EGG PRODUCTION EVALUATION FOR KURDISH LOCAL CHICKEN IN TWO DIFFERENT ENVIRONMENTS AND ESTIMATES OF THEIR GENETIC PARAMETERS

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Abstract - The current experiment was conducted in both of animal production fields in the directorate of Agricultural research in Erbil and Sulaimani provinces. Eggs included in this study collected when the production percentage of the flock was 5% and continued for 16 weeks starting at April 2016.Three families of each of two lines include local black, and black with brown neck were bred in both areas. Water was available ad libitum and the details of management, feeding, and health program were the same and described earlier. Weight and number of eggs produced were recorded daily.General Linear Model used to analyze the studied traits. The model includes the genetic groups,environment and the interaction as effects of the traits. Scheffe's test was conducted to distinguish the significant differences between the least square means of the levels of each factor. Variance component of random effects were estimated according to Restricted Maximum Likelihood-REML method. Mixed model includes the effect of sire in addition to the above main effects. VCV matrices were tested for positive definiteness; in order to develop reliable estimates of genetic parameters. Averages of egg weight, daily egg production and daily egg mass were 58.95 g, 50.30 % and 29.65g, respectively.The present study showeda highly significant effect (p<0.01) of genetic groupon all studied traits, where Black with brown neck excelled the black in their egg weights, daily egg production and daily egg mass by 1.27 g, 15.94 % and 10.03 g respectively. The effect of environment was significant (p<0.01) only on egg weight, where the highest (60.01 g) and lowest (57.88 g) egg weight noticed in Sulaimani and Erbil respectively.Furthermore, the interaction affect the three studied traits significantly (P<0.01), wherethe black with brown neck bred in Sulaimani produced significantly higher egg weight. Highest (P<0.01) daily egg production was recorded for black brown neck bred in both areas. Accordingly, the significant and higher daily egg mass was calculated for black brown neck bred in both areas. Heritability estimates for egg weight, daily egg production and daily egg mass were 0.32, 0.18 and 0.13 respectively. Highest genetic (0.43) and phenotypic (0.53) correlations were found between daily egg production and daily egg mass, while the corresponding estimates between egg weight and daily egg production were negative and being -0.61 and -0.11 respectively, estimates between egg weight and daily egg mass were 0.31 and 0.10 on the same order. It could be concluded that black brown neck chicks surpassed the local black in all egg production traits. In the same genetic line, effect of the environment was clear as the weight of the egg was affected by the surrounding environment and was superior in the Sulaimani governorate. Estimates of genetic and phenotypic correlations between studied traits could be considered as useful for improve egg production.

Keywords - Local Chicken, Egg Production, Genetic Parameters.

I. INTRODUCTION

The level of productive performance of local chicken flocks is greatly influenced by the environmental factors represented by photoperiodic (Shutze et al., 1961), light quality and intensity (Grover et al., 1972), temperature (Clark and Sarakoon, 1967), and nutrition. Moreover these factors are effect negatively or positively on raising the level of flock production. The climate of Kurdistan region in northern Iraq varies from one region to another (Osman, et al., 2017). Local breeds were raised around the world because the adaptation to the environment factors, and resistant to the diseases. Since 2005 four genetic groups were raised in Erbil governorate, and it characteristics traits were studied concerning to their egg production and performance (Abas et al., 2014;Abdulla et al., 2016; Shaker, et al., 2016; Omer, et al., 2016; Aziz, et al., 2017; Shaker and Aziz, 2017; Shaker, et al., 2017 and Abdullah and Shaker, 2018); egg quality (Hermiz, et al., 2012); body weight and meat production (Hermiz, et al., 2014; Hermiz and Ibrahim, 2016 and Hermiz, et al., 2016 a);and semen traits (Hermiz, et al., 2016 b).

Estimating the genetic parameters in an accurate method is very necessary and required in improving the egg production traits as well in constructing selection indexes, earlier study reported that there were a lot of variations in these estimates according to the differences of the genetic make-up (Chen et al 2007).

The current study aims to investigate the egg production status intwo lines of chickens (black and black with brown neck) and the extent ofenvironment influences on it, as well to estimate the genetic parameters using an accurate method to be able to improve their productivity by breeding beside the suitable management.

II. MATERIALS AND METHODS

The current experiment was conducted in both of animal production fields in the directorate of Agricultural research in Erbil and Sulaimani provinces. Eggs included in this study collected when the production percentage of the flock was 5% and continued for 16 weeks starting at April 2016. Three families of each of two lines include local black, and black with brown neck were bred in both areas. Water was available ad libitum and the details of management, feeding, and health program werethe same and described by Hermiz et al. (2014). Weight and number of eggs produced from each family were recorded daily to calculateaverage egg weight (g), daily eggproduction (%), and daily egg mass (g). Egg mass was calculated by multiplying the average daily egg weight by daily egg productionpercentage.

General Linear Model (GLM) within the statistical program SAS (2005) used to analyze the studied traits. The model includes the genetic groups, environment and the interaction as effects of the traits. Scheffe's test within the SAS (2005) was conducted to distinguish the significant differences between the least square means of the levels of each factor. Variance component of random effects were estimated according to Restricted Maximum Likelihood-REML method (Patterson and Thompson, 1971). The mixed model includes the effect of sire in addition to the above main effects. Variance-covariance (VCV) matrices were built from random effects (sire and error) and tested for positive definiteness, in order to develop reliable estimates and VCV used for genetic parameters should be within the allowable range (Hayes and Hill, 1981).

