Body Weights of a Closed PopulaCtion of ornish Fowl. I. Selection for Increased Eight-Week Body Weight

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SELECTION for 8-week body weight was practiced for 2 generations in an unselected population of Cornish fowl. After 2 generations of selection, the 8-week body weight of the selected line exceeded that of the control line by 112 g (29.1%). The hatch weight, 4-week body weight, and 12-week body weight of the selected line also exceeded that of the control line by 4 g, 49 g, and 172 g respectively. There was no apparent influence of natural selection on short-term response to artificial selection.

The ultimate goal of any breeding program is to have a high proportion of desirable individuals in the population. The desired type usually has several economic advantages. Many experiments have been carried out to study the response to selection. Jaap and Smith (1959) selected 3 generations of broiler-type chickens for large body weight at 8 weeks of age. They reported that the selected line at 8 weeks of age weighed about 150 g more than the randombred control from which the selected line originated. The genetic change which occurred in 8-week body weight of broilers produced commercially between 1955-1959 was measured (Jaap et al., 1962). During this period they found that the genetic gain was approximately 222 g.

Gyles and Thomas (1963) used divergent selection to form 2 lines of White Wyandottes : a high line selected for high, 8-week body weight, and a low line selected for low, 8-week weight. After 4 generations of selection, there was a difference of slightly more

than 660 g between the high line and low line. Proudfoot (1973) reported that a practical gain in broiler performance may be expected from a single generation of selection of parental sires for 8-week body weight.

Natural selection can play a role in selection experiments. Siegel (1962) reported that comparisons of expected to effective selection differentials indicated that natural selection was a minor factor in influencing the short-term response to artificial selection for 8-week body weight in chickens.

The purpose of this study was to measure the response to short-term selection for increased 8-week body weight in an unselected population of Cornish flow.

Material and Methods

The data represent 2 generations of selection for high body weight at 8 weeks of age in a population of White Cornish fowl. This population was maintained at the Ministry of Agriculture, Dokki Research Station, Egypt, without any attempted selection for over 20 years. The sole criterion for selection was individual body weight at 8 weeks of age.

The study started with 20 males, each mated to 10 females in individual breeding pens. Pedigreed eggs were collected daily and stored in a cold room for 14 days to allow for a maximum number of chicks per hatch. Two hatches were obtained. The first hatch made up the selected line. The second pedigreed hatch from the same sires and dams made up the randombred line.

All chicks were weighed to the nearest gram at hatch, and to the nearest 5 g at 4 weeks, 8 weeks, and 12 weeks of age. The chicks were reared in a floor brooder with infrared lamps and received continuous light from hatch until 12 weeks of age. In every generation, the heaviest 20 males at 8 weeks of age from the progeny of the selected line were selected along with following 20 heaviest males to be kept as reserves. The 20 selected males were mated at random with no attempted assorted mating to the heaviest females from the selected line using 10 females for each male. Full or half sib matings were avoided.

Each generation the hens were trapnested. Pedigreed eggs were collected daily and kept in a cold room for 14 days before setting. At the same time, about 500 eggs from the randombred line were set with the eggs of the selected line to use as contemporary controls. The control chicks were also wing-banded and reared intermingled with the selected chicks. All previous measurements were obtained from all chicks every generation.

The pedigreed randombred population was reproduced each generation with the selected line. However, the 20 randombred sires were chosen at random, 1 male from each previous sire. Each sire was mated to 10 females that were selected at random. The restriction of no full or half sib mating was practiced on this line also. All management practices were the same as far as possible within and between lines and generations. The data were analyzed by the least squares method described by Harvey (1960), and the separation of means was carried out according to Duncan (1955). The regression of 8-week body weight on generation number was obtained to determine the significant changes in the population means.

Results and Discussion

The responses to individual phenotypic selection for 8-week body weight in the Cornish fowl are shown in Table 1 and Figure 1. Data for both sexes were combined for presentation. Selection for 2 generations resulted in a highly significant increase in 8-week body weight (Table 1). The difference between the selected and the control lines became progressively larger with each successive generation of selection (Table 1). In the second generation of selection, the 8-week body weight of the selected line was about 112 g (29.1%) higher than that of the control line. These results agree with the results of Jaap and Smith (1959); Jaap et al. (1962); Jaap (1963); Gyles and Thomas (1963); and Proudfoot (1973). However, the values of this study were somewhat lower than in the previous results.

