FACTORS AFFECTING HATCHING TRAITS AND POST-HATCH GROWTH IN TWO DEVELOPED CHICKEN STRAINS

By

Yousria K. Afifi ; Nazla Y. Abou El-Ella; Hanan H. Ghanem; O.M, Aly and Magda M. Balat

Anim. Prod. Res.Inst., Agric. Res. Center, Ministry of Agric., Egypt.

.Received: **26/01/2010** Accepted: **22/02/2010**

Abstract: *An experiment was conducted to evaluate the effect of chicken strain, parental age and sex of hatched chicks on hatching traits, and subsequent post chick growth during growing period for Gimmizah (GM) and Mandarah (MN) chicken strains. Three hundred chickens from the both strains were taken at sexual maturity. Internal and external egg quality parameters, hatchability traits, hatch time, chick body weight at hatch and at pull out and chick weight loss during incubation were determined for both strains at 34 and 50 weeks of parent age. Also, post-hatch chick growth for the both parental ages was detected at 4,8and12wks of age. Gimmizah strain represented a higher significant ($p<0.01$) values for egg weight (gm), yolk index, albumen percent and shell thickness (mm) compared to those for MN ones. Also, age-related change in egg weight, yolk index and yolk percentage had significantly ($p<0.05$) influenced. Hatchability of total and fertile eggs was significantly ($p<0.05$) higher for GM strain compared with MN ones. Chicken strain had a significant effect on hatch time where GM chicks hatched earlier (487.6 hr) than those for MN ones (488.1 hr). Also, GM strain had higher significant values in chick body weight at hatch and at pull out and chick body weight loss (gm) during incubation compared to MN strain. Hatch time was significantly ($p<0.01$) earlier (486.75hr) for chicks produced from hens at 50^{th} week compared to those at 34^{th} week of age (489.91 hr). Female chicks were significantly ($p<0.05$) hatched earlier than male chicks by about 1.1 hr. Besides higher ($p<0.05$) body weight was observed for hatched male chicks and for chicks among all growing periods compared to female ones. Gimmizah body weights throughout all experimented growing periods were significantly ($p<0.01$) heavier compared to those for MN ones. Also, post- hatch body weights for chicks at 4, 8 and 12^{th} week of age were significantly ($p<0.01$) heavier for chicks produced from parents aged 50 weeks compared to those produced from chickens at 34 weeks of age.*

In conclusion, Gimmizah strain had a significant influence on most parameters of hatching traits and post-hatch growth compared to Mandarah chicken strain. Moreover, age related changes in the current study had significantly influenced in the most experimented traits.

INTRODUCTION

The chicken strain is important factor affecting egg quality and hatching traits. Different authors reported that there were significant differences between developed chicken strains on most of egg quality parameters such as shell thickness, shell, albumen and yolk percentages (Abd El Gani, 1996; Zaky, 2006). El Afifi *et al.*, (2008) mentioned that there were significant differences in egg albumen due to different strains while, yolk and shell percentages were not affected by strain. Enaiat *et al.*, (2009) reported that there were significant differences between strains on shell thickness and no significant differences on egg shape index and shell percentage. While, Marie *et al.*, (2009) reported that chicken strain had no significant on Haugh unit. Concerning hatching traits,macroscopic fertility and hatchability were affected by chicken strain (Soliman, 2000 and EL-Afifi *et al.*, 2008). Genetic background might contribute the discrepancies between chicken strains with respect to hatchability and hatch time (Burke *et al.*, 1990 and Christensen *et al.*, 2000). Chick weight at hatch is affected by several factors including species or breed (Wilson, 1991). Chick weight loss during holding period of hatch is common and is mainly due to dehydration (Vieira and Moran, 1999).

The possible existence of sex differences in body weight of day-old chicks has been addressed repeatedly with authors (Whiting and Pesti, 1983 and Reis *et al.*, 1997). Therefore, as females, on average, tend to hatch earlier than males, differences in the time spent in the hatcher will affect differently chick weight (Reis *et al.*, 1997).

Also, Egg quality as affected by flock age was recorded by different authors. Latour *et al.*, (1998) and Silversides and Scott, (2001) mentioned that parent age affected internal and external egg quality characteristics. Eggs from early production breed flocks tend to have thicker egg shells and affect other egg quality traits (Brake *et al.*, 1997). These influences may result in compromised viability of the embryos (Peebles and Brake, 1987). Latour *et al.*, (1996) reported that breeder age influence subsequent embryogenesis and hatchability of broiler eggs. Tona *et al.*, (2001) reported that age of the parent flocks influences subsequent fertility. Also, Rizk *et al.*, (2008) reported that eggs from younger birds represented higher significant ($p<0.05$) percentages of fertility and hatchability compared to those from older layer. The older flocks demonstrated a decrease in the length of incubation (Smith and Bohren,1975). Pedroso *et al.*, (2005) reported that the eggs produced from younger hen needs the longer time required to complete the hatching process.

Different authors found that local chicken strain had a significant effect on body weight of chicks during different growing periods (kosba *et al.*,1985; Nawar and Bahi El-Deen 2000; and Amin 2007) . Besides, Amin (2008) showed that differences between both sexes were highly significant in chick body weight and growth rate for local chicken strains.

The purpose of this study was to investigate the effect of chicken strain, parental age and sex of embryos on hatching traits, hatch time, body weight at hatch and at pull out, chick body weight loss during incubation and consequently post- hatch chick growth for GM and MN chicken strains.

MATERIALS AND METHODS

The present study was carried out at El-sabahia Poultry Research Station. Animal Production Research Institute, Agricultural Research Center during years 2004-2006. Three hundred chickens from Gimmizah (GM) and Mandarah (MN) strains (150 chickens per each) were taken at sexual maturity and distributed into 15 pens for each strain until 52 weeks of age under the same hygienic managerial conditions. Feed and water were available *ad-libitum* throughout the study. Chickens were fed a layer diet (16.5% crude protein and 2750 kcal/kg of diet).

