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EFFECT OF IN-OVO INJECTION OF PYRIDOXINE ON HATCHABILITY AND PHYSIOLOGICAL RESPONSE OF HATCHED TURKEY POULTS

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ABSTRACT:A total number of 720 turkey hatching eggs with an average weight of 81± 1g were used to study the effect of injecting the eggs with pyridoxine (vitamin B_6) at 10th, 17th and 24th days of incubation. Hatching eggs were divided into equal six groups at each injecting time. The 1st group without injection or pierced was served as control 1, the 2nd group without injection was pierced in the blunt end and served as control 2, while eggs of the 3rd group was injected into amniotic sac through the air sac with 0.2 ml saline solution. The eggs of the 4th, 5th and 6th groups were injected as group 3 with 400, 600 and 800 µg pyridoxine, respectively, dissolved in 0.2 ml saline solution. The results obtained could be summarized as follows: Embryonic mortality percentage (EM) as well as hatchability percentage (H) and chick weight at hatch (CWH) showed significant (P≤0.05) differences among injection times of embryonic development (ED). The best EM, H and CWH values were recorded at the10th ED. Injection of 0.2 ml saline solution with different levels of pyridoxine to the hatching eggs, significantly (P≤0.05) decrease the EM and significantly (P≤0.05) improved both H and CWH. The best value of Albumin (A)/globulin (G) ratio was at the 17th and 24th ED compared to 10th ED. The best values of plasma total protein (PTP), globulin (G) and A/G ratio were recorded by eggs injected with the lowest level of pyridoxine (400µg). Moreover, the best value of A/G ratio was recorded by control group at the 24th ED. The best value of plasma cholesterol level was recorded for eggs injected the highest level of pyridoxine (800µg) at the 10th ED. Plasma concentrations of thyroid hormones were significantly increased (P≤0.05) by increasing pyridoxine injection. On the other hand, insignificant differences were noted in plasma thyroid hormones concentrations due to periods of ED. The highest values of T_3 hormone were recorded by eggs injected the highest level of pyridoxine at both the 24th and 17th ED, respectively. While the highest values of T_4 hormone were recorded by eggs injected the highest level of pyridoxine at both the 17th and 10th ED, respectively.

In conclusion, in-ovo pyridoxine injection with 800µg to turkey eggs at 10 and 17 day of incubation is a practical and beneficial procedure to improve the hatchability traits.

Key words: Turkey- In-ovo injection - Pyridoxine - Hatchability- Blood biochemical traits

INTRODUCTION

Pyridoxine (vitamin B6) plays an important role in the synthesis and degradation of aspartate aminotransferase in the chicken embryo (Sharma and Gehring, 1987). Pyridoxine has an important role in amino acid, carbohydrate, and fatty acid metabolism and also plays a major role in the energy-producing citric acid cycle (McDowell, 1989). Deficiency of pyridoxine leads to early embryonic death and decreased IgM and IgG response to antibody challenge (Blalock et al., 1984) as well as, depressed appetite, poor growth and characteristic nervous symptoms in chicks (Scott et al., 1976). Pyridoxine concentration in egg yolk remains stable in response to incremental levels in turkey breeder diets whereas it increases in albumen. Average pyridoxine levels in the albumen is only 4% of that present in the yolk (Robel, 1992).

Robel (2002) reported that dietary supplemental pyridoxine had limited influence for increasing the transfer of vitamin B6 in turkey eggs, and that hatchability was only improved by pyridoxine egg injections. Egg injections of pyridoxine were vital for increasing hatchability even though the hen's diet was amply supplemented with Pyridoxine. Elsayed et al. (2010) reported that injection of quail eggs with 120 µg/egg pyridoxine at 7th day of incubation period improved hatchability percentage, chick weight at hatch, growth performance and carcass traits. Ibrahim et al. (2012) found that hatchability was positively affected by pyridoxine (10 mg) injection of fertile ostrich eggs at the 7th day of incubation compared to non-injected group. Pyridoxine and Biotin are water-soluble vitamins (Bender, 1999), any deficiency results in embryonic growth retardation that leads to its death and eventually results in poor hatchability.

The present study was conducted to estimate hatchability percentage, chick weight at hatch and some blood biochemical traits of hatched turkey poults as affected by in-ovo injection with pyridoxine.

MATERIALS AND METHODS

This experiment was carried out at Mehalet Mousa, Turkey Research Station, Kafr El-Sheikh, Animal Production Research Institute, Agricultural Research Center.

