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DETERMINATION OF MATERNAL ANTIBODY (IGY) CONCENTRATION AS A GENETIC MARKER TO IMPROVE FERTILITY, HATCHABILITY AND LIVABILITY PERCENTAGES IN TWO LOCAL STRAINS OF CHICKENS

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ABSTRACT: ***The present study was carried out at the Department of Poultry and Fish Production, Faculty of Agriculture at Shibin El-Kom, Menoufia University. The aim of the present study was to determine the concentrations of maternal antibody (IgY) in blood serum of layers and hatched chicks, in addition to egg yolk of three, control, high and low IgY antibody lines of Sinai and Silver Montazah local strains of chickens as a genetic marker to improve fertility, hatchability and livability percentages.***

The results were summarized as follows:

1. ***Sinai strain had significantly higher IgY antibody concentration than Silver Montazah strain of chickens, being 4.68 vs 4.22 mg/ml in hen blood serum, 4.11 vs 3.46 mg/ml in egg yolk, 3.09 vs 2.66 mg/ml in hatched chicks serum and 48.00 vs 38.41 mg/egg yolk total, respectively.***
2. ***Highly significant differences ($P \leq 0.01$) among lines, the high (LH) lines harvested the highest IgY level and control line (CL) occupied intermediate level, whereas the low lines (LL) had the lowest IgY level in both strains of chickens. The means of IgY concentrations were 3.74, 6.15 and 2.44 mg/ml in Silver Montazah strain, where the corresponding values in Sinai strain were 4.63, 6.65 and 2.47 mg/ml for control, HL and LL lines, respectively.***
3. ***The high IgY antibody lines had significant ($P \leq 0.05$) higher percentages of fertility than the control and low IgY antibody lines. The averages of fertility percentages were 76.97 vs 77.21 for control lines, 85.29 vs 88.19 for high lines and 68.38 vs 68.81 for low lines of Silver Montazah and Sinai strains of chickens, respectively.***
4. ***The means of hatchability percentages of fertile eggs were 72.32% vs 77.60% for Silver Montazah and Sinai chickens, respectively. Also, means of hatchability percentages were 89.18 vs 91.89% for high lines, 75.11 vs 77.65% for control lines and 57.07 vs 61.33% for low lines of Silver Montazah and Sinai strains of chickens, respectively.***
5. ***Sinai chickens had significantly ($P \leq 0.5$) higher livability (%) as compared to Silver Montazah chickens (80.65 vs 75.14%) due to the direct action of maternal antibody (IgY) transferred from layers to newly hatched chicks.***
6. ***High IgY lines had significantly ($P \leq 0.5$) higher percentages of livability at 28d. The means of livability (%) were 75.83 vs 80.91 (%) for control lines, 87.92 vs 93.49 (%) for high lines, and 65.29 vs 65.79 (%) for low lines of Silver Montazah and Sinai strains of chickens, respectively.***
7. ***Since the high IgY antibody improved fertility, hatchability and viability, So that, the IgY can be used as a genetic marker to improve some productive traits in chickens.***

Key words: ***Maternal antibody, productive traits, chickens.***

INTRODUCTION

1. What is maternal antibody in both birds and mammals?.

In birds, maternal factors are mainly transferred via the egg to the offspring (Grindstaff *et al.,* 2003), hence the time period for the uptake of maternal factors is restricted to a period before, and shortly after hatch. While, in mammals, maternal factors can be transferred via the placenta, in colostrums (the first milk transferred from the mother to her offspring just after birth) and in normal milk during lactation (Glezen 2003 and Lemke *et al.,* 2004).

Among the maternal factors which can be transferred by the mother to her offspring are hormones, antibodies and nutrients (Rubolini *et al.,* 2006 and Biard *et al.,* 2007). In birds, maternal transfer of antibody via egg yolk to offspring has mainly been studied in poultry as means of improving chick survival early in life (Blount *et al*., 2002 and Biard *et al*., 2007).

Since, 1996, IgY technology has become the internationally accepted term for describing the production and using of IgG antibody in chickens (Schade, and Hlinak, 1996).

2. The IgY concentrations in blood serum and egg yolk:

Three immunoglobulin classes, which are distinguishable in concentration structure, and immunochemical function, are found in birds: IgA, IgM, and IgY. The birds IgA and IgM are similar to mammalian IgA and IgM in molecular weight, structure and electrophoretic mobility (Carlander, 2002). But, the molecular weight of the chickens IgY was found by mass spectrometry to be 167and 250 Da, while the MW of mammalian IgG is about 160.000 Da (Sun *et al*., 2001).

