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STUDYING OF SOME PRODUCTIVE CHARACTERS IN A CROSS BETWEEN ALEXANDRIA, SASO AND FAYOUMI CHICKENS

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ABSTRACT: The aims of this study were investigated the effects of crossing between Saso cocks (S) with each of Alexandria (A) and Fayoumi (F) hens on body weight at different ages and some egg production traits for two crossing generations. Data of 954 chicks were produced during 2 generations of different crossing S×A, S×F, SA×SA, SF×SF, SA×SF and their reciprocal crossing SF×SA. These data were presented different genotype groups of males and females for base and two crossing generation. The main results are summarized as follows:

1. The estimates of heterosis (H%) for a cross (♂S X ♀F) were -7.01, -35.62, -27.35and -27.20% for BW0, BW4 , BW8 and BW12 respectively.
2. The cross SF was superior to Fayoumi (native breed) by 12.6, 85.9, 109.6 and 128.9% for BW0, BW4, BW8 and BW12 respectively.
3. The estimates of heterosis (H%) for a cross (♂S X ♀A) were - 6.32 , -34.61, -29.78 and -24.19% for BW0, BW4 , BW8 and BW12 respectively.
4. The cross SA was superior to Alexandria (local improving strain) by 8.8, 87.8, 104.1 and 133.0% for BW0, BW4, BW8 and BW12 respectively.
5. In second crossing generation, the estimates of heterosis (H%) for a cross (♂SA X ♀SF) and a reciprocal cross (♂SF X ♀SA) were approximately same values for body weight at different ages and egg production traits.
6. Negative estimates in a second crossing generation for most of studied traits were shown that the second - crosses SF and SA were more better than the third – crosses which produced of crossing (♂SA X ♀SF) and their reciprocal crossing (♂SF X ♀SA).

Key Words: Heterocyst- Saso - Local Egyptian Strain - Productive Traits.

INTRODUCTION

Crossing is a method that can improve growth performance in poultry, which have a main purpose that produce superior crosses for growth traits which are influenced by various genetic and non-genetic factors. Growth can be regarded as a direct fitness trait that increases meat productive efficiency and thereby decreases production costs.

Several investigators confirmed the superiority of crossbreed over the pure breeds in body weight at different ages (**Shebl et al., 1990 and 1995; Mandour et al., 1992; Khalil et al., 1999 and Yalcin et al., 2000).**

Nawar *et al*., (2004) crossed Saso (S), Mandarah (M), Golden Montazah (G) and Rhode Island Red (R), no significant effects were found among the three crosses of Saso with R, M and G or their reciprocals on BW at 8 weeks of age. And no significant differences were found between the pure strains and their crosses or the reciprocal, while the crossbreeding improved growth rate especially during early interval of age (4-6 weeks).

Zaky (2005) crossed Fayoumi (F) and Rhode Island Red (RIR) and showed that body weights at hatch averaged 35.9 , 47 , 42.7 and 37.5 gm. for Fayoumi, Rhode Island Red, F x RIR and RIR x F , respectively , F x RIR crosses were heavier than RIR x F at hatch.

Aly *et al*., (2005) found that the average of body weight for crossbred was significantly higher than Sinai when it was cross with Hubbard. However, Hubbard was significantly superior and higher than that of Sinai or crossbred for body weight at different ages. Furthermore, the crossbred gave intermediate body weight as compared to purebred parents.

On the other hand, **Bothaina and El-Full (2014)** crossed between Rhode Island Red (RIR) as standard foreign breed and Gimmizah (Gim) as a developed strain. They found that RIR x Gim had the worst average daily gain from 4 to 8 weeks (11.83%), from 8 to 12 weeks (12.86%), from day old to 8 weeks (9.84%) and from day old to 12 weeks of age (10.58%) than its parents and its reciprocal.

Roshdy *et.al*., (2007) showed that the highest estimates of heterosis for body weight and body weight gain were 29 and 20% for 10 and 12 weeks of age, respectively and lowest estimates of heterosis for 0 and 2weeks were -13% and -12%. This indicated that using Hubbard as a sire gave high heterosis percentage for body weight at 12 weeks of age.

Also, **Iraqi *et al*.(2013)** showed that the percentage of direct heterosis was 17.87% for this trait. The Sasso X Italian crossbred had positive significant effects of H% were 5.33 and 5.75% for male and female body weight at 12weeks of ages respectively.

The aims of this study were investigated the effect of crossing between Sasso cocks with each of Alexandria and Fayoumi hens on body weight and some egg production traits for two crossing generation.