Experimental design:

A total number of 720 hatching eggs with an average weight of 81± 1 g were collected from Bronze turkey hen's breeder flock at 48-wk of age. Eggs were used to study the effect of in-ovo injection with different levels of pyridoxine (vit. B6) at three ages of embryonic development (ED) (10, 17 and 24 days). There were 240 eggs in each age, divided into equal six groups, 40 eggs/each. The 1st group (T1) without any treatment and served as control 1, the 2nd group was pierced in the blunt end (control 2, T2), while the 3rd one was injected into amniotic sac through the air sac (blunt end of the egg) with 0.2 ml saline solution (T3). The 4th (T4), 5th (T5) and 6th (T6) groups were injected into amniotic sac with 400, 600 and 800 µg pyridoxine, respectively, dissolved in 0.2 ml saline solution. The eggs were cleaned after collection by a rinsing process and then sprayed with a sanitizing solution for disinfection of the shell surface to prevent bacteria and fungi from entering the pore structure. The site of injection was punctured with

a blunt-tip injector needle [18.4 mm length and 1.27 mm bore width (outside diameter)] to target the amnion. The needle provided an injection depth of approximately 2.49 cm from the top of the large end of the egg. The injection whole area was disinfected with an ethyl alcohol; punctured site was sealed with sterile paraffin wax immediately after injection. All eggs were incubated at 37.6 Cº and 65% RH in an automatic incubator.

Measurements:-

Hatched chicks of each treatment were weighed at their access to poultry farm. Embryonic mortality during the incubation period and hatchability were calculated as percentages of fertile eggs.

At hatch day, five poults were randomly selected from each treatment subgroup. Blood samples were collected from wing vein of each bird in heparinized test tubes. Samples were centrifuged at 3000 rpm for 20 minutes. The separated plasma was stored in a deep freezer at -20°C until assayed for triiodothyronine (T_3) and thyroxin (T_4) hormones, total protein, albumin, globulin, total cholesterol, calcium, phosphorus, aspartate amino transamiase (AST) and alanine transamiase (ALT) according to the manufacture recommendations of commercial kits.

Statistical analysis:

Data were subjected to two-way analysis of variance using SAS Institute (2001). Differences among means were detected by using Duncan's multiple range test (Duncan, 1955). The percentage values were transferred to percentage angle using arcsine equation before subjected to statistical analysis, and then actual means are presented. The following model was used:

$Y_{ijk} = \mu + A_i + T_j + (A \times T)_{ij} + e_{ijk}$.

Where:

Y_{ij} = Observation.

μ = General mean.

A_i = Time of injection.

T_j = Pyridoxine effect.

$(A \times T)_{ij}$ = Interaction between time and Pyridoxine effects.

e_{ijk} = Random error.

RESULTS AND DISCUSSIONS

Embryonic mortality, hatchability and chick weight at hatch:

The effects of in-ovo injection time and pyridoxine level and their interactions on embryonic mortality (EM), hatchability (H) of fertile eggs percentage and chick weight at hatch (CWH) are presented in Table 1. Results showed significant ($P \leq 0.05$) differences among ages of ED at 10, 17 and 24 day. However, the best EM, H and CWH values were recorded at the10^{th} ED, while, the worst values were recorded at the 24^{th} ED. Injection of 0.2 ml saline solution with different pyridoxine levels to the Bronze turkey hatching eggs significantly ($P \leq 0.05$) decreased EM (%) compared with those of non injected control groups (T1 and T2) or that of solvent (saline solution only, T3 group). The lowest value in this respect was recorded for T6 group which received the highest level of pyridoxine (800µg), however it did not significantly differ than thoseT5 group (600µg). Moreover, in-ovo pyridoxine supplementation significantly ($P \leq 0.05$) improved both (H%) and (CWH). The highest H (%) values and the heaviest CWH values were also recorded for T6 followed by those of T5 and T4 groups, respectively. The interaction between in-ovo injection time and pyridoxine level had significant effects on EM, H and CWH. Eggs injected with the highest level of pyridoxine (800µg) at the10^{th} ED recorded the best H and EM percentages,

