

THE EFFECT OF CROSSING ON THE PRODUCTIVITY OF DUCKS

III.—ON EGG PRODUCTION

By

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This work was carried out on two pure bred groups of ducks: Pekin and Khaki-Campbell and their two reciprocal crosses during the seasons 1965-1967. Egg weight and number were studied in the four groups of ducks using a total of 78 ducks. The egg components, (Yolk weight and percentage, albumen weight and percentage, shell weight and percentage and shell thickness) were also studied using 400 hundred eggs, representing the four groups. The main results arrived at in the study were as follows:

1. The Pekin breed reached sexual maturity at the latest age (206.31 days) and the K breed was the earliest (151.31 days). The crossbred reached sexual maturity almost in the mid point between the purebred (174.98 days for KP and 179.38 days for PK) and the differences between the 2 reciprocal crosses were insignificant.
2. The number of eggs produced by P was the lowest among the groups studied (41.0 egg) and Khaki-Campbell produced the highest (71.5 eggs). The production of the crossbreds was between the 2 purebreds.
3. The average weight of egg for Pekin was the highest (70.24 grams) and for Khaki-Campbell was the lowest (58.55 grams). The egg weight of crossbreds was in between these two figures.
4. The albumen weight was higher in P eggs than in K (37.95 vs. 34.13 grams). The two reciprocal crosses showed almost the same albumen weight (36.51 and 35.53 grams for KP and PK).
5. The yolk weight was higher in P eggs than in K (25.88 vs. 19.80 grams). The two crosses were in between the values of their parental breeds (24.34 grams for KP and 22.08 grams for PK).
6. The shell weight was higher in P and KP PK than in K and PK (6.33, 6.37, 5.96 and 5.63 grams for P, KP, PK and K respectively).
7. The shell thickness was .347, .395, .366 and .338 millimeter for P, KP, PK and K respectively.

The increasing of egg number of ducks is of major importance to duck raisers as it is the pathway for increasing fecundity and number of ducks raised for meat production. In this work, an attempt was done to study egg production characters of crosses between meat and egg producing breeds of ducks. Dahnovskii (1961) working on crosses between Pekin and Ukrianian White, Ukrianian Grey, and Horn et al (1952) working on crosses between Muscovy and Hungarian White found that crossbred ducklings matured earlier than both purebred parents. Pop and Georgescu (1964) found the average egg production of the crossbreds between Pekin and Khaki-Campbell in the first years to be 104.6 and 103.5 respectively, and those were higher than the production of both parents. Stasko and Mardiak (1963) found

that egg production was lower for the Pekin breed than the Khaki-Campbell and the reciprocal crosses, and these produced almost the same number of eggs as did the Khaki-Campbell. Sommerfeld (1965), found that birds hatching in April and May laid more eggs than those hatched later in June. The average egg weight in ducks is effected by the date of hatch. Birds hatching in April to June laid heavier eggs than those hatching in December, Sommerfeld(1965).

Materials and Methods

On December 1965 the following matings were done using 15 drakes and 50 ducks in each: pure Pekin (P), Khaki-Campbell males X Pekin females (KP), Pekin males X Khaki-Campbell females (PK) and pure Khaki-Campbell (K). The hatched ducklings were reared in floor brooder till the twelfth weeks of age. When they were transferred to the houses of adult ducks. Mature birds were given a ration consisting of 25% corn, 25% rice bran, 10% wheat, 5% broad beans, 25% wheat bran, 10% cotton seed meal. The ration of the ducklings consisted of 25% corn, 25% rice bran, 10% wheat, 10% broad beans, 25% wheat bran, 5% cotton seed meal. Both rations were supplemented with 1.5% lime stone, 1% sodium chloride, 0.1% Terramycin, 0.2% Vitamin A+D₃ and 3% skim milk or fish meal. The mash was mixed with skim milk when offered to the ducklings at the brooding stage. Green fodder was supplied as Egyptian clover in winter and green corn leaves in Summer. The numbers of ducks used for studying age at sexual maturity, egg production and egg weight were 19 P, 19 K, 19 PK and 21 KP. These ducks come out of the 3 hatches that occurred during April 1966. Ducks were bedded in cages until 9 O'Clock in the morning when eggs were collected and recorded. This was done till the age of 300 days. Eggs were weighed at the same day of laying to the nearest gram. One hundred eggs out of each group was used to study the egg component. Each egg was weighed then broken to test its components by the same method used by Hafez et al (1955). Yolks were freed from albumen and chalaza and weighed. Shells were cleared to remove the remains of albumen then weighed with the two shell membranes. The weight of albumen was calculated by difference. Shell thickness was measured to the nearest 0.01 millimeter. Analysis of variance was done to that the differences in the results.

