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Effect of alkaline water and /or magnetic water on some physiological characteristic in broiler chicken

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Abstract
Various types of drinking water (alkaline ionized water, magnetic water, and a mixture of the two, and the tap water) have been employed in this research which was carried out in poultry farming, college of Veterinary medicine at the University of Baghdad and lasted for 36 days, started from 13/12/2016 up to 19/1/2017. To study the effect of the drinking water on 160 Ross broiler chickens' physiological and chemical blood traits. The broiler chickens with an average weight of about 42 grams, which are 24 hours of age, were organized into four groups (40 each) in accordance with the type of the drinking water, the first group used the tap water (control group), the second used the alkaline ionized water, the third one used a mixture of the magnetic and alkaline ionized water and the last one used the magnetic water.The results indicated the second experimental group that proved to reduction in blood glucose, cholesterol, and triglycerides(115g/l,142.91 mg/dl,151.88mg/dl) as compared with control group (244g/l, 258.24 mg/dl,183.59mg/dl) respectivly..In conclusion, this study indicated that the ionized alkaline water is the potential candidate to improve some physiological traits for Ross broiler chickens.

Keywords: Drinking water, blood glucose, alkaline ionized water, cholesterol, broiler

1. Introduction

The water is a necessary nutrient to every living organism and has been reported as the most important nutrient for growth and development. Furthermore the water is consideration the most important nutrient for animals, while growth rate, uniformity and health are common problems in commercial production, water quality and consumption are generally not taken into consideration [1]. Researchers on useful foods is currently popular; however, it is not yet well known that drinking water also has physiological functions, and that there are some health-beneficial effects of water [2, 3]. Through the (1) water molecule itself: flowing water affects cellular function and two together development and functions of organs [4, 5], (2) hydration and Brownian motion of water are fundamentally important for protein function [6]; (3) Atoms and molecules derived from water molecules, such as protons (H+), hydrogen atoms (active hydrogen [H]), hydrogen anions (H-), hydrogen molecules (H2) oxygen molecules (O2), and reactive oxygen species (ROS); and (4) molecules dissolved in water, as mineral ions, mineral nanoparticles, organic and inorganic compounds [7]. In the field of food science and technology, water is an important for good digestion and to create a healthy gut flora, which will help an animal to absorb all the necessary nutrients [8]. Water intake on poultry farms include pH, hardness and total dissolved solids that effect on animal health and the researches shows that pH of water is a major factor effect on the amount of drinking water that birds consume [9].Potable Electrochemically reduced water ERW (pH 8e10) is popular as a health advantageous water in Japan. ERW is also termed alkaline Electrolyzed water, alkali-ionic water, alkaline cathodic water, and alkaline ionized water [10].

The greatest advantage of using ionized water to inactivate the pathogens is users because of the non-existence of chemicals [11].

The use of Alkaline water given to poultry has a beneficial influence on their health condition [12, 13]. It was observed can be used as Antioxidants block dangerous oxidation formed from free radicals, much of the damage caused by carcinogenic substances in food may come round because of an oxidation reaction in the cell.

Principle of magnetic technology depends upon a moving electric charge in the ionized form and the magnetic field [14]. Contact of water with a permanent magnet for a big time produced

magnetic charges and magnetic properties. Such magnetically treated water can reduce microbial load and improve the immune system [15]. Exposing of water to strong magnetic fields affected the mineral content of water and its effects depended upon the strength of the magnetic field and exposure time. Nowadays, the use of magnets to improve water quality is of importance interest due to low cost compared to chemical and physical treatments. In this regard, exposing water to a magnetic field causes an increase in the solubility of calcium salts so that avoids from lame-scale depositing in pipes and also cleans pipes from lame-scales being deposited in the past [16].

[14] Suggested that there is a change in mineral contents of water by magnetizing that causes them to pass the biological membranes more easily. [17] Presented the possibility that magnetic water can prevent aging and fatigue by rising the cell membrane permeability. Also, [18] indicated that the activity of superoxide dismutase was rise in magnetic field. Water magnetization changes water properties which become more energized, active, soft and high pH to slight alkaline and free of microorganism [19]. It's were suggesting that, water solution passes through the magnetic field acquire finer and more homogeneous structures, which increases the fluidity, dissolving capability for various constituents like minerals and vitamins and consequently improves the biological activity of solutions, affecting positively the performance of animals and plants [20]. Physics shows that water changes its weight under the influence of magnetic fields. More hydroxyl (OH-) ions are created to form alkaline molecules, and decrease acidity, for this reason cancer cells do not survive well in an alkaline environment [21]. Water resources and quality have been shown to influence animal performance, limit the extension of animal production and rise health threat [22], and also growth rate by 5-7%, improving meat quality, flavor and tenderness. Also decrease in feed consumption and become better in feed conversion ratio [23].

