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Genetic studies on first lactation and life time traits and sire evaluation using animal models in Sahiwal cattle

Jaswant Singh and C V Singh

Narendra Dev University of Agriculture and Technology, India

The present study was undertaken on 1367 first lactation records of Sahiwal cattle maintained at GLF, Chak Ganjaria, Lucknow (UP) over a period of 71 years (1944-2014). The study was conducted on least squares means, genetic and phenotypic parameters of first lactation and lifetime traits, performance evaluation of pooled lactation traits, breeding value estimation of sires, relationship between EBV's for first lactation and lifetime traits using daughter's average, least-squares and best linear unbiased prediction methods of sire evaluation and effectiveness of sire evaluation methods. The overall least-squares means for first lactation traits viz. AFC, FLMY, FLP, FDP, FSP and FCI were 1287.12 ± 6.81 days, 1941.16 ± 27.66 kg, 321.60 ± 2.80 days, 195.57 ± 4.07 days, 231.34 ± 4.88 days and 514.86 ± 4.82 days, respectively. The heritability estimates for these first lactation traits were 0.39 ± 0.16 , 0.25 ± 0.08 , 0.27 ± 0.08 , 0.06 ± 0.10 , 0.15 ± 0.10 and 0.10 ± 0.10 , respectively. The overall least-squares means for lifetime traits viz. LTMY, LTLL and ADMY were 9262.50 ± 272.92 kg, 1534.28 ± 36.84 days and 5.94 ± 0.10 kg, respectively. The heritability estimates for these lifetime traits were 0.17 ± 0.07 , 0.14 ± 0.07 and 0.49 ± 0.09 , respectively. The genetic and phenotypic correlations among all the first lactation and lifetime traits were observed to be moderate to high. The overall least-squares means for the pooled lactation traits viz. LL, TMY, DP, SP and CI were 300.77 ± 1.58 days, 1815.192 ± 12.87 kg, 163.74 ± 2.31 days, 192.60 ± 2.35 days and 475.64 ± 2.78 days, respectively. The breeding value of 112 Sahiwal sires with three or more number of daughters for all the first lactation and lifetime traits using three sire evaluation methods viz., D₁, LSM and BLUP were estimated. The overall breeding values for FLMY were 1711.63 kg (D₁), 1941.16 kg (LSM) and 1890.08 kg (BLUP), respectively. For LTMY the overall breeding values were 8803.58 kg (D₁), 9262.50 kg (LSM) and 9815.95 kg (BLUP), respectively. The accuracy, efficiency and stability of EBV's of sires for the first lactation and lifetime traits were compared by different methods to judge their effectiveness. The estimated breeding values of sires for all the first lactation traits by D₁, LSM and BLUP revealed that EBV's of sires estimated by least-squares method showed smaller genetic variation in comparison to D₁ and BLUP methods. The LSM was adjudged as the most efficient method of sire evaluation. The LSM had minimum error variance for most of the first lactation and lifetime traits and considered to be more superior over other two methods i.e., D₁ and BLUP. The product moment correlations among the estimated breeding value of sires for first lactation traits by D₁, LSM and BLUP methods ranged from medium to very high and highly significant ($P < 0.01$) in all the three methods of sire evaluation. The rank correlations among the breeding value of sires estimated from first lactation milk yield and lifetime milk yield were medium to high and highly significant ($P < 0.01$). Therefore, the daughters of the sires selected on the basis of high first lactation milk yield would tend to produce higher lifetime milk yield. However, the rank of sires for different traits revealed that 6-7% of top sires almost had similar rank and thus suggested that to improve lifetime productivity major culling of bulls should be done on the basis of their daughter's standard first lactation milk yield.

dr.jaswant75@gmail.com