Egypt. Poult. Sci. Vol (30) (III): (773-798)

IMPROVING THE PRODUCTIVITY AND REPRODUCTIVITY OF BAHEIJ CHICKENS THROUGH CROSSING

By

Effect of upgrading on: Growth traits, chicks viability, body conformation and carcass traits

Nema A. Mosaad, Osama, M. Aly, Nazla. Y. Abou-El-Ella and Yousria K. M. Afifi

Anim. Prod. Res. Inst., Agric. Res, Centre, Ministry of Agric., Dokki Egypt

.Received:**08/07/2010** Accepted: **25/08/2010**

Abstract: *Crossing trials were carried out to evaluate the effect of upgrading (increasing blood of Silver Montazah, SM chickens) on certain traits (body weight, growth rate and growth efficiency percentages, birds viability percentages at different ages) throughout crossing selected Montazah males for mature body weight as a parent line with Baheij (Bj) dams producing three generations progenies [(the 1st generation (½ SM + ½ Bj), the 2nd generation (¾ SM + ¼ Bj) and the 3rd generation (7/8 SM + 1/8 Bj)]. Body measurements (BM) and body conformation (BC) at 8 and 12 wks of age and carcass traits at 16 and 20 wks of age were studied. Results were as follows:*

1- *Averages body weight (BW) of upgraded group chicks surpassed (P<0.001) those of Bj at all studied ages. Moreover, chicks of the 3rd generation were the heaviest (P<0.001) compared to those of the other generations.*

2- *Upgrading improved (P<0.001) growth rate percentage (GR%) at 0-16 wks of age while the contrary was found at the period 8-12 wks of age. The 3rd generation had the highest values of GR% from hatch to 16 wks and 12- 16 wks of age.*

3- *Averages growth efficiency (GE) of upgraded groups surpassed (P<0.001) the purebred at 0-4, 0-12, 0-16 and 0-20 wks of age. the 3rd generation) had the highest (P<001) averages GE at 4-8, 0-12, 12-16, 0-16 and 16-20 wks of age. Moreover, Males had the higher averages concerning studied growth traits compared to the females.*

4- *Only generation affected viability (P<0.01) of chicks through the period 4-8 wks of age.*

5- *Averages of BW, shank length (ShL) and keel length (KL) of birds increased (P<0.01) by age. Also, the birds of the 3rd generation were heavier (P<0.05) than those of the purebred. On the other hand, upgrading did not improve any of the body conformation estimated values.*

6- *Both of generation and genotype significantly affected carcass and giblets weights where the averages of the 3rd generation were higher than those of the 2nd generation and the birds of upgraded group had higher averages for all traits studied compared to the purebred group. Also, the different between averages of most studied traits at 16 and 20 wks of age was highly significant.*

It could be concluded that upgrading through crossing SM sires to Bj dams improved growth traits, chick viability, certain body conformation and carcass traits of progeny of both F2 and F3.

INTRODUCTION

Study of Abdalla (2007) showed that Baheij breed reached genetic equilibrium. Therefore, upgrading was suggested to overcome this problem to improve the productivity of this strain. Baheij breed was developed (Mahmoud *et al.*, 1979) through crossing with Silver Montazah strain (Mahmoud *et al.*, 1974). Therefor, crossing Silver Montazah males to Baheij females had to be applied in order to overcome the problem of reaching genetic equilibrium in Baheij breed, thus allowed effective selection for certain productive traits.

Crossing was found to be effective for improving body weight as reported by Shebl *et al.* (1995), Nawar *et al.* (2004), and Amin (2007) who found positive heterosis in body weight at 6 and 12 wks of age in both sexes, also, Nestor *et al.* (2006) and Amin (2009) reported positive effect of backcrossing on growth traits in turkey. Moreover, Mostafa and Nofal (2000), Amin (2008 and 2009) found significant difference between the two sexes in body weight at different ages.

Crossbreeding was found to improve chick viability (El-Turkey, 1981; Nawar and Abdou, 1999; Nawar *et al.*, 2004).

Several reports have demonstrated that crossbreeding seems to improve body measurements (Abou-El-Ella, 1982 and Sharaf *et al.*, 2006) and body conformation (El-Turkey, 1981), while no significant differences were found between purebred and crossbred as reported by the same auther.

Several investigators found positive effect of crossing on edible meat or giblets percentages (Ali, 1979; Khar, 1981; and Mandour *et al.*, 1996),

while others found no heterotic effect of crossing on the same traits (El-Turkey, 1981; Sharaf *et al.*, 2006). Moreover, pure parents were a significantly source of variation for body weight and all the carcass traits (Mandour *et al.*, 1996).

The aim of the present study is to find out the effect of upgrading on body weight at different ages, growth rat, growth efficiency and birds viability percentages at different periods. Also, body conformation at 8 and 12 wks of age and carcass traits at 16 and 20 wks of age were studied.

MATERIALS AND METHODS

This study was conducted at El-Sabahia Poultry Research Station, Alexandria, Animal Production Research Institute, Agriculture Research Center, Egypt.

Breeding and management:

Upgrading Line:

In the first generation, females of the Baheij (Bj) breed were crossed to selected Silver Montazah (SM) males as a parent line according to the individual mature BW (average), thus, the females produced (1/2SM + 1/2Bj) were backcrossed to the same parent line throughout two additional generations [produced (3/4SM + 1/4Bj) and (7/8SM + 1/8Bj), in the two generations, respectively].

Control line:

Chicks of Baheij breed were randomly chosen to establish a pedigreed control population.

Continuous lighting was provided from hatching to 8 wk of age, at that time, the photoperiod was reduced to 12 h/d. and remained at this level during the rearing period. After the rearing period, at 20 weeks of age, females were housed in breeding pens (10 pullets + 1 male, each). The birds were fed a starter diet (19% crude protein and 2800 Kcal) up to 8 weeks of age, grower diet (15% crud protein and 2700 K cal) up to 20 weeks (17% crude protein and 2850 Kcal). Thereafter, feed and water were supplied *ad libitum*. The average number of progeny reared in the three generations was 68, 135, 133 chick for the BjBj line, and 210, 315, 329 chick for the SM x Bj genotype, respectively.

The studied traits:

- Body weights (BW) at hatch, 4, 8 (not tabulated and presented in Figures 1 and 2). Also, BW 12, 16, and 20 wks of age presented in Tables.

- Growth rate using the following equation (Lerner and Asmundson, 1932).

$$GR = [W_2 - W_1 / 1/2(W_2 + W_1)] \times 100$$

Where: GR: rate of growth, W_1: the initial weight,

W_2: the second weight.

- Growth efficiency through different periods of growth using the following equation (Gondwe and Wollny, 2005):

$$GE = WG_{ti} / LW_{t0}$$

Where, GE is growth efficiency per time period = t_i ; WG_{ti} is weight gain at time = t_i; LW_{to} is live weight at time = t_0

- Chick viability through the growth period (0-8 weeks) of age.

- **Body measurements:**

Shank length, keel length and breast width which was measured with a modified vurger angle meter in millimeters. It was measured at a point very near to the fronh end of the breast bone and ¾ inch down from the keel. at 8 and 12 weeks of age at the 3rd generation, and body conformation was estimated using the following equations (Nordskog, 1976, Mahmoud *et al.*, 1980 and El-Turkey, 1981):

$C_1 = \sqrt[3]{BW}$ / shank length, gm/cm

C_2 = BW/shank length, gm/cm

$C_3 = \sqrt[3]{BW}$ / keel length, gm/cm

C_4 = BW / keel length, gm/cm .

- Random sample of 6 cocks at 16 and 20 weeks of age from each genotype for the two generations were used to study the carcass traits (Absolute values and percentages of carcass, legs, gizzard liver and heart.

Statistical analysis:

Data of growth traits were analyzed using fixed models SAS institute (1988):

$$Y_{ijkl} = U + Gn_i + Gt_j + S_k + (GnGt)_{ij} + (GnS)_{ik} + (GtS)_{jk} + GnGtS)_{ijk} + e_{ijkl}$$

Where: Y_{ijkl}= an observations, U = overall mean, Gn_i = the fixed effect of i^{th} generation, Gt_j = the fixed effect of j^{th}genotype, S_k = the fixed effect of k^{th} sex, and $(GnGt)_{ij}$, $(GnS)_{ik}$, $(GtS)_{jk}$ and $(GnGtS)_{ijk}$ = effects of the interactions between the three factors studied, and e_{ijkl} = random error.

The other traits which studied were analyzed using fixed models SAS institute (1988):

$$Y_{ijk} = U + Gn_i + Gt_j + (GnGt)_{ij} + e_{ijk}$$

Where: Y_{ijk}= an observations, U = overall mean, Gn_i= the fixed effect of i^{th} generation, Gt_j= the fixed effect of j^{th} genotype, $(GnGt)_{ij}$= effect of the interaction between the two main factors, and e_{ijk}= random error. Significant differences among means were tested by Duncan Test (1955).

