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Effect of Crossing on Different Meat Characteris tics of Fayoumi Chicks. I — Body Weight and Related Characteristics

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TWO-SELECTED strains of Fayoumis were crossed to obtain the reciprocal crosses and the pure strains. One strain was selected for high 8-week body weight (GG). The other was selected for increased egg number (PP). Body weights, at hatch, 4, 8, 10, 12, 14, and 16 weeks of age were obtained for the strains and crosses. Eight-week and 16-week shank length, keel length, and breast width were also studied. The blood, feather, and dressing percentages of the different strains and crosses were evaluated. The carcass quality and meat of the leg and breast parts were also assessed. Results indicated the superiority of the GG strain and the cross with the GG females. The Fayoumis had more meat in their legs than their breast.

Several investigations have been carried out to study the Fayoumi chicken. However, little has been published concerning its carcass characteristics. Kamar and Mostageer (1960), Amer (1956), El-Houssari (1967), Ezzeldin (1970) and Abdel-Gawad and El-Ibiary (1971) studied the body weights and dimensions of different Fayoumi flocks at different ages. Ragab and El-Hossari (1970) selected 2 strains of Fayoumi. One was selected for high body weight at 8 weeks of age (GG); the other was selected for high egg number (PP). El-Hossari (1970a), Abdel-Wares (1976), Dourgham (1980) and Hataba (1980) reported higher body weights for these strains and their reciprocal crosses than for any of the other Fayoumi flocks in Egypt.

The GG and PP strains, their reciprocal crosses, and an unselected population of Fayoumi chicks (RR) were used in this experiment. The purpose of this investigation was to study the effect of crossing on meat characteristics of Fayoumi chickens.

Material and Methods

This experiment was carried out at the Fayoum Poultry Research Station, Agriculture Research Centre, Ministry of Agriculture, Egypt. Thirty-six sires were used in this study : 13 sires from each of the GG and PP strains and 10 randombred sires. Each of the GG and PP sires was individually mated to 6 GG dams and 6 PP dams to get the pure strains and their reciprocal crosses (the GP cross : GG moles × PP females, and the PG cross : PP males × GG females). The RR sires were individually mated to 7 RR dams. Pedigreed eggs were collected daily for 10 days and were incubated in an Econome-type incubator.

At hatch all chicks were wing-banded to maintain their pedigree. The chicks were reared in 8-floor brooders from hatch until 14 weeks of age; thereafter they were reared in 3 rearing houses. The progeny of each sire genotype were randomly assigned to every brooder. The chicks received continuous light from hatch until 14 weeks of age. They received *ad libitum* starter diet containing 22% protein and 2900 K Cal/kg ME up to 12 weeks of age. Then they received a finisher diet containing 18% protein and 2900 K Cal/kg ME thereafter. All management practices were the same as far as possible for all the brooders and rearing houses.

All chicks were weighed to the nearest gram at hatch and to the nearest 5 g at 4, 8, 12, 14, and 16 weeks of age. At 8 and 16 weeks the breast width, keel length, and shank length were measured in millimeters on all birds.

At 16 weeks of age, all the males and 4 females from the progeny of each sire genotype were slaughtered for carcass evaluation. The weights of the chosen females for each sire were the nearest to the mean weights of the progeny of that sire. The birds were deprived of feed overnight before slaughtering; then they were weighed individually. They were slaughtered by cutting the gullets and the jugular veins between the first and second vertebrae without separating the heads from the bodies. The birds were reweighed after bleeding to obtain the blood weights. Feathers were removed manually after scalding the birds. The birds were then weighed to obtain the feather weights. The heads, necks, shanks, and visceras were removed. Weights of the eviscerated

carcasses excluding the necks and the giblets were obtained. Edible giblets, including the necks, hearts, livers, and gizzards for every bird were weighed together.

Four male carcasses from the progeny of each sire genotype were chosen for further carcass studies. The weights of the males for each sire were the nearest to the mean weights of male progeny of that sire genotype. The meat (skin and muscles) of the left side of the breast and of the left wings were weighed together for each carcass to estimate the meat of the breasts. The meat of the left legs was also weighed to estimate the meat of the legs.

The means of all traits studied were obtained using the least squares method of Harvey (1960). The separation of means was carried out according to Duncan (1955).

