MATROUH AS A COMMON PARENT IN CROSSING WITH SOME LOCAL STRAINS OF CHICKENS: II- HETEROSIS, ADDITIVE AND MATERNAL EFFECTS ON SOME EGG PRODUCTION TRAITS

By

Hanan H. Ghanem, O. M. Aly and R. Sh. Abou El-Ghar

Animal Production Research Institute, ARC, Ministry of Agriculture, Egypt.

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Abstract: *Matrouh was used as a common parent in crossing with Sliver Montazah, Inshas and Mandarah in two consecutive years 2005 and 2006. Egg number, egg weight and egg mass calculated during 90, 180, 240 and 360 d. of production to estimate the effects of heterosis, direct additive and maternal additive on these traits. Negative estimates of heterosis percentages found for egg number, egg weight and egg mass in the first laying period (90 d. of production). In contrast, positive higher estimates of heterosis percentages obtained for egg number and egg mass in the fourth laying period (360 d. of production) in the different genetic groups. The additive genetic effects increased with respect to egg number in all crosses as the age advance. The same trend occurred with egg mass except at the fourth laying period when crossing Matrouh with Inshas. The estimated maternal additive effects on egg number were low when crossing Matrouh with Silver Montazah, and very low when crossing Matrouh with Mandarah in the first laying period. However, the maternal effect increased in the previously mentioned crosses in the second, third and fourth period. When crossing Matrouh with Silver Montazah maternal additive effects on egg number was much larger than direct additive effects in the third and fourth laying period but they were low in the first and second laying period.*

The phenotypic correlation between annual egg production record and partial record (1st 90d. of production) was low. Contrarily, the correlation between 240 d. of production record and annual egg production record was very high.

It could be concluded that crosses resulted from mating Matrouh dam line with Inshas and/ or Silver Montazah sire line improved egg number and egg mass at different periods of production, while mating Matrouh sire line and/ or Inshas, Silver Montazah and Mandarah dam lines improved egg weight for 90,180,240 and 360 d. of production.

INTRODUCTION

Crossbreeding of chickens plays an important role in the improvement of the native strains in Egypt. The superiority of the improved breeds over the native ones is used to grade them up (El-Turky, 1981and Shebl *et al.*, 1990). Gowe and Fairfull (1982) and Fairfull *et al.*(1983) reported important reciprocal effect for most traits of commercial significant in White Leghorn stocks of chickens. However, Fairful *et al.* (1987) showed that both dominance and epistasis were important in heterosis for egg production traits in Leghorn strain crosses. Sex linked and maternal effects account for the most important reciprocal effects in crossbred chickens, (Crawaford 1990).

The primary trait in layer stock is always egg production (McMillan *et al.*, 1990). Hence, it is of interest to study the egg production curve and the possible change that might have occurred in egg production by crossing. Flock (1977) concluded that egg production in adjacent periods was more closely correlated than in remote periods. However, Oni *et al.* (2007) reported that selection on part record will probably more than offset the loss in efficiency if records are taken for about half of the full laying year.

The objectives of the present study were to compare the egg production traits till 360 d. of laying in four local breeds and their crosses and to estimate heterosis, additive and maternal effects for these traits to determine the best parental line would be used in improving egg production traits. Also to estimate the correlation coefficient between annual egg production record and partial record of egg production traits.

MATERIALS AND METHODS

The present experiment had been carried out at El-Sabahia Research Station, Animal Production Research Institute, Agricultural Research Center, during season 2005-2006.

Experimental work and breeding plan:

Four developed strains of chicken, Matrouh (MT), Sliver Montazah (SM), Inshas (IN), and Mandarah (MN) were used in this study. Ten Matrouh males and 40 females from each of Sliver Montazah, Inshas and Mandarah strains were mating to produce the strain crosses and three groups each involved 40 Matrouh females and 10 males from each of Sliver Montazah, Inshas and Mandarah pure strains involved to produce the reciprocal crosses. Artificial insemination had been applied be assigning four females to each male (Table 1).

