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EFFECT OF PULLETS WEIGHT AT HOUSING TIME ON PERFORMANCE OF SOME LOCAL BREEDS OF CHICKEN AS LAYING HENS

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Abstract

This experiment was carried out at Sids Poultry Research Station, Animal Production Research Instituent, Menistry of Agriculture. The aim of this work was to study the effect of pullets weight at housing time on the performance of some local breeds of chickens as laying hens. 243 hens from three local breeds of chicken, Dokki4 (Dk), Gimmiza (Gm) and Dandarawi, Dn (81 hens/breed) at 18 weeks of age were used in the experiment, the hens were diveded according to their body weight into three groups (high, medium and low body weight) and we obtained data to age of 90 day egg production. Results can be summeriezed as follows:

1. There were significant differences among breeds in body weight at 18 weeks af age and age at sexual maturity. However, the differences between different weight groups in each breed were not significant.
2. The heavier hens of Gm reached sexual maturity later than both Dk or Dn.
3. The medium body weight hens for the different breeds had more egg number and egg mass than both low or high body weight.
4. There were no significant differences between different breeds in respect of feed consumption, but within breed hens with high body weight were consumed more feed than both medium or low body weight hens
5. Dk hens with medium weight were more efficient for feed conversion than other groups.
6. Dn hens had insignificant high fertility and hatchability pecentages than both Gm and Dk hens.
7. The eggs produced from hens with medium body weight of Dk and Dn breeds had high hatchability % than of low or high weights.
8. The weight of eggs produced from high body weight hens in different breeds were higher than those from low or medium body weight hens.
9. There were non significant differences between different groups of weight for different breeds in respect of yolk index, haugh unit and albumen index.

10. There were positive correlation between body weight at 18 weeks of age and sexual maturity with egg weight and feed consumption.
11. There were positive correlation between body weight at sexual maturity and age at first egg, while, the correlation was negative between body weight at 18 weeks and age at first egg.
12. There were negative correlation between body weight at 18 weeks and at sexual maturity with egg number.
13. Egg mass had negative correlation with body weight at sexual maturity and positive correlation at 18 weeks of age. Whearas, body weight at 18 weeks of age had negative correlation with feed conversion, but ethe correlation was positive with body weight at sexual maturity.
14. Within breed, ther were positive correlation between body weight at 18 weeks of age and age at sexual maturity with egg mass production, also, in Dn hens there were positive correlation between body weight at 18 weeks of age and at sexual maturity with feed conversion, but, the correlation was negative in Dk hens. For Gm hens, there were positive correlation between body weight at 18 weeks of age with feed conversion, while, the correlation was negative between body weight at sexual maturity and feed conversion.

INTRODUCTION

Body weight of pullets at sexual maturity is considered as important trait that affect the performance of laying hens. Variation in body weight led to variation in feed consumption (Harms *et al.*, 1982 and Bish *et al.*, 1985). Moreover Loe *et al.*, (1989) examined the effect of 5 strains of Leghorn on the egg production performance by dividing them to different weight groups and found correlation between egg production performance and body weight. Heavy hens require more maintenance diets and consumed more feed than small hens (Zanaty *et al.*, 2001). It is well known that body weight at maturity of hens differs according to many factors, such as breed, age, nutrition, season of hatch and other.. Selection for heavier mature body size within a breed or variety tends to increase egg size (Hafez and Kamar, 1955, Gard and Neshein, 1973), also, Kader *et al.*, 1981 reported that heavier birds produced larger eggs.Moreover,Sabri and Abdel Warth., (2000)reported that the average body weight in Fayoumi laying hens had significant positive correlation with body weight change, egg mass, egg weight and feed conversion, also Hossari *et al.*, (1997) found that the phynotypic correlation between body weight and egg production of Fayoumi hens were insignificant, small positive in PP and PG lines while small negative in GP. (PP and GG are Fayoumi lines selected for egg Production and Growth rate, respectively, and PG and GP

are their crosses).

The local breeds of chicken had different groups of body weight at sexual maturity (Goher *et al.*, 1983, Elbogdady *et al.*, 1993 and Abou Hasera, 1996). Therefor it is necessary to design this experiment to study the effect of pullets housing weight of some local breeds of chicken on egg production performance and estimate the phenotypic correlation correlation with some productive traits.