A total of 181 eggs were collected from GM and MN strains at 34 and 50 weeks of laying age and egg quality measurements were taken within four hours after egg collection. Eggs were weighed with grams and the length and breadth were measured for the shape index calculation (breadth/ length x100). The heights of the albumen and yolk in millimeter were measured using Ames Triple Micrometer. Haugh unit was calculated according to Eisen *et al.*, (1962) using the calculation chart for rapid conversion of egg weight and albumen height. Yolk was separated from the albumen and weighed. The weight of albumen was calculated. Yolk, albumen and shell weight were expressed as percentages of egg weight. The shell plus membranes were weighed. Shell thickness without membrane (mm) was measured at three places in egg shell using a micrometer.

One thousand and five hundred eggs were collected from both strains at two ages of hens (34 and 50 wks). Eggs were stored from 1 to 7 days in room temperature supplied with fans. Two replicated egg hatches were put in Egyptian-made incubator at 99.5°F temperature and 55% RH during the setting phase and during the hatching phase were 99°f temperature and 65% RH. The time of setting eggs in the incubator was recorded for the experiment to obtain the hatch time exactly in hours and considered as zero time of experiment. At (432hr) of incubation, infertile clear eggs were macroscopically evaluated to determine apparent infertility by necked eyes. All fertile eggs from each strain were transferred singly into pedigree hatching baskets in the hatcher for the remainder incubation period. Beginning of 476hr of incubation and at four hours intervals thereafter, the hatcher was opened for checking the hatching chicks. Hatched chicks were removed, wing- banded, weighed to the nearest 0.1 gm and recorded as chick body weight at hatch then placed again in the incubator after recording the time of hatch. Hatching time and body weight at hatch were monitored every four hours after the hatch of first chicks. The chicks were left in the incubator until servicing time. All chicks were weighed again at the time of removal from the hatchers on 21day (504hr) and considered as hatch weight at pull out.

Chicks for either males or females were reared together and sex was determined at the end of the growing period (4weeks). Reversing back to the wing banded chicks, hatching time for both males and females was compared. Also, chick weights at hatch and at pull out were determined for both sexes. Chick body weight loss during incubation expressed as an absolute and percentage bases was calculated according to Khalifah and Shahein, (2006). Macroscopic fertility was calculated as the percentage of fertile eggs from total setting eggs. Hatchability was calculated as the percentage of sound hatching chicks from either total or fertile eggs from each strain and each parental age. A total of 1185 chicks for both strains were brooded on floor and weighed individually again at 4, 8 and 12 weeks of age. All experimented chicks were fed diet containing 19% crude protein and 2800 Kcal/kg of diet as a starter diet until 8 weeks of age, and 15% crude protein and 2700 Kcal/kg of diet for the rest of experimented period. Feed and water were supplied *ad libitum*.

Studied Traits for Progeny (new hatched chicks):

1-Chick body weight throughout growing period, at 4^{th}, 8^{th}, 12^{th} weeks of age.

2- Chick growth rate was calculated according to Broody (1945) at (0-4, 4-8, 8-12, 0- 12) weeks of age.

Mortality throughout the experiment was very low and therefore neglected.

STATISTICAL ANALYSIS

All percentages of the hatch traits were transferred to arcsine values before analysis. Data of hatch time, body weight of chicks during and post-incubation were analyzed using fixed models SAS institute (1989) using the following model:

$$Y_{ijkl} = \mu + S_i + X_j + A_k + (SX.)_{ij} + (SA)_{ik} + (XA\ )_{jk} + (SXA)_{ijk} + e_{ijkl}$$

where, Y_{ijkl} = an observation, μ: overall mean, S_i: effect of strain, X_j: effect of sex, A_k; effect of age, $(SX.)_{ij}$, $(SA)_{ik}$, $(XA\ )_{jk}$, and $(SXA)_{ijk}$= interactions between the main factors and e_{ijkl}: the residual effect.

Data of egg quality and hatching traits were analyzed using the following model:

Significant differences among means were tested using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The main effects of chicken strain and parental age on egg quality traits and their interactions are presented in Table 1. There was no significant difference between both experimented strains with respect to egg shape index and Haugh unit. Gimmizah strain represented a higher significant ($p<0.001$) values for egg weight, yolk index and albumen percentage compared to those for MN ones. Besides, eggs produced from MN strain represented a significant ($p<0.05$) values for yolk percentage, and higher shell weight percentage ($p<0.001$) and shell thickness (mm) ($p<0.01$) compared to those for GM ones. The results reported herein regarding egg weight and egg characteristics for the experimented chicken strains are in good general agreement with those reported by different authors (Abdel Galil *et al.*, 2004; El Full *et al.*, 2005; Zaky 2006 and Enaiat *et al.*, 2009). On the other hand, some researchers came to contradictory results as Basmacioglu and Ergul, (2005) and Challarjee *et al.*, (2007) reported that chicken strain had no significant effect on egg shell percentage and shell thickness.

As hen age increased to 50 week of age, egg weight, yolk index, and yolk weight percentage were significantly increased compared to those from eggs produced from younger hen age on 34^{th} week of age. While, other parameters of egg quality such as egg shape index, albumen and shell percentages and Haugh unit decreased as the hen age increased. In support to our results, different authors mentioned that shell thickness and shell percentage decreased through advanced flock age. Brake *et al.*, (1997) mentioned that eggs from early production breed flock tended to have thicker egg shells and affected other egg quality traits. O'Sullivan *et al.*, (1991) reported that yolk and albumen weights percentage increased as the hen age increased. Also, Table 1 shows that interaction between GM or MN strains by parental age at 34 or 50 weeks of age was significant only in egg weight and not observed in the rest of egg quality measurements. Regarding the interaction,Suarez *et al.*, (1997) mentioned that strain by age interactions were found.

