The present investigation was initiated to find out factors affecting the milk production in Murrah buffaloes and means that could be adopted to bring about faster genetic improvement in milk production.

Milk yield being a sex limited character with moderate to low heritability, the sires have to be selected by progeny testing. A large number of progeny are to be recorded to get a reliable estimate of the breeding value of the sires and selection of superior bulls for wide-spread use to bring about faster genetic progress in milk production. The cost of milk recording being very high, various methods were used to estimate the lactation milk yield, so that sires can be evaluated early and economically. Various testing intervals, part lactation studies, and two sire indices were used to find out the best methods that could be adopted for evaluating the sires.

The study was conducted on 1474 first lactation records of Murrah buffaloes which were progeny of 98 sires and were spread over 10 farms in different agro-climatic regions of the country.
Inverse polynomial, Exponential parabola and Gamma function were used to fit a sample data of weekly milk yield of 179 buffaloes. Exponential parabola explained less than 50 percent of the variation in weekly milk yield in 104 cases. Inverse polynomial and Gamma function explained more than 50 percent variation in 161 and 139 buffaloes respectively. Therefore, Inverse polynomial and Gamma functions were used for fitting the weekly milk yield data of all the buffaloes studied.

Inverse polynomial and Gamma functions were fitted to the weekly milk yield data of the population. Three lactation curves were drawn using the actual weekly milk yield for the population, weekly milk yields obtained by the use of Inverse polynomial and Gamma function constants. Gamma function gave a better fit for the population averages.

Age at first calving (AFC) was 42.52 months and 300 days first lactation yield was 1611.69 kg. Peak yield was observed to be 8.27 kg and initial yield 4.51 kg. Heritability estimate of AFC was 0.264±0.077 and it was 0.172±0.070 for 300 days yield.

Heritability for initial yield was 0.755±0.117. A phenotypic correlation of 0.2669 (P<0.01) was observed between initial yield and 300 days yield. The genetic correlation was 0.3586±0.1578 between these two traits. Ascending period, yield in ascending period, average daily yield in ascending phase had all heritability
of nearly 0.3 and their genetic correlations with 300 days yield were 0.3977±0.1812, 0.5543±0.1568 and 0.7876±0.0848 respectively. Estimate of heritability for peak yield was 0.447±0.093 and genetic correlation with 300 days yield was 0.9258±0.0295.

From this it could be concluded that early traits like peak yield, initial yield or yield in the ascending phase could be used in selection to achieve correlated response in lactation yield (300 days) in Murrah buffaloes.

Among the persistency measures studied, P_211 had an estimate of heritability of 0.337±0.085. Persistency by Ludick-Petersen method and Mahadevan's method had heritability estimate of 0.236±0.075 and 0.216±0.073 respectively, but the genetic correlations with 300 days yield in all cases were low with high standard error.

Lactation yield was estimated by taking samples at different intervals. Weekly sampling underestimated the lactation yield (−0.41%). In general, it was found that estimates starting from second week of lactation were subject to least sampling errors. For different sampling intervals (weekly to 12 weekly), average error ranged from 0.95 kg to 67.86 kg. Average absolute error showed a definite increasing trend as the interval of testing increased. Percentage absolute error followed the same trend. To obtain a reliable estimate of the lactation yield, keeping in view the economy of milk recording, four weekly milk recording
starting from the second week was found to be suitable, since the average error was 1.19 kg and percent absolute error 4.99. This is hence recommended as a suitable interval for periodical sampling of the Murrah buffaloes for assessing their milk production potential.

Part lactations were extended by ratio and regression methods, Gamma and Inverse polynomial functions. The correlation coefficient between 300 days yield and extrapolated 300 days yield increased from 0.6157 for 6 weeks part yield to 0.8128 for 22 weeks yield. Thereafter the increase was slow.

Errors obtained by extrapolation of part yields by Gamma function and Inverse polynomial were very high and these errors declined as the part yield was extended. Errors of estimates obtained by ratio and regression factors for extending part lactation yields were smaller when compared to Gamma function and Inverse polynomial. There was underestimation of 300 days lactation yield obtained by extrapolation of part yields by ratio and regression methods, till 18 weeks. Afterwards, it was overestimated and showed an increasing trend till 38 weeks part yield (about 89 kg). Average absolute error gradually decreased till 34 weeks. The percentage error and percentage absolute error also showed similar trends.

From this, it could be recommended that ratio factors and 22 weeks part yield can be used for assessment of buffalo production and selection of superior sires for
breeding purposes early in lactation.

Sires were evaluated by two methods, namely (1) Simple daughters’ average \( I_d \) and (2) Contemporary deviation method. Sires with 5 or more daughters were evaluated using both the indices. There were 98 sires which were evaluated by the two indices. The ranking of the sires by the two indices was found to be different for a large number of sires evaluated.

Breeding of buffaloes in military farms is by natural service. This results in the daughters of a sire being present in a single herd for a short period. Therefore, daughters of the sires evaluated came to production in different periods of time within a herd. Due to various causes, the environment provided to the animals may not be the same throughout the period of study. When the management conditions change, the productivity of the daughters producing at different periods of time may also change, even though there may not be any differences in the genetic potentiality of buffaloes. Contemporary deviation method corrects for the environmental factors and hence is a better method of evaluation of sires.

In the military farms, the bulls are selected based on the performance of the dams, without evaluation of the sires. This results in good or poor bulls being used for breeding purposes. This is borne out by the fact that out of the 98 bulls studied, 50 bulls had a positive
breeding value and 48 bulls had a negative breeding value. This proportion came close to 50:50 good or poor bulls being used for breeding purposes. It was observed that about 1 out of 8 sires was having breeding value of more than +100 kg. There were only 4 sires with a breeding value of more than 10 percent of the population mean. In order to bring about 0.7 percent improvement in milk production per annum and to select two best bulls for extensive use, about 50 bulls have to be tested at a given time in any progeny testing programme, given no improvement from female side.

Extension of 22 weeks part yield by ratio and regression factors showed that about 35 percent more daughters are needed to evaluate the sires as accurately as in comparison to their evaluation by use of actual 300 days lactation yield. In practice under field conditions, not all the daughters of the bulls can come to production simultaneously. The use of extended part records, can help in earlier assessment of the breeding value of the bulls and thus faster turn over, as well as, better annual genetic gain by increasing intensity of selection and reduction of generation interval.