Egypt. Poult. Sci. Vol. (40) (II): (421-440)(2020) (2003-1092)

Egyptian Poultry Science Journal

http://www.epsj.journals.ekb.eg/

ISSN: 1110-5623 (Print) – 2090-0570 (Online)

EFFECT OF MAGNETIC WATER AND FLOCK AGE ON SEMEN EVALUATION AND HATCHABILITY TRAITS IN GOLDEN SABAHIA STRAIN

Hanan H. Ghanem; Amany A.El-Sahn; Ebtsam E.E.Iraqi and Afaf I. EL-Turky

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

Corresponding author: Hanan Ghanem Email: hananhasen2003@yahoo.com

Received: 30/03/2020 Accepted: 24 /04/2020

ABSTRACT: The present study was designed to evaluate the effect of magnetic water and flock age on semen parameters, egg quality traits, some hatching traits and hatchling internal organs weight for Golden Sabahia strain chickens. Two hundred and eighty females with twenty eight males from this strain at two different ages 35 and 50 weeks were used in this experiment. Besides, 80 cocks (20 cocks / group) used for semen evaluation. Birds of each age were divided into two groups, the 1st drank non magnetic tap water (TW) and the 2nd group drank water exposed to magnetic field (MFW). The main results could be summarized as follows:

1- In Golden Sabahia strain, drank elder cocks with MFW significantly improved ejaculate volume, sperm concentration, motility percentage and number of live sperm compared with elder cocks non-drinking magnetic water.

2- Interaction between magnetic water and flock age reveals that the best improvement of egg weight and shell weight % were observed for MFW × old group.

3- Fertility and hatchability percentages improved for eggs produced from hens drank magnetic water compared with control groups. Also, drank elder chickens magnetic water (MFW × old) significantly improved fertility % compared to (TW × old) group.

4- At 18 day of incubation, the relative weight of yolk sac was higher in eggs produced from birds drank magnetic water compared with those drank non magnetic tap water ($P \leq 0.05$).

5- Drinking chickens with MFW realized the heaviest chicks body weight at hatch and significantly increased of chick length when compared with the control group for this strain. Also, drinking elder hens with magnetic water improved chick length (MFW × old) compared to (TW × old) and (TW × young) groups.

6- Magnetic water had no influence on internal organs weight of chicks at hatch and egg shell weight at 14 and 18 day of incubation.

It was concluded that treated Golden Sabahia strain with magnetic water improved semen parameters, egg quality traits, fertility and hatchability percentages especially for older age.

Key words: Magnetic water, flock age , semen , egg quality, hatching traits,Golden Sabahia

INTRODUCTION

Water is important for living organisms, it is necessary for all numerous vital functions such as digestion, wastes excretion, temperature regulation and transport of nutrients, hormones and oxygen (Counotte et al.,2003). Magnetized water is one of treatment that has improved the properties of water (Attia et al.,2015). The scientific basis for the magnetic technology is a result of the physics of interaction between a magnetic field and a moving electric charge (Yacout et al., 2015). The mineral content of water can be affected by treated water with magnetic filed and its effects depend on the strength of magnetic field and exposure time (Ebrahim and Azab 2017). In addition, magnetic or electrostatic scale technologies can be used as a replacement for chemical softening (lime or limes-soda softening), ion exchange, and reverse osmosis for improving water quality. The drinking of alkaline water has a beneficial influence on poultry health (Olteanu et al.,2012). Moreover, magnetic water increased efficiency in the biochemical reaction of sperm cells (Wang et al., 1998). Also, Al-daraji and Aziz (2008) and El-Hanoun et al. (2017) showed that the quality and quantity of the semen that received magnetized water were significant better than those of tap water. As a result of increasing shell thickness and weight by drinking magnetized water, eggshell quality enhanced but had no effects on egg yield or weight (El-Sabrout and Hanafy ,2017 ; El-Sabry et al.,2018).

Researchers have indicated that flock age influence egg weight and internal egg components and their ratios (Tona et al., 2004 and Nangsuay et al., 2011and 2013). Also, Lapao et al. (1999) reported that albumen height was decreased with breeder age. Moreover, Hamidu et al.(2007) reported that old breeder age has been influence embryonic metabolism during the later period of incubation, which coincided with an increase of embryonic mortality during these days of incubation. Eggs from young flocks have been reported to possess thick shells and produce smaller chicks, resulting in increased embryo mortality (Pedroso etal.,2005). Breeder age affect the absorption and utilization of nutrient from the yolk sac by the embryo (Yadgary et al., 2010). Also, yolk-free body weight, chick weight at hatch are affected by flock age (ȮDea et al., 2004 ;Tona et al., 2004). Chick weight and length are largely measured to evaluated chick quality because there is a critical relationship between baby chick quality and post hatch broiler performance (Tona et al., 2003 and Meijerhaf, 2009).

There are some problems occurring for old cocks,semen parameters and hatchability traits decrease with age in poultry. So the goal of this study was undertaken to search out the effect of magnetized water and flock age for Golden Sabahia strain on semen parameters, egg quality traits, embryos development and hatching traits.

MATERIAL AND METHODS

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

Experiment Design:

Two hundred and eighty females with twenty eight males for Golden Sabahia strain (Ghanem et al., 2017) were used in this study. These breeds were randomly distributed among two different ages 35 and 50 weeks of age at the beginning of the study. Birds of each age were housed

in floor pens as replicates (14 replicate /age) , sex ratio comprised 1 male for 10 females for each pen and divided into two groups the 1st one treated with non magnetic tap water (TW) (70 females+7 males) and the 2nd group treated with tap water exposed to magnetic field (MFW) of 14000 Gauss (70 females+7 males).

The ingredient profiles and nutrient composition of the diet containing 16% crude protein and 2800 ME Kcal / Kg diet according to the recommendation of Animal Production Researsh Institue (Table 1).