Effects of chicken strain and parental age at 34th and 50th week of age on macroscopic fertility and hatchability percentages are presented in Table 2. Macroscopic fertility percentage was numerically lower for MN strain compared with GM ones. Moreover, hatchability expressed as either percentages of all eggs set or fertile eggs was significantly $p<0.001$) higher for GM strain compared with MN ones. Different authors came to the same conclusion herein that there were significant differences between local strains and breeds with respect to fertility and hatchability (Abdel Galil 2004; Ensaf *et al.*, 2005; Amin 2008). Rizk *et al.*, (2008) mentioned that differences between chicken strains could be due to the differences in egg quality traits. On the other hand, O'Dea *et al.* (2004) concluded that strain did not influence any of the fertility or hatchability traits. In addition, El-Sudany (2005) indicated that fertility and hatchability were not affected significantly among local chicken strains. Also, in Table 2 demonstrates that macroscopic fertility and hatchability of fertile and total eggs were not significantly influenced by parental age. Hatchability of fertile and total eggs set for MN strain appears to be superior at 50th week of age compared with younger ones, but this increase failed to be significant. Results of different publications are in harmony with the results reported herein. Hocking and Bernard (2000) and Shahein *et al.*,(2007), reported that parental age had no significant effect on hatchability percentages of fertile and total eggs. Data regarding macroscopic fertility for MN strain in Table 2 demonstrate that older age had lowest fertility. This result was paralleled by those of Deeming and Van MiddleKoop (1999) who reported that fertility percentage was related to hen age and the older ones demonstrated lower fertility. On the other hand, different authors reported that age had a significant effect on fertility and hatchability (Peebles *et al.*, 2000, and El Attar and Fathi, 2002). While, El-Sheikh, (2007) mentioned that, there was a significant difference between flock ages on fertility but not on hatchability. In addition, no significant interaction was noted between strain and parental age with respect to fertility but the significant was observed between strain and flock age for hatchability of fertile and total eggs. In agreement with these results, El-Attar and fathi, (2002) reported that significant differences interaction was detected between strain and flock age.

Table 3 shows the effect of chicken strain, parental age, sex and their interactions on hatch time(hr), chick body weight(gm) and chick body weight loss in the hatcher. Regardless of parental age and sex, chicken strain had a significant ($p<0.05$) effect on hatch time as GM strain hatched earlier (487.6 hr) than MN ones (488.16 hr). Supporting to our results, Brake, (1998) mentioned that hatch time have been observed to differ among strains of the commercial breeder. Also, Christensen *et al*., (2000) reported that hatch time was significantly affected by genetical strain. Also, strain had highly significant ($p<0.001$) effect on chick body weight either for those at hatch or at pull out, besides absolute chick body weight loss in the hatcher as higher chick body weight at hatch and at pull out and chick body weight loss (gm) were recorded for GM strain compared to MN ones. While, chicken strain had no significant effect on chick body weight loss percentage. Results herein regarding the effect of strain on chick body weight at hatch added credence to the conclusions of Wilson, (1991) and Suaraze *et al*., (1997) who reported that weight of chicks at hatch is affected by breed. Besides, Burke *et al*., (1990) referred to that genetic background might contribute the differences between the strains with chick body weight. Whereas, Shahein, (2002) reported that there were no significant differences between both strains with respect to hatch time and chick body weight at hatch, but there were significant differences between strains with respect to body weight at pull out and chick body weight loss (gm).

Data presented in this table demonstrated that parental age as a main factor had a highly significant ($p<0.01$) effect on hatch time, chick body weight and absolute chick body weight loss (gm). Hatch time was significantly ($p<0.001$) earlier (486.75h) for parents aged 50 weeks compared to those at 34 weeks of age (489.91 hr). This result is in agreement with those reported by Pedrose *et al*., (2005) who reported that eggs produced from younger hens required long time to complete the hatching process. Reis *et al*. (1997) concluded that hatching times were not affected by age of the hen. Chick body weight at hatch and at pull out and body weight loss (gm) were higher for chicks produced from parents aged 50 weeks compared to those from parents at 34 weeks of age, irrespective to other main studied factors. Whereas, there was no significant difference between parental ages with respect to chick body weight loss percentage. In support to this outcome, different authors reported that the parental age had highly significant effect on the chick body weight at hatch. (Peebles *et al*., 2000 and El-Sheikh, 2007). On the other hand, Suaraze *et al*., (1997); and

Shahein *et al.*, (2007) reported that the parental age had no significant effect on the chick weight.

Sex as a main factor in the same table had a significant ($p<0.05$) effect on hatch time and chick body weight either at hatch or at pull out. While this significant effect was not observed on chick body weight loss in the incubator. Female chicks were significantly ($p< 0.05$) hatched earlier than male chicks by about 1.1hr. Also, the data show that males were heavier ($p< 0.05$) at hatch compared to females. Whiting and Pesti, (1983) found that sex has a significant source of variation in chick body weight. Zawalasky, (1962) suggested that early-hatching chicks loss weight when held in the hatcher.

Hager and Beane,(1983) quantified this loss, noting a 10 to 12% reduction in the hatcher for prolonged period. This would magnify and explain any sex difference in chick body weight presented in this experiment as females hatched earlier, on average, than males. While, Reis *et al.* (1997) found that chick weights at hatch and at removal from the hatcher were similar for both sexes. Moreover, there was no significant interaction between all studied traits (Table 3).

The main effect of chicken strain, parental age and chick sex on chick body weight and growth rate of post-hatch chicks during the first twelve weeks of growing age and their interactions are presented in Table 4. Gimmizah body weights among all experimented growing periods were significantly ($p<0.001$) higher compared to those for MN ones. Also, post-hatch chick body weights at 4 ,8 ,and 12 weeks were significantly ($p<0.01$) heavier for chicks produced from parents aged 50 weeks compared to those produced from parents aged 34 weeks of age. Male chicks recorded higher significant ($p<0.001$) chick body weight throughout all experimented growing periods than those for female ones. Growth rate for MN chicks had surpassed those for GM ones among the growing periods (4-8) and (8-12) weeks except for those during (0-4) weeks of age. The growth rate of chicks produced from parents aged 50 weeks of age was significantly ($p<0.001$) higher than those produced from parents aged 34 weeks of age among all experimented growing periods. Male chicks recorded a significantly ($p<0.001$) higher growth rate than those for female ones through all growing periods except those during (4-8) wks of age. Different authors found that local chicken strain had a significant effect on body weight of chicks during different growing periods (kosba *et al.*,1985; Nawar and Bahi El-Deen 2000; and Amin 2007). Besides, Amin (2008) showed that differences between both sexes were highly significant in chick body weight and growth rate for local chicken strains.