Early reports about the concentration of antibody classes in birds indicated that IgY makes up about 75% of the total immunoglobulin pool. The serum concentration of IgY, IgA, and IgM have been reported to be 5.0, 1.25, and 0.61 mg/ml, respectively (Lestie and Martin, 1973). In addition, Kaspers, *et al*., (1990), studied the distribution of antibody classes in freshly laid eggs (mg/ml) in chickens. They found that the concentrations of the antibody classes of egg yolk were 8.7 mg/ml for IgY, and 0.017 mg/ml for IgA, while the IgM was not detected, the present results cleared that the egg yolk is the main source for IgY in chickens.

Recently, Ritu, *et al*., (2016), compared the immunoglobulin Y (IgY) level in laying hens of four different breeds of local chickens. They reported that non-significant differences in IgY concentration were recorded among different laying breeds of chickens. The IgY concentration ranged from 3.35 to 5.83, 2.30 to 2.60 and 1.30 to 1.70 mg/ml in hens, egg yolk and chicks, respectively. In addition, there were significant differences among genetic lines or breeds. For example, the IgY concentrations reported were 2.2mg/ml in Single Comb White Leghorn, 2.0 $\pm$ 0.5 mg/ml in line SLU-1329, and 1.7 mg/ml in Rhode Island Red (Carlander, 2002).

Also, Hamal *et al*., (2006) studied the concentration of IgY in the dam's plasma, and egg yolk in two meat lines of chickens. They found that the IgY concentration in dams plasma was 3.26 mg/ml, while it was 1.15 mg/ml in egg yolk with IgY in egg yolk total 22.5 (mg) in the first line. The corresponding concentrations in the second meat line were 6.02 mg/ml in dams and 2.26 mg/ml in egg yolk with total egg yolk of IgY 43.9 (mg).

3. Effects of maternally transferred antibodies to offspring on some productive traits in chickens:

Maternal antibody (IgY) transferred from dams to their offspring had direct or indirect effects on some productive traits in chickens such as:

3.1. Fertility and hatchability:

In chicken strains, the main interest has been focused on the percentages of fertility and hatchability in relation to the immune response system as a useful system that can combat diseases with an integrated physiological response (Kelly *et al*., 2000).

Also, Abd El-Rahman, Amira (2006) reported that the high immune response line had higher percentages of fertility and hatchability than the control and low immune response lines in both Norfa and WL strains of chickens. In addition, the statistical differences between strains of chickens in both fertility and hatchability were highly ($p \leq 0.01$) significant. She found that Norfa strain had higher fertility percentage than WL strain, with an fertility average of 92.16% and 74.15%, whereas the hatchability averages were 86.25% and 68.88%, respectively.

3.2. Livability and pathogen resistance:

The primary short-term benefit of maternal antibody (IgY) transferred from dams to their neonates during the vulnerable period when their own immune system has not yet matured. This has been taken advantage where the laying hens are vaccinated to provide passive immunity to their chicks (Goddard *et al*., 1994). Both the diversity and the amount of maternal antibody being transferred to the neonate are of importance for the passive protection of the young chicks (Nicoara *et al*., 1999).

The time period when maternal antibody (IgY) retained in the circulation of the neonate is dependent on the initial level provided which is restricted to a period before and shortly after birth. The age at which the neonate starts to produce antibodies on its own system differs markedly between species (Grindstaff *et al*., 2003). In some birds, increases in the levels of antibodies have been found in 10-14 days post-hatch (Gasparini *et al*., 2006).

However, maternally transferred antibodies may constitute an important addition to the ability of neonates to take care of pathogens in order to have good livability and low mortality (Gridstaff *et al*., 2006). Also, Gebriel (1991a) studied the association between the VI-locus controlling livability and the immune response region (IR) in chickens. He found that the VI-locus closely linked to IR-region of the major histocompatibility (MHC) in Fayoumi chickens.

MATERIALS AND METHODS

The present study was carried out at the Department of Poultry and fish Production, Faculty of Agriculture, Shibin El-Kom, Menoufia University and Poultry Research Station at Gimmizah, Institute of Animal Production and Agricultural Research Center, Ministry of Agriculture. The experiment was extended from Feb. 2016 to Sept. 2017, in order to determine the concentration of the maternal antibody (IgY), as a genetic marker to improve some productive traits in two local strains of chickens.