A significant ($P \leqslant .01$) regression coefficient of 40 g for 8-week body weight response on generation number (measured as a
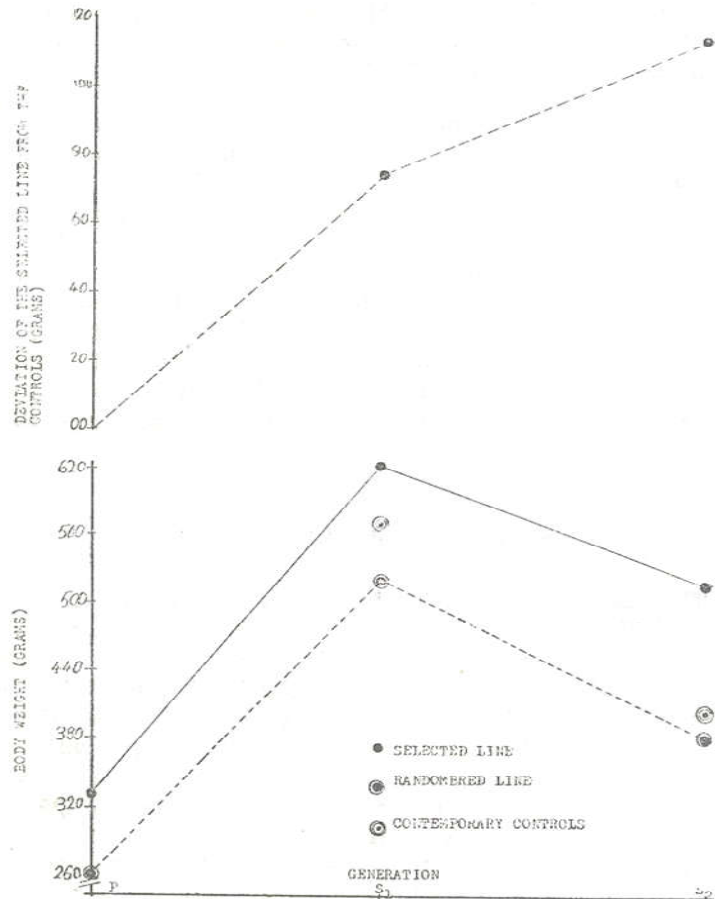
FIG. 1. 8-Wk. Body Wt. of Selected, Contemporary Controls, and Randombred Lines

Table 1. Least square means ± SE and the coefficient variation (CV) of body weights (g) at different ages in the selected line, the randombred line, and the contemporary controls

Age	Line		Generation							
		N	P	CV	N	S_1	CV	N	S_2	CV
Hatch	Selected*	557	36 ± 0.1	(9.2)	787	38 ± 0.1	(8.7)	654	41 ± 0.1	(7.8)
	Control**	---	---	---	313	38 ± 0.2	(10.2)	378	37 ± 0.2	(7.2)
	Random	437	33 ± 0.1	(7.8)	484	37 ± 0.1	(9.8)	495	36 ± 0.1	(7.8)
4 weeks	Selected	540	187 ± 1.7	(19.6)	741	268 ± 1.5	(13.8)	595	288 ± 2.3	(20.8)
	Control	---	---	---	273	238 ± 2.4	(14.8)	305	239 ± 3.4	(20.0)
	Random	437	132 ± 2.0	(7.8)	435	244 ± 2.4	(18.5)	370	233 ± 3.1	(19.3)
8 weeks	Selected	515	332 ± 3.9	(24.3)	719	620 ± 3.7	(14.8)	457	497 ± 7.4	(21.1)
	Control	---	---	---	268	563 ± 6.1	(15.1)	230	385 ± 9.2	(22.2)
	Random	390	267 ± 5.5	(26.2)	399	524 ± 6.1	(18.7)	298	370 ± 5.9	(15.8)
12 weeks	Selected	495	664 ± 8.8	(23.7)	698	909 ± 5.3	(13.5)	449	657 ± 11.2	(25.3)
	Control	---	---	---	231	739 ± 9.2	(14.0)	215	485 ± 11.6	(20.9)
	Random	357	435 ± 8.4	(27.0)	376	655 ± 9.0	(20.0)	254	405 ± 8.2	(16.4)

* Differences between the body weights of the selected line in any generation and the same weights in the preceding generation were highly significant at all ages (P ≤ .01; Duncan, 1955).

** Body weight of the selected line birds was significantly (P ≤ .01) higher than their contemporary controls in both selected generations and at all ages except for the hatch weight of S_1 (Duncan, 1955).

deviation from the controls) was obtained for the selected line. Regression of the randombred line means on generation number yielded a significant regression coefficient of 10 g for their 8-week body weight. This significant regression is because of the increase in the randombred line's 8-week body weight due to better management and improved diet (Table 1).

The standard errors of the selected line appeared to be less than those of the control line. Coefficients of variation of the control line were significantly (P ₃ 0.05) larger than those of the selected line. This may have been due primarily to the differences in the standard deviation (Table 1).

Comparisons of the expected (unweighed) to the effective (weighed) selection differentials indicated no differences between them in either generation. Therefore, apparently natural selection had a relatively unimportant influence on the responses to 2 generations of selection for 8-week body weight in an unselected population of Cornish fowl. During selection for the 8-week body weight in chickens, Jaap and Smith (1959), and Siegel (1962), reported a very small influence of natural selection on short-term response to artificial selection.

The reduced body weight of the birds at 8 and 12 weeks of age during S_2 generation (Fig. 1) was due to an outbreak of Newcastle disease.

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وزن الجسم لقطيع مقفول من الدجاج الكورنش

١ ــ الانتخاب لزيادة وزن الجسم على عمر ٨ أسابيع

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تم الانتخاب لزيادة وزن الجسم على عمر ٨ أسابيع لمدة جيلين فى قطيع من الدجاج الكورنش لم يسبق الانتخاب فيه وبعد جيلين من الانتخاب كان مقدار الزيادة فى وزن الجسم على عمر ٨ أسابيع فى السلالة المنتخبة عن السلالة المقارنة ١١٢ جم (٢٩ر١٪) .

وكذلك زاد الوزن عند الفقس ووزن ٤ أسابيع ــ ١٢ أسبوع فى السلالة المنتخبة عن السلالة المقارنة بمقدار ٤ جم ، ٤٩ جم ، ١٧٢ جم على التوالى .

كما انه لم يظهر هناك اى تأثير للانتخاب الطبيعى على نتائج الانتخاب فى المدى القصير .