MATERIALS AND METHODS

The present experiment was conducted at the Poultry Research Center, Poultry Production Department, Faculty of Agriculture, Alexandria University, during 2012 to 2014, for two crossing generations on the basic flocks (Saso commercial cocks, Alexandria hens and Fayoumi hens).

The mating plan:

Data of 985 chicks were produced during 2 generations of crossing between three strains (Saso, Alexandria and Fayoumi) and the two line crosses. A number of 16 Saso cocks and 32 hens (16 of Alexandia and 16 of Fayoumi) used to produce progeny at first generation.

Two hens (Alexandria and Fayoumi) were randomly assigned to each Saso cock in the breeding pen to produce the F_1 and then take one of hens assigned to each Saso cocks from the F_1 to produce the F_2.

The genotypes of first generation:

1. The cross (SA) obtained of Saso cocks x Alexandria hens mating.
2. The cross (SF) obtained of Saso cocks x Fayoumi hens mating.

The genotypes of second generation:

1. The genotype (SA) obtained of SA cocks x SA hens mating.
2. The genotype (SF) obtained of SF cocks x SF hens mating.
3. The cross (SAF) obtained of SA cocks x SF hens mating.
4. The reciprocal cross (SFA) obtained of SF cocks x SA hens mating.

Flock management:

All experimental parents and hatching eggs received the same managerial treatments for all lines. All trap nested eggs produced from each breeding pen individually recorded according to genetic group and collected daily for 7 days; eight weekly hatches were taken in each generation.

At hatching, the chicks were pedigreed by wing-banded, weighted brooded in floor brooders at a starting temperature of 32°C for the first week after hatching, and then decreased 2-3°C each week thereafter. At eight weeks of age, the chicks were sexed, weighted and moved to the rearing houses. Also at twelve weeks of age the chicks were weighted.

Feed and water were *ad libitum* for all experimental chickens, the formations of rations used throughout the experimental at the different ages are recommended in **NRC (1994)**. No significant changes have been made in feed and management for different genetic groups.

Studied traits:

The following traits were studied for each mating in the two generations.

1. **Body weight (BW):** Individual body weight to the nearest gram was recorded at hatch, four, eight and twelve weeks for each sex and line.
2. **Egg production traits:**

- Body weight at sexual maturity in grams (BWSM) was recorded in grams for each hen at the date of laying its first egg.
- Age at sexual maturity in days (ASM) was estimated for each hen as the number of days from hatching to the day of laying its first egg.
- Egg number (EN 90) during the first 90 days of laying and its average weights' in grams for each hen.

Statistical analysis

To estimate the effects of genotype group, generation and sex a fixed model was applied using the least squares procedure according to the SAS program **(SAS, 2005)** for statistical analysis program**.** The significant tests for the differences between each two means for any studied trait were done according to **Duncan (1955).** Two different statistical models were used as follows:-

Model 1: The data of body weight at different ages, body weight gains at different periods and growth rate, were analyzed

using the following model:

$$\mathbf{Y_{ijkl}} = \mu + \mathbf{A}_i + \mathbf{G_j} + \mathbf{S_l} + \mathbf{e_{ijkl}}$$

Where:

Y_{ijkl}: is the observation of the individual $_{ijkl}$,

μ : is the overall mean,

A_i: is the fixed effect of the i[th] genotype group (i= l, 2,3,4,5,6,7,8 and 9),

G_j: is the fixed effect of the j[th] generation (j= 0, l and 2),

S_l: is the fixed effect of sex,

e_{ijkl} : is the residual

Model 2: The data of egg production traits (using complete record) of females were analyzed using the following model:

$$Y_{ijk} = \mu + A_i + G_j + e_{ijk}$$

Where:

Y_{ijk}: is the observation of the individual $_{ijk}$,

μ : is the overall mean,

A_i: is the fixed effect of the i[th] genotype group (i= l,2,3,4,5,6,7,8 and 9),

G_j: is the fixed effect of the j[th] generation (j= 0, l and 2),

e_{ijk}: is the residual

Estimates of heterosis:

Heterosis was calculated on percentage of midparents according to **Williams *et al.*, (2002)** as follows:

$H_1 = \{F_1- [(P_1+ P_2)/2] / [(P_1 +P_2)/2] \times 100\}$

Where F_1 = the first cross and P_1 or P_2 is a parent in the crosses.

RESULTS AND DISCUSSION

Effect of crossing on body weight at different ages:

Least-squares means of body weight at hatch (BW_0) for males and females in the different genotypes for base and two generations are presented in **Table (1).** The mean values of BW_0 were 43.71, 30.75, 33.06, 34.62, 35.96, 42.31, 44.44, 42.09 and 42.11 gm. for Saso(S), Fayoumi (F) and Alexandria (A) strains and their crosses SxF, SxA, SFxSF, SAxSA, SFxSA and SAxSF , respectively. Results showed that the SA x SA cross produce the heaviest chick (44.44 gm.) with significant differences. However the Fayoumi purebreds produce the lightest chick (30.75 gm.). These results indicated that, the mating of crossing SA x SA was obtained the best value of this trait comparing with other mating.