The chemical composition of two water types was done twice one at the initiation of the experiment and the other at the end of the experiment and is shown in Table 2. Water was exposed to a magnetic field by a permanent magnet in a compact form using a unit called Delta water (Company for magnetic water softeners and Conditioners, Egypt , Figure 1). This is a coaxial permanent system equipment that produced magnetic field strength as high as 14000 Gauss. The strength of the magnet was measured by a gauss meter before the initiation and after the termination of the experiment. This measurement and that for chemical composition of water was done at Application Laboratory, City for Scientific Research and Biotechnology and Egypt-Japan University of Science and Technology, Egypt.

Birds subjected to 16 hours light and 8 hours dark during the experimental period. Feed and water were provided *ad-libtum*. Eggs were collected for 7 days from each group (at 40 wks of age for young and 55 wks of age for old hens). Total of 4200 hatching eggs (700 hatching eggs × 3 batch × 2 age) representing the experimental groups were incubated in Egyptian made incubation at 37.8 and 55% RH during incubation and at 18 day of incubation transferred to hatchers at 37.7 and 65% RH.

Semen Evaluation:

At 45 weeks of age for young cocks and 60 weeks of age for old cocks, 80 cocks (20 cocks / group) were used to evaluate semen quality. Semen samples were collected from cocks of each group once weekly by abdominal massage technique. Some semen parameters were determined such as ejaculate volume(ml),sperm forward motility(%) and live,dead and abnormal sperms (%). Also, sperm concentration was measured by using a haemocytometer according to the procedure described by Bratton et al.(1956). Number of motile sperm was determined by multiplying percentage of forward motility by sperm output. Also, number of live sperm was determined by multiplying percentage of live sperm by sperm output.

Egg quality traits:

A total of 10 eggs were collected from each group at 43 for young hens and 58 for old hens weeks of age, egg quality measurements were taken within four hour after collection. Eggs were weighted with grams and egg shape index was calculated by dividing egg width by egg length and multiplied by 100. The heights of the albumen and yolk in millimeter were measured using Ames Triple Micrometer. Yolk was separated from the albumen and weighted; the weight of albumen was calculated. Yolk, albumen and shell weight were expressed as percentages of egg weight. The shell with membrane thickness (mm) was measured at three places in egg shell using a micrometer.

Egg weight loss, embryonic mortality, Fertility and hatchability percentages:

At 0 and 19 day of incubation all eggs were weighed (g), the percentage of egg weight loss for incubation interval (0-19 days) per each group was calculated. Embryonic mortality percentage expressed as a percentage of fertile eggs set was recorded and classified into three periods (1-7, 8-14 and 15-20 days). Hatching eggs were numbered, and weighted. Macroscopic fertility was estimated as a percentage of fertile eggs out of the number of eggs set. Hatchability of total eggs was estimated as a percentage of sound chicks out of the total eggs set. Hatchability of fertile eggs was estimated as a percentage of sound chicks out of the fertile eggs.

Embryo, yolk sac, egg shell and hatchling body weight, egg shell thickness and chick length

At days 14 and 18 during incubation, eight eggs chosen randomly from each experimental group (total 32 eggs) were weighed and opened then the embryos were separated from the remaining egg contents . Embryos were rinsed in saline and blotted dry on an absorbent paper to remove excess moisture. The dried embryos were allowed to room temperature and then weighed to the nearest 0.001 g. Also, Relative yolk free embryo body weight to egg weight was determined. Then, egg shell weight and thickness were determined for the same eggs and in the same days of incubation. At hatch, chicks were weighed to nearest gram. Also, chick length was measured from the tip of the beak to the end of the middle toe with the chick's dorsal surface extended over a ruler.

Internal organs weight of hatched chicks:

At hatch, relative chicks organs defined as the ratio of stomach, fabricious gland, heart, liver and intense to chicks' weight were calculated.

Statistic analysis:

Data of all studied traits were analyzed using fixed models SAS 2004 using the following model

$Y_{ijk}=\mu+T_i+A_j+(TA_{ij})+e_{ijk}$

Where :

Y_{ijk}: an observation, μ: overall, T_i: effect of treatment, A_j: effect of age, (TA_{ij}): interaction between the main effect, e_{ijk}: the residual effect. Significant differences among mean were tested using Duncan's Multiple Range test (Duncan, 1955).

RESULTS AND DISCUSSION

Water analyses

Analyses of water used in this studied was clarified in Table 2. In brief, water quality was found to be considerably different between tap water and magnetic water. In our research observed that magnetic water had better quality than tap water with respect to pH , conductivity, salinity, dissolved oxygen, sodium, potassium, calcium, magnesium, chloride and carbonate bicarbonate .

Physical semen parameters

Semen parameters were influenced by interaction between magnetic water treatment and flock age for Golden Sabahia as apparent in Table 3. The lowest significant value of semen volume, sperm concentration and sperm output were recorded for older cocks treated with tap water compared with the rest groups. Also, previous traits did not represent any statistical differences among groups treated with magnetic water, regardless of breeder age (MFW× old and MFW× young). Sperm motility % was higher in cocks

supplemented with magnetic water for both flock age than those for other groups. Supplementation cocks with MFW for younger flock age (MFW× young) represented the highest significant value of live sperm% compared with old group (MFW ×old). The opposite trend was detected for abnormal sperm. On the other hand, dead sperm% was similar between interaction groups. Older cocks treated with tap water represented significant reduction of number of motile sperm and number of live sperm compared with those for other group. But there was no statistical difference in previous parameters between TW × young and MFW× old. Age has an adverse effect on the reproductive success of birds.

Our results confirmed with Tabatabaei et al.(2011) who found that by increasing the rooster age from 26-45 weeks, motility % and viability rates of spermatozoa were reduced. Also, Cerolini et al. (1997) and Zhang et al. (1999) reported that likewise sperm concentration either decreases linearly with age or remains stable for a certain period and then decreases.

The improve in the quality of magnetized water (Table 2) was reflected improved semen parameters (Table 3) resulted from cocks treated with magnetic water compared to control are confirmed by Al-Daraji and Aziz (2008) who reported that the improvement in semen quality traits may be due to magnetic waters circulation of blood and oxygen. Moreover, MFW can increase the ability of the body to produce hormones like sexual hormones and improved semen characteristics (Al-Nueimi et al., 2015).