1. Chicken stock :

Two local strains of chickens were used in the present study in the Poultry Research Station at Gimmizah, Institute of Animal Production and Agricultural Research Center, Ministry of Agriculture. The strains of chickens used in the present study were:

1.1. Silver Montazah strain:

Silver Montazah strain is a synthetic local strain of chickens, which developed at the Ministry of Agriculture, Montazah Poultry Research Station. The formation

of Silver Montozah strain started in early 1970 (Mahmoud *et al.,* 1974). The scheme of formation of Silver Montazah strain including two way cross between RIRX Dokki4, random mating and selection programs to select and develop the Silver Montazah strain as egg production strain. The plumage color is colonal white. The ear lobes color is red.

1.2. Sinai (Bedwin fowl):

Sinai chickens were originally obtained from the desert areas of North and West Sinai Governorates. The Sinai breed probably is originated from the natural cross between some foreign breeds with the local chickens reared in Sinai Governorate since War 1945.

2. Experimental Design:

At 18 weeks of age 96 pullets from two local strains, Silver Montazah (SM) and Sinai chickens were taken at random to be used in the present experiment. The pullets were housed individually in wire individual cages in the Poultry Research Station at Gimmizah. Pullets were hatched on the same day. They were reared under the same management practices, and they were immunized using the same vaccination protocols. Eggs were collected and recoded individually for each hen.

At sexual maturity, 4 hens were assigned at random for each sire which formed 12 families of each strain of chickens for reproducing the next generation. Each family contained one sire and 4 hens in both strains.

At 33 weeks of age, 42 eggs were taken at random as one egg from each hen from 21 hens of each strain, which represented 7 families of each strain. Fresh collected eggs were used to determine the concentration of yolk IgY, which transferred from the dam to egg yolk. At the same time, chick blood samples were taken from 80 chicks representing 80 dams (40 dams of each strain) at 4th day of hatch for determination of IgY concentration in chicks blood serum. At the same time, 80 blood samples were collected at 34 weeks of age from 40 hens of each strain of chickens which used for determination of IgY concentration in hens blood serum.

To study the effect of IgY concentration on some economic traits, dams and chickens were divided into 3 lines on the bases of the IgY concentration blood serum (mg/ml) of each hen as the following:

2.1. High antibody (IgY) line (HL):

Hens of each strain reached IgY concentration more than $\overline{X} \pm S.E$ were selected and considered as the parents of HL to produce the offspring of the next generation.

2.2. Low antibody (IgY) line (LL):

Hens of each strain had IgY concentration lower than $\overline{X} \pm S.E$ were selected and considered as the parents of LL to produce the offspring of the next generation.

2.3. Control line (CL):

Hens of CL were taken at random to form the control line of each strain to produce the offspring of the CL in the next generation. The unselected individuals were culled.

3.Mating system and reproduction:

The artificial insemination was used as a mating system for reproducing the next generation. Each family contains one sire and 4 dams. Dams were assigned at random to each sire for reproducing the next generation. Fertile eggs were collected two times a day and numbered according to their dams. Cracked, dirty, and misshapen eggs were removed. Then, fertile eggs were stored in egg storage room at 15 – 17 °C for 7 days, with 70% of relative humidity.

For hatching, all eggs were moved to the incubation room and left for at lest 12 hours at room temperature. Then, all eggs were set with wide end up in the setting trays according to their dams and incubated in a forced draft incubator at 99.5 °F (37.5 °C) with a relative humidity of 65%. Eggs were turned every two hours from the 2nd to 18th day of incubation. All fertile eggs were transferred to a separate hatcher in pedigree baskets according to their dams at 98.5 °F (36.9 °C) and 75% relative humidity.

4. Experimental stock management:

At hatching day, all chicks were removed from the hatcher, wing banded according to their dams for identification. All chicks were brooded in floor brooder with wood shaving litter. The starting brooder temperature was 34 °C during the first week, then the brooder temperature was decreased gradually from 2- 3 °C every week to reach 20- 22°C at almost 42 days of age. The chicks were moved to rearing house at eight weeks of age.

All chicks were exposed to continuous artificial light for 24 hours during the first week of age, then; the artificial light was decreased gradually to reach the natural day light by about 8 weeks of age. All chickens were received only natural day light from 9 to 17 weeks of age. At 18 weeks of age, pullets were moved to individual cages in haying house, where they were kept until 42 weeks of age under 16 house light a day.