RESULTS AND DISCUSSION

1 -**Body weight (BW)**:

Least square means for BW as affected by generation, genetic group, for males and females are presented in Table 1 and Figures 1 and 2. Concerning the effect of generation, the results showed that, chicks of the 3rd generation were the heaviest (P<0.001) compared to those of the 1st and 2nd generations (769.1, 1031.2 and 1299.5 gm) at 12, 16 and 20 wks of age, respectively. The same trend was found at the early periods of growth (0, 4, and 8 wks of age as shown in Figure 1). On the other hand, while the averages of body weight of the 1st and 2nd generations were nearly similar at 12 wks of age, the superiority of the 1st one over the 2nd generation (P<0.001) was found at 16 wks of age while the opposite was found at 20 wks of age.

Results showed that the least squares means of body weight of upgraded group surpassed (P<0.001) those of the contro at all ages studied. The positive effect of crossing agrees with the finding of Yalcin *et al.* (2000), Nawar *et al.* (2004), Mohamed (2003), Aly *et al.* (2005) and Amin (2007) on chicken and Amin (2009) on turkey. Nestor *et al.* (2006) reported that for maximum gains per generation, backcrossing probably should be used for maximum of two or three generations.

Males were heavier (P<0.001) than females at all ages studied except those of 1 day of hatch which had nearly similar weight averages. Same results were reported by Mostafa and Nofal (2000) and Amin (2008). In contrary, Nestor *et al.* (2006) found that males in the F1 generation did not differ from expected for body weight at any age but the females of that cross had higher body weight than expected at 16 and 20 weeks of age.

Statistical analysis revealed no significant interaction between the three main factors except in BW at 8, 16 and 20 wk of age. Significant (P<0.001) effect of interaction between generation (Gn) x genotype (Gt)

was found. The birds in the 3rd generation (7/8 SM + 1/8 Bj) were the heaviest (1171.3 and 1418.5g) at 16 and 20 weeks of age, respectively.

2-Growth rate percentage (GR%):

Generation affected (P<0.001) GR% at 4-8 and 8-12 wk of age (Figure 3). The results in Table 2 showed that least squares means of GR% of birds differed (P<0.001) through the three consecutive generations, where birds of the 3rd generation had the highest values of GR% through the intervals 12-16, and 0-16 wks of age (28.6 and 186.2%, respectively), while the 2nd generation had the highest value at 16-20 wks of age (24.4%). On the other hand, upgrading improved (P<0.001) GR% at 0-16 wk of age (186% vs. 184.6%) for both upgraded and purebred, respectively. Also, upgrading slightly increased GR% values at the 1st periods except at 8-12 wks of age. The contrary was found where the GR% of the purebred was higher (P<0.001) than that of the upgraded group (Figure 4). Results of some investigators were in harmony with the results in this study. Shebl *et al.*, (1995) reported that the crossbreds grew significantly faster than the purebred from the hatch day to 8 wks of age, but vice versa at 8 to 12 wks of age also, Nawar *et al.*, (2004) reported that crossbreeding improved significantly growth rate during early intervals of age (4-6 wks).

Males had significantly (P<0.001) higher values of GR% at the periods 0-4, 0-16, and 0-20 wks of age than females as shown in Figures 3, 4 and Table 2. These results were in agreement with thaose reported by Mostafa and Nofal (2000) and Amin (2008 and 2009) who found significant differences between both sexes in body weight. All interactions between the main factors were not significant except that for GR% at 0-16 wks of age. The birds of upgraded groups at both the 1st and 3rd generations were equal and had significant GR% (185.5%).

3- Growth efficiency (GE):

Figure 5 and Table 3 shows that generation affected GE significantly (P<0.001) at 4-8 wks of age. Also. the same effect was found at 0-12 (P<0.05) and at 12-16, 16-20, 0-16 and during the whole period (0-20) (P<0.001) where the birds of the 3rd generation had the highest means of GE at all the mentioned periods except at 16-20 where the birds of the 2nd generation had the highest values (21.76, 0.34, 0.21, 28.14 and 38.77, respectively, Table 3). In addition, results show that upgrading improved significantly GE at 0-4, 0-12, 0-16 and 0-20 wks of age (P<0.001) (Figure 6

and Table 3). Moreover, Baheij males had significantly higher values of GE at the most periods studied (P<0. 01 to P<0.001).

On the other hand, results revealed highly significant effects of the interaction between Gn x Gt for GE at 0-12, 12-16, 0-16 and 0-20 wks of age. The genotype 7/8SM + 1/8Bj (at the 3rd generation) had the best growth efficiency. Amin (2009) found that all crosses and backcrosses in turkey had significantly the lowest means of growth efficiency through the period (4-20 wks of age) concerning the three generations studied on turkey. On the other hand, he found that the difference between overall means of growth efficiency for both sexes was significant at all periods studied except for 12-16 and 12-20 wks of age.

4- Body measurements (BM) and body conformation (BC):

Results presented in Table 4 suggested that age affected body weight, shank length and keel length significantly (p<0.01) where the averages values of these traits at 12 wks of age were higher than those at 8 wks of age. Also, BW averages differed significantly in both genotypes (upgraded and control) where birds of 7/8 SM + 1/8 Bj were heavier (P<0.05) than those of pure Bj (663.3 vs 494.4 g). Moreover, males were heavier (P<0.01) than females (733.1 vs 558.5). On the other hand, it seemed that upgrading did not improve BC, estimated by any of C_1, C_2, C_3 or C_4. Comparing body conformation for males and females, it was found that C_2 and C_4 were more applicable (P<0.01) than C_1 and C_3. On the other hand, it was found that C3 is not accurate measurement for body conformation at 8 and 12 wks of age compared to C1, C2 and C4 where they were considered more refined (P<0.01). There was significant interaction between age x generation for shank length (P<0.01), keel length and BC values (P<0.05), while interaction effects were not significant for BW or breast width.

These results were in agreement with those reported by El-Turkey (1981) who reported that differences were not significant among body measurements of purebreds and crossbreds at certain ages (8 and 12 wks), while Abou-El-Ella (1982) reported that crossbreeding was found to be effective on body measurements, particularly on keel length and breast width. In addition, El-Turkey (1981) reported that crossbreeding seems to improve body conformation (C_1, C_2, C_3 and C_4). In contrary, Nestor (1971) found that crosses of large strains did not show any heterotic effects in body conformation in turkey.

On the other hand, our results disagreed with those reported by Sharaf *et al.* (2006) concerning both shank and keel length at 4 weeks in quail while the results of the same authers concerning both traits showed that average of reciprocal crossbreds surpassed both of pure and crossbred averages at 5 wks of age. General increase in some body measurements in each genotype as age increased and this finding in agreement with Adedeji *et al.* (2006).

5-Viability percentage (V%):

Results in Table 5 showed that viability of chicks differed significantly ($P<0.01$) through the period 4-8 wks of age for the three generations studied, while there were no significant differences between the two genotypes or between the two sexes at all the periods studied. Also, all the interactions between the three main factors had no significant effects on this trait in the different periods studied. The results of this disagreed with those reported for some investigators who confirmed the superiority of crossbred over purebreds in viability (Fairful, 1990; Mandour *et al.*, 1992; Aly *et al.*, 2005; Amin, 2007).

6-Carcass traits:

Results in Table 6 showed that live body weight, and carcass values differed significantly in birds of the 3rd generation compared to that of the 2nd generation at 16 and 20 wks of age (1278g, 907.1g and 69.4% vs. 1119g, 755.7g and 67.5%, respectively). Also, gizzard, and heart weights and legs percentage differed significantly in the two generations where the values of the 3rd generation were higher than that of the 2nd generation.

On the other hand, it was found that genotype affected ($P<0.01$) live body weight, carcass weight, where the averages of these traits were higher in upgraded group than those of pure Baheij birds. Also, gizzard and heart weights, and both the legs weight and percentage were affected ($P<0.01$) by the same trait. Age affected ($P<0.01$) live body weight, legs weight, carcass, liver and heart weights and percentages, where the values of the birds of 20 wks of age were higher than those of 16 wks except gizzard percentage where the contrary was found ($P<0.01$).

There were significant effects of all types of interaction on some carcass traits (Table 6). Comparisons of upgraded group relative to pure Baheij chickens were associated with superior effects of upgrading on most live body weight and carcass traits compared to Baheij group.

These results were in agreement with those reported by several investigators, that crossbreds were superior to purebreds concerning edible meat (Ali, 1979; Khar, 1981). In addition, Mandour *et al.* (1996) reported that the overall mean of edible giblets percentages were greater ($P<0.05$) for Silver Montazah line crosses than corresponding pure strain.