Egg composition

Interaction between MFW and flock age for Golden Sabahia reveals that best improvement of egg weight and shell weight % were observed for MFW×old age (Table 4). Moreover, the highest relative percentage of yolk weight was recorded for TW × old age and TW × young age. While albumen weight % and Haugh unit were not statistically influenced among all interactions. Moreover, the decrease of egg shell thickness was recorded for group of interaction TW×old. Beside that, eggs of TW × young group represented the same reduction of shell thickness without statistical change with the rest groups.

The increase of egg weight with advancing hen age is due to the decrease both of yolk content and egg shell weight, and the increase of albumen content. This result is supported by Nangsuay et al. (2011) and Vieira and Moran (1998) who concluded that albumen weight increased and yolk decreased by increasing egg size. Also, the increase of egg shell thickness and albumen height for eggs produced from younger flock for eggs produced from younger flock age are demonstrated by Rizk el al. (2008) and Santos et al.(2015) who reported that the age of females decreased the HU and egg shell thickness. Moreover, Iraqi et al. (2017) demonstrated that decreased egg shape index related to the advancing age.

This result was in line with those reported by El-Hanoun et al. (2017) who mentioned that MFW group increased egg shell (%), shell thickness and egg shape index compared with tap water groupin geese eggs. Moreover, El-Sabrout and Hanafy (2017) found that MFW grated more hydroxyl (OH) ions to from calcium carbonate ($CaCo_2$) which is the main component of egg shell ,as found in table 2. On the other hand, the improvement in egg weight are general

agreement with those reported by El-Hanoun(2014), El-Hanoun et al.(2017) and Hassan et al. (2018) who mentioned that magnetic water improved the reproductive performance of birds.

Hatching traits

Data of Table 5 display the interaction between magnetic water treatment and flock age for Golden Sabahia on some incubation parameters. A significant interaction between breeder age and MFW was found for fertility %. It can be observed that younger birds treated with MFW represented the highest significant fertility% compared with the rest groups with no statistical change with MFW × old. Although egg weight loss%, embryonic mortality% and hatchability % for both set and fertile eggs were not statistically influenced among all interaction. Numerically,in within each parental age, eggs produced from hens treated with magnetic had a better hatchability % compared with control groups.

Our data is confirmed by Kirk et al.(1980) and Iqbal et al.(2016) recognized that fertility decreased with age. Many researchers observed that there was many contributing factors affected on hatchability and caused reduction of hatchability of eggs from older flocks as poorer shell quality due to bigger surface area (Bennett 1992), larger egg size (Leeson and Summers 2000), increased early and late embryo mortality (Elibol and Braket 2003), albumen quality deterioration (Tona et al. 2004) and increased the yolk cholesterol content (Dikmen and Sahan, 2007).

The embryo is especially sensitive to external factors that may have a detrimental effect on its development (Dzuganet al., 2011). Embryogenesis is one of the most important developmental stages, and the biological value of adult organisms and breeding results are largely dependent on proper embryonic development. El-Hanoun et al. (2017) evaluated that magnetic treatment of tap water improved fertility and hatchability percentages, health status and biological performance, reproductive hormone levels, total antioxidant capacity of geese and these effects could be due to increased mineral solubility, facilitating nutrient transfer across cell membranes thus, uptake and utilization (Attia et al. (2013) and (2015), and Yahav et al.(2004)).

Yolk absorption and embryonic development

As can be seen from data of Table 6 that the relative yolk weight at 14d and hatch were lower for embryos and chicks produced from birds of Golden Sabahia treated with the magnetic water of both breeder age groups compared with the control groups. At 18d of incubation, the yolk sac % was higher in eggs produced from birds treated with magnetic water compared with those for non treated group ($P \leq 0.05$). Also, eggs from older flock yielded greater yolk sac% than did eggs from the young flock at the same age of incubation. No significant interaction between breeder age and magnetic water treatment was found for embryo body weight from d14 to hatching.

Maximum chicks body weight ($P \leq 0.05$) was found for birds treated with magnetic water (39.26 g). Also, older flock had heavier significant body weight chicks (39.29 g) than younger flock (37.70 g). For both age, lengths of chicks produced from hens supplemented with magnetic water were significantly longer than those for other rest groups. Moreover, Nangsuay et al.(2011) found that the

percentage of yolk absorption through d 18 and percentage yolk absorption at hatch were lower in large eggs than in the small eggs. A possible explanation is that the large amount of albumen in large eggs compared with small eggs can result in less protein uptake from the yolk. So, less yolk would have been absorbed by the chicks of the large eggs compared with those of the small eggs. Moreover, our results are in agreement with the results obtained by OSullivan et al.(1999) who suggested that the higher availability of resources in the eggs, perhaps associated with changes metabolic functions due to the advanced maturity of the hens, can result in a higher nutrient assimilation to the embryos of old hens compared with those of young hens. The increase in chick size may be due to increasing egg weight is attributable to the fact that egg weight, yolk weight and albumen weight improved as the age increased in chickens as reported by Hurnik et al.(1997).

Our results are documented by Ahmed et al. (2016) who found that bone of wings, tibia and fumer tend to be longer in chicks from elder hens than the younger. The present results indicate that magnetizing water significantly increase yolk absorption and this was reflected on improve chick weight. These improvements could be explained based on the effect of magnetic treatment to improving solubility of minerals of water, which facilities the transfer of the nutrient via cells, thus nutrient uptakes and utilization as the water is the media for all the biological and metabolic reactions (El-Hanoun, 2014). The marked increase of studied chick length could be due to the effect of magnetic water. Balieiro et al.(2017) reported that the consumption of water treated by magnetic field for 45d provided an effective way to improve the bone mineral density, bone mineral content, and bone resistance in Wistar rats.

Egg shell weight and thickness at 14 and 18 d of development

Table 7 indicated that there was no significant interaction between MFW and breeder age for Golden Sabahia strain on egg shell weight% at 14d and 18d and egg shell thickness at 14d. However, in both age, the hens that were provided MFW had thinner egg shell than did the control groups ($P \leq 0.05$) at 18 day of embryogenesis.