All chicks were fed *ad libitum* during brooding , rearing and growing periods on a diet containing 19.0%, 17.0% and 15.0% crude protein, and 2860, 2850 and 2850 Kcal ME/Kg diet, respectively. At 17 weeks of age (before sexual maturity), pullets were fed on a diet containing 17.0% crude protein and 2850 Kcal ME/Kg died. At 5.0% egg production, hens were fed on diet containing 16% crude protein and 2750 Kcal ME/Kg diet until 42 weeks of age. Then, hens were fed on diet containing 15% crude protein and 2750 Kcal ME/Kg a diet to the end of productive year. All chicks were vaccinated against diseases and were treated similarly throughout the experimental period.

5. Collection of hen blood samples:

At 34 weeks of age, 2 ml blood sample was collected in dry tube via the wing vein and one fresh laid egg from each hen were collected on week before bleeding for IgY determinations. The blood samples were centrifuged at 3.000 rpm for 10 min at 4 °C. The liquid that remained after blood had clotted was collected, placed in disposable tubes and frozen for subsequent laboratory analysis (Siegel and Gross, 1980).

5.1. Collection of chick blood samples:

The chicks were bled via the jugular vein at 4th day of hatch using a 0.5 ml heparinized insulin syringe with a 28-gauge needle. Plasma samples were collected and stored at –20°C until analysis (Carlander, 2002).

6. Extraction of egg yolk IgY:

In recent years, Polsons PEG (Polyethylene glycodal) precipitation method has become the most commonly used and most effective procedure (Polson, 1990). This method is used for extraction of egg yolk IgY. the volume of egg yolk (ml) was recorded during the extraction method to be used for calculating the IgY concentration in each egg yolk using the following formula:

IgY concentration in whole egg yolk (mg/egg):

= egg yolk volume x IgY concentration in yolk

The levels of the total IgY in the dams blood serum, egg yolk and chicks blood serum were determined in Lab Top in Zagazig City, Sharkia Governorate, using AMS Sat 450 system which imported from England appropriate kits.

8. Studied traits:

8.1. The IgY concentrations in blood samples and egg yolk :

The concentration of IgY were determined in both blood samples of hen at 34 weeks of age and chicks at 4th day of hatch as mg/ml. Also, the IgY was determined in fresh egg yolk as mg/ml.

8.2. Fertility and hatchability percentages:

Fertility and hatchability were determined for each hen of both strains of chickens. The percentage was calculated for each :

Whereas, hatchability percentage was calculated:

8.3. Livability percentage:

The livability percentage of hatched chicks was determined as direct effects of transferred IgY from dam to its hatched chicks during the first 4 weeks after hatch. The livability percentage was calculated..

9. Statistical analysis:

Least square means and their standard errors ($\bar{X} \pm S.E$) for each studied trait were calculated for each line within each its strain. Data obtained were statistically analyzed using SPSS (2004). Probability values $\leq$ 5% were considered for significance. All percentages data were converted to the corresponding arcsine prior statistical analysis as given by SAS (1988). Duncans multiple range test was used for the multiple comparisons of means (Duncan, 1955).

The statistical model used in the present study was as follows:

$Y_{ijk} = U + S_i + L_j + (S \times L)_{ij} + e_{ijk}$

Where :

Y_{ijk} **= The Ith observation of the individual over all means.**

U = The common mean .

S_i **= The fixed effect of ith strains.**

L_j **= The fixed effect of jth lines.**

$(S \times L)_{ij}$ **= The fixed effect of interaction between strains and lines.**

e_{ijk} **= experimental error .**

RESULTS AND DISCUSSION

1. The concentrations of IgY antibody in blood serum and egg yolk:

1.1. Effects of chicken strains on IgY antibody concentration:

The effects of chicken strains on IgY antibody concentration ($\bar{X} \pm S.E$) in hens blood serum, egg yolk and chicks blood serum (mg/ml) in two local strains of chickens (Silver Montazah and Sinai) are given in Table (1). The average of IgY concentration in both silver Moniazah and Sinai strains ($\bar{x}$ ± SE) were 4.22 ± 0.667 and 4.68 ± 0.739 (mg/ml) in breeding hens blood serum, 3.46 ± 0.421 and 4.11 ± 0.671 (mg/ml) in egg yolk and 2.66 ± 0.396 and 3.09 ± 0.412 in newly hatched chicks blood serum, respectively.

