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EFFECT OF ZEOLITE SUPPLEMENTATION ON PRODUCTIVE PERFORMANCE AND BLOOD CONSTITUENTS OF BROILER CHICKENS UNDER DRINKING SALINE WELL WATER CONDITIONS

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ABSTRACT: This work was aimed to study the effect of zeolite (Clinoptiolite) addition on productive performance and blood constituents of broiler chickens drank saline well water (3398 ppm total dissolved solids, TDS). A total number of 120 broiler chicks one day – old unsexed Ross 308 (body weight of 40.09 g ± 0.11). Chicks were randomly separated to four equal treatments (30 chicks of each) which in turn separated to three equal replicates (10 chicks each). The 1st treatment (T1), chicks drank tap water containing 265 ppm TDS with basal diet. The 2nd treatment (T2), chicks drank saline well water containing 3398 ppm TDS with basal diet. The 3rd treatment (T3) and the 4th treatment (T4) chicks drank saline well water containing 3398 ppm TDS with basal diet + 3 % zeolite and + 6 % zeolite, respectively.

Final body weight, total weight gain and feed conversion of broiler chickens were significantly enhanced in control group (T1), T3 and T4 as compared with the chickens in T2. On the other hand, the total feed intake significantly decreased in the chickens of T4 as compared with T1 and T2, while, the total water intake significantly increased in T2 compared with other treatments. Carcass weight percentage was significantly increased in the chickens of T1, T3 and T4 treatments as compared to T2. Red blood cells, hemoglobin and packed cell volume were increased ($P<0.05$) in the chickens of T3 when compared to T2. Albumin level was significantly increased in T4 compared with other treatments. Creatinine, Alanine and aspartic transaminase concentrations were increased ($P<0.05$) in the chickens drank saline well water (T2) as compared to other treatments. On the other hand, glucose and cholesterol levels significantly decreased in the chickens of T2 as compared to T1, T3 and T4.

In conclusion, adding 3 % zeolite in broiler chickens diets might enhance the productive performance and some hemato-biochemical parameters under drinking saline well water conditions.

Key words: Saline well water- Zeolite -Broilers and Productive Performance

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INTRODUCTION

The control of environmental conditions and quality of broiler diet are important to reach maximum production and maintain healthy poultry especially in intensive system of livestock production (Tahseen, 2010 and Karovic et al., 2013). Throughout the lifetime of broilers, they encounter a number of stressors, such as heat stress and drinking saline water. Water forms a high proportion of the body of the chicken, from 55% to 75%, therefore it is very important for life (Nesheim et al., 1979). Quality of ground water depends upon the naturally occurring inclusions such as cations, anions and heavy metals. One of the most demanding problems in Egypt is the scarcity of fresh water for both human and animal consumption in desert areas. Therefore, it is essential to search for new sources of water such as saline well water as possible supplies of drinking water for birds. Dietary high level of salt is toxic for chickens and at moderately levels, causes ascites (Julian et al., 1987). Salt-induced ascites produces clinical and pathological changes that are similar to those of high altitude and naturally occurring ascites, which develops as a result of pulmonary hypertension (Huchzermeyer and De Ruyck., 1986).

New reclaimed desert areas (South Sinai) depend on underground water for drinking of poultry reared in farms erected in these desert lands. Poultry in these areas are usually dependent on drinking well water with varying degrees of salinity (Morsy, 2018). Water salinity is the most important factor determining the suitability of particular water source for poultry in Egypt, and one of the principal factors affecting water quality is the amount of total dissolved salts (TDS) in the water. The presence of high concentrations of calcium, magnesium, sodium, chloride and bicarbonate ions in animal’s drinking water may cause harmful effects resulting in poor performance, illness or even death at the high levels (Kellems and Church, 2002).