Results and Discussion

Body weights

1. *Hatch weight*

There was no significant difference between hatch weights of the males and females in any group. However, there were highly significant differences between the hatch weights of the different strains and crosses (Table 1). The RR had the highest body hatch weights due to the fact that the RR females were older than the other females. Embryonic development heterosis was apparent in the crosses. Similar observations were reported by Singh *et al.* (1974); Stino (1974) and Hataba (1980).

2. *Four-week body weight*

There was a highly significant sexual dimorphism in body weights at 4 weeks of age and thereafter for all strains and crosses (Table 1). There was no significant difference between the average body weights of the GG strain and the PG cross. The PG cross was significantly heavier than its reciprocal cross GP. This indicates the magnitude of the dam effect in the PG cross.

Table 1 • Least square means ± S.E. for body weights of the different strains and their reciprocal crosses (in grams).

Trait	Sex	GG	GP	PG	PP	RR
No. of individuals	Males	125	103	141	155	140
	Females	156	131	148	119	164
Hatch weight	Males	29.9±00.3 b*	26.9±00.3 c	31.1±00.2 a	26.1±00.2 c	31.2±00.3 a
	Females	29.8±00.2 b	27.4±00.2 c	31.4±00.2 a	25.7±00.2 d	30.7±00.2 a
4-week weight	Males	254.5±02.8 a**	238.9±03.1 b	255.7±02.6 a	223.2±02.5 c	237.4±02.6 b
	Females	238.7±02.1 a	219.1±02.3 b	233.3±02.2 a	206.8±02.4 c	213.0±02.0 bc
8-week weight	Males	641.6±07.3 a	596.5±08.1 b	638.7±06.9 a	543.3±06.6 c	583.4±06.9 b
	Females	572.4±05.3 a	512.9±05.7 c	549.9±05.4 b	480.3±06.0 d	506.2±05.1 c
10-week weight	Males	871.6±10.3 a	801.1±11.3 b	864.5±09.7 a	734.3±09.2 c	786.6±09.7 b
	Females	749.0±06.9 a	661.9±07.5 c	715.8±07.0 b	615.5±07.9 d	654.9±06.7 c
12-week weight	Males	1114.6±11.9 a	1021.7±13.2 b	1091.8±11.3 a	918.3±10.8 c	1009.9±11.3 b
	Females	938.9±07.9 a	836.0±08.6 c	891.4±08.1 b	773.9±09.1 d	829.2±07.7 c
14-week weight	Males	1298.0±14.1 a	1181.1±15.5 b	1268.4±13.2 a	1058.3±12.6 c	1171.9±13.3 b
	Females	1056.9±09.1 a	932.7±09.9 c	994.5±09.4 b	854.1±10.5 d	922.7±08.9 c
16-week weight	Males	1394.3±15.2 a	1310.9±16.7 b	1358.2±14.3 ab	1196.0±13.7 c	1320.7±14.4 b
	Females	1149.6±09.7 a	1024.7±10.7 c	1070.9±10.0 b	953.8±11.2 d	1055.6±09.5 bc

* Values between strains within age and sex with different superscript differ significantly ($P \leq .01$) from each other (Duncan, 1955).

** Differences in body weight between males and females were statistically significant ($P \leq .01$) for all strains and crosses and for all ages except at hatch.

3. *Body weight at* 8, 10, 12, *and* 14 *weeks of age*

The average body weights of both males and females for all these ages had the same pattern (Table 1). There was no significant difference between the body weights of the males of the GG strain and the PG cross. However, in the females, there was a significant difference between them. This suggests the presence of some dominant sex-linked genes in the GG strain. The PG cross was significantly heavier than the GP cross. This would also suggest the presence of maternal, dominant, and/or non-additive genes affecting body weights in the GG strain. This is in agreement with El-Hossari (1970b), Abdel-Wares (1976), Dourgham (1980), and Hataba (1980), who used the same strains and crosses.

4. *Sixteen-week body weight*

At this age, the pattern that was present in body weights from 8 weeks of age was disrupted (Table 1). This might be due either to moving the birds from the brooders to the rearing houses or due to maturation. The GG showed the heaviest body weight, and the PP showed the lightest, while the PG and GP crosses and the RR were intermediate.

Shank length

There was a highly significant difference between the shank lengths of the males and females. The shank lengths of the GG strain were significantly longer than those of the PP strain (Table 2). The shank lengths of the PG cross males were similar to those of the GG strain. However, this relation was only apparent at 8 weeks of age for the females. This would suggest some sex-linked dominant genes associated with the GG strain in this trait. The cross GP was almost intermediate between both parents.