while the worst values of these traits were recorded by eggs un-injected pyridoxine (contro1) at the 24th ED. Moreover, the heaviest CWH was occurred in eggs injected with different levels of pyridoxine at the10th ED and in eggs injected with the highest level of pyridoxine (800µg) at the 17th ED, while the lowest CWH was occurred for contro1 group at the 17th ED. In this respect, Pyridoxine (vitamin B6) is a water soluble vitamin (Bender 1999), this is important from a nutritional standpoint, because the water soluble vitamins are not stored to any extent in the body. Therefore, a constant supply must be provided in the maternal diet to be deposited in adequate quantities in the eggs for future offspring consumption (Stevens 1991). Any deficiency could result in embryonic growth retardation that leads to death and eventually poor hatchability. This is due to the important functions that it involved in the metabolism of protein, lipids, phospholipids, fatty acid, cholesterol and carbohydrates (Squires and Naber 1993). Also, it is required to several enzymes, particularly those involved in red blood cell formation transamination, decarboxylation, desulfuration and amine oxidation of amino acids, the coenzymes are in the form of pyridoxal phosphate and pyridoxamine phosphate, and they play an essential role in muscle phosphorylase activity and play an essential role in amino acid interaction and transport in nucleic acid synthesis via the production of active formaldehyde and has an important role in the actions of steroid hormones. The deficiency of vitamin B6 reduces the oxidation of linolenate (Pregnolato et al., 1994). Okada et al. (1998) confirmed that the function of pyridoxine in amino acid metabolism is reflected in an increased requirement when high levels of protein are fed. Pyridoxine deficient chicks show depressed appetite, poor growth and feed consumption, hyper excitability, weakness, microcytic hypochromic anemia, convulsion, and death perosis, toe deviations and also produces characteristic nervous symptoms which play an important role in jerkey, movements of the legs when walking and often undergo extreme spasmodic convulsions that usually terminate in death (Yang and Jenq, 1998). Moreover, pyridoxine deficiency lead to early embryonic death (Landauer, 1967) and decreased IgM and IgG response to antibody challenge (Blalock et al., 1984). So that, ovo pyridoxine was vital for increasing hatchability even though the hen's diet was sufficiently supplemented with pyridoxine (Robel, 2002). The present results of increasing hatchability% due to egg injection with pyridoxine are in harmony with those previously reported by Robel and Christensen (1991) who mentioned that the injection of turkey eggs with 600 µg/egg pyridoxine (B6) at the ED 25 resulted in approximately 4.6% higher hatchability than the control (non injected). Also, York et al. (2004) and Bhanja et al. (2007) reported that the injection of chicken eggs with 100 µg/egg pyridoxine (B6) at14 day of incubation period resulted in apparently higher hatchability (81.5%) than in un injected control (80%). These results were confirmed by Elaroussi et al. (2003) and Elsayed et al. (2010) in quail and Ibrahim et al. (2012) and Amer (2012) in ostrich.

Pyridoxine has an important role in amino acid, carbohydrate, and fatty acid metabolism and also plays a major role in

the energy producing citric acid cycle (McDowell, 1989). Robel (1983) assayed turkey eggs for pyridoxine and observed significant decrease in their pyridoxine concentrations associated with maternal age. This aging feature coupled with the biological variable in the deposition of the vitamin in hen's eggs mean that it is conceivable that some contain insufficient pyridoxine for embryo survival. It was considered that the transport of vitamin from the egg to the chick was responsible for the failure in embryo development. This reasoning reinforces that the practice of injection of vitamins, as well as other nutrients, may become a routine in poultry production (Vieira, 2007).

Biochemical characteristics:

a- plasma proteins:

Data of plasma total protein (PTP), albumin (A), globulin (G) and A/G ratio of Bronze turkey poults at hatch day as affected by injection time and pyridoxine levels and their interactions are presented in Table 2. All studied plasma proteins were not significantly affected due to injection time effect except that of A/G ratio, which recorded the lowest values at the 17^{th} and 24^{th} ED compared to 10^{th} ED. However, the best value was recorded at the 24^{th} ED. It is evidently shown that injection of pyridoxine at different levels had significant ($P\leq0.05$) effect on plasma total protein, while there were insignificant differences duo to injecting eggs with pyridoxine on plasma A, G and A/G ratio. The best values of PTP, G and A/G ratio were recorded by eggs injected with the lowest level of pyridoxine (400µg). Where the low A/G ratio indicates more disease resistance and immune response (Lee et al., 2003). However, there were significantly ($P\leq0.05$) differences in plasma total protein, albumin, globulin and A/G ratio due to interaction between ages of ED and pyridoxine level. The highest interaction value of TPT was recorded by eggs injected with the lowest level of pyridoxine (400µg) at the 10^{th} ED. Moreover, the best interaction value of A/G ratio was recorded by eggs un-injected pyridoxine (contro1) at the 24^{th} ED, whereas, the worst interaction value of G was recorded by eggs injected with the middle level of pyridoxine (600µg) at the 10^{th} ED. These results are in agreement to some degree with the results of El-Sayed et al. (2010) who found that serum total protein, albumin and globulin were significantly higher ($P\leq0.01$) in the groups of quail eggs injected with 120 µg pyridoxine than other groups injected with 40 and 80 µg pyridoxine. In addition, there were non-significant differences in albumin concentration between the groups of quail received 120 µg and 80 µg pyridoxine. Also, Roussel et al. (1988) studied the effects of pyridoxine deficiency on the blood components of neonatal chicken and found that total serum protein concentration was significantly decreased than normal, while serum albumin was declined from one-third to one-fifth of the control values. Moreover, serum protein level was higher ($P\leq0.01$) in vitamin B6 injected birds compared with control birds group (Goel et al., 2013).