These results were agree with **Aly and Abou-El-Ella (2005); Aly et al.,(2005)** and **El-Ngomy (2011)**, who found that the crossbred was superior to the purebreds.

Results in **Table (1)** show that, there is significant difference between males and females for this trait. Also, the second generation was superior by 23.33 and 21.37 % comparing with base and first generations, respectively with significant differences for this trait. The mean values of BW_4 were 320.48, 325.88, 293.44, 272.59, 283.13 and 284.03 gm. for crossbred SF, SA, SFxSF, SAxSA, SFxSA and SAxSF, respectively. Crossbreeding improved these traits as reported by **Nawar et al., (2003)** and **El-Ngomy (2011).**

Least-squares means of body weight at eight (BW_8) and twelve (BW_{12}) weeks for males and females in the different genotypes for three generations are presented in **Table (2).** The mean values of BW_8 were 2058.4, 431.4, 427.71, 904.37, 959.29, 766.45, 771.28, 753.43 and 777.14 for the strains (Saso, Fayoumi and Alexandria) and crossbred (SF, SA, SFxSF, SAxSA, SFxSA and SAxSF), respectively.

These results indicated that the crossbred SA was the heaviest body weight at eight weeks than the native purebred (Fayoumi and Alexandria) and the other crosses with significant differences. These results were agree with **Afifi et al. (2002)** ; **Iraqi et al. (2002)** and **Iraqi et al. (2013)** who found that significant differences between purebred and there crossing for this trait.

Among the base and two generations, the results in **Table (2)** show that, the first generation superior for the BW_8 to both of the base and second generations (120.7% vs.100 and 99.4%, respectively). Means of body weight at twelve weeks (BW_{12}) for males and females in the different genotypes for three generations. The genotype group means, generation, and sex showed generally significant effects at studied age. The heaviest BW_{12} was observed in the commercial hybrid Saso followed by SA crossbred (3478.83 and 1574.87 gm., respectively), while the lightest BW_{12} was in Fayoumi strain (625.42 gm.). Similar results were obtained by **Nawar *et al*. (2003) and Amin (2015)** who reported that Saso chickens were significantly heavier than other strains.

The same trend found among the three generations in BW_{12} as BW_4 and BW_8. It could be noticed that, the first generation was the highest value than the base and second generation with different significant.

The overall mean values of BW_{12} were 2116.76 and 907.07 gm. for males and females, respectively with significant difference between them.

Concerning the sex effect, males had significantly heavier body weight than those of females in all genotype groups at different ages under consideration. Moreover, the distance between sexes was in ascending order along generations. These results are in agreement with those of **El-Khaiat (2008) and Amin (2015)** who found that males were heavier than females at all grower ages .

In general there were highly significant differences ($P \leq 0.001$) between genotypes, generations and sex for body at different ages during the experiment as shown in **Tables (1, 2)**.

Effect of crossing on some egg production traits:

1. Age at sexual maturity (ASM)

The mean values for ASM were ranged from 140.76 to 172.82 days of the different genotype groups **Table (3)**. The results showed that Fayoumi strain was the latest ASM (172.82 days), while the SF x SF crosses was the earliest ASM (140.76 days) with significant differences. However, the second generation was the earliest ASM than the other generations with significant differences ($P \leq 0.001$). These results in agreement with finding by **El-Soudany *et al*., (2003)** and **Iraqi (2008)** who reported that the crossbreeds had age at sexual maturity earlier than purebreds.

2. Body weight at sexual maturity (BW_{SM})

The mean values of BW_{SM} were 1445.22, 1449.29, 2236.37, 2333.56, 1868.93, 1834.69, 1779.2 and 1793.91 gm. for the strains (Fayoumi and Alexandria) and crossbred (SF, SA, SFxSF, SAxSA, SFxSA and SAxSF), respectively **(Table 3)**. Results showed that the SA crosses produce the heaviest BWSM (2333.56 gm.) with significant different. However the Fayoumi and Alexandria purebreds produce the lightest BW_{SM} (1445.22 and 1449.29 gm. respectively) with no significant difference between them.

These results were agree with **Iraqi (2008),** and **El- Dlebshany *et al*.,(2013)** who found that the body weight at sexual maturity of crossbred was superiority than its of purebred.

Among generation the BW_{SM} in first generation was the heaviest (2291.59 gm.) than the base and second generations (1447.76 and 1829.24 gm., respectively) with significant differences among them.

