Genetic and environmental effects over milk production of buffalo cows in Brazil

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ABSTRACT: The objective of this paper was to evaluate the relevance of environmental and genetics effects on milk production of buffalo cows in Brazil. The data were based on the Buffalo Genetic Improvement Program - PROMEBUL, using information of 1,911 cows (107 Jafarabadi, 101 Mediterranean, 1,056 Murrah and 647 crossbred females) with parturition between 1982 and 2003. The mathematic model for evaluating milk production included the fixed effects of herd, parturition year (1982 to 2003) and month (January to December), calf's sex (male or female), genetic group (Jafarabadi, Mediterranean, Murrah, and crossbreed), number of milking (one or two), lactation order (1 to 12) and duration of lactation (as a linear effect). The mean milk production in herds was 1,590.36 ± 609.25 kg. All sources of variation were significant ($P<0.05$) for the studied characteristics, except calf's sex. The mean milk production per genetic group was 1,651.4; 1,592.2; 1,578.3 and 1,135.5 kg, for Murrah, Mediterranean, Crossbred and Jafarabadi, respectively. The duration of lactation was the most important source of variation over milk production, followed by the year of parturition, herd, parturition order, genetic group and month of parturition.

Key words: Buffaloes, Evaluation, Animal Improvement.

INTRODUCTION - Bubalines are found in all continents and used for dairy and meat production or as traction animals. Brazil comprises the largest water buffalo herd from South America, followed by Venezuela and Argentina (Valle, 1999). Buffaloes are regarded as a good option to dairy breeding, because of their potential milk production in distinct environment conditions. Based on the current productivity indexes and the nutrition facts of buffalo milk, which have placed the buffalo milk as a valuable product either *in natura* or in the derivatives production, it is evident that dairy buffalo herds represent an expanding rearing activity (Verruma and Salgado, 1994). Differently from bovines, where several studies aiming to increase the knowledge and understanding of environmental and genetic effects on milk production have been carried out for a while (Freitas et al., 1983), scientific studies in bubalines are scarce, particularly in Brazil. Therefore, the goal of the present

study was to evaluate the importance of environmental and genetic effects over milk production in buffalo cows from Brazil.

MATERIAL AND METHODS - The present database belongs to the program of genetic improvement in buffaloes – PROMEBUL. In this study, we used information of 1,911 females (107 Jafarabadi, 101 Mediterranean, 1,056 Murrah and 647 crossbred cows), comprising 4.850 observations regarding milk production within a parturition period between 1982 and 2003. The data were analyzed according to GLM procedure using the software SAS (2001). The mathematic model for the milk production observed included the fixed effects of parturition year (1982 to 2003) and month (January to December), calf's sex (male or female), genetic group (Jafarabadi, Mediterranean, Murrah, crossbred), number of milking (one or two), lactation order (1 to 12) and the covariable duration of lactation (linear effect).

RESULTS AND CONCLUSIONS - The mean milk production observed within herds was 1,590.36 ± 609.25 kg. The variation coefficient was equal to 38.30%. The distribution of milk production was asymmetric and leptokurtic; 50% of milk production were between 1.150 e 1.191 kg, i.e., within the interquartilic range (Q1-Q3), as corroborated by the histogram of frequency distribution (Figure 1). A summary of the variance analysis for milk production is shown at Table 1. A significant effect (P<0.05) of all analyzed characteristics but sex's calf was observed. The mean production per genetic group were 1651.4; 1592.2; 1578.3 and 1135.5 kg, for Murrah, Mediterranean, crossbred and Jafarabadi, respectively. The milk production per parturition year is shown in the figure 2A, revealing a high phenotypic gain between 1988 and 1990. Such increase is associated with the performance of two daily milkings, instead of one, adopted by some farmers since 1988. Buffalo cows with lactation in the first semester, mainly on February, March and April were less productive than those with lactation in other periods of the year. The parturition order was an important source of variation. Buffaloes between third and seventh parturition were the most productive ones, evidencing a quadratic behavior of milk production in relation to parturition order. The determination coefficient (R2) of the quadratic regression over mean milk production per parturition order was equal to 64% (Figure 2B). The linear effect of lactation duration has also influenced the milk production (P<0.05). The estimative of the regression coefficient obtained in this work showed a

Table 1. Summary of variance analysis for milk production in water buffalo cows from Brazil.

