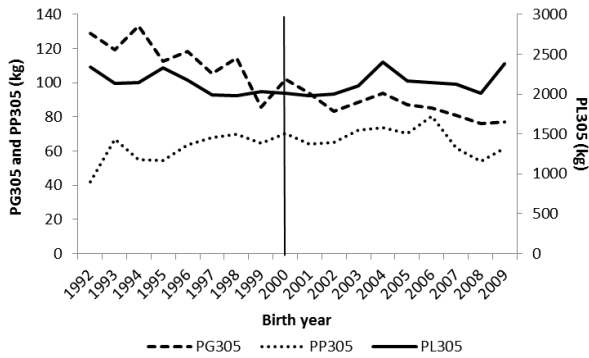
The model for milk traits included the fixed effects of herd, year and season of calving, and as a covariate the linear and quadratic terms of age at calving. Animal, permanent environment and error were included as random effects. Estimations of fat and protein genetic parameters used milk production as a second trait in bivariate analyzes.

For beef traits, the models included the fixed effects of contemporary group (herd, year, season of birth and the feeding system), age of dam at calving, age at weaning and the inbreeding coefficient of the animal, as covariate. Additive direct genetic, additive maternal, and maternal permanent environment were considered as random effects in univariate analyzes.

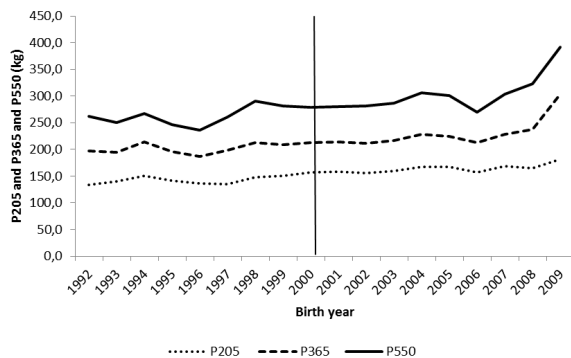
**Statistical Analyzes.** Average productions and PTA for weight and milk traits were regressed on the birth year using the MEANS and REG procedures available in SAS® (SAS Inst. Inc., Cary, NC).

## Results and Discussion

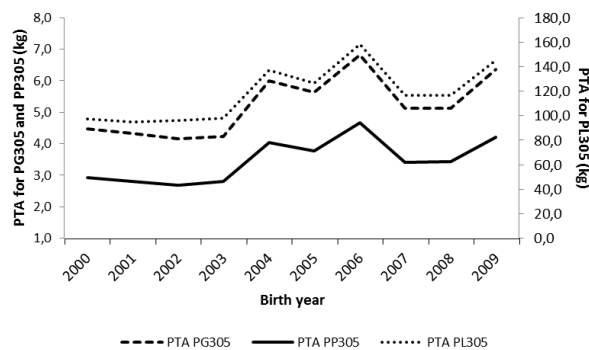
In figure 1, the regression of phenotypic means for 305-d milk (PL305), fat (PG305) and protein (PP305) productions are presented on the birth year of cows from 1992 to 2009. The average weights at 205 (P205), 365 (P365), and 550 (P550) days old are presented in Figure 2, for the same period. Genetic trends for milk traits and for beef traits are presented, respectively, in Figures 3 and 4, from 2000 to 2009.



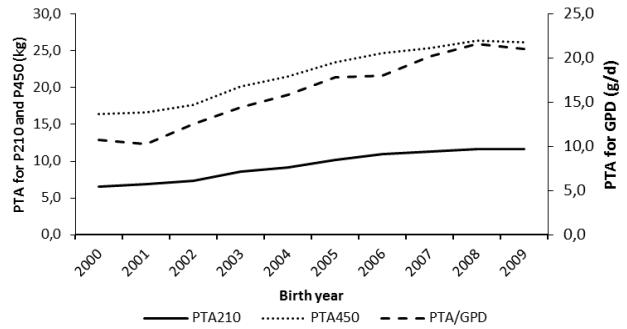
**Figure 1. Phenotypic trends for 305-days production of milk (PL305), fat (PG305) and protein (PP305), according to the birth year of Guzerá cows in the period 1992-2009.**



