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ALLEVIATION OF SALINITY STRESS USING VITAMINS C AND E AND THEIR RELATION TO GROWTH PERFORMANCE, BLOOD COMPONENTS AND SOME HISTOLOGICAL CHANGES OF BROILER CHICKS

By

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Abstract: *A 4X3 factorial design was conducted to study the effect of four levels of sodium chloride (0, 1000, 3000 and 5000 ppm/l) or Vitamins (0, 1gVitamin C/kg diet or 100 mg Vitamin E/kg diet) addition on growth performance, mortality rate, carcass characteristics, blood components and histological changes of the liver and kidney. Three hundred and sixty commercial broiler chicks (Arbor Acres) from 1-7 weeks of age were used. The broiler chickens were nearly equal in live body weight and randomly divided into twelve experimental treatments. Each treatment included 30 chicks in 3 replicates (10 chicks each).*

The results showed that, 3 and 7 weeks of age, body weight was significantly ($P<0.01$) decreased with increasing NaCl at levels of 3000 or 5000 ppm as compared with the control group. Body weight gain and feed consumption were significantly ($P<0.05$) decreased with increasing NaCl at level of 3000 or 5000 ppm as compared with the control group during 1-3 and 1-7 weeks of age. Water and water/feed ratio were significantly ($P<0.01$) increased with increasing NaCl as compared with the control group. Increasing salinity from1000 up to 5000 ppm /l significantly ($P<0.05$) increased mortality rate as compared to drinking tap water during experimental period (except at 3-7 weeks of age). Carcass, dressing and abdominal fat were significantly ($P<0.01$) decreased, while blood serum activities of aspartate-aminotransferase (AST), alanine-aminotransferase (ALT), uric acid, creatinine, sodium, potassium concentrations and heart (%) were significantly ($P<0.01$) increased with increasing salinity levels in the drinking water. Magnesium of serum broiler chicks did not show any *significant effect with the different levels of NaCl addition to the drinking water.*

Regarding at 7 weeks of age Vit.C addition to the diet caused significantly (P<0.05) increased body weight, while mortality rate was significantly (P<0.05) decreased as compared to without addition. Broilers fed diets supplemented with Vit.C improved body weight gain during of experimental period (except at 1-3 weeks of age) as compared to without addition. Also, feed consumption, feed conversion, water consumption and water/feed ratio were insignificantly affected. Broilers fed the diets treated with Vit.C or E significantly (P<0.01) increased creatinine in blood serum. While, AST, ALT enzymes activities, uric acid, sodium, potassium and magnesium concentrations and carcass traits were insignificantly affected as compared with the diets without addition. The high levels of NaCl in the drinking tap water caused loss of tissue architecture, severe necrosis, diffuse inflammatory, cellular infiltration, enlargement of hepatic sinusoids and aggregation of R.B.C$_S$. in central vein and in the sinusoids in liver. While, caused loss of kidney tissue architecture, diffuse inflammatory, cellular infiltration, aggregation of lymphocytes, necrosis of tubular epithelium, severe hemorrhage, severs degeneration of the kidney tissues. The addition of Vit.E or C to the diet with salted water alleviated these changes and decreases the destruction of the liver and kidney.

INTRODUCTION

Most nutritional studies with minerals have been carried out using dietary supplements with little attention given to the role of minerals in drinking water. This is important since underground water supplies often containing high concentrations of dissolved salts are a common source of drinking water for poultry in many countries. *Balnave et al.* (1988) suggests that some minerals may exert adverse effects on the performance of growing broilers and laying hens when present in drinking water at concentrations similar to those found in natural sources. While, the nutritional importance of minerals in the diet has been examined extensively and the role of minerals in drinking water has received much less attention. This is surprising since underground water supplies are a common source of drinking water for poultry in many countries and such water often contains high concentrations of dissolved mineral salts. These salts may contribute to the mineral requirements of poultry although their presence is usually not considered when estimates of requirements are made (Ross, 1979). However, when present of high concentrations of some minerals that can be toxic. Hence, under these conditions the reductions in growth and laying performance will occur. In sub-tropical countries (i.e. Egypt), fresh water in the desert is very dear and represent a serious optical problem for expanding and developing real animal and poultry farms. Under desert ground water which ought to be drinking water in many cases contains variable percentage of salts. Ali *et al.* (1992), Soliman (1993) and Ezzat (1999) declared that liver and kidney functions decreased by increasing salt level in the drinking water for broiler chicks.

On the other hand, Pardue and Thaxton (1986) and Orban (1993) reviewed the role of Vit.C in poultry and indicated that all species of poultry are capable of synthesizing Vit.C and dietary supplementation is not necessary when the bird is managed properly. However, when the birds are subjected to stressful conditions, poor nutrition or certain pathogens, the endogenous synthetic capacity of Vit.C may decline resulting in a decreased performance coupled with increased mortality. Vitamin C or polyphenols increased the antioxidant enzymes in red blood cells (Dragsted et al., 2001). In addition concepts of the biochemical functions of Vit.E include its role as a biological free radical scavenger (McCay, 1985), in nucleic acid and protein metabolism (Catignani, 1980) and in mitochondrial metabolism (Corwin, 1980). Vitamin E has been considered to have a role in the development of immune response in chickens, whereas it is involved in immune response, such as lymphocytes, macrophages and plasma cells against oxidative damage and to enhance the function and proliferation of these cells (Franchini *et al.*, 1991 and Meydani and Blumberg, 1993). Chicken cannot synthesize vitamin E, therefore the requirements must be given from dietary source (Chan and Decker, 1994). In addition Vit.E act as a physiological synergist and as a functioning portion of specific enzymes (Franchini *et al*., 1995).

Therefore, the present study aimed to establish the alleviation of salinity water stress using Vitamins C and E in the diets and their relation to growth performance, blood components and histological changes of the liver and kidney.

MATERIALS AND METHODS

The present study was carried out in Poultry Farm, Poultry Production Department, Faculty of Agriculture, Zagazig University, Zagazig, Egypt. A 4X3 factorial design was conducted to study the effect of four levels of sodium chloride (0 ,1000, 3000 and 5000 ppm/l) added with some vitamins (without, 1g Vitamin C or 100 mg Vitamin E /kg diet) on growth performance traits, mortality rate, carcass characteristics, blood composition and histological changes of the liver and kidney during growing period. Three hundred and sixty commercial broiler chicks (Arbor Acres) from 1-7 weeks of age were used. The broiler chickens were nearly equal in the live body weight divided randomly into twelve experimental treatments. Each treatment included 30 chicks in 3 replicates (10 chicks each). Chicks were kept in brooders with raised wire floors and exposed to 24 hours light. Analysis of tap water and water containing different levels of sodium chloride (NaCl) during the experimental period are shown in Table 1. Different levels of NaCl addition occurred every morning immediately after water troughs were scrubbed, cleaned and refilled in each group. The basal diet contained 21.08 and 18.11% crude protein, 3115 and 3114 ME (k cal /Kg diet), 3.10 and 3.12% crude fat and 3.25 and 3.08% crude fiber from hatching up to 3 weeks (starter period) and from 3 to 7 weeks of age (finisher period), respectively. A starter and finisher diets contained adequate levels of nutrients for growing broiler chicks as recommended by NRC (1994). The diet composition and its chemical analysis are shown in Table2. Feed and water offered *ad libitum* throughout the experimental period. Individual Live body weight, weight gain, feed consumption, feed conversion ratio (g feed/g gain), water consumption, water/feed ratio and mortality rate were recorded at first, third and seventh weeks of age.

At the end of the experiment (7 weeks old), three birds were taken randomly from each treatment for slaughter test. Weights of liver, heart, empty gizzard, carcass, abdominal fat were recorded to the nearest gram. Giblets (liver, heart and empty gizzard), carcass, dressing (giblets plus carcass) and total body fat weights were calculated as a percentage of live body weight. Blood samples were collected individually at slaughtering from 3 birds representing each group. Blood serum was obtained by centrifugation at 600 *g* for 15 minutes and stored at -20°C for subsequent analysis. Serum samples were analyzed for AST (U/l), ALT (U/l), creatinine (mg/dl), uric acid(mg/dl), sodium (mg/dl), potassium(mg/dl) and magnesium (mg/dl) concentrations were estimated in the serum by using kits supplied by Diamond Diagnostic (Cairo, Egypt).

Immediately after slaughtering, samples of liver and kidney were fixed in 10 % formaline and prepared by the ordinary histological techniques. These sections were stained by Haematoxline and Eosin (H & E) then examined under X_{45} power using light ordinary microscope.

Data were statistically analyzed using SAS® software computer program (SAS, 1998). The significant differences between means were detected according to Duncan (1955). Mortality percentages were analyzed by using Chi - square test.

