Genetic parameters for milk yield, age at first calving and interval between first and second calving in milk buffaloes[1]

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ABSTRACT: Genetic parameters for the relation between the traits of milk yield (MY), age at first calving (AFC) and interval between first and second calving (IBFSC) were estimated in milk buffaloes of the Murrah breed. In the study, data of 1578 buffaloes at first lactation, with calvings from 1974 to 2006 were analyzed. The MTDFREML system was used in the analyses with models for the MY, IBFSC traits which included the fixed effects of herd-year-season of calving, linear and quadratic terms of calving age as covariate and the random animal effects and error. The model for AFC consisted of the herd-year-season fixed effects of calving and the random effects of animal and error. Heritability estimates MY, AFC and IBFSC traits were 0.20, 0.07 and 0.14, respectively. Genetic and phenotypic correlations between the traits were: MY and AFC = -0.12 and -0.15, MY and IBFSC = 0.07 and 0.30, AFC and IBFSC = 0.35 and 0.37, respectively. Genetic correlation between MY and AFC traits showed desirable negative association, suggesting that the daughters of the bulls with high breeding value for MY could be physiology maturity to a precocious age. Genetic correlation between MY and IBFSC showed that the selection of the animals that increased milk yield is also those that tend to intervals of bigger calving.

Key words: Dairy buffalo, Genetic and phenotypic correlation, Productive and reproductive traits.

INTRODUCTION - The increase of milky products demand along the last decades promoted great valuation of the bufaline species in the scene of national and international dairy cattle. The producers realized the great potential of this market and started to invest in this activity. Basically, the investments were applied in improvements of conditions and/or management practices. According to Bagnato & Oltenacu (1993) the milk yield and the fertility are the main factors that affect the profitability of milk herds. As the milk yield is related to the variations in the reproductive activity, therefore the minors intervals of calving can be associated to the biggest milk production in productive life in the animal, besides the possible increase in the number of animals calve per year (Silva et al., 2001). Thus, the

genetic importance of the fertility in these herds must be evaluated according to the reproductive performance of the cow and its relations to the milk yield (Bagnato & Oltenacu, 1993). This study had as its aim the estimation of the components of variance, heritability and the existing genetic and phenotypic associations between the milk yield, age at first calving and interval between first and second calving in milk buffaloes.

MATERIAL AND METHODS - Were used information originated from the Milk Control of Buffalos Program which is led by the Department of animal science of FCAV-UNESP/Jaboticabal, SP, Brazil. It was used a database that includes 13 herds whose purpose was the milk production of Murrah bred animals. After preliminary restrictions and eliminations pertinent to each trait, it remained in the database informations of 1578 buffaloes at first lactation that had given calve from 1985 to 2005. Were analyzed the milk yield (MY), age at first calving (AFC) and interval between first and second calving (IBFSC) traits.
Single and two-trait analyses were realized to MY, AFC and IBFSC traits used animal model. The variance components were obtained by derivative free restricted maximum likelihood (MTDFREML) method, developed for Boldman et al. (1995). For MY and IBFSC traits the model included herd-year-season of calving (contemporary group of calve - CGC) as fixed effects, and age of cows as covariate (linear and quadratic), animal and error as random effects the error. The model for AGC included the same random effects and the fixed effects of herd-year-season of birth (contemporary group of birth - CGB). The convergence criterion was 10^{-9} and to each convergence, the program was restarted with estimates of previous apparent convergence as initial values.

RESULTS AND CONCLUSIONS - The heritability estimate for PLT (Table 1) was lower than estimates obtained for Tonhati et al. (2000a) and Tonhati et al. (2000b), of 0.24 and 0.38, respectively. This value has the same magnitude that those (0.21) estimated by Ramos et al. (2006) and higher than (0.14) verified by Rosati & Van Vleck (2002) in work that used information originated from Italian Animal Breeders Association.
The values of the heritability estimated for AGC and IBFSC traits (Table 1) had been very different from the values observed in literature. Cassiano et al. (2004) had obtained to the bred in Brazil (Carabao, Murrah, Mediterranean and Jafarabadi) heritability estimate from 0.12 to 0.38 and 0.04 to 0.05 for the same traits, respectively, for animals maintained in the State of Amazon. Ramos et al. (2006) used information of several calves obtained heritability estimation of 0.02 for calving interval (CI). We believe that the greater estimative obtained in the present study is due to the high variability at first lactation, since in repeatability models only those animals with great potential for milk yield remain longer in herds.
Great differences were not observed for variance components estimate between single and two traits for MY, AGC and IBFSC traits.
The genetic and phenotypic correlations between MY, AGC and IBFSC were lower (Table 2). These results indicate that selection for MY hardly affect genetically, only phenotypically, indicating that would be necessary adjustments in feeding and management practices to provide better conditions to the animals. So this can present minors calving intervals and improving the economic efficiency of the production system. Similarly, Tonhati et al. (2000b) observed genetic correlation between milk yield and calving interval of 0.04, contradicting

the result presented for Ramos et al., (2006) for the same traits (-0.22).

Differently from results obtained for MY x IBFSC traits, desirable genetic correlation was observed for MY x AGC and AGC x IBFSC. First case, results suggest that daughters of bulls with high genetic value for MY would show physiological maturity to a precocious age. This results was the same of those observed (-0.32) for Jahageerdar et al. (1997) for the same traits in buffaloes Surti in India. However, different genetic correlation (0.63) was estimate by Tonhati et al. (2000b) for herd of Murrah bred in São Paulo State. Similarly, the result observed for the genetic correlation between AGC x IBFSC indicates that the selection for age reduction at first calving could bring reduction of interval between first and second calving. Although, it would be interesting to evaluate if the reduction of interval between first and second calving happens due to the reduction of duration of lactation or due to the peak of lactation which is not so accented as much as an adult animal. Such circumstance could occur at field with frequency. In herds that participate of the milk control program is possible to observe the cares with the first calve females. Generally, these animals are not used to the milking management system and may show lower milk production than the expected in this phase. Even though, these animals are kept in herd, indicating that small pressure of selection is carried through in this period.

The heritability estimate for milk yield suggests that this trait would respond the selection program. The age at first calving and interval between first and second calving traits showed small heritability, thus it does not have a good response for the selection.

Table 1. Estimates of the variance components1, heritability (h2) and standard errors (SE) for milk yield (MY), age at first calving (AFC) and interval between first and second calving (IBFSC) traits in single trait analysis.

Traits	σ_a^2	σ_e^2	σ_p^2	$h^2 \pm SE$
MY	35,681.50	144,825.41	180,506.91	0.20 ± 0.01
AFC	1,063.01	13,875.84	14,938.85	0.07 ± 0.05
IBFSC	925.30	5,781.98	6,707.28	0.14 ± 0.07

[1] σ_a^2 = variance of the genetic addictive direct effects; σ_e^2 = variance of the error; σ_p^2 = variance phenotypic

Table 2. Estimates of the heritability (diagonal) and genetic (above diagonal) and phenotypic (below diagonal) correlations milk yield (MY), age at first calving (AFC) and interval between first and second calving (IBFSC) traits in two trait analysis.

Traits	Traits		
	MY	AFC	IBFSC
MY	0.20	-0.12	0.07
AFC	-0.15	0.07	0.35
IBFSC	0.30	0.37	0.14

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