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# STRAIN EFFECT ON SOME PRODUCTIVE AND REPRODUCTIVE PERFORMANCE TRAITS OF LOCAL IMPROVED EGYPTIAN AND CANADIAN CHICKENS

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ORIGINAL ARTICLE

**ABSTRACT:** *This experiment was conducted to evaluate the effect of strain on some productive as well as some reproductive traits of local improved dual purpose three Canadian strains (Shaver A, B and C) and two Egyptian chicken strains (Salam and Mandarah). Results revealed that strain effect was evident for shaver C strain for (body weight at sexual maturity, body weight at 90 days of egg production, 42 and 65 weeks of age), also strain effect was evident for shaver C strain for feed consumption (at sexual maturity, 90 days of egg production, 42 weeks and 65 weeks of age) and (egg weight at 90 days of egg production, 42 and 65 weeks of age). While strain effect for fertility, hatchability and scientific hatchability, age at sexual maturity, Egg number at first 90 days of egg production and egg number at 42 and 65 weeks of age were recorded for Egyptian chickens. Moreover, negative correlation estimates were observed between age at sexual maturity and egg number at different periods as well as positive correlation between body weight at 8 weeks of age and most of productive traits that of high great benefits to select for economic traits in chickens at earlier age.*

**Key words:** *Strain, Egg Parameters, Egypt, Fertility, Hatchability, Correlation*

## INTRODUCTION

In a developing country like Egypt, poultry production is of great importance as a primary supplier of eggs and meat and as a source of income. So, the knowledge of performance of economic traits in chicken is important for the formulation of breeding plans for further improvement in production traits. Growth and production traits of a bird indicate its genetic constitution and adaptation with respect to the specific environment (Ahmed and Singh, 2007).

Local developed stains in Egypt varied according to purpose of production; from these strains is Mandarah chickens that resulting from crossing between Alexandria male (four-way cross of Plymouth, RIR, WL and Fayoumi) and Dokki-4 female. While Salam strain is across between Nicolas male and Maamourah females for four successive generations and they are considered as dual purpose for egg and meat production.

It was found that body weights, age at sexual maturity, egg weights and egg production were significantly varied in four chicken varieties (Niranjan et al., 2008). Moreover, Sola-Ojo and Ayorinde (2011) reported that line and strain effect were evident for fertility, hatchability, body weight, total egg number, hen day egg production, body weight at first egg, and total egg number.

A number of researches have been done earlier on the relationship between body weights, age at sexual maturity, egg weight and egg production in the domestic chickens (Omeje and Nwosu, 1984; Ayorinde et al., 1988; Oni et al., 1991; Adenowo et al., 1995; Chineke, 2001; Udeh, 2010). Also, genetic and phenotypic correlations between growth and production performance of chickens were studied by many authors (Siegel and Dunnington, 1985, Nwagu et al., 2007 and El-Dlebshany 2008).

The objectives of this study were to assess the differences between local developed Egyptian and Canadian shaver chicken strains for reproductive and productive traits as well as estimation of correlation between studied parameters.

## MATERIAL AND METHODS

A total number of 1951 one day old chicks obtained from three Canadian dual purpose strains received from Shaver poultry breeders and two Egyptian strains (Salam and Mandarah).



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Chicks individually weighted, sexed, wing banded and Mark's vaccinated with spectam® at one day old, then randomly distributed and put 25 females/ pen and 24 males/ pen from each strain. Chicks were floor brooded for the first five weeks of age in a clean well ventilated room, previously fumigated with formalin and potassium permanganate with ratio (2:1). The room was provided with heaters to adjust the environmental temperature according to age of the chicks, starting with 35 °C at one day old and decreased 3°C weekly until the end of brooding period then adjusted at 21 °C in the growing and laying periods.

Light was provided 24 hours at the first day then decreased to 21 hours daily till the fourth week of age then reduced to 10 hours of light and 14 hours of darkness during the growing period. At the 18th weeks of age the lighting period increased gradually to 14 hours with 10 hours darkness daily. During laying period the lighting was 16 hours with darkness 8 hours daily (Chao and Lee, 2001).

During laying period males and females were subjected to optimum environments as possible to keep their high performance in cage system. Cocks were trained for semen collection (twice per week) before practicing artificial insemination by three weeks. Artificial insemination (AI) was practiced twice per week for the first week then one time per week. Hens were artificially inseminated with 0.1 ml of the fresh diluted semen (diluted with saline 0.9% by the ratio of 1:1) from its assigned cock. Semen collection was done using massage technique described by Lake and Stewart (1978) and Mostafa (1989).

