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EFFECT OF WATER TRETMEANTS ON THE PRODUCTIVE PERFORMANCE OF DOMESTIC, EGYPTIAN FAYOUMI CHICKENS

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Abstract

Water is one of the main factors for the completion of physiological processes inside the tissues of the bird and therefore must work to maintain the quality of water provided to the bird and ensure its validity to drink, which ensures access to a good production, physiological. This study examined the effect of water on some productive traits of laying hens during 24-47 weeks old. A total of 320 unsexed of Egyptian Fayoumi hens were randomly assigned into 8 groups (40 birds for eau) that were treated as the following treatment1 (T1) received normal water without extras or alteration. (T2) birds were supplied With water treated with chlorine (1 cm cl /1L water) – (T3) hens were supplied With water treated with Iodine (1 cm I/1L water) - It is added chlorine and iodine by 1 cm/liter of water- Use of magnetic separation of the metal device- Use the magnetic separator of metals with the addition of chlorine by 1 cm/liter of water- Use the magnetic separator of metals with the addition of iodine by 1 cm/liter of water- Use the magnetic separator of metals with the addition of chlorine and iodine by 1 cm/liter of water) results of studied traits (body weight, weight gain, feed intake, feed conversion ratio, mortality, viability and production generally exhibited no significant differences between treatments. however, MW treatments revealed their superiority on T1, in particular T8. Generally exhibited no significant differences between treatments (T1, T2, ... and T8). Despite of the fluctuation in results, however treatments revealed their superiority on T5 and T8, in particular.

Key words: Water treatments, Egyptian Fayoumi, broiler chicken, magnetic water.

Introduction

Drinking water inclusions can affect the quality of poultry meat and eggs. Water inclusions can discolor poultry products, particularly eggs. Toxic substances can build up in fat and muscle tissues and hens can export toxic substances into eggs (Trivedi 2003).

Chlorine may be the most popular sanitizer, but there are others that work well, including hydrogen peroxide, chlorine dioxide and ozone. Acidifiers are used to maintain pH of the water supply at less than 7 to improve the effectiveness of the sanitizer and reduce bacterial growth. Many integrators have specific water quality programs in place for growers to follow, so visit with your service technician before changing the water treatment program on your farm (Watkins and Tabler 2009).

Continual use of chlorine may cause corrosion of steel fixtures, residue build-up and reduce effectiveness of any medications applied through the water system (Chlorine, 2008). The initial microbial and mineral content and buffering capacity will determine the type and concentration of sanitizers and acidifiers needed for the water to be treated. A valuable tool to assist with this determination is the oxidation-reduction potential (ORP) (Watkins, 2008). The ORP, is one method used to evaluate the ability of a sanitizer to be a strong oxidizer for destroying bacteria, viruses and other organic material present in water or for reacting with harmful minerals such as Iron and Manganese. An ORP value in the range of 650 millivolts or greater indicates good quality water that can be effectively sanitized by as little as 2–4 parts per million free chlorine (Oviedo, 2006; Sparks, 2009).

Gholizadeh *et al.,* (2008) investigated the effect of magnetic water treatment on growth and quality improvement of poultry. The magnetic water, increased poultry quality meat fat livability and production efficiency, as well as decrease in mortality, feed consumption and a high quality of final product. All that lead to change the

functions of organism, which affect each other (Al-hassani and Amin, 2012). Water magnetization changes water properties which becomes more energized, active, soft and high pH toward slight alkaline and free of germs (Mg-Therapy, 2000). The importance of iodine as an essential element in animal's diet arises from the fact that it is a major component of the thyroid hormone 3,5,3' tri-iodothyronine (T3) and 3,5,3',5' tetra iodothyronine (T4) or thyroxine (Ganong, 2001). These hormones are essential for normal growth as well as mental development throughout the lives of animals and human and they also set the basal metabolic rate (BMR) and play active roles in digestion (Miller *et al*., 1974), thermoregulation, intermediary metabolism, growth, muscle function, circulation, the seasonality of reproduction and immune defense (Follett and Potts, 1990).