It could be concluded that crossing Baheij chickens (as dams) with Silver Montazah (as a sire parent) throughout three generations (upgrading) improved growth traits (body weight, growth rate percentage and growth efficiency) of progeny of both F2 and F3. These results are in agreement with several authors (Emmerson *et al.*, 1991; Ye *et al.*, 1997; Mostafa and Nofal, 2000) in chicken and Amin (2009) in turkey.

CONCLUSION

Comparing the effect of upgrading with that of the purebred (Baheij), it was found that upgrading had more influence on average body weight at 20 wks. These held true for body weight of purebred and crossbred at different ages (4, 8, 12 and 16 wks of age).

Further studies should be made to cross the purebred Bj sires to 7/8SM, 3/4 SM and 1/2 SM at different generations to reach 7/8 Bj and 15/16 Bj. The last mentioned cross will be compared to selected Bj to investigate the improvement concerning upgrading, either-way (increasing the blood of Silver Montazah. or increasing the blood of Bj strain) in order to overcome the problem of genetic equilibrium in Bj chickens.

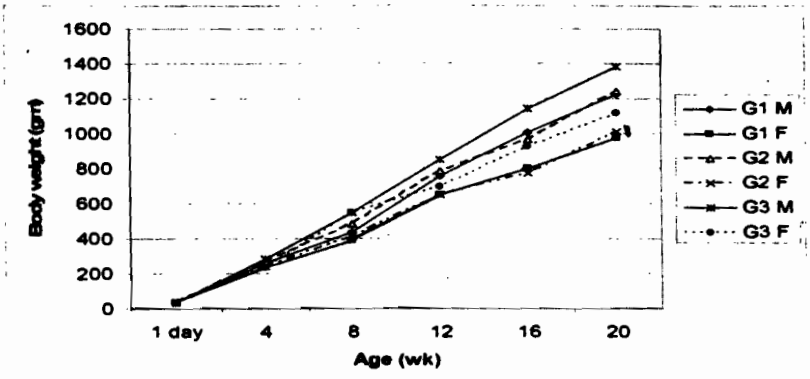

Figure 1. Effect of generation on body weight for males and females

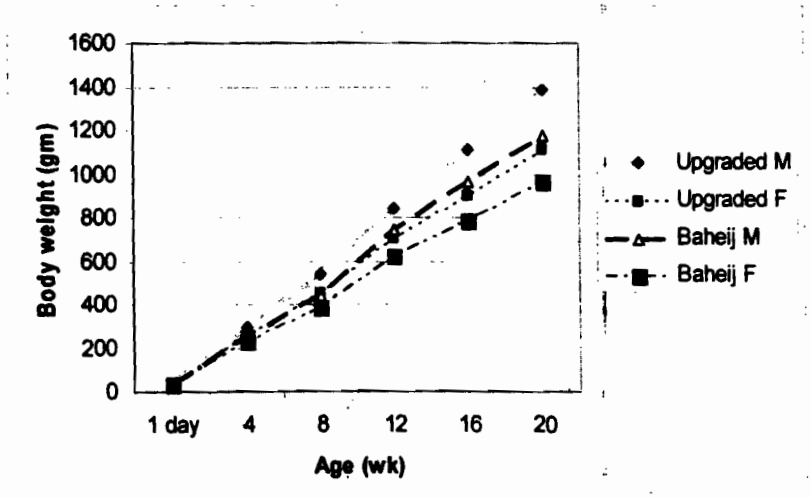

Figure 2. Effect of genotype on body weight for males and females

Table (1): Effect of genotype and generation on least squares means and ± standard error of body weight of male and female birds at different ages studied

Generation	Genotype	Body weight, g								
		12 wks			16 wks			20wks		
		Male	Female	Average	Male	Female	Average	Male	Female	Average
1	1/2SM+1/2Bj	769.1±12.0	687.9±14.3	728.5±9.3	1041.9±16.5	840.1±19.8	941.0±12.9	1264.6±22.2	1028.8±26.4	1146.7±17.2
	BjBj	733.0±20.8	611.4±20.3	672.2±14.5	974.9±28.4	764.4±28.8	869.7±.20.2	1181.9±37.9	921.9±38.9	1051.9±27.2
Overall mean		**751.1±12.0**	**649.6±12.4**	**700.3±8.6^{B}**	**1008.4±16.8**	**802.3±17.5**	**905.4±12.0^{B}**	**1223.2±21.9**	**975.4±23.5**	**1099.3±16.1^{C}**
2	3/4SM+1/4Bj	818.7±10.4	665.5±10.7	742.1±7.4	986.3±14.2	814.1±14.7	900.2±10.2	1306.9±18.4	1058.4±19.3	1182.6±13.4
	BjBj	750.6±17.2	627.2±15.2	688.9±11.5	952.9±23.5	779.0±21.1	866.0±15.8	1177.8±30.5	970.25±27.4	1074.0±20.7
Overall mean		**784.7±10.1**	**646.4±9.3**	**715.5±6.8^{B}**	**969.6±13.7**	**769.5±12.9**	**883.1±5.4^{C}**	**1242.3±17.8**	**1014.3±16.8**	**1128.32±12.2^{B}**
3	7/8SM+1/8Bj	943.8±8.2	757.0±10.1	850.4±6.5	986.3±14.2	1032.2±14.0	1171.3±8.0	1585.7±14.6	1251.3±18.3	1418.5±11.7
	BjBj	748.9±35.1	626.9±30.7	687.9±23.3	952.9±23.5	811.2±41.9	891.0±31.8	1175.4±26.3	985.6±56.5	1080.5±41.8
Overall mean		**846.3±18.0**	**691.9±16.1**	**769.1±12.1^{A}**	**1140.6±24.6**	**922.0±22.1**	**1031.2±16.5^{A}**	**1380.6±31.9**	**1118.5±29.34**	**1299.5±21.7^{A}**
Overall mean of upgraded groups		843.9±6.0	703.5±6.8	773.7±4.5^{a}	1112.9±8.2	895.5±9.5	1004.2±6.3^{a}	1385.7±10.8	1112.84±12.5	1249.3±8.2^{a}
Overall mean of Baheij breed		744.2±14.8	621.8±13.3	682.5±9.9^{b}	966.2±20.2	784.9±18.4	875.5±13.6^{b}	1178.4±26.3	959.3±24.5	1068.8±18.0^{b}
Overall mean		**744.0±8.0^{x}**	**662.6±7.5^{y}**	**773.9**	**1039.56±10.9^{x}**	**840.2±10.3^{y}**	**1011.6**	**1282.0±14.2^{x}**	**1036.1±13.8^{y}**	**1256.3**

SM: Silver Montazah strain and Bj: Baheij breed,

- Means having different letters in every column and within every factor of treatments are significantly different (P<0.05),
- All main factors studied had highly significant (0.001) effect on the body weight while all interactions between them were not significant except that for body weight at 16 and 20 wks of age, which were influenced (p<0.001) by the interaction of generation x genotype.

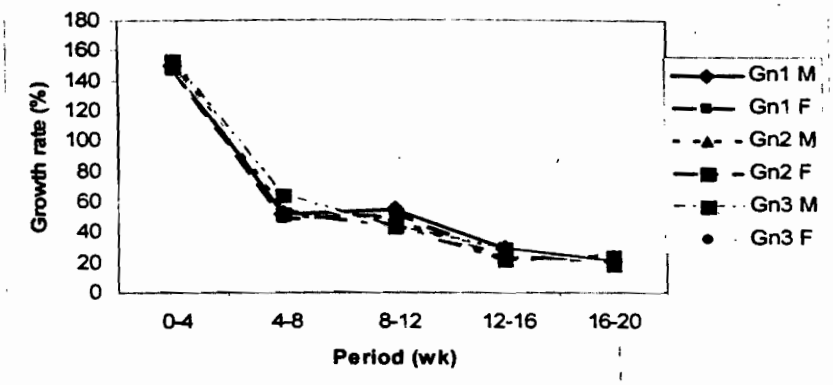

Figure 3. Effect of generation on growth rate percentage for males and females

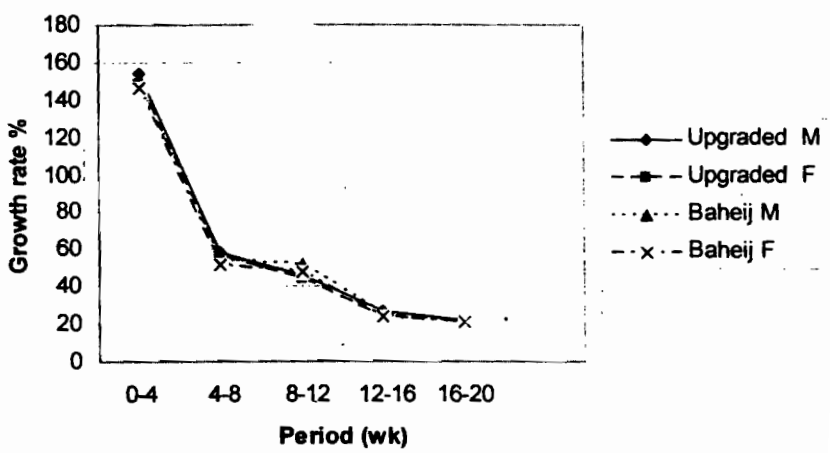

Figure 4. Effect of genotype on growth rate percentage for males and females

Table (2): Effect of genotype and generation on least squares means and ± standard error of growth rate percentage of male and female birds at different ages studied