### Vaccination program

The program of vaccination was done as shown in Table 1:

Table 1 - vaccination program for birds

| Vaccine type | Time of vaccination |
|---|---|
| Spectam 0.5 ml S/C | 1st day |
| Hitchener B1+ Infectious Bronchitis(IB) | 7th day |
| Gumboro (live) | 13th day |
| Lasota | 15th day |
| Gumboro | 23rd day |
| Lasota +IB | 30th day |
| Gumboro | 35th day |
| Lasota | every 2 weeks |
| Infectious Bronchitis (IB) | every month |

### Feeding of birds

Females fed with starter ration (19% CP and 3050 K-cal/kg) ad libitum from zero to 5 weeks of age and then grower ration (14% CP- / and 3100 K-cal/kg from 6-12 weeks). Males fed with broiler starter ration (22% CP and 3150 k-cal/kg) from 0-5weeks of age, then roaster grower (20% CP and 3200 k-cal/kg) from 6- 10 weeks of age, and roaster with finisher (18% CP and 3250 K-cal/kg) from 10-12 weeks of age, finally breeder ration till the end of experiment (16% CP and 3000 k-cal /kg).

### Studied traits

1- Body weight: (weight at sexual maturity, weight at first 90 days of egg production, and 42 and 65 weeks of age).

2- Age at sexual maturity: age at the first egg.

3- Fertility percentage: ((No. of fertile eggs/ Total number of eggs set)*100).

4- Hatchability percentages: Scientific hatchability percentage (No. of hatched eggs / Total number of fertile eggs)*100.

Commercial hatchability percentage (No. of hatched eggs / Total number of eggs set)*100

5- Feed consumption: was calculated at sexual maturity, first 90 days of egg production, 42 weeks of age and 65 weeks of age).

6- Feed conversion: was calculated at first 90 days of egg production, 42 weeks of age and 65 weeks of age).

7- Egg parameters: Egg Number (at first 90 days of egg production, 42 weeks of age and 65 weeks of age); Egg Weight (at first 90 days of egg production, 42 weeks of age and 65 weeks of age); Egg Mass (at first 90 days of egg production, 42 weeks of age and 65 weeks of age)

8- Estimation of correlations.

### Statistical analysis:

Spearman's rank correlations were computed using SAS procedure Guide, 2004 (SAS, 2004).

The analysis of variance (GLM) for the obtained data was performed using Statistical Analysis System (SAS, 2004) software to assess significant differences according to the following model.

XIjl = μ + Gi + eijk

Where:

Xijk = the X th observation of the strain, μ = overall mean, Gi = effect of strain (i = Shaver A, B, C, Salam and Mandarah) and eijk= random error.


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## RESULTS AND DISCUSSION

### Strain effect on fertility, scientific and commercial hatchability

Fitness traits are presented in (Table 2 and Figure 1). It was observed that there were higher non-significant percentages for fertility of local Egyptian strains (Mandarah and Salam) over Canadian shaver strains C and B (93.54 and 92.14% versus 91.10 and 84.15%; respectively), while the lowest fertility percentage was recorded for Shaver A strain 68.32 %. The same trend of fertility was recorded for scientific hatchability where Mandarah and Salam strains recorded higher percentages than Shaver C, B and A (95.32, 93.12% versus 88.59, 83.88 and 82.35 %; respectively), Moreover, commercial hatchability percentages were higher for Mandarah and Salam strains than those of Shaver C, B and A (89.47, 87.30% versus 80.46, 70.95 and 56.18 %; respectively). These results confirmed by those obtained by (Sola-Ojo and Ayorinde, 2011) who found significant ($P<0.05$) effect of genotype on fertility and hatchability of eggs. Higher fertility and hatchability percentages for local breeds over exotic ones also were reported by (Horst, 1991 and Dessie and Ogle, 2001). Moreover, breed differences for fertility percentage were reported by (Kamble et al., 1996) while breed differences for hatchability percentage were recorded by (Alaba, 1990; Atteh, 1990 and Fayeye et al., 2005).

From the above results it was clear that local Egyptian chicken strains (Salam and Mandarah had superiority for fitness traits than Canadian Shaver strain A, B and C. This superiority may be due to adaptation to the Egyptian environmental conditions.