The interaction between strain and sex had significant effects [varied between ($P<0.05$) to ($P<0.001$)] on body weight at the different studied ages and growth rate at the early growth period. The interaction between strain and parental age was significant ($P<0.001$) concerning body weight at 12th week of age and growth rate through the periods of age (8-12) and (0-12) wks. As of age and sex interaction, there were significant ($P<0.01$) effects on body weight at 12thwk of age, also affected ($P<0.001$) growth rate at (8-12) and ($P<0.05$) at (0-12) wks. The interaction of the three main factors had highly significant effects on body weight at 8thand12th week and growth rate at (0-4) and (0-12) wks of age. No significant effects of the interactions on the rest of studied traits were found.

Figures 1and 2, illustrate the distribution of the hatched male and female chicks for GM and MN strains as a percentage of total chicks at different hatching times for different parental ages. In figure 1, chicks produced from GM strain either for males or females at 50th week of age were hatched earlier about four hours compared to those produced from hens at 34th week of age. All chicks for GM strain either for males or females were hatched between the times of 476 hrs to 500 hrs, it means that the hatch of chicks continued for 24 hours. As can be seen from this figure that highest percentages of hatched males (28.7%) and female chicks (38.8%) were observed on 488th hour of hatch time for parents at 50 weeks of age. Whereas, the lowest percentage of hatched chick either for males (4.6%) or females (1.2%) were recorded at 500 hrs of hatch time for the same parental age of GM strain. Also, as can be seen from this figure highest percentages of hatched males (92.75%) and female chicks (28.0%) were observed on 492nd hour of hatch time for parents at 34 weeks of age. Besides, the lowest percentages of hatched chick either for males (13.2%) or females (8.6%) were recorded at 496th hrs of hatch time for the same parental age. It can be observed from this figure that hatched females chicks were greater than males through most of early hatching times till the 488 hrs of hatch time for both experimented parents ages. This trend of hatching was reversed after that and the hatched males chicks were surpassed the females till the end of hatch time. These observations support the previous finding of Burke. (1992) and Ries *et al*., (1997) who reported that a high proportion of early-hatched chicks are female.

In figure 2, chicks produced from MN strain for females at 50th week of age were hatched earlier about four hours compared to those produced from hens at 34th week of age. While, males chicks produced from hens at 50th week of age were hatched earlier about eight hours compared to those produced from hens at 34th week of age. At the same figure, the highest percentages of hatched males (39.8%) and females (36.4%) were observed on 488th hour of hatch time for parents at 50th week of age. While, the lowest percentage of hatched chicks either for males (5.5%) or females (3.2%) was recorded at 500 hour of hatch time for the same parental age of MN strain. Moreover, from this figure, the highest percentage of hatched males (25.4%) at 492nd hour of hatch time and female chicks (25.8%) at 484 hours of hatch time for parents flock at 34 weeks of age. It can be observed that there was no special trend of the distribution of hatched chicks at different hatching times by age for both experimented chicken strains. This observation is supported by Mather and Laughlin, (1976) and Burke, (1992).

In conclusion, Gimmizah strain had a significant influence on most parameters of hatching traits and chick body weight at hatch and at pull out and post-hatch chick growth compared to those for Mandarah chicken strain. Moreover, age related changes in the current study had significantly influenced in the most experimented traits.

Table(1) : Effect of chicken strain and parental age on egg quality traits

Trait / Main factors	Egg weight (g)	Egg shape index	Yolk index	Percentage			Shell thickness mm	Haugh unit
				Albumin weight	Yolk weight	Shell weight		
Strain (St) :								
Gimmizah	50.28±0.54 ^{A}	0.753±0.005	0.498±0.005^{A}	57.72±0.33 ^{A}	31.36±0.33 ^{B}	10.91±0.10^{B}	0.338±0.003^{B}	86.75±0.84
Mandarah	47.66±0.50 ^{B}	0.763±0.004	0.482±0.005 ^{B}	56.19±0.37 ^{B}	32.44±0.33^{A}	11.37±0.13^{A}	0.349±0.003^{A}	84.80±0.96
Significance	***	n.s	***	***	*	***	**	n.s
Parental age (A)								
34week	46.61±0.41 ^{b}	0.765±0.005	0.479±0.005 ^{b}	57.46±0.32 ^{a}	31.17±0.30 ^{b}	11.37±0.11 ^{a}	0.345±0.003	86.92±0.91^{a}
50week	51.18±0.54 ^{a}	0.752±0.004	0.499±0.005 ^{a}	56.39±0.39 ^{b}	32.67±0.35 ^{a}	10.94±0.13 ^{b}	0.342±0.003	84.56±0.90^{b}
Significance	***	*	***	*	**	***	n.s	*
Interaction StxA								
MN*34 weeks	45.11±0.56	0.768±0.005	0.479±0.006	56.98±0.44	31.45±0.41	11.57±0.17	0.349±0.004	85.46±1.45
MN*50 weeks	49.95±0.67	0.760±0.006	0.485±0.006	55.48±0.56	33.33±0.48	11.19±0.19	0.347±0.005	84.22±1.27
GM*34 weeks	48.11±0.51	0.763±0.007	0.481±0.006	57.93±0.45	30.89±0.44	11.17±0.126	0.340±0.003	88.37±1.06
GM*50 weeks	52.67±0.84	0.743±0.004	0.517±0.008	57.50±0.500	31.87±0.49	10.63±0.134	0.335±0.004	84.97±1.27
Significance	*	n.s	n.s	n.s	n.s	n.s	n.s	n.s

Means within each column for each trait with different superscripts are significantly different.
* significant at ($p<0.05$). ** significant at ($p<0.01$). ***significant at ($p<0.001$).

