

Can Egg Production be Improved by Mass Selection Based on Physical Appearance?

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Hutt (1949, p. 296) reviewed the findings of several workers all of whom had reported failure to improve egg production by individual selection based on physical appearance. However, this method is still practised in Australia despite these findings.

It, therefore, seemed desirable to include, for demonstration purposes, an experiment on the effect of this type of selection in a series of breeding investigations initiated in 1946 at the Poultry Research Centre. The general design of these experiments, including methods of management, has been described elsewhere (Skaller, 1957).

In the first experiment, lasting 6 generations, 223 White Leghorn pullets were produced from 54 pullets and 15 hens mated to 9 cockerels. The breeding value for high egg production of all birds was assessed by the subjective judgement of an experienced officer of a Department of Agriculture according to their physical appearance and "handling quality". All birds surviving at the onset of the breeding season were presented to the expert and on the average the best 27 per cent. females and 17 per cent. males retained for breeding. The flock was a "closed" one with the exception of the last year when the 2 cockerels used came from the unselected control flock to avoid further inbreeding.

Figure 1 shows the egg production of this flock expressed as deviation from the unselected Control flock so that between-years variations caused by changes in the environment are minimised.

The selected flock produced more than the control (significant at $P < 0.05$) in one year only, although corrections for possible depressions caused by inbreeding were made by adding 1 egg for each per cent. of Wright's coefficient of inbreeding (F) (see Schoffner, 1948, Schoffner et al., 1953, Skaller, 1956, Tebb, 1957).

To exclude any possible effect of inbreeding, unavoidable in a small closed flock, a differently designed experiment was carried out in 1953 and repeated the following year. The two best and two worst cockerels were selected according to physical appearance in the first year from 20 and in the second year from 34 males available from an unimproved flock. The 4 cockerels were mated in each experiment to the 32 highest and 32 lowest ranking pullets in such a manner that all possible combinations of mating best and worst looking sires to best and worst dams were made.

The results of this experiment are summarized in Table I. The mean egg production of daughters from parents with best physical appearance was over the two years lower than that of pullets from parents graded worst on appearance, though these differences were not statistically significant either within each year or when pooled.

Another analysis revealed that not even the average grading by appearance differed for the progeny of parents graded as best from that of parents graded as worst in appearance.

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TABLE I.
Egg Production of Pullets Produced by Mass Selection on Physical Appearance.

Type of Mating	Surviving to 72 Weeks of Age						Hen-Housed (Prod. Index)			
	1953			1954			1953		1954	
	Pullets	Eggs		Pullets	Eggs		Pullets	Eggs	Pullets	Eggs
Worst x Worst	29	139.4		21	144.7		42	111.9	24	128.0
Worst x Best	32	141.3		21	146.8		43	119.6	28	121.1
Best x Worst	37	136.9		36	143.1		41	129.2	50	125.9
Best x Best	17	129.5		31	137.3		20	114.8	44	106.5

TABLE II.

Egg Production at 72 Weeks of Age of Same Number of Pullets Selected According to Classification on Either Physical Appearance or Egg Records.

Year of Hatch	Pullets Selected No.	* λ %	Classification by Appearance	Eggs	Classification by Records	Eggs	Control Flock Eggs
1953	31	43.6	Best	123.5	Best	146.9	126.6
	28	39.4	Worst	120.9	Worst	89.8	
1954	31	20.7	Best	145.0	Best	166.9	136.1
	28	18.7	Worst	113.4	Worst	88.6	

* λ Representing upper or lower fractions of classified flock.

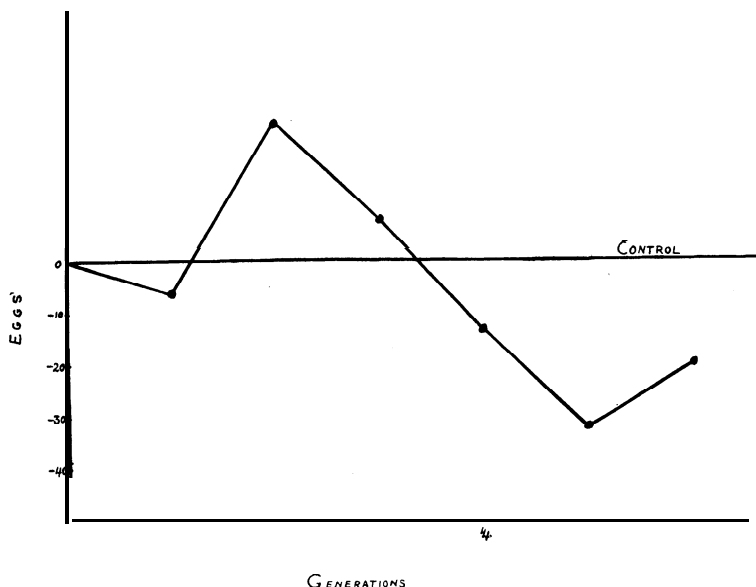


FIG. 1—The effect of individual selection for physical appearance on egg production of 6 generations of survivors up to 72 weeks. Egg production data expressed as deviations from an unselected control flock. All data corrected for effect of inbreeding by adding 1 egg for each per cent. of coefficient of inbreeding (F).

The selection of parents by physical appearance can, obviously, improve egg production only if a pullet's annual egg production could be estimated from its physical appearance. Though it is known that extremely poor or non-layers can be culled from a flock by their appearance and "handling qualities," no correlation between appearance and number of eggs has ever been established after these obviously sub-normal birds have been eliminated.

This was confirmed in the present investigation. In the first experiment the 50 dams with offspring produced 24.3 eggs above the uncultured flock average of 241 pullets, but 20.6 eggs below the same number of hypothetical dams if selection had been based on individual egg records. Similar results, as shown in Table 2, were obtained in the second series of experiments.

In conclusion, both series of experiments clearly confirm that selection on physical appearance is ineffective in changing an established level of egg production.

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