Flock management: Management conditions were similar as possible as throughout the experiment. Fertile eggs collected throughout 7 days and incubated in full-automatic draft machine. All chicks were pedigreed and wing-banded at day-old. The chicks were fed *ad libitum* a commercial ration throughout the experiment. The pullets were housed individual cages at about 20 weeks of age.

Studied Traits:

Egg number, egg weight and egg mass were recorded at 90, 180, 240 and 360 day of production. Egg number recorded as hen housed egg production (number of eggs laid / hen) through out the rest periods (90, 180, 240 and 360 d.) of production. Average Egg weight recorded two times per weeks from age at sexual maturity until 360 day of production.

Statistical Analysis:

The data analyzed by using SAS computation program (SAS Institute, 1997). Duncan's (1955) new multiple range tests used to compare every two means of the different traits studied.

Direct heterosis, direct additive and maternal additive effects on egg production traits at different periods of production were estimated according to Dickerson's methodology (Dickerson 1992) as follow:

Pure lines difference:

$(G^i_x + G^m_x) - (G^i_y + G^m_y) = (X*X) - (Y*Y)$

Direct heterosis effect (H^i):

$H^i_{(xy)}$ (units) = $(X*Y + Y*X) - (X*X + Y*Y)$

$H^i_{(xy)}$ % = $\{(X*Y + Y*X) - (X*X + Y*Y)\} / (X*X + Y*Y)*100$

Direct additive effect (i.e. line group of sire differences)

$(G^i_x - G^i_y) = \{(X*X) + (X*Y)\} - \{(Y*Y) + (Y*X)\}$

Maternal additive effect (i.e. reciprocal crosses different):

$(G^m_x + G^m_y) = (X*Y - Y*X)$

Where:

G^i and G^m represent direct additive and maternal additive effects of the subscript genetic group, X= mean of Matrouh strain, Y= mean of Silver Montazah or Inshas or Mandarah strains.

Phenotypic correlation coefficients for egg number, egg weight and egg mass between the annual and partial record of production were estimated by using SAS computation program (SAS Institute, 1997).

Table 1: Number of males and females were used for mating

Sire	Dames				
		Matrouh	Silver Montazah	Inshas	Mandarah
Matrouh	Females	40	40	40	40
	Males	10	10	10	10

RESULTS AND DISCUSION

Genetic group means:

Pure strains: Inshas strain was the highest means of egg number at different periods of production (48.8, 97.71, 136.1 and 153.42 egg), respectively, Table (2) when compared with the other pure strains, however, these differences were highly significant at different periods. On the other hand, Silver Montazah strain was the lowest means of egg number at 240 and 360 d. of production (97.53 and 105.84 eggs), respectively. This result was in agreement with those reported by Saleh *et al.*(2006) who found that the mean of egg number for Inshas strain was ranged from 53.1 to 69.1 eggs at 40 weeks of age, while it was lower than Afifi 1994, Goher *et al.*(1994) and Balat *et al.*(1995) at the 1st 90 d. of production.

Egg weight of Matrouh strain was the highest means at 1st 90 d. of production, Table (2), while, at 180,240 and 360 d. of production the heaviest eggs were found in Inshas strain (52.16, 54.84 and 56.39 g), respectively. This different was significant at 180 and 240d. of production and highly significant at 360d. of production. Similar results were found by El-Sayed *et al.* (2001) and Saleh *et al.*(2006).

There were highly significant differences between pure strains for egg mass at different periods of production Table (2). However, the best strain for egg mass at 90,180, 270 and 360 d. of production was Inshas (2289.04, 5099.83, 7468.63 and 8646.85), respectively.

Matrouh as a sire line:

The highest mean of egg number was found when crossing Matrouh with Mandarah at the 1st 90, 180, 240 and 360 d. of production (32.61, 78.48, 109.4 and 149.14 egg), respectively (Table 3). While crossing Matrouh with Inshase was the lowest egg number at 1st 90,and 180d of production (28.9 and 57.57egg), respectively, however, Matrouh with Silver Montazah was lowest egg number at 240 and 360d of production (82.12eggs and 112.31eggs), respectively.

