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SELECTION FOR UNIFORMITY IN ALEXANDRIA LOCAL CHICKENS

2-CORRELATED RESPONSE FOR PRODUCTIVE AND REPRODUCTIVE TRAITS

By

M.A.Kosba[1], H.S.Zeweil[2], M.H.Ahmed[2], Summer.M.Shabara[2], and A.A.Debes[3]

[1]Poultry Production Department, Alex Univ. [2]Animal and Fish Production Department, Faculty. of Agric.(Saba Basha), Alex Univ . [3]Animal Production Research Institute, Agricultural Research Center

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Abstract: *Four lines of Alexandria strain were used: selected egg line (EL), selected meat line (ML) and their controls (CEL&CML). The present study was performed for propose of increasing uniformity in Alexandria chickens. Eight weeks body weight and also age of sexual maturity were estimated in all populations. In the meat line selection was done for increasing uniformity for eight weeks body weight so the female chicks which in range ($\bar{x}$ ± S.D.) and the male chicks which in range ($\bar{x}$ ± 0.5S.D.), where were chosen as parents for the next generation and all chicks above or lower than these ranges were discarded. While in the egg line selection was done for increasing uniformity for age of sexual maturity so the layers which in range (x ± S.D.), where were chosen as dams for the next generation and all layers above or lower than this range were discarded. Males which will be the sirs were taken at random. The males and females of each control line were taken at random from their population.*

The main results and conclusions are summarized as follow:

1.Negative correlated responses were observed in fertility percentage, hatchability percentage of fertile eggs, and body weight at hatch day, four and eight weeks of age in males and females. The selection for uniformity did not improve these traits.

2.There are negative correlated responses for uniformity selection on body weight at sexual maturity in E.L. (-56.4gm.) While it was highly positive in the M.L. (249.3gm.).

3.Age at sexual maturity improved as a result of uniformity selection in the two lines (-5.52 and -4.15 in E.L. and M.L., respectively).

4.The duration period of laying the first 10 eggs was increased by 1.8 and 2.1 days as a result of one generation of uniformity selection .

5.The average weight of the first 10 eggs was decreased by - 0.3 and -2.9 gm. in the E.L. and M.L., respectively.

6.The egg number during the first 90 days of laying was increased by 2 and 10.3 eggs in the E.L. and M.L., respectively.

7. In present study, the overall averages of fertility percentage (F%), hatchability percentage (H%), body weight at hatch (BWH), at four weeks (BW4), at eight weeks (BW8), at sexual maturity (BWSM), age at sexual maturity (ASM), duration period of laying the first 10 eggs (P10FE), average egg weight of the first 10 eggs (W10FE) and egg number during the first 90 days of laying (EN90D) were 88.11%, 51.95%, 30.19 gm, 209.9 gm, 540.24 gm, 1553.3 gm, 159.68 days, 13.7 days, 36.8 gm and 53.7 eggs, respectively.

8. Analysis of variance showed that, the differences between two generations were significant only for F%, BWSM and EN90D. The differences between four lines were insignificant for all traits. Interaction effect GxL showed highly significant for all traits expect F% and BW8.

INTRODUCTION

Flock uniformity within male and female populations is the main goal to achieving maximum performance for broilers and egg production and seems to be a short way to supply the market with necessary meat chickens and eggs.

Average body weight and body weight uniformity are inseparable topics. Uniform flocks with the proper weight have several advantages: (a) birds are managed in large groups and are exposed to management changes (lighting, feed and housing) at the same time, whether they are physiologically ready or not, (b) are more efficient, (c) have higher peak production and (d) come closest to expressing their full genetic potential.

Traditionally, the emphasis on uniformity of broiler chicks has been dictated by the last part of the production chain. The automated slaughtering process demands uniformity of product entering the processing plant. Often, achieving uniformity is regarded as the broiler farmer's job and indeed, uniformity of broilers at slaughter weight can be greatly influenced by what happens on the broiler farm. As chick uniformity is unlikely to increase during the production process, a key prerequisite to a uniform end product is uniformity in the day olds. Day-old flocks showing poor uniformity are impossible to manage properly, which will result in lower growth, increased feed conversion and higher mortality during the first week (Van de Ven, 2005).

As the same, when the pullet is grown improperly during the early growing period, it will be difficult to improve the pullet during the remaining growing period.

Some confusion arises when it comes to the question of measuring uniformity. Poultry growers generally assess the uniformity of a flock by eye. Information regarding practical standards for measuring the uniformity was defined by (North, 1978); according to him, uniformity is measured as the percent of the birds that weigh within ± 10% of the average flock weight. Flocks in which less than 70% of the birds meet these criteria are considered no uniform.

Genetics is a good starting point for achieving uniformity. So. selection for uniformity is a method to increasing it in a population. Good management can also result in more uniformity.

Generally, no available literature were found for improve uniformity in our local strains for body weight and age at sexual maturity so our present study aimed to increase the uniformity of Alexandria strain as well as the effect of increasing uniformity on productive and reproductive performance.

MATERIALS AND METHODS

The experimental work of this study was done at the Poultry Research Center, Faculty of Agriculture (El-Shatby) and the Department of Animal and Fish Production, Faculty of Agriculture (Saba-Basha). Alexandria University, Egypt, through two seasons (2004/2005 and 2005/2006). The experimental stock comprised two developed Alexandria lines (meat and egg lines) and their two control lines.