MATERAILS AND METHODS

This study was carried out at Sids Poultry Breeding Research Station, Animal Production Research Instituent, Ministry ot Agriculture during the year of 2001. The experiment was designed to study the effect of pullets housing weight on the performance of some local breeds of chicken as laying hens. A total number of 243 hens at 18 weeks of age from three local breeds of chicken, Dokki 4 (Dk), Gimmizaha (Gm) and Dandarawi (Dn), 81 hens from each strain divided into 3 groups for each strain according to hen body weight as follows:

1. Low weight = weight of hens was 1.5 S.D under the mean of population and represented as (w1).
2. Medium weight = weight of hens was around the general mean of population and represened as (w2).
3. High weight = weight of hens was + 1.5 S.D over the mean of population and represented as (w3).

Each group of each strain was divided into 3 replicates and housed in indivedual cages as follows:

3 strains x 3 body weight groups x 3 replicates = 27 experimental unites x 9 hens for each replicate.

All hens were fed ad libitum on laying diet containing 16% crude protein and 2750 kcal/ kg and they were kept under the same program of light and received natural day light plus artificial light to reach 16/ hours/ day. All hens were vaccinated against

common poultry diseases according to conventional vaccination program used for layers and they also treated with antibiotic, as the birds were needed. At 32 weeks of age the hens were moved from cages to floor pens (one male/ 9 female for each replicate) to produce fertile eggs and measure fertility and hatchability%.The following parameters were estimated during the experiment. The following parameters were estimated during the experiment:

1. Body weight at 18 weeks of age and at sexual maturity.
2. Age at sexual maturity.
3. Number and weight of eggs during the first 90 days of production.
4. Feed consumption and conversion.
5. Frtility and hatchability percentages.
6. Five eggs frome each replicate were examined to determined quality measurements as follows:

- Shell weight % (weight of shell/weight of egg) x 100.
- yolk height was measured with a tripole micrometer and the width diameter with a slide ruler.
- yolk index was determined in percentage according to the formula:

Yolk index = yolk height/yolk width x 100.

- Albumen height was also determined by using a tripol micrometer (Ames apparatus), the measuring was taken twice in the middle between the edge of the yolk and the thick albumin away from chalaza.

- Haugh units were determined according to the following formula:

Haugh unit = 100 log ($h+7.57 - 1.7\ w^{.37}$), Neshein *et al.* (1979).

Where h = albumin height (mm), w = egg weight (gm).

Data were analyzed using analysis of variance (ANOVA) with Mstat.c procedures (Mstat.c, 1988) under Windows and the statistical model for the experiment was:

Yijk = M +Ti + Bj + Ti. Bj +Eijk

Where Yijk = any observation in the experiment.

M = overall mean

Ti = effect of I th body weight groups,

Bj = effect of j th strain,

Ti.Bj = effect of interaction between I th body weight group and j th strain,

Eijk = random error.

Differences between means were compared by Duncans New Multiple Range Test, as described by Snedecor and Cochran, (1981).

RESULTS AND DISCUSSION

Body weight

Table 1. represents the effect of body weight on some productive traits of three local breeds. It can be concluded that there were significant differences among breeds on body weight at 18 weeks of age and at sexual maturity, although body weight of Dk was heavier at 18 weeks old but Gm hens had the heaviest weight at sexual maturity (1464 gm/hen for Gm *vrs* 1240 g/Dk). Dn hens had lowest weight at both 18 weeks of age or at sexual maturity. At the same manner, Gm hens had more weight gain (682 gms) during period from 18 weeks of age to age of sexual maturity than both of Dk (387.7 g) or Dn (339.4 gm/hen). However,the differences between different weight groups in each breed (w1,w2,w3) were not significant. This results were in agreement with the findings of El bogdady *et al.*, (1993) and Abou Hasera., (1996).

Age at sexual maturity

As showen in Table 1 it can be observed that, in general, the heaviest hens (w3) for Gm hens were delayed significantly in sexual maturity (240 days) than lower or medium weight of Dn hens, but there were no significant differences between other groups. In general, it can be concluded that heavier, Gm (214-9.7 days)reached at sexual maturity later than Dk (205.9 days) and Dn (195.6 days) hens.

Egg production

The weight of first egg and average of egg weight of high body weight hens (w3) for the three breeds were higher than that of w1 or w2. Moreover, weight of first egg laid from Gm(38.7 gms) and Dk (38.5 g) were higher than Dn (31.7 gms). This results are in agreement with Kader *et al.* (1981) who found that heavier birds produced larger eggs.

Although, there were no significant differences between different breeds in respect of egg number, but Dn hens had more egg number (24.2 egg/hen) with insignificant differences with Dk (23.3 egg) or Gm (21.9 egg). On the other hand,Gm hens produced more egg mass (929.3 gm/hen) than Dk (898.7 g/hen) or Dn (861.2 g/hen). Moreover, medium body weight hens (w2) for the different breeds had more egg number and egg mass than both hens with low or high body weight.

