

## CORRELATED RESPONSE TO SELECTION FOR HIGH EGG NUMBER IN A CLOSED FLOCK OF FAYOUMI FOWLS

By

M.T. RAGAB and M.A. EL-HOSSARI

*Chairman of the Board of Directors for the Meat and Milk Organization, Cairo, U.A.R.*

*Department of Animal Production, Ministry of Agriculture, Dokki.*

### Summary

Five generations of family selection for high egg production were carried out on a Fayoumi line. The direct response per generation was 3.6 eggs in egg production to January the first (the criterion of selection used). The correlated responses in the other traits were towards decreasing in age at sexual maturity, body weight and egg weight at sexual maturity and in pause duration. The decreases observed per generation were 6.73 days, 20.90 grams, 0.63 grams and 5.83 days respectively. While the correlated responses were toward increasing in egg weight at 12 months of age, in hatchability and in all the egg number traits studied ( $P_1$ ,  $P_2$ , and  $P_4$ ). The increases observed per generation were 0.23 gram, 2.38 percent, 3.90 eggs, 5.60 eggs and 4.57 eggs in respective order.

The realized genetic correlation for egg production to January the first with the other economic traits were -0.530 with (S.M.), -0.538 with (M.B.W.), -0.588 with (M.E.W.), 0.290 with (12.E.W.), -0.696 with pause duration, 0.507 with ( $P_1$ ), 0.464 with ( $P_2$ ) and 0.710 with ( $P_4$ ).

### Introduction

It was generally assumed that a genetically controlled superiority in egg production in chicken is associated with a reduced egg weight. Recent works, however, showed that this is not usually true since the correlated response to selection in the unselected traits depends on the genetic structure of the flock under selection.

Schultz (1953) found a reduction in egg weight resulting from selection for egg number, but he found that selection for egg weight seemed to have little effect upon egg number. Wyatt (1954) found that selection for increased winter production resulted in a decreased egg weight and March body weight. On the other hand, he was able to show that selection for increased egg weight resulted in lowered egg production and increased March body weight. Abplanalp (1956) showed that selection pressure directed towards increased egg size would cause a considerable reduction in egg number, while selection pressure directed towards high egg production would be less effective in lowering egg weight.

Nordskog and Testing (1962) found that individual selection for egg rate, for four generations in both Fayoumi and Leghorn lines, was associated with a decline in the rate of egg production.

In this paper, the correlated responses to selection for high egg number were reported, and the expected and the observed correlated responses were compared, in order to study the realized genetic correlation between egg number and other economic traits in a production strain of a Fayoumi flock.

### Material and Methods

Family selection was carried out for five generations on a closed flock of Fayoumi chicken to increase egg number. The criterion of selection used was egg production from the first onset of egg till a specific day (January the first). Before selection, the data were adjusted to their hatch mean in order to remove hatch effect (Hossari, 1966). A random bred control group was used to estimate the genetic changes more accurately. The details of the selection methods used were those used by Ragab and Hossari (1969).

TABLE 1  
Observed and Expected correlated responses to Selection for Egg Number per generation

Traits	Observed change per generation	Expected change per generation	Environmental effect
S.M. (days) . . . . .	- 6.73*	- 5.70	- 6.34*
M.B.W. (grams) . . . . .	-20.90*	-15.04	-18.60*
M.E.W. (grams) . . . . .	- 0.63	- 0.56	- 0.47
12.E.W. (grams) . . . . .	0.23	0.07	0.78
Pause (days) . . . . .	- 5.83*	- 3.01	- 0.75
P <sub>1</sub> (eggs) . . . . .	3.90*	3.75	- 0.41
P <sub>2</sub> (eggs) . . . . .	5.60*	3.92	- 1.27
P <sub>3</sub> (eggs) . . . . .	3.46*	3.90	- 2.92*
P <sub>4</sub> (eggs) . . . . .	4.57*	5.29	- 2.39*
Hatch (%) . . . . .	2.38*	-	- 1.13

\* The value is statistically significant.

### Results and Discussion

Table 1 gives the observed and expected correlated responses to selection for egg number per generation. The traits studied are:

<i>Abbreviation</i>	<i>Trait</i>
S.M.	: Age by days at first egg laid (sexual maturity)
M.B.W.	: Body weight 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 <sub>1</sub>	: Egg number in the first 21 weeks production
P <sub>2</sub>	: Egg number to 12 months of age.
P <sub>3</sub>	: Egg number to January the first.
P <sub>4</sub>	: Egg number to June the first.
Hatch	: Percentage hatchability from all eggs.

After five generations of selection for high egg number, all the measurements of egg production were significantly increased by 7.9 eggs in (P<sub>1</sub>), 10.1 eggs in (P<sub>2</sub>), 18.1 eggs in (P<sub>3</sub>) and by 23.1 eggs in (P<sub>4</sub>). Hatchability percentage was also increased by 11.88 per cent. There was no significant change in total egg weight as correlated response to such selection, but age at sexual maturity, body weight at sexual maturity, and pause duration were decreased by 18.8 days, 98.8grams and by 25.0 days respectively.