Table (2): Effect of chicken strain and parental age on fertility and hatchability percentages

Trait / Factors	Fertility %	Hatchability of all eggs %	Hatchability of fertile eggs %
Strain (St)			
Mandarah(MD)	83.37±1.74	75.17±2.05^{B}	89.81±1.29^{B}
Gimmizah(GM)	88.19±1.37	82.87±1.56^{A}	94.01±1.09^{A}
Significance	Ns	***	***
Parental age (A)			
34week	86.69±1.78	78.42±2.56	89.95±1.89
50week	84.69±1.55	78.43±1.69	92.49±092
Interaction StxA			
GM *34 weeks	88.27±2.32	82.90±2.96	93.83±2.04
GM *50 weeks	88.13±1.71	82.84±1.70	94.14±1.22
MD*34 weeks	85.10±2.71	73.9±53.90	86.06±2.90
MD*50 weeks	82.56±2.22	75.71±2.43	91.47±1.27

Means within each column for each trait with different superscripts are significantly different.

All interactions of the main factors had no significant effects on all traits studied in this table.

***significant at ($p<0.001$). n.s: non significant

Table (3): Effect of chicken strain, parental age, and sex on hatch time, hatched chick body weight and body weight loss (weight and percentage)

Trait / Main factors	Hatch time (hr)	Chick body weight (gm)		Chick body weight loss	
		At hatch	At pull out	(gm)	(%)
Strain (St)					
Gimmizah (GM)	487.62+0.30	37.66+0.14	35.67+0.14	1.99+0.03	5.29+0.07
Mandarah (MD)	488.16+0.28	36.38+0.13	34.50+0.13	1.88+0.03	5.17+0.07
Significance	*	***	***	***	
Parental age (A)					
34week	489.91+0.32	34.99+0.14	33.15+0.13	1.84+0.03	5.25+0.08
50week	486.75+0.26	38.12+0.11	36.14+0.11	1.98+0.03	5.21+0.07
Significance	***	***	***	***	n.s.
Sex (S)					
Male (M)	488.57+0.33	37.18+0.15	35.26+0.15	1.92+0.03	5.19+0.09
Female (F)	487.47+0.26	36.81+0.13	34.88+0.13	1.93+0.03	5.26+0.07
Significance	*	*	*	n.s.	n.s.
Interaction StxA					
MD*34week	490.39+0.43	34.32+0.18	32.58+0.18	1.74+0.04	5.08+0.11
MD*50week	486.99+0.36	37.47+0.15	35.52+0.15	1.95+0.04	5.22+0.11
GM*34week	489.41+0.47	35.70+0.19	33.76+0.19	1.94+0.05	5.43+0.13
GM*50week	486.99+0.36	35.96+0.15	36.94+0.15	2.03+0.03	5.20+0.09
Interaction StxS					
MD*M	488.8+0.47	36.92+0.21	34.98+0.22	1.84+0.05	5.01+0.13
MD*F	487.78+0.37	36.11+0.17	34.21+0.16	1.90+0.04	5.27+0.09
GM*M	488.34+0.49	37.56+0.21	35.55+0.20	2.01+0.04	5.37+0.11
GM*F	487.08+0.37	37.74+0.19	35.76+0.19	1.97+0.04	5.23+0.09
Interaction SxA					
M*34week	490.78+0.49	35.50+0.21	33.62+0.20	1.88+0.05	5.29+0.13
M*50week	487.24+0.43	38.21+0.18	36.26+0.18	1.95+0.04	5.13+0.11
F*34week	489.34+0.41	34.64+0.18	32.83+0.17	1.81+0.04	5.23+0.10
F*50week	486.43+0.33	38.06+0.14	36.06+0.14	2.00+0.03	5.27+0.09

* Significant at ($p<0.05$). ***significant at ($p<0.001$). n.s: non significant.

- All interactions of the main factors had no significant effects on all traits studied in this table.

Table (4) Effect of chicken strain, parental age, and sex on chick body weight and growth rate through growing period

Main effect	Chick body weight (g)			Growth rate			
	4week	8week	12week	0-4	4-8	8-12	0-12
Strain (St)							
Gimmizah GM)	270.62+1.41	474.35+3.28	881.36+7.22	153.04±0.25	54.32±0.55	59.68±0.76	184.27±0.16
Mandarah MD)	229.00+1.43	444.23+2.66	866.81+4.99	146.92±0.30	63.34±0.55	64.36±0.44	184.48±0.09
Significance	***	***	***	***	***	***	n.s.
Parental age (A)							
34week	239.99+1.85	430.66+3.52	838.82+7.25	150.70±0.35	57.15±0.63	64.04±0.59	184.93±0.15
50week	252.52+1.54	467.28+2.50	884.86+4.81	149.11±0.28	60.34±0.53	62.18±0.51	184.19±0.10
Significance	***	***	***	***	***	***	***
Sex (S)							
Male (M)	258.24+1.77	473.01+3.52	926.35+6.05	151.30±0.33	58.86±0.66	65.69±0.61	185.26±0.12
Female (F)	240.92+1.55	447.06+2.58	837.99+4.50	148.63±0.28	59.85±0.55	60.83±0.51	183.87±0.11
Significance	***	***	***	***	n.s.	***	***
Interaction St x A							
MD*34week	219.21+2.48	411.09+5.64	800.94+10.85	147.42±0.51	61.12±0.89	63.75±0.87	184.57±0.23
MD*50week	234.24+1.69	455.27+2.75	886.69+4.92	146.67±0.36	64.08±0.66	64.55±0.51	184.45±0.10
GM*34week	261.91+1.57	451.59+2.91	882.28+5.51	154.15±0.31	52.90±1.68	64.37±0.76	185.34±0.16
GM*50week	276.38+2.03	4 84.56+4.40	880.83+10.97	152.31±0.35	54.95±0.73	56.95±1.03	183.65±0.22
Significance	n.s.	n.s.	***	n.s.	n.s.	***	***
Interaction StxS							
MD*M	241.10+2.27	465.62+4.42	927.38+7.26	148.66±0.49	62.68±0.92	67.02±0.71	185.29±0.14
MD*F	221.68+1.73	431.46+3.08	828.50+5.00	145.88±0.36	63.74±0.68	62.68±0.52	183.97±0.11
GM*M	276.34+2.09	481.89+5.56	924.43+10.91	154.08±0.35	54.26±0.79	63.25±1.07	185.20±0.19
GM*F	266.30+1.87	469.07+3.95	855.02+8.57	152.25±0.34	54.36±0.75	57.49±0.98	183.69±0.22
Significance	*	***	**	*	n.s.	n.s.	n.s.
Interaction SxA							
M*34week	255.61+2.47	454.00+4.63	880.76+8.33	153.03±0.45	54.96±0.95	64.18±0.90	185.49±0.21
M*50week	259.85+2.43	480.65+4.47	945.87+7.22	150.24±0.45	60.42±0.82	66.35±0.77	185.16±0.14
F*34week	229.14+2.36	414.72+4.49	809.40+9.56	149.07±0.47	58.64±0.81	63.94±0.77	184.54±0.19
F*50week	247.70+1.95	458.93+2.86	848.42+4.87	148.37±0.35	60.29±0.69	59.69±0.61	183.63±0.12
Significance	n.s.	n.s.	**	n.s.	n.s.	***	*