The lowest egg weight were recorded at different periods when crossing Matrouh with Mandarah (44.72g, 48.93g, 50.21g and 53.41g), respectively, Table (3). While, the high egg weight were obtained when crossing Matrouh with Inshase at 1st 90,180,240 and 360 d. of production (46.74, 50.38, 53.42 and 54.96g, respectively).

The highest egg mass was observed when crossing Matrouh with Mandarah 1460.85, 3840.82, 5494.29 and 7965.12g at the 1st 90, 180, 240 and 360 d. of production, respectively, (Table 3). In contrast, the lowest egg mass was found when crossing Matrouh with Inshas at 1st 90 and 180 d of production (1350.83 and 2900.45g), respectively, and when crossing Matrouh with Silver Montazah at 240 and 360d. of production (4256.68 and 6155.04g), respectively. The same results were found by El-Hanoun 1995, Shebl *et al.*(1995), and Iraqi *et al.*(2007).

When crossing Matrouh with Mandarah increased egg number and egg mass. When crossing Matrouh with Silver Montazah or Inshas improved egg weight. This resulted indicated that when used Matrouh as a sire line enhanced the egg weight at annual egg production.

Matrouh as a dam line:

The highest number of egg was found when crossing Silver Montazah with Matrouh at 1st 0d. of production (31.79 egg) when compared with other genetic group, moreover, the highest egg number at 180, 240 and 360 d. of production was found when crossing Inshas with Matrouh (75.8, 122.8 and 157.69 egg), respectively,(Table 4). The same trend was found for egg mass, the corresponding value of egg mass were 3837.82, 6438.36 and 8546.43g at the same periods of production, respectively (Table 4). This result indicated that Matrouh strain could be used dam line to improve egg production traits.

However, the best egg weight was found when crossing Inshas with Matrouh 52.42 and 54.2g at 240 and 360d. of production, respectively.

Generally, when used Matrouh as a dam line, it lead to improve annual egg number and egg mass traits, while when used Matrouh as a sire line it lead to improve egg weight.

Heterotic effect:

Direct heterosis contrast given in Table (5, 6 and 7), indicated heterotic effect on all traits of egg production at different periods. Heterosis percentage estimates for egg number were negative and high at the 1st 90 days of production (- 26.59, -39.28 and –28.1) for SM x MT, IN x MT and MN x MT, respectively and the estimates increased to (-1.68, -8.81 and 3.2) at 240 days of production, respectively. However, heterosis percentage estimates for egg number were positive and height at 360 days of production (20.11, 9.87 and 27.74) for SM x MT, IN x MT and MN x MT, respectively. These results are in agreement with those reported by Ledur *et al.* (2000) who reported that the mean heterosis was significant over time and increased with age for three White Leghorn strains and their two-way crosses. The same trend were observed for egg mass, the heterosis was positive only at 360 days of production (20.3, 8.72 and 26.62) for SM x MT, IN x MT and MN x MT, respectively. The same findings were found by Sabri *et al.*(2000). who reported that negative heterosis was observed for local strain crosses at the first period of production. Gavora *et al.*(1996) and Mohamed 1997 found positive heterotic effects ranging from 9.2 to 32.8% for egg production traits at the first periods of production. Heterosis estimate for egg weight was negative and low for all crosses at different periods except MT X SM (0.45%) and MN X MT (0.57%) were low and positive. The same findings were reported by Udeh and Omeje (2005), Santosh and Deepak (2006). In generally, heterosis for egg number and egg weight at the early periods 90 and 180 days of production were negative for all crosses , while heterosis for egg number and egg mass at 240 and 360 d. of production were positive for crosses. This result indicated that local strain and their crosses should be recorded till 52 weeks of production to improve egg production traits using by different breeding programs (Ezzeldin and Mostageer, 1983 and 1984).