Zeolite (clinoptilolite) is able to enhance the productive performance of chickens under different conditions (Hcini et al., 2018; Wu et al., 2013; Mallek et al., 2012 and Khambualai et al., 2009). Zeolites are crystalline, hydrated aluminotectosilicates of alkali and alkaline-earth cations, having infinite, three-dimensional structures of interconnecting channels and great pores, capable of trapping molecules in suitable conditions (Mumpton and Fishman, 1977; Mumpton, 1999). Also, the beneficial effects of zeolite may be attributed to the aluminum, silicon, or sodium content of zeolites, because it has been established that these minerals can influence calcium -metabolism, thus improving calcium (Ca) and phosphorus (P) utilization (Waldroup et al., 1984; Leach et al., 1990; Elliot and Edwards, 1991; Watkins and Southern, 1991 and Shariatmadahari, 2008).

Studies have revealed that the zeolite (clinoptilolite) is able to adsorb damaging toxins that can reduce the growth of animals (Oğuz and Kurtoğlu, 2000), affects gut morphology, decreases pH and lowers pathogenic bacteria counts, which suggests that intestinal health can be enhanced by its use (Khambualai et al., 2009 and Wu et al., 2013). However, some studies have demonstrated enhancement in the growth of broiler chickens as result of adding zeolite in their feed (Karamanlis et al., 2008).

In animal nutrition, zeolite are used to protect animals against mycotoxin intoxication (Rizzi et al., 2003; Modirsanei et al., 2004 and Desheng et al., 2005), to reduce radionuclides (Vitorovic et al., 2002; Branislava and Gordana, 2004) and heavy metals (Boranić, 2000), in addition improved utilization of feed nutrients by prevent digestive tract diseases and improved hygienic and sanitary conditions in animal housing facilities (Meisinger et al., 2001 and Melenova et al., 2003).

Addition of natural zeolite (clinoptilolite) to broiler diet led to promote the productive performance of chickens (Suchy et al., 2006; and Nikolakakis et al., 2013) and improve feed conversion ratio and body weight gain (Debeic, 1994). Boyer (2000) reported that zeolite (clinoptilolite) supplementation led to a significant increase in feed efficiency and reducing the toxic effects of surplus ammonium ions. In contrast, some researchers found that using of zeolite had no effect on poultry performance (Evans and Farrell, 1993). Therefore, this study was aimed to determine the effect on zeolite addition on productive performance and blood constituents of broilers chickens drinking saline well water.

MATERIALS AND METHODS

The present study was conducted in the South Sinai Research Station, located at Ras Suder that belongs to the Desert Research Center, Ministry of Agriculture, Egypt. The experiment started in September up to October, 2016. The work aimed to study the effect of zeolite supplementation on productive performance and blood constituents of Ross broiler chicks received saline well water. A total number of 120 broiler chicks (one day – old unsexed Ross 308) were obtained from a commercial hatchery and body weight of 40.09 g ± 0.11. Chicks were randomly divided into four equal treatments (30 chicks of each) which in turn divided into three equal replicates (10 chicks each). The 1st treatment (T1), chicks drank tap water containing 265 ppm total dissolved solids (TDS) with basal diet. The 2nd treatment (T2), chicks drank saline well water containing 3398 ppm TDS with basal diet. The 3rd treatment (T3), chicks drank saline well water containing 3398 ppm TDS with basal diet + 3 % zeolite. The 4th treatment (T4), chicks drank saline well water containing 3398 ppm TDS with basal diet + 6 % zeolite. Water minerals, pH and TDS were measured Table (1) according to Muller (1995). Chemical composition of the zeolite (Clinoptilolite) was represented in Table (2). However, zeolite sample is a non-dusting, hard and resistance to attrition, non-clouding in liquids (due to absence of clays), good permeability, relatively high density and high-water retention according to Metallurgical Research and Development Center. Chicks were housed in cages where birds have no access to litter. Pen cage of 60 cm long, 40 cm width and 50 cm height was allotted to house five birds till the end of the trial. Lighting program consisted of a period of 23 h light and 1 h of darkness in 2nd week but 21 h light and 3 h of darkness in 3rd, 4th and 5th weeks. The temperature was controlled and gradually reduced from 33°C to 23°C on day 35. Chicks were kept under the same managerial and hygienic conditions.