RESULTS AND DISCUSSION

1. Growth performance:

At 3 and 7 weeks of age, body weight was significantly ($P<0.01$) decreased with increasing NaCl at levels of 3000 or 5000 ppm as compared with control (Table 3). While, live body weight for broiler chicks drank water contained 1000 ppm NaCl recorded heavier than in other salted water at 7 weeks of age. The results may be attributed to accumulation of water in body rather than real growth of tissues. The theory of 'active transport' means that energy from ATP should be provided to maintain suitable concentrations of sodium inside the epithelial cells, which should be less than the concentration of sodium in the lumen. Then the sodium ions can be transported into the epithelial cells and in turn the absorption of glucose and amino acids is facilitated (Guyton, 1987). Body weight gain was significantly ($P<0.05$) decreased with increasing NaCl at levels of 3000 or 5000ppm as compared with control during 1-3 and 1-7 weeks of age (Table 3). These results are in agreement with those obtained by Lott **(**1992) and Rashwan *et al.* (1997) who noticed that live body weight decreased significantly ($P<0.01$) as a result of high salt level in drinking water and may be due to dehydration which adversely affect feed consumption, without consistent change in feed efficiency.

With regard to vitamins addition, broilers fed the diets supplemented with Vit.C significantly ($P<0.05$) increased body weight as compared without vitamins addition at 7 weeks of age (Table 3). These results are in agreement with those obtained by Al-Taweil and Kassab (1990) and Abd-Ellah (1995) who reported that body weight was improved with Vit.C(1g/l) to the drinking water due to the action of Vit.C in increasing metabolic rate in the body (Degkwitz, 1987). Addition of Vit. C to the diet significantly ($P<0.05$) improved body weight gain during the experimental period (except at 1-3 weeks of age) as compared to without vitamins addition (Table 3). At 7 weeks of age, body weight and weight gain were significantly ($P<0.01$) improved with broiler drinking tap water plus Vit.C as compared with other treatments which may be due to increase feed consumption.

Data presented in Table 4 showed that, feed consumption was significantly ($P<0.05$) decreased with increasing NaCl at levels of 3000 or 5000 ppm as compared with control group during 1-3 and 1-7 weeks of age. These findings may be due to loss of appetite resulting from lesions of appetite center in the lateral nucleus of the hypothalamus (Smith, 1969). The receptors in the crop and esophagus were influenced by the rate of filling, capacity and discharge of feed. Hormones or other factors may regulate the set point at which the receptors operate (Polin and Wolford, 1973). However, feed conversion value was significantly ($P<0.01$) decreased with increasing NaCl at a level of 5000 ppm as compared with control.

With regard to vitamins addition, broilers fed the diets added with Vit.C or E insignificantly affected feed consumption and conversion during the experimental period (Table 4). These results are in disagreement with those obtained by Abd-Ellah (1995) and El-Fiky (1998) who found that vitamin C addition (1g/ l) to the drinking water improved ($P<0.01$) feed intake and feed conversion efficiency as compared with the control group. With regard to interaction between vitamins in the diet with salinity water, feed consumption and conversion values were insignificantly affected during the experimental period (Table 4).

On the contrary, water and water/feed ratio values were significantly ($P<0.01$) increased with increasing NaCl level as compared with control (Table 5). The increase in water intake may be due to the impact of Na^+ ions on thirst center (Guyton, 1987 and Villee *et al.*, 1989). The increases in water intake as a result of increasing NaCl level are in agreement with many investigators (Smith and Teeter, 1989; Britton, 1992; Adrizal *et al.*, 1997; Oviedo-Rondon *et al.*, 2001). These findings may be due to stimulation in lateral hypothalamus or lesions in ventral medial nucleus of the hypothalamus (Akerman *et al.*, 1960). Sturkie (1976) found that the polydipsia might result from lesions of the thirst center in the brain, which may be as a result of more salt intake.

With regard to vitamins addition, water consumption and water/feed ratio were insignificantly affected during the experimental period (Table 5). These results are in agreement with those obtained by Balnave *et al.* (1991) and Ezzat and Abd El-Razik (2003) who found that the average daily water intake was considerably decreased in response to supplementation of either ascorbic acid or NaCl in drinking water as compared to the control group. Addition of Vit.C or E with 3000 and 5000 ppm NaCl significantly ($P<0.05$) increased water consumption and water/feed ratio as compared with control group during experimental period.

The results obtained in Table 6 showed that increasing salinity levels from1000 up to 5000 ppm /l significantly ($P<0.05$) increased mortality rate as compared with drinking tap water during the experimental period (except at 3-7 weeks of age). These findings may be due to caused loss of tissue architecture, severe necrosis, diffuse inflammatory, cellular infiltration, enlargement of hepatic sinusoids and aggregation of $R.B.C_S$. in central vein and in the sinusoids (Figures 4-12). Also, loss of tissue architecture, diffuse inflammatory, cell infiltration, aggregation of lymphocytes, necrosis of tubular epithelium, severe hemorrhage, severs degeneration of the kidney tissues (Figures 16-24). However, Mirsalimi *et al.* (1994) found that dietary salt produced an expansion of extra cellular fluid volume which may be associated with pulmonary hypertension induced right ventricular failure and ascites with death. These results are in agreement with those obtained by Pang *et al*, (1979), Rashwan *et al.* (1997) and Ezzat (1999). These results may be attributed to increase of NaCl levels in feed or water, which may occurred the stressful and toxic effect of high level of salt on health of chicks.

Broilers fed the diet supplemented with Vit. C or E significantly ($P<0.05$) decreased mortality rate during experimental period as compared to with control (Table 6). Similarly, addition of Vit.C or E with 3000 and 5000 ppm NaCl were significantly ($P<0.05$) decreased mortality rate as compared with 3000 and 5000 ppm NaCl/l during experimental period except at 3-7 weeks of age (Table 6). Metwally (2003) indicated that mortality rate (%) significantly ($P<0.05$) lower in group fed the vitamin E supplemented diets. Hoffmann and Roche (1995) reported that ascorbic acid alleviating detrimental effects of mycotoxins, heavy metals and pollutants on health and performance of chicks. Moreover, the addition of ascorbic acid in drinking water was essential for resistance to disease in poultry.

2. Carcass characteristics:

Results in Table 7 showed that, carcass (%), dressing and abdominal fat (%) were significantly ($P<0.01$) decreased with increasing salinity levels in water. These results are in agreement with those obtained by Al- Harthi (2001) who reported that dressing percentage was decreased significantly when dietary NaCl level was elevated up to 5000 ppm. Marks and Washburn (1983) noticed that abdominal fat in broilers was significantly reduced (17 to 28%) in the birds fed 2.4% salt as compared with 0.4% salt controls which may have related to the high water/feed ratios of the chicks. While, heart (%) was significantly ($P<0.01$) increased with increasing salinity levels in water. These findings may be due to the increase of the blood volume with increasing levels of NaCl. Broilers drank tap water showed no affected in liver (%) gizzard (%) and giblets (%) as compared with those drank water with salinity.

Addition of Vit.C or E to the diets did not significantly affect carcass traits as compared without vitamins addition. Broilers fed diet containing Vit. E with drinking tap water significantly ($P<0.05$) increased carcass and dressing (%) as compared with other treatments. While, broilers drinking water containing 5000 ppm NaCl significantly ($P<0.05$) increased heart (%) as compared with other treatments. The results obtained in this study revealed that liver (%), gizzard (%), giblets and abdominal fat (%) were not significantly effect by interaction between sodium chloride and Vit.C or E.

3. Blood components:

The results obtained in Table 8 showed that AST and ALT enzymes activities were significantly ($P<0.01$) increased by increasing NaCl in drinking water. These results may be due to the damage of hepatic cells with increasing level of NaCl in drinking water (Figures 1 to 12). Similarly, uric acid and creatinine concentrations were significantly ($P<0.05$) increased by increasing level of NaCl in drinking water. This toxicity effect may be due to the large renal and glomeruler casts, severe necrosis, mononuclear cells infiltration and hemorrhage (Figures 13 to 24). These results are in agreement with those of Rashwan *et al.* (1997) and Ezzat and Abd El-Razik (2003) they noticed that liver and kidney functions decreased by increasing level of NaCl in drinking water. Sodium and potassium concentrations in serum were significantly ($P<0.05$) increased with increasing NaCl at levels of 3000 or 5000ppm as compared with control group. Increasing concentration of sodium and potassium in blood may be due to the increase of water consumption containing the high level of NaCl which caused apparent increase in the blood sodium and potassium concentrations and consequently, due to stress on kidney functions (Table 8). These results are in agreement with those obtained by Egwuatu *et al.* (1983) and Rashwan *et al.* (1997) who found that high significantly ($P<0.01$) increase of the blood sodium concentrate accomplished to increasing water salinity and due to the increased retention of salt and water in both intracellular and extra cellular fluids compartments. Magnesium of broiler chicks did not show any significant effect with addition of different levels of NaCl to the drinking water. These results are in agreement with those obtained by Rashwan *et al.* (1997) who reported that calcium and magnesium were insignificantly affected by salinity levels (2000 up to 3000 ppm NaCl).

Addition of Vit.C and E significantly ($P<0.01$) increased creatinine in blood. While, AST, ALT, uric acid, sodium, potassium and magnesium were insignificantly affected as compared without vitamins addition (Table 8). These results are in agreement with those obtained by Abaza (2002) who reported that selenium either at a level of 0.2 ppm or 0.5 ppm with the addition of 200 IU Vit. E no significant differences in serum AST. While, addition of Vit.C or E to the broilers diet drinking salinity water up to 3000 ppm/l significantly ($P<0.01$) increased AST enzyme activity and creatinine as compared with control group. (Table 8).