Flock History:

Alexandria strain is a local strain chickens which established in 1958 at Faculty of Agriculture (El-Shatby) by Prof. Dr. H. EL-Ibiary. It resulted from crossing between Fayoumi as Egyptian breed and Barred Plymouth Rock, Rhode Island Red and White Leghorn as standard breeds (Kosba, 1966).

The Experimental Plan:

Four lines of Alexandria were used in the present study:

1-Egg Line (E.L.):

Obtained in seasons 1992 and 1993 by crossing three strains of chickens i.e. Alexandria, Norfa and Matrouh (Zatter, 1994). This line was selected for age at sexual maturity and egg production traits from season 1995 till now (Ghanem, 1995 and 2003).Then this line was selected for white feather color (Khalil, 2005).

2-Control population for egg line(C.E.L.):

Control population for the selected egg line was obtained by random mating of the same base population of egg line without selection for any trait (Zatter, 1994 and Khalil, 2005).

3-Meat Line(M.L.):

Obtained in seasons 1991 and 1992 by crossing four strains of chickens i.e. Alexandria, Gimmiza., Mandarah, and Silver Montazah (EL-Hanoun, 1995).This line was selected for eight weeks body weight and meat production traits from season 1997 till now (Abd Alla, 1997; Abd EL-Halim, 1999; EL-Tahawy, 2000 and EL-Dlebshany, 2004).Then this line was selected for black feather color (Khalil, 2005).

4-Control population for meat line(C.M.L.):

Control population for the selected meat line was obtained by random mating of the same base population of meat line without selection for any trait (EL-Hanoun, 1995 and Khalil, 2005).

Selection Method:

The methods of selection were described before on Kosba et al (2009)

The Mating Plan:

A-Season (2004-2005):

Four large breeding houses had been used for mass mating as follows: house (1) comprised males and females of E.L., house (2) comprised males and females of C.E.L., house (3) comprised males and females of M.L. and house (4) comprised males and females of C.M.L.

Each house had about 6 to 11 sires and 45 to 85 dams for each line Table (1).

B-Season (2005-2006):

Twenty five individual breeding pens had been used to produce the chickens of the selected and control lines. In M.L. 7 pens were used, each pen had one sir mated to a minimum of 8 dams. In E.L. 10 pens were used, each pen had one sir mated to 5 dams. In two control lines 4 pens were used for each line, each pen had one sir mated to a minimum of 10 dams.

The numbers of parents and offspring at hatch for each season and line are shown in Table (1).

The numbers of observations of different traits for each season and line are shown in Table (2).

The numbers of observations of different traits for all seasons and lines are shown in Table (3).

Flock Husbandry:

Was described before on Kosba et al (2009).

Table 1: Sires, dams and offspring number of selected and control populations in two seasons

Line	seasons					
	2004/2005[1]			2005/2006[2]		
	Sires	Dams	Offspring	Sires	Dams	Offspring
E.L	11	85	1405	10	50	481
C.E.L.	6	45	355	4	40	533
M.L.	10	79	1084	7	62	593
C.M.L.	6	45	315	4	41	341
Total	33	254	3159	25	193	1948

1= mass mating & 2= breeding pens mating (family mating).

Table 2: The numbers of observations of different traits for each season and line

Traits	1st Generation		2nd Generation	
	♂	♀	♂	♀
E.L.				
BWH	502	673	154	221
BW4	502	673	154	221
BW8	502	673	154	221
ASM		222		50
BWSM		222		50
P10FE		219		17
W10FE		218		17
EN90D		160		5
C.E.L.				
BWH	107	163	136	223
BW4	107	163	136	223
BW8	107	163	136	223
ASM		81		54
BWSM		81		54
P10FE		79		12
W10FE		67		12
EN90D		47		5
M.L.				
BWH	367	514	192	278
BW4	367	514	192	278
BW8	367	514	192	278
ASM		197		68
BWSM		197		68
P10FE		192		20
W10FE		168		20
EN90D		110		4
C.M.L.				
BWH	121	143	105	161
BW4	121	143	105	161
BW8	121	143	105	161
ASM		63		51
BWSM		63		51
P10FE		59		17
W10FE		50		17
EN90D		26		9

Table 3: The numbers of observations of different traits for all seasons and lines

Traits	All observations
BWH	4060
BW4	4060
BW8	4060
BWSM	786
ASM	786
P10FE	615
W10FE	569
EN90D	366

Studied Traits:

1. **Fertility and hatchability percentages.**

Fertility and hatchability percentages (for fertile eggs) were estimated for each hatch (about 5-7 hatches) as follows:

$$\textbf{Fertility\%} = \frac{\text{Number of fertile eggs}}{\text{Total setting eggs in incubator}} * 100$$

$$\textbf{Hatchability\%} = \frac{\text{Number of chicks}}{\text{Number of fertile eggs}} * 100$$

For statistical analysis of these traits, all Percentages were transferred to angule.

2. **Body weight:** individual body weight (g) was recorded at hatch, four and eight weeks of age for each sex and line.

3. **Body weight at sexual maturity:** was recorded in grams for each hen at the date of laying its first egg.

4. **Age at sexual maturity:** was estimated for hen as the number of days from hatching to the day of laying its first egg.

5. **The duration period of laying the first 10 eggs:** The number of days for each hen to give its 10 first eggs.

6. **Average weight of the first 10 eggs:**_was estimated in grams for each hen as the average weight of its first 10 eggs.

7. **Egg number during the first 90 days of laying:** was estimated as the number of eggs laid during the first 90 days of laying for each hen.