Chicks were healthy and treated with vaccines.

Chicks received three types of diets throughout the experimental period. Starter diet which was introduced from one day to 14 days of age, grower diet which was used from 15 days to 28 days of age and finisher diet which was used from 29 days to 35 days (end of experiment). The three diets were formulated to cover all nutrients requirements of broiler chicks according to Ross Nutrition guide. Composition and calculated analysis of the experimental diet was presented in Table (3).

Weekly live body weights were individually recorded for each chick and the average live body weights were calculated for each replicate and treatment during the five weeks experimental periods. Total weight gain (TWG) was calculated for each replicate and treatment by subtracting the initial boy weight (IBW) of birds from the final body weight (FBW). Total feed intake (TFI) was recorded on weekly basis until the end of the experiment when birds were 35 days old by calculated from the difference between the amount of feed provided for each replicate and treatment and the residual quantity for the same replicate and treatment. Feed conversion ratio was calculated for each replicate and treatment by divided TFI / TWG. Total water intake (TWI) and mortality rate were recorded from one day old till the end of experiment. At the end of the experiment (35 days). Four chickens were randomly taken from each replicate and treatment to slaughter to determine the carcass characteristics by removing the feathers, dismembering the legs and evacuating the contents of the carcass. Measurements of the carcass, such as the weight of each heart, gizzard, liver and spleen were recorded as percent of live body weight. On 35 day of experimental period, 1 ml of blood was collected from wing vein from 10 birds of each treatment into anticoagulant EDTA treated for determination of red blood cells (RBC's), hemoglobin (Hb), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were determined by the coulter (HA-VET, Clinding – Belgium). Another blood samples were collected from the slaughtered birds in non-EDTA tubes. Serum was collected by centrifugation for 15 minutes at 3000 rpm and it stored at –20 ^{0} C until determination of aldosterone hormone which determined by ELISA method using commercial kits and blood metabolites (total protein, albumen, glucose, cholesterol, creatinine and alanine and aspartic transaminase) by using commercial kits. Globulin was calculated by the difference between total protein and albumin.

Data were analyzed by the least square analysis of variance using the General Linear Model Procedure (SAS, 2004) according to following model:

$Y_{ij}=\mu + Tr_i + e_{ij}$

Where,

Y_{ij}= Observations.

μ = Overall mean.

Tr_i = Effect of i^{th} treatment (i: 1-4).

e_{ij}= Experimental error.

Duncan’s New Multiple Range Test (Duncan, 1955) separated differences among treatment means.

RESULTS AND DISCUSSION

1. Productive performance

Final body weight, total weight gain and feed conversion of broiler chickens were significantly enhanced in control group (T1), T3 and T4 as compared with the chickens in T2. On the other hand, the total feed intake significantly decreased in the chickens of T4 as compared with T1 and T2, while, the total water intake significantly increased in T2 which drink saline well water without zeolite supplementation compared with other treatments (Table 4). These results may be explain the importance of return to addition of zeolite to broiler diet which drinking saline well water in decreased the adverse effect of saline water and led to promote of chicken growth performance in the T3 and T4 (Suchy et al., 2006 and Nikolakakis et al., 2013), as well as improve body weight gain and feed conversion ratio (Debeic, 1994) and led to a significant increase in feed efficiency as well as reducing the toxic effects of excess ammonium ions (Boyer, 2000). These results agree with previous studies in which it was reported that added zeolite in broiler chicken diets increased body weight (Eleroglu et al., 2011) and enhanced growth rate (Karamanlis et al., 2008). The positive effect of zeolite on productive performance could be due to its ability to reduce adverse effects of saline well water such as aflatoxins and heavy metals as has been described by Jand et al. (2005) and Ortatatli et al. (2005). On the other hand, Total water intake significantly increased in T2 compared with T1, T3 and T4 (Table 4). This result agreement with Mumpton and Fishman (1977) who reported that water intake was reduced when zeolite was included in the diet of broiler chickens.

