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Genetic and Phenotypic Correlation between Eight-Week Body Weight and Related Characteristics in White Baladi Chickens

F.K.R. Stino, G.A.R Kamar and A.M.J. Al-Mufti

Department of Animal Production, Faculty of Agriculture, Cairo University, Giza, Egypt.

THE genetic and phenotypic correlations between the different traits studied were obtained for White Baladi chickens. In general, the genetic correlations were higher than the phenotypic correlations. Due to the large sample size; most of the genetic aud phenotypic correlations, although low in magnitude, were significant. The genetic and phenotypic correlations between the body weights at 4, 8, and 12 weeks of age and body dimensions were high and significant in most cases. However, correlations with hatch weight and feathering were lower in magnitude and mostly not significant.

Association between two or more traits is usually considered a result of linked polygenic blocks or to pleiotropy. Polygenic blocks, if they have relatively loose linkages, may cause only a transient association (Lerner, 1958). However, the genes may be so closely linked that unless an extremely large number of individuals can be obtained, no recombinant types will be observed and the phenotypic effect of the linked genes will appear to be the effect of a pleiotropic gene. A pleiotropic effect may result from the use of the basic gene product for different reactions. Thus, if phenotypic selection pressure changes the genes present, both traits will be affected.

The purpose of this study was to determine the genetic and phenotypic correlation coefficients between the broiler body weight and other related characteristics of the White Baladi fowl. These relations would help in developing a selection program to increase the broiler body weight of this long neglected native breed of Egypt.

Material and Methods

Two hundred White Baladi hens were kept in breeding pens, ten hens with one male. Two pedigreed hatches were obtained. The first hatch was fed an adequate (22% protein corn-soy) diet. The second hatch from the same sires and dams were fed an inferior or stress diet (19% protein corncottonseed meal) diet. All chicks were weighed at hatch, and at 4,8, and 12

weeks of age. At 8 weeks of age, the following traits were measured for all the birds: breast width; keel length; shank length; and feathering. For the complete management and measurement procedures, see Stino *et al.* (1982).

The genetic correlations (rG) and the phenotypic correlations (r_P) were calculated using the combined estimates of sire and dam variances and covariances according to Becker (1967). The standard errors of the genetic correlations were computed according to Robertson (1959).

Results and Discussion

1. *Hatch weight*

For the group receiving the adequate diet, the genetic correlaions between hatch weight and breast width were low but significant (Table 1). However, the genetic correlations of the group receiving the stress diet betwen the hatch weight and most other traits studied were all significant (Table 2).

TABLE 1. **Genetic correlations of birds raised on the adequate diet (combined sexes, sire + dam component).**

Trait	Hatch Weight	4-Week Weight	8-Week Weight	12-Week Weight	Feath-ering	Breast Width	Shank Length
4-Wk. Weight	.22± .15						
8-Wk. Weight	.20± .12	.94± .02**					
12-Wk. Weight	.21± .11	.93± .02**	.96± .10**				
Feathering	.10± .30	.01± .60	.12± .27	.01± .26			
Breast Width	.27± .04**	.81± .03**	.79± .03**	.84± .02**	.21± .22		
Shank Length	.31± .44	.78± .22**	.85± .05**	.83± .05**	.37± .40	.63± .06**	
Keel Length	.02± .41	.70± .12**	.76± .08**	.73± .08**	.56± .34	.41± .06**	.92± .03**

**Significant correlation ($P \leq .01$)

The phenotypic correlations between the hatch weight and most of the other studied traits were low. Correlations with other body weights were significant under both nutritional regimens. However, under the stress diet, the phenotypic correlations were significant with breast width, shank length, and keel length. These significant genetic and phenotypic correlations were mainly due to the large sample size.

TABLE 2. **Genetic correlations of birds raised on the stress diet (combined sexes, sire + dam component).**

Traits	Hatch weight	4-Week weight	8-Week weight	12-Week weight	Feathering	Breast widtg	Shank length
4-Wk. Weight	.41± .15 **						
8-Wk. Weight	.35± .11 **	.85± .27 **					
12-Wk. Weight	.38± .17	.84± .10	1.00± .00 **				
Feathering	.17± .16 **	.24± .28 **	.11± .07 **	—.01± .31 **			
Breast Width	.33± .10	.89± .04 **	.89± .03 **	.89± .05 **	—.41± .28 **		
Shank Length	.31± .15	.91± .06 **	1.01± .01 **	1.0± .01	.89± .18	.89± .04 **	**
Keel Length	.11± .12	.88± .07	.95± .02	.10± .05	—.13± .19	.80± .05	1.02± .0

*Significant correlation (P≤.05)

**Significant correlation (P≤.01)

2. *Four-week body weight*

There were highly positive, significant, genetic and phenotypic correlations between 4-week body weight and most other traits studied. This was true for both groups raised on the two diets. However, the genetic correlations between 4-week body weight and feather score, as expected, were not significant. The genetic correlations, with all other traits, were higher than the phenotypic correlations. Earlier, published data by Sefton and Siegel (1974) indicated the presence of similar trends. It was also apparent that the further away the chicks were in age from each other, the lower the correlation coefficients were.