**Figure 2. Phenotypic trends for weights at 205 (P205), 365 (P365) and 550 (P550) days old, according to the birth year of Guzerá cows in the period 1992-2009.**



**Figure 3. Genetic trends for 305-days production of milk (PL305), fat (PG305) and protein (PP305), according to the birth year of Guzerá cows in the period 1992-2009.**



**Figure 4. Genetic trends for weights adjusted at 210 (P210) and 450 (P450) days old, and post-weaning daily gain (GPD), according to the birth year of Guzerá cows in the period 1992-2009.**

Since the beginning of the breeding programs, Guzerá breeders were technically advised in order to adopt management practices and technologies, such as heifers' body condition to begin reproductive life, milk recording, food supplementation, artificial insemination, mating planning focused in minimizing inbreeding. The phenotypic decreasing or absent trend observed in the first period was attributed to the increasing in records from a gradually larger number of herds monitored by the breeding program.

With the genetic evaluation results for milk traits in 2000 and for beef traits in 2001, published annually after in sire summaries, breeders began to use PTA to select animals in their herds, besides the management improvements. Then, from 2000 to 2009, it was found a phenotypic trend to increase 24.3 kg/year in milk yield, from which 5.2 kg/year was probably due to the genetic trend provided by the use of positive and highly PTA bulls. Peixoto et al. (2006) indicated that the use of bulls of unknown genetic merit or based on their phenotypic performance in the Guzerá cattle were responsible for the low performance of animals, which has been changed since the publication of the first sire summary. The phenotypic increase was relatively smaller than that expected considering the genetic progress reached in the period studied. In 2005, a crisis in the Brazilian dairy sector had begun, resulting in discouragement of breeders that reflected on milk production (Verneque et al. (2008).

In Brazil, the bonus payment for milk composition and quality has been practiced only recently by the dairy industry, what delayed the inclusion of those traits in the selection objectives in dairy herds. This fact can be assessed in this study by the observation of the phenotypic and genetic trends found for fat and protein yield, which was -2.3 and -1.1 kg/year, and 0.2 kg/year and 0.1 kg/year, respectively. However, a positive response would be expected in genetic merit for the production of fat and protein, due to the positive genetic correlation with milk yield. Wattiaux (2006) cited correlations of 0.75 and 0.82 between, respectively, milk and fat production, and between milk and protein production, what would allow indirect gains for these traits.

According to Madalena (2001), one of the advantages of the dual-purpose systems is the flexibility that the producer has to attend the market demands, choosing for growing and terminating animals when the price of milk is unfavorable, reducing costs with concentrated feed, decreasing the number of animals milked, and leaving more milk for calves. In this study, the phenotypic trend was 1.9 kg/year for weaning weight, whereas the genetic trend for weaning was 0.2 kg/year. It was also estimated an increasing in phenotypic trend for 365-d weight of 6.3 kg/year, and for 550-d weight of 8.3 kg/year. And the genetic trend estimated for the yearling adjusted to 450 days old was 0.4 kg/year. These values indicated positive genetic and phenotypic progress in the Guzerá herds in the period 2000-2009. Although the average PTA for weight traits was high, the same trend was not observed in relation to phenotypic means, probably related to the management practices concerning mainly to feeding. According to Dantas et al. (2013), the herds participating in the breeding programs of Guzerá cattle are bred on pasture-based systems, with low inputs, that could be affecting the expression of the cows' genetic potential.

The phenotypic and genetic trends for the post-weaning average daily gain of Guzerá cows were -2.9 g/d/year and 0.08 g/d/year, respectively. Although the average daily gain is a trait of economic importance for beef production systems, it is not so much important for milk production systems because selection for average daily gain would result in increased nutritional requirements early in life, with higher costs for maintenance of dairy heifers (Lobo et al (2000)).

### Conclusion

In the Guzerá production systems, genetic gains despite lower than that expected were obtained for both milk and beef traits.

Management condition changes had also affected the phenotypic expression of the genetic potential of Guzerá cows for the traits under selection.

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