Mortality rate insignificant increased in T2 compared with other treatment (T1, T3 and T4) figure (1)

2. Carcass traits

Table (5) shows that the effects of zeolite supplementation on carcass characteristics of broilers drinking saline well water, results showed that, carcass weight percentage (CW %) was significantly increased in the chickens of T1, T3 and T4 treatments as compared to chickens of T2. These results may be due to the zeolite supplementation decreased the negative effect of saline well water in CW %, these results in agreement to findings of Ozturk et al. (1998); Moghaddam et al. (2005); Khajali et al. (2006) and Heba A Basha et al. (2016) which alluded that dietary zeolite can't improve broiler carcass yield.

Nevertheless, the relative weights of total edible parts (heart, gizzard, liver and spleen) did not significantly different between treatments. These results may be due to these organs did not affect directly by drinking saline water.

3. Hematological parameters

There were significant difference between treatments in RBC's, Hb and PCV, however, RBC's, Hb and PCV were increased ($P<0.05$) in the chickens of T3 when compared with the chickens of T2 (Table 6). These results may be returns to the adverse effect of drinking well saline water on red blood cells and this redirected on Hb and PCV % in T2 which drinking saline water. These results in hematological parameters may be due to intake saline well water might be caused hemodilution and increased total body water (Morsy et al., 2012; Emam et al., 2017 and Morsy, 2018). Moreover, salt stress caused varying degrees of anhydremia resulting in an elevation of specific gravity and hematocrit value in the blood (Amal Hassan, 2013). Meanwhile, improvement in hematological parameters of chickens received 3 and 6 % zeolite (T3 and T4) may indicate that the significant role of zeolite in decreasing the damaging effects of saline water on chickens through reduce a toxic materials such as heavy metal salts (Andronikashvili et al., 2009), hence it may be revocable in increase the values of RBC's and Hb (Shadrin, 1998 and Morsy, 2018).

There were insignificant differences between treatments in mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC).

4. Biochemical parameters

Table (7) showed that there were insignificant differences between treatments on TP, globulin. On the other hand, albumin level was significantly increased in the chickens of T4 compared with other treatments, this result may be return to zeolite enhance the liver function and thus increased albumin level, this was clear in the increase of ALT and AST in the chickens of T3 and T4 compared with the chickens of T2.

ALT, AST and creatinine increased ($P<0.05$) in the chickens drank saline well water (T2) as compared to the chickens in other treatments indicating that increased salt load might cause negative effects on the liver and kidney functions and in turn the animal's health (Amal, Hassan, 2013; Morsy et al., 2012 and 2016 and Morsy, 2018). However, there were no significant differences among T3 and T4 and T1 in ALT and creatinine levels and might indicate that zeolite might be safe supplements (Tukmechi et al., 2011 and Sheikhzadeh et al., 2017).

Moreover, glucose level significantly increased in the chickens of T1, T2 and T3 compared with the chickens of T2. These results may return to zeolite decrease the adverse effects of drinking saline well water and thus increased metabolic rate in the chickens of T3 and T4. However, drinking saline well water in the chickens of T2 showed significantly increased in the creatinine level and significantly decreased in the aldosterone level compared with the chickens of T1 (Table 6 and Figure 2).

Meanwhile, there were insignificant effect of zeolite level on creatinine and aldosterone level in the chickens of T3 and T4. This decrease in aldosterone hormone of T2 could be owing to the physiological effects of salt retention and excretion by reducing their plasma aldosterone level by approximately 50 % of control values (Amal, Hassan, 2013; Digby, 2007, Emam et al., 2017 and Morsy, 2018).