b- Plasma cholesterol, calcium and phosphorus:

Results presented in Table 3 indicated that, significant ($P\leq0.05$) difference was observed in plasma cholesterol and phosphorus levels due to time of injection. While, plasma calcium level did not statistically differ with this respect. The highest numerical values of plasma cholesterol and plasma calcium levels, besides, the lowest values of

plasma phosphorus level were recorded for the group injected at the 17th ED (Table 3). Nearly similar trend is shown for plasma cholesterol, calcium and phosphorus levels as affected by pyridoxine injection at any level to the hatching eggs (Table 3). The interaction between injection time with pyridoxine level had significant ($P \leq 0.05$) effects on plasma cholesterol, calcium and phosphorus levels. The best value of plasma cholesterol level was recorded for eggs injected with the highest level of pyridoxine (800µg) at the 10th day of incubation, whereas, the worst values of both plasma calcium and phosphorus levels were recorded by eggs un-injected with pyridoxine and bored (contro1) at the 10th day of incubation and eggs injected with the middle level of pyridoxine (600µg) at the 17th day of incubation, respectively. These findings are consistent with the findings of El-Sayed et al. (2010) who showed that serum cholesterol concentration was significantly elevated by saline and pyridoxine injections. Also, Frances et al. (1979) found that serum cholesterol levels of vitamin B6 deficient hens were lower than those of hens receiving an adequate diet. On the other hand, Goel et al. (2013) reported that serum cholesterol level was not significantly affected by vitamin B6 injection. The current results are supported by Siegel et al. (2006) and El-Sayed et al. (2010) who reported that serum calcium concentration were non-significantly affected by pyridoxine injection. In addition, phosphorus level was negatively affected by both saline and pyridoxine injections, therefore, control group had significant higher serum level of phosphorus than other groups. These results effectively support the current findings of hatching traits and coincided with the earlier suggestion of Christensen and Eden (1985) who showed that the improvement in hatchability percentages of Turkey eggs was associated with higher embryonic Ca and P. Moreover, this increment had important role in stimulating muscular activity and contraction (Christensen and Biellier, 1982).

Liver function and thyroid activity:

As shown in Table 4, plasma concentrations of thyroid hormones (T_3 and T_4 hormones), as an indication of thyroid activity, were significantly increased ($P \leq 0.05$) by increasing pyridoxine injection at level (800µg) compared with the lowest (400µg) and control groups (un-injected). On the other hand, insignificant differences were noted in plasma thyroid hormones (T_3 and T_4 hormones) concentrations due to injection time (Table 4). The interactions between injection time with pyridoxine level were significant ($P \leq 0.05$). The highest values of T_3 hormone were recorded by eggs injected the highest level of pyridoxine (800µg) at both 24th and 17th ED, respectively. While the highest values of T_4 hormone were recorded by eggs injected the highest level of pyridoxine (800µg) at both 17th and 10th ED, respectively. In this respect, El-Sayed et al. (2010) found that serum triiodothyronine (T_3) concentration was significantly increased in the group of quails received 120 µg pyridoxine than other received groups (40 and 80 µg pyridoxine), while non-significant differences between the groups of quails received 120 µg pyridoxine and control group. Also, Virden et al. (2003 and 2004) showed that serum T_3 concentration was significantly elevated in Hubbard hens received high levels of pyridoxine (100 µg) while non-

significant effects with the low pyridoxine levels (40 and 60 µg) were observed.

Our results are consistent with previous results of DeOliveira (2007) who reported an increase in the thyroxine hormones during the late stage of embryonic development, when the chick embryo needs more oxygen and energy to survive and hatch after being switched to lung respiration. Furthermore, the embryonic ability to consume the liver and muscular glycogen as a source of energy during the hatching days depends mainly on thyroid hormone levels.

It is clearly observed that, both injection time and pyridoxine level in the hatching eggs and their interaction, (Table 4) could insignificantly affect the hepatic enzymes activities. Where, chicks produced from eggs injected the lowest level of pyridoxine (400µg) recorded the lowest and insignificant values of both AST ALT enzymes. These results indicated that pyridoxine injection in the hatching eggs had no deleterious effect on liver functions and may protect the hepatocytes of chicks from being destroyed and that is meant a better liver function associated with pyridoxine injection in the hatching eggs. The results were supported by Siegel et al. (2006) who reported that serum AST was significantly ($P \leq 0.01$) affected by pyridoxine injection while serum ALT concentration were non significantly affected. El-Sayed, et al. (2010) found that serum AST level was significantly increased in the groups of quails received 40 µg pyridoxine. Moreover, non-significant differences were observed between both groups of quails received 80 µg and 120 µg pyridoxine or between control and saline groups. He added that, serum ALT concentration was non-significantly affected by pyridoxine injection, control group had higher ALT level than other groups and non-significant differences between other groups were recorded.

