

Body Weight as Influenced by Sex and Hatching Time in Fayoumi and Rhode Island Red Chickens

A. Mostageer, G.A.R. Kamar, Z. Ezzeldin and A. Obeidah

Anim. Production Dept. Faculty of Agric., Cairo University, Cairo, Egypt.

THE PRESENT study was carried out at the poultry Breeding Farm, Faculty of Agriculture, Cairo University, to study the effect of hatching date and sex on both body weight and relative growth rate. The characters studied were body weight at hatch, 4, 8 and 12 weeks of age. The relative growth rates between these four were also studied.

Two breeding shifts were sought. Twenty groups of one male and five females, were used for each of the two breeds in the first shift. During the second shift each of the males was mated to five new females. The number of Fayoumi progeny used for analysis was 1821 (852 males and 969 females.) The number of Rhode Island Red was 1514 (554 males and 960 females). Data were corrected for hatch and sex effects, and the estimates were calculated from the data before and after correction. The main results obtained were summarized in the following :

1. The mean weight at hatch was 28.45 g. for mixed progeny in Fayoumi and 34.52 g. in Rhode Island Red. No apparent differences were obtained between sexes at this age in the two breeds.
2. The mean of body weight at 12 weeks of age was 510 g. for mixed progeny in Fayoumi and 453g. in Rhode Island Red. Differences between sexes increased by advanced of age and reached the value of 71.0 g. in Fayoumi and 97.2 g. in Rhode Island Red at 12 weeks of age.
3. The results are not in favour of the additional work of correcting data for hatch effect.
4. An early hatching season is recommended for Fayoumi, and a later one for Rhode Island Red.

Body weight and growth rate are the main characteristic sought by the broiler breeders. Body weight is generally agreed to be a highly heritable character, and the inheritance of rate of growth appears to be nearly as that of body weight. Besides the genetic factors, there are so many environmental conditions affecting these two characters such as, temperature, humidity, light, nutrition, date of hatch and maternal effects. This work was done to estimate the effect of hatch and sex on both body weight and growth rate on Fayoumi compared to Rhode Island Red a foreign breed introduced to Egypt.

In the northern hemisphere, the early hatched chicks in the season, namely, September and onwards, are expected to be faster in growth and to attain the heaviest body weights. The poorest growth and body weights were observed in the latest hatches, (Kempester, 1936 ; Lerner and Asmundson 1938; and Burovoi, 1941). Heywany (1947) ; Barrot and Prigle 1947 ; Bauman 1952) and Kotby (1958) found that November hatches were faster in growth than hatches of other months of the year. The differences between hatches increased and persisted up to 12 weeks of age in Fayoumi (Kotby 1958) and to 16 weeks of age in White Leghorn (Carber and Godfery, 1952). It may be concluded that chicks subjected to better environmental conditions at the beginning of their life continue to grow well in later ages. Ghany (1955) stated that growth rate till the fourth week of age was retarded in late hatched chicks as compared with early ones. Hafez and Kamar (1955) found that the average hatching weight in Fayoumi chickens was heavier in Spring hatches than in Winter ones, and the latter was heavier than Autumn and Summer hatches. The body weights throughout their experimental period were heavier in Summer hatches than those in spring ones, while those hatches in autumn and Winter showed intermediate weights. Hossari (1967) pointed out that chicks hatching during February showed marked increase in body weight over other hatches till 16 weeks of age. He also noticed that this effect was more obvious in males than in females.

Material and Methods

This work was done at the Poultry Breeding Farm, Faculty of Agric. Cairo University. Twenty groups, each of one male and five females, were used for each of Fayoumi and Rhode Island Red. Two shifts of five weekly hatches each, were obtained from the maining. The first shift was during Oct.-Dec. 1965 and the second shift with new females mates was within Jan.-Feb. 1966. Chicks were reared in floor brooders, and were given the normal ration in the farm. Chicks were weighted at hatch, 4, 8, and 12 weeks of age. Only the chicks surviving till 12 weeks of age were used for analysis. At this last age, chicks were differentiated according to sex. The actual number of Fayoumi dams producing progeny for analysis was 193, of which 176 produced males and 179 produced females. The comparable numbers for Rhode Island Red dams were 187, 163 and 182. Table I shows the symbols used in this study.