Source of variation	Milk production
DF	MS
Genetic group	3	2006618.3 ***
Herd	11	8885855.8***
Month	11	324807.0*
Year	33	3264497.4***
Sex	1	2566.5 ns
Parturition order	11	6570447.7***
Number of milking	1	46314319.4***
Duration of lactation (linear)	1	279762034.6***
Error	4777	667062500
Total (R2,%)	4849	(50.7)

rising of 5.7 kg of milk per each increasing day in the lactation duration. Buffalo cows with daily milkings were 31% more productive than those with a single daily milking, with mean values equal to 1920.4 kg and 1462.7 kg, respectively.

Figure 1. Histogram of frequency for milk production of buffalo cows in Brazil.

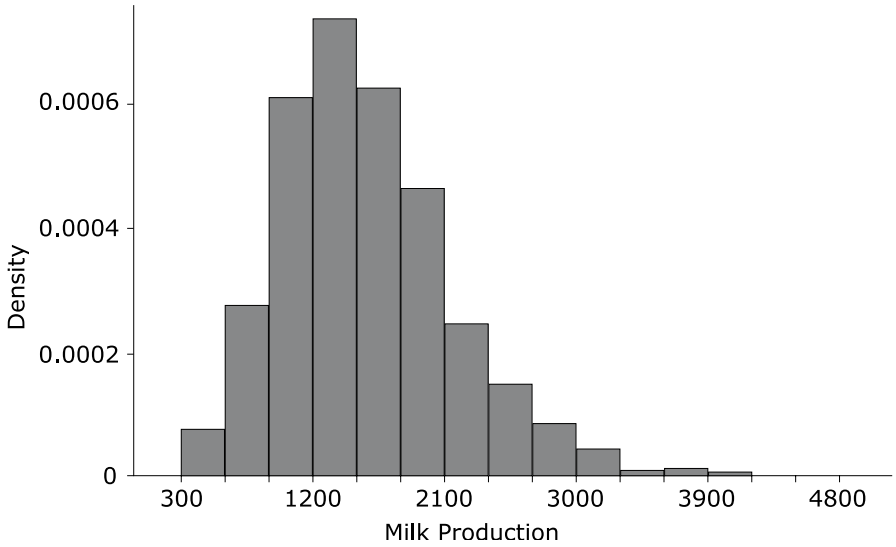
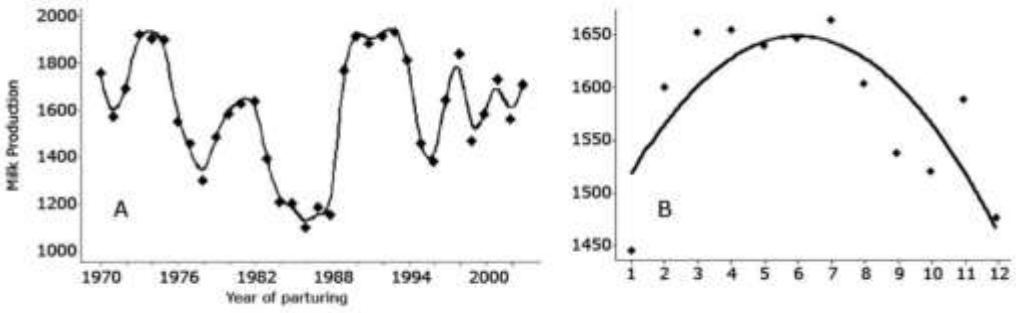


Figure 2. Milk production of buffalo cows in Brazil in relation to parturition year (A) and order (B).



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