Feed consumption and conversion

As showen in Table 1, there were no significant differences between different breeds in this trait, but Gm hens had consumed more feed (117.3 g/ day) than Dk (98.6 g/ day) or Dn (99.1 g/day). in different breeds hens with high body weight (w3) ate more feed than both hens with medium(w2) or low(w1) body weight, these results were in agreement with Zanaty *et al.*, (2001). On the other hand, Dk hens are more efficient for conversion feed to egg(7.6 gms feed/ gm egg) with no significant differnce with other breeds (8.05, 8.83 g feed/g egg) for Dn and Gm hens, respectively. Hens with medium weight (w2) had better feed conversion than those of low (w1) or high (w3) body weight. Dk hens with medium weight (w2) are more efficient for conversion of feed to eggs than other groups.

Fertility and hatchability %

It can be observed from table (2) that Dn hens had insignificant high fertility % (91.39) and hatchability %(83.59%) than both Gm (89.48 and 83.58%) or Dk hens (88.20 and 77.31%) for fertility and hatchability percentages, respectively.

Moreover, Dn and Dk eggs produced from high body weight hens had high fertility than both other weights(w1 andw2), but for Gm hens eggs produced from medium

body weigh hens had more fertility % than both from high or low weights(w1and w3).

In respect of hatchability, eggs produced from hens with medium body weights (w2) for Dk and Dn breeds had high hatchability % than both low or high weights (w1and w3), but for Gm, eggs produced from low body weight (w1) hens had high hatchability % than from both w2and w3. This results may be related to the high body weight of Gm hens than both of Dk or Dn hens.

Chick weight and egg weight

Gm hens had heavier chick weight (34.15 gms) and egg weight (45.18 gms) than both Dk (30.7 and 42.59 g) or Dn (29.11 and 36.79 g) for chick and egg weight respectively. Egg weight in high body weight (w3)in different breeds were higher than that of low or medium body weight hens.

Egg quality measurements

Shell weight % of the medium body weight (w2) of Dk (12.26 %)and Gm (9.68%) eggs were higher than those of low or high body weight hens. Yolk weight % was higher for eggs produced from medium body weight (w2) for both Gm (33.01 %) and Dn (36.35 %) hens, Albumen weight% was higher for eggs produced from hens with high body weight of Dk (55.35%) and Dn (54.22%).

On the other hand, data presented in Table 2 indicated that there were non significant differences between different groups of weight for different breeds in respect of yolk index, Haugh unit and albumen index.

Correlation coeffecient

Table 3 showed correlation coeffient between body weight at 18 weeks and sexual maturity old with different traits. It showed that, in genral, there were positive correlation between body weight at 18 weeks and sexual maturity with egg weight and feed consumption, also, there were positive correlation between body weight and age at sexual maturity, while, the correlation was negative between body weight at 18 weeks and age at sexual maturity. On the other hand, there were negative correlation between body weight at 18 weeks and at sexual maturity with egg number. Egg mass had negative correlation with body weight at sexual maturity and positive correlation at

18 weeks of age, whereas, body weight at 18 weeks of age had negative correlation with feed conversion,but ethe correlation was positive with body weight at sexual maturity. Moreover, within breed, ther were positive correlation between body weight at 18 weeks and at sexual maturity with egg mass production, also, in Dn hens there were positive correlation between body weight at 18 weeks of age and at sexual maturity with feed conversion, but, the correlation was negative in Dk hens. For Gm hens, there were positive correlation between body weight at 18 weeks of age with feed conversion, while, the correlation was negative between body weight at sexual maturity with feed conversion.

Table 1. effect of body weight on some productive performance of Dk, Gm and Dn hens.