Results and Discussion

Sexual Maturity:

The attainment of sexual maturity occurs at a certain age when body weight reaches a certain threshold which varies from one breed to another. The age at sexual maturity for the groups of ducks studied are shown in Table (1). It is observed that the Pekin group reached sexual maturity at the latest age among all the groups. The K group was the earliest in this

respect, while the crossbreds were intermediate between the two purebred groups. Mostageer and Kamar (1962) found in chickens that the crossbreds were intermediate in age at sexual maturity between the two parental breeds. King and Henderson (1954) observed no maternal effect in sexual maturity of chickens. There was no significant difference between the 2 reciprocal crossbred groups, but a highly significant difference was observed between the purebred groups.

Egg Number :

The egg yield per bird was calculated from the first egg till the 300th day of age. The P gave the lowest production (41.0 eggs) while the highest yield was attained by the K (71.5 eggs). The crossbreds gave production in between the two purebreds, although K P had a higher production compared to its reciprocal cross. However, this difference proved to be insignificant. Egg production index as measured from the first egg till a fixed age is very liable to be affected by sexual maturity. Thus the foregoing results may be due to the restriction of the production period till a certain age, so that the birds laying earlier had a higher opportunity to lay more. The production percentage may then show the other side of the picture. This criterion (i.e. the production percentage) showed that the K P ranked the first followed by K, KP and P. (53.27%, 48.03, 46.09% and 43.76% respectively.

TABLE I.—EGG PRODUCTION CHARACTERISTICS

Breeds and Crosses	Average age at Sexual maturity (days)	Average body wt. at sexual maturity (kg)	Egg number to 300 days of age	Production percent*	Average wt. of egg till 300 days (grams)	Mass of egg produced (kg)
P	206.31	2.320	41.0	43.76	70.24	2.880
KP	174.98	1.953	66.6	53.27	66.80	4.449
PK	179.38	1.856	55.6	46.09	61.66	3.428
K	151.31	1.572	71.5	48.03	58.55	4.186

* Number of egg laid till 300 days.

The production interval in days.

TABLE 2.—F. VALUES FOR EGG PRODUCTION CHARACTERS

Source of variance	d.f.	age at sexual maturity	weight of first egg	egg numbers	egg weight
Error	72	—	—	—	—
Between hatches	2	6.25**	2.39 NS	1.43 NS	16.44**
Within hatches	3	—	—	—	—
a) Between P & K mothers	1	45.19**	9.45**	8.78**	84.48**
Between P & KP mothers	1	75.65**	17.93**	43.42**	13.52**
Between K & PK mothers	1	18.49**	.08 NS	4.22**	14.80**
b) Between purebreds and cross bred	1	9.32**	2.71 NS	5.63*	25.89**
Between purebreds	1	127.69**	24.49**	43.11**	40.67**
Between crossbreds	1	2.32 NS	.29 NS	3.33 NS	46.25**

* Significant (at 5% level).

** Highly significant (at 1% level).

NS: Not significant.