Direct additive effect:

At different periods of production egg number and egg mass for crosses sired by Matrouh were significantly lower than these sired by Silver Montazah. It appears from the present results that both rarely and mainly no additive genetic effects have their impact on egg production traits (Table 5). On the other hand, egg number, egg weight and egg mass of Matrouh sired were insignificantly better than sired by Inshas (Table 6). While, egg number and egg mass at 180, 240, 360 d. of production for Inshas sired were highly significant better than sired by Matrouh, this result leads us to consulted that Inshas or/ and Silver Montazah strains could be used as a sire line to improve egg production traits.

Matrouh sire line was superior for egg weight at different periods and at different crossing except on MT X MN crossing at the first 90,180 and 240 days of production. These results agree with those reported by Kosba *et al.*(1981), El-Turky 1981, Nawar and Abdou 1999 and Abou El-Ghar *et al.*(2007) who found that Matrouh sire line was superior for egg number and egg weight at 1st 90 d. of production.

Maternal effect:

Maternal additive effects were present in Tables (5, 6 and 7) for all egg production traits at different periods. The estimated maternal additive effects on egg number were low when crossing Matrouh with Silver Montazah, and very low when crossing Matrouh with Mandarah in the first laying period. However, the maternal effect increased in the previously mentioned crosses in the second, third and fourth periods. Egg number and egg mass traits of mothered by Matrouh strain were superior to those mothered by Silver Montazah or Inshas. Therefore, it may be effective to use Matrouh as a line of dam in crossbreeding programs for producing highly egg number and egg mass. While, when used Sliver Montazah, Inshas, or Mandarah dam lines increased egg weight until 52 weeks of laying. Similar results were reported on chickens by (Nawar and Abdou, 1999 and Farghaly and Saleh 1988).

Correlation coefficient:

Phenotypic correlation coefficients among the four periods of egg number for strains and their crosses were shown in, Table (8). Phenotypic correlation between 90 and 180 d. of production was positive and high in pure strains and highly significant was found in Mandarah, while it was negative and low for their crosses except when crossing Matrouh with Mandarah the correlation was high and significant at $p < 0.05$. The lowest correlation between 90 and 240 d. of production was found in Inshas strain 0.086, while it was high and significant in Silver Montazah and Mandarah strains (0.707 and 0.636, respectively). The corresponding values were -0.0183, -0.385 and 0.524 when crossing Matrouh with Silver Montazah, Matrouh with Inshas and Matrouh with Mandarah, respectively. Correlation between 90 and 360 d. of production was the lowest value when compared with the correlation between 90, 180 and 90, 240 d. of production for the pure strains and their crosses.

Their were highly significant differences for correlation between egg number between 180 and 240 d. of production and between 180 and 360 d. of production in pure strains and their crosses except in Inshas strain. However, the correlation coefficient for egg number between 240 and 360 d.

of production was very high and highly significant for pure strains and their crosses. The phenotypic correlation coefficients for egg number between the part record of production and annual total production increase progressively from the first period.

The same trend was found in the phenotypic correlation coefficient between the four periods of egg mass,(Table 9). The correlation coefficients for Matrouh, Silver Montazah, Inshas and Mandarah were positive and high between 180 d. with 240 d., 180 d. with 360 d. and 240 d. and 360 d. for egg mass and the correlation was significant and ranged from (0.79 to 0.98), (0.26 to0.98) and (0.54 to 0.93), respectively. The same pattern was found for their crosses SM X MT (0.9, 0.68 and 0.75) for egg mass between 180 with 240, 180 with 360 and 240 with 360 d. of production, respectively. The corresponding values for IN x MT was high and significant $p< 0.01$ (0.88, 0.75 and 0.89), respectively. However, the correlations of MN x MT for egg mass in the same periods were (0.75, 0.78 and 0.6), respectively. While, the lower correlations coefficient estimate were found between 90 d. with 360 d. on all pure strains and their intercrosses except MT x MN. This result indicated that the estimates of correlations for part production record were close together in and they were higher compared to records that were further apart. This was confirmed by results obtained by Kumaer *et al.*, 2004 and Oni *et al.*, 2007