Item	Dk				Gm				Dn				Mean
	W1	W2	W3	Mean	W1	W2	W3	Mean	W1	W2	W3	Mean	
Inetial weight	f 712	cd 820	a 1025	c 852.3	g 664	e 765	b 918	de 783.1	h 531	G 661	de 786	g 659	764.9
Final weight	cde 1175	bcd 1209	abc 1336	bcd 1240	Abc 1407	abc 1415	a 1572	ab 1465	f 878	Ef 916.8	def 1038	ef 944	1216
Gain weight	bcd 463.2	cd 389.4	d 310.6	cd 387.7	A 742.6	abc 650.4	abc 653.6	ab 682	d 347	D 355.8	d 315.8	d 339	469.7
Age at sexual	ab 211.8	b 193.2	ab 212.6	ab 205.9	Ab 208	ab 210.8	a 240.4	ab 219.7	b 185	B 197	ab 204.4	b 196	207
Weight of first egg	a 34.1	a 36.8	a 39.4	a 38.5	a 37.1	a 38.8	a 40.3	a 38.7	a 30.6	A 30.3	a 34.3	a 31.7	36.3
Average egg weight	bcde 37.3	abcde 39.7	a 44.4	abcde 38.8	ab 43	abcd 41.4	ab 43.2	abc 42.5	e 34.5	De 35.4	cde 36.7	de 35.5	38.9
Egg number*	bc 21.9	a 29	d 19	Bc 23.3	e 16.6	a 28.4	cd 20.8	bc 21.9	b 24	A 27.2	bc 21.6	b 24.2	23.1
Egg mass	cde 816.9	a 1151	bcd 843.6	bcd 898.7	e 713.8	a 1176	bcd 898.6	bc 929.3	cde 828	B 962.9	de 792.7	bcd 861	896.4
Feed consumption	*ab* 93.1	ab 99.5	ab 103.2	ab 98.6	*ab* 106.9	ab 119.1	*a* 126.1	ab 117.3	b 86.4	Ab 98.6	ab 112.5	ab 99.2	105
Feed conversion	ab 7.97	b 6.04	ab 8.56	ab 7.67	a 10.48	ab 7.09	ab 9.82	ab 8.83	ab 7.3	Ab 7.16	ab 9.93	ab 8.05	8.18

• Up to 90 days of production.

abc, Means in the same raw different letters are significantly different ($p < 0.05$).

w1 w2 w3 : body wieght groups.

Table 2. effect of body weight on fertility and hatchability % and egg quality measurements of Dk, Gm and Dn chickens.

Item	Dk				Gm				Dn				Mean
	W1	W2	W3	Mean	W1	W2	W3	Mean	W1	W2	W3	Mean	
Fertility %	ab 88.53	b 87.38	ab 88.71	ab 88.2	b 87.4	a 95.8	b 85.24	ab 89.48	b 85.38	ab 92.8	a 96	ab 91.39	89.69
Hatchability %	d 74.06	cd 80.88	cd 76.97	cd 77.31	b 89	bc 83.69	cd 78.64	bc 83.58	d 73	a 100	cd 77.77	bc 83.59	81.49
Chick weight %	b 31.19	bc 30.57	bc 30.52	bc 30.76	a 33.99	a 34.4	a 34.06	a 34.15	c 28.5	bc 29.58	bc 29.26	bc 29.11	31.34
Egg weight %	bc 40.14	ab 42.6	a 45.03	ab 42.59	a 44.89	a 45.13	a 45.5	a 45.18	d 36.58	d 35.71	cd 38.11	d 36.79	41.52
Shell weight %	abc 10.42	a 12.26	ab 11.86	abc 11.52	bc 9.12	abc 9.68	c 8.63	abc 9.15	abc 10.24	abc 10	abc 9.87	abc 10.04	10.23
Yolk weight %	ab 34.32	ab 33.01	ab 32.78	ab 33.37	b 30.64	ab 33.94	ab 33.35	ab 32.65	a 36.14	a 36.35	a 35.8	a 36.09	34.04
Albumen weight %	b 55.27	b 54.79	b 55.35	b 55.14	a 60.23	ab 56.37	ab 58.02	ab 58.21	b 53.62	b 53.32	b 54.22	b 53.72	55.68
Yolk inex	a 46.11	a 45.62	a 45.23	a 45.65	a 45.11	a 41.57	a 44.83	a 43.83	a 43.96	a 44.08	a 45.08	a 44.37a	44.62
Haugh unit	a 88.23	a 89.66	a 90.12	a 89.34	a 89.38	a 89.17	a 86.82	a 88.46	a 90.94	a 87.86	a 89.29	a 89.36	89.05
Albumen index	a 10.3	a 10.55	a 10.86	a 10.57	a 10.58	a 10.39	a 9.71	a 10.23	a 10.93	a 9.46	a 10.95	a 10.45	10.14

• abc, Means in the same raw different letters are significantly different ($p < 0.05$)

w1w2 w3 : body wieght groups.

Table 3. correlation coeffecient of body weight at 18 weeks of age and age atsexual maturity age with some productive traits.