Keel length

There was a highly significant sexual dimorphis min keel lengths at 8 and 16 weeks of age for all strains and crosses. The differences between strains and crosses within the same sex were mostly the same at the two ages (Table 2). The keel length of

Table 2.- Least square means ± S.E. for shank length, keel length and breast width of the different strains and their reciprocal crosses (in millimeters).

Trait	Sex	GG	GP	PG	PP	RR
No. of individuals	Males	125	103	141	155	140
	Females	156	131	148	119	164
8-week shank length	Males	70.24±.34 ab*	69.23±.38 bc	70.91±.33 a	67.23±.31 d	68.91±.33 c
	Females	66.63±.26 a	65.44±.29 bc	66.23±.27 ab	63.85±.30 d	65.10±.25 c
16-week shank length	Males	96.50±.48 ab	94.88±.53 b	97.01±.45 a	90.94±.43 c	95.24±.45 b
	Females	83.13±.31 a	80.82±.34 b	81.95±.32 b	79.04±.35 c	81.22±.30 b
8-week keel length	Males	75.83±.41 a	72.83±.45 b	75.52±.39 a	69.88±.37 c	73.09±.39 b
	Females	72.20±.34 a	69.31±.37 b	70.14±.35 b	67.18±.39 c	69.72±.33 b
16-week keel length	Males	104.63±.52 a	100.77±.57 bc	102.52±.49 b	95.94±.47 d	100.64±.49 c
	Females	99.60±.44 a	95.33±.47 b	95.90±.45 b	91.14±.50 c	94.66±.42 b
8-week breast width	Males	20.18±.21 a	18.93±.24 b	20.10±.20 a	18.32±.19 b	18.87±.20 b
	Females	18.85±.17 a	17.75±.18 b	18.65±.17 a	16.97±.19 c	17.62±.16 bc
16-week breast width	Males	27.45±.26 b	27.05±.28 b	28.47±.24 a	27.11±.23 b	26.91±.24 b
	Females	26.75±.21 a	26.37±.22 ab	27.14±.21 a	25.65±.24 b	25.96±.20 b

* Values between strains within trait, age and sex with different superscript differ significantly (P≤.01) from each other (Duncan, 1955).

the reciprocal cross GP and PG were intermediate between their parents. This indicates that mostly additive genes control this trait. The randombred control (RR) keel lengths were also intermediate between the two pure strains.

Breast width

There was a highly significant difference between the breast widths of males and females at 8 and 16 weeks of age. There was no significant difference between the GG and PG breast widths in both sexes at 8 weeks of age and in the females at 16 weeks of age (Table 2). The breasts of the PG cross at 16 weeks of age were wider than those of both parents, indicating heterosis. There was a significant difference between the reciprocal crosses PG and GP in both sexes at the two ages. This would indicate the magnitude of the dam effect on breast widths.

Blood weight percentage

The females of all strains and crosses (except the RR) had significantly higher blood percentages than the males. There were no significant differences in blood percentages between the males of the different strains and crosses. However, the blood percentage of the RR females was significantly lower than that of any other strain or cross females (Table 3).

Feather weight percentage

The female feather percentages were significantly higher than those of the males for all the strains and crosses. This is due to their lighter body weights and similar feather weights to those of the males. The reciprocal cross males showed an apparent paternal effect in their feather percentages. However, the reciprocal cross females showed heterosis in their feather percentages (Table 3).

Dressing percentage

The dressing percentages of the Fayoumi birds were lower than those of any meat type breeds ,although the birds were 16

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Table 3.- Least square means ± S.E. for blood, feather, dressing, and edible parts percentages of the different strains and crosses at 16 weeks of age.