The aim of the present work is to study the effects of the magnetic of water separator of metals with the addition of chlorine and iodine as treatments on productive performance (body weight, weight gain, feed intake, feed conversion ratio, egg production and mortality) of Egyptian Fayoumi chickens in Egypt.

Materials and Methods

The experimental work of the present study was carried out at the Fayoum Poultry Research Station, Animal Production Research Institute, Agricultural Research Centre, Fayoum Governorate. A total of 320 of Fayoumi egg laying hens, of 24 weeks age, were selected. They were housed in individual cages placed in a close-sided house. Hens were fed the same diet component for protein (16-17% crude protein) and metabolic energy (2650-2800 kcal energy representative/ km feed). Ingredients and chemical composition of laying hens feed is shown in table 1, during the experimental period of 24 weeks until 47 weeks.

Table 1: Ingredient and chemical composition (g/kg) of the experimental diet for laying hens.

Ingredients	%
Yellow corn	66.33
Soybean meal (48% CP)	24.2
Limestone	7.50
Di-calcium phosphate	1.32
Vit. + Min. Premix	0.25
NaCl	0.25
DL-methionine	0.15
Total	kg 100
Calculated composition, %	
ME, kcal / kg diet	2777
Protein %	% 17
C/P ratio	163.4
Methionine %	,% 0.39
Methionine + Cystine %	% 0.67
Lysine %	% 0.8
Calcium %	3.1
Phosphorus available %	0.37
Analyzed values 2	
Dry matter %	90.73
Crude protein %	16.97
Crude fat %	2.45
Crude fiber %	3.96
Ash %	6.37
Nitrogen free extract %	60.98

1Vit+Min mixture provides per kilogram of diet: vitamin A, 12000 IU; vitamin E, 10 IU; menadione, 3 mg; Vit. D3, 2200 ICU; riboflavin, 10 mg; Capantothenate, 10 mg; nicotinic acid, 20 mg; choline chloride, 500 mg; vitamin B12, 10 mg; vitamin B6, 1.5 mg; vitamin B1, 2.2 mg; folic acid, 1 mg; biotin, 50 mg. Trace mineral (milligrams per kilogram of diet): Mn, 55; Zn, 50; Fe, 30; Cu, 10; Se, 0.10; Anti-oxidant, 3 mg. AOAC (2004).

Experimental design

The birds were divided into eight treatments, each treatment contains 40 hens. The treatments are as follows:

- T1: Control, normal water without additives or transactions,

- T2: Water treated with chlorine (1 ml/1 liter of water),

- T3: Water treated with iodine (1 ml/1 liter of water),

- T4: Water with chlorine + iodine (1 ml/1 liter of water, each),

- T5: Water with the use of magnetic devise for separation of the metal,

- T6: Water with use magnetic separator of metals with chlorine (1 ml/1 liter of water),

- T7: Water with use magnetic separator of metals with iodine (1 ml/1 liter of water),

- T8: Water with use magnetic separator of metals with chlorine + iodine (1 ml/1 liter of water, each).

All routine works were followed in bird's management such as lighting, temperature, ventilation and vaccination programs. Birds were exposed to photoperiod regime of 16 hrs. light and 8 hrs. dark cycles. Laying hens were reared according to common husbandry practice for laying hens. Vaccination and medical program were done according to common veterinarian care practice.

Measurements

Live body weight and gain

Live body weight (g) of each bird was record at the

beginning (at 24th week of age) and the end of experimental period (47th week of age) in early morning before receiving any feed or water. Also, body weight gain during the experimental period was calculated.

Feed intake, feed conversion and mortality rate

Feed intake was measured weekly, the diets were weighed at the beginning and the residual diets was collected and weight to calculate the amount of feed consumed (g/bird/day). Feed conversion ratio was calculated as the amount of feed consumed (g) required to produce a unit (g) of egg mass (Feed conversion ratio = g feed intake/g eggs produced). Mortality rate of dead birds were presented as the number of bird dead in each treatment during the whole of experimental period.

