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Random regression models and re-ranking of breeding values compared with traditional model in Holstein cattle in Brazil

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Test-day Models have been studied as an alternative of cumulative 305-day milk yield for breeding programs in Brazil. The purpose of this study was to compare the ranking of estimated breeding values based on traditional model for 305-days milk yield (PTA305) and random regression models. Thus data from 262,426 records from the first lactation of Holstein cows were used. The pedigree data included 30,228 cows with records from 296 herds and 1,053 sires, totaling 59,486 animals. Single trait animal model for 305-day milk yield and a single trait random regression model with Legendre polynomials of orders four or five were used to fit data. Covariance matrices of random regression coefficients were estimated by the program REMLF90 on the SGI/ALTIX system of CENAPAD. The ranks of estimated breeding values were based on traditional 305-day milk yield breeding values (PTA305) and on random regression breeding values for the individual test-day milk yield and the sum of all test-days from day 6 to 305 (PTA305RR). The coincidence between ranks of all animals and only sires, using the traditional model and random regression model, was estimated by the Spearman rank correlation based on ranking of PTA305 or PTA305RR. The Spearman rank correlations between estimated breeding values were 0.87 and 0.89 for all animals and only sires, respectively. Despite of the strength of those correlation values, correlations lower than 0.89 might indicate serious re-ranking for the top animals or sires. The selection for the 1%, 2%, 5%, 10% and 20% of best sires presented rank correlations of 0.82, 0.64, 0.60, 0.58 and 0.71, respectively. The re-ranking of best sires, when PTA305 is compared to RRM305, may be illustrated by the ranking of the best five sires and their breeding value curves. The best sire ranked for PTA305 did not present either the best genetic lactation curve with the best initial production or the most persistent lactation. In addition, that sire was ranked as the fifth best sire in the ranking of PTA305RR breeding values. The second best sire for PTA305 would be the first best sire for PTA305RR with a lactation curve more persistent than the first one. It is worth mentioning that the third, fourth and ninth sires ranked for PTA305RR were superior to the first sire ranked for PTA305. The adoption of random regression models in Brazil instead of traditional model for 305-day milk yield may be favorable to the genetic evaluations of sires. Besides the suppression of the bias caused by the use of extension and adjustment factors to generate 305-day milk yield, the re-ranking of sires may consider animals with flatter genetic curves and permit to include persistency measures in future genetic evaluations.

Keywords: genetic correlation, breeding values, milk yield, REMLF90, persistency