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The Effect of Crossbreeding on Some Economic Traits for Chicks of Lohmann Chicken

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Abstract: **The experiment has been conducted at the poultry farm of Al-Qadisyah University, College of Agriculture, Department of Animal Production , for the period 24/11/2018 till 10/4/2019 by using 80 hatching chicks which belong to 20 dams and 5 sires, each sire includes 16 chicks. Four chickens are put with each sire, the first sire(Leghorn) crossbreeding with dams of Lohmann , the remaining sires are local cocks ,with five Lohmann hens. The chicks of each sire divided into two replicates ,each replicate contains 8 chicks , the experiment continues for 42 days of age.**

The experiment aims to study the effect of sire groups on growth traits (weight at hatching , weight at 42 days of age , weight gain and daily weight gain) Also , the effect of sire on weekly consumption feed , in addition to estimate the heritability for previous traits and the genetic correlations among these traits.

The results can be summarized as follows :

1- **The overall means of weight at hatching , weigh at 42 days of age , weight gain and daily weight gain are 34.572 , 354.898 , 320.327 and 7.627 gm respectively , the sire groups appear significantly ($p<0.05$) effect on weight at hatching and weight at 42 days of age and weekly consumption seeds.**
2- **Sex has significantly ($p<0.05$) effect on weight at hatching and weight at 42 days of age.**
3- **The conversion feed ratio is 3.462 gm consume feed/ gm of meat.**
4- **The estimated values of heritability for weight at hatching weight at 42 days of age , weight gain and daily weight gain and daily weight gain , are 0.332 , 0.55 , 0.55 and 0.56 respectively.**

The values of genetic correlation between weight at hatching and weight at 42 days of age and between weight at hatching and weight gain are 0.98 and 0.58 respectively.

I. INTRODUCTION

Poultry industry is one of the main pillars of the economies of many countries because of the advantages of rapid capital cycle and a significant contribution to the expansion of food needs of consumers, and the industry's heavy reliance on chicken stimulated researchers to focus on developing the productivity of chicken breeds and follow special strategies to produce breeds Specialized commercial [1].

Productive and egg-specific traits are important economic traits that can be genetically improved by selection and methods of mating [2,3.4], and to improve any population requires first estimation of genetic parameters, and genetic correlations) of economic traits in order to develop an appropriate improvement plan. Genetics are based on scientific foundations to advance this population towards the desired goal.

Numerous studies have shown the relationship between the weight of the chick and the body weight at different ages of birds [5,6,7].

Heritabilities of hatching weight , weight at different ages up to eight weeks and feed conversion efficiency have been reported by [8,9,10,11,12].

The present experiment aims to find out the effect of crossing laying hens with local cockss on:

1- Growth characteristics (weight at hatching, weight at 42 days of age, weight gain, daily weight gain, weekly and total feed consumption and feed conversion efficiency.

2- Estimating the heritabilites and the genetic correlations of the above traits.

II. Materials and Methods

Twenty laying hens of Lohmann breed are used divided into five sires, five chickens of Lohmann breed have put with first sire(Loghorn cock)and five hens for following local sires (second,third,fourth and fifth sire). The eggs have

collected according to the sire number then , the eggs were sent to the hatchery ,eighty hatching chicks were weighed after hatching and were distributed according to pedigrees (sires) and were put placed in the boxes, each box area of 1.5 × 2 m, the chicks for each sire divided into two replicates ,each replicate includes eight chicks and the weight of feed consumption per was calculated weekly for 42 days(six weeks)per sire for a period of 42 days, also the chicks were weighed at this age.

III. Studied Traits

1- Living body weight:

The chickens have been weighed at one day at the end of the experiment of 42 days by the weight of each replicate (8 birds / replicate) using an electronic balance, the following equation is applied to estimate the average weight of the bird in the one replicate:

$$= \frac{\text{Total bird weights in refined}}{\text{Total number of birds in refined}}$$

2-Weight gain:

The weight gain achieved during the 42-day trial period is calculated according to the following equation:
Weight gain (g) = live body weight at the end of the period (g) - live body weight at the beginning of the period (g) (weight at hatching).

$$\textbf{3-Daily weight gain} = \frac{\text{Weight gain}}{\text{Number of breeding days (42 days)}}$$

4-Weekly Consumption Feed:

The amount of feed consumption per week is calculated by weighing the remaining feed quantity at the end of the period and subtracting it from the total quantity provided at the beginning of the period according to the equation reported by [13].
Amount of weekly consumed feed (g) = feed provided at the beginning of the period (g) - the remaining feed at the end of the period (g).