Despite, lack or no information in this field and a few researches have been done found that using electromagnetic drinking water for chickens, resulted in shortening of the fattening period of broiler chickens. Consequently, this study aimed to know the effect of ionized water and or with magnetic water compared with tap water in some blood parameters in poultry, for the purpose shed more light on the effect of these types of water.

2. Materials and Methods

The present experiment was carried out at the Poultry Farm, College of Veterinary Medicine, Baghdad University. The experiment lasted 36 days started from 13/12/2016 up to 19/1/2017. A total of 160, one day old broiler chicks (Ross 308) chicks were randomly assigned to four experimental treatments. Each treatment consisted of two replicate pens with 20 birds each one. Each pen was two square meters. The experiment was a complete randomized design and water treatments were as follows: first treatment (T1) was drunk the tap water and kept as a control group, second treatment (T2) was drunk the alkaline ionizer water, third treatment (T3) was drunk the magnetized water, fourth treatment (T4) was drunk the mixture alkaline ionizer and magnetized water.

The diet was formulated according to the [24] nutrient requirements for broiler chickens. Alkaline ionized water (pH 9-10) was produced using Bawell to produce ionized water, a Chinese-origin device. While, the magnetic treated water was given vigorously 1000 Gaussdischarge1000 liters/H. The water and feed were offered ad libitum to all groups and the feeding regime had standard commercial broiler mash (starter and finisher) and the light program was 23L/1D. All chicks were thirsty to three hours before vaccination. The chicks were treated and vaccinated with productive vaccines according to (table 1) the following program:

Table 1: Protective vaccines program

Old (day)	Vaccines and method of to give vaccine
10, 22	Newcastle disease vaccine(lasota)* By drinking water
12	infectious Bursal disease vaccine** By drinking water
1,2,3	Uveprim (Sulphadiazine+ Trimethoprim) *** By drinking water
1,2,3	Enrosol-R (Enrofloxacin)**** By drinking water

All vaccines were obtained from:- *Laprovet Company,**Ceva Company, ***Uvedco,****Vapco Company

Blood sample was withdrawn from jugular vein from 10 birds on the 36nd day in each group10ml of the blood samples was collected (3ml) into plastic tubes containing EDTA for hematological studies, while the remaining 7ml of blood samples was deposited in anticoagulant free plastic tube which were subjected to centrifugation at 4000 RPM. during 10 minutes. The serum samples were stored at -20 °C for biochemical studies. Total erythrocyte counts and total leukocyte counts were determined by using of Hemocytometer (Neubaeur counting chamber) according to [25], Hb concentration was determined by Sahli's (acid haematin) method [26], Packed cell volume (PCV) was determined by Microhaematocrite [27].

In the separated serum Determination total protein g/L,glucose mg/dL and liver enzymes (Alkaline phosphatase ALP) U/I., Aspartic transaminase (AST) U/I. and Alanine transaminase (ALT U/Iby using commercial kits"SPINREACT'', Spain, The procedures of experimental were carried outbasing on the National Institute of Health Guidelines for Animal Care and approved by the Ethics Committee of our Institution [28, 29].

3. Statistical analysis

The data was analysed through one way ANOVA and difference between means was compared by Duncan's ultiple Range Test using statistical software SPSS 22

4. Result and discussion

4.1 Effect of drinking treated water on hematological parameters

Data referring to the hematological parameters in table 2 shows the effect of the treated water on blood parameters for broiler chickens, the result was no significant difference within the experimental groups on the RBCs and WBCs counts also the Heterophils to lymphocyte ratio, Hemoglobin concentration and Hematocrit percentage, were characterized by mean values (1.48 ± 0,05 and 1.94± 0.14), (28.89 ± 0.69 and 29.34 ± 0.30), (0.34 ± 0.01 and 0.37 ± 0.03), (10.48 ± 0.26 and 12.56 ± 2.14) respectively. In the end of experimental period (thirty six days).

Table 2: Effect of drinking alkaline ionizer water and/or magnetized water and tab water on blood profiles (mean ± SE).

Parameters \ Treatments	Control G	Alkaline ionizer water G	Magnetized water G	Alkaline ionizer & magnetized water G
RBC(106/mm3)	1.88 ± 0.06	1.81 ± 0.05	1.48 ± 0.37	1.94 ± 0.14
WBC(106/mm3)	29.02 ± 0.38	29.34 ± 0.30	29.14 ± 0.36	28.89 ± 0.69
H/L ratio	0.35 ± 0.01	0.36 ± 0.01	0.34 ± 0.01	0.37 ± 0.03
Hemoglobin (g/dl)	12.56 ± 2.14	10.48 ± 0.26	10.54 ± 0.35	10.94 ± 0.78
Hematocrit (PCV%)	28.48 ± 1.08	28.06 ± 0.84	27.72 ± 0.88	28.92 ± 2.37

A, B Different letters in row denote significant (P<0.05) difference among mean groups.