In addition, cholesterol level was significantly decreased in the chickens of T2 as compared with other treatments, Decreased cholesterol level in the chickens of T2 was in agreement with those of Amal, Hassan (2013) and Morsy (2018) who observed that where fat metabolism were adversely affected by drinking saline well water. However, there were no significant differences among the chickens of T3, T4 and T1 in cholesterol level which established that added of zeolite in diets did not have opposing effects on cholesterol level (Curtui, 2000; Lotfollahian et al., 2004; Miles and Henry, 2007; Safaeikatouli et al., 2011 and Morsy, 2018).

IN CONCLUSION,

Adding 3 % zeolite in the broiler diets might enhance the productive performance and some hemato-biochemical parameters of broiler chicken under drinking saline well water conditions.

Table (1): Chemical analysis of tap and saline well water

Parameters	**Tap water**	**Saline well water**
Total dissolved solids (mg/l)	265.0	3398.0
Electric conductivity (µS/m)	512.0	5540.0
pH	6.9	7.6
Sodium (mg/l)	30.0	640.0
Potassium (mg/l)	4.0	8.0
Calcium (mg/l)	46.0	302.7
Magnesium (mg/l)	10.7	160.3
Carbonate (mg/l)	0.0	15.0
Bicarbonate (mg/l)	125.0	115.9
Sulphate (mg/l)	52.3	800.0
Chloride (mg/l)	59.1	1414.0

Table (2): Chemical composition of the zeolite (Clinoptilolite)

Cations	%
K_2O	3.266
CaO	3.583
Na_2O	0.780
Major elements (oxides)	%
SiO_2	62.22
Al_2O_3	11.096
Na_2O	0.780
MgO	0.599
CaO	3.583
Fe_2O_3	4.033
K_2O	3.266
TiO_2	0.339
ZrO_2	0.112
Other elements	Trace
Cl	0.025
BaO	0.085
P_2O_5	0.033
ZnO	0.025
SrO	0.047
PbO	0.002
MnO	0.120
SO_3	0.035

Table (3): Composition of the experimental basal diet

Ingredient (%)	Starter	Grower	Finisher
Yellow corn	55.00	59.32	64.60
Soybean meal (44 %)	30.40	26.90	22.20
Corn gluten meal (62 %)	8.00	6.90	6.20
Di-Calcium phosphate	2.10	1.85	1.70
Calcium Carbonate	1.30	1.25	1.10
Corn Oil	2.00	2.70	3.20
Salt	0.30	0.30	0.30
Premix*	0.30	0.30	0.30
HCl -Lysine	0.40	0.30	0.25
DL-Methionine	0.20	0.18	0.15
Total	100	100	100
Calculated Analysis			
ME, Kcal/Kg	3015	3110	3205
Crude Protein (%)	23.01	21.16	19.10
Calcium (%)	1.071	0.986	0.881
A. Phosphorus (%)	0.513	0.459	0.424
Lysine (%)	1.439	1.246	1.076
Methionine (%)	0.604	0.554	0.495
Meth+Cys	0.992	0.915	0.826

*Vitamins and minerals premix provided per kilogram of the diet: Vit. A, 1000 IU; D_3 2000 ICU; Vit. E, 10 mg; Vit. K, 1mg; B_1, 10 mg; B_2, 5 mg; B_6, 1500 mg; B_{12}, 10mg Pantothenic acid, 10 mg; Nicotinic acid, 30 mg; Folic acid, 1mg; Biotin, 50 mcg; Chloride, 500 mg; copper, 10 mg; iron, 50 mg; Manganese, 60 mg; Zinc, 50mg, and selenium, 0.1 mg.