3. Egg number during the first90 days of laying (EN_{90})

Least-squares means of egg number during the first 90 days (EN_{90}) of laying in the different genotypes for base and two generations are presented in **Table (4).** Values of EN_{90} were 41.92, 47.33, 59.79, 57.44, 54.14, 54.31, 53.33 and 53.26 eggs for different genotype groups (Fayoumi, Alexandria, SF, SA, SFxSF, SAxSA, SFxSA and SAxSF, respectively). The results showed that the SF was the highest EN_{90} followed by SA crossbred while; the strains (Fayoumi and Alexandria) were the lowest EN_{90}. The same trend of means for EN_{90} was around the mean range found by **Iraqi (2008)**. These results may be due to that, birds having higher BW_{SM} produced more eggs than those having relatively lower body weight **(Mitra *et al*. 1976).**

The mean values of the EN90 were 45.33, 58.53 and 53.84 eggs for G_0, G_1 and G_2, respectively. These results showed that the first generation was the highest egg number during the first 90 days and the base generation was the lowest with significant differences.

In general the results showed that the crossbreeding increased rate of laying in agreement with those **Nawar and Bahie El-Deen (2000), Iraqi (2008)** and **Amin (2008).**

4. Egg weight during the first90 days of laying (EW_{90}):

The mean values for EW_{90} were ranged from 36.80 to 46.30 gm. of the different genotype groups for base and two generations (**Table 4**). These results showed that SF x SF crossing was the highest EW_{90} (46.3gm.), while the Fayoumi strains was the lowest EW_{90} (36.8 gm.) with significant differences. Moreover, the second generation was the highest EW90 by 7.56 and 1.24 gm. than the base and first generation, respectively, with significant differences ($P \leq 0.001$). Similar differences between egg weights for the different genotypes were recorded by **Zatter (1994), Abou El-Ghar *et al*. (2009)** and **Lalev *et al*. (2014)** who found that crossing affecting significantly the egg weight.

Estimates of Heterosis:

1. Estimates of Heterosis for the first generation:

Estimates of heterosis, calculated by percent, for crossing between males of Sasso and females of Fayoumi for growth traits in the 1st generation were shown in **Table (5)**. The estimates of heterosis (H%) for a cross (♂S X ♀F) were -7.01, -35.62, -27.35and -27.20 for BW_0, BW_4 , BW_8 and BW_{12} respectively.

Although there were negative estimates of heterosis for body weight at different ages which indicate that means of parent (Sasso and Fayoumi) were best in body weight than the cross , but in fact the cross SF was superior than Fayoumi (native breed) by 12.6, 85.9, 109.6 and 128.9% for BW_0, BW_4 , BW_8 and BW_{12} respectively.

Estimates of heterosis, calculated by percent, for crossing between males of Sasso and females of Alexandria for body weight at different ages in the 1^{st} generation were shown in **Table (6)**. The estimates of heterosis (H%) for a cross (♂S X ♀A) were - 6.32 , -34.61, -29.78 and -24.19 for BW0, BW4 , BW8 and BW12 respectively.

Although estimate of heterosis results were negative for body weight at different ages which indicate that means of parent (Saso and Alexandria) were best in body weight than the cross , but in fact the cross SA was superior than Alexandria (local improving strain) by 8.8, 87.8, 104.1 and 133.0% for BW_0, BW_4, BW_8 and BW_{12} respectively.

Similar results were found by **Zatter (1994)**, **Nawar *et al*.(2004), Aly and Abou-El-Ella (2005) and Iraqi et *al*. (2013)**.

Heterosis results were same trend for each of crossing between Saso males with Fayoumi females and Saso males with Alexandria females for body weight at different ages. These heterosis of body weight at different ages were negative values may be due to additive effect which play an important role than non-additive genetic effect. Also, the superior of Saso males were hybrid chickens.

The improvements of the crosses (SF and SA) were noticed in body weight at different ages when comparing with the local Egyptian strain. More after, the improvement percent of a cross SF was better than it was of a cross SA relative to Fayoumi (native breed) and Alexandria (improvement strain), respectively.

2. Estimates of Heterosis for the second generation:

Estimates of heterosis, calculated by percent, for crossing between SF males and SA females for growth and egg production traits of the 2nd generation were shown in **Table (7)**. The corresponding values of the reciprocal crossing which results of SA males and SF females mating were shown in **Table (8)**.

The estimates of heterosis (H%) for a cross (♂SF X ♀SA) were 19.61, -11.36, -18.10 and -19.43% for BW_0, BW_4 , BW_8 and BW_{12} , respectively. The corresponding values for a reciprocal cross (♂SA X ♀SF) were 19.02, 17.14, -18.30 and -19.83%.

