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SIGN OF HETEROSIS WITHIN A POPULATION FAYOUMI CHICKEN

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Two strains of chicken originated from a Fayoumi flock namely "production strain" and a "growth strain", were crossed in order to test heterosis with regards to hatchability percentage and early body weight at 8 weeks of age.

Overdominance was found important in the former trait, and dominance was significant in the latter. The degree of heterosis caused by paternal and maternal effects were about equal with respect to the both traits studied.

For the maximum degree of heterosis most of the practical breeders believe that it is from the crosses of divergent origin, but Dobzhansky and Levene (1951) on drosophila threw doubt on that. They found that heterosis can be a result of co-adaptive of analogous chromosome segments of unlike genetic contents which exist in the population. So, one may expect heterosis in crosses between lines derived from the same population.

Warren (1930) reported that crosses between strains of white Leghorn chickens produced offspring that were in some respect superior to the pure progeny. Hutt and Cole (1952), crossed two strains of W. Leghorn found that the cross was better in hatchability, egg production, bigger in egg size earlier at sexual maturity than the pure strains. The work of Nordskog and Ghostley (1954) indicated also that the crosses between strains within different breeds of chicken showed heterosis.

In this study an attempt has been made to test the crosses between twn different strains originated from a Fayoumi flock namely a "productioo strain" and a "growth strain". Ha' chability percentage and body weight at 8 weeks of age were the traits studied at the beginning of the experiments.

Material and Methods

The chickens used in these experiments were taken from two strains. One strain (denoted as P) was selected for high egg number for seven generations and the other strain (denoted as G) was selected for high body weight at 8 weeks of age. After these periods of selection the two strains have become two different genetic make-up. The two strains were crossed as followed :

Pen.1.	G × G	4 males × 35 females	(Pure strain G)
Pen.2.	P × P	4 males × 35 females	(Pure strain P)
Pen.3.	G × P	4 males × 35 females	(Cross, G as males)
Pen.4.	P × G	4 males × 35 females	(Cross, P as males)

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The experiments lasted 16 weeks (December to March) and after seven weeks the males in each pen were shifted by other 4 males in order to reduce "male effect." The total number of the eggs set were 5112 eggs - 1033 eggs for (G × G), 1682 eggs for (P × P), 1521 eggs for (G × P) and 876 eggs for (P × G). There were 16 hatches and the chicks were weighed at 8 weeks of age in the last five hatches. The total number of the chicks weighed were 1450 chicks - 405 chicks for (G × G), 397 chicks for (P × P), 353 chicks for (G × P) and 313 chicks for (P × G).

TABLE 1.—HATCHABILITY PERCENTAGE FROM ALL EGGS

	(1) G × G	(2) P × P	(3) G × P	(4) P × G	Average
December . . .	66.3	76.6	84.4	82.1	77.4
January	74.3	71.4	86.3	81.1	78.6
February	70.6	70.0	76.2	80.4	74.3
March	69.4	77.7	78.4	77.0	75.6
Average . .	70.2	73.9	81.7	80.2	76.5

TABLE 2.—BODY WEIGHT AT 8 WEEKS OF AGE (GRAMS)

	(1) G×G	(2) P×P	(3) Average (1)+(2)	(4) G×P	(5) P×G
(1)	479.0	358.1	418.6	442.4	431.7
(2)	534.5	376.3	455.4	498.0	501.5
(3)	477.4	338.2	417.8	466.6	429.5
(4)	568.4	457.5	512.9	498.0	548.5
(5)	634.2	462.8	548.5	532.5	544.6
Average . .	542.7	398.6	470.7	487.5	491.2

TABLE 3.—THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN CROSSES

	Hatchability Percentage (%)				8-wk. Body Wt. (gm.)		
	3—1	4—1	3—2	4—2	Hatch no.	4—3	5—3
Dec. . . .	18.1	15.8	7.8	5.5	(1)	23.8	13.1
Jan. . . .	11.8	6.6	14.9	9.7	(2)	42.6	46.1
Feb . . .	5.6	9.8	6.2	10.4	(3)	48.8	11.7
March . .	9.0	7.6	0.7	-0.7	(4)	-14.9	35.6
					(5)	-16.9	-3.9
Average	11.1*	10.0*	7.4*	6.3*		16.8*	20.5*

* The difference is statistically significant (at 1%).

Results and Discussion

Table 1 shows the hatchability percentage from all eggs set for the different treatments. Each figure represents the average hatchability percentage of the four hatches in the month. It is clear from this table that the total average of the cross (G × P) and the reciprocal cross (P × G) are significantly higher than the two parent strains (G) and (P). The two crosses are nearly equal with this respect. The same observation can be seen in the samples taken in different months. This indicatess that "overdominance" played a considerable part in these crosses.

Table 2 shows the average body weight at 8 weeks of age for the different treatments in 5 consecutive hatches from the 1st of March to the 4th of April. It can be seen that the total average weight of the cross (G × P) and the reciprocal (P × G) are significantly larger than the intermediate weight (460.9 gm) between the average of the two parent strains (G) and (P). There is insignificant difference between the two crosses. This suggests that dominant deviation is important in such crosses.

The results of these experiments in the Fayoumi strains support the work of Hutt and Cole (1952) and Nordskog and Ghostley (1954) using strains from other breeds and provide evidence to the importance of "heterosis" due to the crosses between strains within a particular flock of chicken.

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دلائل قوة الهجين فى قطيع من الدجاج الفيومى

للدكتور محمد على فتح الباب الحصرى

الملخص

خلطت سلالتان احدهما لانتاج البيض والأخرى لسرعة النمو ، استنبطنا من قطيع للدجاج الفيومى بمحطة تربية الدواجن بالفيوم . وذلك لدراسة قوة الهجين الناتجة عن هذا الخلط بالنسبة لصفتين هما : التفريخ ووزن الجسم فى عمر ثمانية أسابيع .

وقد دلت النتائج على أن « السيادة الزائدة » لها دور فعال بالنسبة للصفة الأولى « والسيادة التامة » مهمة بالنسبة للصفة الثانية . كما وجد ان الأبوين يؤثران تأثيرا متساويا تقريبا فى الأفراد الناتجة من هذا الخلط .

من ذلك نرى أن التفاعلات الجينية تلعب دورا مهما فى هاتين الصفتين داخل هذا القطيع .