Table 2 - Least square means ± standard errors of the effect of different strains on Fertility, Scientific hatchability and Commercial hatchability

| Strain \ Parameter | Fertility | Scientific hatchability | Commercial hatchability |
|---|---|---|---|
| Shaver A | 68.32±3.75 b | 82.35±2.45 b | 56.18±5.11 c |
| Shaver B | 84.15±3.92 a | 83.88±3.36 b | 70.95±5.47 bc |
| Shaver C | 91.10±3.01 a | 88.59±3.92 ab | 80.46±3.88 ab |
| Salam | 92.14±2.58 a | 93.12±3.44 ab | 87.30±5.18 ab |
| Mandarah | 93.54±2.41 a | 95.32±2.94 a | 89.47±5.18 a |

a, b and c = means on the same column (for the average of strains) significantly ($p \leq 0.01$).

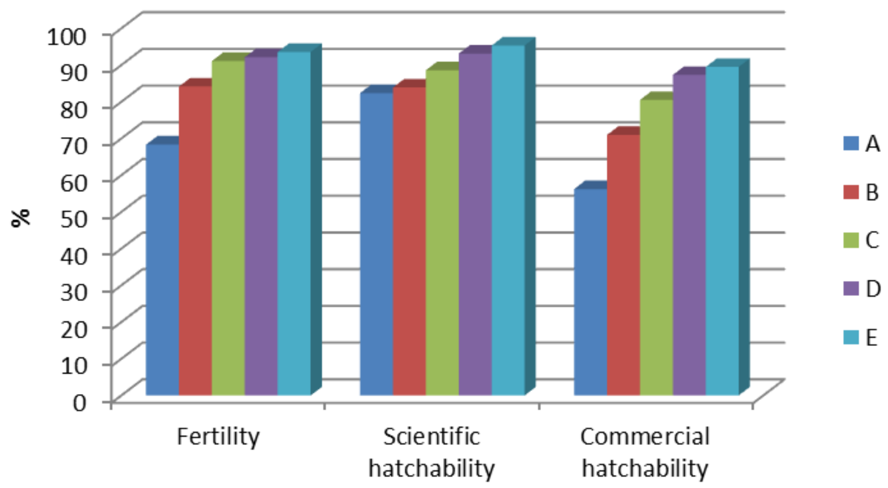


Figure 1 - Fertility, Scientific and commercial hatchability percentages among three Canadian and two Egyptian local strains. A, B, C, D and E =( Shaver A, Shaver B, Shaver C, Salam and Mandarah)

### Strain effect on body weight

Results of body weight for different local Egyptian and Canadian chicken strains at different periods are presented in (Table, 3).

### Body weight at sexual maturity

It was observed that shaver C strain reached sexual maturity with the heaviest weight (2661.34 g) followed by shaver A (1873.38 g) while the lowest body weight at sexual maturity was recorded for Shaver B strain (1615.63 g). Strain and line effects for body weight at sexual maturity were also recorded by (Udeh, 2010 and Sola-Ojo and Ayorinde, 2011 and El-labban et al., 2011).

### Body weight at 90 days of egg production, 42 and 65 weeks of age

Shaver C strain recoded superiority in body weight at 90 days egg production over other studied strains (2832.66 g) followed by Shaver A strain (2100.51 g), but the lowest body weight recorded for Mandarah strain


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(1960.70 g). The same trend was recorded for body weight at 42 weeks of age where the highest body weight was recorded for Shaver C strain (3157.21 g) followed by Salam strain (2172.21 g), while the lowest body weight recorded for Mandarah strain (2100.90 g). These results confirmed by those obtained by (Niranjan et al., 2008 and Yahaya et al., 2009) who found strain differences for body weight at 40 weeks of age. In addition Shaver C strain also recorded the highest body weight at 65 weeks at age (3388.76 g) followed by Shaver A (2309.88 g). Similar results obtained by (Niranjan et al., 2008) who found significant differences between different layer strains at 64 weeks of age. On the other hand, Mandarah strain had the same trend of body weight at 90 days of egg production and 42 weeks of age and recorded the lowest body weight (2127.60 g). Strain effect for body weight were also recorded by (Ojedapo et al., 2008 and Singh et al., 2009) who found that there were line and strain effect for body weight at 30, 40 and 50 weeks of age for four strains of laying hens.

**Strain effect on age at sexual maturity**

Age at sexual maturity for different local Egyptian and Canadian chicken strains are summarized in (Table, 3 and Figure 2). Egyptian Mandarah strain reached sexual maturity earlier than other strains (151.60 days) followed by Salam strain (163.66 days), while Canadian Shaver B strain reached sexual maturity at older age (181.87 days). It was noticed that Egyptian strains reached sexual maturity at earlier age than Canadian Shaver strains. Differences in age at sexual maturity between different lines of poultry were also recorded by (Udeh, 2007; Niranjan et al., 2008; Yahaya et al., 2009; Udeh, 2010; El-labban et al., 2011; Udeh and Omeje, 2011), but disagree with AL-Nasser et al., 2008 who found that there were no differences for age at sexual maturity for Lohmann LSL-Classic white and brown strains.