* Significant at ($p<0.05$), ** Significant at ($P<0.01$), ***significant at ($p<0.001$), n.s: non significant.

Figure (1): Distribution of Gimmizah male and female hatched chicks produced from different parental ages at different hatch times

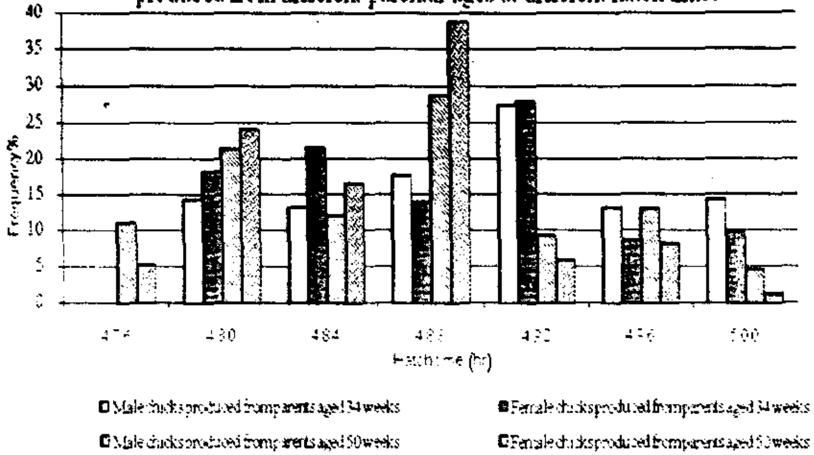
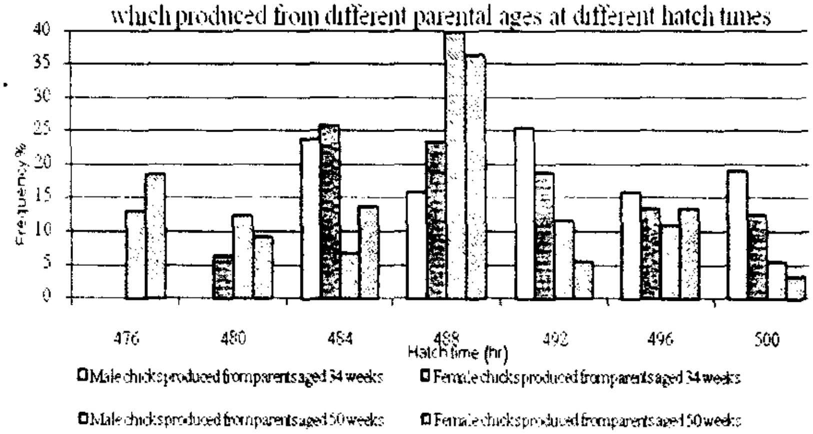


Figure (2): Distribution of Mandarah male and female hatched chicks which produced from different parental ages at different hatch times



REFERENCES

Abd El-Ghani, A.I. (1996). *Influence of body weight and strain on productive performance of some new developed Egyptian chickens. Egypt. Poult. Sci. 16: 601-619.*

Abdel Galil, M.A.(2004). *Effect of using some anti-heat stress compounds on the performance of some local breeds of chicken under hot climatic condition. Egypt. Poult. Sci. 24: 417-427.*

Abdel Galil, M.A and M.H., Abdel Samad, (2004). *Effect of vitamin E, C, Selenium and Zinc supplementation on reproductive performance of two local breeds of chickens under hot climate condition. Egypt.Poult. Sci. 24: 217-229.*

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

Amin, E.M. (2008). *Effect of strain and sex among some local and foreign strains of chickens on productive traits (Growth and egg production) under environmental condition of the newly reclamed area. Egypt. Poult. Sci. 28: 351-366.*

Basmacioglu, H, and Ergul, M. (2005). *Research on the factors affecting cholesterol content and some other characteristics of egg in laying hens. The effect of genotype and rearing system. Turk. J. Vet. Anim. Sci. 29: 157-164.*

Brake, J. (1998). *Relationship of time of feeding and strain to egg shell quality and hatchability in broiler breeders.Poult. Sci. 67: 538-543.*

Brake, J.; T.J.walsh; C.E.Benton; Jr. J.N. Petitte; R.Meiherhof and G.Penalva,(1997). *Egg handling and storage.Poult. Sci. 76: 144-151.*

Burke, W.H., (1992). *Sex differences in incubation length and hatching weights of broiler chicks.Poult. Sci. 71: 1933-1938.*

Burke, W.H., K.D. Arbtan and N.Snapir, (1990). *The role of plasma thyroid hormones in the regulation of body weight of single comb white leghorn and broiler embryos.Poult. Sci. 69: 1388-1393.*

Chatterjee,R.N.; Rai, R.B.; Pramanik,S.C.; Sundar, J. Senani, S. and Kundn, A. (2007). *Comparative growth, production, egg and carcass traits of different crosses of brown Nicobari with white leghorn under intensive and extensive management system in Andamans. India Livestock research for Rural Development.19 (12).*