Correlated response:

The realized selection and correlated response were estimated according to the numerator of the following equation after (Guill and Washburn, 1974), for estimating realized heritability.

$$h^2_R = \frac{(\text{selected progeny X} - \text{selected parent X}) - (\text{progeny control X} - \text{parent control X})}{(\text{selected parent X} - \text{parent X})}$$

Statistical analysis:

After adjusting the data for hatching date, all performance data was analysis by least squares procedure (using Excel program (Windows^{XP}, 2003)).

The average (X), standard deviation (S.D.), standard error (S.E.) and coefficient of variability (C.V.) were estimated for all studied traits.

Complete data were recorded for body weight at hatch, 4-weeks and 8-weeks of age.

Data of body weight at hatch and four weeks of age were analyzed using the following model:

$$Y_{ijkl} = \mu + G_i + L_j + S_k + (GL)_{ij} + (GS)_{ik} + (LS)_{jk} + (GLS)_{ijk} + e_{ijkl}$$

Where:

μ = the overall mean,

G_i = the effect of generation, i = 1-2,

L_j = the effect of line, j = 1-4,

S_k = the effect of sex, k = 1-2,

$(GL)_{ij}$ = the interaction of the i th generation with the j th line,

$(GS)_{ik}$ = the interaction of the i th generation with the k th sex,

$(LS)_{jk}$ = the interaction of the j th line with the k th sex,

$(GLS)_{ijk}$ = the interaction of the i th generation with the j th line and the k th sex

e_{ijkl} = the remainder error

Data of body weight at eight weeks of age were analyzed for each generation alone using the following model:

$$Y_{jkl} = \mu + +L_j + S_k + (LS)_{jk} + e_{jkl}$$

Where:

μ, L_j, S_k and $(LS)_{jk}$ as defended the previous model and

e_{jkl} = the remainder error.

Data of fertility, hatchability and egg production traits (body weight at sexual maturity, age at sexual maturity, the duration period of laying the first 10 eggs, average weight of the first 10 eggs and egg number during the first 90 days of laying) were analyzed using the following mode:

$$Y_{ijk} = \mu + G_i + L_j + (GL)_{ij} + e_{ijk}$$

Where:

μ, G_i, L_j, and $(GL)_{ij}$ as defended the first model and

e_{ijl} = the remainder error.

Significance of the main and interaction effects were tested at level $P \leq 0.05$ (*) and $P \leq 0.01$ (**) while the appropriate F value higher than 5% were considered to be non- significant.

Differences between each two mean were done according to (Duncans. 1955).

RESULTS AND DISCUSSION

Correlated response to uniformity selection

Table (4) represented the realized correlated response for unselected traits in the two selected lines after one generation of uniformity selection. Negative correlated responses were observed in fertility percentage, hatchability percentage of fertile eggs, and body weight at one day, four and eight weeks of age in males and females. The selection for uniformity did not improve these traits. There are negative correlated responses for uniformity selection on body weight at sexual maturity in E.L. (-56.4 gm.) while it was highly positive in the M.L. (249.3gm.). Age at sexual maturity improved as a result of uniformity selection in the two lines (-5.52 and -4.15

in egg and meat lines, respectively). The duration period of laying the first 10 eggs was increased by 1.8 and 2.1 day as a result of one generation of uniformity selection. The average weight of the first 10 eggs was decreased by -0.3 and -2.9 gm. in the E.L. and M.L., respectively. While the egg number during the first 90 days of laying was increase by 2 and 10.3 eggs in the egg and meat lines, respectively.

Table 4: Realized correlated response for the unselected traits in two selected lines by sex in the second generation

Traits	Sex	E.L.	M.L.
F%		-7.38	-4.01
H%		-49.21	-29
BWH(gm)	♂	-2.2	-2
	♀	-1.8	-2
	Comb.	-2	-2
BW4(gm)	♂	-1.3	-16.3
	♀	-9.7	-10.7
	Comb.	-6.3	-12.5
BW8(gm)	♂	-58.7	-64.5
	♀	-40	-33.7
	Comb.	-47.7	-42
BWSM(gm)	♀	-56.4	249.3
ASM(day)	♀	-5.52	-4.15
P10FE(day)	♀	1.8	2.1
W10FE(gm)	♀	-0.3	-2.9
EN90D(egg)	♀	2	10.3

Incubation traits

Fertility percentage:

Absolute means (%) and angule means ± standard error of fertility of the Alexandria lines and generations are shown in Table (5). The eggs of the first generation had higher value of fertility percent (92.25%) than eggs of the second generation (80.55%). The overall means of fertility percentages were 88.19, 88.91, 86.60 and 89.75% for the egg line, its control, meat line and its control, respectively. These figures were in close agreement to that found by Zatter (1994) who working on the same strains, where the fertility percentage equaled 88.36% while El-Tahawy (2000) reported an average of 95.58% for the same strains. These results in agreement with Khalil (2005), however, El-Delebshany (1999) and Ghanem (2003) reported highly significant differences ($P \leq 0.001$) within generations and lines. The calculated realized correlated response percent was -7.38% and -4.01% for the E.L. and M.L., respectively as a result of uniformity selection Table (4).