**Strain effect on feed consumption**

Feed consumption at different periods in local Egyptian and Canadian chicken strains are listed in (table, 3). Higher significant differences for feed consumption at sexual maturity for Shaver C strain (146.59 g), followed by Mandarah strain (127.00 g), while the lowest feed consumption recorded for Shaver A (103.20 g). The same trend for feed consumption at 90 days of egg production was recorded for Shaver C (140.36 g) followed by Shaver A (133.47 g), on the other hand Mandarah strain recorded the lowest feed consumption (128.48 g). Shaver C strain also, recorded the highest significant for feed consumption at 42 weeks and 65 weeks of age (142.64 and 145.12 g; respectively) while Salam strain recorded the lowest feed consumption at the same periods (130.77 and 131.24 g; respectively). The results agreed with those obtained by Lacin et al., 2008 who found Strain effect for feed consumption among different layer strains.

**Table 3 - Least square means ± standard errors of the effect of different strains on body weight, age at sexual maturity and feed consumption.**

| Parameter* | Strains | | | | | Average |
|---|---|---|---|---|---|---|
| | Shaver A | Shaver B | Shaver C | Salam | Mandarah | |
| Body weight | | | | | | |
| 1 | 1873.38±19.10$^{b}$ | 1615.63±22.45$^{d}$ | 2661.34±32.37$^{a}$ | 1728.73±27.35$^{c}$ | 1649.60±18.49 $^{d}$ | 1903.76±20.69 |
| 2 | 2100.51±17.67$^{b}$ | 1977.97±16.64$^{c}$ | 2892.66±23.25$^{a}$ | 1998.63±23.36$^{c}$ | 1960.70±13.97 $^{c}$ | 2184.67±18.28 |
| 3 | 21.59.05±13.17$^{b}$ | 2119.79±15.18$^{bc}$ | 3157.21±26.26$^{a}$ | 2172.21±22.69$^{b}$ | 2100.90±15.80 $^{c}$ | 2340.51±20.39 |
| 4 | 2309.88±27.34$^{b}$ | 2229.39±24.30$^{b}$ | 3388.76±40.25$^{a}$ | 2279.57±26.82$^{b}$ | 2127.10± 22.71$^{c}$ | 2464.96±24.69 |
| Age at SM | 160.14±0.54 $^{d}$ | 181.87±0.33 $^{a}$ | 166.73±0.24 $^{b}$ | 163.66±0.62 $^{c}$ | 151.60 ± 0.54 $^{e}$ | 164.80±0.50 |
| FC1 | 103.20±5.10 $^{d}$ | 120.87±0.65 $^{c}$ | 146.59±0.27 $^{a}$ | 127.00±0.16 $^{bc}$ | 127.73±0.13 $^{b}$ | 125.11±1.19 |
| FC2 | 133.47±0.18 $^{b}$ | 131.01±0.16 $^{c}$ | 140.36±0.15 $^{a}$ | 128.48±0.08 $^{e}$ | 129.50±0.05 $^{d}$ | 132.55±0.20 |
| FC3 | 135.65±0.12 $^{b}$ | 133.88±0.14 $^{c}$ | 142.64±0.13 $^{a}$ | 130.98±0.10 $^{d}$ | 130.77±0.08 $^{d}$ | 134.77±0.20 |
| FC4 | 137.81±0.06 $^{b}$ | 135.41±0.12 $^{c}$ | 145.12±0.15 $^{a}$ | 131.49±0.11 $^{d}$ | 131.24±0.08 $^{d}$ | 136.19±0.23 |

$^{a, b, c, d \text{ and } e}$ means on the same raw (for the average of strains) significantly ($P \leq 0.01$). Body weight 1, 2, 3 and 4, Age at SM, FC1, FC2, FC3 and FC4= body weight at age at sexual maturity, body weight at 90 days of production, body weight at 42 weeks of age, body weight at 65 weeks of age, age at sexual maturity, feed consumption at sexual maturity, feed consumption at 90 days of production, feed consumption at 42 weeks of age and feed consumption at 65 weeks of age