Christensen, V.L., D.O. Noble and K.E. Nestor, (2000). *Influence of selection for increased body weight, egg production, and shank width on the length of the incubation period of Turkey.Poult. Sci. 79: 613-618.*

Deeming, D.C.; and Van Middletoop, J.H. (1999). *Effect of strain and flock age on fertility and embryonic mortality of broiler breeder eggs. Br. Poult. Sci. 40: 522-526.*

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

El-Afifi, Sh.F.; A.A. Hamed and S.Gamal (2008). *Effect of dietary fatty acid content on laying performance and hatchability of Dandrawi and Fayoumi Layers. Egypt. Poult. Sci. 28: 311-326.*

El-Attar, A.H.; and Fathi, M.M. (2002). *Relationship between strain and flock age in broiler breeder hens. Egypt. Poult. Sci., 22: 27-42.*

El-Full, E.A.; A.A. Abdel Warith; H.A. Abdel Latif and M.A. Khalifa, (2005). *A comparative study on pause and clutch size traits in relation to egg production traits in three local breeds of chickens. Egypt. Poult. Sci. 25: 825-844.*

Eisen, E.J.; Bohren B.B. abd Mcbean H.E.(1962). *The Haugh unit as a measure of egg albumen quality . poult. Sci. 41: 1461-1468.*

El-Sadany, A.M.A.(2005). *Responses of two local strains of laying hens to two sources oils on productive and reproductive performances and egg quality. M.Sc: Thesis Faculty of Agriculture. Damanhor. Alexandria University.*

El-Sheikh, T.M. (2007). *Influence of hatching egg weight and parental age on embryonic mortality, hatchability and chick quality in Japanese quail. Egypt. Poult. Sci. 27: 893-912.*

Enaiat, M.M. El Anwar; A. Salem Amina; M. abou-Eilla Eman and A.H.A. Al-Kotait, (2009). *Comparative study between two local strains under cage and floor housing systems. Egypt. Poult. Sci. 29: 439-464.*

Ensaf, A.El Full; Abd El Whed, H.M; Namra, M.M; Osman, A.M.R; and Hataba, N.A. (2005). *Results of random sample test laying performance of nine Egyptian strains of chicken. Egypt. Poult. Sci., 25: 195-208.*

Hager, J.E., and W.L. Beane, (1983). *Posthatch incubation time and early growth of broiler chicken.Poult. Sci. 62: 247-254.*

Hocking, P.M.; and Bernard, R. (2000). *Effects of the age of male and female broiler breeder on sexual behavior, fertility and hatchability of eggs. Br. Poult. Sci., 41: 370-377.*

Khalifah, M.M. and E.H.A. Shahein, (2006). *Effect of dietary folic acid supplementation on production and hatching performance in Bahij Chicken strain. Egypt. Poult. Sci. 26: 843-855.*

Kosba, M.A.; Safaa M. Hamdy and T.H. Mahmoud, (1985). *A comparative study of the performance of four local Egyptian breeds of chicken. 1st sci. symp. on local strains of Poultry, Alex. Univ., 118-127.*

Latour, M.A.; Peebles, E.D., Boyle, C.R.; Doyle, S.M.; Pansky, T.; and Brake J.D. (1996). *Effect of breeder hen age and dietary fat on embryonic and neonatal broiler serum lipids and glucose.Poult. Sci. 75: 965-701.*

Latour, M.A.;E.D. Peebles; S.M.Doyle; T.Pansky; T.W.Smith and C.R. Boyle,(1998). *Broiler breeder age and dietary fat influence the yolk fatty acid profiles of fresh eggs and newly hatched chicks. Poult. Sci. 77: 47-53.*

Marie, Y.A.; M.A.Ibrahim; M.A. Mahmoud and H.A. abou Khashaba, (2009). *Influence of nutrient density on productive and reproductive performance of some local laying hen strains. Egypt. Poult. Sci. 29: 527-564.*

Mather, C.M. and K.F. Laughlin, (1976). *Storage of hatching eggs: The effect on total incubation period. Br. Poult. Sci. 17: 471-479.*

Nawar, M.E. and M.Bahie El-Deen (2000). *A comparative study of some economic traits of seven genotypes of chickens under intensive production system. Egypt. Poult. Sci. 20: 1031-1045.*

O'sullivan, n. p.; E. A. Dunnington and P.B.Siegel,(1991). *Relationships among age of dam, egg component, embryo lipid transfer and hatchability of broiler breeder eggs.Poult. Sci. 70:2180-2185.*

O'Dea E.E; G.M.Fasenco; J.J.Feddes; F.E.Robenson and C.Segura(2004) *Investegating the eggshell conductance and embryonic metabolism of modern and unselected domestic avian genetic strains at two flock ages. Poult Sci. 83:2059-2070.*

Pedroso, A.A.; M.A. Andrade; N.S. Leando; J.F. Menten and J.K. Stringhini (2005). *Fertility and hatchability of egg laid in the pullet-breeder transition period and in the initial production period. Anim.Reprod. Sci. 90 (3-4): 355-364.*

Peebles, E.D., and J.Brake, (1987). *Eggshell quality and hatchability in broiler breeder eggs.Poult. Sci. 66: 596-604.*

Peebles, E.D; Zumwalt, C.D.; Doyle, S.M.; Gerard, P.D.; Latour, M.A; Boyle, C.R; and Smith, T.W. (2000). *Effect of breeder age and dietary fat source and level on broiler hatching egg characteristics. Poult. Sci. 79: 629-639.*

Reis, L.H.; L.T. Gama and M.Chaveiro soares, (1997). *Effects of short storage conditions and broiler breeder age on hatachability, hatching time and chick weights.Poult. Sci. 76: 1459-1466.*

Rizk, R.E.; Nadia, A. El-Sayed; E.H.A. Shahein and Hedaia, M.Shalan. (2008). *Relationship between eggshell, eggshell membranes and embryonic development through different egg production periods in two developed chicken strains. Egypt. Poult. Sci., 28: 535-551.*