Interaction effects between NaCl and Vit. C or E on sodium and potassium concentrations were significantly ($P<0.01$) increased, while magnesium concentration was insignificant. Addition of Vit.C or E to the broilers diet drinking salinity water at 3000 and 5000 ppm/l significantly ($P<0.01$) increased sodium and potassium concentrations as compared with tap water plus Vit.C or E in the diets.

4. Histological changes:

4.1. The liver:

The liver of the control group showed normal architecture of hypatocyte, hepatic cord, central vein, hepatic sinusoids and hepatic lobules (Figure 1). The addition of Vit.E to the feed with drinking tap water only showed healthy tissue of hepatic cell (Figure 2). While Vit. C addition showed a very clear healthy tissues of hepatic cells (Figure 3). On the other hand, the liver of treated group, which received 1000 ppm NaCl, showed a mild destruction in the hypatocyte, degeneration of the hepatic cells and R.B.$C_{S.}$ aggregation in the sinusoids (Figure 4). The addition of Vit. E to the feed with the same level of NaCl alleviate the pathological changes (Figure 5), while Vit. C addition caused slight improvement of the symptoms of the broiler treated with 1000 ppm NaCl only but this improvement was slightly more than that achieved by the addition of Vit. E (Figure 6). The excess of NaCl at 3000 ppm (Figure 7) showed congestion and destruction of the central veins, focal and diffuse inflammatory, cellular infiltration, cytoplasmic vaccules, necrotic hepatocyte, aggregation of R.B.$C_{S.}$ and enlarged hepatic sinusoids. However, the addition of Vit. E to feed with the same level of NaCl was slightly improving the previous changes (Figures 8). While, Vit. C addition revealed slight modifications for salinity bad effects of the liver (Figure 9). Concerning the concentration of 5000 NaCl addition in the drinking water (Figure 10), caused loss of tissue architecture, severe necrosis, diffuse inflammatory , cellular infiltration, enlargement of hepatic sinusoids and aggregation of R.B.C_S. in central vein and in the sinusoids. However, addition of Vit. E to the feed with same level of NaCl showed less change than the previous case (Figure 11). While, Vit. C addition revealed slight modifications for salinity bad effects of the liver and lesser than pervious sample. (Figure 12). Similar observations were reported by Soliman (1993), Rashwan *et al.* (1997) and Ezzat and Abd El-Razik (2003).

4.2. The kidney:

The kidney of the control group showed healthy tissues and normal cortex of the kidney (Figure 13). The addition of Vit.E to the feed with drinking tap water only showed normal architecture of central lobules and renal glomeruli of the kidney (Figure 14). While, Vit. C addition showed a very clear healthy tissues and normal the cortex of the kidney (Figure 15). The concentration of 1000 ppm NaCl in the drinking water (Figure 16) showed degeneration changes, diffuse inflammatory, cellular infiltration and destruction in the glomerulus (renal corpuscles). The addition of Vit.E to the feed with the same level of NaCl improves the pathological changes (Figure 17), while Vit C addition caused slight improvement of the symptoms of the broiler treated with 1000 ppm NaCl only but this improvement was slightly more than that achieved by the addition of Vit. E (Figure 18). The excess of the NaCl to 3000 ppm showed focal inflammatory cellular infiltration, necrosis of tubular epithelium, aggregation of lymphocytes and destruction of the renal corpuscles and renal tubules (Figure 19). While, Vit. E addition to the diet with the same level of NaCl showed some improvement of tissues of the kidney than the addition of 3000 ppm only (Figure 20). However, Vit. C addition to the diet with the same level of NaCl showed improved tissues of the kidneys but higher than the addition of Vit. E in diet with 3000 ppm NaCl in the drinking water (Figure 21). The use of 5000 ppm NaCl in drinking water caused loss of tissue architecture, diffuse inflammatory, cell infiltration, aggregation of lymphocytes, necrosis of tubular epithelium, severe hemorrhage, severs degeneration of the kidney tissues (Figure 22). On the other hand, the additions of Vit. E addition to the diet with the same level of NaCl showed some improvement of tissues of the kidney than the addition of 5000 ppm NaCl only improved the change and decrease the destruction of the kidney (Figure 23). Vit. C to the diet with the same level of NaCl gave mild changes higher than the changes of Vit. E addition to the diet with the same level of NaCl (Figure 24). Similar trend was reported by Rashwan *et al.* (1997) and Ezzat and Abd El-Razik (2003) in broiler and Morrision *et al. (*1973) in poults.

In conclusion, excess of any salts in drinking tap water induce severe damage to the organs and tissues, especially liver and kidney of broiler chicks. Moreover, Vit. E or Vit.C addition to the broilers diets with saline water alleviated the toxic effects of saline drinking water up to 5000 ppm. on growth performance, blood components and histological changes in broiler chicks. Therefore, it can be recommend that the maximum use sodium chloride level in the drinking tap water can be bear safely by broiler chicks neither injurious on its physiological and productive performance was 1000 ppm/l with Vit. C supplementation from 1 to 7 weeks of age.

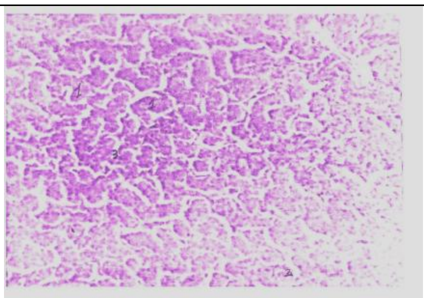

Figure (1): A histological section in the liver of a control broiler. Showing normal architecture of hypatocyte, hepatic cord, central vein, hepatic sinusoids and hepatic lobules. Mag.100, St. (H&E).

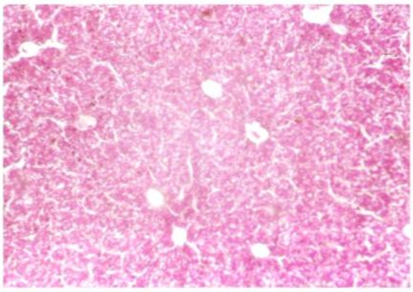

Figure (2): A histological section in the liver of a control plus Vit.E. broiler showing healthy tissue of hepatic cell Mag.100, St.(H&E).

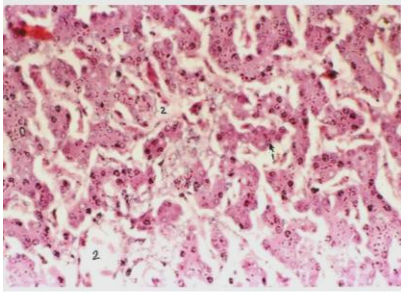

Figure (3): A histological section in the liver of a control plus Vit.C broiler showing a very clear healthy tissues of hepatic cells. Mag.100, St. (H&E).

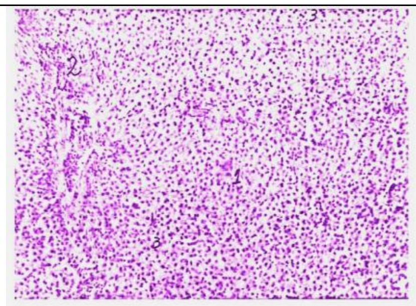

Figure (4): A histological section in the liver of 1000 ppm NaCl broiler showing a mild destruction in the hypatocyte, degeneration of the hepatic cells and R.B.$C_{S.}$ aggregation in the sinusoids Mag.100, St.(H&E).

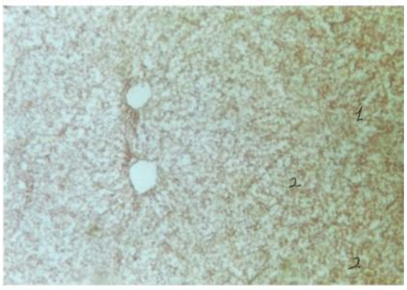

Figure (5): A histological section in the liver of 1000 ppm NaCl plus Vit. E. broiler showing improves the pathological changes than pervious sample. Mag.100, St.(H&E).

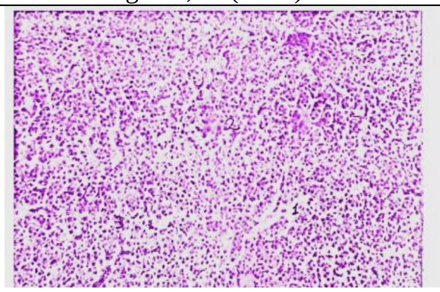

Figure (6): A histological section in the liver of 1000 ppm NaCl plus Vit. C broiler showing improvement was slightly more than that achieved by the addition of Vit. E . Mag.100, St. (H&E).