The estimates of heterosis (H%) for egg production traits of a cross (♂SF X ♀SA) were -2.28, -22.36 , -8.88 and 1.99% for ASM, BWSM, EN90 and EW90, respectively. The corresponding values for a reciprocal cross (♂SA X ♀SF) were -2.36, -21.72, -9.00 and 2.19%.

The estimates of heterosis (H%) for a cross (♂SA X ♀SF) and a reciprocal cross (♂SF X ♀SA) were approximately same values for body weight at different ages and egg production traits.

Negative estimates in a second crossing generation for most of studied traits were indicated that the second-crosses SF and SA were more better than the third- crosses which produced of (♂SA X ♀SF) and their reciprocal (♂SF X ♀SA).

CONCLUSION

Crossing between Saso cocks (S) with each of Alexandria (A) and Fayoumi (F) hens were improving body weight at different ages and some egg production traits.

The second- crosses SF and SA were better in the most of studied traits than the third- crosses which produced of crossing (♂SA X ♀SF) and their reciprocal crossing (♂SF X ♀SA).

Table (1): Least squares means($\overline{X}$) and standard errors (SE), for body weight (gm.) at hatch and four weeks of age for three generation of genotypes males and females.

Generation	Genotype	Traits					
		BW_0		Genotype mean	BW_4		Genotype mean
		male	female		male	female	
G_0	**Saso(S)**	$43.71^{b} \pm 0.08$	-	$43.71^{A} \pm 0.08$	$823.20^{a} \pm 6.81$	-	$823.20^{A} \pm 6.81$
	Fay.(F)	-	$30.75^{e} \pm 33$	$30.75^{F} \pm 0.33$	-	$172.44^{e} \pm 2.52$	$172.44^{E} \pm 2.52$
	Alex.(A)	-	$33.06^{d} \pm 0.21$	$33.06^{E} \pm 0.21$	-	$173.53^{d} \pm 2.03$	$173.53^{E} \pm 2.03$
G_1	**Saso x Fay (SF)**	$34.39^{e} \pm 0.46$	$34.81^{c} \pm 0.41$	$34.62^{D} \pm 0.30$	$326.05^{cb} \pm 12.13$	$315.59^{c} \pm 12.09$	$320.48^{B} \pm 8.56$
	Saso x Alex. (SA)	$35.94^{d} \pm 0.34$	$35.99^{c} \pm 0.32$	$35.96^{C} \pm 0.32$	$340.08^{b} \pm 13.34$	$312.75^{c} \pm 10.30$	$325.88^{B} \pm 8.40$
G_2	**SF x SF**	$42.18^{c} \pm 0.50$	$42.44^{ab} \pm 0.77$	$42.31^{B} \pm 0.46$	$308.08^{cb} \pm 9.38$	$279.51^{ab} \pm 9.26$	$293.44^{C} \pm 6.74$
	SA x SA	$45.54^{a} \pm 0.64$	$43.73^{a} \pm 0.57$	$44.44^{A} \pm 0.44$	$291.13^{c} \pm 11.05$	$260.57^{a} \pm 8.04$	$272.59^{D} \pm 6.76$
	SF x SA	$42.14^{c} \pm 0.51$	$42.04^{b} \pm 0.56$	$42.09^{B} \pm 0.38$	$312.76^{cb} \pm 13.21$	$257.21^{b} \pm 9.56$	$283.13^{CD} \pm 8.94$
	SA x SF	$42.29^{c} \pm 0.77$	$41.88^{b} \pm 0.61$	$42.11^{B} \pm 0.50$	$298.19^{c} \pm 8.36$	$266.53^{b} \pm 8.69$	$284.03^{CD} \pm 6.27$
G_0		$43.71^{A} \pm 0.08$ (100%)	$32.20^{C} \pm 0.19$ (100%)	**$34.63^{B} \pm 0.26$ (100%)**	$823.20^{A} \pm 6.81$ (100%)	$173.13^{C} \pm 1.58$ (100%)	**$310.27^{B} \pm 0.26$ (100%)**
G_1		$35.20^{B} \pm 0.29$ (80.53%)	$35.41^{B} \pm 0.26$ (109.97%)	**$35.31^{B} \pm 0.19$ (101.96%)**	$333.42^{B} \pm 9.05$ (40.50%)	$314.14^{A} \pm 7.88$ (181.45%)	**$323.28^{A} \pm 5.99$ (104.19%)**
G_2		$42.85^{C} \pm 0.35$ (98.03%)	$42.58^{A} \pm 0.34$ (133.07%)	**$42.71^{A} \pm 0.24$ (123.33%)**	$302.33^{B} \pm 5.03$ (36.73%)	$267.18^{B} \pm 4.50$ (154.32%)	**$284.08^{C} \pm 3.53$ (91.56%)**
Overall mean		**40.48 ± 2.93**	**35.06 ± 3.43**	**36.95 ± 3.39**	**464.41 ± 67.60**	**221.90 ± 52.85**	**306.59 ± 62.05**

Means having the different small or capital letters are significantly different ($P \leq 0.05$)

Table(2): Least squares means ($\overline{X}$) and standard errors (SE), for body weight (gm.) at eight and twelve weeks of age for three generation of genotypes males and females.