The phenotypic correlations between 90d., 180d of production for egg weight (Table 10) were low for Matrouh and Inshas (0.302, 0.257), respectively, but correlation high for Silver Montazah and Mandarah (0.862 and 0.612), respectively. However, the correlation was negative and very low in their crosses expect when crossing Matrouh with Mandarah there was high and significant ($p\leq0.01$). The correlation between 90, 360d of production for egg weight was negative in all pure strains and their crosses expect on Silver Montazah it was positive and high 0.527. The correlation between 180 ,240 d of production for egg weight was highly significant different in Matrouh and Silver Montazah strains, while, it was very low in Mandarah strain (0.03).when crossing Matrouh with Mandarah the correlation was high (0.434) when compared with the other crosses. The highest correlation coefficient for egg weight was found between 180,360 d of production and between 240, and 360 d of production in pure strains and their crosses.

Generally, the phenotypic correlation between annual egg production record and partial record (1st 90d. of production) was low and the correlation between 240 d. of production record and annual egg production record was very high. This result indicates that these measures are evaluating essentially the same source of genetic variation. These results are in agreement with those reported by Ezzeldin and Mostageer (1984) and Crawford 1990.

CONCLUSION: Crosses resulted from mating Matrouh dam line with Inshas and/ or Silver Montazah sire lines improved egg number and egg mass at different periods. While mating Matrouh sire line and/ or Inshas, Silver Montazah and Mandarah dam lines improved egg weight for 90,180,240 and 360 d. of laying.

Table(2): Means and SE of egg number, egg weight and egg mass at the 1st 90, 180, 240 and 360 d. of production for pure strains

Pure strains	90 d	180d	240d	360d
	Egg number			
MT	41.73±1.29^{AB}	76.24±2.1^{B}	99.00±2.76^{B}	108.63±3.45^{B}
SM	43.74±4.03^{A}	80.85±5.57^{B}	97.53±6.66^{B}	105.84±6.24^{B}
IN	48.80±0.93^{A}	97.71±5.5^{A}	136.18±9.47^{A}	153.42±8.26^{A}
MN	35.61±2.18^{B}	78.43±4.1^{B}	105.74±5.38^{B}	121.72±7.43^{B}
Sign	**	**	**	**
	Egg weight (g)			
MT	47.13±0.41^{A}	51.35±0.33^{AB}	52.8±0.39^{B}	53.38±0.24^{B}
SM	45.85±0.35^{B}	50.32±0.49^{B}	52.47±0.46^{B}	53.38±0.41^{B}
IN	46.95±0.73^{A}	52.16±0.31^{A}	54.84±0.22^{A}	56.39±0.17^{A}
MN	45.93±0.44^{B}	50.65±.038^{B}	52.57±0.36^{B}	53.05+0.36^{B}
Sign	*	*	*	**
	Egg mass (g)			
MT	1963.31±50.23^{A}	3916.08±114.91^{B}	5232.4±164.31^{B}	5798.98±186.77^{B}
SM	2001.08±179.6^{A}	4053.83±253.07^{B}	5098.93±312.2^{B}	5637.66±309.22^{B}
IN	2289.04±32.7^{A}	5099.83±299.37 A	7468.63±523.31 A	8646.85±449.04 A
MN	1632.97±97.45^{B}	3975.0±216.21^{B}	5567.31±302.9^{B}	6466.79±412.31^{B}
Sign	**	**	**	**

*Means in each column with different litters differ significantly at .05 level., NS: Non significant
** Means in each columns with different litters differ significantly at .01 level

Table(3): Means and SE of egg number, egg weight and egg mass at the 1st 90, 180, 240 and 360 d. of production for Matrouh as a sire line