In conclusion, injection of hatching turkey eggs with at 800µg pyridoxine at 10 and 17 days of incubation is a practical and beneficial procedure for improving the hatchability traits and physiological responses of hatched turkey poults as indicated with better blood biochemical and metabolic hormones expression.

Table (1): Effect of in-ovo injection with pyridoxine on embryonic mortality,hatchability and hatch weight of Bronze Turkey poults.

	Hatchability of fertile eggs (%)	**Embryonic mortality (%)**	**Chick weight at hatch (g)**
Effect of injection time (A)			
A1	77.41 [a]	22.59 [b]	54.04 [a]
A2	75.93 [ab]	24.07 [ab]	52.87 [b]
A3	73.33 [b]	26.67 [a]	53.48 [ab]
SEM	1.171	1.171	0.286
Effect of pyridoxine (T)			
T1	68.89 [c]	31.11 [a]	51.11 [b]
T2	70.37 [c]	29.63 [a]	52.27 [b]
T3	71.85 [c]	28.15 [a]	51.90 [b]
T4	77.78 [b]	22.22 [b]	54.81 [a]
T5	80.74 [ab]	19.26 [bc]	55.17 [a]
T6	83.70 [a]	16.30 [c]	55.52 [a]
SEM	1.656	1.656	0.405
Effect of interaction (A x T)			
A1 x T1	68.89 [de]	31.11 [ab]	52.17 [def]
A1 x T2	71.11 [cde]	28.89 [abc]	52.71 [cde]
A1 x T3	73.33 [cde]	26.67 [abc]	52.32d [ef]
A1 x T4	80.00 [abc]	20.00 [cde]	55.47 [a]
A1 x T5	84.45 [ab]	15.55 [de]	55.64 [a]
A1 x T6	86.67 [a]	13.33 [e]	55.93 [a]
A2 x T1	71.11 [cde]	28.89 [abc]	49.73 [g]
A2 x T2	71.11 [cde]	28.89 [abc]	52.10 [def]
A2 x T3	71.11 [cde]	28.89 [abc]	50.35 [fg]
A2 x T4	77.78 [abcd]	22.22 [bcde]	54.64 [abc]
A2 x T5	80.00 [abc]	20.00 [cde]	54.97 [abc]
A2 x T6	84.45 [ab]	15.55 [de]	55.41 [a]
A3 x T1	66.67 [e]	33.33 [a]	51.42e [fg]
A3 x T2	68.89 [de]	31.11 [ab]	52.00 [ef]
A3 x T3	71.11 [cde]	28.89 [abc]	53.02 [bcde]
A3 x T4	75.55 [bcde]	24.45 [abcd]	54.31 [abcd]
A3 x T5	77.78 [abcd]	22.22 [bcde]	54.91 [abc]
A3 x T6	80.00 [abc]	20.00 [cde]	55.22 [ab]
SEM	2.869	2.869	0.701

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

A1, A2 and A3 =injection time at 10, 17 and 24 days, respectively. T1=Control 1(without injection), T2=Control 2(without injection and bored only), T3=Control 3 (injection with 0.2 ml saline solution), T4= injection with 0.2 ml saline solution + 400µg pyridoxine, T5=injection with 0.2 ml saline solution + 600 µg pyridoxine, T6= injection with 0.2 ml saline solution + 800 µg pyridoxine

Table (2): Effect of in-ovo injection with pyridoxine on blood plasma proteins of hatched Bronze Turkey poults.