Determination of blood parameters is essential to exhibit the health status of animals in general and the poultry in particular (Broilers), the changes may occur through in some state like infection or bad condition, while in this an experiment due to nutritional circumstances change. These changes mainly due to metabolic processes, but it were non-significantly between treatment groups.

This result of blood parameters was in agreement with [30, 31]. The authors found that uses alkaline ionized water drinking don't influence on blood parameters, Furthermore, the blood profiles were not influenced by the water supplementation with the alkaline ionizer [32]. While, the effect of magnetized water on those parameters was conformity with [33] who found that no significant difference in blood parameters when taken blood sample through twenty eight to fifty six days within used magnetized water as compared with tap water.

4.2 Effect of drinking treated water on some blood biochemical parameters

Table 3 shows some metabolic profile parameters of broiler chicken in the treated groups with ionized water and /or magnetize water, these analyses consider monitoring of the healthy state of the animals. The results showed that the Alkaline ionizer water group had signed (P<0.05) decrease in glucose concentration as compared with the control group, but no significant with other treated groups, also it shows no significant differences between treated and control groups in total protein, ALP, SGOT and SGPT. Whereas the cholesterol and triglycerides concentration, the groups drinking ionized water and alkaline magnetize water were recorded lower value as compared with other groups.

Table 3: Effect of drinking alkaline ionizer water and/or magnetized water and tab water on blood serum (glucose, total protein, cholesterol, triglycerides) and liver enzymes (mean ± SE).

Parameters \ Treatments	Control Group	Alkaline ionizer water Group	Magnetized water Group	Alkaline ionizer & magnetized water Group
Glucose g/L	244 ± 49.85 A	115 ± 19.87 B	137.90 ± 27.25 A+B	179 ± 44.87 A+B
Total protein g/L	134.75 ± 8.12	292.40 ± 121.65	145.02 ± 26.85	150.28 ± 17.13
Alkaline phosphatase (ALP) U/I	234.31± 4.90	281.75 ± 15.21	272.95 ± 60.97	284.04 ± 38.05
Aspartate Amino transferase- (SGOT)U/I	34.60 ± 3.18	31.40 ± 4.71	32.40 ± 1.69	33.40 ± 4.23
Alanine Amino transferase (SGPT) U/I	27.80 ± 3.39	21.20 ± 1.24	23.20 ± 2.72	25.60 ± 5.49
Cholesterol mg / dL	258.24 ± 39.75 A	142.91±12.57 B	181.66 ± 37.45 A+B	123.74 ± 29.52 B
Triglycerides mg/ dl	183.59 ±15.18 A+B	151.88 ±12.12 B	210.80 ±5.19 A	161.07 ± 20.27 B

A, B Different letters in row denote significant (P<0.05) difference among mean groups.

The reduce serum glucose in group drinking alkaline ionized water was significantly as compared with the control group, these results were in agreement with those [34, 35]. Also, these results were an agreement with [36] who mentions that the magnetized water drinking had influence to raise the thyroid hormone concentration which lead to rise metabolic rate of carbohydrate by increasing secretion of insulin act as enter glucose into the cell. Also, these outcomes reverse correlation between total protein concentration and activity enzymes alanine amino transferase and aspartate amino transferase in serum and healthy state of animals [37]. Furthermore the treated groups exhibit no affect at liver enzymes GPT and GOT and ALP, marker enzymes in serum (healthy state of the liver) as compared with control group these results were agreements with [38, 39]. The decline in serum cholesterol level in treated groups, due to these types of waters has abilities to act as anti-oxidant effect on (HMG-CoA) which was responsible on the cholesterol syntheses, these results agreement's with some suggested on ionized alkaline water [40-41], They reported that the blood cholesterol level was significantly decreased by consuming alkaline water for a longer period, (lead to enhance healthy state of the body). Regarding triglyceride concentration was observed that significantly decreased (P<0.05) in Alkaline ionizer and Alkaline ionizer & magnetized water groups as compared with other groups, similar results was observed by [42] referred to drunk ionized water has anti-metabolic syndrome effects significant decrease in starved blood sugar levels, total cholesterol and triglyceride levels. Also in agreement with [38], who found in a study on Otsuka Long-Evans Tokushima Fatty (OLETF) rats, ERW given to one group exhibit significantly lower blood glucose levels than controls given tap water. Moreover, blood levels of triglycerides and total cholesterol also decreased in the rats fed ERW.

5. Conclusion

From this study, it can be concluded that treated water have no effect on some blood parameters and liver enzymes, despite positive effect on some biochemical parameters in serum of animal especially on low sugar and cholesterol and triglyceride in this study.

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