Matrouh as a sire line	Egg number			
	90 d	180d	240d	360d
MT X SM	30.95+1.98	60.17+1.91^B	82.12+2.22^C	112.31+2.25^C
MT X IN	28.9+0.14	57.57+2.32^B	91.67+2.23^B	130.23+3.37^B
MTX MN	32.61+1.93	78.48+1.05^A	109.4+2.5^A	149.14+0.99^A
Significant	NS	**	**	**
	Egg weight (g)			
MT X SM	44.92+0.45^B	50.38+0.22^A	51.88+0.39^B	54.80+0.30^A
MT X IN	46.74+0.04^A	50.38+0.13^A	53.42+0.41^A	54.96+0.28^A
MTX MN	44.72+0.3^B	48.93+.028^B	50.21+0.47^C	53.41+0.19^B
Significant	**	**	**	**
	Egg mass (g)			
MT X SM	1390.45+90.55	3031.51+97.71^B	4256.68+87.73^C	6155.04+139.15^C
MT X IN	1350.83+6.62	2900.45+120.42^B	4924.68+133.11^B	7158.57+196.71^B
MTX MN	1460.85+95.8	3840.82+67.2^A	5494.29+140.65^A	7965.12+71.94^A
Sign	NS	**	**	**

** Means in each column with different litters differ significantly at .01 level ., NS: Non significant

Table(4): Means and SE of egg number, egg weight and egg mass at the 1st 90, 180, 240 and 360 d. of production for Matrouh as a dam line

Matrouh as a dam line	Egg number			
	90 d	180d	240d	360d
SM X MT	31.79+1.78^A	70.95+2.87^A	111.11+5.71^B	145.3+8.7^B
IN X MT	26.07+2.13^B	75.80+0.41^A	122.8+5.21^A	157.69+2.02^A
MN X MT	23.00+0.63^B	64.29+1.24^B	101.88+1.97^B	145.14+2.18^B
Significant	*	**	**	*
	Egg weight (g)			
SM X MT	46.07+0.42	49.48+0.58	51.76+0.63	52.44+0.63^B
IN X MT	46.21+0.74	50.62+0.62	52.42+0.22	54.2+0.27^A
MN X MT	46.27+0.13	50.49+0.21	51.72+0.25	52.41+0.30^B
Significant	NS	NS	NS	**
	Egg mass (g)			
SM X MT	1461.84+72.93^A	3505.2+115.06^B	5232.4+164.31^B	7605.21+409.31^B
IN X MT	1202.55+9509^B	3837.82+64.26^A	6438.36+130.5^A	8546.43+110.44^A
MN X MT	1064.97+31.17^B	3245.42+57.02^C	5270.44+117.34^B	7568.9+139.03^B
Significant	*	**	**	*

* Means in each column with different litters differ significantly at .05 level., NS: Non significant

** Means in each column with different litters differ significantly at .01 level

Table (5): Pure line differences, heterosis, additive effects and maternal additive effects of egg number at 90, 180, 240 and 360 d. of production for pure strains and their crosses

Crosses	Items	Egg production periods			
		90 d	180 d	240 d	360 d
MT X SM	P L D	2.01	4.61	-1.47	-2.79
	DH E(U)	-22.73	-25.97	-3.30	43.14
	DHE (%)	-26.59	-16.53	-1.68	20.11
	DAE	2.85	15.39	27.52	30.2
	MAT	0.84	30.78	28.99	32.99
MT X IN	P L D	7.07	21.47	37.18	44.79
	DH E(U)	-35.56	-41.1	-20.71	25.86
	DHE (%)	-39.28	-23.63	-8.81	9.87
	DAE	-4.24	-40.2	68.31	-72.26
	MAT	-2.83	18.73	31.13	27.47
MT X MN	P L D	-6.12	2.19	6.74	13.09
	DH E(U).	-21.73	-11.9	654	63.91
	DHE (%)	-28.1	7.70	3.20	27.74
	DAE	-15.73	-12.0	-0.78	9.09
	MAT	-9.61	-14.19	-7.52	-4.00

PLD: Pure line difference, D H E: Direct heterosis effect, DAE: direct additive effect and M A T: Maternal additive effect,

Table (6): Pure line differences, heterosis, additive effects and maternal additive effects of egg weight at 90, 180, 240 and 360 d. of production for pure strains and their crosses