	Total protein (g/dl)	**Albumin (A) (g/dl)**	**Globulin (G) (g/dl)**	**A/G ratio**
Effect of injection time (A)				
A1	6.99	3.82	3.17	1.584 [a]
A2	6.86	3.61	3.25	1.161 [b]
A3	7.19	3.60	3.59	1.108 [b]
SEM	0.150	0.098	0.182	0.130
Effect of pyridoxine (T)				
T1	7.08 [a]	3.80	3.28	1.501
T2	6.41 [b]	3.59	2.82	1.389
T3	7.04 [ab]	3.46	3.58	1.080
T4	7.33 [a]	3.68	3.65	1.054
T5	6.98 [ab]	3.77	3.21	1.449
T6	7.23 [a]	3.74	3.49	1.231
SEM	0.213	0.139	0.257	0.184
Effect of interaction (A x T)				
A1 x T1	6.03 [def]	4.12 [a]	1.91 [ef]	2.617 [a]
A1 x T2	7.03 [bcd]	3.84 [ab]	3.19 [bcde]	1.367 [c]
A1 x T3	7.95 [ab]	3.22 [b]	4.73 [a]	0.683 [c]
A1 x T4	8.34 [a]	3.91 [ab]	4.43 [ab]	0.930 [c]
A1 x T5	5.62 [ef]	3.95 [ab]	1.67 [f]	2.447 [ab]
A1 x T6	6.95 [bcd]	3.86 [ab]	3.09 [bcdef]	1.460 [bc]
A2 x T1	7.13 [bcd]	3.66 [ab]	3.47 [abcd]	1.057 [c]
A2 x T2	6.71 [cde]	3.76 [ab]	2.95 [bcdef]	1.317 [c]
A2 x T3	6.46 [def]	3.32 [ab]	3.14 [bcdef]	1.060 [c]
A2 x T4	6.64 [cdef]	3.63 [ab]	3.02 [bcdef]	1.220 [c]
A2 x T5	7.26 [abcd]	3.52 [ab]	3.74 [abcd]	0.967 [c]
A2 x T6	6.93 [bcd]	3.75 [ab]	3.18 [bcde]	1.343 [c]
A3 x T1	8.07 [ab]	3.61 [ab]	4.46 [ab]	0.830 [c]
A3 x T2	6.49 [f]	3.17 [b]	2.32 [def]	1.483 [bc]
A3 x T3	6.70 [cde]	3.83 [ab]	2.87 [cdef]	1.497 [bc]
A3 x T4	7.01 [bcd]	3.52 [ab]	3.49 [abcd]	1.013 [c]
A3 x T5	8.04 [ab]	3.82 [ab]	4.22 [abc]	0.933 [c]
A3 x T6	7.81 [abc]	3.62 [ab]	4.18 [abc]	0.890 [c]
SEM	0.368	0.241	0.446	0.319

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

A1, A2 and A3 =injection time at 10, 17 and 24 days, respectively. T1=Control 1(without injection), T2=Control 2(without injection and bored only), T3=Control 3 (injection with 0.2 ml saline solution), T4= injection with 0.2 ml saline solution + 400µg pyridoxine, T5=injection with 0.2 ml saline solution + 600 µg pyridoxine, T6= injection with 0.2 ml saline solution + 800 µg pyridoxine

Table (3): Effect of in-ovo injection with pyridoxine on blood plasma cholesterol, calcium and phosphorus of hatched Bronze Turkey poults.

	Cholesterol (mg/dl)	**Calcium (mg/dl)**	**Phosphorus (mg/dl)**
Effect of injection time (A)			
A1	304.75 ^{b}	9.62	7.06 ^{a}
A2	320.56 ^{a}	9.84	5.84 ^{c}
A3	315.63 ^{ab}	9.73	6.09 ^{b}
SEM	4.503	0.090	0.069
Effect of pyridoxine (T)			
T1	312.49	9.78	6.48
T2	305.73	9.54	6.31
T3	306.87	9.80	6.41
T4	317.64	9.78	6.24
T5	321.19	9.65	6.23
T6	317.98	9.82	6.30
SEM	6.368	0.127	0.098
Effect of interaction (A x T)			
A1 x T1	313.06 ^{bcd}	9.83 ^{a}	7.55 ^{a}
A1 x T2	304.81 ^{bcde}	9.05 ^{b}	7.45 ^{a}
A1 x T3	305.84 ^{bcde}	9.79 ^{ab}	7.53 ^{a}
A1 x T4	317.87 ^{bcd}	9.80 ^{a}	7.12 ^{a}
A1 x T5	311.68 ^{bcde}	9.48 ^{ab}	7.00 ^{ab}
A1 x T6	275.26 ^{e}	9.77 ^{ab}	5.71 ^{def}
A2 x T1	319.24 ^{bcd}	9.75 ^{ab}	6.19 ^{cd}
A2 x T2	327.15 ^{ab}	9.86 ^{a}	5.73 ^{de}
A2 x T3	328.87 ^{ab}	9.91 ^{a}	6.12 ^{cde}
A2 x T4	309.28 ^{bcde}	9.86 ^{a}	5.62 ^{ef}
A2 x T5	315.81 ^{bcd}	9.66 ^{ab}	5.17 ^{f}
A2 x T6	323.02 ^{abc}	9.97 ^{a}	6.20 ^{cd}
A3 x T1	305.15 ^{bcde}	9.75^{ab}	5.71 ^{def}
A3 x T2	285.22 ^{de}	9.73 ^{ab}	5.75 ^{de}
A3 x T3	285.91 ^{cde}	9.71 ^{ab}	5.57 ^{ef}
A3 x T4	325.77 ^{ab}	9.67 ^{ab}	5.97 ^{de}
A3 x T5	336.08 ^{ab}	9.79 ^{ab}	6.52 ^{bc}
A3 x T6	355.67 ^{a}	9.71 ^{ab}	7.00 ^{ab}
SEM	11.031	0.221	0.170

$^{a, b,c}$ …Means within a column in the same effect with different superscripts are significantly differ ($P \leq 0.05$).