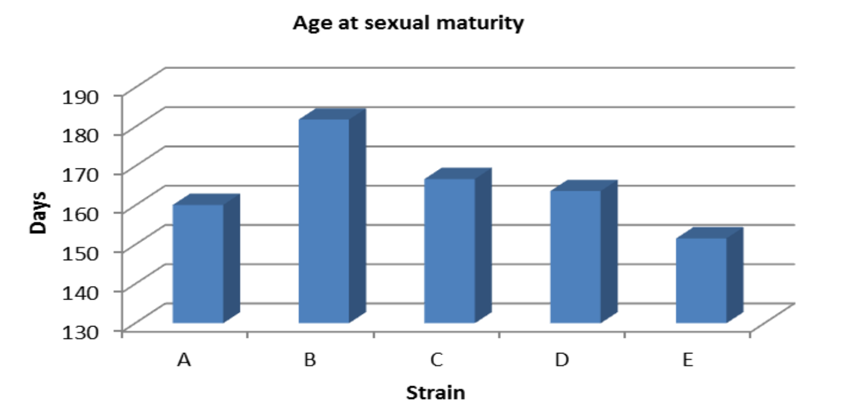


Figure 2 - Age at sexual maturity(days) between three Canadian and two Egyptian local strains
A, B, C, D and E = (Shaver A, Shaver B, Shaver C, Salam and Mandarah)


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**Strain effect on egg parameters**

Egg number, weight and egg mass for different periods in local Egyptian and Canadian Chicken strains are presented in (Table, 4).

Table 4 - Least square means ± standard errors of the effect of different strains on egg production (egg number, egg weight and egg mass) and feed conversion.

| Parameter | Strains | | | | | Average |
|---|---|---|---|---|---|---|
| | Shaver A | Shaver B | Shaver C | Salam | Mandarah | |
| EN1 | 46.42±0.76 [c] | 35.83±0.40 [e] | 44.48±0.56 [d] | 61.75±0.30 [d] | 65.92±0.54 [a] | 50.88±0.56 |
| EN2 | 101.71±0.49 [c] | 71.83±0.72 [d] | 100.36±0.34 [c] | 118.57±0.16 [b] | 123.14±0.55 [a] | 102.97±0.85 |
| EN3 | 179.65±0.72 [c] | 130.63±1.21 [e] | 160.51±0.48 [d] | 191.01±0.49 [b] | 199.94±0.68 [a] | 172.25±1.17 |
| EW1 | 63.24±0.24 [c] | 64.16±0.14 [b] | 66.83±0.19 [a] | 51.28±0.08 [d] | 50.46±0.03 [e] | 59.18±0.32 |
| EW2 | 68.64±0.14 [b] | 62.72±0.13 [c] | 71.33±0.25 [a] | 55.62±0.06 [d] | 53.94±0.08 [e] | 62.42±0.31 |
| EW3 | 67.05±0.07 [b] | 64.45±0.22 [c] | 70.45±0.25 [a] | 56.16±0.03 [d] | 55.14±0.08 [e] | 62.73±0.28 |
| EM1 | 2937.36±49.55[c] | 2294.67±21.88 [d] | 2967.88±34.07 [c] | 3165.30±12.74[b] | 3327.40±28.19 [a] | 2937.34±21.39 |
| EM2 | 6977.72±24.42[b] | 4482.15±50.93 [d] | 7154.11±22.31 [a] | 6595.60 ± 9.76 [c] | 6645.17±36.49 [c] | 6362.17±36.49 |
| EM3 | 12046.56±50.70[a] | 8439.30±102.35[e] | 11391.59±60.05 [b] | 10728.14±30.26[d] | 11023.69±32.70[c] | 10715.58±62.15 |
| F.conv.1 | 4.20±0.07 [b] | 5.18±0.04 [a] | 4.31±0.05 [b] | 3.65±0.01 [c] | 3.52±0.03 [d] | 4.17±0.03 |
| F.conv.2 | 3.50±0.01 [d] | 5.43±0.05 [a] | 3.59±0.01 [b] | 3.57±0.04 [c] | 3.55±0.02 [c] | 3.93±0.04 |
| F.conv.3 | 4.01±0.02 [c] | 5.69±0.07 [a] | 4.47±0.02 [ab] | 4.29±0.01 [b] | 4.16±0.01 [bc] | 4.53±0.03 |

[a, b, c, d and e] means on the same raw (for the average of strains) significantly (p ≤ 0.01). EN1, EW1, EM1, EN2, EW2, EM2, EN3, EW3 and EM3= Egg number at first 90 days of production, average egg weight at first 90 days of production, Egg mass at first 90 days of production, Egg number at 42 weeks of age, average egg weight at 42 weeks of age, Egg mass at 42 weeks of age, Egg number at 65 weeks of age, average egg weight at 65 weeks of age and Egg mass at 65 weeks of production; respectively

**Egg number**

Egg number at first 90 days of production (Table, 4 and Figure 3) revealed that Salam strain recorded the highest significant values for egg production followed by Mandarah strain (65.92 and 61.75), while the lowest egg number recorded for Shaver B strain (35.83). Also, egg number at 42 weeks of age was of highest significant for Salam strain followed by Mandarah strain (123.14 and 118.57; respectively), while Shaver B recorded the lowest egg number (71.83). Significant strain differences for egg number at first 90 days of age were also recorded by (El-labban et al., 2011).