Crosses	Items	Egg production periods			
		90 d	180 d	240 d	360 d
MT X SM	P L D	-1.28	-1.03	-0.33	0.00
	DH E(U)	-1.99	-1.81	-1.63	0.48
	DHE (%)	-2.14	-1.78	-1.55	0.45
	DAE	-0.13	1.93	-0.45	-2.36
	MAT	1.15	-0.9	-0.12	-2.36
MT X IN	P L D	-0.18	0.81	2.04	3.01
	DH E(U)	-1.13	-2.51	-1.51	-0.61
	DHE (%)	-1.2	-2.43	-1.4	-0.56
	DAE	0.71	-1.05	-10.75	-2.25
	MAT	0.53	0.24	-1.29	-0.76
MT X MN	P L D	-1.2	-6.7	-0.23	-0.33
	DH E(U)	-2.07	-2.58	-3.44	-0.61
	DHE (%)	-2.23	-2.53	-3.17	0.57
	DAE	94.61	0.21	1.28	-1.33
	MAT	1.55	1.56	1.51	-1

PLD: Pure line difference, D H E: Direct heterosis effect, DAE: direct additive effect and M A T: Maternal additive effect,

Table (7): Pure line differences, heterosis, additive effects and maternal additive effects of egg mass at 90, 180, 240 and 360 d. of production for pure strains and their crosses

Crosses	Items	Egg production periods			
		90 d	180 d	240 d	360 d
MT X SM	P L D	37.77	137.75	-133.47	-161.32
	DH E(U)	-1112.1	-1433.2	-337.31	2323.8
	DHE (%)	-28.31	-17.99	-3.33	20.3
	DAE	109.16	611.44	1347.19	1289.04
	MAT	71.39	473.69	1480.66	1450.36
MT X IN	P L D	325.73	1183.75	2236.23	2847.87
	DH E(U)	-1698.97	-2277.64	-1337.99	1259.17
	DHE (%)	-39.95	-25.26	-10.54	8.72
	DAE	-177.45	-2121.12	-3749.91	-4235.73
	MAT	-148.28	-937.37	1513.68	1387.86
MTX MN	P L D	-330.34	58.92	334.91	667.81
	DHE(U)	-1070.46	-804.84	-34.98	3266.25
	DHE (%)	-25.25	10.2	-0.33	26.62
	DAE	-726.22	-536.48	111.06	271.59
	MAT	-395.88	-595.4	-223.85	-396.22

PLD: Pure line difference, D H E: Direct heterosis effect, DAE: direct additive effect and M A T: Maternal additive effect.

Table(8): Estimates of phenotypic correlation coefficients among the different periods of egg number for different genetic groups

Pure strains and their crosses	90 with180	90 with 240	90 with 360	180 with 240	180 with 360	240 with 360
MT	0.524	0.299	0.221	0.804**	0.776**	0.930**
SM	0.707	0.707	0.635	0.999	0.976**	0.976**
IN	0.486	0.086	-0.486	0.6	0.143	0.543
MN	0.830**	0.636*	0.479	0.891**	0.782**	0.964**
MTXSM	-0.201	-0.183	0.174	0.900**	0.655*	0.700**
MTXIN	-0.280	-0.385	-0.091	0.712**	0.748**	0.755**
MTXMN	0.699*	0.524	0.413	0.734**	0.587*	0.622*

90,180,240 and 360are the different periods of production in days. * significant at .05 level., ** significant at .01 level

Table(9): Estimates of phenotypic correlation coefficients among the different periods of egg mass for different genetic groups

Pure strains and their crosses	90 with180	90 with 240	90 with 360	180 with 240	180 with 360	240 with 360
MT	0.221	0.235	0.298	0.79**	0.734**	0.832**
SM	0.563	0.635	0.515	0.976**	0.976**	0.929**
IN	0.71	0.543	0.314	0.829*	0.257	0.543
MN	0.733*	0.721*	0.552	0.952**	0.855**	0.903**
MTXSM	-0.228	-0.16	0.246	0.9**	0.682*	0.745**
MTXIN	-0.28	-.0385	-0.091	0.713**	0.748**	0.755**
MTXMN	0.73**	0.755**	0.825**	0.747**	0.783**	0.601*