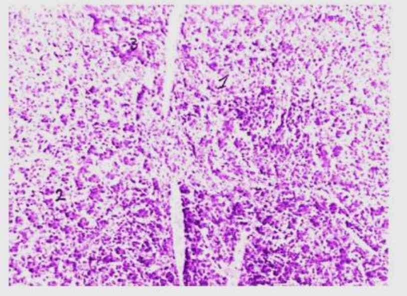

Figure (7): A histological section in the liver of 3000 ppm NaCl broiler showing congestion and destruction of the central veins, focal and diffuse inflammatory cellular infiltration, cytoplasmic vaccules, necrotic hepatocyte, aggregation of R.B.$C_{S.}$ And enlarged hepatic sinusoids. Mag.100, St.(H&E).

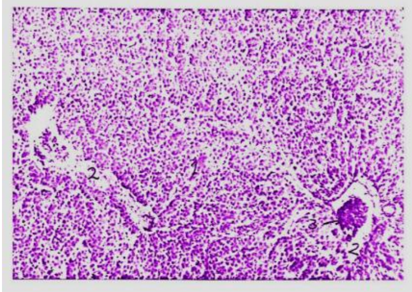

Figure (8): A histological section in the liver of 3000 ppm NaCl plus Vit. E. showing slightly improving than the previous. Mag.100, St. (H&E).

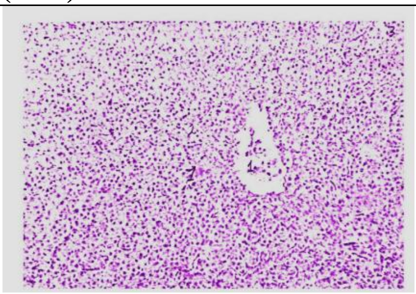

Figure (9): A histological section in the liver of 3000 ppm NaCl plus Vit. C. showing revealed slight modifications for salinity bad effects of the liver. Mag.100, St. (H&E).

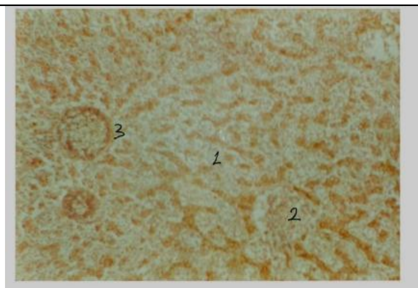

Figure (10): A histological section in the liver of 5000 ppm NaCl broiler showing loss of tissue architecture, severe necrosis, diffuse inflammatory, cellular infiltration, enlargement of hepatic sinusoids and aggregation of R.B.C_S. In central vein and in the sinusoids Mag.100, St.(H&E).

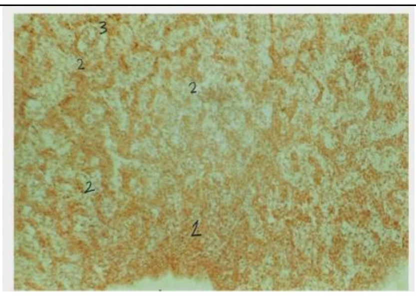

Figure (11): A histological section in the liver of 5000 ppm NaCl plus Vit. E broiler showing less change than the previous case. Mag.100, St. (H&E).

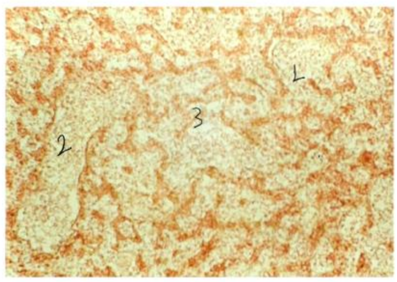

Figure (12): A histological section in the liver of 5000 ppm NaCl plus Vit. C broiler showing revealed slight modifications for salinity bad effects of the liver and lesser than pervious sample. Mag.100, St.(H&E).

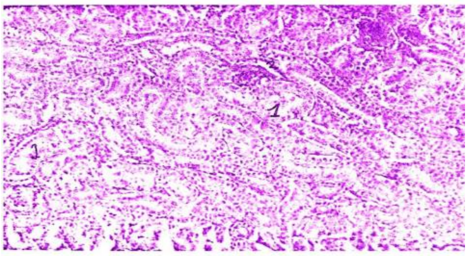

Figure (13): A histological section in the kidney of a control broiler. Healthy tissues and normal the cortex of the kidney. Mag.100, St. (H&E).

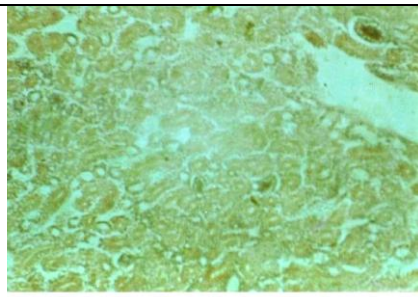

Figure (14): A histological section in the kidney of a control plus Vit. E broiler showing normal architecture of central lobules and renal glomeruli of the kidney. Mag.100, St. (H&E).

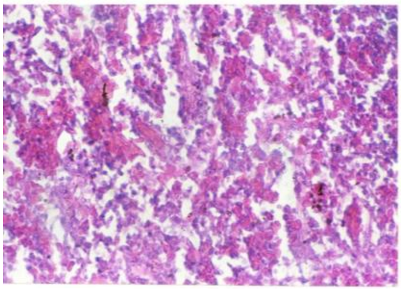

Figure (15): A histological section in the kidney of a control plus Vit. C broiler showing a very clear healthy tissues and normal the cortex of the kidney. Mag.100, St. (H&E).

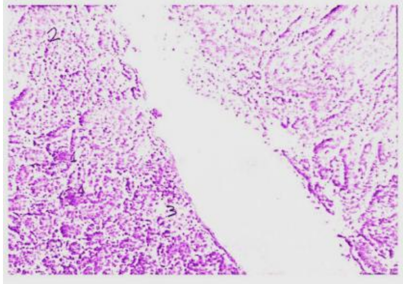

Figure (16): A histological section in the kidney of 1000 ppm NaCl broiler showing degeneration changes, diffuse inflammatory cellular infiltration and destruction in the glomerulus. Mag.100, St.(H&E).

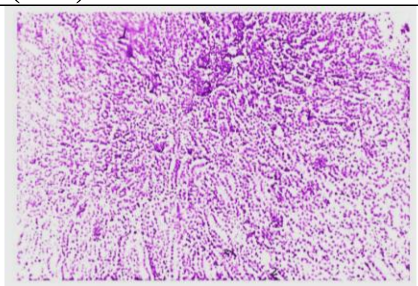

Figure (17): A histological section in the kidney of 1000 ppm NaCl plus Vit. E. broiler showing improves the pathological changes than pervious sample. Mag.100, St. (H&E).

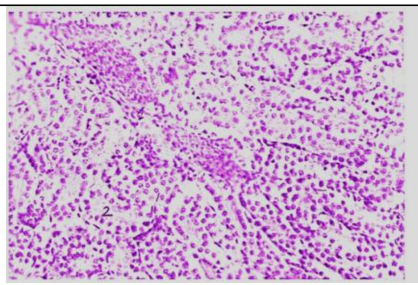

Figure (18): A histological section in the kidney of 1000 ppm NaCl plus Vit. C broiler showing improvement was slightly more than that achieved by the addition of Vit. E. Mag.100, St. (H&E).

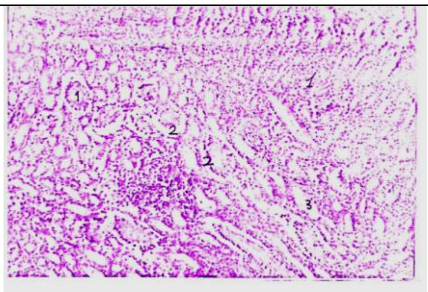

Figure (19): A histological section in the kidney of 3000 ppm NaCl showing focal inflammatory cellular infiltration, necrosis of tubular epithelium, aggregation of lymphocytes and destruction of the renal corpuscles and renal tubules. Mag.100, St.(H&E).

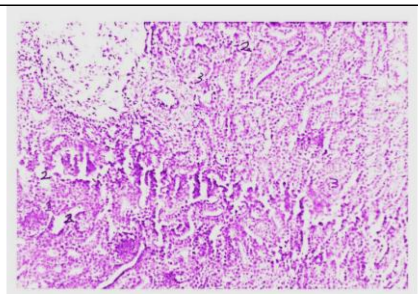

Figure (20): A histological section in the kidney of 3000 ppm NaCl plus Vit. E some improvement of tissues of the kidney than pervious group. Mag.100, St.(H&E).

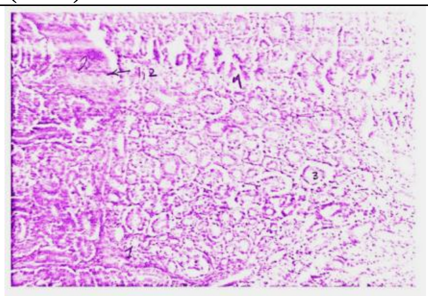

Figure (21): A histological section in the kidney of 3000 ppm NaCl plus Vit. C improved the tissues of the kidneys but higher than the addition of Vit. E Mag.100, St.(H&E).