Egg production, egg weight

Eggs were collected and recorded daily. The percentage of egg production (%) for each treatment was calculated according to the following equation:

Egg production percentage = Number of eggs produced/number of live hens × 100

However, eggs were individually weighed daily for each treatment and the average egg weight was calculated in gm.

Body weight, weight gain, feed intake, feed conversion ratio, mortality and viability were measured according to Al-Fayad and Naji (1989) andSaber *et al*., (2018). The experiment was designed as complete randomized block design.

Statistical analysis F

Data collected in this study were statistically analyzed using the general linear models (GLM) of SAS (1996). One-way model was used to study the main effect of treatments on different parameters, the used model was:

$$Y_{ijk} = U+T_i+R_j+E_{jik}$$

Where:

Y_{ij}= the observation of the parameter measured.

T_i= effect of (i) the treatments (i= 1- 8)

Rj= effect of (j) the treatments (j= 1- 3)

μ = overall mean.

E_{ij}= experimental error.

Significant differences among means were achieved using the Duncan's Multiple Range test (Duncan, 1955). Significant level was set at 5%.

Results and Discussion

Results of feed intake (FI), feed conversion ratio (FCR), body weight (BW), mortality percentage (M%), egg weight (EW) and egg production percentage (EP%) during the different experimental periods 24-31, 32-39 and 40-47weeks of age under different treatments are shown in tables 2 and 4.

Feed Intake (FI) and feed conversion ratio (FCR)

In table 2 the water treated with a magnetic separator and 1% chlorine and 1% Iodine (T8), throughout the whole experiment period had effect on (FI) in comparison to the control group. However, laying hens in treatment group (T8) consumed a lower (P≤0.05) amount of feed than those fed the control diet, being 120.667 and 125.792 g/day, respectively table 2. The different experimental drink water did not affect significantly on average weekly FI and FCR except these in the two groups T5 and T8 which recorded better (P≤0.05) values than most the other experimental groups.The results from this trial showed that magnetic water influence feed conversion. This result agreed those found by each of Al-hassani and Amin (2012) and Al-Fadul (2006). Ali *et al.,* (2014) observed improved feed conversion of birds provided with drinking magnetic water compared with those in the control group. Also, feed intake was affected by magnetic

Table 2: Effect of the treatments water on feed intak (g) and feed convertion [(fed intak g)/(eggs g)].

Parameter / Treatments	The first period (24-31 wk)(A1)		The second period (32-39 wk) (A2)		The third period (40-47 wk) (A3)		Overall period (24-47 wk) (A)	
Control	FI	FC	FI	FC	FI	FC	FI	FC
T1	112.000^{a}	2.944^{a}	131.875^{a}	3.263^{b}	133.500^{a}	3.240^{ab}	125.792^{a}	3.149^{a}
T2	112.000^{a}	2.946^{a}	131.375^{a}	3.346^{a}	133.250^{ab}	3.219^{ab}	125.542^{a}	3.170^{a}
T3	111.625^{a}	2.929^{b}	130.375^{a}	3.275^{b}	133.000^{ab}	3.251^{a}	124.833^{ab}	3.152^{a}
T4	111.125^{a}	2.740^{ab}	126.125^{b}	3.086^{c}	131.250^{c}	3.134^{c}	121.625^{bc}	2.987^{b}
T5	111.125^{a}	2.731^{ab}	131.125^{a}	3.156^{c}	133.250^{ab}	3.035^{d}	125.333^{ab}	2.974^{b}
T6	111.000^{a}	2.854^{a}	131.250^{a}	3.254^{b}	132.875^{ab}	3.166^{c}	125.083^{ab}	3.092^{a}
T7	107.500^{a}	2.854^{a}	131.125^{a}	3.231^{b}	132.750^{b}	3.214^{b}	124.958^{ab}	3.100^{a}
T8	106.750^{a}	2.565^{b}	125.250^{b}	2.976^{d}	130.000^{d}	2.974^{e}	120.667^{c}	2.838^{c}

^{a,b,c,d}…Means within each column with different superscripts are significantly different (P≤0.05) *Feed intak (FI), Feed convertion (FC) *Treatments water (T), Age (A).