It is clear that Sinai strain had significantly (P≤0.05) higher IgY concentration in hens, egg yolk and chicks than Silver Montazah strain. Also, Sinai strain had highly significantly (P < 0.01) higher egg yolk total concentration of IgY (mg) per egg than Silver Montazah strain (48.0 ± 1.013 vs 38.41 ± 0.963 mg/egg), respectively (Table 1). Similar results were reported by Carlander (2002). He stated that there were significant differences among genetic lines or breeds. For example, the IgY concentrations reported were 2.2 ± 0.4 mg/ml in Single Comb White Leghorn, 2.0 ± 0.5 mg/ml in line

SLU-1329, and 1.7 ± 0.5 mg/ml in Rhode Island Red.

Table (1): Effect of chicken strains on IgY concentration ($\bar{X} \pm S.E$) in hens, egg yolk and chicks in two local strains of chickens.

Traits	IgY concentration ($\bar{X} \pm S.E$)				
	No	S.M.	No	Sinai	Level of significantly
Hen serum (mg/ ml)	40	4.22 ± 0.667	40	4.68 ± 0.739	0.05*
Egg yolk (mg/ ml)	21	3.46 ± 0.421	21	4.11 ± 0.671	0.01**
Egg yolk total (mg/ ml)	--	38.41 ± 0.963	--	48.0 ± 1.013	0.01**
Chick serum (mg/ ml)	40	2.66 ± 0.396	40	3.09 ± 0.412	0.05*

S.M. = Silver Montazah strain

*** = Significant (P < 0.05)**

**** = Highly Significant (P < 0.01)**

Also, it was reported that the average IgY concentration in the dams serum and egg yolk in two meat line chickens was ranged from 3.26 to 6.02 mg/ml in dams serum and from 1.15 to 2.26 mg/ml in egg yolk (Hamal *et al.,* 2006). They also, reported that the total egg yolk IgY concentration was ranged from 22.5 to 43.9 mg/egg.

On the other hand, Ritu *et al.,* (2016) compared the immunoglobulin Y (IgY) level in laying hens of four different breeds of local chickens. They reported that non-significant differences in IgY concentrations were recorded among laying breeds of chickens.

1.2. Effect of chicken lines on IgY antibody concentration:

The effects of chicken lines on IgY levels ($\bar{X} \pm S.E$) in hens of control and selected lines for high (HL) and low (LL) levels of IgY in two local strains of chicken (Silver Montazah and Sinai) were given in Table (2) . The averages of IgY concentrations were 3.74 ± 1.068, 6.15 ± 1.589 and 2.44 ± 0.676 in Silver Montazah strain, where the corresponding values in Sinai strain were 4.63 ± 1.465, 6.65 ± 1.665 and 2.47 ± 0.634 for control, HL and LL lines, respectively.

The statistical differences among lines within each strain were highly significant. (P≤0.01). The percentages of change of IgY concentrations from the control line (100%) were 164.4% and 65.2% for high (HL) and low (LL) lines of Silver Montazah strain, respectively. The corresponding values were 143.6% and 53.3% for high (HL) and low (LL) lines of Sinai strain, respectively.

The statistical differences between the local strains of chickens (Silver Montazah and Sinai) maybe due to the local disease environment, the nutrient availability, clutch size and pause length. Since, Sinai strain of chickens was originally obtained from the desert areas of North and South Sinai Governorates. So, it was expected to have significantly higher IgY concentrations than Silver Montazah strain.

2. Effect of IgY antibody transferred from layers to egg yolk on fertility percentage:

2.1. Effects of chicken strains on fertility percentages:

The fertility percentages of two local strains of chickens, Silver Montazah and Sinai, are given in Table (3). Means of fertility percentages of both strains of chicken were 76.68% and 76.91% for Silver Montazah and Sinai strains of chickens, respectively. The statistical differences between both strains of chickens, Silver Montazah and Sinai, were not significant .

Table (2): Effect of chicken lines ($\overline{X} \pm S.E$) on IgY antibody concentration.

Line	No.	($\overline{X} \pm S.E$)	% Change of control
Silver Montazah Strain			
Control line	12	3.74 ± 1.068b	100.0
High IgY line	15	6.15 ± 1.589a	164.4
Low IgY line	13	2.44 ± 0.676c	65.2
Sinai strain			
Control line	10	4.63 ± 1.465b	100.0
High IgY line	16	6.65 ± 1.665a	143.6
Low IgY line	14	2.47 ± 0.634c	53.3

*** Means having different superscripts in a column with each strain are significantly different (P < 0.05)**

Table (3): Effects of IgY antibody transferred from layers (2strains) to egg yolk on fertility.