Egg Weight:

Comparing the average egg weight in the four groups of birds, it was found that the highest average was that of the P while the lowest was that of the K with the two crossbreds in between (Table 1). Sabalina (1963) found that crosses in chickens had intermediate egg weight between their parental breeds. A clear maternal effect is shown between the two reciprocal crosses. Similar results were observed by Mostageer (1958) in chicken. However, King and Brunkner (1953) suggested that sex linkage is a factor in the inheritance of egg weight in chickens. While Robert et al (1952) inferred that egg weight in chickens is influenced by several genes without dominance, and males are equal in determining egg weight and found no evidence of sex linked genes.

Egg Components :

Table(3) shows the mean weights of the egg components with their percentage, and the shell thickness. Significant differences between the two purebred groups were observed in all the egg components and shell thickness, indicating distinct breed differences, but no significant differences were observed between the reciprocal crosses (Table 4).

The mean weights of the albumen for the reciprocal crosses were intermediate between those of the two purebred groups and higher than the mean albumen weight of the K. The percentage of albumen in P K was higher than in K P, this last value was the lowest among the breeds and crosses studied. A maternal effect may be observed with regard to the two reciprocal crosses. It may be worth noting here that most of the maternal influence observed in egg size is manifested in the weights of the egg white.

The yolk weight was higher in P than in K, which had the lowest value. The yolk weight of the crosses was in between the values of their parental breeds with a clear maternal effect. The same trend is noticed also in yolk percentage.

The shell weight was significantly higher in P than K, and in KP than in PK. The percentage of shell was highest in KP followed by K, PK and P.

The shell thickness, one of the important characters in the egg producing strains, was significantly higher in KP than in the reciprocal crosses. The differences between the two purebred groups proved to be insignificant (Table 4). The two crosses showed higher shell thickness than both the parental groups. Trail (1963) found in chickens that shell thickness for crosses were significantly higher than the purebreds. While Mostageer (1958), observed that the thickness of shells of the crossbreds were intermediate between the parental breeds and paternal effect was also clear in the Rhode Island Red Fayoumi crosses.

TABLE 3.—AVERAGE WEIGHT AND PERCENTAGE OF EGG COMPONENTS

Breeds and crosses	Egg weight (grams)	Albumen weight (grams)	Alb. %	Yolk weight (grams)	Yolk %	Shell weight (grams)	Shell %	Shell thickness (1/100mm)
P.	70.16	37.95	54.1	25.88	36.8	6.33	9.1	34.7
K.P.	66.82	36.51	53.9	24.34	36.4	6.37	9.7	39.5
P.K.	63.57	35.53	55.9	22.08	34.7	5.96	9.4	36.6
K	59.66	34.13	57.3	19.80	33.2	5.63	9.5	33.8

TABLE 4.—F. VALUES FOR EGG COMPONENTS

Source of variance	d.f.	Albumen weight	Yolk weight	Shell weight	Shell thickness
Between purebreds and crossbreds.	1	0.30 NS	0.34 NS	11.93**	195.17**
Between the 2 purebreds	1	27.60**	288.59**	49.69**	5.99*
Between the 2 crossbreds	1	0.56 NS	21.38**	26.95**	54.9**
Error	396	—	—	—	—

* Significant (at 5% level);

** Highly significant (at 1% level);

NS : Not significant:

Practical Application

From the practical point of view ; the results of this study, with respect to using ducks for meat production , could be presented in a different manner, by comparing the live weight mass of ducklings to be marketed at the twelfth week of age from each of the four groups studied, and the costs of its production. This will not be attempted for egg production since the efficiency of feed utilization was not calculated in this respect.