Generation	Genotype	Traits					
		BW$_8$		Genotype mean	BW$_{12}$		Genotype mean
		male	female		male	female	
G$_0$	Saso(S)	2058.40^{a} ± 13.21	-	2058.40^{A}±13.21	3478.83^{a} ± 22.32	-	3478.83^{A}±22.32
	Fay.(F)	-	431.40^{c} ± 4.74	431.40^{E}±4.74	-	625.42^{c} ± 6.87	625.42^{E} ± 6.87
	Alex.(A)	-	427.71^{c} ± 4.87	427.71^{E}±4.87	-	675.89^{c} ± 7.69	675.89^{E} ± 7.69
G$_1$	Saso x Fay (SF)	966.89^{c} ± 28.91	849.66^{a} ± 24.43	904.37^{C}±19.43	1694.75^{c} ± 48.24	1370.70^{a} ± 25.30	1493.93^{C} ± 31.62
	Saso x Alex. (SA)	1052.65^{b} ± 38.36	872.90^{a} ± 21.11	959.29^{B}±22.79	1769.84^{b} ± 54.17	1394.45^{a} ± 33.39	1574.87^{B} ± 35.29
G$_2$	SF x SF	821.23^{d} ± 19.11	714.34^{b} ± 17.92	766.45^{D}±14.32	1438.92^{d} ± 34.11	1178.51^{b} ± 28.39	1305.46^{D} ± 26.39
	SA x SA	869.29^{d} ± 26.13	707.70^{b} ± 19.05	771.28^{D}±18.41	1477.50^{d} ± 44.00	1132.16^{b} ± 28.03	1268.03^{D} ± 32.44
	SF x SA	840.57^{d} ± 29.44	677.25^{b} ± 27.85	753.43^{D}±23.47	1399.24^{d} ± 53.06	1109.04^{b} ± 36.91	1244.47^{D} ± 38.12
	SA x SF	832.43^{d} ± 17.84	708.85^{b} ± 22.40	777.14^{D}±15.66	1382.02^{d} ± 31.46	1106.82^{b} ± 32.17	1258.91^{D} ± 27.43
G$_0$		2058.40^{A} ± 13.21 (100%)	429.07^{C} ± 3.53 (100%)	772.81^{B} ± 30.82 (100%)	3478.83^{A} ± 22.32 (100%)	657.27^{C} ± 5.61 (100%)	1252.54^{B}± 53.32 (100%)
G$_1$		1011.95^{B} ± 24.60 (49.16%)	861.54^{A} ± 16.06 (200.79%)	932.82^{A} ± 15.14 (120.70%)	1705.73^{B} ± 36.90 (40.03%)	1382.85^{A} ± 24.20 (210.39%)	1535.86^{A} ± 23.89 (122.62%)
G$_2$		873.34^{C} ± 10.89 (42.43%)	704.62^{B} ± 10.50 (164.22%)	768.45^{B} ± 8.59 (99.44%)	1420.69^{C} ± 19.26 (40.84%)	1135.72^{B} ± 15.48 (172.79%)	1272.77^{B} ± 15.08 (101.62%)
Overall mean		1252.20 ± 186.30	575.92± 113.25	812.10 ± 143.32	2116.76 ± 292.73	907.07 ± 170.85	1329.54 ± 222.23

Means having the different small or capital letters are significantly different ($P \leq 0.05$)

Table (3): Least square means ($\overline{X}$) and standard errors (SE), for age at sexual maturity (days) and body weight at sexual maturity (gm.) in the different genotypes for three generation.