Chicken strains	No, of Layers	Fertility (%) ($\overline{X} \pm S.E$)	Level of significance
Silver Montazah	40	76.68 ± 3.42	N.S.*
Sinai	40	76.91 ± 3.48	

N.S. = Not significant

In chicken strains, the main interest has been focused on the percentages of fertility in relation to the immune response system as a useful system that can combat diseases with an integrated physiological response (Kelly *et al.,* 2000).

The present results disagree with the results reported by Abd El-Rahman, Amira (2006). She found that Norfa strain had significantly higher fertility percentages than White Leghorn strain with an fertility percentages average of 92.16% vs 74.15%, respectively.

2.2. Effects of chicken lines on fertility percentage:

The effects of control and selected lines for high (HL) and low (LL) IgY concentration of two local strains of chickens on fertility percentages are given in Table (4) . The results explained that the high IgY antibody had significantly higher percentage of fertility than the control and low IgY antibody lines in both Silver Montazah and Sinai, strains of chickens. The statistical differences among lines were significant ((P≤0.05). Also, the interaction between (S x L) was highly significant (P≤0.01).

The averages of fertility percentage of both strains of chickens were 76.97 vs 77.21 for control lines, 85.29 vs 88.19 for high lines and 68.38 vs 68.81 for low lines of Silver Montazah and Sinai strains of chickens, respectively (Table, 4).

Similar results were reported by Abd El-Rahman, Amira (2006). She found that the high antibody level lines had higher percentage of fertility than the control and low antibody level lines in both Norfa and WL strains of chickens. Also, the statistical differences among lines were highly significant (P≤0.01).

Table (4): Effect of selected line of chickens on fertility percentage.

Lines	no. of Layers	Fertility (%) ($\bar{X} \pm S.E$)	% change as control
Silver Montazah			
Control	12	76.97 ± 3.49b	100.00
High line	15	85.29 ± 4.16a	110.81
Low line	13	68.38 ± 3.12c	88.84
Sinai			
Control	10	77.21 ± 3.51b	100.00
High line	16	88.19 ± 4.21a	114.22
Low line	14	63.81 ± 2.97c	82.64

*** Means having different superscripts in a column with each strain are significantly different (P < 0.05)**

3.Effect of the IgY antibody transferred from layers to egg yolk on hatchability percentages:

3.1. Effects of chicken strains on hatchability percentages:

The average of hatchability percentages of two local strains of chickens, Silver Montazah and Sinai are given in Table (5). The means of hatchability percentages of both local strains of chickens were 72.32% and 77.60% for Silver Montazah and Sinai, respectively. Sinai strain had significantly (P ≤ 0.05) higher percentage of hatchability than Silver Montazah of chickens .

The present results agree with the results reported by Abd El-Raman, Amera (2006). She found that Norfa strain had significantly higher percentage of hatchability than White Leghorn strains of chickens. The averages of hatchability were 86.25 vs 68.88% for Norfa and White Leghorn strains of chicken, respectively. The statistical differences between strains of chickens were highly (P≤0.01) significant.

3.2. Effects of chicken lines on hatchability percentages:

The effects of control and selected lines for high (HL) and (LL) IgY concentration of two local strains of chickens on hatchability percentages are given in Table (6). The results explained that high IgY lines had higher percentages of hatchability than both control and low IgY lines in both local strains of chickens. Means of hatchability percentages were 89.18, 75.11 and 57.07% for high, control and low likes, of Silver Montazah chickens, respectively. Similar trend was observed in Sinai chickens, the means of hatchability percentages were 91.89, 77.65 and 61.33% for high, control and low lines of Sinai chickens, respectively. The statistical differences in hatchability percentages among lines were highly significant (P≤ 0.01). Also, the statistical differences of the interaction (S×L) were highly significant (P≤ 0.01) .

The present results were in good agreement with the results obtained by Abd El-Rahman, Amira (2006). She reported that the high IgY antibody line

had higher percentages of hatchability than the control and low IgY antibody lines in both Silver Montazah and Sinai strains of chickens. Also, she reported that the statistical differences among lines of both local strain of chickens were highly significant (P ≤ 0.01).

