

**CORRELATED RESPONSES TO SELECTION FOR
HIGH BODY WEIGHT AT 8 WEEKS OF AGE
IN A CLOSED FLOCK OF FAYOUMI FOWL**

By

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Seven generations of individual selection for 8-week body weight were carried out on a Fayoumi line. The direct response was 176.7 grams in unsexed chicks. Correlated responses in the other traits were positive; 54.9 grams in 4-week body weight; 235.1 grams in 12-week body weight; 396.4 grams in body weight at sexual maturity; 45.7 days in age at sexual maturity; 4.6 grams in egg weight at sexual maturity and 4.5 grams in egg weight at 12 months of age. The realised genetic correlation estimated from direct and indirect responses between 8-week body weight and the other traits were .923, .864, .426, .282 and .198 in respective order.

There were insignificant changes in egg number measurements and in hatchability due to such selection.

Where the value of the animal is dependent upon many characters, the correlated response to selection in any one of these characters to any other becomes of great importance since it shows how much the improvement of a character will affect the others. This depends on the magnitude of the genetic correlation between the selected character and the other correlated traits.

Godfrey and Goodman (1955) found that five generations of selection for high body weight at 12 weeks of age increased egg size and decreased hatchability. Singh *et al.* (1960) showed that although selection was practiced only for body weight at 9 weeks of age, they found larger body weight at all ages, larger egg weight at 32 weeks of age, and birds matured about one week earlier as correlated response to selection. Egg production increased in the first months from the twenty fourth week on, but decreased in the next three months.

Maloney *et al.* (1963), after ten generations of individual selection to increase 8-week body weight, age at sexual maturity increased only in the first four generations, but decreased thereafter and no significant change in egg production. But, there was a significant increase in body weight at 8 weeks of age, and in March egg weight as correlated responses.

Lerner *et al.* (1947), gave an example of expected correlated responses in certain meat traits, shank length, keel length and breast depth, when selecting for large body weight. Jaap *et al.* (1962) did not find much agreement between expected and observed correlated responses in low heritable traits (egg production, broadness and height of albumen). However, there was a close agreement between expected and observed correlated response in egg weight which has a high heritability estimate. Such agreement was also found by Ideta and Siegel (1966).

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In this paper the correlated responses to selection for high body weight at 8 weeks of age were reported and the expected and the observed correlated responses were compared in order to study the realised genetic correlation between 8-week body weight and the other economic traits in the growth strain of the Fayoumi.

Material and Methods

Individual selection was carried out for seven generations on a closed flock of Fayoumi chicken to increase body weight at 8 weeks of age. The methods of selection used and the design of the experiments in the different generations were shown before by Ragab and Hossari (1969).

The estimation of the expected correlated response to selection :

Selection responses expected per generation in the correlated traits was calculated as following (Nordskog and Festing, 1962).

$$\bar{G}_y = G^x \cdot \frac{h_y}{h_x} \frac{y}{x} G^{xy}$$

Where \bar{G}_x = represents the genetic change in the selected trait x,

G_y = represents the genetic change in the correlated trait y,

h_x, h_y = are the root heritabilities.

x, y = are the standard deviations of traits x and y,

G_{xy} = is the genetic correlation between the traits x and y.

TABLE 1

Traits	Observed gain		Expected gain	Inv. effect R-F ₀
	G-F ₀	G-R		
4 WK. (grams)	13.20*	18.00*	14.90	7.30*
8 WK. (grams)	32.10*	40.90*	36.90	41.40
12 WK. (grams)	46.90*	54.00*	36.50	32.20*
M.B.W. (grams)	47.70*	66.07*	57.19	-110.30*
S.M. (days)	4.20*	7.61*	3.74	-20.80*
M.E.W. (grams)	0.37	0.77*	0.41	-3.13*
12. E. W. (grams)	0.38	0.76*	0.54	-2.34*
Pause (days)	-1.65	-0.21	-	0.44
P ₁ (eggs)	1.71	1.76	5.96	-13.63*
P ₂ (eggs)	-2.35	-0.42	-0.72	-11.54*
P ₃ (eggs)	-0.07	-1.30	1.51	7.37*
P ₄ (eggs)	-0.27	1.68	5.56	-11.66*
Hatch (%)	2.40	1.68	-	1.3

* The difference is statistically significant.

CORRELATED RESPONSES TO SELECTION FOR HIGH BODY WEIGHT 39

Table (1) shows the observed change in the different traits. This is expressed as :

1. (G - F₀): The difference between the original flock average (F₀) before selection and the strain average (E) after selection.
2. (G - P): The difference between the randombred control average (P) and the strain average (G) after selection.