The lower of egg shell thickness at 18d may be related to the enhancement of Ca from the shell during embryogenesis to meet the needs of hatch. Alfanso-Torres et al. (2009) accelerated that different percentage of calcium in the egg shell may affect bone development in embryogenesis.

Internal organs

In Golden Sabahia strain, the relative weight of stomach, fabricious gland, liver, intense and heart was not statistically influenced among all experimental groups (Table8). These results are in accordance with the previous researches reported by El-Hanoun (2014) who mentioned that geese drank water exposed to magnetic water had no benefic effects on the relative weight of liver and gizzard. Also, Sargolzehi et al. (2009) showed that magnetic water did not positively affect carcass composition. Our results are supported by Fares et al. (2015) who found that the significant difference in initial egg weights before incubation did not affect the relative weights of liver or heart body chicks.

IN CONCLUSION,

magnetizing tap water with 14000 gauss for Golden Sabahia strain particularly for old chickens, could be a useful tool for improving semen parameters, egg quality and hatchability traits.

ACKNOWLEDGEMENTS

We would like to thank Dr. Ahmed Ibrahim, Chairman of the broad of Delta Water Company for his support in this study and for supplying it with a magnetic water treatment device.

Table (1): Composition and the nutritive value of the basal diets

Ingredients	**%**
Yellow corn	66.33
Soybean meal (44%)	24.2
Dicalcium phosphate	1.32
Limestone	7.50
Salt (Nacl)	0.25
DL – methionine	0.15
Vit& Min mix.*	0.25
Total	**100.00**
Calculated analysis:	
Metabolizable energy (Kcal/kg)	2777
Crude protein %	16.97
Calcium %	3.1
Available phosphate %	0.37
Methionine % + cyctine %	0.67
Lysine %	0.8

* Composition of premix in 3 kg is :Vit. A, 10.000 IU ;Vit . D3, 2.000 IU ;Vit E , 10.000 mg ; Vit. K3,1.000 mg; Vit . B1 , 1 mg ; Vit . B2 , 4 mg ; Vit B6 ,1.5 mg ; Vit . B12 , 10 mcg ; Niacin , 20.000 mg ; Pantothenic acid 10.000 mg ; Folic acid , 1 mg ; Biotin , 50 mg ; Choline chloride , 500 mg ; Copper , 4 mg ; Iron , 30 mg ; Manganese , 40.000 mg ; Zinc , 45.000 mg ; Cu , 3.000 mg ; Iodine , 300 µg ; Selenium , 0.1 mg ; Cobalt , 0.1 mg, carrier $Caco_3$ add to 3 Kg.

Table (2): Analysis of water types used in the experiment*

Parameters	**Unit**	**Tap water**	
		Unmagnified	**magnetized**
PH	-	6.83	7.10
Conductivity	Ms/Cm	693	736
Salinity	Mg/L	360	390
Dissolved Oxygen	ppm	6.5	7.3
Sodium (Na^+)	ppm	6.3	7.1
Potassium (K^+)	ppm	1.4	1.8
Calcium (Ca^{2+})	ppm	16.7	17.5
Magnesium (Mg^{2+})	ppm	4.6	5.4
Chloride (Cl^-)	ppm	2.9	3.1
Carbonate (CO_3^-)	ppm	3.8	4.1
Bicarbonate (HCO_3^-)	ppm	24.1	25.6
Organic matter	ppm	50	41

* Analyzed water at laboratory of Egypt- Japan University of Science and Technology , Alexandria, Egypt .

Table (3): Effect of magnetic water treatment, flock age and their interactions on semen evaluation traits of Golden Sabahia strain

Main effect	Semen parameters								
	Ejaculate volume(ml)	**Sperm concentration (×10^8/ml)**	**Sperm forward Motility(%)**	**Live sperm(%)**	**Dead sperm(%)**	**abnormal sperm(%)**	**Sperm output (×10^8/ejaculate)**	**Number of motile sperm (×10^8/ejaculate)**	**Number of live sperm (×10^8/ ejaculate)**
Water treatment									
Tap water (TW)	0.41±0.07b	2.29±0.11b	83.2±1.83b	94.3±0.58	2.6±0.22	3.1±0.46	0.98±0.19b	82.10±15.68b	92.05±17.64b
Magnetic water (MFW)	0.54±0.05a	2.92±0.07a	93.5±1.12a	95.42±0.48	2.08±0.34	2.5±0.29	1.59±0.17a	148.52±15.98a	152.53±17.22a
Sig	*	**	**	Ns	Ns	Ns	**	**	**
Flock age									
Old 50 wk	0.35±0.06b	2.41±0.14b	87.1±2.64	93.8±0.49b	2.6±0.34	3.6±0.37b	0.90±0.18b	84.17±17.01b	93.8±0.49b
Young 35 wk	0.58±0.03a	2.81±0.1a	90.25±1.67	95.83±0.42a	2.08±0.26	2.08±0.23a	1.66±0.15a	149.1±14.97a	159.1±14.97a
Sig	**	**	Ns	**	Ns	**	**	**	**
Interaction									
TW × old	0.25±0.09b	2.02±0.06c	82.60±3.74b	93.46±0.93b	2.8±0.37	3.8±0.73a	0.53±0.21b	44.27±17.05c	48.92±18.57c
TW × young	0.55±0.02a	2.55±0.12b	84.4±0.60b	95.2±0.49ab	2.4±0.25	2.40±0.4bc	1.42±0.11a	119.94±10b	135.18±11.18b
MFW × old	0.45±0.07a	2.80±0.08ab	92.2±2.08a	94.2±0.37b	2.4±0.60	3.4±0.24ab	1.27±0.21a	116.44±18.96b	119.42±19.42b
MFW × young	0.6±0.06a	3.0±0.1a	94.43±1.25a	96.29±0.61a	1.86±0.40	1.86±0.26c	1.83±0.23a	171.43±20.54a	176.18±22.98a
Sig	**	**	**	*	Ns	*	**	**	**

[a ,b,c]Means within the same column in the same trait with different superscripts are significantly different (P≤0.05) .

Table (4): Effect of magnetic water treatment, flock age and their interactions on some egg quality traits of Golden Sabahia strain.