Trait	Sex	GG	GP	PG	PP	RR
No. of individuals	Males	124	101	141	150	138
	Females	49	51	52	50	40
Blood Weight %	Males	5.12±.06 a*	5.04±.07 a	5.21±.06 a	5.14±.05 a	5.26±.06 a
	Females	5.33±.11 a	5.54±.11 a	5.63±.11 a	5.36±.11 a	4.86±.12 b
Feather Weight %	Males	6.56±.10 ab	6.85±.11 a	6.22±.10 b	6.31±.09 b	6.55±.10 ab
	Females	7.37±.16 c	8.74±.16 a	8.45±.16 ab	8.06±.16 b	8.79±.18 a
Dressing Weight %	Males	58.42±.17 abc	57.96±.19 c	59.04±.16 a	58.29±.16 bc	58.71±.16 ab
	Females	58.97±.25 a	56.90±.24 b	58.07±.24 a	56.21±.25 b	58.61±.27 a
Edible parts Weight %	Males	68.13±.17 ab	68.05±.19 b	68.76±.16 a	68.27±.16 at	68.70±.16 ab
	Females	68.41±.25 a	66.75±.24 b	67.81±.24 a	65.90±.24 b	68.60±.27 a

* Values with different superscript within trait and sex differ significantly ($P \leq .01$) from each other (Duncan, 1955).

weeks of age. The male dressing percentages of the PP strain and its croses were significantly higher than those of the females. The GG strain females had higher dressing percentages than the males of the PP strain. The cross with the GG female parents had significantly higher dressing percentages than its reciprocal (Table 3). This indicates the presence of dam effect.

Edible parts weight percentage

This includes the carcasses and the edible giblets. Results were similar to those obtained for the dressing percentages (Table 3). The male edible parts percentages were significantly higher than those of the females. Data also indicated that the giblets (heart, gizzard, liver, and neck) constituted about 10% of the live body weight. The higher standard errors of the females were due to their fewer numbers.

Breast and leg meat

In general the legs of the Fayoumi male chickens had significantly more meat than the breast. The breast and leg meat of the GG strain were higher than those of any other strain (Table 4). The PP males had less meat than any other strain or cross. Crossing the GG and PP strains resulted in progenies with intermediate amounts of meatiness. However, the cross coming from the GG females showed heterosis and a considerable maternal effect.

The increase in meatiness of the GG males over the PP males is attributable to the different selection applied to the two populations. The randombred control line had intermediate amounts of meat between the two selected strains.

Table 4. Least square means ± S.E. of the breast and legs (in half the carcass) of the different strains and their reciprocal crosses of the Fayoumi males at 16 weeks of age.

Trait	GG	GP	PG	PP	RR
# of individuals	49	50	52	52	40
Breast meat (g)	$129.7 \pm 2.3^{a*}$	116.9 ± 2.3^{bc}	124.8 ± 2.2^{ab}	109.6 ± 2.2^{c}	120.7 ± 2.5^{ab}
Leg meat (g)	151.5 ± 2.6^{ab}	144.5 ± 2.6^{b}	155.2 ± 2.5^{a}	134.7 ± 2.5^{c}	145.8 ± 2.9^{ab}

*Values within parts with different superscript differ significantly ($P \leq .01$) from each other (Duncan, 1955).

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تأثير الخلط على صفات انتاج اللحم فى الدجاج الفيومى

١ ـ وزن الجسم والصفات المتعلقة به

فريد كمال رمزى استينو ، هانى محمد صبرى ، جمال الدين عبد الرحمن قمر ومحمد الحصرى .

كلية الزراعة ـ جامعة القاهرة

تم خلط ـ سلالتين من الدجاج الفيومى للحصول على الخلطان العكسية والسلالات النقية . كانت احد السلالتين منتخبة لزيادة وزن الجسم على عمر ٨ اسابيع (جج) . اما السلالة الاخرى فكانت منتخبة لزيادة عدد البيض (بب) وتم وزن جميع الخلطان والسلالات النقية على اعمار الفقس ـ ٤ اسابيع ـ ٨ اسابيع ـ ١٠ أسابيع ـ ١٢ أسبوع ـ ١٤ أسبوع ـ ١٦ أسبوع .

وتمت دراسة الصفات التالية على عمر ٨ أسابيع و ١٦ أسبوع : طول القدم ـ طول القص ـ عرض الصدر وكذلك ايضا تم تقدير نسبة الدم والريش ونسبة التصافى لجميع الخلطان والسلالات ـ كما تم تقدير صفات الذبيحة من حيث نسبة التصافى لكل من منطقة الصدر والافخاذ .

ولقد اثبتت النتائج تفوق السلالة (جج) وكذلك الخلطان الناتجة من امهات السلالة (جج) .

واثبتت النتائج ايضا ان كمية اللحم فى منطقة الافخاذ اكبر من كمية اللحم فى منطقة الصدر فى الدجاج الفيومى .