III. RESULTS AND DISCUSSION

Averages of egg weight, daily egg production and daily egg mass were 58.95±0.29 g, 50.30±1.70 % and 29.65±1.03 g, respectively (Table 1).Tables 1 and 2 describe the results including the factors affectingthe mentioned traits for the two local chicken lines in both environments. The present study showeda highly significant effect ($p<0.01$) of genetic groupon all studied traits. Black with brown neck produced significantly ($p<0.01$) higher weights of eggs comparing with those produced from black (59.58vs.58.31 g).Unlike to these results,previous study conducted by Abdulla et al. (2016) revealed to the superiority of local black upon the black with brown neck. Earlier studies used pure or cross breeds, strains or lines and noticed the significant differences in egg weight according to their genetic groups (El-Labban et al., 2011;Hermiz et al., 2012; and Abdullah and Shaker, 2018), while Abas et al. (2014) and Shaker et al. (2016) found no significant differences between the two lines. Also daily egg production and daily egg mass were significantly ($p<0.01$) affected by genetic group (Table 2), where black brown neck excelled the black by 15.94 % and 10.03 g in their daily egg production and daily egg mass respectively (Table 1). The significant superiority of black with brown neck in their mass production is a result of their superiority in their egg weight and egg production. The differences between these two lines were also significant according to the study conducted previously by Abas et al. (2014).Main strains and their crosses were used by El-Labban et al. (2011) and Khawaja et al. (2013) and they revealed to the significant differences in their daily egg production and daily egg mass. Table 2 shows that the effect of environment was significant ($p<0.01$) only on egg weight, where the highest (60.01 g) and lowest (57.88 g) egg weight noticed in Sulaimani and Erbil respectively (Table 1). No significant differences were observed in both areas for daily egg production and daily egg mass.Furthermore, the interaction affected the three studied traits significantly ($P<0.01$) (Table 2). Table 1 includes that the black with brown neck bred in Sulaimani produced significantly higher egg weight comparing with the others. Highest daily egg production was recorded for black brown neck bred in both areas and was differ significantly comparing with black chicks bred in both areas. Accordingly, the significantly higher daily egg mass was calculated for black brown neck bred in both areas.

Heritability estimates for egg weight, daily egg production and daily egg mass were 0.32, 0.18 and 0.13 respectively (Table 3). Several studies mentioned that egg production traits have mostly moderate to low estimates of heritability using various variance components (Adebambo et al., 2006; and El-Labban et al., 2011). Highest genetic (0.43) and phenotypic (0.53) correlations were found between daily egg production and daily egg mass, while the corresponding estimates between egg weight and daily egg production were negative and being -0.61 and -0.11 respectively, the estimates between egg weight and daily egg mass were 0.31 and 0.10 on the same order (Table 3). Saleh et al. (2006) obtained negative genetic (-0.53) and phenotypic (-0.43) correlation between egg number and egg weight at 45 weeks of age. Also, Oleforuh-Okoleh (2011) noticed that the genetic correlation between egg number and egg weight was negative, suggesting an increase in egg number led to a decrease in egg weight. However, genetic correlationsresulted in this study were all lower than those estimated earlier by El-Labban et al.(2011), as well lower than those of phenotypic correlation (Saleh et al., 2006; and El-Labban et al.(2011). Adebambo et al. (2006) reported that genetic improvement for one trait could result in improvement for the other trait as correlated response.

IV. CONCLUSION

It was observed from the current study that the black brown neck was exceeding the local black in egg weight. In the same genetic line, effect of the environment was clear as the weight of the egg was affected by the surrounding environment and was superior in the Sulaimani governorate. Estimates of genetic and phenotypic correlations between studied traits could be considered as useful for improve egg production.

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Factors	No	Egg weight (g)	Daily egg production (%)	Daily egg mass (g)
		Means± S.E.	Means± S.E.	Means± S.E.
Overall mean	48	58.95 ± 0.29	50.30 ± 1.70	29.65 ± 1.03
Genetic Group:				
Black (BL)	24	58.31 ± 0.27 b	42.33 ± 1.80 b	24.64 ± 1.06 b
Black brown neck (BBN)	24	59.58 ± 0.27 a	58.27 ± 1.80 a	34.67 ± 1.06 a
Environment				
Erbil (E)	24	57.88 ± 0.27 b	52.11 ± 1.80 a	30.13 ± 1.06 a
Sulaimani (S)	24	60.01 ± 0.27 a	48.50 ± 1.80 a	29.17 ± 1.05 a
Interaction:				
E x BL	12	58.18 ± 0.38 b	42.36 ± 2.55 b	24.63 ± 1.49 b
E x BBN	12	57.58 ± 0.38 b	61.86 ± 2.55 a	35.64 ± 1.49 a
S x BL	12	58.44 ± 0.38 b	42.31 ± 2.55 b	24.65 ± 1.49 b
S x BBN	12	61.58 ± 0.38 a	54.69 ± 2.55 a	33.69 ± 1.49 a

Table 1. Least Square Means ± S.E. for the factors affecting egg weight, daily egg production and mass:

Means having different letters within each factor/column differ significantly (P<0.05) according to Scheffe's test.

Factors	d.f.	Egg weight	Daily egg production	Daily egg mass
		Mean squares	Mean squares	Mean squares
Genetic Group	1	19.342 **	0.3048 **	1205.65 **
Environment	1	54.561 **	0.0156	11.115
Interaction	1	42.028 **	0.1119 **	409.46 **
Residual	44	1.712	0.0078	26.911

Table 2. Mean squares and test of significance for factors affecting egg weight, daily egg production and mass:
**** P<0.01**

	Egg weight	Daily egg production	Daily egg mass
Egg weight	0.32	-0.61	0.31
Daily egg production	-0.11	0.18	0.43
Daily egg mass	0.10	0.53	0.13

Table 3. Genetic parameters for egg weight, daily egg production and mass:

The values on, above, and below the diagonal are estimates of heritability, genetic and phenotypic correlations among traits, respectively.

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