Main effect	Egg weight (g)	Egg shape index	Yolk weight %	Albumen weight %	Albumen height (mm)	Shell weight %	Shell thickness (mm)	Haugh unit
Water treatment								
Tap water (TW)	52.61±0.55b	75.52±1.03	32.69±068b	53.1±0.61b	8.05±0.57	14.36±0.43b	0.34±0.009b	89.82±3.58
Magnetic water (MFW)	54.96±0.70a	76.96±0.52	30.18±0.59a	54.96±1.16a	8.15±036	15.13±0.49a	0.36±0.007a	91.02±2.02
Sig	**	NS	**	*	NS	*	*	NS
Flock age								
Old 50 wk	55.71±0.65a	77.19±0.53	31.19±0.71	54.03±0.75	7.43±0.46b	15.22±0.46a	0.34±0.006b	86.22±2.88b
Young 35 wk	52.05±0.47b	74.84±1.11	31.71±0.65	53.67±1.46	9.13±0.22a	14.31±0.43b	0.36±0.01a	96.93±0.98a
Sig	**	NS	NS	NS	*	*	*	*
Interaction								
TW × old	53.63±0.68b	77.59±0.93a	32.93±0.87a	52.85±0.70	7.46±0.86	14.93±0.36b	0.33±0.011b	85.6±5.35
TW × young	51.80±0.76b	72.14±1.49b	32.28±1.20a	53.30±1.16	9.04±0.23	13.78±0.41c	0.345±0.014ab	96.86±0.93
MFW × old	57.0±078a	76.84±0.55a	29.46±0.84b	55.92±1.04	7.4±0.41	15.5±0.48a	0.35±0.007a	86.8±2.92
MFW × young	52.30±0.60b	77.14±1.05a	31.22±0.67b	54.03±2.53	9.21±0.38	14.75±0.42b	0.36±0.014a	97.0±1.72
Sig	**	**	*	NS	NS	*	*	NS

[a ,b,c]Means within the same column in the same trait with different superscripts are significantly different (P≤0.05) .

Table(5): Effect of magnetic water treatment, flock age and their interactions on fertility percentage and some hatchability traits of Golden Sabahia strain

Main effect		Embryonic mortality			Fertility %	Hatchability %	
	Egg weight loss (0-19)	Early (1-7 days)	Mid (8-14 days)	Late (15-20 days)		of total eggs	of fertile eggs
Water treatment							
Tap water (TW)	10.02±0.79	1.37±0.57	0.93±0.37	9.7±114	91.43±0.55b	87.99±1.38	82.28±1.42
Magnetic water (MFW)	9.13±1.52	1.27±0.55	085±0.35	8.36±134	94.58±0.45a	89.51±1.11	82.29±110
Sig	Ns	Ns	Ns	Ns	**	Ns	Ns
Flock age							
Old 50 wk	10.46±1.46	1.86±0.72	0.71±0.34	10.30±145	92.27±0.74b	87.13±1.52	82.35±1.56
Young 35 wk	8.46±1.23	0.78±0.24	1.07±0.37	7.77±0.85	93.75±0.42a	90.38±0.61	84.22±0.91
Sig	Ns	Ns	Ns	Ns	*	Ns	Ns
Interaction							
TW × old	10.71±1.33	2.02±1.07	1.07±0.61	10.62±1.95	90.44±0.94c	86.30±2.39	81.46±2.45
TW × young	9.62±1.0	0.73±0.36	0.79±0.47	8.79±1.25	92.43±0.40b	89.70±1.16	83.09±1.65
MFW × old	10.22±1.30	1.71±1.08	035±0.26	9.98±2.38	94.10±0.82ab	87.97±2.08	83.23±2.14
MFW × young	8.07±1.66	0.83±0.35	1.36±0.61	6.74±1.07	95.06±0.45a	91.06±0.35	85.35±0.59
Sig	Ns	Ns	Ns	Ns	*	Ns	Ns

[a ,b,c]Means within the same column in the same trait with different superscripts are significantly different (P≤0.05) .

Table(6): Effect of magnetic water treatment, flock age and their interactions on embryo, hatchling body weight, chick length and yolk sac % at different age of incubation for Golden Sabahia strain.

Main effect	Embryo body weight		Hatchling body weight	Yolk sac %			Chick length (cm)
	14d	18d		14d	18d	21d	
Water treatment							
Tap water (TW)	24.41±0.73	35.05±0.85	37.56±0.64b	54.99±2.75a	28.85±1.2b	13.25±0.81a	17.8±023b
Magnetic water (MFW)	25.73±041	36.05±0.58	39.26±0.45a	52.51±1.02b	32.08±1.0a	9.11±0.76 b	19.5±0.44a
Sig	NS	NS	*	*	*	*	*
Flock Age							
Old 50 wk	25.21±071	35.81±0.54	39.29±0.55a	55.45±3.05a	32.51±007a	11.10±0.60a	19.2±0.29
Young 35wk	25.88±053	35.22±0.94	37.70±0.52b	52.77±0.97b	30.21±1.11b	10.35±1.01b	18.89±0.33
Sig	NS	NS	*	*	*	*	NS
Interaction							
TW × old	24.75±1.29	35.43±1.48	38.38±1.07	55.19±2.12a	29.19±1.30	12.64±1.05a	17.83±0.33b
TW × young	25.93±0.84	34.85±1.07	36.9±0.77	55.72±1.22a	28.18±1.9	12.31±1.23a	17.75±0.36b
MFW × old	25.67±0.06	36.0±0.41	39.85±0.58	53.47±1.28b	32.94±1.05	9.16±0.73b	19.75±036a
MFW × young	25.8±0.47	36.2±2.08	38.5±0.65	51.73±147b	31.62±1.09	9.22±1.08b	18.56±1.0a
Sig	NS	NS	NS	*	NS	*	*

[a,b]Means within the same column in the same trait with different superscripts are significantly different (P≤0.05) .