Let us assume that we rear 100ducks of each of the four matings studied. The results obtained in this study indicate that we are to expect to set for incubation 26 eggs in each of the two matings P and KP and 48 eggs in both K and PK matings daily. According to percentages of hatchability obtained in this study the numbers of ducklings expected to hatch will be 13.34, 14.37, 24.96 and 23.04 for P, KP, PK and K respectively. The numbers of ducklings alive at the age of twelve weeks, using the actual figures of mortality rate observed in the present work are expected to be 10.54, 10.06, 17.47 and 15.90 for the four breeds and crosses with the above mentioned respective order. Multiplying these figures by the corresponding average weight of ducklings at twelve weeks of age we get the actual mass of weight produced for marketing. This will be 20.39 kgs for P, 18.02 for KP, 30.94 kgs for PK and 21.72 kgs for K. The total marketing weight produced is shown to be the highest for the PK crossbreds. If we assume the price of the Kilogram of live weight to be 25 paisters, the price (in piasters) of the amount of live weight produced will be 510 ; 450, 773 and 543 for P,KP, PK and K respectively. The actual amount of food consumed by the birds to produce the above mentioned weights are 91.66 kgs for P, 91.37 kgs for KP, 151.78 for PK and 60.40 kgs for K. The prices (in piasters) of these amounts of food for these breeds and cross in the same respective order (assuming that the kilogram of the ducks ration costs

3.5 (piasters) will be 321, 320, 531 and 211. Thus the differences (in piasters) between the prices of the ducks produced at twelve weeks of age and the price of the food consumed till that age are 189, 130, 242 and 332 for P, KP, PK and K respectively. The K breed ranked the first followed by the PK.

For the small private farms it may then be advisable to use the pure K rather than the crosses, the aim being the highest gain. In the big Governmental farms, however, the mass of ducklings produced for marketing, and not the net income, is the first goal sought. The PK crosses seems then to be the ideal one, since, compared to the pure K, the same number of mothers will produce more live weights for marketing of the cross bred ducklings than it will give if producing pure K (in fact 150% more).

REFERENCES

- DAHNOVSEKH, N.V., (1961).—Hybrid ducks. *Pticevodstvo*, **11** (10): 24-26. (*A.B.A.*, **30**: 517. (1962).
- HAFIZ, E.S.E., BADELDIN, A.L. AND KAMAR, G.A.R., (1955).—Egg components in the Fayoumi fowls during the first laying year. *Poult. Sci.*, **34**: 400-410.
- HORN, A., GERENCER, V. AND TOT, G.S., (1952).—Highly productive interspecific duck hybrids. *Acta, Agron. Hung.*, **2** (1): 131-148. (*A.B.A.*, **21**: 1443- (1952).
- KAMAR, G.A.R. AND MOSTAGGER, A., (1963).—Efficiency of feed utilization by purebred and crossbred broilers in the subtropics. *The Empire J. of Exp. Agric.*, **31**: 19-26.
- KING, S. AND BRUCHNERO (1953).—A comparative analysis of purebred and crossbred poultry. *Poult. Sci.*, **31**: 1030-1036.
- MOSTAGGER, A., (1958).—Some economical characteristics in different breeds and crosses of the fowl. *M. Sc. Thesis, Cairo University*.
- MOSTAGGER, A. AND KAMAR, G.A.R. (1962).—On the inheritance of egg weight. *Poult. Sci.*, **40**: 857-860.
- POP, M. AND GEORGESOU, (1964).—Aspects of the productivity of Pekin × Khaki Campbell crossbreds. *Rev. Zootech Med. Vet. (Bucaresti)* **14** (5): 34-43 (*A.B.A.*, **32**: 3385, (1964).
- ROBERTS, L. E. CARD, W.E., SHAKIER AND WATERS, N.F. (1952).—Inheritance of egg weight. *Poult. Sci.*, **31**: 870-875.
- SABALINA, A., (1963).—The growth and development of crossbred chickens from faverolles and black shumens. *Izv. Inst. Zivahn. "G. Dimitrov" Kostinbrod*. **18**: 95-106. (*A.B.A.*, **32**: 2394, (1964).
- SOMMERFELD, W., (1965).—The effects of different hatching times on growth, egg production and fertility in American Pekin ducks. *K Arch. Getuglez., Kleintierk.*, **14**: 275-290. (*A.B.A.*, **34**: 2501- (1966).
- STASKO, J. AND MARDIAK, J., (1963).—Retational crossbreeding with Pekin and Khaki-Campbell ducks II. sexual maturity and egg production. *Zivocinska Vyroba*, **8** (36): 343-352 (*A.B.A.*, **32**: 556, (1964).
- TRAIL, J.C.M. (1963).—Upgrading the indigenous poultry of Uganda. III. Shell egg end inter quality. IV. Egg production. *J. Agric. Sci.*, **60**: 221-224, 225-227.