Salam strain continues recoding the highest significant egg number at 65 weeks of age followed also by Mandarah strain (199.94 and 191.01; respectively). On the other hand the worst egg number recorded for Shaver B strain (130.63). It was clear that there were superiority for number at different periods of production for Egyptian Local strains (Salam and Mandarah) over Canadian shaver Strains. Strain differences for egg production at different ages of laying hens where reported by (Udeh, 2007; Lacin et al., 2008; Niranjan et al., 2008; Yahaya et al., 2009; Sola-Ojo and Ayorinde, 2011; Udeh and Omeje, 2011).

**Egg weight**

It was noticed that Shaver C recorded the highest significant differences for egg weight (Table, 4 and Figure 4) at 90 days of egg production, 42 and 65 weeks of age ( 66.83, 71.33 and 70.45 g; respectively), while the lowest egg weights for the periods were recorded for Salam strain (50.46, 53.94 and 55.14 g; respectively). Results agreed with those obtained by Udeh, 2007 who reported that the comparative performance between the two strains of chicken showed significant differences in weight of first egg, egg weight at 30 and 40 weeks. Also strain differences for egg weight were recorded by Lacin et al., 2008; Niranjan et al., 2008; Yahaya et al., 2009; Udeh and Omeje, 2011). It was clear that egg weights were negatively correlated with egg number as observed in Salam strain.

**Egg mass**

Salam strain was of highest significant values for egg mass (Table, 4 and Figure 5) at 90 days of egg production (3327.40 g), while shaver B recorded the lowest egg mass (2294.67 g), but egg mass at 42 weeks of age was of highest significant values for Shaver C (7154.11 g) and the lowest egg mass also recorded for Shaver B (4482.15 g). On the other hand egg mass at 65 weeks of age was significant for Shaver A (12046.56 g) and Shaver B was still of the lowest egg mass (8439.30 g). The results in agreement with those obtained by (El-labban et al., 2011) who found strain differences for egg mass at first 90-days, egg mass for 210-days, egg mass for first ten eggs, egg mass for one week per month and egg mass for two days per week. Strain effect for egg mass also recorded by (Udeh, 2007).

**Strain effect on feed conversion**

From the data presented in (Table, 4) Salam and Mandarah strains represented the best feed conversion rate at first 90 days of production 3.52 and 3.65 kg, while Shaver A strain recorded the best feed conversion at 42 weeks of age (3.50 kg) followed by Salam and Mandarah strains (3.55 and 3.57 Kg), more over the same trend was recorded for feed conversion at 65 weeks of age; Shaver A strain showed the highest feed conversion ratio (4.01kg) followed by Salam and Mandarah strains (4.16 and 4.29 Kg). From the mentioned results Egyptian Salam and Mandarah strains represented best feed conversion over Shaver B and C Strains. The same results reported by Udeh, 2007 who found significant strain effect for feed conversion into eggs between two strains of brown Nick and Black Olympia layer type chickens. Strain effect for feed conversion in different layer strains was also recorded by Lacin et al., 2008.

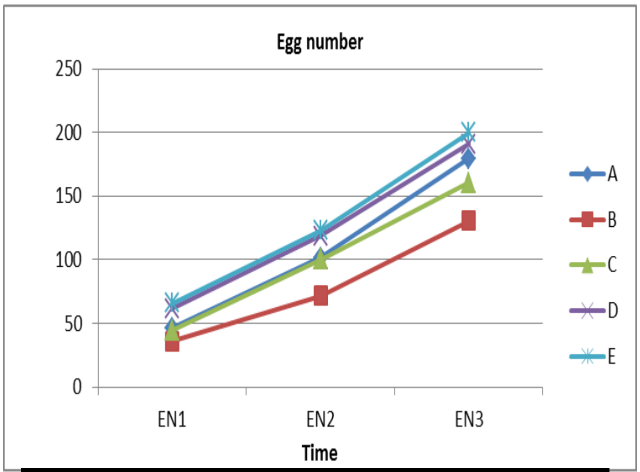


Figure 3 - Egg number between three Canadian and two Egyptian local strains
A, B, C, D and E =(Shaver A, Shaver B, Shaver C, Salam and Mandarah) EN1, EN2 and EN3=( Egg number at first 90 days of production, 42 and 65 weeks of age