Relative growth rate between W_a and W_b was calculated as :

$$G_{ab} = \frac{2(W_b + W_a)}{W_a + W_b} \times 100, \text{ where}$$

W_a is the first weight and W_b is the second weight. Six such characters (shown in Table I together with the rest of the symbols in this work were calculated for each chick and used for analysis.

The correction for hatches effects were calculated as deviations from the least squares means. Data were transformed to deviation from hatch effects.

TABLE 1. Symbols used and their descriptions

Symbol	Description
Fay.	Fayoumi
R.I.R.	Rhode Island Red
M	Males uncorrected for hatch effect
F	Females uncorrected for hatch effect
MF	Males + Females uncorrected for hatch effect.
MC	Males corrected for hatch effect.
FC	Females corrected for hatch effect.
MFC	Males + Females corrected for hatch effect and for sex
W 1	Hatching weight
W 2	4-weeks weight
W 3	8-weeks weight
W 4	12-weeks weight
G 12	Relative growth rate between W1 and W2
G 13	Relative growth rate between W1 and W3
G 14	Relative growth rate between W1 and W4
G 23	Relative growth rate between W2 and W3
G 24	Relative growth rate between W2 and W4
G 34	Relative growth rate between W3 and W4

Data were transformed to deviation from hatch effects. When grouping to the two sexes, the data were corrected first for hatch effect and the correction for sex was then performed. Table 2 shows the number of progeny and the degrees of freedom for both sexes in the two breeds.

TABLE 2. Number of progeny and degrees of freedom.

Breed	No. of progeny	d.f.		
		Sire	Dam	Individual
<i>Fayoumi</i>				
M & MC	852	19	156	676
F & FC	969	19	159	790
MF & MFC . . .	1821	19	173	1628
<i>R.I.R.</i>				
M & MC	554	19	143	391
F & FC	960	19	162	778
MF & MFC . . .	1514	19	167	1327

TABLE 3. Mean values of the ten traits studied in Fayoumi

Groups characters	M	F	MF	MC	FC	MFC
W 1 (g)	28.431	28.483	28.459	28.578	28.578	28.536
W 2 (g)	132.198	121.125	126.306	129.074	119.801	119.185
W 3 (g)	316.150	284.656	299.338	309.360	280.272	280.457
W 4 (g)	548.656	477.612	510.852	547.039	483.480	485.397
G 12 (%)	125.360	120.076	122.548	125.630	121.026	119.827
G 13 (%)	165.424	162.057	163.632	165.112	161.921	161.805
G 14 (%)	179.251	176.565	177.769	179.531	177.135	176.789
G 23 (%)	82.371	80.853	81.563	81.932	79.983	80.692
G 24 (%)	121.794	118.639	120.115	123.254	120.424	119.996
G 34 (%)	53.508	50.406	51.857	55.569	53.422	53.076

Results and Discussion

The means of the absolute body weight and relative growth rate are shown in Table 3 for the Fayoum breed. It can be observed that there are no differences in the weights of chicks at hatch between the two sexes. In general, the mean was about 28.4 before correction. The mean of hatching weight after correction was a bit higher and showed the same values for both sexes (28.58 g). In the case of Rhode Island Red, it could be seen from Table 4 that no appreciable differences in hatching weights are present between the two sexes, before correction, although there is a tendency for the males progeny to assume heavier weights (about 0.5 g.) However, the means of hatching weight are much more higher than the corresponding figures for Fayoumi.

TABLE 4. Mean values of the ten traits studied in R.I.R.

Groups characters	M	F	MF	MC	FC	MFC
W 1 (gm)	34.778	34.375	34.521	34.917	34.437	34.435
W 2 (gm)	132.004	115.047	121.232	126.242	114.595	114.576
W 3 (gm)	300.117	251.851	269.488	288.768	248.995	248.936
W 4 (gm)	514.585	417.381	452.938	507.691	426.400	426.245
G 12 (%)	113.006	103.248	106.812	111.026	104.903	104.772
G 13 (%)	156.238	149.108	151.717	155.046	149.038	148.876
G 14 (%)	173.289	167.379	169.544	173.272	168.468	168.443
G 23 (%)	77.348	74.195	75.357	77.512	72.912	72.778
G 24 (%)	117.379	112.203	114.109	119.705	114.084	114.071
G 34 (%)	52.432	48.752	50.106	55.046	52.304	52.351

It is a well known fact that the hatching weight is highly correlated with the weight of the egg set (Jull and Quinn, 1931; Pope and Schaible, 1957; and Powell and Boumen, 1964). Thus the difference between the two breeds with respect to body weight at hatching could be attributed mainly to difference of the egg weight of these two breeds. Obeidah (1969) using the same flock found that the average egg weight of Fayoumi was 41.13 g while that of Rhode Island Red was 48.90 g.