90,180,240 and 360are the different periods of production in days. * significant at .05 level., ** significant at .01 level

Table(10): Estimates of phenotypic correlation coefficients among the different periods of egg weight for different genetic groups

Pure strains and their crosses	90 with180	90 with 240	90 with 360	180 with 240	180 with 360	240 with 360
MT	0.302	-0.014	-0.263	0.741**	0.266	0.273
SM	0.862**	0.335	0.527	0.714*	0.857*	0.762*
IN	0.257	-0.657	-0.257	0.371	-0.600	0.086
MN	0.612	0.164	-0.139	0.030	-0.152	0.600
MTXSM	-0.164	0.457	-0.142	0.391	0.582	0.400
MTXIN	-0.011	0.315	-0.305	-0.028	0.287	0.161
MTXMN	0.818**	0.713**	-0.692*	0.434	-0.825**	-0.587*

90,180,240 and 360are the different periods of production in days. * significant at .05 level., ** significant at .01 level

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الملخص العربي

استخدام مطروح كأب ثابت في الخلط مع بعض السلالات المحلية من الدجاج

٢ - قوة الهجين و التأثير المضيف والتأثير الأمي على بعض صفات إنتاج البيض

حنان حسن غانم و أسامة محمود و رضا أبو الغار

معد بحوث الإنتاج الحيواني- مركز البحوث الزراعية- وزارة الزراعة- مصر

تم استخدام مطروح كأب ثابت مع كلا من المنتزه الفضي و إنشاص و المندرة في الموسمين ٢٠٠٥& ٢٠٠٦ و تم تقدير قياس عدد و وزن البيض كتلة البيض عند ٩٠و١٨٠و٢٤٠و٣٦٠ يوم من الإنتاج و ذلك لتقدير قوة الهجين و التأثير المضيف و التأثير الأموي على بعض صفات إنتاج البيض . النسبة المئوية لقوة الهجين كانت سالبة في كلا من عدد و وزن البيض و كتلة البيض في الفترة الإنتاجية الأولى (٩٠ يوم إنتاجي) ، و على العكس كانت موجبة وعالية لكل من عدد البيض و كتلة البيض في الفترة الرابعة من وضع البيض (٣٦٠ يوم إنتاجي) لكل المجاميع الوراثية. يزداد التأثير الوراثي المضيف لعدد البيض في كل الخلطات مع التقدم في العمر و كان على نفس النمط كتلة البيض ماعدا في فترة وضع البيض الرابعة حينما يتم خلط مطروح مع إنشاص. التأثير الأموي المقدر لعدد البيض كان منخفضا عند خلط مطروح مع المنتزه الفضي و كانت منخفضة جدا عند تزاوج مطروح مع المندرة في فترة وضع البيض الأولى ، بينما في الخليط السابق كان التأثير الأموي يزداد في الفترة الثانية و الثالثة و الرابعة من وضع البيض.

التأثير الأموي المضيف كان اكبر من التأثير الوراثي المضيف في الفترة الثالثة و الرابعة من وضع البيض و لكنها كانت اقل في الفترة الأولى و الثانية من وضع البيض عند خلط مطروح مع المنتزه الفضي. الارتباط الظاهري بين تسجيل إنتاج البيض السنوي و الجزئي (٩٠ يوم إنتاجي) كان منخفض و الارتباط بين تسجيل إنتاج البيض عند ٢٤٠ يوم و تسجيل البيض السنوي كان عالي جدا.

و هذه النتائج تدل على أن استخدام مطروح كخط أموي مع كلا من إنشاص أو المنتزه الفضي كخطوط أبويه يحسن من عدد البيض و كتلة البيض في كل فترات إنتاج البيض، بينما عند تزاوج مطروح كخط أبوي مع كلا من إنشاص أو المنتزه الفضي أو المندره كخطوط أموية يحسن من وزن البيض عند ٩٠ و ١٨٠و ٢٤٠و ٣٦٠ يوما من الإنتاج.