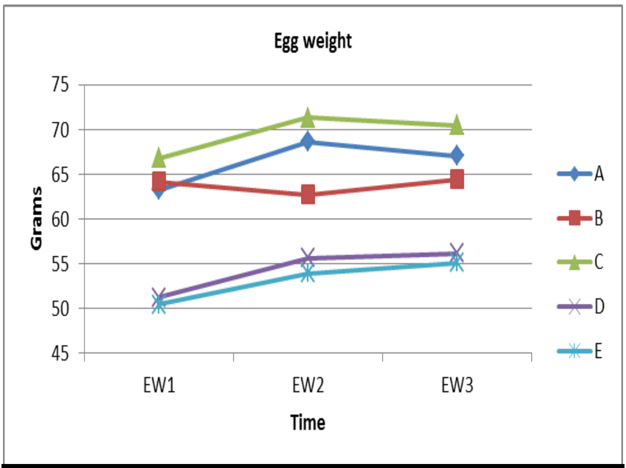


Figure 4 - Egg weight between three Canadian and two Egyptian local strains
A, B, C, D and E =(Shaver A, Shaver B, Shaver C, Salam and Mandarah) EW1, EW2 and EW3=( Egg weight at first 90 days of production, 42 and 65 weeks of age

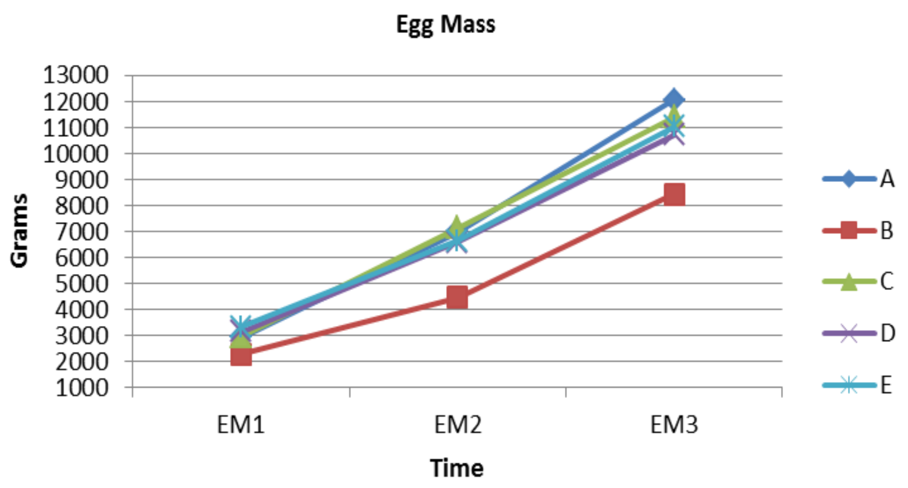


Figure 5 - Egg mass between three Canadian and two Egyptian local strains
A, B, C, D and E =( Shaver A, Shaver B, Shaver C, Salam and Mandarah) EM1, EM2 and EM3=( Egg mass at first 90 days of production, 42 and 65 weeks of age

**Correlations among some productive traits**

Correlation coefficients among some production traits were presented in table (Table 5). It was observed that there were highly positive correlations between body weights at 8 weeks, body weight at first 90 days, body weight at first 42 weeks of age and body weight at first 65 weeks of age. While negative correlation values were recorded between BW1, BW2, BW3 and Sexual maturity (-0.13, -0.02 and -0.05) on the other hand mild positive correlations were recorded between BW4, BW5 and Sexual Maturity (0.06 and 0.07). These results agreed with those obtained by (Udeh, 2010) who found that the genetic and phenotypic correlations of age at sexual maturity were negative with all of body weight at 4-wk, 8-wk of age,

Negative correlation estimates were observed for EW1 and EN1, EW2 and EN1, EW3 and EN1 (-0.84, -0.65 and -0.71; respectively), also EW2 and EN2, EW3 and EN2 (-0.49 and -0.56), in addition EW3 and EN3 (-0.55). These results agreed with those obtained by (Veeramani et al., (2008) and El-labban et al., 2011). But not agreed with those obtained by Nwagu et al., (2007) who reported that correlation between egg number and egg weight was small non-significant. On the other hand, Positive correlation estimates were recorded between EN1 and EM1, EN2 and EM2, EN3 and EM3 (0.89, 0.76 and 0.72; respectively).

Highly negative correlation estimates were observed between age at sexual maturity and EN1, (-0.70), EN2 (-0.87) and EN3 (-0.83). The same results were obtained by Veeramani et al. (2008) who found negative correlation between ASM and Egg production on both genetic and phenotypic scale.