Table(7): Effect of magnetic water treatment, flock age and their interactions on egg shell weight and thickness, at 14 and 18 days of incubation for Golden Sabahia strain

Main effect	**Egg shell weight (g)**		**Egg shell thickness (mm)**	
	14 d	**18 d**	**14 d**	**18 d**
Water treatment				
Tap water (TW)	6.37±0.16	5.894±0.34	0.33±0.001	0.30±0.05a
Magnetic water (MFW)	6.27±0.18	5.66±0.29	0.329±0.001	0.282±0.011b
Sig	NS	NS	NS	*
flock age				
Old 50 wk	6.33±0.14	5.9±0.286	0.325±0.001	0.288±0.045
Young 35 wk	6.320±0.19	5.57±0.35	0.330±0.001	0.294±0.004
Sig	NS	NS	NS	NS
Interaction				
TW×old	6.58±0.23	5.92±0.51	0.33±0.001	0.295±0.12a
TW×young	6.20±0.22	5.68±0.47	0.331±0.001	0.302±0.006a
MFW×old	6.08±0.15	5.86±0.36	0.321±0.001	0.279±0.12b
MFW×young	6.5±0.34	5.46±0.49	0.329±0.001	0.285±0.009b
Sig	NS	NS	NS	*

[a,b]Means within the same column in the same trait with different superscripts are significantly different ($P \leq 0.05$) .

Table(8): Effect of magnetic water treatment, flock age and their interactions on some internal organs of hatched chicks .

Main effect	Stomach %	Fabricious gland %	Heart %	Liver %	Intense %
Water treatment					
Tap water (TW)	4.43±0.12	0.54±0.08	0.59±0.02	2.43±0.09	4.02±0.19
Magnetic water (MFW)	4.51±0.12	0.44±0.09	0.63±0.02	2.35±007	3.75±0.16
Sig	NS	NS	NS	NS	NS
Flock Age					
Old 50 wk	4.51±0.13	0.50±0.08	0.63±0.02	2.34±0.08	3.80±0.15
Young 35 wk	4.40±0.08	0.48±0.09	0.59±0.02	2.46±0.08	4.01±0.21
Sig	NS	NS	NS	NS	NS
Interaction					
TW × old	4.47±0.23	0.61±0.13	0.62±0.04	2.32±0.17	3.94±0.28
TW × young	4.39±008	0.48±0.103	0.56±0.02	2.52±0.08	4.14±0.26
MFW × old	4.54±0.16	0.42±0.1	0.64±0.03	2.35±0.08	3.70±0.18
MFW × young	4.43±0.18	0.49±0.21	0.63±003	2.35±0.17	3.86±0.34
Sig	NS	NS	NS	NS	NS

Figure (1): Magnetic device was used in this study (Delta water 14000 gauss)

REFERENCES

Ahmed, Mona, R. ;Wesam, A. Fares.; Rizk,R.E.; and AbdAlla, E.A. 2016. Skeleted embryonic development and hatching traits as affected by egg shell osteopontin protein during two stage of laying cycle. Egypt. Poult. Sci. **J.**, 36:805-823.

Al-Daraji, H.J.; and Aziz, A.A. 2008. The use of magnetically treated water for improving semen traits of roosters.Alanbar. J. Vet. Sci., 1:79-92.

Alfonso-Torres, K.A.; Gargaglioni,L.H. ; Pizauro,J.M.; Fariafilho,D.E.; and Furlan, R.L. 2009. Breeder age and bone development in broiler chicken

embryos. Veterinaria,Zoot.,61:219-226.

Al-Nueimi, S.H.; Al-Badry, K.J.; Atteyh, A.J.; Alsabea, W.S.; Ibrahim, F.F.; and Rajab, B. 2015. Effect of magnetic water drinking on testis dimension, scrotal circumference and blood parameters of Holstein bulls bron in Iraq. Adv. Anim. Vet. Sci., 3:413-417.

Attia, Y.A.; Abd El-Hamid, A.; El-Hanoun, A,M.; Al-Harthe, M.A.; Abdel-Rahman, G.M.; and Abdella, M.M.2015. Response of the fertility, semen quality, blood constituents, immunity and antioxidant status of rabbit bucks to type and magnetizing of water. Ann.Anim. Sci.,15:387-407.

Attia, Y.A; Abd El Hamid,E.;Ismaiel, A.M.; El Nagar, A.; and Asmaa, S. 2013. The toxication of nitrate by two antioxidants oraprobiotic and the effects on blood and seminal plasma profiles and reproductive function of NZW rabbit bucks. Anim.,7:591-601.

Balieiro,N. G.;Engraciafilho, J.R.;De Oliveira, B.R.S.M.; Coelho, C.M.M.;De Souza, L.F.A.; and Louzada, M.J.Q. 2017. Water treatment by magnetic field increases bone mineral density of rats. J.Clin.Densit., 20: 526-531.

Bennett, C.D., 1992. The influence of shell thickness on hatching in commercial broiler flocks. J Appl. Poult. Res., 1:61–65.

Bratton, R. W.; Foote,K.; and Shipman, K. 1956. Procedure for counting bovine sperm with a heamocytometer and calibration ofperation used of photometer to estimate sperm count by optical density. Anim. Breed. Lab. Procedure. No. 40, Cornell Univ. Thaca. N.Y., USA.

Cerolini, S.; Kelso, K.A.; Noble, R.C.;Speake, B.K.;Pizzi, F.; and Cavalchini, L.G. 1997. Relationship between spermatozoan lipid composition and fertility during aging of chickens. Biology Reprod.**,**57:976–980.

Counotte, G.; Avicultur, A.; and Conocer,B. 2003. Doe tinchem: Reed Business Information, 20-22.

Dikmen, B.Y.; and Sahan, U. 2007. Correlation between breeder age, egg cholesterol content, blood cholesterol level and hatchability of broiler breeders.Br.Poult. Sci.,48:98-103.

Duncan, D.B.,1955. Multiple range and multiple F. Test. Biometrics, 11:1-24.

Dzugan,M.;Droba, M.; and Niedziolka,W.J. 2011. Effect of cadmium injected inovo on hatching results and the activity of plasma hydrolytic enzymes in newly hatched chicks. Acta. Veterinaria. Hungarica., 59:337-347.

