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# ESTIMATION OF GENETIC AND NON-GENETIC PARAMETERS OF PRODUCTION AND REPRODUCTION TRAITS IN MURRAH BUFFALOES

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## ABSTRACT

**In the present study the data on lactation of 332 Murrah buffaloes were utilized to study the genetic parameter of production traits such as and to study the non genetic factors that affect the production such as the lactation length (LL), daily milk yield (DMY), annual milk yield (AMY) and lactation yield (LYD) and to study the non-genetic factors that affect the production traits, such as year of calving, season of calving and dam's parity. The least square means of lactation length, daily milk yield, annual milk yield and lactation yield were 362.77±4.49 days, 4.53±0.06 kg, 1540.34±17.86 kg and 1838.45±32.33kg respectively. Among the non-genetic factors, dam's parity had highly significant effect on all production traits considered. Daily milk yield and annual milk yield differed significantly in different years of calving and Season of calving had significant effect on lactation length, daily milk yield and annual milk yield. Heritability estimates for LL, DMY, AMY and LYD were found to be 0.11±0.11, 0.18±0.14, 0.23±0.15 and 0.19±0.14 respectively. The genetic correlations between the productive traits were all positive ranging from 0.23±0.15 between LL and DMY and 0.84±0.17 between LYD and DMY. The phenotypic correlation ranged from 0.14 between LL and AMY and 0.95 between AMY and DMY. In general, correlations with large and positive value indicating that selecting one trait will positively affect the other trait.**

***Key words :*** *Murrah; genetic correlation; non-genetic factors*

Therefore, it becomes imperative to genetically evaluate the production traits of Murrah buffaloes as a way of increasing their productivity through selection. Estimate of heritability is an important population parameter which measures the degree of correspondence between phenotypic value and breeding value of a trait of interest in predicting and genetic improvement of a trait expected as a result of selection. Similarly, genetic correlation estimates the degree of association between genes responsible for genetic part of the variance whereas phenotypic correlation is an expression of the observed relationship between phenotypic performances of traits of interest. This knowledge of genetic and phenotypic correlation is valuable in determining the method of selection and breeding system adopted for improvement of economic traits and for the estimation of genetic response. The objective of the present study was to investigate the potential for genetic improvement of Murrah buffaloes by estimating genetic parameters associated with the production traits.

## MATERIALS AND METHODS

The lactation records of 332 Murrah buffaloes maintained at CIRB, Hissar Haryana, that calved over 10 years' period (1999-2008) were utilized, the duration was divided into 5 periods and the year was divided into 3 seasons as summer, rainy and winters. First and second periods was considered as early parity, third and fourth as mid and above fifth lactation considered as late parity. The genetic parameters heritability, genetic and phenotypic correlation were estimated by paternal half sib correlation method using the least-squares and maximum likelihood computer program.

## RESULTS AND DISCUSSION

The overall least square means of lactation length (LL), daily milk yield (DMY), annual milk yield (AMY) and lactation yield (LYD) in the current study was found to be 362.77±4.49 days, 4.53±0.06 kg, 1540.34±17.86 kg and 1838.45±32.33 kg, respectively (Table-1). Analysis of variance revealed that year of calving had significant effect on annual milk yield and daily milk yield ($P<0.05$), however, year of calving had no significant effect on lactation length and lactation yield. Season of calving had significant effect on lactation length ($P<0.05$), annual milk yield and daily milk yield ($P<0.01$), but not affected the lactation yield. Dam's parity had significant effect on all production traits considered at 0.1% level of significance. (1) also reported significant effect of season and period of calving and dam's parity on annual milk yield, lactation

**Table-1 :** Least square means of production traits.

| Traits | Number of records | Mean±S.E. | Range | | CV % |
|---|---|---|---|---|---|
| | | | from | to | |
| Lactation Length (LL) | 332 | 363.77 ± 5.49 | 339.76 | 374.83 | 18.65 |
| Daily Milk Yield (DMY) | 332 | 4.55 ± 0.09 | 4.23 | 4.79 | 20.42 |
| Annual Milk Yield (AMY) | 332 | 1546.34 ± 19.86 | 1451.94 | 1616.78 | 17.62 |
| Lactation Yield (LYD) | 332 | 1840.45 ± 34.33 | 1633.53 | 1972.98 | 26.60 |