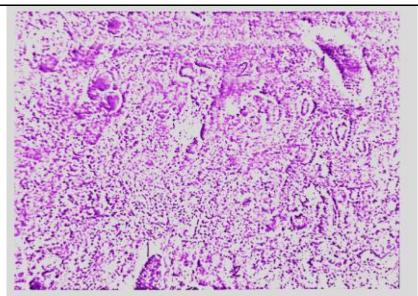

Figure (22): A histological section in the kidney of 5000 ppm NaCl broiler showing loss of tissue architecture, diffuse inflammatory, cell infiltration, aggregation of lymphocytes, necrosis of tubular epithelium, severe hemorrhage, severs degeneration of the kidney tissues. Mag.100, St.(H&E).

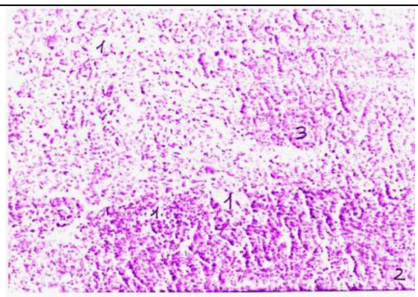

Figure (23): A histological section in the kidney of 5000 ppm NaCl plus Vit. E showing some improvement of tissues of the kidney than pervious group. Mag.100, St. (H&E).

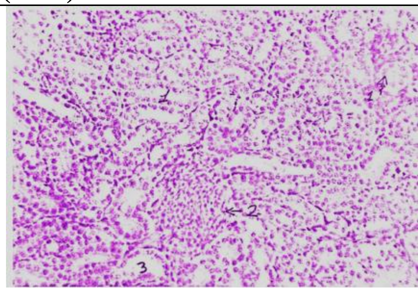

Figure (24): A histological section in the kidney of 5000 ppm NaCl plus Vit. C showing mild changes higher than the addition of Vit. E Mag.100, St. (H&E).

Table 1: Chemical Analysis of Tap Water Used In Poultry Farm, During the Experimental Period.

	Ppm											
Tap water*	Na	K	Mg	Ca	Fe	Mn	Pb	Cl	So_4	Hco_3	Co_3	Total salinity
	398.2	5.64	10.93	22.8	0	0.27	0	135.8	59	39.8	10.1	682.4

*Tap water (underground water) used for the chicks of the Faculty of Agriculture, Zagazig University, Zagazig, Egypt.

Table 2: Composition and Calculated Analysis of Starter and Finisher Experimental Diets.

Ingredients %	**Starter**	**Finisher**
Yellow corn	59.84	66.0
Soybean meal (44%)	26.58	26.52
Corn Gluten (60%)	6.43	1.00
Vegetable oil	3.00	3.00
Di calcium phosphate	1.8	1.34
Lime stone	1.41	1.37
Vit &min mix*	0.30	0.30
NaCl	0.30	0.23
L-Lysine	0.16	0.12
DL Methionine	0.18	0.12
Total	100	100
Calculated analysis:**		
Crude protein %	21.08	18.11
Meatabolizable energy Kcal/Kg	3115	3114
Calcium %	1.02	0.92
Av. Phosphors %	0.47	0.36
Lysine %	1.10	1.00
Methionine	0.50	0.38
NaCl	0.36	0.29

* Supplied per Kg of diet: vit. A, 12000 IU; vit. D3, 2200 IU; vit. E, 10mg; vit. K3 2 mg;vit. B1, 1mg; vit. B 2, 5 mg; vit. B 6, 1.5 , mg; . vit. B 12, 10mcg; Nicotinic acid, 30 mg; Folic acid, 1 mg; Pantothenic acid, 10 mg; Biotin, 50 mcg; Choline chloride, 500 mg; Copper, 10 mg; Iron, 30 mg; Manganese, 60 mg; Zinc, 50 mg; Iodine, 1 mg; Selenium, 0.1 mg; Cobalt, 0.1 mg.

** According to analytical data NRC (1994).

Table 3: Live body weight (g) and body weight gain of broiler chicks as affected by inclusion levels of salinity, addition of vitamins C and E and their interaction during the experimental period.

Items	Live body weight (g)			Weight gain (g)		
	1Wk	3Wk	7Wk	1-3 Wks	3-7 Wks	1-7 Wks
NaCl (ppm)						
	NS	**	**	*	*	**
0	133.938±0.424	681.309±3.331 [a]	1881.744±23.759 [a]	547.370±3.682 [a]	1200.435±25.816 [b]	1747.806 ±23.524 [a]
1000	133.506±0.278	655.719±4.640 [b]	1886.769±26.179 [a]	522.213±4.735 [b]	1231.049±28.894 [a]	1753.262±26.146 [a]
3000	133.321±0.221	642.120±9.693 [bc]	1820.087±12.265 [b]	508.799±9.608 [bc]	1177.967±9.811 [b]	1686.766±12.319 [b]
5000	133.790±0.281	624.934±8.385 [c]	1735.878±20.089 [c]	491.144±8.472 [c]	1110.944±22.611 [b]	1602.088±20.082 [c]
Vitamins						
	NS	NS	*	NS	*	**
Without vitamin	133.343±0.290	660.159±8.806	1798.058±21.191 [b]	526.816±8.889	1137.899±17.831 [b]	1664.715±21.310 [b]
With Vit.C (1g/kg diet)	133.713±0.269	640.805±9.384	1866.456±33.472 [a]	507.092±9.249	1225.652±28.769 [a]	1732.743±33.351 [a]
With Vit. E (100 mg/kg diet)	133.638±0.237	644.363±6.338	1828.844±14.540 [ab]	510.724±6.339	1174.374±13.523 [b]	1685.098±14.512 [b]
Interaction between NaCl and vitamins						
	NS	**	**	**	**	**
Tap water(TW)	133.037±0.686	692.815±2.990 [a]	1843.889±34.671 [b]	559.778±3.676 [a]	1151.074±37.604 [cd]	1710.852±34.004 [b]
TW + 1000	134.778±0.170	672.074±1.636 [abc]	1952.194±42.351 [a]	537.296±1.614 [abc]	1280.120±41.020 [ab]	1817.417±42.423 [a]
TW + 3000	134.000±0.949	679.037±3.186 [ab]	1849.148±6.992 [b]	545.037±4.011 [ab]	1170.111±6.913 [bc]	1715.148±6.745 [b]
TW + 5000	133.111±0.559	668.593±3.221 [abc]	1829.444±39.723 [b]	535.481±3.240 [abc]	1160.852±37.185 [cd]	1696.333±40.035 [b]
TW + Vit.C (1g/kg diet)	133.630±0.329	643.787±7.242 [bcd]	1973.565±14.176 [a]	510.157±7.751 [bcd]	1329.778±20.798 [a]	1839.935±13.925 [a]
TW + 1000 + Vit.C (1g/kg diet)	133.778±0.333	654.778±6.407 [abcd]	1857.296±24.514 [b]	521.000±6.090 [abcd]	1202.519±21.407 [bc]	1723.519±24.247 [b]
TW + 3000 + Vit.C (1g/kg diet)	133.148±0.610	649.861±12.961 [bcd]	1819.403±14.498 [bc]	516.713±12.471 [bcd]	1169.542±27.396 [cd]	1686.255±15.040 [bc]
TW + 5000 +Vit.C (1g/kg diet))	133.185±0.185	634.130±27.260 [cd]	1812.858±36.344 [bc]	500.944±27.188 [cd]	1178.729±11.454 [c]	1679.673±36.311 [bc]
TW + Vit. E (100mg/diet)	133.630±0.616	642.370±12.425 [bcd]	1828.000±14.709 [b]	508.741±12.283 [bcd]	1185.630±14.433 [c]	1694.370±14.911 [b]
TW + 1000 +Vit. E (100mg/diet)	134.074±0.582	629.366±20.617 [cd]	1699.495±16.557 [d]	495.292±20.797 [cd]	1170.130±17.603 [d]	1565.421±17.113 [d]
TW + 3000 +Vit. E (100mg/diet)	133.259±0.582	613.228±15.682 [d]	1727.207±28.678 [cd]	479.968±15.331 [d]	1113.980±41.784 [cd]	1593.948±28.652 [cd]
TW + 5000 +Vit. E (100mg/diet)	134.037±0.243	632.208±8.238 [cd]	1780.931±45.077 [bcd]	498.171±8.477 [cd]	1148.722±50.280 [cd]	1646.894±44.905 [bcd]

Means are bearing different letters in each classification, differ significantly ($P<0.05$).
NS: Not significant, * $P<0.05$, ** $P<0.01$.

Table 4: Feed consumption (g) and feed conversion (g feed/g gain) of broiler chicks as affected by inclusion levels of salinity, addition of vitamins C and E and their interaction during the experimental period.