water in this trial. This finding agreed with the study of Al-Mufarrej *et al.,* (2005), Mitre (2018) overall, there were no significant results observed in weight gain, feed conversion or livability for birds receiving magnetized water as compared to birds receiving the control or untreated water. There was an improvement in water quality when exposed to the magnetic field with considerable change in the pH, total dissolved solids, total hardness, conductivity, salinity, dissolved oxygen, evaporating temperature, minerals, organic matter and total count of bacteria (Khudiar and Ali, 2012; Al-Mufarrej *et al.,* 2005). Increasing the permeability of the cells, allowing the expansion of the gastrointestinal tract and increase feed utilization, which lead to increasing water permeability to improve absorption of nutrients and minerals in the body (Oyngi *et al.,* 2012). In addition, magnetic water Improves feed metabolism (Lam, 2001; Saeed and Al-Shidede, 2013). Al-Fadul (2006) concluded that the magnetization of water improves the water properties, which consequently improves the growth performance, feed efficiency and saves water consumption for broilers. Magnetized water result in reduced DNA damage (Hafizi *et al.,* 2014; Shah and Nagarajan, 2013) and improve animal performance (Gholizadeh *et al.,* 2008; Attia *et al.,* 2015; El-Hanoun *et al.,* 2017a; b). The different groups exposed to magnetized water significantly increased feed intake particularly group supplemented with 3000 and 4000 gauss. Groups supplemented with different strengths of magnetic water significantly improved FCR compared with the control group. Water intake and water/ feed ratio were significantly lower of magnetized water groups than the control group, with the groups on 2000 gauss exhibited the lowest water intake and those on 3000 and 4000 gauss exhibited the lowest water/feed ratio. The results showed that no significant differences between groups on survival ratio, the group exposed to 3000 gauss magnetized water was the highest in the survival ratio (Saber *et al.,* 2018). Chlorine dioxide significantly ($P<0.05$) reduced E. coli and Salmonella It was revealed that gut histo-morphology, villus height (920.03 ¼m) and goblet cell count per unit (80.25) of birds in group DW-0.5 was significantly improved FCR significantly improved with increasing level of Dutrion, it can be concluded from present findings that addition of chlorine dioxide (Dutrion) can serve as an effective tool to improve broiler performance by reducing the load of harmful pathogens and improving gut health of birds (Sultan *et al.,* 2014).

Body weight(BW)

Data concerning the body weight of the experimental groups as affected by the different treatments during the different experimental periods are shown in table 3. During the first, second and third periods there were significant differences in (BW) among layer groups drink water treatment in comparison to control group in (group 8) where as the value were significantly ($P \leq 0.05$) higher, being 1.416, kg for the first period, 1.519 kg g for the second period and 1.611 kg for the third period, respectively. Besides, the same trend was noticed with layer groups drink water treatment . In general, the average (BW) of experimental layers was significantly higher ($P \leq 0.05$) effected by drink water treatment to layer at the (group 8) tested levels compared to the control group throughout the whole experiment period.This results showed that magnetic water may be due to increased utilization of food intake and food conversion coefficient for meat production This results agreement with (Mahmoud *et al.,* 2017) the results noted a significant higher BW for birds of magnetic water,This resultsdis agreement with (Mohamed *et al.,* 2018), Mitre, Kenia, (2018) said to final body weight and total body weight gain, meanwhile numerically increased total feed intake which reflected on deterioration ($P \geq 0.05$) of the feed

Table 3: Effect of the treatments water on body weight (Kg) and mortality (%).

