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GENETIC AND PHENOTYPIC CORRELATIONS FOR SOME SEXUAL MATURITY TRAITS IN MURRAH BUFFALO HEIFERS UNDER LOOSE HOUSING SYSTEM

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Abstract: Buffalo form the back bone of farmers in Indian dairy Industry**.** Data on 288 records of Murrah buffalo heifers kept at the Livestock research centre, NDR, Karnal, Haryana for the period 2000 to 2009, were analyzed to study the genetic and phenotypic correlations among four traits including age at maturity, weight at maturity, age at first conception and weight at first conception. The overall means (± S.E) for ages at maturity and first conception were 958.29 ± 12.16 and 1058.56 ± 15.45 days, respectively. The corresponding values for weights were 415.65 ± 3.08 and 437.26 ± 3.78 kg. The genetic correlations (multivariate analysis) for age at maturity with; weight at maturity, age at first conception and weight at first conception were 0.49, 0.78 and 0.08, respectively. The corresponding values for phenotypic correlations were 0.48, 0.68 and 0.36.
Keywords: Murrah heifers, Sexual maturity, Genetic and Phenotypic correlations.

Introduction

Buffalo is the main dairy animal of India subcontinent and India is regard as treasure house of world best buffalo germ plasma. The sexual maturity traits are important parameter of its life. Murrah buffaloes are one of the most efficient milk producers in India but the life time performance of a dairy buffalo is adversely affected by a number of genetic and environmental factors. The genetic improvement in a trait depends upon its heritability, repeatability and its genetic and phenotypic correlations with other traits. The degree of association between genes responsible for additive variance of different traits is measured through genetic correlations, while phenotypic correlation is an expression of observed relationship between phenotypic performances of different traits. Knowledge of relationship is valuable when related traits are considered for selection. If genetic correlation among two traits is positive and high, the selection for one trait would result in an improvement of the other trait. Generally, the fertility traits have low genetic variance. The evaluation of farm

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animals should be based upon multi trait procedures, especially for fertility traits, because these have low heritability estimates and can use additional information from correlated traits. This study presents genetic and phenotypic correlations for some sexual maturity traits in Murrah buffalo heifers.

Materials and Methods

Data on 288 records of Murrah buffalo heifers kept at the Livestock Research Center, NDRI, Karnal, Haryana for the period 2000-2009, were analyzed to compute genetic and phenotypic correlations among four traits of sexual maturity including age at maturity, weight at maturity, age at first conception and weight at first conception. The data were edited carefully as far as the accuracy and reliability of the records were concerned for pedigree information. The records outside a range of 3 standard deviations from the phenotypic mean were removed. The number of observations varied according to the type of trait. The records with maturity age exceeding 1669 days were not included, while the upper limit for age at first conception was 1972 days. The data were analyzed by Statistical Analyses System (SAS, 1998) for fixed effects and covariate, while genetic parameters were estimated by animal model using pedigree data. The data were subjected to least-squares analysis of variance using LSMLMW PC-2 VERSION software package (Harvey, 1990). The model contained fixed effect of period-season (interaction) of birth; the weight at one year age was taken as covariate for all the four traits. The additive genetic effect of the animal was also included in the model. The entire periods was grouped into three periods comprising first period (P1) from 2000-2002, second period (P2) from 2003-2005 and third period (P3) from 2006-2009. Furthermore, the birth years based upon climatic conditions were divided into four seasons viz. winter (December to march), summer (April to June), rainy (July to august) and autumn (September to November).

Results and Discussion

The means and coefficients of variation for various sexual maturity traits in Murrah buffalo heifers (**Table-1**). The coefficient of variation for the four traits ranged from 12.09 to 23.84 per cent. Age at first conception had larger variability (23.84 %),followed by age at maturity (18.85 %), weight at first conception (14.65 %) and weight at maturity (12.09 %).The age at maturity ranged from 527 to 1669 days with a mean (± S.D) of 958 ± 206.5 days. The age at sexual maturity were comparable to the values already reported by (Nawale et al., 2012) in Murrah buffaloes. It is lower than reported by (Saini, et al., 1988) in Murrah buffalo. However, the present estimate was higher than the values reported by (Basu et al.,

1984) in murrah buffaloes. The mean (± S.D) age at first conception was 1058.57 ± 262.9 days and ranged from 637 to 1972 days. The present estimate was lower than the values reported by (Rathi et al., 1971) in murrah buffaloes. The average (±S.D) weights at maturity and first conception were 415.6 ± 50.9 and 437.2 ± 64.2 kg, respectively. The ranges were 290 to 615 and 300 to 692 kg, respectively. However, the present estimate was higher than values reported by (Asghar and Iqbal, 1984) in buffalo heifers. The variation in the estimates of the present study and some earlier studies may be due to differences in the size of data set, the state of nutrition and other managemental conditions.