4. Effects of IgY antibody transferred from layers to hatched chicks on livability:

4.1. Effects of chicken strains on livability percentages:

The effects of two local strains of chickens, Silver Montazah and Sinai on livability percentages are given in Table (7) Means of livability percent of both local strains of chickens, Silver Montazah and Sinai were 75.14% vs 80.65%, respectively. The statistical differences between strains of chickens were significant (P≤0.05) .

It was reported that newly hatched chicks started to produce antibodies on its own immune system differs markedly between species (Grindstaff *et al.,* 2003). In some birds, production of antibodies may constitute an important addition to the ability of newly hatched chicks to take care of pathogens in order to have good livability and low mortality (Gridstaff *et al.,* 2006).

4.2. Effects of chicken lines on livability:

Effects of control and selected lines for high (HL) and low (LL) IgY levels of two local strains of chickens on livability percentages are given in Table (8). The results explained that the livability associated with the IgY concentration in layers. High IgY lines had higher percentages of livabity. The means of livability percentage were 75.83 vs 80.91% for control lines, 87.92 vs 93.49% for high lines 65.29 vs 65.79%for low lines of Silver Montazah and Sinai strains of chickens, respectively.

High IgY lines increased livability percentages by 15.09 to 17.70%, where low IgY lines decreased livability percentages by 16.95 to 21.16% as compared to control lines of both strains of chickens. The statistical differences among lines were highly significant (P≤0.01).

In this respect, the antibody response of the immune system or transferred from layers to newly hatched chicks was genetically resistance to Marek's disease (Briles and Oleson, 1971), tuberculin bacteria (Karakoz *et al.,* 1974). Salmonilla pullorum and Newcastle disease virus (Pevzner, *et al.,* 1981), lymphoid leucosis disease (Gebriel *et al.,* 1979, Nordskog and Gebriel, 1983), Escherichia coli (Peleg, *et al.,* 1985) and livability (Gebriel, 1991b).

In addition, high IgY lines increased the livability (%) by 15.09 to 17.72%, where, low IgY lines decreased livability (%) with 16.95 to 21.16% as compared to control lines of both strains of chickens. But, the statistical differences of the interaction (S×L) were not significant.

Table (5): Effects of two local strains of chickens .

Chicken strains	No, of Layers	Hatchability(%) ($\bar{X} \pm S.E$)	Level of significance
Silver Montazah	40	72.32 ± 3.11	0.01 *
Sinai	40	77.60 ± 4.14	

*** = significant (P ≤ 0.05)**

Table (6): Effects of control and selected lines for high (HL) and low (LL) of IgY concentration of two local strains of chickens on hatchability percentages.

Lines	no. of Layers	Hatchability (%) $(\overline{X} \pm S.E)$	Level of significance
Silver Montazah			
Control	12	75.11 ± 3.09b	100.00
High line	15	89.18 ± 5.92a	118.73
Low line	13	57.07 ± 2.96c	75.98
Sinai			
Control	10	77.65 ± 4.15b	100.00
High line	16	91.89 ± 6.05a	118.34
Low line	14	61.33 ± 3.67c	78.98

*** Means having different superscripts in a column with each strain are significantly different (P < 0.05).**

Table (7): Effects of strain of chickens on livability percentages.

Chickon strains	no. of hatched chicks	livability (%) ± SE	Level of significance
Silver Montazah	269	75.14 ± 4.49	0.05 *
Sinai	308	80.65 ± 4.48	

*** = significant**

Table (8): Effects of selected lines of chickens on livability percentage.

Lines	no. of hatched chicks	Livability (%) $(\overline{X} \pm S.E)$	% Change of control
Silver Montazah			
Control	80	75.83 ± 3.09b	100.00
High line	108	87.92 ± 5.92a	115.09
Low line	81	65.29 ± 2.96c	83.05
Sinai			
Control	77	80.91 ± 3.30b	100.00
High line	125	93.49 ± 2.06a	117.72
Low line	106	65.79 ± 3.58c	78.84

*** Means having different superscripts in a column with each strain are significantly different (P < 0.05)**

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تقدير تركيز المناعة الأمية (IgY) كدليل وراثي لتحسين نسب الخصوبة والفقس والحيوية في سلالتين من الدجاج المحلي