The results obtained here seem to support Abpanalp (1956) who showed in his analysis that selection towards high egg production had little effect in lowering egg weight. However, Schultz (1953) and Wyatt (1954) found a reduction in egg weight due to selection for high egg number. The selection experiments of Schierman *et al.* (1959) on both Fayoumis and Leghorns showed different results. They found a reduction in body weight and egg weight as a result of selection for high egg production in the Fayoumis, while they could not find such effect in the Leghorns.

From Table 1, it can be seen also that the environment was responsible for decreasing the performance of most of the traits studied. It must be also noted, that egg weight at 12 months of age was not decreased. This means that the environmental effects which decreased egg number might not affect egg weight in the same direction. This observation was also found by Hossari (1961) in the same flock when analysing the environmental correlation between egg weight and egg production.

The comparison between the observed and expected correlated response to selection indicates that the differences between them are statistically insignificant.

#### *The Realized Genetic Correlation*

The realized genetic correlations were calculated as shown by Nordskog and Festing (1962).

Table 2 shows the realized genetic correlation between the criterion of selection (egg production to January the first) and the other economic traits studied.

TABLE (2)

Pause	S.M.	M.B.W.	M.E.W.	12.E.W.	Pause	P <sub>1</sub>	P <sub>2</sub>	P <sub>4</sub>
P <sub>3</sub>	-0.530	-0.540	-0.588	0.290	-0.696	0.507	0.464	.710

It is clear that these correlations were rather great in the large egg production traits studied. The magnitude of the correlation between egg number and pausing (/0.696) indicated that selection pressure when directed towards a reduction in pause duration, would be effective in increasing egg number. The positive correlation between egg number and egg weight at 12 months of age showed that selection for high egg number did not affect egg weight at later stage in the pullet laying season.

#### References

- Abplanalp, H. (1956).— "Selection procedures for poultry flocks with many hatches." *Poul. Sci.*, 35, 1265.
- Hossari, M.A. (1961).— "The genetic analysis of a selection experiment of Fayoumi domestic fowl." M.Sc. Thesis, Univ. of London (June, 1961).
- (1966).— "The Fayoumi domestic fowl. B. Hatch effect on some of the economic traits. *Agric Res. Rev.*, 44, (4), 128.
- Nordskog, A.W., and Festing, M. (1962).— Selection and correlated responses in the fowl." *Proc. XIIIth World's Fowl. Congress, Sydney, Australia, 1962*, 25.
- Ragab, M.T. and el-Hossari M.A. (1969).— "Selection for high egg yield and for rapid growth in a closed flock of Fayoumi fowl." *Proceeding of the Third Conference of Animal production, Cairo, May 1969* (in press).
- Shultze, F.T. (1953).— "Concurrent unbreeding and selection in the domestic fowl." *Heredity*, 7, 1.
- Wyatt, A.J. (1954).— "Genetic variation and covariation in egg production and other economic traits in chickens." *Poul. Sci.*, 33, 1266.

## تأثير الانتخاب لكثرة عدد البيض على بعض الصفات الاقتصادية الأخرى فى قطيع من الدجاج الفيومى

### الملخص

أجريت تجارب الانتخاب العائلى لمدة خمسة أجيال لزيادة عدد البيض فى سلالة من الدجاج الفيومى، ووجد أن عدد البيض زاد فى الجيل الواحد « متوسط الأجيال » ٣٤٦ بيضة فى إنتاج البيض حتى أول شهر يناير كتأثير مباشر لهذا الانتخاب كما زاد أيضا عدد البيض فى المقاييس الأخرى كتأثير غير مباشر لهذا الانتخاب إذ بلغ ٣٩ بيضة فى الإنتاج مدة ٢١ أسبوع ، ٦ بيضة فى الإنتاج الى عمر ١٢ شهر ٤٦٠ بيضة فى الإنتاج حتى أول شهر يونيو . ووجد ان النضج الجنسى « العمر عند وضع أول بيضة » قد نقص فى الجيل الواحد ٨٣ يوم كما نقص عدد أيام الانقطاع عن البيض ٧٣ يوم ووزن الجسم عند النضج الجنسى نقص ٢٠٩ جم ووزن البيضة عند النضج الجنسى نقص ٦٣ جم بينما زاد وزن البيض فى عمر ١٢ شهر ٢٣ جم ، وزادت نسبة التفريخ ٢٢٨ ٪ فى الجيل الواحد نتيجة لهذا الانتخاب .

وحسب الارتباط الوراثى الحقيقى بين صفة عدد البيض المنتخب لها والصفات السابقة فوجدت على التوالى ٥٠٧ ، ٤٦٤ ، ١٠٦ ، ٧١٠ . لصفات عدد البيض ، ٢٩٠ . لوزن البيض فى عمر ١٢ شهر ، - ٦٩٦ . بصفة الانقطاع عن البيض ، - ٥٣٠ . لصفة النضج الجنسى - ٥٤٠ ، ٥٨٨ . لوزن الجسم ووزن البيضة وقت البلوغ .