5- Feed conversion efficiency:

Accordoing to the total food conversion efficiency as reported by
(13) in the following equation:

$$\text{Feed conversion efficiency (g)} = \frac{\textbf{Average amount of feed consumption}}{\textbf{Final body weight (g)}}$$

statistical analysis :
Data are analyzed by SAS [14] using General Linear Model based on following equations :
$Y_{ijk} = Gi + Gi + Sj + GS (ij) + e_{ijk}$

Y_{ijk}= the observation values

μ: The overall mean
Gi: the effect of i th sire where i = 1, 2, 3, 4, and 5
Sj: : the effect of the jth sex where j= 1 male, 2 female
GS (ij) : Interaction between sire and sex
e_{ijk} : the value of the random error, which is distributed with an average
μ= 0 and a variation of $=^2\delta e$
$Y_{ij} = \mu + Gi + eij$
Y_{ij}: The value of any watch
μ: the overall mean
Gi: As it passed earlier
eij: As it passed earlier
The heritability and genetic correlations are estimated by using the questions which are based on variance components [15] .

$^2\delta s$: variance between sires
$^2\delta w$: variance between progeny
$^2\delta s + {}^2\delta w$ =Total variance = $^2\delta p$

$$h^2 = \frac{4^2\delta s}{^2\delta p}$$

$$rG = \frac{Covs}{\sqrt{[2\delta s(x)\ 2\delta s(y)]}}$$

Covs =combined variance of sres for x and y traits
$^2\delta s(x)$=variance between sires for x trait
$^2\delta s(y)$ =variance between sires for y trait

IV. Results and discussion

Table (1) shows that the mean weight at hatching and final weight at age 42 days and weight gain and daily weight gain were 34.57, 354.898, 320.327 and 7.627 g respectively, and the sires appear a significant($p< 0.05$) effect on these traits ,where the sire number one inquires a highest values among other sires, this may be due to the genetic makeup of the genotype.

In this regard [16], have found in the pure Mandarah and Salam lines and the two lines resulting from crossbreeding the Mandarah with El-salam and El-Salam with Mandarah lines and stated that the weight at hatching was 35.20, 34.86, 34.93 and 34.99 g respectively, The Mandarah line surpasses El-Salam but the differences are non-significant.

The same researchers also have stated that the daily weight gain from hatching to 4 weeks of age differed significantly ($p<0.05$) between the lines of sires.[17,18] explain that crossbreeding between strains causes in improving body weight.

Table (1) shows that males significantly ($P< 0.05$) outperformed females in weight at hatching and weight at 42days of age and males do not show significant differences in the weight gain and daily weight gain comparison with females despite its superiority over females.

[16] appear that sex has not significantly affect growth traits. While [18] have found that the sex has a significant effect on weight at the age of 4 and 8 weeks.in this study ,it is found that the correlation coefficient between hatching weight and weight at 42 days of age is 0.836 ($P< 0.05$) and the regression coefficient of weight at 42 days of age on weight at hatching is 11.209 g increase in weight of 42 days per unit weight at hatching.

This result is similar with those findings have been reported by [5,6,7] who demonstrate a relationship between chick weight and live body weights at different ages.

Table (2) indicates that the feed consumption during the first, second, third, fourth, fifth and sixth week was 70.75, 156.850, 211.200, 254.575, 288.175, 315.150g respectively, and the total feed consumption was 1299.025g.

The sires have a significant effect on feed consumption and the sires appeared variation among them in this trait. The lowest total feed consumption for chicks which belonging to sire number 5(1248.625 g) and the highest was for sire number 1(1343.875 g).

In this regard [16] indicate that the sires differ significantly ($p< 0.05$) in feed consumption ranged from 20.80 to 22.19 g at the second week, 35.8 to 37.58 at the fourth week and 49.95 to 54.01 g at the eighth week.

The feed conversion efficiency of the experiment is 3.462 gm of feed per 1gm of meat, which means that the efficiency of the bird expresses the consumption of 3.462gm of feed for one gram of meat. .

[19] in chicken chicks of three different weight categories obtained a feed conversion efficiency of 5.4, 5.2 and 5.1 kg feed / kg live weight respectively, and [7] have observed that a feed conversion efficiency ranging from 3.150 to 3.697 kg feed live weight.

[16] mention that the feed conversion efficiency at the age of 4 weeks ranged from 3.76 to 4.10 gm feed / gm meat, and at the age of 8 weeks ranged between 4.12-4.45 gm feed / gm meat.

Table (3) shows that the estimated heritability values for the weight characteristics at hatching and weight at the age of 42 days and the weight gain and the average daily weight gain is 0.322, 0.55, 0.55 and 0.56. Among the different weight traits are high and ranged from 0.58 to 0.98, meaning that the selection of any of these traits leads to improvement in other traits.