Parameter Treatments	The first period (24-31 wk)(A1)		The second period (32-39 wk) (A2)		The third period (40-47 wk) (A3)		Overall period (24-47 wk) (A)	
Control	B.W	M	B.W	M	B.W	M	B.W	M
T1	1.335^{d}	0.938	1.428^{d}	1.351	1.521^{c}	1.894	1.428^{e}	0.500^{a}
T2	1.316^{cd}	1.250	1.453^{c}	0.347	1.529^{c}	1.136	1.433^{de}	0.333^{ab}
T3	1.325^{c}	0.938	1.404^{bc}	0.676	1.530^{c}	1.071	1.420^{e}	0.333^{ab}
T4	1.381^{b}	0.625	1.486^{b}	0.658	1.548^{bc}	1.042	1.472^{bc}	0.304^{ab}
T5	1.395^{b}	0.000	1.508^{ab}	0.625	1.573^{b}	0.329	1.492^{b}	0.125^{c}
T6	1.351^{bc}	0.625	1.490^{b}	0.329	1.534^{b}	0.338	1.458^{c}	0.167^{b}
T7	1.355^{c}	0.625	1.465^{c}	0.329	1.541^{bc}	0.338	1.454^{cd}	0.167^{b}
T8	1.416^{a}	0.313	1.519^{a}	0.313	1.611^{a}	0.000	1.515^{a}	0.042^{c}

^{a,b,c,d}…Means within each column with different superscripts are significantly different ($P \leq 0.05$) *body weight (B.W), Moratality (M) *Treatments water (T), Age (A).

efficiency parameters and performance indexwhen used magnetic water. Rona (2004) showed that magnetic drinking water for broiler chickens resulted in shortening of fattening period, increasing growth rate by 5-7% and improving flavor and tenderness of meat. In accordance with the improvement found herein in laying performance and feed utilization because of magnetized water and lack of comparable results with laying hens, studies with broilers indicates that magnetic drinking water increased growth rate by 5-7% and improved flavor and tenderness of meat and shorted of the fattening period (Rona, 2004; Shamsaldain and Al Rawee, 2012). In addition, Al-hassani and Amin (2012) demonstrated that Cobb-chicks given magnetic water significantly increased feed intake on 1st and 4th week of age compared with control group received nonmagnetic water. Indeed, magnetic field increased body weight compared to chickens received nonmagnetic water (Mustafa, 2012). Chlorine dioxide significantly (P<0.05) reduced E. coli and Salmonella It was revealed that gut histo-morphology, villus height (920.03 ¼m) and goblet cell count per unit (80.25) of birds in group DW-0.5 was significantly improved body weight gain significantly improved with increasing level of Dutrion, it can be concluded from present findings that addition of chlorine dioxide (Dutrion) can serve as an effective tool to improve broiler performance by reducing the load of harmful pathogens and improving gut health of birds (Sultan *et al.,* 2014). Chlorine dioxide did not alter water and feed intake of birds though significantly improved body weight gain and efficiency of feed utilization by birds. This could be due to the inhibitory effects of chlorine dioxide on the growth and colonization of pathogenic microflora which competes for the readily available nutrients with the host bird. Aç1kgöz *et al.,* (2011) reportedsimilar findings when birds were fed some acidifying agents who did not change feed and water intake however, improved body weight gain and FCR. A more balance microbiota with reduced number of pathogens (Dibner and Richards, 2005) and improved gut integrity of the birds as noticed in present study assisted birds in better utilization of feed and improving body weight gain (Cengiz *et al.,* 2012). Islam *et al.,* (2008) noticed that broiler fed on an acidifying agent gained better body weight gain and significantly better carcass yield that coincides with current findings.

Mortality percentage

Data concerning mortality percentage (M%) of the different experimental groups during water the different experimental periods are shown in table 3. The results revealed that M% values were lower (P ≤ 0.05) with layer during water groups (5 and 8)in compression to the control group. The recorded values were (0.00 and 0.313%), (0.625 and 0.313%) and (0.329 and 0.00 %) for the first, second and third periods, respectively. The same trend was noticed throughout the whole experiment period. Generally during water the different experimental periods are shown at groups (5 and 8) decreased the mortality rate in comparison to the control group. the water is treated with a magnetic separator and 1% chlorine and 1% Iodine may be due to the effectiveness of water in some bacterial, viral and protozoan diseases that are among the most common poultry diseases Increased utilization of feed intake and poultry vitality causing reduced mortality. This results showd that magnetic water may be due to the increased vitality of birds and disease resistance to high immunity. This results agreed with Gholizadeh *et al.,* (2008) stated that magnetic water increased livability of broiler chickens. Natural water after sterilization is called dead water, so magnetic water transfer water from dead to live (Batmanghelidj, 2005; Khudiar and Ali, 2012; Al-Nuemi *et al.,* 2015). Physics shows that water changes weight under the influence of magnetic fields more hydroxyl (OH-) ions are created to

Table 4: Effect of the treatments water on egg production (%)and egg weight (g).