The expected gain estimate theoretically and the environmental effect are also indicated. The traits shown are :

<i>Abbreviation</i>	<i>Traits</i>
4 WK.	: Body weight at 4 weeks of age.
8 WK.	: Body weight at 8 weeks of age.
12 WK.	: Body weight at 12 weeks of age.
M.B.W.	: Body weight at sexual maturity.
S.M.	: Age at sexual maturity.
M.E.W.	: Egg weight at sexual maturity.
12.E.W.	: Egg weight at 12 months of age.
Pause	: Pausing days from December to April.
P ₁	: Egg number in the first 21 weeks of production.
P ₂	: Egg number to 12 months of age.
P ₃	: Egg number to January the first.
P ₄	: Egg number to June the first.
Hatch	: Percentage of hatchability from all eggs.

Seven generations of selection for high body weight at 8 weeks of age increased the average weight at 4 weeks of age, 54.9 grams in the male progeny and 61.7 grams in the female progeny as correlated responses. At 12 weeks of age the average weight were increased by 262.3 and 207.8 grams respectively, and at sexual maturity the increase in the average pullet-weight was 396.4 grams.

There was a significant increase in (S.M.) 45.67 days, in (M.E.W.) 4.6 grams, and in (12.L.W.) 4.5 grams as correlated response to selection. Egg number measurements (P₁, P₂ and P₄) were not decreased due to such selection. Egg number to January the first (P₃) was decreased by 7-8 eggs. This measurement, however, was affected by date of hatch (Hossari, 1966) and the decrease observed might be due to such effect.

It can be seen also from these selection experiments that hatchability was not changed.

The delay of sexual maturity due to selection for early body weight was also found by Lerner (1946), Nordskog and Festing (1962) and by Maloney *et al.* (1963), but Clark and Cunningham (1953) and Singh *et al.* (1960) reported reverse situation.

It is generally assumed that increasing body weight may cause a decrease in egg number and hatchability. This was supported by Singh *et al.* (1960) and Nordskog and Festing (1962). However, other workers could not find such deleterious effect in their flocks as Clark and Cunningham (1953) and Maloney *et al.* (1963). The results of our experiments seem to support the latter workers.

The Realised Genetic Correlation

The realised genetic correlation (G_{xy}) can be estimated from the direct response (\bar{G}_x) due to selection on 8-week body weight (Trait x), and correlated response (\bar{G}_y) in trait y due to selection in trait x using the following formula derived from the above equation:

$$rG_{xy} = \frac{\bar{G}_y}{\bar{G}_x} \cdot \frac{h_x}{h_y} \cdot \frac{x}{y}$$

Table (2) shows that realised genetic correlation between 8-week body weight and the other economic traits studied.

TABLE 2

Traits	4 WK	12 WK.	M.B.W.	S.M.	M.E.W.	12 E.W.
8 WK.	.923	.864	.426	.282	.214	.198
	Pause	P ₁	P ₂	P ₃	P ₄	
	.009	.189	-.037	.128	-.133	

It can be seen that the realised genetic correlations of body weight at 8 weeks of age with other body to weight and egg weight traits were positive, while these correlations were insignificant with egg production traits.

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CORRELATED RESPONSES TO SELECTION FOR HIGH BODY WEIGHT 41

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تأثير الانتخاب لسرعة النمو على بعض الصفات الاقتصادية الأخرى في قطيع من الدجاج الفيومي

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الملخص

أجريت تجارب الانتخاب لزيادة وزن الجسم في عمر ثمانية أسابيع في سلالة من الدجاج الفيومي، ووجد أن الوزن زاد في هذا العمر بمقدار ١٧٦٧ جم كآثر مباشر لهذا الانتخاب، وزاد وزن الجسم أيضا ٥٨٣ جم في عمر أربع أسابيع، ٢٣٥١ جم في عمر ١٢ اسبوع، ٢٩٦٤ جم في وزن الجسم عند البلوغ كآثر غير مباشر لهذا الانتخاب. كما أن العمر عند وضع أول بيضة زاد ٤٥٧ يوم وزاد وزن البيض ٤٦ جم عند النضج الجنسى، ٤٥ جم في عمر ١٢ شهرا. وقد قدر الارتباط الورائى الحقيقى من الصفة المنتخب لها والصفات السابقة فوجد ٩٢٣، ٨٦٤، ٤٢٦، ٢٨٢، ٢١٤، ١٩٨ على التوالى.

ولم يظهر تأثير معنوى في عدة تفاتيش لانتاج البيض، ولا في نسبة التفريخ من جراء هذا الانتخاب.