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Genetic and Phenotypic Relationship Between Age at First Calving and Some Lifetime Traits in Nili-ravi Buffaloes

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Abstract
Pedigree and performance of 878 Nili-Ravi buffaloes progeny of 38 sires maintained for 47 years were recorded at Livestock Production Institute, Bahadurnagar, Okara, Pakistan. The phenotypic correlations of age at first calving with lifetime milk yield, productive life, herd life and coefficient of reproductive ability were negative and significant. However, the phenotypic correlation (0.03) between age at first calving and longevity was non-significant. The genetic correlations of age at first calving with lifetime milk production, productive life, herd life, longevity and the coefficient of reproductive ability were -0.52, -0.41, -0.44, -0.11 and -0.60, respectively. These negative and significant genetic correlations indicated that reduction in age at first calving in buffaloes would help to improve lifetime milk yield, longevity and reproductive ability as a correlated response.

Introduction

Buffalo is the most important dairy animal in Pakistan as it contributes about 72 percent of the milk produced in the country. Also the buffalo population has increased from 11.9 to 20.7 millions during the period 1980 to 1997 (Anonymous, 1997) which manifests the preference and liking of the livestock farmers for this species. However, buffalo has been blamed for late age at maturity and long calving intervals. These two factors reduce the reproductive efficiency and result in reduced calf crop and milk yield on lifetime basis. The lifetime milk production primarily depends on factors like early growth rate, age at first calving, first lactation milk yield and the herd life. Stability of a buffalo in the herd is determined primarily by its productive and reproductive efficiency and as such can be considered as a good index of overall efficiency of the animal.

The economic feasibility of the Nili Ravi buffaloes cannot be established in the absence of the lifetime performance parameters. There is a dearth of information in the available literature on the genetic and phenotypic relationship between age at first calving and various lifetime traits in the Nili Ravi buffaloes in Pakistan. The knowledge of genetic and phenotypic correlations between these traits would help utilize the information expressed in early life for predicting the lifetime performance. Present study was planned to workout genetic and phenotypic correlations between age at first calving and different lifetime performance traits in this breed of buffaloes.

Materials and Methods

Pedigree and performance records of Nili Ravi buffaloes maintained at Livestock Production Research Institute 3ahadarnager District Okara (Pakistan) over a period of 47 years (1940-1986) were utilized for the present investigation. Data on 878 Nili Ravi buffaloes progeny of 38 sires, who had completed lifetime records, were available lot computing various genetic and phenotypic parameters of lifetime traits. The lifetime performance traits examined in the study include: Age at first calving, productive life (Number of days in milk during the lifetime of an individual), herd life the period from first calving to disposal from the herd, the buffaloes who have completed at least one lactation in the herd prior to their disposal were considered for the estimation, longevity, (the period from birth to disposal excepting those who died due to accidents or diseases), lifetime milk yield and coefficient of reproductive ability (number of calves/age in years). The phenotypic and genetic correlations were worked out between age at first calving and the above mentioned lifetime performance traits according to the procedure described by Becker (1992).

Results and Discussion

The phenotypic and genetic correlations of age at first calving and sorne lifetime traits are summarized in Table 1.

Correlations between Age at First Calving and Lifetime Milk Yield: The phenotypic and genetic correlations between age at first calving and lifetime milk yield are given in Table 1. The phenotypic correlation between age at first calving and lifetime milk yield was 0.22 (Table 1). This correlation was statistically significant. This is in line with the findings of many other workers (Larson *et al.*, 1957; Gopal and Bhatnagar, 1972). Gopal and Bhatnagar (1972) reported negative but significant correlation between age at first calving and lifetime milk production up to 6, 8 and 10 years of age. However, they found non-significant effect of age at first five lactations of Sahiwal cows. The phenotypic correlation between age at first calving and lifetime milk production as reported by Hussain (1988) was -0.06 which was non-significant. The phenotypic correlation between age at first calving and lifetime milk yield is reported to be -0.06 in Murrah buffaloes (Dutt and Taneja, 1996). Early maturity had not any adverse effect on the, lifetime productive and