Table (4): Effect of zeolite supplementation on productive performance of broilers drinking saline well water

Traits	T1	T2	T3	T4	±SE
IBW (g)	40.05	40.09	40.09	40.21	0.28
FBW (g)	1878.69^{a}	1632.12^{b}	1939.07^{a}	1835.56^{a}	53.13
TWG (g)	1838.64^{a}	1592.03^{b}	1898.98^{a}	1795.44^{a}	53.15
TFI (g)	2933.27^{a}	2939.32^{a}	2928.13^{ab}	2882.60^{b}	16.99
FC	1.59^{a}	1.84^{b}	1.54^{a}	1.60^{a}	0.05
TWI (ml)	5974^{b}	6306^{a}	5852^{c}	5946^{b}	20.84

T1= tap water containing 265 ppm TDS, T2= saline well water containing 3398 ppm TDS, T3 = saline well water containing 3398 ppm TDS + 3 % zeolite supplementation, T4 = saline water containing 3398 ppm TDS + 6 % zeolite supplementation.

IBW = initial body weight (1 days); FBW = final body weight (35 days); TWG = Total weight gain (FBW-IBW); TFI = feed intake; FC (g feed/g gain) = feed conversion; TWI=Total water intake

$^{a-b-c}$ Means bearing different superscripts within the same row are significantly different ($P<0.05$).

Table (5): Effect of zeolite supplementation on carcass characteristics of broilers drinking saline well water

Traits	T1	T2	T3	T4	±SE
LBW (g)	1773.33	1685.00	1826.66	1800.00	93.04
CW (%)	77.68^{a}	73.63^{b}	77.00^{a}	76.75^{a}	0.49
HW (%)	0.49^{ab}	0.50^{ab}	0.58^{a}	0.37^{b}	0.05
GW (%)	1.67	1.57	1.58	1.57	0.12
LW (%)	2.42	2.28	2.72	2.30	0.32
SW (%)	0.19	0.13	0.12	0.11	0.03

T1= tap water containing 265 ppm TDS, T2= saline water containing 3398 ppm TDS; T3 = saline well water containing 3398 ppm TDS + 3 % zeolite supplementation, T4 = saline water containing 3398 ppm TDS + 6 % zeolite supplementation.
LBW = live body weight (35 days); CW = carcass weight, HW = heart weight, GW = gizzard weight, LW = liver weight, SW = spleen weight.
$^{a-b}$ Means bearing different superscripts within the same row are significantly different ($P<0.05$).

Table (6): Effect of zeolite supplementation on hematological parameters of broilers drinking saline well water

Traits	T1	T2	T3	T4	±SE
Red blood cells ($\times 10^6/mm^3$)	2.62^{ab}	2.40^{b}	2.74^{a}	2.67^{a}	0.08
Hemoglobin (g/dl)	10.02^{ab}	9.42^{b}	10.46^{a}	10.10^{ab}	0.25
Packed cell volume (%)	28.72^{ab}	26.60^{b}	30.31^{a}	28.89^{ab}	0.88
MCV (fl)	109.62	110.84	110.51	108.20	1.36
MCH (pg)	38.27	39.28	38.19	37.81	0.62
MCHC (%)	34.93	35.44	34.55	34.94	0.43

T1= tap water containing 265 ppm TDS, T2= saline well water containing 3398 ppm TDS, T3 = saline well water containing 3398 ppm TDS + 3 % zeolite supplementation, T4 = saline water containing 3398 ppm TDS + 6 % zeolite supplementation.
MCV = mean corpuscular volume, MCH = mean corpuscular hemoglobin, MCHC = mean corpuscular hemoglobin concentration.
$^{a-b}$ Means bearing different superscripts within the same row are significantly different ($P<0.05$).