Hatchability percentage of the fertile eggs:

Absolute means (%) and angule means ± standard error of hatchability of the Alexandria lines and generations are shown in Table (6). While the overall average of hatchability percentage for the fertile eggs in the first generation was 46.94%, it increased to 62.12% at the second generation. May be that is due to the lowest mean of hatchability for the control of M.L. and E.L. (29.9 and 27.53% which almost due to some environmental effects in the incubation draft. However, Cuningham et al. (1974) and Ghanem (2003) reported that the selected line had a lower value of fertile eggs hatchability than the control line. Khalil (2005) found that the base generation had higher hatchability percent 81.47% than the other next two generations (70.12 and 76.28%). Estimates of hatchability percentages of the fertile eggs during two generations were 59.99, 46.86, 53.46 and 40.13% for the E.L., C.E.L., M.L. and C.M.L., respectively. However, comparing with the estimates of hatchability reported here, higher means of hatchability percentage were found by Kosba (1966); Abd-Alla (1978); Sheble (1986); Ghanem (1995); El-Delebshany (2004) who working on the same strain. In this respect, Ghanem (2003) and Khalil (2005) reported highly significant differences ($P \leq 0.001$) between generations and insignificant differences between lines. On the other hand, El-Delebshany (1999) reported highly significant differences ($P \leq 0.01$) between Alexandria lines.

Correlated response for this trait was -49.21% and -29% for the E.L. and M.L., respectively as a result of selection for uniformity Table (4). It could be concluded that selection, environmental and/or management effects were affected hatchability percentages of the Alexandria strain through this period.

Table 5: Absolute means (%) and angule means ± standard error of fertility of the Alexandria lines and generations.

Lines	1st Generation		2nd Generation		Overall average	
	%	Angule	%	Angule	%	Angule
E.L.	93.01	74.7±1.18	78.20	62.0±1.75	88.19	69.7±2.14
C.E.L.	92.09	73.6±1.40	84.66	67.2±2.26	88.91	70.6±1.61
M.L.	91.31	72.5±1.39	78.12	62.0±3.22	86.60	68.9±2.16
C.M.L.	92.68	74.7±1.54	83.50	66.4±3.89	89.75	71.6±2.24
Overall average	92.25	73.6^{A}±0.67	80.55	64.2^{B}±1.41	88.11	69.7±1.02

Means which have the same letter are non-significant at $P \leq 0.05$

Table 6: Absolute means (%) and angule means ± standard error of hatchability of the Alexandria lines and generations.

Lines	1st Generation		2nd Generation		Overall average	
	%	Angule	%	Angule	%	Angule
E.L.	62.2	51.9ᵃ±4.98	54.56	47.9ᵃ±3.74	59.99	50.8±3.04
C.E.L.	29.91	33.2ᵇ±3.02	71.48	57.4ᵃ±3.06	46.86	43.3±4.26
M.L.	50.55	45.6ᵃ±4.12	59.58	50.8ᵃ±2.61	53.46	46.7±2.52
C.M.L.	27.53	31.9ᵇ±5.85	65.56	54.3ᵃ±4.01	40.13	39.2±4.63
Overall average	46.94	43.3±2.69	62.12	51.9±1.83	51.95	46.1±1.77

Means which refer to GxL interaction and have the same letter are non-significant at $P \leq 0.05$

Body weight traits:

Body weight at hatch:

Least squares means and standard error (x̄±S.E) for body weight at hatch for each generation and line are shown in Tables 8 and 9 for separated and combined sex, respectively. The overall average of body weight at hatch for males and females were 30.4 and 30.0 gm, respectively with no significant differences between them (Table7). Abd El-Halim (1999); El-Tahawy (2000); El-Delebshany (2004) and Khalil (2005) found significant differences between the two sexes at hatch weight in Alexandria chickens. Overall averages of body weight at hatch in the first and second generation were 31.10 and 28.6gm, respectively (Table8). However, highly significant differences ($P \leq 0.001$) among generations were found by Abd El-Halim (1999); El-Tahawy (2000): Ghanem (2003) and Khalil (2005) for body weight at hatch in the same strain.

It could be obtained from Table 8 that body weight at hatch for different lines in the first generation (31.4, 30.1, 31.20 and 30.7) were significantly.

In the present study, the overall average of body weight at hatch was 30.19 gm (Table 8) and this value is lower than those reported by Afifi (1994) who working on five local strains (Alexandria; Matrouh; Gimmiza; Silver Montazah and Mandarah) and found that the average of body weight at hatch ranged from 30.7 to 37.2 gm.

As reported before, selection for increasing uniformity in Alexandria strain reduces body weight at hatch. This effect may be due to culling birds or parents which have high body weight during selection. Moreover, the calculated realized correlated response for uniformity selection on 1 st day body weight was -2.2, -1.8 and -2 gm. in the E.L.; -2, -2 and -2 gm. in the M.L. for male, female and combined sex, respectively Table (4).

Body weight at four weeks of age:

Least squares means and standard error (x̄±S.E) for body weight at four weeks of age for each generation and line are shown in Tables 9 and 10 for separated and combined sex, respectively. The overall averages of 4-weeks body weight for males and females were 221.5 and 201.6 gm. as shown in Table 9 with insignificant. Four weeks body weight was higher for males than those for females in Alexandria chickens as found by El-Turky (1981); Ali (1992); Afifi (1994) and Khalil (2005).

Overall averages of body weight at four weeks of age were (205.9 and 216.9) for first and second generation, respectively (Table 10). The overall means of four weeks body weight were (214.4, 206.2, 208.8 and 203.7) for E.L., C.E.L., M.L. and C.M.L. respectively (Table 10). In general, no significant differences were found between generations and lines. These results aren't agreement with those reported by EL-Hanoun (1995), EL-Delebshany (1999 and 2004), Ghanem (2003) and Khalil (2005). They found highly significant differences between generations, lines and sex.