Generation	Genotype	Traits	
		ASM	BWSM
G0	Saso(S)	-	-
	Fay.(F)	$172.82^{c} \pm 1.03$	$1445.22^{d} \pm 13.90$
	Alex.(A)	$163.54^{b} \pm 1.00$	$1449.29^{d} \pm 9.85$
G1	Saso x Fay.(SF)	$143.55^{a} \pm 1.55$	$2236.37^{b} \pm 44.64$
	Saso x Alex.(SA)	$145.92^{a} \pm 1.60$	$2333.56^{a} \pm 42.45$
G2	SF x SF	$140.76^{a} \pm 0.90$	$1868.93^{c} \pm 30.54$
	SA x SA	$140.77^{a} \pm 0.82$	$1834.69^{c} \pm 41.07$
	SF x SA	$141.60^{a} \pm 1.48$	$1779.20^{c} \pm 47.08$
	SA x SF	$141.48^{a} \pm 0.86$	$1793.91^{c} \pm 38.38$
G0		$166.97^{C} \pm 0.77$ (100%)	$1447.76^{C} \pm 8.05$ (100%)
G1		$144.90^{B} \pm 1.13$ (86.78%)	$2291.59^{A} \pm 31.13$ (158.29%)
G2		$141.08^{A} \pm 0.48$ (84.49%)	$1829.24^{B} \pm 19.20$ (126.35%)
Overall mean		**159. 12 ± 12.62**	**1645. 48 ± 187.90**

Means having the different small or capital letters are significantly different ($P \leq 0.05$)

Table (4): Least square means ($\overline{X}$) and standard errors (SE), for egg number and egg weight (gm) until 90 days of egg production in the different genotypes for three generation.

Generation	Genotype	Traits	
		EN	EW
G_0	Saso(S)	-	-
	Fay.(F)	$41.92^{d} \pm 1.10$	$36.80^{d} \pm 1.05$
	Alex.(A)	$47.33^{c} \pm 0.66$	$40.10^{c} \pm 0.89$
G_1	Saso x Fay.(SF)	$59.97^{a} \pm 1.70$	$44.46^{b} \pm 0.46$
	Saso x Alex.(SA)	$57.44^{ab} \pm 1.41$	$44.99^{ab} \pm 0.48$
	SF x SF	$54.14^{b} \pm 0.71$	$46.30^{a} \pm 0.23$
G_2	SA x SA	$54.31^{b} \pm 0.64$	$46.13^{a} \pm 0.26$
	SF x SA	$53.33^{b} \pm 0.83$	$45.66^{ab} \pm 0.48$
	SA x SF	$53.26^{b} \pm 0.67$	$45.75^{ab} \pm 0.28$
G_0		$45.33^{C} \pm 0.59$ (100%)	$38.45^{C} \pm 0.63$
G_1		$58.53^{A} \pm 1.09$ (129.12%)	$44.77^{B} \pm 0.34$
G_2		$53.84^{B} \pm 0.35$ (118.77%)	$46.01^{A} \pm 0.14$
Overall mean		**48.85 ± 10.19**	**45. 41 ± 2.42**

Means having the different small or capital letters are significantly different (P≤0.05)

Table (5): Percent heterosis (%) of body weight at different ages resulting from crossing Sasso cocks and Fayoumi hens at the 1st generation**.**

Traits	Parents		Cross SF	% Heterosis
Growth traits	♂ **Sasso**	♀ **Fayoumi**		
BW (gm):				
At hatch	43.71 ± 0.08	30.75 ± 0.33 (100%)	34.62 ± 0.30 (112.59%)	-7.01
4 weeks	823.20 ± 6.81	172.44 ± 2.52 (100%)	320.48 ± 8.56 (185.85%)	-35.62
8 weeks	2058.40 ± 13.21	431.40 ± 4.74 (100%)	904.37 ± 19.43 (209.64%)	-27.35
12 weeks	3478.83 ± 22.32	625.42 ± 6.87 (100%)	1493.93 ± 31.62 (238.87%)	-27.20

Table (6): Percent heterosis (%) for body weight at different ages resulting from crossing Sasso males and Alexandria females at the 1st generation.

Traits	Parents		Cross SA	% Heterosis
Growth traits	♂ **Sasso**	♀ **Alexandria**		
BW (gm.):				
At hatch	43.71 ± 0.08	33.06 ± 0.21 (100%)	35.96 ± 0.32 (108.77%)	-6.32
4 weeks	823.20 ± 6.81	173.53 ± 2.03 (100%)	325.88 ± 8.40 (187.79%)	-34.61
8 weeks	2058.40 ± 13.21	427.71 ± 4.87 (100%)	872.90 ± 21.11 (204.09%)	-29.78
12 weeks	3478.83 ± 22.32	675.89 ± 7.69 (100%)	1574.87 ± 35.29 (233.01%)	-24.19

Table (7): Percent heterosis (%) for certain traits resulting of the crossing between SF male and SA female at the 2nd generation.