Following the successive weights presented in Table (3 and 4) it could be seen that, the Fayoumi birds showed higher body weights compared to Rhode Island Red and the difference between breeds grows larger as the birds get older reaching the maximum difference at the age of 12 weeks. At this age the MF value for Rhode Island Red was 450 compared to 510 in Fayoumi.

However, other workers found that body weight at 12 weeks of age was higher in Rhode Island Red compared to Fayoumi breed. For instance, Mostageer (1958) reported values of about 460 g for Fayoumi and 480 g for Rhode Island Red, for body weight at twelve weeks of age. Also Nordskof and Phillips (1960) found that Fayoumi is much lower in weight than heavy and light breeds.

Males in both breeds were heavier than females at 4 weeks and the difference between sexes grew larger as the chicks advanced in age. Roberts (1964) using White Leghorn concluded that males in general weighted more than females from hatch to ten weeks of ages. Buvanendran (1969) Reported also that males are significantly heavier than females at this age (10 weeks).

Comparing the relative growth rate between any two weights (Tables 3,4), it can be seen that the values decreased as the difference between the two ages concerned increased and also with the advancement of age. It can also be noticed that the relative growth rates were generally higher in Fayoumi than in Rhode Island Red. The same observation was pointed out by Mostageer (1958) when comparing these two breeds. The growth rate of males was generally higher than that of females, and the figures obtained from MF showed intermediate values. Correction for hatch and sex showed no effect on the mean values of relative growth rate.

The effect of hatch on the four weights studied as differences for the mean are presented in Table 5 for Fayoumi and in Table 6 for Rhode Island Red. The first hatch was at the end of October and the last hatch was in March. It could be observed with respect to the hatching weight that the effect of the first 3 hatches is negative in all the birds studied. This may be a reflection of the weight of the dams producing the hatching eggs being young and smaller in weight and thus producing smaller eggs at this time of the year. With respect to the three other weights studied the picture is reversed. In fact it could be concluded that the first hatches are the best in case of W2 and W3 in Fayoumi. As for W4 in Fayoumi (weight at 12 weeks of age thus being the character sought first by the breeder) the first two hatches had the best results. In Rhode Island Red still the first 4 hatches are generally best in case of W2 and W3 with the addition of hatch 7 at the end of January. W4 had also good results in the first 2 hatches but the best hatch was the seventh though the 10th hatch assumed also considerable values above the mean in both sexes.

For practical application it could be concluded from the results presented that the last 4 hatches (from 7 till 10) may give the best results in Rhode Island Red compared to the first 6 hatches, i.e. a bit later hatching season may be recommended in Rhode Island Red chicks. In Fayoumi however the first 2 or 3 hatches are the best and at least the season of hatching should be as early as possible. These results in general confirm the general agreement between poultry raisers that the early hatches in the season give the best body weights and growth rates.

TABLE 5. The effect of hatch (g) on the four characters W₁, W₂, W₃ and W₄* in Fayoumi

	No. of chicks	W ₁	W ₂	W ₃	W ₄
<i>Males</i>					
Hatch 1 . . .	49	-2.415	10.314	43.191	176.941
Hatch 2 . . .	142	-2.712	8.095	61.379	116.412
Hatch 3 . . .	135	-0.453	46.445	35.084	-9.928
Hatch 4 . . .	78	0.947	5.414	16.216	-86.206
Hatch 5 . . .	116	0.982	-39.074	-34.102	-54.798
Hatch 6 . . .	43	0.305	-18.725	-52.267	-36.923
Hatch 7 . . .	65	0.360	-10.535	5.870	-27.424
Hatch 8 . . .	46	1.465	-8.530	-35.447	-41.170
Hatch 9 . . .	75	0.342	-1.807	-18.427	12.028
Hatch 10 . . .	103	1.179	-8.402	-21.496	48.932
<i>Females</i>					
Hatch 1 . . .	51	-2.481	7.945	30.904	157.500
Hatch 2 . . .	156	-3.027	3.917	48.606	81.648
Hatch 3 . . .	126	-0.452	41.311	37.387	-34.710
Hatch 4 . . .	90	0.799	7.588	16.172	-64.425
Hatch 5 . . .	123	1.576	-36.345	-21.492	-60.838
Hatch 6 . . .	62	0.486	-13.268	-41.966	-34.771
Hatch 7 . . .	91	0.465	-14.910	-9.723	-31.216
Hatch 8 . . .	54	1.421	-8.226	-25.642	18.742
Hatch 9 . . .	83	0.265	2.428	-17.923	11.399
Hatch 10 . . .	133	0.948	-9.560	16.325	-43.330