Table 1: Phenotypic and genetic correlations of age at first calving and some lifetime performance traits

Traits correlated	No. of Sitres	No. of records	Phenotypic correlation	Genetic correlation
Age at first calving and lifetime milk yield	37	865	-0.22**	-0.52**
Age at first calving and productive life	38	747	-0.20**	-0.41**
Age at first calving and herd life	37	747	-0.20**	-0.44**
Age at first calving and longevity	37	748	0.02[NS]	-0.11**
Age at first calving and coefficient of reproductive ability	37	748	-0.39**	-0.60**

reproductive performance in Murrah buffaloes. However, late maturity was compensated with shorter calving intervals and recovery of milk production against early calves (Rao and Rao, 1997). A significant but negative correlation as obtained in the present study indicated that reduction in age at first calving would help improve the lifetime milk production.

The genetic correlation between age at first calving and lifetime milk yield was 0.52 (Table 1). This estimate was also significant. Negative and significant genetic correlation between these two traits have also been reported by Lin and Allaire (1978), Bhatia (1980) and Hussain (1988). Lin and Allaire (1978) compared the efficiency of selection on milk yield to a fixed age, genetic correlation between age at first calving and lifetime milk yield was -0.37. Genetic correlation of lifetime milk yield with age at first calving in Sahiwal cows was 0.44 as reported by Bhatia (1980). The genetic correlation between age at first calving and lifetime milk yield in Sahiwal cows was reported to be -0.34 by Hussian (1988). A genetic correlation between the two traits was reported to be -0.01 18 in Murrah buffaloes (Dutt and Taneja, (1996). These estimates of genetic correlation suggested that selection for reduced age at first calving would help improve lifetime milk yield in buffaloes.

Correlations between Age at First Calving and Productive Life: The phenotypic correlation between the two traits was (0.22) which was statistically significant (Table 1). A significant but negative correlation between these two traits is a desirable association because any reduction in age at first calving would help improve productive life in buffaloes. The present findings has been substantiated by results obtained by Bhatnagar and Sharma (1983) in Karen Swiss cows. The correlation of productive life with age at first calving as reported by these workers were -0.51 with days in milk constant, 0.32 with constant first lactation milk yield and 0.49 with both constant. Kalsi and Dhillon (1982) also reported that the period to first calving significantly influenced total period in milk in buffaloes. A phenotypic correlation between the two traits was reported to be -0.09 in Murrah buffaloes (Dutt and Taneja, 1996).

The genetic correlation between age at first calving and productive life was 0.41 which was statistically significant (Table 1). These results are in conformity with the findings of Dutt and Taneja (1996) who reported a genetic correlation between the two traits was reported to be

-0.04±22 in Murrah buffaloes. This suggested that any selection based on reduced age at first calving would help improve the productive life in buffaloes.

Correlation between Age at First Calving and Herd Life: The phenotypic correlation between age at first calving and herd life was 0.20 and this estimate was statistically significant (Table 1). This suggested that reduction in age at first calving would result in longer herd life which is a desirable association. However, Essl (1982) reported that the herd life was not related to age at first calving in Simmental, Brown Mountain arid Pinzgau cows. On the contrary, a phenotypic correlation of -0.08 was reported between the two traits in Murrah buffaloes (Dutt and Taneja, 1996).

The genetic correlation between age at first calving and herd life was 0.44 (Table 1). This correlation was also significant statistically. These results are in conformity with the findings of Dutt and Taneja (1996) who reported a genetic correlation hetween the two traits was reported to be -0.06±22 in Murrah buffaloes. It is a desirable association as reduction in age at first calving would help to improve the over all herd life of buffaloes.