Table (7): Effect of zeolite supplementation on some biochemical parameters of broilers drinking saline well water

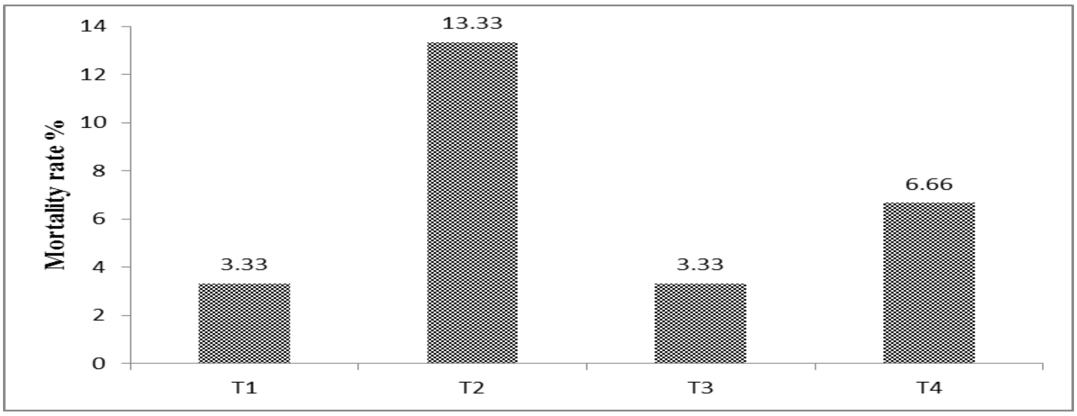
Traits	T1	T2	T3	T4	±SE
Total protein (g/dl)	3.78	3.25	3.38	3.66	0.29
Albumin (g/dl)	2.23^{b}	2.39^{b}	2.42^{b}	2.83^{a}	0.08
Globulin (g/dl)	1.55	0.86	0.96	0.83	0.24
Glucose (mg/dl)	157.98^{ab}	146.53^{b}	161.72^{a}	167.91^{a}	6.69
Cholesterol (mg/dl)	137.12^{a}	118.56^{b}	141.76^{a}	141.92^{a}	9.12
ALT (i.u./l)	11.58^{b}	28.81^{a}	$17.61b^{b}$	16.44^{b}	2.06
AST (i.u./l)	24.84^{c}	45.96^{a}	34.04^{b}	25.94^{c}	1.94
Creatinine (mg/dl)	0.16^{b}	0.50^{a}	0.34^{ab}	0.41^{a}	0.07

T1= tap water containing 265 ppm TDS, T2= saline well water containing 3398 ppm TDS, T3 = saline well water containing 3398 ppm TDS + 3 % zeolite supplementation, T4 = saline water containing 3398 ppm TDS + 6 % zeolite supplementation.

ALT =alanine transaminase, AST = aspartic transaminase.

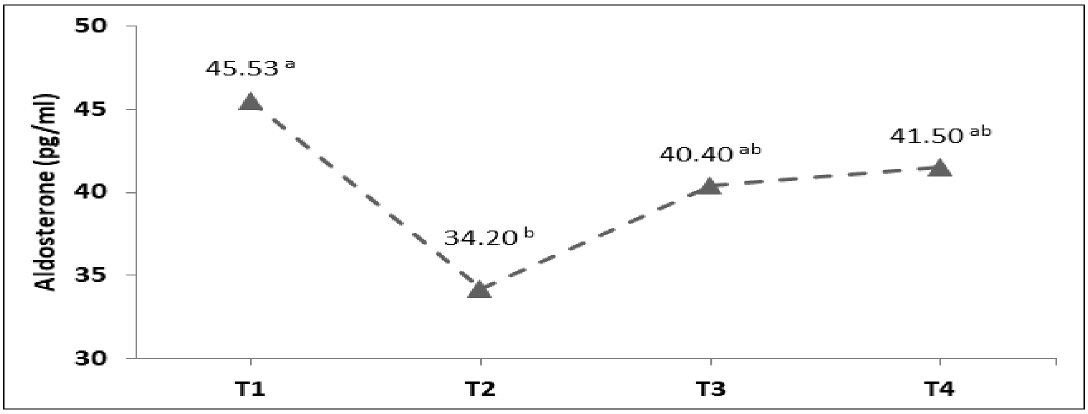
$^{a-c}$ Means bearing different superscripts within the same row are significantly different (P<0.05).

