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

GOHER L.M., M.A. ABDEL GALIL AND M.H. ABDEL SAMAD

Animal production Research Institute, Agricultural Research Centre, Ministry of Agriculture, Dokki, Giza, Egypt

(Manuscript received August 2003)

Abstract

This experiment was carried out at Saida Poultry Research Station, Animal Production Research Institute, Ministry 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, Dokhi (DK), Gimnza (GM) and Gandaawi, Dn (81 hens/breed) at 18 weeks of age were used in the experiment, the hens were divided according to their body weight into three groups (high, medium and low body weight) and we obtained data to age of 60 day egg production. Results can be summarized as follows:

1. There were significant differences among breeds in body weight at 18 weeks of 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 percentages 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. Whereas, body weight at 18 weeks of age had negative correlation with feed conversion, but the correlation was positive with body weight at sexual maturity.

14. Within breed, there 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 Dn 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 Loo 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 Nesheim, 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 phenotypic correlation between body weight and egg production of Fayoumi hens were insignificant, small positive in FP 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 (Ghori et al., 1983, Elbogdady et al., 1993 and Abou Hasera, 1996). Therefore 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 with some productive traits.

MATERIALS AND METHODS

This study was carried out at Sids Poultry Breeding Research Station, Animal Production Research Institute, Ministry of 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), Gimnizaha (Gm) and Dandarawi (Dnt), 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 represented 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 individual cages as follows:

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

All hens were fed ad libitum on laying diet containing 18% 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 repli-
cate) to produce fertile eggs and measure fertility and hatchability%. The following pa-
rameters were estimated during the experiment. The following parameters were esti-
imated 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. Fertility and hatchability percentages.
6. Five eggs from each replicate were examined to determine quality measurements
   as follows:

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

\[
\text{Yolk index} = \frac{\text{yolk height}}{\text{yolk width}} \times 100.
\]

- Albumen height was also determined by using a triple 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:

\[
\text{Haugh unit} = 100 \log (h+7.57 - 1.7 w^{-0.27}), \text{ Nasheim et al. (1979).}
\]

Where \(h = \) albumen 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:

\[
Y_{ijk} = M +Ti + Bj + Ti. Bj + Eijk
\]
Where $Y_{ijk} =$ any observation in the experiment.

$M =$ overall mean

$T_i =$ effect of $i^{th}$ body weight groups,

$B_j =$ effect of $j^{th}$ strain,

$T_iB_j =$ effect of interaction between $i^{th}$ body weight group and $j^{th}$ strain,

$E_{ijk} =$ 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 vs 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 ($w_1$, $w_2$, $w_3$) were not significant. This results were in agreement with the findings of El Boghady et al., (1993) and Abou Hasera., (1996).

Age at sexual maturity

As shown in Table 1 it can be observed that, in general, the heaviest hens ($w_3$) 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 (195.8 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 g/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 shown 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 (7.8 gms feed/gm egg) with no significant difference with other breeds (9.05, 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 and w2), but for Gm hens eggs produced from medium
body weight 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 coefficient**

Table 3 showed correlation coefficient between body weight at 18 weeks and sexual maturity old with different traits. It showed that, in general, 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 the correlation was positive with body weight at sexual maturity. Moreover, within breed, there 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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Dk</th>
<th>Gm</th>
<th>Dn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W1</td>
<td>W2</td>
<td>W3</td>
</tr>
<tr>
<td>Initial weight</td>
<td>f</td>
<td>cd</td>
<td>a</td>
</tr>
<tr>
<td>Final weight</td>
<td>cde</td>
<td>bcd</td>
<td>abc</td>
</tr>
<tr>
<td>Gain weight</td>
<td>bcd</td>
<td>cd</td>
<td>d</td>
</tr>
<tr>
<td>Age at sexual</td>
<td>ab</td>
<td>b</td>
<td>ab</td>
</tr>
<tr>
<td>Weight of first egg</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Average egg weight</td>
<td>bcd</td>
<td>abcd</td>
<td>abcd</td>
</tr>
<tr>
<td>Egg number*</td>
<td>bc</td>
<td>a</td>
<td>d</td>
</tr>
<tr>
<td>Egg mass</td>
<td>cde</td>
<td>abed</td>
<td>abed</td>
</tr>
<tr>
<td>Feed consumption</td>
<td>f</td>
<td>ab</td>
<td>ab</td>
</tr>
<tr>
<td>Feed conversion</td>
<td>ab</td>
<td>83.1</td>
<td>98.5</td>
</tr>
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</table>

* Up to 90 days of production.

abc. Means in the same raw different letters are significantly different (p < 0.05).
w1 w2 w3: body weight groups.
Table 2. Effect of body weight on fertility and hatchability % and egg quality measurements of Dk, Gm and Dn chickens.