Items	Feed consumption (g)			Feed conversion (g feed/g gain)		
	1-3 Wks	3-7 Wks	1-7 Wks	1-3 Wks	3-7 Wks	1-7 Wks
NaCl (ppm)						
	*	*	**	NS	NS	**
0	704.433±12.428^{a}	3314.127±24.091^{a}	4018.560±30.210^{a}	1.288±0.028	2.770±0.060	2.302±0.032^{b}
1000	685.106±10.088^{ab}	3277.159±28.556^{ab}	3962.264±31.799^{ab}	1.313±0.022	2.674±0.070	2.264±0.041^{b}
3000	666.703±11.145^{b}	3238.488±37.833^{ab}	3905.191±39.486^{bc}	1.316±0.043	2.750±0.036	2.316±0.025^{ab}
5000	654.220±7.416^{b}	3181.103±31.263^{b}	3835.323±30.324^{c}	1.335±0.027	2.870±0.049	2.396±0.029^{a}
Vitamins						
	NS	NS	NS	NS	NS	NS
Without vitamin	676.008±10.364	3242.639±27.840	3918.647±31.622	1.286±0.024	2.857±0.051	2.357±0.030
With Vit.C (1g/kg diet)	689.833±10.667	3294.579±29.211	3984.412±33.401	1.365±0.030	2.701±0.054	2.306±0.036
With VIT. E (100 mg/kg diet)	668.163±9.496	3228.770±29.061	3896.932±33.146	1.311±0.020	2.757±0.034	2.316±0.022
Interaction between NaCl and vitamins						
	NS	NS	NS	NS	NS	NS
Tap water(TW)	699.930±23.496	3299.170±52.521	3999.100±34.844	1.251±0.049	2.875±0.137	2.340±0.067
TW + 1000	727.090±15.518	3269.240±14.700	4096.330±25.862	1.353±0.033	2.638±0.088	2.257±0.063
TW + 3000	686.280±25.083	3273.970±39.408	3960.250±64.461	1.260±0.055	2.798±0.038	2.309±0.043
TW + 5000	684.810±6.337	3269.420±63.590	3954.230±61.352	1.279±0.005	2.825±0.140	2.335±0.087
TW + Vit.C (1g/kg diet)	693.700±24.328	3317.277±34.020	4010.977±52.766	1.35±0.033	2.496±0.056	2.181±0.044
TW + 1000 + Vit.C (1g/kg diet)	676.807±22.753	3244.780±56.792	3921.587±59.495	1.300±0.057	2.702±0.094	2.277±0.066
TW + 3000 + Vit.C (1g/kg diet)	667.590±24.944	3232.507±56.919	3900.097±81.660	1.294±0.065	2.766±0.066	2.313±0.048
TW + 5000 +Vit.C (1g/kg diet))	674.170±22.782	3270.470±94.061	3944.640±79.996	1.359±0.124	2.767±0.050	2.350±0.051
TW + Vit. E (100mg/diet)	658.350±16.919	3212.487±64.975	3870.837±65.273	1.295±0.037	2.711±0.082	2.285±0.039
TW + 1000 +Vit. E (100mg/diet)	651.700±22.274	3169.460±48.449	3821.160±39.860	1.320±0.066	2.963±0.062	2.441±0.015
TW + 3000 +Vit. E (100mg/diet)	664.370±2.526	3221.330±50.578	3885.700±49.457	1.387±0.040	2.897±0.081	2.439±0.037
TW + 5000 +Vit. E (100mg/diet)	646.590±8.578	3152.520±74.415	3799.110±70.531	1.298±0.022	2.750±0.078	2.307±0.050

Means are bearing different letters in each classification, differ significantly ($P<0.05$).
NS: Not significant, * $P<0.05$, ** $P<0.01$.

Table 5: Water consumption (g) and water/ feed of broiler chicks as affected by inclusion levels of salinity, addition of vitamins C and E and their interaction during the experimental period.

Items	Water consumption (g)			Water/feed		
	1-3 Wks	3-7 Wks	1-7 Wks	1-3 Wks	3-7 Wks	1-7 Wks
NaCl (ppm)						
	**	**	**	**	**	**
0	1349.833±6.637 ^{d}	7057.633±95.627 ^{c}	8407.467±97.949 ^{d}	1.922±0.041 ^{d}	2.130±0.031 ^{c}	2.093±0.030 ^{d}
1000	1416.956±4.605 ^{c}	7452.667±133.301 ^{c}	8869.622±135.253 ^{c}	2.072±0.034 ^{c}	2.276±0.050 ^{c}	2.240±0.044 ^{c}
3000	1509.822±22.077 ^{b}	7874.533±112.147 ^{b}	9384.356±127.397 ^{b}	2.268±0.037 ^{b}	2.434±0.043 ^{b}	2.405±0.038 ^{b}
5000	1669.656±19.741 ^{a}	8496.211±184.156 ^{a}	10165.867±191.632 ^{a}	2.555±0.043 ^{a}	2.672±0.057 ^{a}	2.651±0.048 ^{a}
Vitamins						
	NS	NS	NS	NS	NS	NS
Without vitamin	1485.867±39.177	7630.817±185.910	9116.683±218.376	2.208±0.079	2.358±0.071	2.331±0.070
With Vit.C (1g/kg diet)	1495.492±37.708	7964.017±206.160	9459.508±240.110	2.180±0.081	2.422±0.076	2.380±0.075
With Vit. E (100 mg/kg diet)	1515.590±38.282	7825.695±178.967	9341.285±213.979	2.276±0.075	2.428±0.068	2.401±0.067
Interaction between NaCl and vitamins						
	**	**	**	**	**	**
Tap water(TW)	1348.667±12.94 ^{d}	7010.500±132.301 ^{c}	8359.167±138.548 ^{e}	1.932±0.082 ^{c}	2.125±0.023 ^{d}	2.090±0.017 ^{d}
TW + 1000	1353.100±14.899 ^{d}	7159.133±150.755 ^{c}	8512.233±165.252 ^{de}	1.864±0.059 ^{c}	2.125±0.046 ^{d}	2.078±0.049 ^{d}
TW + 3000	1347.733±11.433 ^{d}	7003.267±248.521 ^{c}	8351.000±245.716 ^{e}	1.970±0.086 ^{c}	2.141±0.093 ^{d}	2.111±0.088 ^{d}
TW + 5000	1407.700±2.139 ^{cd}	7337.167±297.500 ^{c}	8744.867±298.087 ^{de}	2.056±0.02 ^{bc}	2.249±0.130 ^{cd}	2.214±0.104 ^{cd}
TW + Vit.C (1g/kg diet)	1426.600±8.083 ^{bcd}	7745.967±165.31 ^{bc}	9172.567±173.128 ^{cd}	2.062±0.084 ^{bc}	2.336±0.072 ^{cd}	2.289±0.074 ^{cd}
TW + 1000 + Vit.C (1g/kg diet)	1416.567±9.753 ^{cd}	7274.867±178.622 ^{c}	8691.433±176.483 ^{de}	2.096±0.076 ^{bc}	2.244±0.075 ^{cd}	2.218±0.069 ^{cd}
TW + 3000 + Vit.C (1g/kg diet)	1515.733±52.215 ^{b}	7780.500±151.603 ^{bc}	9296.233±183.731 ^{bcd}	2.272±0.035 ^{b}	2.406±0.065 ^{bcd}	2.385±0.0600 ^{bc}
TW + 5000 +Vit.C (1g/kg diet))	1519.933±22.004 ^{b}	8156.167±176.039 ^{ab}	9676.100±198.042 ^{bc}	2.262±0.108 ^{b}	2.496±0.056 ^{abc}	2.454±0.052 ^{abc}
TW + Vit. E (100mg/diet)	1493.8±49.41 ^{bc}	7686.933±187.814 ^{bc}	9180.733±233.693 ^{cd}	2.270±0.057 ^{b}	2.397±0.108 ^{bcd}	2.375±0.098 ^{bc}
TW + 1000 +Vit. E (100mg/diet)	1671.367±28.193 ^{a}	8395.100±305.975 ^{ab}	10066.47±292.442 ^{ab}	2.571±0.108 ^{a}	2.650±0.108 ^{ab}	2.636±0.092 ^{a}
TW + 3000 +Vit. E (100mg/diet)	1682.333±16.961 ^{a}	8794.8±379.458 ^{a}	10477.130±377.465 ^{a}	2.532±0.025 ^{a}	2.732±0.133 ^{a}	2.698±0.109 ^{a}
TW + 5000 +Vit. E (100mg/diet)	1655.267±58.384 ^{a}	8298.733±316.49 ^{ab}	9954.000±369.925 ^{abc}	2.561±0.095 ^{a}	2.633±0.082 ^{ab}	2.619±0.072 ^{ab}

Means are bearing different letters in each classification, differ significantly (P<0.05).
NS: Not significant, * P <0.05, **P<0.01.

Table 6: Mortality rate value^{+} of broiler chicks as affected by inclusion levels of salinity, addition of vitamins C and E and their interaction during the experimental period.

