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Performance Prediction of Arian Broiler Breeder Using Artificial Neural Network

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Abstract

This study was conducted using artificial neural network (ANN) for prediction of the whole production period of broiler breeder performance traits via its initial performances. Therefore, the input variables of fitting ANN models were house number, number of hens in the house, age, egg production and body weight at 20-24 weeks of age. For the reason a total of 8000 broiler breeders were kept and recorded in 4 houses for 27 weeks, from 20 to 47 weeks of age. The traits used in ANN modelling, including body weight, feed intake and egg production, were weekly measured and the data were recorded and stored in Excell software. ANN model evaluation, data editing and manipulation were performed using R software. The ANN models were performed using NeuralWorks Professional software and the adequacy of the models were evaluated using RMSE and R^2 statistical parameters. Adequate ANN model with superior adequacy parameters of R^2 and RMSE was used for prediction of body weight (BW), feed intake (FI), egg number (EN), egg weight (EW) and egg mass (EM) of the whole production period. The used ANN model for prediction of body weight had 5 inputs, 5 neurons at 1st hidden layer, 3 neurons at 2nd hidden layer and 1 output, thus we write it as 5-5-3-1. Similarly, the ANN model structure for feed intake, egg number, egg weight and egg mass were 7-7-4-1, 8-8-4-1, 7-7-3-1 and 7-7-3-1, respectively. R^2 of adequate selected models for BW, FI, EN, EW and EM training data set were 0.991, 0.998, 0.989, 0.993 and 0.996. Also, the RMSE of the models were 1.55, 0.992, 0.266, 3.838 and 0.506, respectively. The results indicated the possibility of predicting whole production period using early stage production records. The results of the study shown that architecture and the specification of the neural networks such as inputs, outputs and neurons of hidden layers can affect the performance of the ANN model. The adequate selected model for each trait had a unique structure and components. Investigation of growth rate in light birds displayed that difference in body weight were compensated at the end of the production period. Compensation of body weight with higher growth rate, and the same feed intake and lower maintenance requirement, obtained at the cost of lower egg weight at all period of production.

Key Words: Broiler Breeder, Production Performance, Artificial Neural Network, Modelling