Genetic analysis of partial egg production records in Japanese quail using random regression models

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ABSTRACT

The main objectives of this study were to detect the most appropriate random regression model (RRM) to fit the data of monthly egg production in 2 lines (selected and control) of Japanese quail and to test the consistency of different criteria of model choice. Data from 1,200 female Japanese quails for the first 5 months of egg production from 4 consecutive generations of an egg line selected for egg production in the first month (EP1) was analyzed. Eight RRMs with different orders of Legendre polynomials were compared to determine the proper model for analysis. All criteria of model choice suggested that the adequate model included the second order Legendre polynomials for fixed effects, and the third-order for additive genetic effects and permanent environmental effects. Predictive ability of the best model was the highest among all models ($\rho = 0.987$). According to the best model fitted to the data, estimates of heritability were relatively low to moderate (0.10 to 0.17) showed a descending pattern from the first to the fifth month of production. A similar pattern was observed for permanent environmental effects with greater estimates in the first (0.36) and second (0.23) months of production than heritability estimates. Genetic correlations between separate production periods were higher (0.18 to 0.93) than their phenotypic counterparts (0.15 to 0.87). The superiority of the selected line over the control was observed through significant ($P < 0.05$) linear contrast estimates. Significant ($P < 0.05$) estimates of covariate effect (age at sexual maturity) showed a decreased pattern with greater impact on egg production in earlier ages (first and second months) than later ones. A methodology based on random regression animal models can be recommended for genetic evaluation of egg production in Japanese quail.

<u>Key words:</u> Japanese quail, egg production, random regression and penalizing adaptively likelihood