Generation	Genotype	Growth rate percentage								
		0-12 wks (Growth period)			12-16 wks			16-20 wks		
		Male	Female	Average	Male	Female	Average	Male	Female	Average
1	1/2SM+1/2Bj	180.9±0.6	180.4±0.7	180.7±0.4	30.1±1.0	20.6±1.2	25.33±0.8	20.3±0.9	21.3±1.1	20.8±0.7
	BjBj	181.7±0.9	178.3±0.5	180.0±0.7	28.5±1.8	24.1±1.8	26.3±1.3	20.1±1.6	22.6±1.6	21.4±1.1
Overall mean		**181.3±0.6**	**179.4±0.6**	**180.3±0.4**	**29.3±1.0**	**22.3±1.1**	**25.8±0.8^{B}**	**20.2±0.9**	**22.0±1.0**	**21.1±0.7^{B}**
2	3/4SM+1/4Bj	183.4±0.5	179.9±0.5	181.6±0.4	19.1±0.9	21.2±0.5	20.12±0.7	28.1±0.8	25.5±0.8	26.8±0.5
	BjBj	182.4±0.8	179.2±0.8	180.8±0.5	23.4±1.5	22.3±1.3	22.9±0.9	21.7±1.3	22.2±1.1	22.0±0.8
Overall mean		**182.9±0.5**	**179.5±0.4**	**181.2±0.3**	**21.3±0.9**	**21.7±0.8**	**21.5±0.6^{C}**	**24.9±0.7**	**23.9±0.7**	**24.4±0.5^{A}**
3	7/8SM+1/8Bj	185.1±0.4	181.2±0.5	183.1±0.3	32.0±0.7	30.1±0.9	31.0±0.6	18.5±0.6	19.0±0.8	18.8±0.5
	BjBj	181.7±1.6	179.1±1.4	180.4±1.1	26.6±2.9	25.7±2.6	26.2±2.0	19.2±2.5	19.7±2.3	19.4±1.7
Overall mean		**183.4±0.8**	**180.1±0.8**	**181.7±0.6**	**29.3±1.5**	**27.9±1.4**	**28.6±1.0^{A}**	**18.9±1.3**	**19.3±1.2**	**19.1±0.9^{C}**
Overall mean of upgraded groups		183.1.3	180.5±0.3	181.8±0.2	27.1±0.5	23.9±0.6	25.5±0.4	22.3±0.4	21.9±0.5	22.1±0.3
Overall mean of Baheij breed		181.9±0.7	178.8±0.6	180.4±0.5	26.2±1.3	24.0±1.1	25.1±0.8	20.4±1.1	21.5±1.0	20.9±0.7
Overall mean		**182.5±0.4**	**179.7±0.4**		**26.6±0.7**	**24.0±0.6**		**21.3±0.6**	**21.7±0.6**	
Significance of:										
Generation		NS			***			***		
Genotype		NS			NS			NS		
Sex		NS			NS			NS		

Cont. Table (2)

Generation	Genotype	Growth rate percentage								
		12-20 wks (Rearing period)			0-16 wks			0-20 wks		
		Male	Female	Average	Male	Female	Average	Male	Female	Average
1	1/2SM+1/2Bj	50.8±1.4	41.3±1.6	46.0±1.1	186.9±0.2	184.0 ±1.3	185.5±0.2	187.5 ±0.6	186.9±0.7	187.2±0.4
	BjBj	46.5±2.3	45.8±2.4	46.1±1.7	186.2±0.4	182.7 ±0.4	184.4±0.3	188.6±1.9	185.8±0.9	187.2±0.7
Overall mean		**48.6±1.4**	**43.5±1.9**	**46.1±1.0**	**186.5±0.2**	**183.3±0.2**	**184.9±0.2^{B}**	**188.1±0.6**	**186.3±0.6**	**187.2±0.4**
2	3/4SM+1/4Bj	46.4±1.1	45.6±1.2	46.0±0.8	186.2±0.1	183.6±0.2	184.9±0.1	189.6±0.5	187.2±0.5	188.4±0.3
	BjBj	44.6±1.9	43.8±1.7	44.2±1.3	185.9±0.3	183.2±0.3	184.6±0.2	188.7±0.8	186.5±0.7	187.6±0.5
Overall mean		**45.5±1.1**	**44.7±1.0**	**45.1±0.8**	**186.1±0.2**	**183.4±0.2**	**184.7±0.7^{B}**	**189.1±0.5**	**186.9±0.4**	**186.9±0.4**
3	7/8SM+1/8Bj	49.7±0.9	48.3±1.1	49.0±0.7	186.9±0.2	184.0±0.3	185.5±0.1	187.5±0.6	186.9±0.7	187.2±0.4
	BjBj	45.2±3.9	45.7±3.5	45.4±2.6	186.2±0.4	182.7±0.4	184.4±0.3	188.6±0.9	185.8±0.9	187.2±0.7
Overall mean		**47.4±2.0**	**47.0±1.8**	**47.2±1.3**	**187.5±0.3**	**184.9±0.3**	**186.2±0.2^{A}**	**189.6±0.8**	**187.4±0.8**	**188.5±0.6**
Overall mean of upgraded groups		49.0±0.7	45.0±0.8	47.0±0.5	187.4±0.1	184.5±0.1	186.0±0.1^{a}	189.3±0.3	187.5±0.3	188.4±0.2
Overall mean of Baheij breed		45.4±1.6	45.1±1.5	45.3±1.1	186.0±0.3	183.2±0.2	184.6±0.2^{b}	188.6±0.7	186.2±0.6	187.4±0.4
Overall mean		**47.2±0.9**	**45.1±0.9**		**186.7±0.1^{X}**	**183.9±0.1^{Y}**		**188.9±0.4^{X}**	**186.8±0.3^{Y}**	
Significance of:										
Generation		NS			***			NS		
Genotype		NS			***			NS		
Sex		NS			***			***		

SM: Silver Montazah strain and Bj: Baheij breed,

- Means having different letters in every column and within every factor of treatments are significantly different ($P<0.05$),
- All interactions between the main factors were not significant except that for growth rate % at 0-16 period, which was influenced ($p<0.001$) by the interaction of generation x genotype.

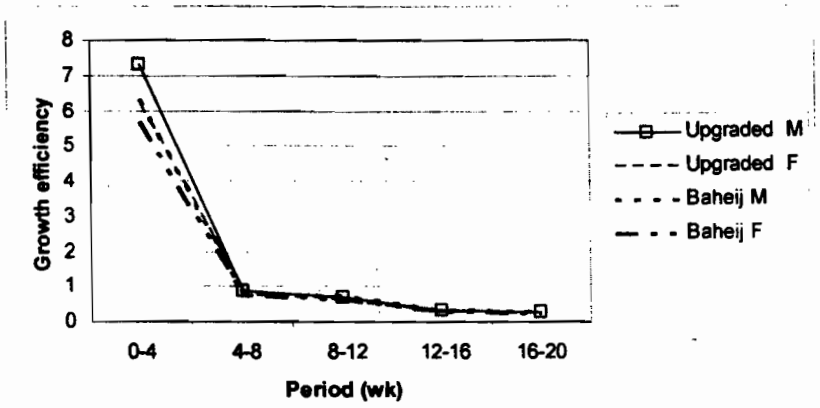

Figure 5. Effect of generation on growth efficiency for males and females

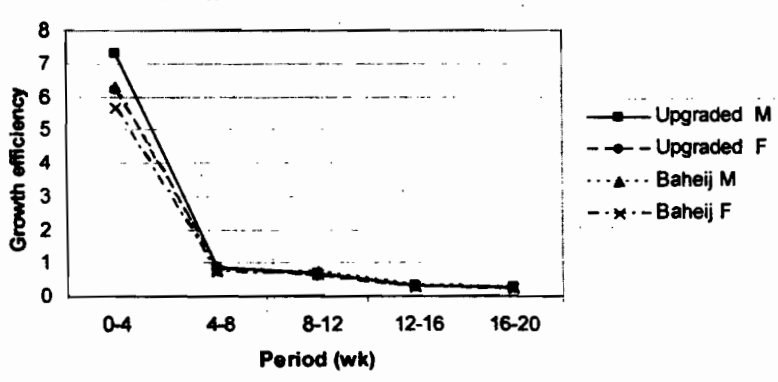

Figure 6. Effect of genotype on growth efficiency for males and females

Table (3): Effect of genotype and generation on least squares means and ± standard error of growth efficiency of male and female birds at different periods studied

