

Egg Shell Quality Assessment – Do We Need Multiple Records?

A.S. Leaflet R3171

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Summary and Implications

The objective of this study was to estimate repeatability within and between ages for dynamic stiffness in two lines of layer chickens in order to verify if multiple records are necessary to adequately describe a bird’s genetic merit for egg shell quality. Repeatability was low across ages to moderate within age, which suggests that for accurate evaluation eggs should be collected at different stages of laying cycle, with additional benefit from analyzing more than one egg within age.

Introduction

Layer chickens express their genetic potential for egg production over a long period of time. To serve their purpose and maintain consumer safety, the eggs have to be protected by strong shells. One of the measures of shell quality that is predictive of probability of egg cracking is dynamic stiffness. An egg is rolled and tapped by a small hammer. Uniformity of the sound waves that are produced around the shell is the basis of dynamic stiffness.

In theory, every single egg that is laid could be evaluated for shell quality to provide the most accurate information on the hen’s potential to lay eggs with superior shells; the opposite would be to evaluate just one egg per hen to save costs. Repeatability is a parameter that describes how similar repeated records of the same individual are. For traits with high repeatability, a single record captures the majority of the information about an individual, whereas for low repeatability traits, multiple records are needed to get an accurate assessment. To help making an informed decision on the number of records needed to evaluate hens for shell quality, the objective of this study was to estimate the repeatability of dynamic stiffness within and between ages.

Materials and Methods

The data for this study was collected in four generations of a pure-bred White Leghorn (WL) line that is a part of breeding program for white shelled egg layers and a Rhode Island Red (RIR) line that contributes to commercial brown egg layers. In total 93,748 and 81,646 records for dynamic stiffness were available for 24,678 WL and 21,321 RIR hens, respectively, based on evaluation of 2-3 eggs per hen at each of four ages. We applied a statistical model that corrects the data for known systematic factors (like hatch, age, and the station processing the eggs) and simultaneously estimates proportions of variance that can be attributed to genetics, factors common to records of the same birds within age, and records of the same bird at different ages.

Results and Discussion

The Figure shows estimates of the repeatability of dynamic stiffness for the two lines.

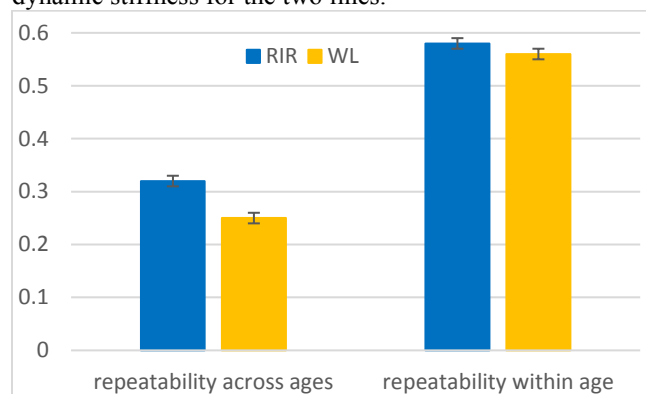


Figure. Repeatability of dynamic stiffness records within and between ages in two lines of layer chickens

In both lines, repeatability across ages was relatively low (on average 0.29), suggesting that collecting records at different ages is necessary to adequately describe a hen’s potential to lay eggs with strong shells throughout the production cycle. Repeatability within age was higher (on average 0.57) but substantially lower than one, which suggest that evaluating more than one egg per age brings in additional information.

Acknowledgments

This project was supported by Hy-Line International.