Four weeks body weight for males in the second generation was significantly higher than the other means which refer to GxS interaction. Also, Four weeks body weight for males in selected lines were significantly higher than the other means which refer to LxS interaction (Table 9). Four weeks body weight of meat line and its control at the second generation were significantly higher than the other means which refer to GxL interaction (Table 10).

The overall average of this trait was 209.9 gm. Table 10, which agreed with those reported by El-Tahawy (2000) and Ghanem (2003) on the same strain.

Table 7: Least squares means (gm) and standard errors (x̄ ± S.E.) for one day body weight for each generation, sex and line:

Line	1st generation		2nd generation		Overall Average	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
E.L.	31.6±0.14	31.2±0.11	28.5±0.21	28.5±0.17	30.9±0.13	30.5±0.10
C.E.L.	30.5±0.28	29.8±0.21	29.6±0.25	28.9±0.20	30.0±0.19	29.3±0.15
M.L.	31.5±0.17	31.0±0.14	28.0±0.18	27.6±0.17	30.3±0.14	29.8±0.12
C.M.L.	30.7±0.30	30.7±0.26	29.2±0.31	29.3±0.21	30.0±0.22	30.0±0.17
Overallaverage	31.4±0.10	30.9±0.08	28.7±0.12	28.5±0.10	30.4±0.08	30.0±0.07

Table 8: Least squares means (gm) and standard errors (x̄ ± S.E.) for combined sex at one day body weight for each generation and line:

Line	1st generation	2nd generation	Overall Average
E.L.	31.4^{a} ±0.09	28.5^{d} ±0.13	30.7±0.08
C.E.L.	30.1^{b} ±0.17	29.2^{c} ±0.16	29.6±0.12
M.L.	31.2^{a} ±0.11	27.8^{e} ±0.12	30.0±0.09
C.M.L.	30.7^{a} ±0.19	29.3^{c} ±0.18	30.0±0.14
Overall average	31.1±0.06	28.6±0.07	30.19±0.05

Means which refer to GxL interaction and have the same letter are non-significant at P ≤ 0.05

Table 9: Least squares means (gm) and standard errors (x̄ ± S.E.) for four weeks body weight for each generation, sex and line:

Line	1st generation		2nd generation		Overall Average	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
E.L	225.6±2.12	206.2±1.77	227.0±3.34	205.1±2.70	255.9^{a}±1.80	206.0^{c}±1.49
C.E.L	219.2±4.28	192.1±3.14	221.9±3.67	200.7±3.05	220.7^{b}±2.79	197.0^{d}±2.22
M.L	215.6±2.13	191.0±1.69	234.2±3.06	215.4±2.45	222.0^{ab}±1.79	199.5^{d}±1.45
C.M.L	192.1±3.33	181.6±3.01	227.0±4.58	216.7±3.85	208.3^{c}±3.00	200.2^{d}±2.67
Overall average	217.9^{B}±1.36	197.1^{D}±1.11	228.2^{A}±1.78	209.4^{C}±1.48	221.5±1.09	201.6±0.89

Means which refer to GxS interaction and have capital letter are significant at P ≤ 0.05
Means which refer to SxL interaction and have the same letter are non significant at P ≤ 0.05

Table 10: Least squares means (gm) and standard errors (x̄ ± S.E.) for combined sex at four weeks of age for body weight for each generation and line:

L.N.	1st generation	2nd generation	Overall average
E.L.	214.5^{b} ±1.39	214.1^{b} ±2.17	214.4±1.18
C.E.L.	202.8^{d} ±2.67	208.7^{c} ±2.41	206.2±1.79
M.L.	201.2^{d} ±1.39	223.1^{a} ±1.69	208.8±1.17
C.M.L.	186.4^{e} ±2.25	220.8^{a} ±2.69	203.7±2.00
Overall average	205.9±0.88	216.9±1.16	209.9±0.71

Means which refer to GxL interaction and have the same letter are non-significant at P ≤ 0.05

The calculated realized correlated response for uniformity selection on 4-weeks body weight was -1.3, -9.7 and -6.3gm in the E.L.; -16.3, -10.7 and -12.5 in the M.L. for male, female and combined sex, respectively as showed in (Table 4).

Body weight at eight weeks of age:

No significant differences between generations were found as a result oanalysis of variance for body weight at eight weeks of age. Therefore, analysis of variance for this trait was done for each generation alone.

Least squares means and standard error (x¯±S.E) for body weight at eight weeks of age for each sex and line are shown in Tables 11 for the first and second generation, respectively. In both generations, the averages eight weeks body weight of males were higher than those of females (588.0 vs. 471.5 gm. in the first generation and 632.7 vs. 535.8 in the second generation, respectively). In Alexandria populations Abou El-Ella (1982); Ibrahim (1987); Ali (1992); Zatter (1994); Abd Alla (1997); Ghanem (2003) and Khalil (2005) came to similar results. The calculated realized correlated response as a result of uniformity selection was -47.7 and -42 gm for combined sex for E.L. and M.L., respectively (Table 4).

Table 12 presents the effect of selection for uniformity on the coefficient of variability (CV) of the eight weeks body weight. Increasing uniformity, due to selection, reduces coefficient of variability at eight weeks of age. Since, coefficient of variability for the E.L. and M.L was 22.16% and 22.08%, respectively at the first generation and reduces to 20.21% and 18.35%, respectively at the second generation. Moreover, overall average of coefficient of variability was 21.83% at the first generation and decreases to 20.38% at the second generation. These results are in agreement with relationship. between uniformity and CV, which was cleared discussed by Bilgili (2004).