Generation	Genotype	Growth efficiency								
		0-12 wks (Growth period)			12-16 wks			16-20 wks		
		Male	Female	Average	Male	Female	Average	Male	Female	Average
1	1/2SM+1/2Bj	21.31 ±0.37	19.22 ±0.44	20.26 ±0.29	0.37 ±0.01	0.24 ±0.01	0.30 ±0.01	0.23±0.01	0.24±0.01	0.24±0.0
	BjBj	20.54 ±0.64	17.28 ±0.62	18.91 ±0.42	0.36 ±0.02	0.28 ±0.02	0.32 ±0.01	0.23±0.02	0.26±0.02	0.24±0.01
Overall mean		**20.92±0.37**	**18.25±0.38**	**20.55±0.27^{B}**	**0.37 ±0.01**	**0.26 ±0.01**	**0.31 ±0.01^{B}**	**0.23±0.01**	**0.25±0.01**	**0.24±0.00^{B}**
2	3/4SM+1/4Bj	22.60 ±0.32	18.54 ±0.33	20.57 ±0.23	0.21 ±0.01	0.24 ±0.01	0.23 ±0.00	0.34±0.01	0.30±0.01	0.32±0.0
	BjBj	21.11 ±0.53	17.89 ±47	19.50 ±0.36	0.27 ±0.02	0.25 ±0.01	0.26 ±0.01	0.25±0.01	0.26±0.01	0.26±0.01
Overall mean		**21.85 ±0.31**	**18.22±0.25.**	**21.07±0.21^{B}**	**0.25 ±0.01**	**0.25 ±0.01**	**0.25 ±0.00^{C}**	**0.30±0.01**	**0.28±0.00**	**0.01^{A}±0.29**
3	7/8SM+1/8Bj	26.40 ±0.25	19.80 ±0.31	22.60 ±0.20	0.39 ±0.01	0.37 ±0.01	0.38 ±0.00	0.21±0.00	0.21±0.01	0.21±0.00
	BjBj	20.42 ±1.08	17.43 ±0.95	18.92 ±0.73	0.31 ±0.04	0.30 ±0.03	0.31 ±0.02	0.22±0.03	0.22±0.03	0.22±0.02
Overall mean		**22.91 ±0.56**	**18.61 ±0.50**	**21.76 0.38^{A}**	**0.35 ±0.02**	**0.34 ±0.02**	**0.34 ±0.01^{A}**	**0.21 ±0.00**	**0.22 ±0.01**	**0.21 ±0.00^{C}**
Overall mean of upgraded groups		29.10 ±0.18	19.19 ±0.21	21.14 ±0.14^{a}	0.32 ±0.00	0.28 ±0.0	0.30 ±0.00	0.26 ±0.00	0.25±0.01	0.26±0.01
Overall mean of Baheij breed		20.69 ±0.45	17.53 ±0.41	19.11 ±0.31^{b}	0.32 ±0.01	0.28 ±0.01	0.30 ±0.00	0.23 ±0.01	0.24±0.00	0.24±0.0
Overall mean		**21.15±0.25^{X}**	**18.82±0.23^{Y}**		**0.32±0.00^{X}**	**0.28±0.00^{Y}**		**0.25 ±0.00**	**0.25 ±0.00**	
Significance of:										
Generation (Gn)		*			***			***		
Genotype (Gt)		***			NS			NS		
Sex (S)		***			**			NS		
Gn x Gt		**			**			NS		

Cont. Table 3

Generation	Genotype	Growth efficiency								
		12-20 wks (Rearing period)			0-16 wks			0-20 wks		
		Male	Female	Average	Male	Female	Average	Male	Female	Average
1	1/2SM+1/2Bj	0.89±0.07	0.54±0.08	0.71±0.05	29.21±0.49	23.04 ±0.59	26.42 ±0.39	35.94 ±5.72	29.23±4.60	33.16 ±6.23
	BjBj	0.64±0.12	0.61±0.12	0.63±0.08	27.66 0.85	21.69 ±0.86	24.67 ±0.61	33.70 ±4.16	26.50±3.5	30.21 ±5.27
Overall mean		**0.77±0.07**	**0.57±0.02**	**0.67±0.05**	**28.46±0.49**	**22.69 ±0.53**	**25.55±0.36^{B}**	**35.37±5.44**	**28.37±4. 45**	**32.33±6.11^{B}**
2	3/4SM+1/4Bj	0.63±0.06	0.61±0.06	0.62±0.04	27.64 ±0.42	22.93 ±0.44	25.28 ±0.31	37.70 ±5.95	30.09±5.35	33.75 ±6.65
	BjBj	0.59±0.10	0.59±0.09	0.59±0.06	27.01 ±0.70	22.38 ±0.64	24.70 ±0.47	33.74 ±4.05	28.13±3.63	30.63±4.73
Overall mean		**0.61±0.06**	**0.60±0.05**	**0.60±0.03**	**27.32± 0.41**	**22.66 ±0.39**	**24.99±0.28^{C}**	**36.18±5.69**	**29.44±4.92**	**32.82 ±6.30^{B}**
3	7/8SM+1/8Bj	0.68±0.04	0.65±0.05	0.67±0.04	35.66 ±0.34	27.37 ±0.42	31.43 ±0.27	43.30±10.21	33.34±7.00	39.42 ±10.3
	BjBj	0.60±0.19	0.61±0.18	0.60±0.13	26.87 ±1.45	22.80 ±1.27	24.80 ±0.96	32.81 ±5.11	27.86±3.39	30.08 ±4.87
Overall mean		**0.64±0.10**	**0.62±0.09**	**0.63±0.07**	**31.18± 0.74**	**25.09 ±0.67**	**28.14±0.50^{A}**	**42.76±10.20**	**32.82±6.91**	**38.77±10.29^{A}**
Overall mean of upgraded groups		0.74±0.03	0.60±0.04	0.67±0.02	30.78 ±0.24	24.65 ±0.28	27.71 ±0.19^{a}	39.86 ±8.91	31.29±6.22	36.23 ±8.95^{a}
Overall mean of Baheij breed		0.61±0.08	0.60±.07	0.60±0.05	27.18 ±0.61	22.29 ±0.55	24.74 ±0.41^{b}	33.61 ±4.20	27.63±3.60	30.43 ±4.90^{b}
Overall mean		**0.67±0.04**	**0.60±0.04**		**28.98±0.33^{X}**	**23.47±0.31^{Y}**		**38.78±8.62^{X}**	**30.29±5.90^{Y}**	
Significance of:										
Generation (Gn)		NS			***			***		
Genotype (Gt)		NS			***			***		
Sex (S)		NS			***			***		
Gn x Gt		NS			***			***		

SM: Silver Montazah strain and Bj: Baheij breed,

- Means having different letters in every column and within every factor of treatments are significantly different (P<0.05).
- The interactions between the Gn x S, Gt x S and Gn x Gt x S were not significant at the different periods.

Table (4): Effect of genotype and generation on least squares means and ± standard error of body weight, some body measurements and body conformation of the two genotypes studied at 8 and 12 weeks of age for males and females of the 3rd generation