Traits	Parents		Cross	% Heterosis
BW (gm.)	♂ **SF**	♀ **SA**		
At hatch	34.39 ± 0.46	35.99 ± 0.32	42.09 ± 0.38	19.61
4 weeks	326.05 ± 12.13	312.75 ± 10.30	283.13 ± 8.94	-11.36
8 weeks	966.89 ± 28.91	872.90 ± 21.11	753.43 ± 23.47	-18.10
12 weeks	1694.75 ± 48.24	1394.45 ± 33.39	1244.47 ± 38.12	-19.43
Egg production traits				
ASM	143.55 ± 1.55	145.92 ± 1.60	141.60 ± 1.48	-2.28
BWSM (gm.)	2236.37 ± 44.64	2333.56 ± 42.45	1779.20 ± 47.08	-22.36
EN 90 days	59.97 ± 1.70	57.44 ± 1.41	53.33 ± 0.83	-8.88
EW 90 days	44.46 ± 0.46	44.99 ± 0.48	45.66 ± 0.48	1.99

Table (8): Percent heterosis (%) for certain traits resulting of the crossing between SA male and SF female at the 2nd generation.

Traits	Parents		Cross	% Heterosis
BW (gm)	**♂ SA**	**♀ SF**		
At hatch	35.94 ± 0.34	34.81 ± 0.41	42.11 ± 0.50	19.02
4 weeks	340.08 ± 13.34	315.59 ± 12.09	284.03 ± 6.27	17.14
8 weeks	1052.65 ± 38.36	849.66± 24.43	777.14 ±15.66	-18.30
12 weeks	1769.84 ± 54.17	1370.70 ± 25.30	1258.91 ± 27.43	-19.83
Egg production traits				
ASM (days)	145.92 ± 1.60	143.55 ± 1.55	141.48 ± 0.86	-2.36
BWSM (gm)	2333.56 ± 42.45	2236.37 ± 44.64	1793.91 ± 38.38	-21.72
EN 90 days	57.44 ± 1.41	59.97 ± 1.70	53.26 ± 0.67	-9.00
EW 90 days	44.99 ± 0.48	44.46 ± 0.46	45.75 ± 0.28	2.19

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الملخص العربى

دراسة بعض الصفات الإنتاجية فى خليط بين دجاج الأسكندرانى و الساسو و الفيومى

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أجريت هذه التجربة بهدف دراسة أثر الخلط بين ديوك الساسو (S) مع كلا من دجاجات الإسكندرانى (A) و الفيومى (F) على وزن الجسم عند الأعمار المختلفة وكذلك بعض صفات إنتاج البيض لمدة جيلين من الخلط. جمعت البيانات على ٩٨٥ كتكوت ناتج خلال جيلين من الخلطات المختلفة S×A, S×F, SA×SA, SF×SF, SA×SF و الخليط العكسى SF×SA . وكانت أهم النتائج ما يلى:

١. كانت تقديرات قيمة قوة الخلط (H%) للخليط (♂S X ♀F) -٧,٠١ و -٣٥,٦٢ و -٢٧,٣٥ و – ٢٧,٢٠ % لوزن الجسم عمر يوم و ٤ أسابيع و ٨ أسابيع و ١٢ أسبوع على الترتيب.
٢. اظهر الخليط SF تفوق على سلالة الفيومى (سلالة محلية أصيلة) بـ ١٢,٦ و ٨٥,٩ و ١٠٩,٦ و ١٢٨,٩% لصفات وزن الجسم عند عمر يوم و ٤ أسابيع و ٨ أسابيع و ١٢ أسبوع على الترتيب.
٣. كانت تقديرات قيمة قوة الخلط (H%) للخليط (♂S X ♀A) -٦,٣٢ و -٣٤,٦١ و -٢٩,٧٨ و -٢٤,١٩% لصفات وزن الجسم عند عمر يوم و ٤ أسابيع و ٨ أسابيع و ١٢ أسبوع على الترتيب.
٤. اظهر الخليط SA تفوق على سلالة الإسكندرانى (سلالة محلية محسنة) ٨,٨ و ٨٧,٨ و ١٠٤,١ و ١٣٣,٠% لصفات وزن الجسم عند عمر يوم و ٤ أسابيع و ٨ أسابيع و ١٢ أسبوع على الترتيب.
٥. فى جيل الخلط الثانى ، كانت تقديرات قوة الخلط للخليط (♂SA X ♀SF) و الخليط العكسى (♂SF X ♀SA) متماثلة القيمة تقريبا لصفات وزن الجسم عند الأعمارالمختلفة وصفات إنتاج البيض.
٦. أظهرت التقديرات السالبة فى جيل الخلط الثانى لمعظم الصفات المدروسة أن الخليط الثنائى SF و SA أفضل من الخليط الثلاثى الناتج من خلط (♂SA X ♀SF) و الخلط العكسى (♂SF X ♀SA).