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ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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Repeatability of Egg Number and Egg Weight in Two Strains of Layer Type Chicken

I. Udeh
Department of Animal Science, Delta State University, Asaba Campus, Nigeria

Abstract: The daily egg production records obtained from two strains of layer type chicken for a period of 16 weeks were used to estimate the repeatability of egg number and egg weight in this population. There were 50 pullets for each strain. The pullets were housed in single bird cages and monitored for egg number and egg weight. The egg numbers were summarized on monthly basis for four months while egg weights were recorded at first egg, 30 and 40 weeks respectively. The results indicate that the repeatability estimates for monthly egg numbers ranged from 0.12-0.85 in strain 1 and 0.05-0.62 in strain 2. The repeatability estimates for egg numbers for the four months taken together were low in strain 1 (R = 0.17) and strain 2 (R = 0.07). The repeatability estimates for weight of first egg, egg weight at 30 and 40 weeks were generally low in the two strains of chicken and ranged from 0.04-0.19. The only exception was egg weight at 40 weeks in strain I (R = 0.44). The low repeatability estimates recorded for most of the traits imply that collection of additional records and improvement of non genetic factors influencing egg production will improve the accuracy of characterizing the inherent transmitting ability of the birds in these traits.

Key words: Repeatability estimate, egg production, strain, transmitting ability

INTRODUCTION

Repeatability measures the degree of association between records on the same animal for traits expressed more than once in an animals life. Its estimate indicates the gain in accuracy expected from multiple measurements (Falconer, 1989). The advantage of this to breeding programmes is the increase in the proportion of additive genetic variance and improvement of selection response. Repeatability and heritability estimates reported for reproductive traits (fertility and hatchability) and fitness traits related to them such as egg number, egg weight, shell thickness and semen quality traits were generally low (Ansah *et al*., 1985; Chineke, 1999; Szwaczkowski, 2003; Bennerwitz *et al*., 2007). In consequence, selection effectiveness was generally low. The low repeatability and heritability estimates reported for these traits were attributed to the huge influence of non genetic factors (Falconer, 1989). The improvement of egg production parameters are desirable because of their economic importance. This can be brought about by improvement of both genetic and non genetic factors influencing egg production. Since egg production varies from one period to another, a knowledge of the repeatability estimates will guide the breeder in designing an appropriate breeding plan for their improvement. The objective of this study is to estimate the repeatability of egg number and egg weight in two strains of layer type chicken.

MATERIALS AND METHODS

The experiment was conducted at the poultry breeding unit of the teaching and research farm, Department of Animal Science, Enugu State University of Science and technology, Enugu. Two strains of layer type chicken were used for the study namely H and N Brown Nick (strain 1) and Black Olympia (strain 2). In each strain, 50 pullets were randomly selected from a population of 100 pullets established at day old and maintained on deep litter floor to 18 weeks of age. The 50 pullets selected from each strain were housed individually in cages and fed *ad libitum* layers mash which on analysis yielded 17% Cp, 2676 ME/kg and 3% calcium from 18-40 weeks of age. *Ad libitum* water was also provided throughout the period. Daily records of egg number were taken from 24-40 weeks of age and the values summarized monthly for four months. Egg weights were taken at first egg, 30 and 40 weeks of age respectively. The data obtained with respect to each trait within a strain were subjected to one way analysis of variance using the following model described by Becker (1984).

$$Y_{km} = \mu + \alpha k + ekm$$

Where:

Y_{km} = Record of the kth egg laid by the mth hen.
μ = Overall mean
αk = Effect of the k^{th} hen
ekm = Environmental deviation of mth measurement within an individual.

Table 1: Variance components and repeatability of egg numbers in two strains of layer type chicken

	Strain 1				Strain 2			
Months	δ^2_w	δ^2_E	R	S.E	δ^2_w	δ^2_E	R	S.E
1	0.98	1.72	0.36	0.31	0.57	0.35	0.62	0.26
2	0.35	1.42	0.20	0.30	0.04	0.69	0.05	0.26
3	0.14	0.98	0.12	0.28	0.48	0.20	0.71	0.21
4	1.83	0.31	0.85	0.13	0.02	0.31	0.06	0.26
0-4 Months	0.36	1.80	0.17	0.16	0.09	1.22	0.07	0.10

Note that δ^2_w = Variance between birds; δ^2_E = Variance within birds;
R = Repeatability; S.E = Standard Error of Repeatability

Table 2: Between individual and within individual components of variance and repeatability of egg weight in two strains of layer type chicken

	Strain 1				Strain 2			
Traits	δ^2_w	δ^2_E	R	S.E	δ^2_w	δ^2_E	R	S.E
WFE	0.70	19.07	0.04	0.11	4.65	22.88	0.17	0.18
EW 30	0.30	3.79	0.07	0.13	1.72	7.94	0.18	0.17
EW 40	4.03	5.08	0.44	0.24	1.45	6.25	0.19	0.16

Note that WFE = Weight of First Egg; EW30 = Egg weight at 30 weeks; EW40 = Egg weight at 40 weeks

The variance components were determined from the mean square expectation of the ANOVA and repeatability estimated using the following expression:

$$R = \frac{\delta^2_B}{\delta^2_B + \delta^2_W}$$

Where:

δ^2_B = Variance component due to differences among individual

δ^2_W = Within individual component of variance.

The standard error of repeatability was calculated by using the standard expression given by Becker (1984).

RESULTS AND DISCUSSION

The variance components and repeatability estimates for monthly egg production of the two strains of layer type chicken are shown in Table 1. The repeatability estimates vary from one month to another in the two strains of chicken probably because of the variability of the environmental factors influencing egg production. In strain 1, the repeatability estimates decreased from month I to month 3. It was highest in month 4 and lowest in month 3. In strain 2, the repeatability estimates decreased from month 1 to 2, peaked in month 3 and decreased in month 4. The repeatability estimates for egg numbers for the four months taken together were low in strains 1 and 2. Table 2 presents the between individuals and within individuals components of variance and repeatability estimates for egg weight in two strains of chicken. The repeatability estimates for egg weights were generally low in both strains of chicken ranging from 0.04-0.19. The only exception was egg weight at 40 weeks in strain 1 which recorded a moderate estimate of 0.44. The low repeatability estimates observed for egg numbers and egg weights were in agreement with the reports of Chineke (1999) and Oyedepo *et al.* (2007) that the repeatability estimates for egg numbers and egg weights in chicken were low. It is pertinent to note that repeatability estimates for reproductive traits as reported by several authors (Ansah *et al.*, 1985; Szwaczkowski, 2003; Bennerwitz *et al.*, 2007) were generally low. This was attributed to the huge influence of environmental and age related factors (Falconer, 1989). In order to improve the accuracy of predicting the breeding values of the birds, collection of additional records and improvement of non genetic factors influencing egg production in chicken are worthwhile.

Conclusion and Recommendation: It was concluded that the repeatability estimates obtained for egg numbers and egg weights were low. Therefore it was recommended that collection of additional records and improvement of non genetic factors influencing egg production will improve the accuracy of predicting the inherent transmitting ability of the birds in these traits.

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