Age	Genotype	Sex	Body weight (g)	Shank length (cm)	Keel length (cm)	Breast width (cm)
8 wk	7/8SM+1/8Bj	M	585.5±21.6	6.81±0.27	6.13±0.30	4.36±0.22
		F	455.2±12.8	6.83±0.14	6.10±0.15	4.40±0.09
	Average		**494.5±13.3**	**6.83±0.13**	**6.11±0.14**	**4.39±0.09**
	BjBj	M	499.0±20.2	7.44±0.32	6.76±0.41	5.00±0.24
		F	445.1±10.2	6.98±0.14	6.24±0.15	4.55±0.08
	Average		**452.4±9.5**	**7.04±0.13**	**6.31±0.14**	**4.61±0.08**
	Overall mean of males		559.9±17.9	6.99±0.22	6.31±0.25	4.55±0.18
	Overall mean of females		449.8±8.0	6.91±0.10	6.18±0.11	4.48±0.06
Overall mean of 8 weeks			**474.2±8.5^{b}**	**6.93±0.09^{b}**	**6.21±0.10^{b}**	**4.50±0.06**
12 wk	7/8SM+1/8Bj	M	937.4±29.2	7.97±0.19	7.58±0.22	4.77±0.15
		F	783.2±18.8	7.90±0.13	7.43±0.11	4.85±0.16
	Average		**832.1±18.2**	**7.92±0.10**	**7.48±0.10**	**4.82±0.08**
	BjBj	M	880.9±128.4	7.38±0.40	7.13±0.52	4.90±0.56
		F	726.4±65.3	7.08±0.17	6.75±0.25	4.93±0.34
	Average		**803.6±72.8**	**7.23±0.21**	**6.94±0.27**	**4.91±0.30**
	Overall mean of males		928.0±31.1	7.87±0.12	7.50±0.20	4.79±0.15
	Overall mean of females		778.3±18.0	7.87±0.17	7.37±0.11	4.85±0.09
Overall mean of 12 weeks			**828.9±17.9^{a}**	**7.84±0.10^{a}**	**7.42±0.10^{a}**	**4.83±0.08**
7/8SM+1/8Bj		M	766.0±33.8	7.40±0.19	6.87±0.22	4.57±0.13
		F	617.2±21.0	7.36±0.11	6.67±0.12	4.62±0.07
Overall mean of 7/8SM+1/8Bj			**663.3±18.8^{A}**	**7.37±0.10**	**6.79±0.10**	**4.61±0.06**
BjBj		M	626.3±68.0	7.42±0.24	6.88±0.31	4.97±0.23
		F	465.6±14.4	6.99±0.13	6.28±0.14	4.58±0.08
Overall mean of BjBj			**494.4±18.3^{B}**	**7.06±0.12**	**6.390±0.13**	**4.65±0.08**
Overall mean of Males			733.1±31.2^{X}	7.40±0.15	6.87±0.18	4.66±0.12
Overall mean of Females			558.5±15.8^{Y}	7.22±0.09	6.57±0.09	4.60±0.05
Overall mean			**604.7±15.0**	**7.27±0.08**	**6.65±0.08**	**4.62±0.05**
Significance of::						
Age			**	**	**	NS
Genotype			*	NS	NS	NS
Sex			**	NS	NS	NS
Age x Genotype			NS	**	*	NS

Cont. Table (4)

Age	Genotype	Sex	Body conformation			
			C1	C2	C3	C4
8 wk	7/8SM+1/8Bj	M	1.27±0.06	89.10±5.31	1.43±0.08	100.47±6.69
		F	1.14±0.02	67.20±1.88	1.29±0.03	75.89±2.38
	Average		**1.18±0.02**	**73.80±2.41**	**1.33±0.03**	**83.30±2.95**
	BjBj	M	1.08±0.04	67.75±1.45	1.20±0.06	74.57±2.30
		F	1.11±0.02	64.06±1.14	1.25±0.03	72.19±1.54
	Average		**1.10±0.02**	**64.49±1.01**	**1.24±0.02**	**72.52±1.36**
	Overall mean of males		1.21±0.05	82.63±4.21	1.36±0.06	92.80±5.25
	Overall mean of females		1.12±0.01	65.51±1.07	1.27±0.02	73.90±1.38
Overall mean of 8 weeks			**1.14±0.02^{b}**	**69.30±1.40^{b}**	**1.29±0.02**	**78.08±1.72^{b}**
12 wk	7/8SM+1/8Bj	M	1.24±0.03	118.56±4.11	1.31±0.04	125.35±4.95
		F	1.18±0.02	100.18±2.87	1.25±0.02	106.25±2.93
	Average		**1.20±0.02**	**106.02±2.57**	**1.27±0.02**	**112.31±2.76**
	BjBj	M	1.31±0.14	123.51±24.94	1.37±0.02	129.14±26.55
		F	1.27±0.06	103.20±10.95	1.34±0.16	107.83±9.30
	Average		**1.29±0.07**	**113.35±13.18**	**1.35±0.08**	**118.49±12.65**
	Overall mean of males		1.25±0.03	119.39±5.03	1.32±0.08	123.98±5.88
	Overall mean of females		1.18±0.02	100.44±2.75	1.26±0.02	106.38±2.77
Overall mean of 12 weeks			**1.21±0.02^{a}**	**106.84±2.69^{a}**	**1.28±0.02**	**113.01±2.85^{a}**
7/8SMx1/8Bj		M	1.25±0.03	104.20±4.07	1.37±0.04	113.23±4.54
		F	1.16±0.02	83.50±2.46	1.27±0.02	90.89±2.49
Overall mean of 7/8SM+1/8Bj			**1.19±0.02**	**89.91±2.27**	**1.30±0.02**	**97.81±2.39**
BjxBj		M	1.15±0.06	86.00±11.02	1.26±0.07	92.77±11.25
		F	1.12±0.02	66.90±1.88	1.26±0.03	74.78±1.99
Overall mean of BjBj			**1.13±0.02**	**70.33±2.61**	**1.26±0.02**	**78.00±2.68**
Overall mean of Males			1.23±0.03	99.93±4.13	1.34±0.04	108.41±4.48^{X}
Overall mean of Females			1.14±0.01	77.07±1.80	1.26±0.02	84.65±1.83^{Y}
Overall mean			**1.17±0.01**	**83.11±1.86**	**1.28±0.01**	**90.93±1.94**
Significance of::						
Age			**	**	NS	**
Genotype			NS	NS	NS	NS
Sex			NS	**	NS	**
Age x Genotype			*	*	*	*

SM: Silver Montazah strain, Bj: Baheij breed, M: Male, F: Female,

- Means having different letters in every column and within every main factor of treatments are significantly different (P<0.05).
- Genotype had no significant effect on all traits studied except that for body weight where it affected significantly (P<0.01), and the interactions of Age x Genotype , Age x Sex, and Genotype x Sex had no significant effects on all traits studied.

Table (5): Effect of genotype and generation on least squares means and ± standard error of viability of male and female birds at different periods studied

Gene-ration	Genotype	Chicks viability				
		0-4 wks	4-8 wks			0-8 wks
		Non sexed	Males	Females	Average	Non sexed
1	1/2SM+1/2Bj	89.42±2.39	98.89±1.65	100.00±1.65	99.44±1.16	88.91±2.32
	BjBj	95.56±5.35	100.00±3.69	100.00±3.20	100.00±2.44	97.15±5.20
Overall mean		**92.49±2.93**	**99.44±2.02**	**100.00±1.08**	**99.72±1.35^{A}**	**93.03±2.85**
2	3/4SM+1/4Bj	94.07±2.32	95.28±1.60	97.32±1.60	96.30±1.31	90.30±2.25
	BjBj	95.97±4.63	98.21±3.20	95.39±3.20	96.80±2.26	92.98±4.51
Overall mean		**95.02±2.59**	**96.75±1.78**	**96.36±1.78**	**96.52±1.26^{B}**	**91.59±2.52**
3	7/8SM+1/8Bj	94.22±2.39	100.00±1.65	98.84±1.65	99.42±1.17	93.83±2.33
	BjBj	97.92±4.63	100.00±3.20	100.00±3.69	100.00±2.44	95.99±4.51
Overall mean		**96.07±2.61**	**100.00±1.80**	**99.42±2.02**	**99.71±1.35^{A}**	**94.92±2.54**
Overall mean of upgraded groups		92.57±1.37	98.06±0.94	98.72±0.94	98.39±0.66	90.98±1.33
Overall mean of Baheij breed		96.48±2.82	99.40±1.94	98.46±1.94	98.93±1.37	95.73±2.74
Overall mean		**96.07±2.61**	**98.73±1.08**	**98.59±1.08**	**98.44**	**94.92±2.54**

SM: Silver Montazah strain and Bj: Baheij breed,

- Means having different letters in every column and within every factor of treatments are significantly different ($P<0.05$),
- All main factors studied and all interactions between them were not significant except generation which affected ($P<0.01$) viability at 4-8 period.