Figure (1): Effect of zeolite supplementation on mortality rate % of broilers drinking saline well water



T1= tap water containing 265 ppm TDS, T2= saline well water containing 3398 ppm TDS, T3 = saline well water containing 3398 ppm TDS + 3 % zeolite supplementation, T4 = saline water containing 3398 ppm TDS + 6 % zeolite supplementation.

Figure (2): Effect of zeolite supplementation on aldosterone hormone of broilers drinking saline well water.



T1= tap water containing 265 ppm TDS, T2= saline well water containing 3398 ppm TDS, T3 = saline well water containing 3398 ppm TDS + 3 % zeolite supplementation, T4 = saline water containing 3398 ppm TDS + 6 % zeolite supplementation.
[a-b] Means bearing different superscripts are significantly different ($P<0.05$).

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الملخص العربى

تأثير إضافة الزيولايت على الأداء الإنتاجى ومكونات الدم لدجاج اللحم تحت ظروف شرب ماء البئر المالح

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يهدف البحث إلى دراسة تأثير اضافة الزيولايت (كلينبولايت) على الأداء الإنتاجى ومكونات الدم لدجاج اللحم (سلالة الروس) التى تشرب ماء البئر المالح (3398 جزء فى المليون أملاح كلية ذائبة). أستخدم فى هذه الدراسة عدد 120 كتكوت (عمر يوم واحد غير مجنس من سلالة الروس 308) ووزن الجسم 40,09±0,11 جم) قسمت الكتاكيت عشوائياً إلى أربعة مجاميع متساوية (30 كتكوت/ معاملة). المعاملة الأولى كانت الكتاكيت تشرب ماء عذب (265 جزء فى المليون أملاح كلية ذائبة) واعتبرت مجموعة كنترول بينما المجموعة الثانية كانت الكتاكيت تشرب ماء البئر المالح (3398 جزء فى المليون أملاح كلية ذائبة). المجموعة الثالثة والرابعة كانت الكتاكيت تشرب ماء البئر المالح بالإضافة إلى 3 % و 6% زيولايت فى العليقة على التوالى.
أظهرت النتائج تحسن معنوي لصفات وزن الجسم النهائى والزيادة الكلية لوزن الجسم والتحويل الغذائى لدجاج المعاملات الأولى (الكنترول) والمعاملة الثالثة والرابعة عند مقارنتهم بدجاج المعاملة الثانية. كما أوضحت النتائج إنخفاض معنوى للغذاء المأكول فى دجاج المعاملة الرابعة مقارنة بالمعاملة الاولى والثانية. بينما زاد معنويا كمية المياة المستهلكة الكلية فى المعاملة الثانية مقارنة بباقى المعاملات. زادت معنوياً نسبة التصافى فى دجاح المعاملات الأولى والثالثة والرابعة مقارنة بدجاج المعاملة الثانية. كما زاد معنوياً عدد كرات الدم الحمراء والهيموجلوبين وحجم الكتلة الخلوية فى دجاج المعاملة الثالثة مقارنة بدجاج المعاملة الثانية. كما زاد مستوى الألبيومين معنوياً فى دجاج المعاملة الرابعة مقارنة بباقى المعاملات. اوضحت النتائج زيادة معنوية لتركيزات أنزيمات الألانين والأسبارتك الناقلة لمجموعة الأمين وكذلك تركيز الكرياتنين فى دجاج المعاملة الثانية مقارنة بباقى المعاملات. من ناحية أخرى انخفض معنوياً مستوى الجلوكوز والكولسترول فى دجاج المعاملة الثانية مقارنة بدجاج المعاملات الأولى والثالثة والرابعة..
تخلص الدراسة إلى أن اضافة 3 % زيولايت لعلائق دجاج اللحم ربما يحسن من الأداء الإنتاجى وبعض مقاييس الدم تحت ظروف شرب ماء البئر المالح.

الكلمات الدالة : ماء البئر المالح ، الزيولايت، دجاج التسمين والاداء الإنتاجى