* Differences between hatches proved to be highly significant in all the four characters

TABLE 6. The effect of hatch (g) on the four characters W₁, W₂, W₃ and W₄* in R.I.R.

	No. of chicks	W ₁	W ₂	W ₃	W ₄
<i>Males</i>					
Hatch 1	18	-2.976	- 4.854	-0.990	88.975
Hatch 2	85	-3.674	6.052	53.821	72.544
Hatch 3	88	-0.591	34.780	21.346	-54.623
Hatch 4	43	1.149	0.967	0.767	-89.901
Hatch 5	44	0.716	-46.811	-41.495	-71.555
Hatch 6	24	1.454	- 9.992	-42.726	-55.817
Hatch 7	78	-0.087	11.770	61.489	104.296
Hatch 8	43	1.661	-12.289	-43.419	-13.157
Hatch 9	57	0.904	- 3.786	-23.066	-12.867
Hatch 10	74	1.944	24.163	14.273	32.106
<i>Females</i>					
Hatch 1	30	-1.368	7.610	22.564	122.256
Hatch 2	109	-3.435	5.994	56.523	82.012
Hatch 3	173	-0.788	23.681	7.047	-63.875
Hatch 4	76	0.275	- 1.728	9.288	-61.179
Hatch 5	142	0.593	-40.472	-27.985	-63.921
Hatch 6	41	0.906	- 7.849	-34.546	-42.098
Hatch 7	130	0.273	2.405	30.718	52.471
Hatch 8	73	0.784	- 6063	-40.854	-22.683
Hatch 9	80	1.402	- 1.994	-30.374	-19.994
Hatch 10	106	1.357	18.415	7.620	17.010

* Differences between hatches proved to be highly significant in all the four characters.

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تأثير ميعاد الفقس والجنس على وزن الجسم في الفيومي والروود أيلند

محمد مستجير ، جمال قمر ، زينب عز الدين وعلى عبيده
كلية الزراعة ، جامعة القاهرة

أجرى هذا البحث بمزرعة الدواجن بكلية الزراعة جامعة القاهرة لدراسة تأثير الجنس وميعاد الفقس على وزن الجسم ومعدل وزن الجسم . وقد درست وزن الجسم عند الفقس ، ٤ أسابيع ، ثمانية أسابيع وعند ١٢ أسبوعاً ومعدل وزن الجسم بين هذه المجموع الأربعة. وكان عدد الفيومي ١٨٢١ منها ٨٥٢ ذكر ، ٩٦٩ أنثى وكان عدد الروود أيلند ١٥١٤ منها ٥٥٤ ذكر ، ٩٦٠ أنثى أنتجوا على دفعات الفقس وقد عدلت الأوزان لدفعة الفقس والجنس وكانت النتائج كالآتي :

(١) كان متوسط وزن الفقس ٢٨٠٤٥ جرام لكلا الجنسين بالنسبة للفيومي أما الروود أيلند رد فكان متوسط وزن الفقس ٢٢٠٥٢ جرام . ولم يظهر للجنس تأثير واضح بالنسبة لهذا العمر لكلا النوعين .

(٢) كان متوسط وزن الجسم عند ١٢ أسبوع ٥١٠ جرام بالنسبة لكلا الجنسين في الفيومي وكان بالنسبة للروود أيلند رد ٤٥٣ جرام وكان الفرق بين الجنسين واضحاً بتقدم العمر حيث بلغ ٧١٠ جرام في الفيومي ، ٩٧٢ جرام بالنسبة للروود أيلند رد عند هذا العمر . أيلند رد عند هذا العمر .

(٣) بالنسبة لدفعات الفقس المبكر أعطى نتائج أفضل أما بالنسبة للروود أيلند رد فإن الفقس المتأخر أعطى نتائج أفضل .