Item		Weight gain	Age of first egg	Egg number	Egg weight	Egg weight1	Egg mass	Feed cos.	Feed cov
Dk	1	-0.52	-0.177	-0.299	0.203	0.283	-0.283	0.194	-0.277
	2	+0.498	+0.002	-0.407	0.169	0.223	-0.413	0.188	-0.237
Gm	1	-0.582	-0.524	+0.553	0.046	0.229	+0.43	+0.079	+0.102
	2	+0.910	+0.397	-0.113	0.516	0.621	-0.094	+0.476	-0.16
Dn	1	-0.603	-0.252	-0.113	0.133	0.265	-0.113	+0.477	+0.317
	2	+0.356	+0.347	-0.211	0.269	0.045	-0.264	+0.215	+0.178
Pool	1	-0.163	-0.121	-0.03	0.269	0.269	+0.024	+0.156	-0.068
	2	+0.837	+0.471	-0.23	0.626	0.273	-0.102	+0.460	+0.077

• body weight at 18 weeks old.

• body weight at sexual maturity.

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تأثير وزن الجسم عند التسكين لإنتاج البيض على بعض الصفات الإنتاجية للدجاج المحلى

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اجريت هذه الدراسة بمحطة بحوث الانتاج الحيوانى بسدس التابعة لمعهد بحوث الانتاج الحيوانى مركز البحوث الزراعية وزارة الزراعة وذلك بغرض دراسة تاثير وزن الجسم عند التسكين لانتاج البيض على الاداء الانتاجى لسلالات كل من الدقى والجميزة والدندراوى وقد استخدم عدد ٢٤٣ دجاجة بواقع ٨١ من كل سلالة وقد قسمت كل سلالة بعد وزنها على عند ١٨ اسبوعاً حسب وزن الجسم الى ثلاث مجاميع عالى و متوسط و منخفض واخذت بيانات انتاج البيض خلال ٩٠ يوماً الاولى من انتاج البيض واستهدف البحث دراسة تاثير وزن الجسم عند التسكين لانتاج البيض على بعض الصفات الانتاجية لها ويمكن تلخيص نتائج البيانات المتحصل عليها فى:

١- يوجد فرق معنوى فى وزن الجسم بين الانواع عند عمر ١٨ اسبوعاً وعند النضج الجنسى ولكن لايوجد فرق معنوى بين المجاميع داخل كل سلالة.

٢- وصلت دجاجات الجميزة العالية فى وزن الجسم الى النضج الجنسى متاخرا عن دجاجات الدقى او الدندراوى.

٣- الدجاجات ذات وزن الجسم المتوسط فى السلالات الثلاثة اعلى فى انتاج البيض وكتلة البيض عن كل من الدجاجات العالية او المنخفضة الوزن.

٤- داخل سلالات الدواجن المختلفة فان المجموعات ذات وزن الجسم العالى تستهلك علف اكثر من غيرها المتوسطة او المنخفضة فى الوزن.

٥- دجاجات الدقى ذات وزن الجسم المتوسط كانت احسن فى كفاءة تحويل العلف الى بيض.

٦- البيض الناتج من دجاج الدندراوى كان اعلى فى صفات الفقس والخصب عن الناتج من دجاج الدقى او الجميزة بفارق غير معنوى وعلى الوجه الاخر فان البيض الناتج من الدجاجات ذات الوزن المتوسط فى الدقى والدندراوى نسبة الفقس فيه عالية عن الدجاجات ذات الوزن المنخفض والعالى.

٧- وزن البيض الناتج من الداجاجات ذات الوزن العالى فى الانواع المختلفةكان اكبرمن الناتج من الاوزان المتوسطة.

٨- لا يوجد فرق معنوى بين المجاميع المختلفة فى الوزن والانواع المختلفة فى دليل الصفار، وحدة هو او دليل البياض.

٩- يوجد ارتباط موجب بين وزن الجسم عند عمر ١٨اسبوعاً وعند النضج الجنسى مع وزن البيض والعلف المستهلك.ووجد ارتباط موجب بين وزن الجسم عند النضج الجنسى والعمر عند اول بيضه بينما كان الارتباط سالب مع وزن الجسم عند عمر ١٨ اسبوعاً .

١٠- يوجد ارتباط سالب بين وزن الجسم عند عمر ١٨ اسبوعاً والوزن عند النضج الجنسى مع عدد البيض ولكن كان الارتباط موجباً مع وزن الجسم عند عمر ١٨اسبوعاً وكتلة البيض وكان سالبا بين كتلة البيض والوزن عند النضج الجنسى.

١١- تزداد كفاءة تحويل العلف بانخفاض وزن الجسم عند عمر ١٨ اسبوعاً .

١٢- فى سلالة الدندراوى والجميزة كان هناك ارتباط موجب بين وزن الجسم عند عمر ١٨ اسبوعاً وكفاءة تحويل العلف، اما فى سلالة الدقى٤ كان الارتباط سالباً بين الوزن عند ١٨ اسبوعاً وعند عمر النضج الجنسى مع صفة تحويل العلف.