The analysis of variance showed that effect of period of birth had significant variation ($P<0.05$) for age at sexual maturity and age at first conception whereas, non significant for body weight at sexual maturity and body weight at first conception. However, season of birth had no significant on all the four traits whereas, the regression effect of one year weight on all the four traits was significant .Present findings are in agreement with those of (Basu et al., 1984) observed significant effect of periods on age at sexual maturity in murrah heifers. The period differences signify genetic change in population over time since a different sire group had been used in each period and was also associated with managemental factors. The highest age at sexual maturity (980.63±18.66 days) and age at first conception (1130.03±28.19 days) was observed for the heifers were born during the period of 2000-2002. While, the lowest age at sexual maturity (922.55±22.33 days) and age at first conception (983.51±26.01days) was observed for the heifers born during the period of 2006-2009. The lowest age at sexual maturity and age at first calving were observed for the heifers born during the period of 2006-2009.This might be due to selection of good breeding stocks and improvement in the management of reproductive efficiency of the buffalo heifers over the years in the farm. The animals maintained at high state of nutrition mature and conceive earlier than those raised at low state of nutrition (Shah, 1991).

The genetic correlations of maturity age with weight at maturity and first conception age were positive and significant **(Table-2)**. The genetic correlation between maturity age and weight at first conception was also very low. The genetic correlations of first conception weight with maturity weight and first conception age were negative but very low. Similar results were reported by (Basu *et al*., 1984), who made a genetic study on sexual maturity traits in Murrah buffaloes.

The phenotypic correlation of maturity age with first conception age was 0.64 which was positive and highly significant ($P<0.01$, **Table-2**). Similarly, the phenotypic correlation

between first conception age and first conception weight was also positive (0.59) and highly significant (P<0.01). The phenotypic correlation of first conception weight with maturity weight (0.08) was positive, significant but very low. The phenotypic correlations of maturity age with maturity weight (0.48) and first conception age with maturity weight (0.28) were positive and highly significant (P<0.01). Comparatively lower phenotypic correlations (0.23 and0.45, respectively) between age at first conception and weight at first conception were reported in some earlier studies (Asghar and Iqbal, 1984). The variation in the estimates may be due to the differences in breed type, location, managemental practices, state of nutrition etc. The results of the present study are in accordance with those reported by Gurung and Johar (1982), who observed that the correlations of body weights at 6, 12, 18, 24and 30 months age with age at first calving were highly significant ranged from -0.46 ± 0.11 to 0.86 ± 0.04 in Murrah buffaloes.

It can be concluded that maturity age is a good indicator of fist conception age. Significant and positive relationship was also found between maturity age and maturity weight, indicating that these traits are more influenced by environment. Furthermore, it is useful to analyze sexual maturity traits in a multivariate analysis in an evaluation programme because they are low heritable and can benefit from additional information for organized research farm.

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Table 1: Mean standard deviations (SD) and Coefficients variation (CV) for various sexual maturity traits in Murrah buffalo heifers

Traits	Number	Mean	SD	Range	CV (%)
Age at maturity(days)	288	958.29	206.5	527-1669	18.85
Weight at maturity(Kg)	288	415.65	50.92	290-615	12.19
Age at first conception(days)	288	1058.56	262.19	521-1972	23.84
Weight at first conception(Kg)	288	437.26	64.23	300-692	14.65

Table 2: Genetic and Phenotypic correlation for various sexual maturity traits from multivariate analysis in Murrah buffalo heifers

Traits	Age at maturity	Weight at maturity	Age at first conception	Weight at first conception
Age at maturity		0.48**	0.68**	0.36**
Weight at maturity	0.49		0.28**	0.09*
Age at first conception	0.78	0.05		0.59**
Weight at first conception	0.08	-0.04	-0.08	

(Genetic correlations are below diagonal, while phenotypic correlations are above diagonal)*Significant (P<0.05); ** highly significant (P<0.01)