Table (6): Effect of genotype and generation on least squares means and ± standard error of live body weight, g and initial weights (g) and percentages of carcass traits at 16 and 20 weeks age at the 2nd and 3rd generations

Generation	Genotype	Age, wks	Live body weight	Carcass traits			
				Carcass		Legs	
				Wt	%	Wt	%
2	3/4SM+1/4Bj	16	1014±13	663±18	65.4±1.1	66.9±3.1	6.59±0.29
		20	1336±15	951±30.	71.1±1.3	74.4±3.4	5.58±0.27
	Average		**1175±10**	**794±48**	**68.0±1.2**	**70.7±2.3**	**6.08±0.18**
	BjBj	16	945±14	611±17	64.7±1.8	58.6±3.4	6.21±0.27
		20	1181±15	816±17	69.1±1.1	63.7±3.2	5.40±0.30
	Average		**1063±11**	**714±36**	**66.9±1.3**	**61.2±2.2**	**5.80±0.19**
	Overall mean at 16 wk		980±10	640±14	65.1±1.0	62.8±2.3	6.40±0.18
	Overall mean at 20 wk		1259±12	884±27	70.1±0.9	69.1±2.4	5.49±0.19
Overall mean of generation 2			**1119±7^{b}**	**756±31^{b}**	**67.5±0.8**	**65.9±1.7**	**5.94±0.13^{a}**
3	7/8SM+1/8Bj	16	1348±15	912±33	67.6±1.8	59.4±3.4	4.41±0.27
		20	1602±12	1150±28	71.8±1.7	77.7±2.9	4.85±0.23
	Average		**1475±10**	**1051±40**	**70.0±1.3**	**68.6±2.2**	**4.63±0.17**
	BjBj	16	974±15	644±11	66.1±1.1	54.7±3.4	5.62±0.27
		20	1186±17	825±23	69.6±04	76.2±3.6	6.42±0.30
	Average		**1080±14**	**735±30**	**67.8±0.8**	**65.4±2.4**	**6.02±0.19**
	Overall mean at 16 wk		1161±10	778±47	66.9±1.0	57.0±2.4	5.01±0.19
	Overall mean at 20 wk		1394±12	1014±50	70.9±1.0	77.0±2.2	5.64±0.18
Overall mean of generation 3			**1278±8^{a}**	**907±42^{a}**	**69.1±0.8**	**67.0±1.6**	**5.32±0.13^{b}**
Overall mean of 16 wks of age			**1070±7^{Y}**	**706±28^{Y}**	**65.9±0.7^{X}**	**59.9±1.7^{Y}**	**5.70±0.11**
Overall mean of 20 wks of age			**1328±10^{X}**	**955±33^{X}**	**70.5±0.6^{Y}**	**73.0±1.6^{X}**	**5.56±0.13**
Overall mean of upgraded group			1325±8^{A}	928±41^{A}	69.1±0.9	70.0±1.6^{A}	5.4±0.2^{B}
Overall mean of Baheij breed			1072±7^{B}	724±23^{B}	67.4±0.7	63.3±1.7^{B}	5.9±0.1^{A}
Overall mean			**1213**	**833**	**68.3**	**67.0**	**5.6**

Significance of:					
Generation (Gn)	**	**	NS	NS	**
Genotype (Gt)	**	**	NS	**	**
Age	**	**	**	**	NS
Gn x Get	**	**	NS	NS	**
Gn x Age	*	NS	NS	**	**
Gt x Age	**	**	NS	NS	NS
Gn x Gt x Age	NS	NS	NS	NS	NS

SM: Silver Montazah strain, Bj: Baheij breed, M: Male, F: Female,

- Means having different letters in every column and within every main factor of treatments are significantly different (P<0.05).

Cont. Table (6):

Gener-ation	Genotype	Age, wks	Carcass traits					
			Gizzard		Liver		Heart	
			Wt.	%	Wt.	%	Wt.	%
2	3/4SM+1/4Bj	16	38.5±2.4	3.8±0.2	28.2±1.5	2.8±0.1	8.8±0.9	0.87±0.1
		20	43.1±2.7	3.2±0.2	30.8±1.6	2.3±0.1	10.1±0.9	0.76±0.1
	Average		**40.8±1.8**	**3.5±0.2**	**29.5±1.1**	**2.5±0.1**	**9.4±0.6**	**0.81±0.1**
	BjBj	16	30.6±2.7	3.2±0.2	24.6±1.6	2.6±0.1	7.04±0.9	0.75±0.1
		20	31.5±2.7	2.7−0.2	33.2±1.6	2.8±0.1	10.4±0.9	0.88±0.1
	Average		**31.2±1.9**	**3.0±0.2**	**28.9±1.1**	**2.7±0.1**	**8.7±0.6**	**0.82±0.1**
	Overall mean at 16 wk		34.6±1.8	3.5±0.2	26.4±1.1	2.7±0.1	7.9±0.6	0.81±0.1
	Overall mean at 20 wk		37.3±1.9	3.0±0.1	32.0±1.1	2.6±0.1	10.2±0.6	0.82±0.1
Overall mean of generation 2			**35.9±1.3**	**3.2±0.8**	**29.2±0.8**	**3.2±0.1**	**9.1±0.4^{b}**	**0.81±0.0**
3	7/8SM+1/8Bj	16	44.1±2.7	3.3±0.2	27.0±1.6	2.0±0.1	9.6±0.9	0.71±0.1
		20	42.0±2.3	2.6±0.2	26.6±1.4	1.7±0.1	15.9±0.8	1.0±0.1
	Average		**43.0±1.8**	**2.5±0.2**	**26.8±1.1**	**1.8±0.1**	**12.7±0.6**	**0.85±0.1**
	BjBj	16	32.0±2.7	3.3±0.2	22.1±1.6	2.3±0.1	7.1±0.9	0.73±0.1
		20	42.4±2.7	3.6±0.2	36.0±1.6	3.0±0.1	12.2±0.9	1.03±0.1
	Average		**37.2±1.9**	**3.4±1.2**	**29.1±1.1**	**2.7±0.1**	**9.7±0.6**	**0.88±0.1**
	Overall mean at 16 wk		38.1±1.9	2.3±0.2	24.6±1.1	2.1±0.1	8.3±0.6	0.72±0.1
	Overall mean at 20 wk		42.2±1.8	3.1±0.1	31.3±1.1	2.4±0.1	14.1±0.6	1.01±0.1
Overall mean of generation 3			**40.1±1.3**	**3.2±0.8**	**27.9±0.8**	**3.2±0.1**	**11.0±0.4^{a}**	**0.87±0.0**
Overall mean of 16 wks of age			**36.3±1.3**	**3.4±0.1^{X}**	**25.5±0.8^{Y}**	**2.4±0.1^{Y}**	**8.1±0.4^{Y}**	**0.76±0.0^{Y}**
Overall mean of 20 wks of age			**39.7±1.3**	**3.0±0.1^{Y}**	**31.7±0.8^{X}**	**2.5±0.1^{X}**	**12.1±0.4^{X}**	**0.92±0.0^{X}**
Overall mean of upgraded groups			41.9±1.3^{A}	3.2±0.1	28.1±0.75	2.2±0.1	11.1±0.4^{A}	0.83±0.0
Overall mean of Baheij breed			34.1±1.3^{B}	3.2±0.1	29.1±0.8	2.7±0.1	9.2±0.5^{B}	0.84±0.0
Overall mean			**38.2**	**3.2**	**28.5**	**2.4**	**10.4**	**0.85**
Significance of:								
Generation (Gn)			*	NS	NS	NS	**	NS
Genotype (Gt)			**	NS	NS	NS	**	NS
Age			NS	**	**	*	**	**
Gn x Gt			NS	**	NS	**	NS	NS
Gn x Age			NS	*	**	NS	**	**
Gt x Age			NS	NS	NS	NS	NS	NS
Gn x Gt x Age			*	*	NS	NS	NS	NS

SM: Silver Montazah strain, Bj: Baheij breed, M: Male, F: Female,

- Means having different letters in every column and within every main factor of treatments are significantly different.

REFERENCES

Abdella, M.M. (2007). *Heritability and genetic correlation of feed efficiency and some egg production traits in Baheij chicken strain. M.Sc. Thesis, Fac. of Agric., Univ. of Alexandria, Egypt.*

Abou-El-Ella, N. (1982). *A comparative study on the performance potentiality of four locally developed strains and their F_1 crosses. M.Sc. Thesis, Fac. of Agric., Univ. of Alexandria, Egypt.*

Adedeji, T.A., O.A. Adebambo, S.O. Peters, L.O. Ojedapo and A.O. Ige (2006). *Growth performance of crossbred and purebred chickens resulting from different sire strain in a humid tropical environment. J. Anim. Vet. Adv. 5(8): 674-678.*

Ali, M.A. (1979). *Genetic studies in poultry. Comparative study of Dandarawy, Rhode Island Red, S.C.W. Leghorn and Dokki-4 breeds of chickens and their crosses. M.Sc. Thesis, Fac. Of Agric., Univ. of Alex., Egypt.*

Aly, O.M.; R.S. Abou El-Ghar; N.Y. Abou El-Ella, and W.Z. Aly (2005). *Using potency ratio to interpret hybrid vigor in crossing between two local strains. Egypt. Poult. Sci. 25(II): 413-428.*

Amin, E.M. (2007). *Effect of crossing on growth performance and viability of commercial and native Egyptian chicken breeds. Egypt. Poult. Sci. 27(4): 1151-1173.*

Amin, E.M. (2008). *Effect of crossing between the local Black Baladi (Bronze) and white Nicholas Turkeys on productive and reproductive traits. 1- Egg production and hatch traits. Egypt. Poult. Sci. 28(1): 165-184.*

Amin, E.M. (2009). *Effect of crossing between the local Black Baladi (Bronze) and White Nicholas turkeys on productive and reproductive traits. 2. Effect of repeated backcrossing for two generations on growth traits. Egypt. Poult. Sci. 29(3): 851-885.*