Ebrahim, S.; and Azab, E. 2017. Biological effect of magnetic water on human and animals.Biomedical,Sci., 3:7-85.

El- Sabry, M.I; Charal, J.W; Mcmillan, K.W.; and Lavergene,T.A. 2018. Does magnetized drinking water affect productivity and egg quality of layers. Egypt.J. Anim. Products., 55:117-123.

El-Hanoun, A.M. 2014. Effect of magnetically treated water on some productive and reproductive performance in Egyptian gees. 7th International Poultry Conference – Proceeding 3-6 Nov. Ainm.Sukhna.Red.Sea.Egypt., pp:93-103.

El-Hanoun, A.M.; Wesam, A.Fares.;Attia, Y.A.; and Abdella, M.M. 2017. Effect of magnetized well

water on blood components, immune indices and semen quality of Egyptian male geese.Egypt.Poult. Sci. J., 37:91-103.

Elibol, O.; and Braket J. 2003. Effect of frequency of turning from three to eleven days of incubation on hatchability of broiler hatching eggs.Poult. Sci., 82:357–359.

El-Sabrout, K.; and Hanafy,M. 2017. Effect of magnetized water on productive traits of laying chickens. Anim. Sci., 33:739-742.

Fares, Wesam.A.; Mona, R,M. Ahmed.; Rizk, R.E.; and Shahein, E.H. 2015. Effect of egg shell conducatance constant on embryonic intestine function, hatching characters and subsequent growth for developed chickens and its relation with 1-hatching eggs storage. Egyp**t.** Poult. Sci. J.,35:875-893.

Ghanem, Hanan,H.; Afaf, I. El-Turky.; Abou El-Ghar, R.Sh.; Aly, O.M.; Hedaia, I. Shalan.; and Mahmoud, T.H. 2017. Golden Sabahia..A new strain of chickens. Egypt.Poult.Sci. J.,37:57-63.

Hamidu,J.A.; Fasenko, G.M.; Feddes, J.J.; O Dea, E.E.; Ouellette, C.A.; Wineland,M.J.; and Christensen, V.L. 2007. The effect of broiler breeder genetic strain and parent flock age on egg shell conductance and embryonic metabolism. Poult.Sci., 86:2420-2432**.**

Hassan,S.S.;Attia,Y.A.; El-Sheikh, M.H.Ali.; and Abdelkader, M.A.2018. Productive egg quality and physiological responses of Gimmizah chicken as affected by magnetized water of different strengths. Egypt. Poult. Sci. J., 38: 51-64.

Hurnik, J.F.;Summer, J.D.; Reinhart, B.S.;and Sweirczewks, E.M. 1997.Effect of age on the performance of laying hens during the first year of production. Poult. Sci., 56:222–230.

Iqbal, J.; Khan, S. H.;Mukhtar,N.; Ahmed, T.;and Pasha, R.A. 2016. Effects of egg size (weight) and age on hatching performance and chick quality of broiler breeder. J.Anim.Res., 44: 54–64.

Iraqi,Ebtsam,E.E.;Mona,M.A.;Wesam, A.Fares.;El-Prollosy,A.A; and Rizk,R.E.2017.Effect of supplementing the diet with carotenoids-enriched Spirulina algae.1-On productive performance and physiological response of developed chickens. Egypt.Poult.Sci. J.,37:603-602.

Kirk, S.; Emmans, G.C.;Mcdonald, R.;andArnot, D. 1980. Factors affecting the hatchability of eggs from broiler breeders.Br.Poult. Sci., 21:37–53.

Lapao,C.;Gama,L.T.; and ChaveiroSoares,M. 1999. Effects of broiler breeder age and length of egg storage on albumen characteristics and hatchability. Poult.Sci.,78:640-645.

Leeson, S.;and Summers, J.D. 2000. Broiler breeder production.Guelph: University Books.

Meijerhaf, R. 2009. The influence of incubation on chick quality and broiler performance. 20th Annual Australian Poult.Sci. Symposium, 9-11 Feb., 2009, Sydney. NSW, Australia., pp.167-170.

Nangsuay, A.; Ruangpanit, Y.; Meijerhof, R.; and Hamanghune, S. 2011. Yolk absorpation and embryo development of small and large eggs originating from young and older breeder hens.Poult.Sci.,90:26-48.

Nangsuay,A.; Meijerhof, R.; Ruangpanit, Y.; Kemp, B.; and

VandemBrand, H. 2013. Energy utilaization and heat production of embryos from eggs originating from young and old broiler breeder flocks.Poult.Sci., 92:474-482.

O'Dea,E.E.; Fasenko.G.M.; Feddes,J.J.; Robinson, F.E.; Segura,J.C.; and Ouellette, C.A. 2004. Investigating the egg shell conductance and embryonic metabolism of modern and unselected domestic avian genetic strains at two flock age.Poult.Sci.,83:2059-2070.

O' Sullivan, N.P.; Dunnington, E.A.; and Siegel, P.B. 1999. Relationships among age of dam egg components, embryo lipids transfer, and hatchability of broiler breeder eggs. Poult.Sci., 70:2180-2185.

Olteanu,M.;Criste,R.D.;Mariana, R.; and Surdu,I. 2012. Effect of the neutral electrolyzed water (ANK) on broiler performance. Archiva.Zoot., 15:77-85.

Pedroso,A.A; Andrade, M.A; Leandro, M.S; Menten, J.F; and Stringhini,J.H. 2005. Fertility and hatchability of eggs laid in the pullet-to-breeder transition period. Anim. Reprod. Sci., 90:355-364.

Rizk, R.E.; Nadia, A. ElSayed.; Shahein, E.H.;andHedaia, M. Shalan. 2008. Relationship between egg shell membranes and embryonic development through different egg production periods in two developed chicken strains. Egypt. Poult. Sci.,28:535-551.

Santos,T.C.I.; Murakami,A.E.I.; Oliveira,C.A.L.;Moraes,G.V.I.;Stefanello,C.I.I.; Carneiro,T.V.I.; Feitosa,C.C.G.; and Kaneko, I.N.I.2015. Influence of European quail breeders age on egg quality, incubation, fertility and progeny performance.Braz.J.Poult.Sci.,1:49-56.

