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Genetic and Phenotypic Parameters Estimates of Milk Yield Traits in Iranian Khuzestan Buffalos

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Abstract: Buffalo milk has excellent physical and chemical qualities as a consequence of the high percentage of constituents. A total of 7583 milk and lactation records, 7547 fat yield and fat percentage records in 228 buffaloes herds during 1985 to 2005 were collected by Animal husbandry centre of Jahad-Agriculture Organisation in Khuzestan province. We estimated genetic and phenotypic parameters for Milk yield parity (MYP), Fat yield parity (FYP) and Fat percent parity (FPP). Estimates were carried out through single trait animal model using DFREML program. In order to predict effects of herd, parity, year and season of calving on milk and fat yield, fat percentage and the length of lactation periods we used SAS program. The effects of herd, year and season were highly significant on all of the considered traits ($P<0.01$). The highest heritability of milk yield traits for Milk yield parity (1st MYP), Fat percent parity (2st FYP) and Fat yield parity (3st FPP) estimated as 0.48, 0.59 and 0.77, respectively. Genetic and phenotypic correlation between milk yield and fat percentage were low. We conclude that by good selection programmer and improving management including nutrition, health care and reproduction traits one could improve milk and other production traits.

Key words: Genetic · Phenotypic · Traits · Lactation · Buffaloes

INTRODUCTION

Compared with cow's milk, buffalo milk has a higher percentage of all components, such as protein and fat. The mean protein and fat percentages reported for buffalo milk varies from 4.13 to 4.55% [1, 2] and from 6.87 to 8.59% [2, 3], respectively. In spite of its higher fat percentage, milk cholesterol content is lower for buffalo than for cow's milk (275 vs 330 mg and 1562 vs 2287 mg, respectively) [4]. This is of major interest, together with some studies that report a larger number of small fat globules in buffalo milk as compared to bovine and sheep milk.

Buffaloes are the multi-purpose and most valuable livestock species in smallholder mixed farming system in some parts of Iran. The country has a population of 519,000 heads of buffalo. Khuzestan, a province in the southwest of Iran, is one of the important regions for raising buffalo. More than 22% of the buffalo population in Iran is found in this area with a herd size of 5 to 300 animals [5]. Buffaloes have important role in Khuzestan agricultural economy. They are adapted to harsh environmental conditions in the area. They are well resistant against ticks and disease and used to eat low quality feeds. Improvement through the selection of traits associated with milk quality and milk yield for dairy buffaloes is dependent on the availability of reliable genetic parameter estimates for these traits. The estimates of genetic parameters are helpful in determining the method of selection to predict direct and correlated response to selection, choosing a breeding system to be adopted for future improvement as well as in the estimation of genetic response. Moreover, the accuracy of genetic parameter estimates is determined by many factors, such as the quantity and quality of information (records and pedigree), the statistical model applied and the method of covariance estimation. In order to establish a breeding plan, estimation of genetic parameters is necessary. The objective of this study was to determine estimates production and genetic capacity of Khuzestan' buffalos.

MATERIALS AND METHODS

A total of 7583 milk and lactation records, 7547 fat yield and fat percentage records in 228 buffaloes herds during 1985 to 2005, were collected by Animal husbandry

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centre of Jahad-Agriculture Organisation in Khuzestan province. Data were manipulated for deletion of outlying records. Primary analysis of data were performed using SAS package [6], program in order to predict effects of herd, parity, year and season of calving on milk and fat yield, fat percentage and the length of lactation periods. The structure of data is presented in Table 1. Genetic parameters (heritability, genetic and phenotypic correlation) were estimated using Restricted Maximum Likelihood method by Animal Model of DFREML software [7]. Lactation records shorter than 90 days of lactation and calving interval out of 300 to 800 days were deleted.