A1, A2 and A3 =injection time at 10, 17 and 24 days, respectively. T1=Control 1(without injection), T2=Control 2(without injection and bored only), T3=Control 3 (injection with 0.2 ml saline solution), T4= injection with 0.2 ml saline solution + 400µg pyridoxine, T5=injection with 0.2 ml saline solution + 600 µg pyridoxine, T6= injection with 0.2 ml saline solution + 800 µg pyridoxine

Table (4): Effect of in-ovo injection with pyridoxine on liver function and thyroid activity of hatched Bronze Turkey poults.

	Liver function		Thyroid activity	
	AST	**ALT**	**T3**	**T4**
Effect of injection time (A)				
A1	54.18	25.45	1.782	9.074
A2	52.06	24.43	1.793	9.106
A3	54.68	25.65	1.798	8.944
SEM	1.038	0.924	0.015	0.085
Effect of pyridoxine (T)				
T1	55.04	25.09	1.732 ^{c}	8.467^{d}
T2	53.96	25.42	1.780 ^{bc}	8.837 ^{c}
T3	53.54	26.02	1.738 ^{c}	9.080 ^{bc}
T4	51.49	23.63	1.787 ^{bc}	8.809 ^{cd}
T5	53.38	25.63	1.827 ^{ab}	9.240 ^{b}
T6	54.43	25.27	1.883 ^{a}	9.814 ^{a}
SEM	1.185	1.306	0.022	0.120
Effect of interaction (A x T)				
A1 x T1	55.97	26.14	1.690 ^{d}	8.453 ^{d}
A1 x T2	55.05	25.11	1.777 ^{abcd}	8.837 ^{cd}
A1 x T3	53.54	25.01	1.713 ^{cd}	8.953 ^{bcd}
A1 x T4	52.85	24.52	1.807 ^{abcd}	8.977 ^{bcd}
A1 x T5	53.97	26.95	1.840 ^{abc}	9.333 ^{abc}
A1 x T6	53.72	24.96	1.867 ^{ab}	9.890 ^{a}
A2 x T1	53.80	22.59	1.753 ^{bcd}	8.473 ^{d}
A2 x T2	51.83	25.31	1.777 ^{abcd}	8.837 ^{cd}
A2 x T3	51.17	26.61	1.713 ^{cd}	8.593 ^{bcd}
A2 x T4	49.59	22.87	1.807 ^{abcd}	8.977 ^{bcd}
A2 x T5	53.33	25.42	1.823 ^{abc}	9.417 ^{abc}
A2 x T6	52.63	23.80	1.887 ^{a}	9.977 ^{a}
A3 x T1	55.35	26.53	1.753^{bcd}	8.473 ^{d}
A3 x T2	55.00	25.82	1.787 ^{abcd}	8.837 ^{cd}
A3 x T3	55.91	26.45	1.787 ^{abcd}	9.333 ^{abc}
A3 x T4	52.02	23.50	1.747 ^{bcd}	8.473 ^{d}
A3 x T5	52.85	24.52	1.817^{abcd}	8.970 ^{bcd}
A3 x T6	56.93	27.06	1.897 ^{a}	9.577 ^{ab}
SEM	2.052	2.263	0.037	0.208

$^{a, b,c}$ …Means within a column in the same effect with different superscripts are significantly differ ($P \leq 0.05$).

A1, A2 and A3 =injection time at 10, 17 and 24 days, respectively. T1=Control 1(without injection), T2=Control 2(without injection and bored only), T3=Control 3 (injection with 0.2 ml saline solution), T4= injection with 0.2 ml saline solution + 400µg pyridoxine, T5=injection with 0.2 ml saline solution + 600 µg pyridoxine, T6= injection with 0.2 ml saline solution + 800 µg pyridoxine

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الملخص العربى

تأثير حقن بيض التفريخ بالبيرودوكسين على الفقس والإستجابة الفسيولوجية لكتاكيت الرومى حديثة الفقس