Table 11: Least squares means (gm) and standard errors (x̄ ± S.E.) for eight weeks body weight in the first generation for each sex and line:

Line	1st generation		
	♂♂	♀♀	combined
E.L.	605.4 ^{a} ±4.92	483.4 ^{d} ±3.70	535.5±3.46
C.E.L.	583.9 ^{b} ±8.29	470.6 ^{de} ±7.07	515.5±6.35
M.L.	584.1 ^{b} ±5.38	463.0 ^{e} ±4.03	513.4±3.82
C.M.L.	531.2 ^{c} ±7.37	447.6 ^{f} ±6.38	485.9±5.46
Overall average	588.0 ^{A} ±3.17	471.5 ^{B} ±2.40	520.8±2.23
Line	2nd generation		
	♂♂	♀♀	combined
E.L.	644.9 ^{b} ±9.41	540.9 ^{e} ±6.62	583.6±6.09
C.E.L.	682.1 ^{a} ±9.47	568.1 ^{d} ±7.89	611.3±6.73
M.L.	599.6 ^{c} ±6.85	510.1 ^{f} ±5.21	546.6±4.63
C.M.L.	611.2 ^{c} ±10.94	528.4 ^{ef} ±8.17	561.1±7.01
Overall average	632.7 ^{A} ±4.63	535.8 ^{B} ±3.48	574.5±3.05

Means within each factor having different letter are significant at $P \leq 0.05$

Table 12: Coefficient of variation (C.V.) for eight weeks body weight in the four lines and in the two generations

Line	1st generation	2nd generation
E.L.	22.16	20.21
C.E.L.	20.24	20.87
M.L.	22.08	18.35
C.M.L.	18.27	20.37
Overall average	**21.83**	**20.38**

Egg production traits:

Body weight at sexual maturity:

Least squares means and standard error (x̄±S.E) for body weight at sexual maturity for each generation and line are shown in Table (13).Pullets average weight at sexual maturity were (1471.4 and 1760.2 gm) for the first and second generation and (1547.7, 1580.2, 1553.2 and 1535.2 gm)for the E.L., C.E.L, M.L. and C.M.L., respectively. The overall average of the pullets' weight at age of sexual maturity was 1553.3 gm, which approximately agreed with those reported by Sheble (1991); El-Delebshany (2004) and Khalil (2005) on the same strain. Also, Ghanem (2003) and Khlil (2005) came to the same result. In the present study there was no effect of lines on the body weight at sexual maturity and this is not agreement with those obtained by Ghanem (2003) and Khlil (2005).

Interaction effect G×L showed highly significant (P≤0.01) Table 32 may be that is due to environmental effects. In addition, the calculated realized correlated response as a result of uniformity selection was -56.4 and 249.3 gm. for E.L. and M.L., respectively (Table 5).

Table 13: Least square means (gm) and standard error (x̄± S.E.) for body weight at sexual maturity for each generation and line and line

Line	1st Generation	2nd generation	Overall average
E.L.	1476.9 ^{d} ± 11.46	1862.2 ^{a} ± 25.00	1547.7 ± 13.80
C.E.L.	1403.6 ^{e} ± 16.38	1845.3 ^{a} ± 25.44	1580.2 ± 23.41
M.L.	1478.6 ^{d} ± 13.65	1769.3 ^{b} ± 18.24	1553.2 ± 13.62
C.M.L.	1516.7 ^{cd} ± 22.07	1558.1 ^{c} ± 87.53	1535.2 ± 40.84
Overall average	1471.4 ^{B} ± 7.50	1760.2 ^{A} ± 23.54	1553.3 ± 9.74

Means within each factor having different letter are significant at P≤0.05

Age at sexual maturity:

Least squares means and standard error (x̄±S.E) for age at sexual maturity for each generation and line are shown in Table 18. Age at sexual maturity was 157.5 and 165.16 days for the first and second generation and 160.58, 160.61, 158.70 and 158.67 days for the E.L., C.E.L. M.L. and C.M.L., respectively. There was no effect of generation or lines on age at sexual maturity.

In the present study, the overall average of this trait was 159.68 days. This value is lower than those reported by El-Turkey (1981); Sheble (1986); Hassan (1993); Khalifah et al. (1993); Abd Alla (1997) and El-Delebshany (2004) who working on the same strain and reported that the average of this trait ranged from 164.7 to 187day.

Table 15 presents coefficient of variability for age at sexual maturity which indicated that the coefficient of variability in the second generation was higher than those in the first generation; this result may be due to the large selected number of pullets in the first generation than in the second one.