RESULTS AND DISCUSSION

Primary analysis showed that the effects of herd, year and season were highly significant on all of the considered traits (P<0.01). While parity effects was only significant on milk and fat yield (P<0.05). The results of the present study were consistent with the estimates reported by Aziz *et al*. [8] but were lower than the results of Mourad *et al*. [1], Gutierrez *et al*. [9] and Rosati and Van Vleck. [2], for different breeds of buffaloes.

There are very good variation among buffaloes which is a good tool for selection (Table 1). Amount of variation for fat yield is more than the other Considered traits according to calculated CV (46.08) followed by milk yield (CV=39.63). The average milk yield and Average of days in milk were (2085.13, 218.2) days in 228 herds ranging from 74 to 786 days, respectively. In general, estimates of obtained in the present study was lower than the estimates reported by Afzal *et al*. [10]. It may be largely due to different management methods and environmental condition employed. Heritability of milk yield, fat yield and fat percentage were high for all of the parities using multi-trait animal model (Table 2). Overall estimates of heritability for all traits were higher. Several researchers have indicated that variance heterogeneity is due to differences between production systems, environmental conditions specific to each region, herd size and management and number of daughters per sire [11, 14]. In this study, the higher number of sires common to Khuzestan's buffaloes may be decreasing the heterogeneity of variances. Consequently, this factor should be considered for future joint genetic evaluations.

Genetic correlations between all traits were positive, with the exception of those between (1st FPP, 2st FPP and 3st FPP) and Milk yield parity (MYP) (0.96). The genetic correlations estimates obtained in this study are in agreement with this reported by Suhail, *et al*. [15]. The highest Phenotypic correlation was between (1st FYP) and Fat yield parity (FYP). These results pointed out that a great part of total phenotypic variation is due to the additive genetic action of the genes.

Table 1: Summary of data structure and descriptive statistics for milk yield, Fat yield and milk fat (%F) and Days in milk

Traits	No. of records	Average	Min	Max	SD	CV
Milk yield (kg)	7583	2085.13	345	7065	826.25	39.63
Fat yield (kg)	7547	129.47	13	446	59.66	46.08
Fat (%)	7547	5.67	2	9	1.13	19.99
Days in milk	7583	218.2	74	786	71.57	32.80

SD = standard deviation; CV = coefficient of variation

Table 2: Heritability (diagonal) genetic (above diagonal) and phenotypic (below diagonal) correlation of milk yield traits of Khuzestan's buffaloes

	Milk yield parity (MYP)			**Fat yield parity (FYP)**			**Fat percent parity (FPP)**		
Trait	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
1st MYP	**0.48**	0.45	0.68	0.83	0.73	0.77	-0.13	-0.12	-0.12
2st MYP	0.46	**0.47**	0.45	0.64	0.84	0.78	-0.08	-0.07	-0.07
3st MYP	0.59	0.46	**0.38**	0.63	0.50	0.72	-0.13	-0.12	-0.12
1st FYP	0.85	0.50	0.62	**0.56**	0.91	0.96	0.10	0.95	0.11
2st FYP	0.67	0.64	0.51	0.82	**0.59**	0.93	0.55	0.05	0.06
3st FYP	0.70	0.56	0.73	0.84	0.78	**0.57**	0.09	0.08	0.09
1st FPP	-0.13	-0.10	-0.12	0.05	0.05	0.06	**0.65**	0.80	0.80
2st FPP	-0.12	-0.10	-0.11	0.06	0.05	0.06	0.72	**0.77**	0.73
3st FPP	-0.13	-0.01	-0.12	0.06	0.05	0.07	0.72	0.75	**0.77**

CONCLUSIONS

There was a high variation among recorded buffaloes in Khuzestan province as well as high heritability for considered traits which expect selection procedures effective. Low genetic and phenotypic correlation between milk yield and fat percentage shows that these traits could improve independently. Overall, results shows that by good selection.

Programmer and improving management including nutrition, health care and reproduction traits one could improve milk and other production traits.

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