Items	Initial number	Total mortality			Mortality rate		
		1-3(weeks)	3-7 (weeks)	1-7(weeks)	1-3(weeks)	3-7 (weeks)	1-7(weeks)
NaCl (ppm)							
					*	NS	
0	90	0	1	1	0.000^{a}	1.111	1.111^{a}
1000	90	2	3	5	2.222^{a}	3.333	5.556^{b}
3000	90	6	6	12	6.667^{b}	6.667	13.333^{c}
5000	90	8	7	15	8.889^{bc}	7.778	16.667^{cd}
Vitamins							
					*	*	
Without vitamin	120	11	10	21	9.167^{b}	8.333^{b}	17.500^{b}
With Vit.C (1g/kg diet)	120	3	5	8	2.500^{a}	4.167^{a}	6.667^{a}
With Vit. E (100 mg/kg diet)	120	2	2	4	1.667^{a}	1.667^{a}	3.333^{a}
Interaction between NaCl and vitamins							
					*	NS	*
Tap water(TW)	30	0	1	1	0.000^{a}	3.333	3.333^{ab}
TW + 1000	30	2	2	4	6.667^{b}	6.667	13.333^{d}
TW + 3000	30	4	3	7	13.333^{c}	10.000	23.333^{e}
TW + 5000	30	5	4	9	16.667^{cd}	13.333	30.000^{f}
TW + Vit.C (1g/kg diet)	30	0	0	0	0.000^{a}	0.000	0.000^{a}
TW + 1000 + Vit.C (1g/kg diet)	30	0	1	1	0.000^{a}	3.333	3.333^{ab}
TW + 3000 + Vit.C (1g/kg diet)	30	1	2	3	3.333^{ab}	6.667	10.000^{cd}
TW + 5000 +Vit.C (1g/kg diet))	30	2	2	4	6.667^{b}	6.667	13.333^{d}
TW + Vit. E (100mg/diet)	30	0	0	0	0.000^{a}	0.000	0.000^{a}
TW + 1000 +Vit. E (100mg/diet)	30	0	0	0	0.000^{a}	0.000	0.000^{a}
TW + 3000 +Vit. E (100mg/diet)	30	1	1	2	3.333^{ab}	3.333	6.667^{ab}
TW + 5000 +Vit. E (100mg/diet)	30	1	1	2	3.333^{ab}	3.333	6.667^{bc}

These values were analysis by using Chi-Square
Means are bearing different letterss, differ significantly (P0.05)

Table 7: Carcass characteristics (%) of broiler chicks as affected by inclusion levels of salinity, addition of vitamins C and E and their interaction at 7weeks of age.

Items	Pre-slaughter	Carcass (%)	Liver (%)	Heart (%)	Gizzard (%)	Giblets (%)	Dressing (%)	Abdominal fat (%)
NaCl (ppm)								
		**	NS	*	NS	NS	**	*
0	1876.333±33.283	75.220±0.497 ^{a}	2.719±0.103	0.600±0.017 ^{c}	2.583±0.093	5.901±0.169	81.122±0.531 ^{a}	2.847±0.097 ^{a}
1000	1888.000±32.602	72.517±0.458 ^{b}	2.695±0.127	0.648±0.024 ^{bc}	2.549±0.070	5.892±0.149	78.409±0.542 ^{b}	2.630±0.075 ^{ab}
3000	1825.778±21.902	71.126±0.446 ^{bc}	2.719±0.099	0.687±0.033 ^{ab}	2.554±0.093	5.960±0.139	77.086±0.493 ^{b}	2.430±0.102 ^{bc}
5000	1741.889±28.526	70.609±0.558 ^{c}	2.814±0.147	0.728±0.030 ^{a}	2.595±0.063	6.137±0.154	76.745±0.530 ^{b}	2.224±0.095 ^{c}
Vitamins								
		NS	NS	NS	NS	NS	NS	NS
Without vitamin	1868.500±36.989	72.316±0.711	2.654±0.118	0.697±0.036	2.511±0.071	5.862±0.174	78.178±0.675	2.616±0.107
With Vit.C (1g/kg diet)	1803.167±24.093	72.303±0.600	2.759±0.094	0.639±0.019	2.637±0.052	6.035±0.102	78.338±0.605	2.515±0.098
With Vit. E (100 mg/kg diet)	1827.333±25.354	72.484±0.728	2.797±0.091	0.661±0.019	2.563±0.077	6.021±0.105	78.506±0.761	2.467±0.106
Interaction between NaCl and vitamins								
		*	NS	*	NS	NS	*	NS
Tap water(TW)	1949.333±56.772	75.253±0.876 ^{ab}	2.559±0.206	0.563±0.016 ^{c}	2.507±0.194	5.630±0.372	80.883±0.659 ^{ab}	3.039±0.122
TW + 1000	1975.333±42.451	72.927±1.088 ^{abc}	2.469±0.165	0.643±0.054 ^{bc}	2.412±0.121	5.524±0.135	78.453±1.219 ^{bc}	2.670±0.111
TW + 3000	1819.000±44.411	71.016±0.874 ^{c}	2.664±0.222	0.770±0.024 ^{ab}	2.593±0.191	6.027±0.358	77.043±1.210 ^{c}	2.493±0.131
TW + 5000	1730.333±58.299	70.066±0.730 ^{c}	2.923±0.363	0.812±0.069 ^{a}	2.531±0.115	6.266±0.453	76.330±0.785 ^{c}	2.260±0.215
TW + Vit.C (1g/kg diet)	1845.667±49.831	74.630±0.966 ^{ab}	2.750±0.149	0.616±0.035 ^{c}	2.687±0.072	6.053±0.105	80.683±0.896 ^{ab}	2.742±0.106
TW +1000 + Vit.C (1g/kg diet)	1827.667±32.338	72.330±0.915 ^{bc}	2.772±0.265	0.621±0.043 ^{c}	2.678±0.120	6.071±0.318	78.400±1.232 ^{bc}	2.648±0.143
TW +3000 + Vit.C (1g/kg diet)	1828.000±38.314	71.104±0.785 ^{c}	2.777±0.212	0.637±0.057 ^{bc}	2.559±0.150	5.973±0.288	77.077±0.561 ^{c}	2.449±0.224
TW +5000 +Vit.C (1g/kg diet))	1711.333±45.407	71.151±1.210 ^{c}	2.737±0.240	0.677±0.021 ^{bc}	2.624±0.107	6.041±0.175	77.190±1.111 ^{c}	2.222±0.227
TW +Vit. E (100mg/diet)	1834.000±59.632	75.779±0.966 ^{a}	2.848±0.201	0.617±0.033 ^{c}	2.556±0.228	6.021±0.371	81.800±1.337 ^{a}	2.759±0.242
TW +1000 +Vit. E (100mg/diet)	1861.000±62.517	72.293±0.603 ^{bc}	2.844±0.236	0.680±0.035 ^{abc}	2.557±0.109	6.081±0.211	78.373±0.718 ^{bc}	2.571±0.179
TW +3000 +Vit. E (100mg/diet)	1830.333±47.754	71.257±0.997 ^{c}	2.715±0.145	0.656±0.063 ^{bc}	2.509±0.209	5.880±0.118	77.137±1.068 ^{c}	2.347±0.228
TW +5000 +Vit. E (100mg/diet)	1784.000±53.703	70.609±1.200 ^{c}	2.782±0.246	0.692±0.011 ^{abc}	2.629±0.142	6.103±0.184	76.713±1.153 ^{c}	2.189±0.094

Means are bearing different letters in each classification, differ significantly ($P<0.05$).
NS: Not significant, * $P<0.05$, ** $P<0.01$.

Table 8: Some blood components of broilers as affected by inclusion levels of salinity, addition of vitamins C and E and their interaction at 7weeks of age.

