

## Genetic analysis of production and reproduction traits in Jaffarabadi buffaloes

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### ABSTRACT

Lactation records of 189 Jaffarabadi buffaloes maintained at Cattle Breeding Farm, JAU, Junagadh, over a period of 20 years (1991-2010) were analysed for genetic analysis of some production and reproduction traits in Jaffarabadi buffaloes. The production traits included were 300-days milk yield, lactation length and peak yield, and the reproduction traits were calving interval and dry period to study the effects of non-genetic factors viz. period, parity and season of calving. Least squares analysis revealed that period of calving had highly significant effect ( $P \leq 0.01$ ) on all the five traits under the study. Season of calving had highly significant effect ( $P \leq 0.01$ ) on reproduction traits, while non-significant effect ( $P > 0.05$ ) on production traits. Parity of calving had highly significant effect ( $P \leq 0.01$ ) on 300-days milk yield and peak yield while non-significant effect ( $P > 0.05$ ) on lactation length, calving interval and dry period.

**Keywords:** Jaffarabadi buffaloes, genetic analysis, least-squares analysis

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### INTRODUCTION

Buffaloes contribute to about more than 53% of the total milk production in India (DAHD, 2012). Jaffarabadi buffaloes occupy a position amongst the most reputed buffalo breeds of India on account of its excellent milk and milk-fat yields. Selection programmes on buffaloes partly depend upon the knowledge of variations in different production and reproduction traits with environmental and managerial factors. Reports on effects of non-genetic or environmental factors on production and reproduction traits in Jaffarabadi buffaloes are scanty. The current study was undertaken to determine the effects of non-genetic factors viz. period, parity and season of calving on 300-days milk yield, lactation length, peak yield, calving interval and dry period in Jaffarabadi buffaloes.

### MATERIALS AND METHODS

Lactation records of 189 Jaffarabadi buffaloes maintained at Cattle Breeding Farm, JAU, Junagadh from 1991-2010 were collected for the study. Traits

analyzed were 300-days milk yield (300-DMY), lactation length (LL), peak yield (PY), calving interval (CI) and dry period (DP). Abnormal lactations were removed for further analysis. Years were divided into periods of four years each (P-1 to P-5). Seasons were grouped into three viz. winter (November-February), summer (March-June) and monsoon (July-October). Lactation records upto the seventh parity (L-1 to L-7) were considered for analysis.

Effects of non-genetic factors were determined by least squares analysis using software programme LSMLMW (Harvey, 1990). Model assumed for least squares analysis was:

$$Y_{ijkl} = P_i + S_j + L_k + e_{ijkl} \quad \text{Where,}$$

$Y_{ijkl}$  = lactation record of the individual during  $i$ th period in  $j$ th season for  $k$ th parity

$P_i$  = fixed effect of  $i$ th period of calving

$S_j$  = fixed effect of  $j$ th season of calving

$L_k$  = fixed effect of  $k$ th parity of calving

$e_{ijkl}$  = residual effect with mean 0 and variance  $\sigma_e^2$

Differences amongst the least-squares means for

**Table 1:** Least squares means of the traits under study

	N	LSM	N	LSM	N	LSM	N	LSM	N	LSM	N	LSM
$\mu$	522	1742.50 $\pm$ 43.38	531	337.81 $\pm$ 7.08	493	9.42 $\pm$ 0.22	413	534.36 $\pm$ 11.31	384	189.45 $\pm$ 7.30		
Season	NS		NS		NS		**		**			
Winter	168	1796.49 $\pm$ 56.42	171	339.89 $\pm$ 9.19	163	9.38 $\pm$ 0.27	138	549.67 $\pm$ 15.08	131	204.30 $\pm$ 9.66		
Summer	82	1736.35 $\pm$ 72.22	83	333.78 $\pm$ 11.83	72	9.68 $\pm$ 0.37	73	549.67 $\pm$ 18.40	71	200.47 $\pm$ 11.81		
Monsoon	272	1694.65 $\pm$ 47.38	277	339.76 $\pm$ 7.70	258	9.19 $\pm$ 0.23	202	503.72 $\pm$ 12.87	182	163.58 $\pm$ 8.27		
Period	**		**		**		**		**			
P-1	19	1830.23 $\pm$ 139.22	19	411.16 $\pm$ 22.85	18	7.94 $\pm$ 0.68	19	634.78 $\pm$ 33.98	19	217.11 $\pm$ 21.42		
P-2	62	1647.10 $\pm$ 77.45	62	332.85 $\pm$ 12.70	58	8.25 $\pm$ 0.38	59	526.56 $\pm$ 19.56	58	174.14 $\pm$ 12.40		
P-3	172	1808.85 $\pm$ 51.14	175	324.04 $\pm$ 8.31	168	10.37 $\pm$ 0.25	151	517.88 $\pm$ 13.53	147	184.43 $\pm$ 8.59		
P-4	150	1887.71 $\pm$ 49.53	153	325.98 $\pm$ 8.09	133	10.58 $\pm$ 0.25	128	538.53 $\pm$ 13.14	112	215.45 $\pm$ 8.73		
P-5	119	1538.59 $\pm$ 60.93	122	295.02 $\pm$ 9.85	116	9.93 $\pm$ 0.30	56	454.03 $\pm$ 19.87	48	156.13 $\pm$ 13.29		
Parity	**		NS		**		NS		NS			
L-1	119	1478.75 $\pm$ 58.33	123	334.30 $\pm$ 9.49	111	8.15 $\pm$ 0.29	102	549.50 $\pm$ 15.26	89	217.03 $\pm$ 9.89		
L-2	129	1757.49 $\pm$ 55.80	131	324.43 $\pm$ 9.10	122	9.42 $\pm$ 0.27	100	528.29 $\pm$ 14.97	97	189.93 $\pm$ 9.49		
L-3	99	1910.00 $\pm$ 65.16	99	348.90 $\pm$ 10.71	96	9.94 $\pm$ 0.32	79	548.59 $\pm$ 17.29	75	185.05 $\pm$ 11.02		
L-4	72	1927.41 $\pm$ 75.85	73	352.17 $\pm$ 12.41	68	10.15 $\pm$ 0.37	57	552.48 $\pm$ 20.48	55	194.68 $\pm$ 13.04		
L-5	52	1826.36 $\pm$ 86.63	52	343.69 $\pm$ 14.23	50	9.62 $\pm$ 0.42	38	548.48 $\pm$ 24.07	36	193.75 $\pm$ 15.45		
L-6	33	1816.39 $\pm$ 106.72	34	350.04 $\pm$ 17.34	30	10.40 $\pm$ 0.53	24	508.64 $\pm$ 29.77	20	151.15 $\pm$ 20.27		
L-7	18	1481.07 $\pm$ 140.40	19	311.14 $\pm$ 22.49	16	8.23 $\pm$ 0.71	13	504.51 $\pm$ 39.55	12	194.57 $\pm$ 25.68		

