

Abstract

The amount of milk production during a lactation period depends on the shape of the lactation curve and its parameters. The objective of this study was to compare some nonlinear functions (Wood, Dhanoa, Wilmink, Ali-Schaeffer, Cappio Borlino, Cobby-Le Du, Dijkstra, Rook, Gous and Nelder) to describe the milk production curve of the three lactating periods of Holstein cattle in Iran and the relationship between curve parameters with some economic traits and inbreeding rate. For this purpose, test-day records of milk yield related to first, second and third three lactation periods, collecting by the Animal Breeding Center of Iran during 1983 to 2017, were used. All functions were fitted to the records of the three lactation periods and the best function was selected by the goodness of fit criteria. Curve parameters were calculated for all animals using the best function. Genetic parameters of curve parameters and their relationship with economic traits (Milk, Fat, Protein yield of 305 days, Somatic cell score, Calving age, Calving interval and Dryday period) were estimated using single and two-trait analysis via Gibbs sampling. The effect of inbreeding was estimated by including it as a covariate in the model and, the values of each lactation curve parameters were evaluated with grouping economic traits in three groups (Low, Medium and High). The Rook function was the best fit for describing the milk production curve and has a high predictive value in estimating of milk production curve parameters. The range heritability of traits for the first, second and third lactation varied from 0.001 to 0.043, 0.001 to 0.086 and 0.0003 to 0.067, respectively, and Genetic correlation between the curve parameters were estimated in the range of -0.491 (between the parameter associated with maximum production (c) and peak production time (pt)) to 0.988 (between the rate of initial production (a) and the parameter associated with maximum production (c)). Genetic correlations of parameters a, c, and pm parameters with milk, fat and protein yield, and age at first calving was favorable and has an undesirable correlation with somatic cell score. The b, pt Parameters had a favorable genetic correlation with all traits, whereas d parameter showed a poor correlation with most traits except somatic cell score in the first lactation. Inbreeding effects were decreasing on most traits and cows with high milk production, had a high primary production, peak milk and persistency that were significantly between the three groups. Therefore, it is better to use the Rook function to describe the milk production curve of Holstein cows in Iran and, changes in environmental conditions will have more effect on the improvement of these traits than genetic selection due to the low heritability of lactation curve parameters. The parameters c, pt and pm can be improved by direct selection for the persistency because of the their positive and moderate correlation with persistency.

Keywords: Persistency, Economic traits, Lactation curve, Iranian Holstein, Correlation, Inbreeding



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