Parameter Treatments	The first period (24-31 wk)(A1)		The second period (32-39 wk) (A2)		The third period (40-47 wk) (A3)		Overall period (24-47 wk) (A)	
Control	EP	EW	EP	EW	EP	EW	EP	EW
T1	32.49	38.03^{d}	47.88	40.42^{bc}	58.17	41.23^{cd}	46.18	39.89^{e}
T2	33.45	37.98^{d}	48.85	39.27^{d}	58.58	41.41^{b}	46.96	39.55^{f}
T3	33.05	37.90^{d}	48.69	39.82^{cd}	58.81	40.90^{d}	46.85	39.54^{f}
T4	35.33	39.23^{c}	48.99	40.89^{b}	60.18	41.91^{b}	48.17	40.68^{c}
T5	35.27	40.86^{b}	49.52	41.56^{a}	59.79	43.91^{a}	48.19	42.11^{b}
T6	35.95	38.91^{c}	50.18	40.35^{bc}	60.81	41.97^{b}	48.98	40.41^{d}
T7	35.30	38.88^{c}	49.83	40.59^{b}	58.90	41.23^{cd}	48.01	40.23^{d}
T8	36.74	41.61^{a}	51.69	42.09^{a}	61.22	43.72^{a}	49.88	42.47^{a}

^{a,b,c,d}…Means within each column with different superscripts are significantly different (P≤0.05) *Egg production (EP), Egg weight (EW) *Treatments water (T), Age (A).

form alkaline molecules and reduce acidity (Ibrahim, 2006)The mineral content of water may be changed with exposure to strong magnetic field and the quality can be improved by increasing the magnetic field over a more prolonged time than by a weak magnetic field over a shorter duration (Lam, 2001). However, the result dis agree from Al-hassani and Amin (2012) showed that it has being insignificant effect when used magnetic water with broiler chickens.

Egg production% and egg weight

Generally, drinking layer hens on water supplemented with (group 8) throughout the whole experiment period (24-47weeks) significantly higher ($P \leq 0.05$) improved both (EP %) in comparison to the control group. The recorded values were (46.18 and 49.88 %) , respectively. The differences between the other experimental groups in compared with the control group were supplementation insignificant table 4. Layers receiving the eight dietary treatments not different in a (EW) except (group 5 and 8) which was significantly ($P \leq 0.05$) higher than the others table 4. It is worthy to note that addition the water is treated with a magnetic separator and 1% chlorine and 1% Iodine to layer diets at most tested levels resulted in an increase in both (EP%) and (EWg) in compared with the control group. These results are in good agreement with those reported by noted that the drinking water plays an important role in the transmission of some bacterial, viral and protozoan diseases that are among the most common poultry diseases. Important factors to prevent waterborne diseases in broiler production are the protection of supply sources, This result may be due to the increased vitality of birds and the good utilization of food intake (Mohamed *et al.,* 2018) Magnetized water improves health by inhibiting bacterial growth, while reducing pain, swelling and weakness (Jassim and Aqeel, 2017). The results showed that all groups offered different strength of magnetic water showed similar egg production percentage, while egg production percentage improved in magnetized water groups compared with the control group. The groups received different strength of magnetized water significantly ($p \leq 0.05$) increased egg weight and egg mass compared with them control group. In addition, the groups offer 2000 and 3000 gauss magnetic water significantly increased compared with the control group and group supplemented with 4000 gauss water (Saber *et al.,* 2018) Since the disturbing role of free radicals and oxidative stress in production has been proven (Khan *et al.,* 2012; Attia *et al.,* 2016). Thus, it could be assumed that the potential reduction of oxidative stress well result in improving the productive and reproductive of laying hens offered water exposed to different magnetic field found herein (Agarwal *et al.,* 2012; Naher *et al.,* 2013).

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