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Table 5 - Correlation coefficients among some production traits

| Parameter | BW1 | BW2 | BW3 | BW4 | BW5 | SM | EN1 | EW1 | EM1 | EN2 | EW2 | EM2 | EN3 | EW3 | EM3 | F.Con1 | F.Con2 | F.Con3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BW1 | - | 0.68** | 0.69** | 0.73** | 0.70** | -0.13** | 0.01 | 0.26** | 0.22** | 0.20** | 0.43** | 0.53** | 0.05 | 0.40** | 0.57** | -0.16** | - 0.41** | - 0.24** |
| BW2 | | - | 0.90** | 0.86** | 0.78** | -0.02 | -0.22** | 0.50** | 0.06 | -0.02 | 0.63** | 0.43** | -0.14** | 0.60** | 0.32** | 0.04 | -0.28** | -0.11* |
| BW3 | | | - | 0.94** | 0.84** | -0.05 | -0.28** | 0.53** | 0.00 | -0.07 | 0.64** | 0.39** | - 0.20** | 0.63** | 0.28** | 0.10 | -0.23** | -0.07 |
| BW4 | | | | - | 0.87** | 0.06 | -0.25** | 0.50** | 0.02 | -0.06 | 0.60** | 0.37** | -0.26** | 0.60** | 0.24** | 0.08 | -0.215** | -0.05 |
| BW5 | | | | | - | 0.07 | -0.28** | 0.51** | -0.03 | -0.08 | 0.60** | 0.35** | -0.22** | 0.58** | 0.21** | 0.12** | -0.20** | -0.02 |
| SM | | | | | | - | -0.70** | 0.54** | -0.65** | -0.87** | 0.33** | -0.67** | -0.83** | 0.41** | -0.64** | 0.70** | 0.76** | 0.71** |
| EN1 | | | | | | | - | -0.84** | 0.89** | 0.86** | -0.65** | 0.48** | 0.85** | -0.71** | 0.40** | -0.93** | -0.62** | -0.59** |
| EW1 | | | | | | | | - | -0.50** | -0.74** | 0.89** | -0.16** | -0.73** | 0.93** | -0.07 | 0.61** | 0.36** | 0.35** |
| EM1 | | | | | | | | | - | 0.77** | -0.27** | 0.65** | 0.76** | -0.33** | 0.61** | -0.98** | -0.72** | -0.68** |
| EN2 | | | | | | | | | | - | -0.49** | 0.76** | 0.93** | -0.56** | 0.62** | -0.82** | -0.87** | -0.77** |
| EW2 | | | | | | | | | | | - | 0.19** | -0.49** | 0.97** | 0.23** | 0.39** | 0.00 | 0.05 |
| EM2 | | | | | | | | | | | | - | 0.68** | 0.09 | 0.88** | -0.62** | -0.98** | -0.83** |
| EN3 | | | | | | | | | | | | | - | -0.55** | 0.72** | -0.80** | -0.81** | -0.87** |
| EW3 | | | | | | | | | | | | | | - | 0.19** | 0.46** | 0.11* | 0.09 |
| EM3 | | | | | | | | | | | | | | | - | 0.58** | -0.87** | -0.95** |
| F.Con1 | | | | | | | | | | | | | | | | - | 0.73** | 0.68** |
| F.Con2 | | | | | | | | | | | | | | | | | - | 0.88** |
| F.Con3 | | | | | | | | | | | | | | | | | | - |

BW1, BW2, BW3, BW4, BW5, SM, EN1, EW1, EM1, EW2, EM2, EN2, EN3, EW3, EM3, F.Con1, F.Con2 and F.Con3= body weight at 8 weeks of age, body weight at sexual maturity, body weight at first 90 days, body weight at first 42 weeks of age, body weight at first 65 weeks of age, age at sexual maturity, egg number at 42 weeks, egg weight at 42 weeks, egg mass at 42 weeks, egg number at first 90 days of production, egg weight at first 90 days of production, egg mass at first 90 days of production, egg number at 65 weeks, egg weight at 65 weeks, feed conversion at first 90 days of egg production, feed conversion at 42 weeks and feed conversion at 65 weeks of age



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## CONCLUSION

From the above results we can conclude that Canadian Shaver C strain recorded the best results for most productive traits, while Egyptian strains (Salam and Mandarah) recorded the best results for reproductive traits as well as egg numbers. Also, we can select for body weight at eight weeks of age for improving most of productive traits as egg number, egg weight and egg mass instead of selection in older ages of birds that will be economically more benefit.

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