<table>
<thead>
<tr>
<th>Item</th>
<th>Dk</th>
<th>Gm</th>
<th>Dn</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W1</td>
<td>W2</td>
<td>W3</td>
<td>Mean</td>
</tr>
<tr>
<td>Fertility %</td>
<td>ab</td>
<td>b</td>
<td>ab</td>
<td>ab</td>
</tr>
<tr>
<td>Hatchability %</td>
<td>d</td>
<td>cd</td>
<td>cd</td>
<td>cd</td>
</tr>
<tr>
<td>Chick weight %</td>
<td>b</td>
<td>bc</td>
<td>bc</td>
<td>bc</td>
</tr>
<tr>
<td>Egg weight %</td>
<td>b</td>
<td>ab</td>
<td>ab</td>
<td>ab</td>
</tr>
<tr>
<td>Shell weight %</td>
<td>abc</td>
<td>abc</td>
<td>abc</td>
<td>abc</td>
</tr>
<tr>
<td>Yolk weight %</td>
<td>ab</td>
<td>ab</td>
<td>ab</td>
<td>ab</td>
</tr>
<tr>
<td>Albumen weight %</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>Yolk index</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Haugh unit</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>Albumen index</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

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

w1 w2 w3, body weight groups.
Table 3. Correlation coefficients of body weight at 18 weeks of age and age at sexual maturity age with some productive traits.

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight gain</th>
<th>Age of first egg</th>
<th>Egg number</th>
<th>Egg weight</th>
<th>Egg weight1</th>
<th>Egg mass</th>
<th>Feed cos.</th>
<th>Feed cov</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dk</td>
<td>1</td>
<td>-0.52</td>
<td>-0.177</td>
<td>-0.299</td>
<td>0.203</td>
<td>0.283</td>
<td>-0.263</td>
<td>0.194</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>+0.498</td>
<td>+0.002</td>
<td>-0.407</td>
<td>0.169</td>
<td>0.223</td>
<td>-0.413</td>
<td>0.188</td>
</tr>
<tr>
<td>Gm</td>
<td>1</td>
<td>-0.582</td>
<td>-0.524</td>
<td>+0.553</td>
<td>0.046</td>
<td>0.229</td>
<td>+0.43</td>
<td>+0.079</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>+0.910</td>
<td>+0.397</td>
<td>-0.113</td>
<td>0.516</td>
<td>0.621</td>
<td>-0.094</td>
<td>+0.476</td>
</tr>
<tr>
<td>Dn</td>
<td>1</td>
<td>-0.603</td>
<td>-0.252</td>
<td>-0.113</td>
<td>0.133</td>
<td>0.265</td>
<td>-0.113</td>
<td>+0.477</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>+0.356</td>
<td>+0.347</td>
<td>-0.211</td>
<td>0.269</td>
<td>0.045</td>
<td>-0.264</td>
<td>+0.215</td>
</tr>
<tr>
<td>Pool</td>
<td>1</td>
<td>-0.163</td>
<td>-0.121</td>
<td>-0.03</td>
<td>0.269</td>
<td>0.269</td>
<td>+0.024</td>
<td>+0.156</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>+0.837</td>
<td>+0.471</td>
<td>-0.23</td>
<td>0.826</td>
<td>0.273</td>
<td>-0.102</td>
<td>+0.460</td>
</tr>
</tbody>
</table>

* Body weight at 18 weeks old.
* Body weight at sexual maturity.
REFERENCES


تأثير وزن الجسم عند التسکین لانتاج البيض
على بعض الصفات الإنتاجية للدجاج الحلى

ليلى محمد جوهر، محمد عبد العزيز عبد البال، محمود حسین عبد الصمد

معهد بحوث الانتاج الحيواني، مركز البحوث الزراعية، وزارة الزراعة، الدقى، جيزة، مصر

اجريت هذه الدراسة بمسحة بحوث الانتاج الحيواني بمساحة أرضية لمعهد بحوث الانتاج الحيواني مركز البحوث الزراعية وزارة الزراعة وذلك بعرض دراسة تقدير وزن الجسم عند التسکین لانتاج البيض على الانتاج الإنتاجي للسلاسل كالمان التمييز والتمدث. وقد استخدم عدد 430 دجاج بواقع 81 من كل سلالة وقد قسم كل سلالة بعد زونها على عند 18 أسبوعًا حسب وزن الجسم إلى ثلاث مجموعات عالية ووسطية ومنخفضة. و Wouldn’t it be interesting to see what you would recommend for them to try next? How can you help them improve their performance by offering relevant feedback or suggestions? If you could provide any insights or recommendations, please share your thoughts! Thanks in advance!
10- يوجد ارتباط سالب بين وزن الجسم عند عمر 18 أسبوعاً والوزن عند التضخج الجنسي مع معدل الكبيط، ولكن كان الارتباط موجباً مع وزن الجسم عند عمر 18 أسبوعاً وكمية البويض وكان سالباً بين كمية البويض والوزن عند التضخج الجنسي.

11- تراوحت كفاءة تحويل العلف بين انتفاض وزن الجسم عند عمر 18 أسبوعاً.

12- في سلاسة الدندراوي، البويضية كان هناك ارتباط موجب بين وزن الجسم عند عمر 18 أسبوعاً وكمية تحويل العلف، أما في سلاسة الدقيقية، كان الارتباط سالباً بين الوزن عند عمر 18 أسبوعاً وكمية تحويل العلف.