SAS Institute; 1989. *User s Guide Statistics. SAS Institute INC., Cary, NC, USA.*

Shahein, E.H. (2002). *Factors affecting hatchability and their relation to embryonic development in local chicken strains. Ph.D. Thesis, Fac. Of Agric. Kafr El-Sheikh, Tanta University.*

Shahein, E.H.A.; Amany, A.El.Sahn; and Rizk, R.E. (2007). *Hatching traits and embryonic development as influenced by flock age in local chicken. Egypt.Poult. Sci., 27: 309-319.*

Silversides, F.G. and scott, T.A. (2001). *Effect of storage and layer age on quality of eggs from two lines of hens. Poult. Sci. 80: 1240-1245.*

Smith, K.P., and B.B. Bohren, (1975). *Age of pullet effect on hatching time, egg weight and hatchability.Poult. Sci. 54: 959-963.*

Soliman, F.N.K.(2000). *Effect of short pre-incubation storage periods on egg weight loss, embryonic development, chick weight, fertility and hatchability in two local chicken strains, Egypt. Poult. Sci. 20: 157-171.*

Suarez, M.E.; H.R Wilson; F.B. Mather; J. Wilcox and B.N. McPherson, (1997). *Effect of strain and age of the broiler breeder female on incubation time and chick weight.Poult. Sci. 76: 1029-1036.*

Tana, K., Bamelis, F.; Coucke, W.; Bruggeman, V. and Decuypere, E. (2001). *Relationship beween broiler breeders age and egg weight loss and embryonic mortality during incubation in large-Scale conditions. Journal of Applied Poultry Res., 10: 221-227.*

Vieria, S.L. and E.T. Moran, Jr. (1999). *Effects of egg of origin and chick post-hatch nutrition on broiler live performance and meal yields. World's Poult. Sci. J. 55: 125-142.*

Whiting, T.S., and G.M. Pesti, (1983). *Effect of the dwarfing gene (dw) on egg weight, chick weight, and chick weight: egg weight ratio in a commercial broiler strain.Poult. Sci. 62: 2297-2302.*

Wilson, H.R., (1991). *Interrelationship of egg size, chick size, posthatching growth, and hatchability. World's Poult. Sci. J. 47: 5-20.*

Zaky, H.I. (2006). *The effect of heterosis between Fayoumi and white leghorn chickens on egg quality triats under desert conditions. Egypt. Poult. Sci. 26: 39-52.*

Zawalsky, M., (1962). *The effect of sex, egg weight and preincubation storage on hatching time and chick weight. Poult. Sci. 41: 1697.*

الملخص العربى

العوامل المؤثرة على صفات الفقس والنموبعد الفقس فى سلالات الدجاج المستنبط

يسرية كمال عفيفى،نظلة يوسف ابو العلا،حنان حسن غانم،

اسامه محمود على،ماجد مصطفى بلاط

معهد بحوث الانتاج الحيوانى - مركزالبحوث الزراعية - وزارة الزراعة- القاهرة

اجريت هذه التجربه على سلالتى الجميزة و المندرة بغرض دراسه تأثير كل من السلاله و عمر الاباء و الجنس على صفات التفريخ و ايضا صفات النمو للابناء بعد الفقس اثناء فتره النمو ، حيث تم استخدام عدد ٣٠٠ دجاجه من السلالتين مناصفه عند بدايه البلوغ الجنسى وذلك عند اعمار ٣٤و٥٠ اسبوع , و تم دراسه صفات الجوده الداخليه و الخارجيه للبيض الناتج وكذا صفات التفريخ و ميعاد الفقس لكل من الذكور و الاناث و كذلك وزن الكتاكيت الناتجه عند الفقس من البيض و عند خروجها من ماكينه التفريخ و قياس معدل الفقد فى وزن الكتكوت الناتجة داخل الماكينةووزن الكتاكيت عند اعمار ٤،٨، ١٢، اسبوع ٠

ويمكن تلخيص النتائج المتحصل عليها كالآتى:

اظهرت نتائج الدراسه ان لسلاله الجميزه قيم اعلى فى كل من وزن البيض ومعامل الصفاروكذلك نسبه الصفار وسمك القشره مقارنه بسلاله المندره ٠

يتلاحظ انه كان لعمر الامهات تأثير على كل من وزن البيض و معامل الصفارو نسبتهم٠ تفوقت سلاله الجميزة على سلاله المندره فى كل من نسبه الخصوبة و نسبه التفريخ للبيض الكلى و البيض المخصب ٠ سجلت كتاكيت الجميزه فقس مبكر مقارنه بسلاله المندره وكذلك انتجت كتاكيت ذات وزن جسم أعلي وذلك عند الفقس وعند الخروج من الماكينه وايضا كان معدل الفقد فى وزن الجسم داخل ماكينة الفقس أعلى مقارنه بسلاله المندره ٠ سجلت الكتاكيت الناتجة من امهات عمرها ٥٠ اسبوع فقس مبكرمقارنه بتلك الناتجة من امهات عمرها ٣٤ اسبوع٠سجلت الاناث فقس مبكرا مقارنة بالذكور٠ سجلت الذكور وزن جسم أعلى مقارنة بالأناث عند الفقس وكذا فى مراحل النمو النمو المدروسة حتى ١٢ اسبوع ٠سجلت كتاكيت الجميزة تفوقا معنوى فى وزن الجسم خلال فترات النمو المدروسه حتى ١٢ اسبوع مقارنة بسلالة المندرة٠سجلت الكتاكيت المرباة والناتجة من اباء عمرها ٥٠ اسبوع زيادة معنوية فى الوزن مقارنه بتلك الناتجة من اباء عمرها ٣٤ اسبوع وذلك خلال فترات النمو عند ٤ ، ٨ ، ١٢ اسبوع من العمر٠

***من تلك النتائج يمكن استنتاج ان سلالة الجميزة سجلت اعلى القيم لصفات الفقس وكذلك صفات وزن الجسم خلال مراحل النمو المختلفة مقارنة بسلالة المندرة وكذلك فان عمر الآباء كان له تاثير معنوى فى معظم الصفات المدروسة٠**