REPEATABILITY OF EGG PRODUCTION, EGG WEIGHT AND EGG SHAPE OF AN EXOTIC COMMERCIAL LAYER IN NIGERIA

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ABSTRACT

Records of individual egg production, egg weight and egg index taken over a 56 day period from forty-nine 50 weeks old Hubbard layers were analysed for estimates of repeatability of the three traits. The estimates for two, four, six and eight 7-day records varied between 0.27 and 0.40 for rate of egg production, 0.58 to 0.60 and 0.60 to 0.62 for egg weight and index (shape) respectively. The results indicate that two 7-day records were adequate for characterising both egg weight and shape in chickens while rate of egg production requires four 7-day records.

Key Words: Repeatability, egg traits.

INTRODUCTION

In poultry, correlations between part and full year egg production are usually used in selecting for egg production and other traits. This is so because repeatability estimates give reliable indications of the correlation between independent measurements in terms of a ratio of all the genetic and permanent environmental to the total phenotypic variance (Akinokun and Dettmers, 1977). Thus in order to make savings and increase production efficiency on the farm, an early determination of the future probable performance of each hen would be helpful. birds with high estimated future performance for such traits can be selected and those with low values culled.

Repeatability estimates for egg production in chickens are reported to be generally low varying from 0.02 to 0.32 (Akinokun and Dettmers, 1977, Goodman, 1965, King and Hall, 1955, Koroley, 1974, Kotaiah *et al.* 1976). estimates for egg weight are high and range from 0.57 to 0.78 (Csuka and Novy, 1974c, Goodman, 1965, Ibe, 1984, Scheinberg, Ward and Nordskog, 1953). Akinokun and Dettmers 91977) however reported a wide variation of 0.15 to 0.80 for egg weight of the local chicken of Nigeria. There is less information on the repeatability of egg shape. Kotaiah *et al* (1974) however reported values of 0.58 to 0.68 for this trait.

While much work has been done on the repeatability of egg traits in temperate countries, there is comparatively scanty information on these traits in the tropics. Since almost all the commercial poultry stocks in Nigeria are imported from the temperate region their performance under the prevailing tropical environmental conditions has to be continually monitored. This study was therefore designed to determine the repeatability estimates for rate of egg production, egg weight, index and the ade-

quacy or otherwise of their estimation from 8 or fewer records.

MATERIALS AND METHODS

Forty-nine Hubbard layers were randomly selected from a flock population of about 576 birds at the Okeoyi Poultry farm of the Kwara State Agricultural Development corporation, Ilorin. The birds were caged individually and daily records of egg production, egg weight and egg index were kept over a 56-day period between 50 and 57 weeks of age of the birds. Egg index was estimated as the ratio of egg width to its length. Egg length was taken as the distance between the broad and narrow ends while egg width was taken as the diameter of the egg at the widest cross-sectional region. both parameters were taken using a pair of callipers graduated in centimetres.

The analysis of variance for estimating repeatability values based on the model suggested by Becker (1975) was used in determining the variance components. The model used was of the form $Yij = \mu + Hi + eij$

where Yij = record of the jth egg laid by the ith hen

μ = overall mean

Hi = effect of the ith hen.

eij = random error

Estimates of σB^2 and σW^2 were obtained by equating each of the observed mean squares in the ANOVA table to the expected and solving for the two unknowns in the resulting equations.

$$\sigma B^2 = MS_E \text{ and } \sigma W^2 = (MS_I - MS_E)/K$$

where MSI and MSE = means squares for individual and errors respectively.

K = number of measurements per individual (2,4,6 or 8).

The repeatability, R, was calculated as the ratio of $\sigma B^2/\sigma B^2 + \sigma W^2$.

The standard error (S.E) of each estimate was calculated using the formula (Becker, 1975)

$$= \sqrt{\frac{2(1-r)\ 2(1+(k-1)r)2}{K(K-1)\ (n-1)}}$$

K = Number of measurements per hen

n = Number of hens (49)

For repeatability of egg production, the number of eggs produced per hen were summed for each 7-day period and recorded over eight periods so that each 7 days constituted one measurement on each hen. The repeatability was calculated for 2, 4, 6 and 8 independent periods. For repeatability of egg weight and egg index, 2, 4 and 6 seven-day periods were used for the estimation.

RESULTS AND DISCUSSION

The analysis of variance tables for the three egg traits on two, four, six and eight 7-day periods are shown in Table 1. The observed mean squares were used to estimate the various components of variance used for repeatability estimation.

The repeatability of rate of egg production varied from 0.27 to 0.40 over the four periods (Table 2). These values are higher than the 0.02 to 0.23 reported by Koroley (1974) for White leghorn hens and the 0.19 to 0.32 obtained by Akinokun and Dettmers (1977) for the Appolo, harco, Rhode Island Red and Local chickens of Nigeria. The variation in these estimates probably indicate the influence of differences in the genotype of the birds used apart from environmental effects.

The repeatability of mean weekly (7-day) egg weight over the three periods (two, four and six 7-day periods) were quite close (Table 2) and varied from 0.58 to 0.60 (means 0.59 + 0.06). The estimates fall within the range of 0.46 to 0.71 reported for most temperate breeds. The values were however higher than those reported by

Table 1
Analyses of Variance of the three egg traits

	Sources of Variation	Period 2 df	2 MS	4 df	4 MS	6 df	6 MS	8 df	8 MS
Egg Production	Between hens	48	1.26	48	2.64	48	3.25	48	3.65
	Within hens	48	0.72	143	0.74	235	0.69	322	0.75
Egg Weight	Between hens	48	148.20	48	306.51	48	481.33	–	–
	Within hens	399	10.23	853	11.84	1308	11.61	–	–
Egg Index	Between hens	48	0.0081	48	0.016	48	0.0256	–	–
	Within hens	399	0.0006	853	0.005	1308	0.0066	–	–

Table 2
Repeatability estimates (± S.E.) for three egg traits

	No of Record			
	2	4	6	8
Egg Production	0.27 ± 0.08	0.40 ± 0.14	0.39 ± 0.10	0.34 ± 0.09
Egg Weight	0.60 ± 0.07	0.58 ± 0.05	0.59 ± 0.04	ND
Egg index	0.62 ± 0.07	0.60 ± 0.05	0.60 ± 0.04	ND

ND = not determined

Akinokun and Dettmers, (1977) from the three and four 30-day records reported for the Apollo and Local chickens in Nigeria. The result indicates that the mature egg weight of the birds used in this study has probably been attained before this age (50 weeks).

The repeatability of 0.60 to 0.62 for egg index obtained in this study were slightly higher than the 0.52 and 0.56 reported by Goodman (1965) and Kotaiah *et al* (1976) respectively and also agree closely with the 0.68 reported by King and Hall (1955).

Repeatability estimates are reported to be influenced by environmental variations (Korolev, 1974). it appears however that there is less variation in the estimates of egg weight and egg index as obtained in this work indicating lesser effect of environmental variations unlike egg production.

According to Falconer (1970) the gain in accuracy from taking several measurements instead of only one can be determined from the relationship $Vp(n)/Vp = 1 + R(n-1)n$

where Vp is the phenotypic variance, n is the number of measurements and R, the repeatability of the trait. Akinokun and Dettmers (1977) noted that it is not worthwhile to take more than two measurements if the value of R is above 0.70 as there is sizeable gain in accuracy from taking only two measurements. Thus for both egg weight and egg index, for which high repeatability values were obtained, only two measurements are required to adequately characterise these traits. For egg production however, four records would be required.

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