Sargolzehi, M.; ResaeeRokn-Abadi, M.; and Naserian, A. 2009. The effect of magnetic water on milk and blood components of lactating saanen goats. Int. J. Nutr.Metab., 1:20-24.

SAS, 2004. SAS user guide statistics. Release 9.1 SAS institute INC., eary NC.USA.

Tabatabaei, S.;Batavani,R.; and Ayen,E. 2011. Effects of vitamin E addition to chicken semen on sperm quality during in vitro storage of semen. Vet.Res.Forum., 2:103-111.

Tona,K.; Bamelis,F.;Deketelere,B.; Bruggeman, V.; Moraces, V.M.; Buyse, J.;Onagbesan, O.; and Decuypere,E.2003. Effect of egg storage time on spread of hatch, chick quality and chick juvenile growth.Poult.Sci.,82:736-741.

Tona,K.;Onagbesan, O.; DeKetelaere,B.; Decuypere,E.; and Bruggeman,V. 2004. Effect of age of broiler breeders and egg storage on egg quality hatchability, chicks quality, chick weight and chick posthatch growth to forty two days. Appl.Poult. Res., 13:10-18.

Vieira,S.L.; and Moran,E.T. 1998. Broiler yield using chicks from extremes in breeder age and dietary propionate. . J. Appl. Poult.Res.,7:320-327.

Wang, Y.; Cha, F.; and Yang, T. 1988. Influence of magnetized water on growth and development and physiological characteristics of fluecuredtobaceo. Acta. Agric. Univ. Henanensis., 32:263-269.

Yacout, M.H.; Hassan, A.A.;Khalel, M.S.;Shwerab, A.M.;and Abdel-Gawad, E.I. 2015.Effect of Magnetic Water on the performance of Lactating

Goats.J Dairy. Vet. Anim. Res., 2: 39-48.

Yadgray, L.; Cahaner,A.; kedar O.; and Uni, Z. 2010. Yolk sac nutrient composition and fat uptakein late term embryos in eggs from young and old broiler breeder hens. Poult.Sci.,89:2441-2452.

Yahav,S.; Collin, A.; Shinder,D.; and Picard, M. 2004. Thermal manipulations during broiler chicks embryogenesis the effect of timing and temperature. Poult.Sci.,83:1959-1963.

Zhang, X.; Berry, W.D.; Mcdaniel, G.R.; Roland, D.A.; Liu, P.; Calvert, C.;andWilhite, R. 1999. Body weight and semen production of broiler breeder malesas influenced by crude protein levels and feeding regimens during rearing.Poult. Sci., 78: 190–196.

الملخص العربى

تأثير الماء الممغنط و عمر القطيع على تقييم السائل المنوى و صفات الفقس فى دجاج سلالة الصبحية ذهبى

حنان حسن غانم، امانى عادل الصحن ،إبتسام السيد إبراهيم عراقى،عفاف ابراهيم التركى

معهد بحوث الانتاج الحيواني – مركزالبحوث الزراعية – الجيزة – مصر

أجريت هذه الدراسة لتقييم تأثير الماء الممغنط و عمر القطيع على صفات السائل المنوى وصفات جودة البيض و بعض صفات الفقس ووزن الأعضاء الداخلية للكتاكيت الفاقسة لدجاج سلالة الصبحية ذهبى . أستخدم 280 أنثى مع 28 ذكرمن هذه السلالة عند عمرين مختلفين 35 و 50 إسبوع فى هذه التجربة ، بالإضافة إلى عدد 80 ديك (20 ديك / مجموعة) أستخدمت لتقييم السائل المنوى . وقد تم توزيع الطيور لكل عمر إلى مجموعتين ، الأولى شربت ماء عادى غير ممغنط و المجموعة الثانية شربت ماء تعرض إلى المجال المغناصيسى .

النتائج الرئيسية تتلخص فى الأتى :

1- فى سلالة الصبحية ذهبى ،الديوك الأكبر عمرا التى شربت ماء تعرض إلى المجال المغناطيسى تحسن لها معنويا حجم القذفة و تركيز الحيوانات المنوية و نسبة الحيوية و عدد الحيوانات المنوية الحية بالمقارنة بالديوك الأكبر عمرا التى لم تشرب ماء ممغنط .

2- التداخل بين الماء الممغنط و عمر القطيع يشير إلى أن أفضل تحسن لوزن البيض و نسبة وزن القشرة لوحظ لمجموعة الماء الممغنط × العمر الكبير .

3- تحسنت نسبة الخصوبة و الفقس للبيض الناتج من دجاجات شربت ماء ممغنط بالمقارنة بالمجموعة الكنترول . أيضا الدجاج الأكبر عمرا الذى شرب ماء ممغنط (الماء الممغنط × العمر الكبير) تحسن له معنويا نسبة الخصوبة بالمقارنة لمجموعة (الماء العادى × العمر الكبير) .

4- عند اليوم ال 18 من التحضين ، كان الوزن النسبى لكيس الصفار أعلى فى البيض الناتج من طيور شربت ماء ممغنط بالمقارنة بالتى شربت ماء عادى غير ممغنط.

5- شرب الدجاج بماء ممغنط أنتج كتاكيت أثقل وزن جسم عند الفقس و زاد طول الكتكوت معنويا عندما قورنت بالمجموعة الكنترول لهذه السلالة . أيضا شرب الدجاج الأكبر عمرا بالماء الممغنط حسن طول الكتكوت (الماء الممغنط × العمر الكبير) بالمقارنة بالمجاميع (الماء العادى × العمر الكبير) و (الماء العادى × العمر الصغير) .

6- الماء الممغنط ليس له تأثير على أوزان الأعضاء الداخلية للكتكوت عند الفقس و وزن القشرة عند اليوم ال 14 و 18 من التحضين .

نستخلص من ذلك أن معاملة دجاج الصبحية الذهبى بالماء الممغنط حسن صفات السائل المنوى وصفات جودة البيض والنسبة المئويه لكلا من الخصوبة و التفريخ و خاصه فى قطيع العمر الكبير.