3. *Eight-week body weight*

The genetic and phenotypic correlations between the 8-week body weight and the rest of the characters studied were similar to those for 4-week body weight (Tables 1 to 4).

4. *Twelve-week body weight*

Results were similar to those obtained for the correlations of 4 and 8-week body weight (Tables 1-4). This is expected since very high, positive, genetic and phenotypic correlations were present between the weights at different ages. Similar results were previously published (Sefton and Siegel, (1974).

TABLE 3. **Phenotypic correlations of birds raised on the adequate diet (combined sexes).**

Traits	Hatch Weight	4-Wk. Weight	8-Wk. Weight	12-Wk Weight	Feathering	Breast Width	Shank Length
4-Wk. Weight	.13+.03**						
8-Wk. Weight	.09+.03**	.86+.01**					
12-Wk. Weight	.10−.03**	.75+.02**	.81+.01**				
Feathering	.04+.03	.14+.03**	.11+.03**	.11+.03**			
Breast Width	.05+.03	.47+.03**	.06+.02**	.48+.03**	.05±.03		
Shank Length	.03−.03	.69+.02**	.82+.01**	.65+.02**	.08±.03*	.50±.02**	
Keel Length	.06+.03	.64+.02**	.74+.02**	.58+.02**	.10−.03**	.45±.03**	.74±.02**

*Significant correlation (P≤.05)
**Significant correlation (P≤.01)

TABLE 4. **Phenotypic correlations for birds raised on the stress diet (combined sexes).**

Traits	Hatch Weight	4-Week Weight	8-Week Weight	12-Week Weight	Feathering	Breast Width	Shank Length
4-Wk. Weight	.25±.03**						
8-Wk. Weight	.19±.04**	.77±.02**					
12-Wk. Weight	.21±.04**	.71±.02**	.84±.01**				
Feathering	.07±.04	.19±.04**	.17±.04**	.11±.04**			
Breast Width	.15±.04**	.63±.02**	.80±.01**	.69±.02**	.17±.04**		
Shank Length	.14±.04**	.64±.02**	.77±.02**	.68±.02**	.14±.04**	.61±.02**	
Keel Length	.12±.04**	.59±.03**	.71±.02**	.63±.02**	.18±.04**	.55±.03**	.78±.02**

**Significant correlation(P/.01)

5. *Feathering*

Results for the genetic and phenotypic correlations between feather scores and the other traits studied were mostly not significant (Tables 1 to 4).

5. *Feathering*

Results for the genetic and phenotypic correlations between feather scores and the other traits studied were mostly not significant (Tables 1 to 4). Some of them were positive ; others were negative and with different magnitudes. There was no specific trend observed. However, the genetic and phenotypic correlations were mostly low in magnitude.

6. *Breast width*

The genetic correlations between breast width and all other characters studied, except for feathering, were positive, high, and highly significant for birds raised on both diets (Tables 1 and 2). The phenotypic correlations also show the same trend as those of the genetic correlations. However, the magnitude of the genetic correlations were higher than those of the phenotypic correlations (Tables 1-4). Previous data (Dillard *et al.*, 1953) indicated that breast width was not as highly correlated with other traits as it was in this study. This discrepancy might be due to breed differences. Under the stress diet condition, both the genetic and phenotypic correlations had a higher magnitude than under the adequate diet.

7. *Shank length*

The genetic and phenotypic correlations between shank length and most other traits studied were high, positive, and highly significant (Tables 1 to 4). The magitude of the genetic correlations were higher than those of the phenotypic correlations. These results are in agreement with previously published data (Merritt, 1966). Under the stress diet condition, both the genetic and phenotypic correlations were higher than under the adequate diet.

8. *Keel length*

The genetic and phenotypic correlations between keel length and almost all other traits studied were high, positive, and highly significant for birds raised on both diets (Tables 1 -4). These results are in close agreement with those of Dillard *et al.* (1953). As for the other traits studied, the magnitude of the genetic correlations were higher than those for the phenotypic correlations. Also the genetic and phenotypic correlations for the birds raised on the stress diet were higher than those raised on the adequate diet.

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الارتباط الوراثي والمظهرى بين وزن الجسم على عمر ٨ أسابيع والصفات المرتبطة به ٠

فريد كمال رمزى استينو ، جمال عبد الرحمن قمر وعبد المنعم جميل المفتى

قسم الانتاج الحيوانى ـ كلية الزراعة ـ جامعة القاهرة

تم تقدير الارتباط الوراثى والمظهرى بين كل الصفات تحت الدراسة فى الدجاج البلدى الابيض وعموما كان الارتباط الوراثى اعلى من الارتباط المظهرى ٠ ونظرا لكبر حجم العينة المقدرة عليها هذا الارتباط فان اغلب قيم الارتباط الوراثى والمظهرى كانت معنوية ولو انها كانت ذات قيمة منخفضة ٠ ولقد كانت الارتباط الوراثى والمظهرى بين اوزان الجسم على عمر ٤ ، ٨ ، ١٢ اسبوع ومقاييس جسم مرتفع ومعنوى فى اغلب الاحوال ٠ اما الارتباط بين هذه الصفات ووزن الفقس وكذلك التريش فلقد كان منخفض غير معنوى فى اغلب الاحيان ٠