Means with different superscripts indicate significant differences

\*\* Highly significant effect at P=0.01

NS - Non-significant effect (P&gt;0.05)

different sub-groups under period, season and parity were tested by Duncan's new multiple range test.

#### RESULTS AND DISCUSSION

Results pertaining to least squares analysis for 300-DMY, LL, PY, CI and DP are presented in Table 1. The least squares means of 305-DMY, LL, PY, CI and DP were  $1742.50 \pm 43.38$ ,  $337.81 \pm 7.08$ ,  $9.42 \pm 0.22$ ,  $534.36 \pm 11.31$  and  $189.45 \pm 7.30$ , respectively.

Effect of Period of calving: Period of calving had highly significant effect ( $P \leq 0.01$ ) on all the traits under consideration. Highest 305-DMY was found during P-4 ( $1887.71 \pm 49.53$ ), while, lowest 305-DMY was found during P-5 ( $1538.59 \pm 60.93$ ). Highest LL was obtained for P-1 ( $411.16 \pm 22.85$ ) and lowest LL was obtained for P-5 ( $295.02 \pm 9.85$ ), however, there was no statistically significant difference between P-2 through P-5 as per DNMR. Highest PY was obtained for P-4 ( $10.58 \pm 0.25$ ) which had statistically non-significant ( $P > 0.05$ ) difference from P-3 and P-5; while P-1 and P-2 had lower PY, whose difference was non-significant ( $P > 0.05$ ). P-1 yielded highest CI ( $634.78 \pm 33.98$ ), while P-5 yielded lowest CI ( $454.03 \pm 19.87$ ). Pertaining to DP, P-1 had highest DP ( $217.11 \pm 21.42$ ) which was not found to be significantly different from that of P-4. Lowest DP was obtained for P-5 ( $156.13 \pm 13.29$ ) which was not found to be significantly different from that of P-2. Thus, all the traits were significantly influenced by period of calving. This is due to differences in the managerial practices over the years. Improvement in production and reproduction traits is thus possible by improving farm management.

Effect of season of calving: Season of calving had highly significant effect ( $P \leq 0.01$ ) on reproduction traits viz. CI and DP while there was no significant effect ( $P > 0.05$ ) of season of calving on production traits viz. 300-DMY, LL and PY. Winter and summer calvers had significantly ( $P \leq 0.05$ ) higher CI and DP than monsoon calvers.

Effect of parity of calving: Effect of parity of calving had highly significant effect ( $P \leq 0.01$ ) on 300-DMY and PY, while it had non-significant effect ( $P > 0.05$ ) on LL, CI and DP. L-1 and L-7 were found to be having non-significant differences in estimates of 300-DMY and lower than 300-DMY of L-2 through L-6. Highest 300-DMY was obtained for L-4 while lowest 300-DMY was obtained for L-1.

Conclusions: Least squares analysis of 300-DMY, LL, PY, CI and DP revealed that all the five traits were under the influence of non-genetic factors. 300-DMY and PY were found to be influenced by period and parity of calving. LL was influenced only by period of calving. CI and DP were found to be influenced by season as well as period of calving. Thus, consideration of concerned non-genetic factors for each of the traits along with proper management may lead to improvement in the performance of animals. These factors need to be accounted for before implementation of any breed improvement programme in Jaffarabadi buffaloes.

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