**Table-2 :** Effect of non-genetic factors on productive traits of Murrah buffaloes.

| | LS Mean ± SE productive traits | | | |
|---|---|---|---|---|
| **Factors** | **Lactation Length (days)** | **Daily Milk Yield(Kg)** | **Annual Milk Yield(Kg)** | **Lactation Yield(Kg)** |
| Overall | 362.77±4.49 (332) | 4.53±0.06 (332) | 1540.34±17.86 (332) | 1838.45±32.33 (332) |
| **Year of Calving** | | | | |
| (1999-2000) | 367.31±9.32 (59) | 4.38±0.12b (59) | 1493.94±37.10b (59) | 1797.88±67.16 (59) |
| (2000-2002) | 367.36±8.22 (79) | 4.73±0 .11a (79) | 1595.07±32.70ab(79) | 1933.59±59.19 (79) |
| (2002-2004) | 366.34±8.60 (64) | 4.38±0.11b (64) | 1497.85±34.22b (64) | 1803.59±61.93 (64 |
| (2004-2006) | 356.65±9.34 (60) | 4.42±0.12ab (60) | 1513.69±37.16ab(60) | 1781.41±67.26 (60) |
| (2006-2008) | 356.17±8.44 (70) | 4.74±0 .11a (70) | 1601.15±33.60a (70) | 1875.78±60.81 (70) |
| **Season of Calving** | | | | |
| Summer (Jan-April) | 348.22±9.24b (56) | 4.78±0.12a (56) | 1616.78±36.79a (56) | 1853.27±66.59 (56) |
| Rainy (May-August)) | 365.99±8.36ab (70) | 4.23±0.11b (70) | 1451.94±33.28b (70) | 1751.14±60.24 (70 |
| Winter (Sep-Dec)) | 374.09±4.96a (206 | 4.58±0.06a (206) | 1552.31±19.73a(206) | 1910.95±35.71 (206) |
| Level of Significance | **(P <0.05) | **(P <0.01) | **(P <0.01) | NS |
| **Dam's parity** | | | | |
| Early (1-2)) | 339.76±6.07b (154) | 4.26±0.08b (154 | 1456.67±24.15b (154) | 1633.52±43.72b (154) |
| Mid (3-4) | 374.83±7.24a (101) | 4.74±0.09a (101) | 1601.92±28.83a (101) | 1972.97±52.18a (101) |
| Late (=5) | 373.71 ±7.95a (77) | 4.60±0.10a (77) | 1562.43±31.65a (77) | 1908.86±57.29a (77) |
| $R^2$ | 0.075 | 0.133 | 0.140 | 0.133 |

yield and lactation length of Murrah buffaloes. The similar findings were also reported by (2).

The heritability estimates of lactation length, daily milk yield, annual milk yield and lactation yield in the present study was found to be 0.11±0.11, 0.18±0.14, 0.23±0.15 and 0.19±0.14 respectively (Table-1) reported by (3). However, lower estimate of heritability had been reported by (3). This estimate was in agreement with (2, 4), Meanwhile, Umrikar and Deshpande (1985) reported lower value of heritability for total lactation milk yield. The low estimates of heritability for production traits suggested that certain factors are confounded with animal effect causing the additive gene component to be underestimated. The moderate heritability estimate for annual milk yield (0.23±0.15) suggested that mass selection. Results revealed that the genetic correlation among production traits were positive and significant (Table-2). There exist a low genetic correlation between lactation length and annual milk yield 0.24±0.12 and lactation length and daily milk yield 0.23 ± 0.15 was estimated. However, there high and significant positive genetic correlations between lactation length and lactation yield 0.74 ± 0.25, lactation yield and annual milk yield 0.83 ± 0.16, lactation yield and daily milk yield 0.84 ± 0.17 and annual milk yield and daily milk yield 0.82 ± 0.17 were estimated. (2) also reported high and significant positive genetic correlation of 0.60±0.23 between lactation length and lactation yield (P<0.01). Similarly, (5) also reported high positive correlation between lactation yield and lactation length in Murrah buffaloes. The high genetic correlation among different production traits indicated that these traits had strong genetic association. Thus, selection for the improvement in one trait will also result in the

**Table-3 :** Heritability (along diagonal), genetic (above diagonal) and phenotypic correlation (below diagonal) of production traits in Murrah buffaloes.

| Traits | Lactation Length (LL) | Daily Milk Yield (DMY) | Annual Milk Yield (AMY) | Lactation Yield (LYD) |
|---|---|---|---|---|
| LL | 0.11±0.11 | 0.23±0.15 | 0.24±0.12 | 0.74±0.25 |
| DMY | 0.15 | 0.18±0.14 | 0.82±0.17 | 0.84±0.17 |
| AMY | 0.14 | 0.95 | 0.23±0.15 | 0.83±0.166 |
| LYD | 0.77 | 0.70 | 0.73 | 0.19±0.14 |

improvement in the other trait. Results revealed that phenotypic correlation among lactation length, annual milk yield and daily milk yield were positive but low (Table-2). The phenotypic correlation between lactation length and annual milk yield is 0.14, lactation length and daily milk yield is 0.15. However, the magnitude of phenotypic correlation among lactation length, lactation yield, annual milk yield and daily milk yield were high and positive. The phenotypic correlation of lactation length with lactation yield is 0.77, lactation yield with annual milk yield is 0.73, lactation yield with daily milk yield is 0.70 and annual milk yield with daily milk Yield is 0.95. Higher phenotypic correlation between lactation length and lactation yield were also reported by (5, 6) showed that the animals which had long lactation length also produce high milk yield.

## CONCLUSIONS

The study revealed that environmental factors such as year of calving, season of calving and dam's parity had significant effect on all production traits considered and suggested that these environmental factors should be used as an important criterion for selection to improve the overall productive performance of murrah buffaloes. Heritability estimates for all production traits were low (0.11 ± 0.11) to moderate (0.23 ± 0.15). Suggested that there are limited scope for improvement in these traits through individual selection. The genetic and phenotypic correlation among productions traits were all positive ranging from moderate to high and governed by similar set of genes. Therefore, improvement in one trait could be achieved by selecting the other trait which will improve the performance of the animal and overall productivity of the herd.

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