Similar results have been found for estimated heritability values of the weight at hatching by [9] (0.36) in chicks of Venda chicken verity, (12) (0.306), (8) (0.315),(10) (0.46), (11) (0.46).

[9] also have found that the genetic equivalent values of weight at age of 4 weeks and 8 weeks are 0.25 and 0.41, respectively.

[12] explain that the genetic heritability of the weight gain from hatching to the age of two weeks is 0.458. Estimates of heritability vary according to clans, environmental conditions, methods of estimation, time, number of sires and sons per sire or dam , the variation of genetic variations in species and between individuals and the sample size (20,15,21.

Table (1) :The overall means ±standard error for the growth traits.

Traits / Factors	Weight at hatching	Weight at 42 day of age	Weight gain	Daily weight gain
Group of sire 1	a 36.767 ±1.406	a 405.867 ±21.391	a 396.100 ±20.286	a 8.788 ±0.483
2	Ab 34.933 ±1.405	Abc 353.00 ±21.391	ab 318.00 ±20.286	abc 7.573 ±0.483
3	Ab 34.875 ±1.362	Bc 351.750 ±20.712	ab 316.875 ±19.642	abc 7.545 ±0.468
4	B 32.250 ±1.362	Bc 324.875 ±20.712	b 292.625 ±19.642	bc 6.967 ±0.466
5	Ab 34.033 ±1.406	C 339.00 ±21.391	c 304.967 ±20.286	c 7.261 ±0.483
Sex **Males**	a 37.203 ±0.855	a 375.180 ±13.012	337.977 ±12.222	8.047 ±0.231
Females	B 31.940 ±0.901	b 334.617 ±13.967	302.679 ±12.212	7.207 ±0.233
Overall mean	34.572 ±0.621	354.898 ±9.446	320.327 ±8.958	7.627 ±0.213

Means with similar characters mean no significant differences with a probability level of 5%. Means with different letters mean variations with a probability level of 5%.

Table (2): The overall means ±standard error for the weekly and total feed consumption traits.

Traits / Factors	Weakly consumption feed(gm)						Total consumption feed(gm)
	1	2	3	4	5	6	
Sire groups	a	a	A	A	a	a	a
	74.625	166.250	233.625	255.00	291.625	319.750	1343.875
1	±0.955	±1.619	±2.582	±1.426	±1.122	±1.208	±4.336
	bce	Bc	B	A	b	b	bc
2	70.250	159.00	217.625	254.625	287.375	315.375	1307.250
	±0.953	±1.619	±2.581	±1.425	±1.121	±1.208	±4.335
	ce	Ce	ce	A	b	b	c
3	70.125	156.500	210.125	256.375	288.375	314.750	1299.250
	±0.955	±1.618	±2.852	±1.426	±1.122	±1.207	±4.336
	d	D	D	A	b	b	d
4	66.750	148.875	188.250	254.500	287.250	311.500	1260.125
	±0.954	±1.620	±2.582	±1.425	±1.122	±1.207	±4.335
	de	E	e	A	b	b	e
5	68.625	153.625	206.375	252.375	286.250	314.375	1248.625
	±0.955	±1.618	±2.580	±1.425	±1.121	±1.208	±4.336
Overall mean	70.075	156.850	211.200	254.575	288.175	315.150	1299.025
	±0.427	±0.727	±1.154	±0.638	±0.502	±0.540	±1.962

Means with similar characters mean no significant differences with a probability level of 5%. Means with different letters mean variations with a probability level of 5%.

Table (3): Heritabilities and genetic correlations for the growth traits.

Traits	Heritability	Traits	Genetic correlation
Wt hatch	0.322	wt hatch × wt 42 d	0. 98
Wt 42 d	0.550	wT hatch × wt gain	0.58
wt gain	0.550	wt hatch × daily wt gain	0.80
Daily wt gain	0.650	wt 42 d × wt gain	0.97
		wt 42 d × Daily wt gain	0.96
		wt gain × Daily wt gain	0…95

Wt hatch=weight at hatching

Wt 42 d=weight at 42 days of age

V. Conclusions

1- sire groups have a significant effect on different growth characteristics.
2- The chicks resulting from the domestic cocks are low growth and this is one of the characteristics of laying hens.
3- High feed conversion efficiency in most groups.
4- Based on heritability values, certain traits such as weight at the age of 42 days can be adopted as an electoral criterion.
5- The first sire (Leghorn) shows a decrease in the value of the feed conversion efficiency ie weight gain at the age of 42 days and a decrease in total feed consumption.

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