Table 14: Least squares means (day) and standard error (x̄± S.E.) for age at sexual maturity for each generation and line:

Line	1st Generation	2nd generation	Overall average
E.L.	158.6 6 [c] ±0.91b	169.13 [a] ±2.62	160.58±0.92
C.E.L.	154.21 [d] ±1.40	170.20 [a] ±2.57	160.61±1.49
M.L.	158.11 [bd] ±0.82	160.43 [b] ±1.81	158.70±0.77
C.M.L.	155.78 [cd] ±1.38	162.25 [b] ±2.37	158.67±1.34
Overall average	157.50±0.53	165.16±1.18	159.68±0.52

Means within each factor having different letter are significant at $P \le 0.05$

Table 15: Coefficient of variation (C.V.) for age at sexual maturity in the four lines and the two generations

Line	1st generation	2nd generation
E.L.	8.53	10.97
C.E.L.	8.17	11.11
M.L.	7.28	9.31
C.M.L.	7.05	10.45
Overall average	**7.95**	**10.69**

The duration period of laying the first 10 eggs:

Least squares means and standard error (x̄±S.E) for the duration period of laying the first 10 eggs for each generation and line are shown in (Table 16). The duration period of laying the first 10 eggs was 13.6 and 14.7days in the first and second generation, and 13.6, 14.4, 13.6 and 13.2 days for the E.L., C.E.L, M.L. and C.M.L., respectively. In agreement with that, Abd EL–Halim (1999), EL-Tahawy (2000), Ghanem (2003) and Khalil (2005) reported significant differences among generations and lines. The pullets of the second generation in two selected lines had higher duration period to produce the first ten eggs than those of the first one (Table 16). Table 4 showed that the selection for uniformity increased this trait by 1.8 and 2.1 days in E.L. and M.L., respectively.

Table 16 indicated that the overall average for this trait was 13.7 days. This result is in agreement with those foud by Khalil (2005). However, Zatter (1994): Abd El-Halim (1999) and El-Tahawy (2000) they found that this trait ranged from 12.9 to 22.7 days in Alexandria local strain.

Average weight of the first 10 eggs:

Least squares means and standard error (x̄±S.E) for the average weight of the first 10 eggs for each generation and line are shown in (Table 17). The pullets of the second generation in two selected lines laid lighter eggs than the first generation (Table 17). Table 4 showed that the selection for uniformity affected this trait by -0.3 and -2.9 gm in E.L. and M.L., respectively.

The overall mean found in the present study for this trait 36.8 gm. was similar to those found by Abd El-Halim (1999).

Egg number during the first 90 days of lying:

Least squares means and standard error ($\bar{x}$±S.E) for egg number during the first 90 days of lying for each generation and line are shown in Table 18. Analysis of variance of this trait revealed that the differences between generations were significant ($P \leq 0.05$). Ghanem (2003) and Khalil (2005) reported highly significant ($P \leq 0.001$) differences among generations and lines. Egg number during the first 90 days of laying increased by 2 eggs for E.L. and 10.3 eggs for M.L. in the second generation as a result of selection for increasing uniformity (Table 4). In contrast, Petitte et al. (1981) reported that broiler breeder may not respond to increases in uniformity as well as table egg strain. North (1978) expects a difference of 12 eggs per bird when two flocks of layers differ in uniformity by 9%.

In the present study, the overall mean for this trait was 53.7 eggs while it was 63.9 eggs as reported by Afifi (1994) compared with 33.6 eggs found by Kosba et al. (1997) on the same strain.

Table 16: Least squares means (days) and standard errors ($\bar{x}$ ± S.E.) for duration period of laying the first 10 eggs for each generation and line

Line	1st Generation	2nd generation	Overall average
E.L.	$13.5^{d} \pm 0.12$	$15.1^{b} \pm 0.78$	13.6 ± 0.13
C.E.L.	$14.5^{bc} \pm 0.28$	$14.3^{c} \pm 0.98$	14.4 ± 0.27
M.L.	$13.4^{d} \pm 0.14$	$15.7^{a} \pm 0.65$	13.6 ± 0.15
C.M.L.	$13.1^{d} \pm 0.21$	$13.3^{d} \pm 0.42$	13.2 ± 0.19
Overall average	13.6 ± 0.08	14.7 ± 0.36	13.7 ± 0.09

Means having different letter are significant at $P \leq 0.05$

Table 17: Least squares means (gm.) and standard errors ($\bar{x}$± S.E.) for average weight of the first 10 eggs for each generation and line

Line	1st Generation	2nd generation	Overall average
E.L.	$36.8^{a} \pm 0.11$	$35.5^{b} \pm 1.24$	36.7 ± 0.14
C.E.L.	$36.6^{a} \pm 0.18$	$35.6^{b} \pm 1.88$	36.4 ± 0.32
M.L.	$37.2^{a} \pm 0.13$	$34.5^{c} \pm 0.72$	36.9 ± 0.15
C.M.L.	$36.8^{a} \pm 0.26$	$37.0^{a} \pm 0.79$	36.9 ± 0.27
Overall average	36.9 ± 0.07	35.6 ± 0.55	36.8 ± 0.09

Means having different letter are significant at $P \leq 0.05$

Table 18: Least squares means and standard errors ($x^{-} \pm$ S.E.) for egg number during the first 90 days of laying for each generation and line

Line	1st Generation	2nd generation	Overall average
E.L.	$54.1^{bc} \pm 0.39$	$46.4^{d} \pm 3.06$	53.9 ± 0.40
C.E.L.	$53.5^{c} \pm 0.57$	$43.8^{e} \pm 2.92$	52.6 ± 0.70
M.L.	$55.8^{ab} \pm 0.40$	$38.3^{f} \pm 3.54$	55.2 ± 0.50
C.M.L.	$56.5^{a} \pm 0.77$	$28.7^{g} \pm 1.09$	49.3 ± 2.18
Overall average	$54.7^{A} \pm 0.25$	$37.5^{B} \pm 1.93$	53.7 ± 0.34

Means within each factor having different letter are significant at $P \leq 0.05$

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الملخص العربي

أجريت هذه الدراسه بمركز بحوث الدواجن- كلية الزراعه بالشاطبى – وقسم الإنتاج الحيوانى والسمكى- كلية الزراعه سابا باشا - جامعة الإسكندريه – خلال موسمين ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦.