Correlations between Age at First Calving and Longevity: The phenotypic correlation between the two traits as obtained from variance and covariance analysis was 0.03 (Table 1). This estimate was non significant indicating that reduction in age at first calving in buffaloes will not affect the longevity. Asker *et al.* (1969) defined longevity in Egyptian buffaloes as the average length of the productive life of a female in the herd and reported a highly significant correlation of 0.21 between longevity and age at first calving which was not in conformity with the present findings. Singh and Tomar (1981) analyzed data on 138 Murrah buffaloes and reported that age at disposal was significantly affected by age at first calving. The partial correlation of age at first calving with longevity was -0.49 with first lactation length and milk yieln held constant as reported by Bhatnagar and Sharma (1983) in Karen Swiss cows.

The genetic correlation between age at first calving and longevity was 0.11 which was statistically significant (Table 1). This indicated that measures to reduce age at first calving would automatically help to improve longevity in buffaloes.

Correlations Between Age at First Calving and Coefficient of Reproductive Ability: The phenotypic correlation between age at first calving and coefficient of reproductive ability was calculated to be 0.39 which was significant (Table 1). This estimate of correlation indicated that reduced age at first calving would help to improve the reproductive ability expressed as number of calving over age in years.

The genetic correlation between age at first calving and coefficient of reproductive ability was calculated to be 0.06 (Table 1). This estimate was found to be significant. Hussain (1988) had also reported a negative and significant genetic correlation of 0.53 between age at first calving and coefficient of reproductive ability in Sahiwal cows. The present estimate of genetic correlation between the two traits under report indicated that improvement in over all reproductive ability was possible with reduction in age at first calving.

References

Anonymous, 1997. Economic survey of Pakistan, 1996-97. Finance Division, Economics Advisory Wing, Islamabad.

Asker, A.A., L.H. Bedeir, A.A. Alitribt, I.A. Ahmad and S.S. Khishin, 1969. Longevity in Egyptian buffaloes. J. Anim. Prod. UAR., 9: 173-179.

Becker, W.A., 1992. Manual of Quantitative Genetics. 5th Edn., Academic Enterpise Pullman, USA., pp: 113-117.

Bhatia, S.S., 1980. Note on the selection for lifetime milk production in Sahiwal cattle. Indian J. Anim. Sci., 50: 450-453.

Bhatnagar, D.S. and R.C. Sharma, 1983. Note on longevity in relation to age at first calving and first lactation yield in Karan-Swiss cows. Asian J. Dairy Res., 3: 237-240.

Dutt, T. and V. K. Taneja, 1996. Genetic improvement in lifetime milk yield expected from selection on single traits or indices. Indian J. Anim. Sci., 66: 371-374.

Essl, A., 1982. [Investigations to the problems of breeding dairy cows with high life production, 1: Fundamental considerations and results of model calculations]. Züchtungskunde, 54: 267-275, (In German).

Gopal, D. and D.S. Bhatnagar, 1972. The effect of age at first calving and first lactation yield on lifetime production in Sahiwal cattle. Indian J. Dairy Sci., 25: 129-133.

Hussain, S.M., 1988. Studies on Sahiwal cattle in Pakistan: II. Genetic and phenotypic parameters of some lifetime production functions. M.Sc. Thesis, University of Agriculture, Faisalabad, Pakistan.

Kalsi, J.N. and J.S. Dhillon, 1982. Performance of buffaloes in first three lactations. Indian J. Dairy Sci., 35: 218-219.

Larson, C.J., A.B. Chapman and L.E. Casida, 1951. Butterfat production per day of life as a criterion of selection in dairy cattle. J. Dairy Sci., 34: 1163-1169.

Lin, C.Y. and F.R. Allaire, 1978. Efficiency of selection on milk yield to a fixed age. J. Dairy Sci., 61: 489-496.

Rao, A.V.N. and H.R.M. Rao, 1997. Life time production performance of Murrah buffaloes. Indian Vet. J., 74: 906-907.

Singh, B.B. and N.S. Tomar, 1981. Evaluation of culling in Murrah Buffaloes. Indian Vet. J., 58: 303-307.