Items	AST (U/l)	ALT (U/l)	Uric acid (mg/dl)	Creatinine (mg/dl)	Sodium (mg/dl)	Potassium (mg/dl)	Magnesium (mg/dl)
NaCl (ppm)							
	**	**	*	**	**	**	NS
0	39.889 ± 1.274 ^{c}	0.577 ± 0.020 ^{c}	2.822 ± 0.157 ^{ab}	0.936 ± 0.064 ^{d}	120.923 ± 2.361 ^{c}	9.017 ± 0.192 ^{c}	1.570 ± 0.080
1000	62.000 ± 2.522 ^{b}	0.770 ± 0.035 ^{a}	3.189 ± 0.181 ^{ab}	1.524 ± 0.102 ^{c}	120.051 ± 2.287 ^{c}	8.870 ± 0.246 ^{c}	1.588 ± 0.087
3000	70.444 ± 2.467 ^{a}	0.633 ± 0.018 ^{b}	3.500 ± 0.146 ^{a}	1.964 ± 0.259 ^{b}	144.336 ± 2.311 ^{b}	11.007 ± 0.232 ^{b}	1.633± 0.053
5000	62.556 ± 2.892 ^{b}	0.687 ± 0.014 ^{b}	3.589 ± 0.170 ^{a}	2.378 ± 0.323 ^{a}	158.778 ± 2.281 ^{a}	14.353 ± 0.213 ^{a}	1.691 ± 0.044
Vitamins							
	NS	NS	NS	**	NS	NS	NS
Without vitamin	57.583 ± 3.587	0.635 ± 0.021	3.250 ± 0.163	1.029 ± 0.076 ^{b}	135.263 ± 5.225	10.717 ± 0.685	1.620 ± 0.056
With Vit.C (1g/kg diet)	60.250 ± 4.117	0.688 ± 0.028	3.275 ± 0.162	2.086 ± 0.254 ^{a}	136.278 ± 5.266	10.758 ± 0.707	1.623 ± 0.068
With Vit. E (100 mg/kg diet)	62.949 ± 4.159	0.691 ± 0.035	3.387 ± 0.174	1.987 ± 0.217 ^{a}	139.661 ± 5.420	11.272 ± 0.684	1.632 ± 0.055
Interaction between NaCl and vitamins							
	**	**	NS	**	**	**	NS
Tap water(TW)	43.667 ± 1.202 ^{d}	0.550 ± 0.049 ^{d}	2.767 ± 0.260	0.758 ± 0.129 ^{f}	120.610 ± 4.803 ^{c}	8.820 ± 0.410 ^{c}	1.500 ± 0.125
TW + 1000	55.333 ± 2.603 ^{c}	0.650 ± 0.031 ^{bcd}	3.267 ± 0.406	1.263 ± 0.155 ^{de}	119.170 ± 4.760 ^{c}	8.710 ± 0.531 ^{c}	1.670 ± 0.146
TW + 3000	73.667 ± 5.840 ^{a}	0.670 ± 0.025 ^{bc}	3.533 ± 0.240	0.964 ± 0.046 ^{ef}	143.107 ± 3.663 ^{b}	11.300 ± 0.410 ^{b}	1.640 ± 0.115
TW + 5000	57.667 ± 3.528 ^{bc}	0.670 ± 0.023 ^{bc}	3.433 ± 0.348	1.130 ± 0.112 ^{ef}	158.163 ± 3.517 ^{a}	14.037 ± 0.464 ^{a}	1.670 ± 0.100
TW +Vit.C (1g/kg diet)	38.333 ± 1.764 ^{d}	0.610 ± 0.023 ^{bcd}	2.900 ± 0.346	1.023 ± 0.012 ^{ef}	121.390 ± 4.629 ^{c}	9.053 ± 0.324 ^{c}	1.570 ± 0.190
TW+1000+Vit.C (1g/kg diet)	67.667 ± 4.055 ^{abc}	0.820 ± 0.040 ^{a}	3.167 ± 0.318	1.653 ± 0.199 ^{d}	120.220 ± 3.927 ^{c}	8.770 ± 0.485 ^{c}	1.563 ± 0.209
TW+3000+Vit.C (1g/kg diet)	68.333 ± 3.756 ^{abc}	0.620 ± 0.020 ^{bcd}	3.333 ± 0.260	2.557 ± 0.157 ^{bc}	144.847 ± 4.672 ^{ab}	10.730 ± 0.445 ^{b}	1.660 ± 0.087
TW+5000+Vit.C (1g/kg diet)	66.667 ± 4.333 ^{abc}	0.700 ± 0.023 ^{b}	3.700 ± 0.346	3.111 ± 0.236 ^{a}	158.657 ± 5.026 ^{a}	14.477 ± 0.350 ^{a}	1.697 ± 0.082
TW + Vit. E (100mg/diet)	37.667 ± 2.028 ^{d}	0.570 ± 0.029 ^{cd}	2.800 ± 0.321	1.027 ± 0.093 ^{ef}	120.770 ± 4.714 ^{c}	9.177 ± 0.368 ^{c}	1.640 ± 0.139
TW+1000+Vit. E (100mg/diet)	63.000 ± 3.786 ^{abc}	0.840 ± 0.035 ^{a}	3.133 ± 0.348	1.657 ± 0.095 ^{d}	120.763 ± 4.905 ^{c}		1.530 ± 0.142
TW+3000+Vit. E (100mg/diet)	69.333 ± 4.096 ^{ab}	0.610 ± 0.044 ^{bcd}	3.633 ± 0.328	2.370 ± 0.132 ^{c}	145.053 ± 5.260 ^{ab}	10.990 ± 0.447 ^{b}	1.600 ± 0.111
TW+5000+Vit. E (100mg/diet)	63.333 ± 6.960 ^{abc}	0.690 ± 0.032 ^{b}	3.633 ± 0.296	2.892 ± 0.064 ^{ab}	159.513 ± 4.933 ^{a}	14.547 ± 0.359 ^{a}	1.707 ± 0.076

Means are bearing different letters in each classification, differ significantly (P<0.05).
NS: Not significant, * P <0.05, **P<0.01.

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الملخص العربي

تخفيف العبء الملحي بإستخدام فيتامين E, C وعلاقته بأداء النمو، مكونات الدم وبعض التغيرات الهستولوجية في بداري التسمين

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تم إجراء تجربة عامليه(4×3) وذلك لدراسة تأثير أربعة مستويات من كلوريد الصوديوم (صفر ،1000، 3000 و 5000 ppm /لتر ماء) ،مع إضافة الفيتامينات (صفر، 1جرام فيتامين C، 100 ملجم فيتامين E /كجم عليقة) علي أداء النمو، معدل النفوق، صفات الذبيحة، مكونات الدم، التغيرات الهستولوجية لكبد وكلية أثناء فترة النمو. أستخدم في هذه الدراسة ثلاثمائة وستون من بداري التسمين (أربوإيكرز) من 1-7 أسابيع من العمر، وكانت متساوية تقريبا في وزن الجسم الحي ومقسمة عشوائيا إلي إثنا عشر معامله تجريبية. كل معاملة بها 30 كتكوت يمثلها 3 مكررات (10 كتاكيت لكل منها).

أوضحت النتائج أنخفاض وزن الجسم معنويا مع زيادة مستويات كلوريد الصوديوم في ماء الشرب عند مستوي 3000، 5000 جزء في المليون عند المقارنة مع مجموعة الكنترول عند 3 ،7 أسابيع من العمر. كما انخفضت الزيادة الوزنية واستهلاك الغذاء معنويا وذلك بزيادة مستويات كلوريد الصوديوم في ماء الشرب عند مستوي 3000، 5000 جزء في المليون عند المقارنة مع مجموعة الكنترول عند الفترات 1-3 ، 1-7 أسبوع من العمر. بينما ازداد استهلاك الماء والنسبة بين الماء والغذاء معنويا مع زيادة مستويات كلوريد الصوديوم في ماء الشرب عند المقارنة مع مجموعة الكنترول . كما زاد معدل النفوق زيادة معنوية مع زيادة مستويات الملوحة الي 1000 جزء في المليون عند المقارنة مع مجموعة الكنترول (ماء الشرب) خلال فترات التجربة (ماعدا 3-7 أسبوع من العمر).

أنخفض وزن الذبيحة، والأجزاء المأكولة ودهن البطن أنخفاضا معنويا 0 بينما زادت معنويا النسبة المئوية للقلب بالنسبة لوزن الجسم وكل من نشاط أنزيم AST، ALT ، حمض اليوريك، الكرياتينين، الصوديوم، البوتاسيوم في الدم ومع زيادة مستويات الملوحة في ماء

الشرب. بينما لم يتأثر معنويا الماغنسيوم في سيرم بداري التسمين مع المستويات المختلفة لكلوريد الصوديوم في ماء الشرب.

ومن ناحية أخري أدي إضافة فيتامين C إلي العليقة إلي زيادة وزن الجسم معنويا عند عمر7 أسابيع ، بينما أنخفض معدل النفوق انخفاضا معنويا عند المقارنة مع المجموعة الغير مضاف إليها الفيتامين. كما أدي إضافة فيتامين C إلي عليقة بداري التسمين إلي تحسن الزيادة الوزنية للجسم خلال فترات التجربة (ماعدا الفترة من 1–3 أسبوع من العمر) عند المقارنة مع المجموعة الغير مضاف إليها الفيتامين، بينما لم يتأثر معنويا كل من معدل استهلاك الغ ذاء وتحويل الغذاء واستهلاك الماء والنسبة بين الماء إلي الغذاء . بداري التسمين التي تم تغذيتها علي علائق مضافة إليها فيتامين C أو E أدي إلي زيادة تركيز الكرياتينين معنويا في سيرم الدم بينما لم تتأثر معنويا إنزيمات AST، ALT ، تركيزات حمض اليوريك ، الصوديوم، البوتاسيوم والماغنسيوم في الدم وصفات الذبيحة عند المقارنة مع المجموعة الغير مضاف إليها الفيتامين مع زيادة مستويات الملوحة في ماء الشرب. كذلك لم يتأثر معنويا كل من تركيز الماغنسيوم في سيرم بداري التسمين مع المستويات المختلفة لكلوريد الصوديوم في ماء الشرب.

أدي زيادة المستويات من كلوريد الصوديوم في ماء الشرب الي زيادة اختلال أنسجة الكبد والكلي، تكرز خلوي وارتشاح خلوي وتضخم في الوريد الكبدي والخلايا اللمفاوية وموت موضعي للخلايا وإرتشاح وتجمع دموي ونزف حاد بالكبد والكلي. أما إضافة فيتامين E, C إلى العليقة مع الماء المالح أدي الي تخفيف هذه التغيرات وانخفاض الهدم الحاد في خلايا الكبد والكلية.