تأثير الخلط على إنتاج البط

٣ - إنتاج البيض

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الملخص

اجريت هذه التجربة على نوعين من البط هي البكين والكاكي كامبل والخليط بينهما في المدة من ١٩٦٥-١٩٦٧ وشملت الدراسة للأربع مجموعات وزن وعدد البيض مستخدمين عدد ٧٨ بطة . وللدراسة مكونات البيضة (الصفار ونسبته المثوية والبياض ونسبته المثوية والقشرة ونسبتها المثوية وسمك القشرة) استخدم مائة بيضة لكل مجموعة وكانت أهم النتائج المتوصل اليها هي :

١ - بالنسبة لعمر النضج الجنسي كان البكين يصل الى النضج الجنسي متأخرا (٢٠٦ر٣١ يوم) والكاكي كامبل ينضج جنسيا على عمر مبكر (١٥١ر٣١ يوم) ويصل الخليط الى النضج الجنسي على عمر متوسط بين كلا الأبوين (١٧٤ر٩٨ يوم بالنسبة لخليط الكاكي كامبل × البكين ، ١٧٩ر٣٨ يوم بالنسبة لخليط البكين × الكاكي كامبل) وكانت الفروقا بين نوعي الخليط غير معنوية احصائيا .

٢ - كان عدد البيض الناتج من البكين حتى عمر ٣٠٠ يوم من الفقس أقل عددا مقارنة بالمجموعات الأربعة (٤١٠ بيضة) وبالنسبة للكاكي كامبل أعلى عددا (٧١٥ بيضة) وكان إنتاج البيض بالنسبة للخليط متوسط بين نوعي الأباء .

٣ - كان وزن البيضة بالنسبة لمجموعة البكين أعلى وزنا مقارنة بالمجموعات الأخرى (٧٠٢٤ر٧٠٢٤ جرام) وبالنسبة للكاكي كامبل أقل المجموعات (٥٨٥٥ر٥٨٥٥ جرام) وكان وزن البيضة بالنسبة للخليط يعطى صورة وسط بين الأبوين .

٤ - كان وزن البياض عند دراسة مكونات البيضة بالنسبة للبكين أعلى منه مقارنة بالكاكي كامبل (٣٧٦٠ - ٣٤١٣ جرام بالنسبة للبكين والكاكي كامبل على التوالي) والخليط كان يعطى وزناً من البياض متساوياً لنوعى الخليط .

٥ - بالنسبة لوزن الصفار كان فى البكين أعلى منه فى الكاكي كامبل (٢٥٨٨ - ١٩٨٠ جرام بالنسبة للبكين والكاكي كامبل على التوالي) وكان وزن الصفار فى الخليط وسط بين الأبوين (٢٤٣٤ جرام لخليط الكاكي كامبل × البكين ٢٢٠٨٤ جرام بالنسبة لخليط البكين × الكاكي كامبل .

٦ - بمقارنة وزن القشرة بالنسبة للبيض الناتج من البكين وخليط الكاكي كامبل × البكين كان أعلى منه بالنسبة لنوعى الكاكي كامبل وخليط البكين × الكاكي كامبل (٦٣٣ - ٦٢٢ - ٥٩٦ - ٥٦٣ جرام بالنسبة للبكين وخليط الكاكي كامبل × البكين وخليط البكين × الكاكي كامبل والكاكي كامبل على التوالي) .

٧ - سمك القشرة كان (٣٤٧ - ٣٩٥ - ٣٦٦ - ٣٣٨ ر من المليمتر بالنسبة للبكين - خليط الكاكي كامبل × البكين - خليط البكين × الكاكي كامبل - الكاكي كامبل على التوالي) .