Balat, Magda M.; Yousria K. Afify; Nazla Y. Abou El-Ella; and Mervat A. Breakaa (2005). *Breed differences for adaptation to economical feeding system. 1. Growth traits. Anim. Prod. Res. Inst. Conf. and the Regional Symposium on Buffalo Prod. And Future Prespect., Sakha, 27-29 September 2005: 481-492.*

Duncan, D.B. (1955). *Multiple range and multiple F. test. Biometrics 11: 1-42.*

El-Turkey, A.I. (1981). *Hybrid vigor potence ratio in performance of crossbred from four local breeds of chickens. M.Sc. Thesis, Fac. of Agric., Alex. Univ., Egypt.*

Emmerson, D.A., N.B. Anthory, and K.E. Nestor (1991). *Genetics of growth and reproduction in the turkey. 11. Evidence of non additive genetic variation. Poult. Sci. 70: 1084-1091.*

Fairfull, R.W. (1990). *Heterosis, cited by "Poultry Breeding and Genetics", page 913-933. El-Sevier science publishers, B.V. New York, USA.*

Khar, S. K. (1981). *Performance studies of 4x4 diallel crosses for broiler production. A.B.A. 48: 1508.*

Lerner, I.H., and V.S. Asmunsdon (1932). *Inheritance of rate of growth in domestic fowl. Sci. Agric. 12: 652.*

Mahmoud, T.H.; I.F. Sayed and Y.H. Madkour (1974). *"The Silver Montazah" a new variety of chickens. Agric. Res. Rev. Vol. 52 (6): 97-105.*

Mahmoud, T.H.; A.I. El-Turky; Y.H. Madkour and A. Heider (1979). *"Baheij" a new breed of chickens. Agric. Res. Rev., Cairo, 67:227.*

Mahmoud, T.H.; N.A. Mosaad; Y.H. Madkour; N.Abdel-Salam and M.A. Khalifah (1980). *A comparison study of certain body measurements in a standard and local breed of chickens. Agric. Res. Rev., Cairo, 58 (6): 215-230.*

Mandour M.A.; G.A. Abd-Allah, and M.M. Sharaf (1996). *Effect of crossbreeding on some carcass traits of native and standard breeds of chickens. Egypt. Poult. Sci. Vol. 16 (I): 171-185.*

Mandour, M.A.; M.M. Sharaf; M.A. Kosba; and N.M. El-Naggar (1992). *Estimation of combining ability and heterosis for some economic traits in local and commercial broiler strains of chickens from a full dialel cross. Egypt. Poult. Sci. 12: 57-78.*

Mohamed, A.A. (2003). *Effect of diallel crosses on poultry performance. M.Sc. Thesis, Faculty of Agriculture, Alexandria University, Egypt.*

Mostafa, M.Y. and R.Y. Nofal (2000). *Effect of crossing two breeds of turkey on live body measurements, growth performance and livability. Egypt. Poult. Sci. 20: 239-252.*

Nawar, M.E.; O.M. Aly; and A.E. Abd El-Hamid (2004). *The effect of crossing on some economic traits in chicken. Egypt. Poult. Sci. 24 (1): 163-176.*

Nawar, M.E. and F.H. Abdou (1999). *Analysis of heterotic gene action and maternal effects in crossbred Fayoumi chickens. Egypt Poult. Sci. 19 (3): 671-689.*

Nestor, K.E. (1971). *Genetic of growth and reproduction in the turkeys. 4. Strain crossing for improvement of growth and reproduction. Poult. Sci. 50: 1683-1689.*

Nestor, K.E., J.W. Anderson, R.A. Patterson, and S.G. Welleman (2006). *Genetics of growth and reproduction in the turkey. 16. Effect of repeated backcrossing of an Egg line to a commercial sire line. Poult. Sci. 85: 1550-1554.*

Nordskog, A.W. (1976). *Noteson Poultry Breeding and Genetics. Dept. of Animal Science. Iowa State Univ., Ames, Iowa.*

SAS Institute (1988). *User s Guide Statistics. SAS Institute INC., Cary, NC, USA.*

Sharaf, M.M.; M.A. Mandour and A.E. Taha (2006). *Effect of dialed crossing on some growth performance, carcass traits and immune response against New Castle disease virus vaccine of Japanese quails. Egypt. Poult. Sci. 26 (4): 1451-1470.*

Shebl, M.K.A.; Magda M. Balat; and Nadia A. El-Sayed (1995). *Introducing Naked-Neck gene to Alexandria strain in comparison to their local crossbreds in certain economic traits. Egypt. Poult. Sci. 15: 1-5.*

Yalcin, S.; X. Zhang; G.R. McDaniel; and D.L. Kuhlers (2000). *Effects of divergent selection for incidence of tibial dyschon droplasia (TD) on purebred and crossbred performance. 2. Processing Yield. Br. Poult. Sci. 41(5):566-569.*

Ye, X., J.W. Anderson, D.O. Noble, J.Zhu, and K.E. Nestor (1997). *Influence of crossing a line selected for increased shank width and a commercial sire line on performance and walking ability of turkeys. Poult. Sci. 76: 1327-1331.*

الملخص العربى

تحسين الصفات الإنتاجية والتكاثرية لدجاج بهيج بواسطة الخلط

تأثير التزاوج القمى على:

أ. صفات النمو والحيوية وتناسق أعضاء الجسم وصفات الذبيحة

نعمة أحمد محمد مسعد – أسامة محمود على –

نظلة يوسف أبو العلا – يسرية كمال عفيفى

معهد بحوث الإنتاج الحيوانى – مركز البحوث الزراعية- وزارة الزراعة – الدقى

تم إجراء دراسة لتقييم تأثير الخلط الرجعى (زيادة دم سلالة المنتزه الفضى) على بعض الصفات الإنتاجية (وزن الجسم – معدل النمو – كفاءة النمو)] وكذلك نسبة حيوية الطيور عند أعمار مختلفة ، وذلك من خلال خلط ديوك المنتزه الفضى المنتخبة لوزن الجسم الناضج كخط آباء مع إناث البهيج لإنتاج ثلاث أجيال متتابعة من الأبناء كما يلى: الجيل الأول (٢/١ منتزة فضى + ٢/١ بهيج) ، الجيل الثانى (٤/٣ منتزة فضى + ٤/١ بهيج) ، الجيل الثالث (٨/٧ مبتزة فضى + ٨/١ بهيج). أيضاً تم دراسة مقاييس وتكوين الجسم عند ٨ ، ١٢ أسبوع وأيضا صفات الذبيحة عند ١٦ ، ٢٠ أسبوع من العمر، وكانت النتائج كما يلى :-

١- تفوقت طيور مجموعة الخلط الرجعى فى وزن الجسم معنوياً عن طيور المجموعة المقارنة (كنترول) عند جميع الأعمار المدروسة وكذلك كانت طيور الجيل الثالث الأعلى معنويا فى وزن الجسم مقارنة بطيور الجيلين الأول والثانى.

٢- أدى استخدام الخلط الرجعى إلى تحسين نسبة معدل النمو من الفقس حتى ١٦ أسبوع من عمر الطيور بينما وجد العكس خلال الفترة ٨-١٢ أسبوع من العمر. حقق الجيل الثالث أعلى نسبة معدل نمو خلال الفترات من الفقس إلى ١٦ أسبوع ، وأيضا من ١٢-١٦ أسبوع من العمر.

٣- تفوقت طيور مجموعة الخلط الرجعى فى كفاءة النمو على طيور مجموعة بهيج خلال فترات النمو من الفقس إلى أربعة أسابيع ، ١٢ ، ١٦ ، ٢٠ أسبوع من العمر. كانت طيور الجيل الثالث الأعلى معنويا فى كفاءة النمو خلال الفترات ٤-٨ ، من الفقس إلى ١٢ أسبوع ، ١٢-١٦ ، من الفقس إلى ١٦ أسبوع وكذلك من ١٦-٢٠ أسبوع من عمر الطيور. وكانت متوسطات الذكور أعلى معنويا عن متوسطات الإناث بالنسبة لصفات النمو المدروسة.

٤- تأثرت الحيوية معنويا بالجيل خلال الفترة ٤-٨ أسبوع من العمر.

٥- كان تأثير العمر معنويا على كل من وزن الجسم ، طول الساق وأيضا طول عظمة القص وأيضا تفوقت طيور الجيل الثالث عن طيور الكنترول ، من ناحية أخرى لم تتأثر أى من صفات تكوين الجسم بالخلط الرجعى.

٦- تفوقت طيور الجيل الثالث على طيور الجيل الثانى بالنسبة لوزن الذبيحة، والأعضاء الداخلية المأكولة ، وأيضا تفوقت مجموعة الخلط الرجعى بالنسبة لجميع الصفات المدروسة مقارنة بطيور سلالة بهيج. أيضا كانت الاختلافات معنوية بين متوسطات الصفات المدروسة عند ١٦ ، ٢٠ أسبوع من العمر.