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الملخص العربي

أجريت هذه الدراسة بقسم إنتاج الدواجن و الأسماك ، كلية الزراعة بشبين الكوم ، جامعة المنوفية ، وامتدت التجربة من شهر فبراير عام ٢٠١٦م حتى شهر سبتمبر عام ٢٠١٧م ، بهدف تقدير تركيز المناعة الأمية (IgY) في كل من سيرم الدم وصفار البيض في نوعين من السلالات المحلية من الدجاج هما المنتزه الفضى وسيناء كدليل وراثي لتحسين نسب الخصوبة والفقس والحيوية . وقد نوقشت النتائج ولخصت في النقاط التالية :

1- حققت سلالة دجاج سيناء تركيز معنوى عالى للمناعة الأمية (IgY antibody) عن سلالة المنتزه الفضى ، وكان متوسط تركيز المناعة الأمية هو (٤,٤٦ مقابل ٤,٢٢ مليجرام/ مل) في سيرم الأمهات ، (٤,١١ مقابل ٣,٤٦ مليجرام/ مل) في صفار البيض ، (٣,٠٩ مقابل ٢,٦٦ مليجرام/ مل) في سيرم دم الكتاكيت حديث الفقس ، على التوالى .و٤٨,٠٠ مقابل ٤١,٣٨ مليجرام لكل بيضة في سلالة سيناء والمنتزه الفضي علي التوالي.

2- حقق الخط عالى المناعة (HR) أعلا تركيز من المناعة الأمية ، وحقق خط المقارنة (CL) تركيز متوسط، بينما حصل الخط المنخفض المناعة على أقل تركيز من المناعة الأمية في كل من دجاج سيناء ودجاج المنتزه الفضى. كان متوسط تركيز المناعة الأمية (IgY) عالية المعنوية ($P \leq 0.01$) حيث كانت ٣,٤٧ ,٦,١٥ ,٢,٤٤ مليجرام/مل في سلالة المنتزه الفضي, بينما كانت القيم المقابلة في سلالة ٤,٦٣ ,٦,٦٥ ,٢,٤٧ مليجرام /مل في خط المقارنة والخط عالي المناعة والخط المنخفض المناعة , علي التوالي

3- حققت الخطوط عالية المناعة الأمية نسبة خصوبة معنوية عالية ($P \leq 0.05$) عن خطوط المقارنة والخطوط المنخفضة المناعة الأمية ، كانت متوسطات نسبة الخصوبة هى (٧٦,٩٧ مقابل ٧٧,٢١%) في خطوط الكنترول ، (٨٥,٢٩ مقابل ٨٨,١٩%) في الخطوط عالية المناعة ، (٦٨,٣٨ مقابل ٦٨,٨١%) في الخطوط المنخفضة المناعة في كل دجاج المنتزه الفضى وسيناء ، على التوالى .

4- كان متوسط نسبة الفقس في البيض المخصب ٧٢,٣٢ مقابل ٧٧,٦٠% في سلالة دجاج المنتزه الفضى ودجاج سيناء ، على التوالى .وأيضا كانت متوسطات. أيضا كانت متوسطات نسبة الفقس (٨٩,١٨ مقابل ٩١,٨٩%) في الخطوط عالية المناعة الأمية، (٧٥,١١ مقابل ٧٧,٦٥%) في خطوط المقارنة ،

(٥٧,٠٧ مقابل ٦١,٣٣%) في الخطوط منخفضة المناعة في سلالات المتزه الفضى وسيناء ، على التوالى .

5- حقق دجاج سيناء نسبة حيوية عالية المعنوية ($P \leq 0.05$) بالمقارنة بسلالة دجاج المنتزه الفضى (٨٠,٦٥ مقابل ٧٥,١٤%) على التوالى نتيجة للتأثير المباشر للمناعة الأمية المنقولة من الأمهات البياضة إلى الكتاكيت حديثة الفقس.

6- حققت الخطوط عالية المناعة الأمية نسبة حيوية عالية معنويا ($P \leq 0.05$) . كان متوسط نسبة الحيوية (٧٥,٨٣ مقابل ٨٠,٩١%) في خطوط المقارنة ، (٨٧,٩٢ مقابل ٩٣,٤٩%) في الخطوط عالية المناعة ، (٦٥,٢٩ مقابل ٦٥,٧٩%) في الخطوط منخفضة المناعة في كل من سلالات دجاج المنتزه الفضى وسيناء ، على التوالى.

7- هذه النتائج تؤكد إمكانية استخدام تركيزات المناعة الأمية كدليل وراثى لتحسين بعض الصفات الإنتاجية في الدجاج.

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