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أجريت هذه الدراسة فى محطة بحوث تربية الرومى بمحلة موسى– معهد بحوث الانتاج الحيوانى وذلك بهدف دراسة تأثير حقن البيض المخصب للرومى بالبيريدوكسين (فيتامين ب 6) على نسبة الفقس و النفوق الجنينى ووزن الكتاكيت الفاقسة وبعض مكونات الدم. واستخدم فى هذه الدراسة عدد 720 بيضة رومى مخصبة من سلالة البرونز خلال ثلاث فترات مختلفة من التفريخ (فى اليوم العاشر، السابع عشر، الرابع والعشرون) بواقع 240 بيضة فى بداية كل فترة. تم تقسيم البيض فى بداية كل فترة من الفترات السابقة الى 6 معاملات تبعا لميعاد حقن البيض بواقع (40 بيضة/معاملة) كالتالى:

- المعاملة الأولى: تم فيها أخذ البيض المخصب دون حقنه أو ثقبه، المعاملة الثانية: تم فيها ثقب البيض فقط دون حقنه ، المعاملة الثالثة: تم فيها حقن البيض بمقدار 0.2مل محلول ملحى 0.9% (كنترول)، المعاملة الرابعة: تم فيها حقن البيض بمقدار 0.2مل محلول ملحى يحتوى على 400 ميكروجرام بيرودوكسين ، المعاملة الخامسة: تم فيها حقن البيض بمقدار 0.2مل محلول ملحى يحتوى على 600 ميكروجرام بيرودوكسين والمعاملة السادسة: تم فيها حقن البيض بمقدار 0.2مل محلول ملحى يحتوى على 800 ميكروجرام بيرودوكسينز وتتلخص أهم النتائج المتحصل عليها فيما يلى:

- وجد أن هناك تأثيرا معنويا نتيجة تأثير ميعاد حقن بيض تفريخ الرومى بالبريدوكسين على كل من النسبة المئوية للنفوق الجنينى، نسبة الفقس ووزن الكتاكيت الفاقسة وسجلت أفضل النتائج لهم خلال الفترة الأولى (المبكرة) من الحقن. كما أدى حقن بيض تفريخ الرومى بالبريدوكسين تحت أى مستوى الى إنخفاض معنوى فى النسبة المئوية للنفوق الجنينى وتحسن معنوى لكل من نسبة الفقس ووزن الكتاكيت الفاقسة.
- وجد أن بيض تفريخ الرومى الذى تم حقنه بالمستوى الأعلى من البريدوكسين خلال الفترة الأول من الحقن سجل أفضل النتائج لكل من النسبة المئوية للنفوق الجنينى ونسبة الفقس.
- سجلت نسبة الألبيومين الى الجلوبيولين أقل وأفضل القيم خلال الفترتين الأخيرتين من الحقن مقارنة بالفترة الأولى من الحقن، كما سجلت أفضل النتائج لنسبة الألبيومين الى الجلوبيولين فى البيض الذى لم يتم حقنه (كنترول 1) خلال الفترة الأخيرة من الحقن.
- وجد أن أفضل القيم لتركيز الكوليسترول قد سجلت فى بلازما دم الكتاكيت الناتجة من البيض الذى تم حقنه بالمستوى الأعلى من البريدوكسين خلال الفترة الأولى من حقن البيض.
- وجد أن تركيز هرمونات الغدة الدرقية (T_3 , T_4) إرتفع معنويا بزيادة مستوى حقن البريدوكسين مقارنة بكل من المستوى الأدنى من البريدوكسين وكذلك المجاميع التى لم تحقن بالبريدوكسين، بينما لم يتأثر تركيز هرمونات الغدة الدرقية معنويا بفترة الحقن.
- وجد أن أعلى قيم لتركيزهرمون T_3 قد تم تسجيلها فى بلازما دم الكتاكيت الناتجة من البيض الذى تم حقنه بالمستوى الأعلى من البريدوكسين خلال الفترتين الثانية والثالثة من حقن البيض على الترتيب، بينما أعلى قيم لتركيز هرمون T_4 قد تم تسجيلها فى بلازما دم الكتاكيت الناتجة من البيض الذى تم حقنه بالمستوى الأعلى من البريدوكسين خلال الفترتين الثانية والأولى من حقن البيض على الترتيب.

الخلاصة:- يتضح من هذه النتائج أن حقن بيض تفريخ الرومى بالبريدوكسين خاصة بمعدل 800 ميكروجرام فى اليومين العاشر و السابع عشر من التفريخ أدى الى تحسين نسب التفريخ وتقليل النفوق الجنينى وزيادة وزن الكتاكيت الفاقسة من خلال تحفيز مكونات الدم البيوكيميائية ونشاط الغدة الدرقية خلال المرحلة الأخيرة من التفريخ.