أجريت هذه الدراسه على أربعة خطوط من الدجاج الإسكندرانى (خط منتخب لإنتاج البيض– خط مقارنه لإنتاج البيض- خط منتخب لإنتاج اللحم – خط مقارنه لإنتاج اللحم). وذلك بغرض زيادة درجة التجانس فى دجاج الإسكندرانى. تم تسجيل وزن الجسم عند عمر ٨ أسابيع وكذلك عمر البلوغ الجنسى فى كل الخطوط. وتم الإنتخاب فى خط اللحم لزيادة درجة التجانس فى وزن الجسم عند عمر ٨ أسابيع وذلك بإنتخاب الإناث التى تقع فى المدى (المتوسط الحسابى لوزن الجسم عند عمر ٨ أسابيع ± وحده واحده من الإنحراف القياسى) وتم إنتخاب الذكور الواقعه فى المدى (المتوسط الحسابى لوزن الجسم عند عمر ٨ أسابيع ± نصف وحده من الإنحراف القياسى)

وذلك كأباء للجيل التالى واستبعدت كل الطيور الواقعه خارج هذا المدى، وبالنسبه لخط البيض تم الإنتخاب فيه لزيادة درجة التجانس فى عمر البلوغ الجنسى وذلك أنتخبت الدجاجات التى يقع عمر بلوغها الجنسى فى المدى (المتوسط الحسابى لعمر البلوغ الجنسى ± وحده واحده من الإنحراف القياسى) كأمهات للجيل التالى واستبعدت كل الدجاجات الواقع عمر بلوغها الجنسى خارج هذا المدى أما بالنسبه للذكور فقد أخذت عشوائيا وفى كلا من خط المقاريه لأنتاج البيض وخط المقارنه لإنتاج اللحم تم إجراء التزاوج عشوائيا بدون إنتخاب.

كانت الصفات التى درست كل جيل هى: نسبة الخصوبه – نسبة التفريخ للبيض المخصب – وزن الجسم عند الفقس، ٤ ، ٨ أسابيع من العمر– عمر ووزن الجسم عند البلوغ الجنسى – متوسط الوزن والفتره اللازمه لإنتاج العشرة بيضات الأولى – عدد البيض خلال ال ٩٠ يوم الأولى من بداية الإنتاج.

وكانت أهم النتائج التى تم التحصل عليها هى :

١. هناك بعض الصفات التى لم تتحسن نتيجة الإنتخاب لزيادة التجانس فى القطيع مثل نسبة الخصوبه – نسبة التفريخ – وزن الجسم عند الفقس وعند ٤ و٨ أسابيع من العمر حيث وجد أن الإستجابه المرتبطه لهذه الصفات كانت ذات قيم سالبه.

٢. كانت الإستجابه المرتبطه لوزن الجسم عند البلوغ -٥٦.٤ و ٢٤٩.٣ جرام فى كلا من خطى البيض واللحم على الترتيب.

٣. تحسن عمر البلوغ الجنسى نتيجة الإنتخاب لزيادة التجانس فى القطيع حيث قل بمقدار -٥.٥٢ يوم فى خط البيض وبمقدار -٤.١٥ يوم فى خط اللحم.

٤. زادت المده اللازمه لوضع أول عشرة بيضات بمقدار ١.٨ و ٢.١ يوم فى كلا من خطى البيض واللحم على الترتيب نتيجة الإنتخاب لزيادة التجانس فى القطيع.

٥. قل متوسط وزن أول عشرة بيضات بمقدار -٠.٣ جرام فى خط البيض وبمقدار -٢.٩ جرام فى خط اللحم نتيجة جيل من الإنتخاب لزيادة التجانس فى القطيع.

٦. زاد عدد البيض الموضوع فى ال٩٠ يوم الأولى من الإنتاج بمقدار ٢ بيضه فى خط البيض و١٠.٣ بيضه فى خط اللحم.

٧. المتوسط العام بعد جيل من الإنتخاب لكل من نسبة الخصوبه ونسبة التفريخ ووزن الجسم عند الفقس وعند ٤ و٨ أسابيع من العمر وعند البلوغ الجنسى والعمر عند البلوغ الجنسى و المده اللازمه لوضع أول عشرة بيضات و متوسط وزن أول عشرة بيضات و عدد البيض الموضوع فى ال٩٠ يوم الأولى من الإنتاج كان ٨٨.١١% و٥١.٩٥% و٣٠.١٩ جرام و٢٠٩.٩ جرام و540.24 جرام و١٥٥٣.٣ جرام و١٥٩.٦٨ يوم و١٣.٧ يوم و٣٦.٨ جرام و٥٣.٧ بيضه على الترتيب.

٨. أظهر تحليل التباين أن الجيل كان له تأثير معنويا على نسبة الخصوبه ووزن الجسم عند البلوغ وعدد البيض الموضوع فى ٩٠ يوم الأولى من الإنتاج، وأن الجنس كان له تأثيرا معنويا على وزن الجسم عند ٨ أسابيع، وأن الخط لم يكن له تأثيرا معنويا على أى صفه، فى حين أن التداخل بين الجيل والخط كان له تأثير معنوى على كل الصفات تقريبا عدا نسبة الخصوبه ووزن الجسم عند ٨ أسابيع.