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Effect Of Using Iron Nanoparticles Or Iron Methionine By Embryonic Nutrition Or Nutritional Supplements On Productive And Physiological Performance In Maamaura Chickens Strain

Magdy S. Hassan*; Yasser S. Rizk*; Ebrahim A. Alsied**, Sherin G. Abdelrazik*(1) ; Rehab A. Mohammed*;Wael H. Eisaa*and Kamal M.A. Eid*

** Poultry Breeding Department, Animal Production Research Institute, Agricultural Research Center, Dokki, Giza 12611, Egypt.*

*** Poultry Production Department, Fac. of Agric. Ain Shams Univ, Shoubra El- Kheima, Cairo, Egypt*

Corresponding author: sherygabr7@gmail.com

ABSTRACT

The aim of this study is to study the effect of *in ovo* injection with iron nanoparticles or iron methionine, also with their studies when adding them as nutritional supplements to diets on productive and physiological performance of Maamaura chickens strain. 540 fertile eggs from Maamaura chickens strain were used in this study. Eggs were randomly divided into 6 treatments groups in the incubator, each of which included 3 replicates (30 eggs each). The experiment is designed as follows: T1 control without injection, T2 injected with 0.1 ml saline solution 9.0% T3 injected with 0.1 ml of nano iron methionine particles / egg, T4 injected with 0.1 ml iron methionine/egg, T5 after the eggs hatch the hatched chicks were fed diet supplemented with 20 mg iron methionine / kg diet and T6 hatched chicks were fed diet supplemented with 5 mg nano iron methionine - particles / kg diet. Live body weight was taken at day old and every two weeks to the end of the experiment, feed intake was determined every two weeks hatchability, mortality percentage and chick weight at hatch were determined. Some blood parameter and carcass traits were determine at the end of the experimental.

The results obtained that T3 and T4 significantly increased the weight of hatched chicks, live body weight and hatchability percentage and also improved feed conversion at all period of estimation, and decreased embryo mortality. The results also showed that T4and T5 respectively significantly increases body weight and enhanced FCR. The improvement was found in all blood parameters and all carcass traits by all treatments compared to control.

Conclusively, it could be recommended by using *in ovo* injection with iron methionine and iron methionine nano particles to improving the productive and physiological performance of chickens specially local breeds of layer chicks. Also the use of Iron nano-particles *in ovo* injection gave the best results under the prevailing conditions.

Key words: Chicken; *Inovo Injection;* Iron nanoparticles; Iron Methionine; Growth Performance; Immunological Performance.

INTRODUCTION

The present work was aimed to study the effect *inovo injection* and dietary feed additives with Iron nano particles on productive, physiological performance of Maamaura chicken strains. Iron is essential for animal and poultry so it supplemented in their diets. Iron necessary for the life of poultry, so it is preferable to add it to nutrients is an integral part of many proteins and enzymes. Majority of iron is present in the erythrocytes as hemoglobin (molecule that contains one hem group and one protein chain in each of its four units (Conrad *et al.,* 1999).

(Lozoff *et al.*, 2006) found that the (Fe) playing many rolls in the cell growth, differentiation, myoglobin , production of hemoglobin and the component of red blood cells this is because the Iron responsible for transports oxygen around the body. Iron (Fe) act as a cofactor for the function of over 300 different enzymes and is an important structural cofactor for many proteins, including DNA synthesis and oxygen transport (Whitnall and Richardson, 2006; Scott and Chen, 2008 and Li and Zhao, 2009). *In ovo* injection help provide optimal nutrition for the embryos. The injection of methionine was an important amino acid effective on performance. An increase in growth was observed with Iron sulfate nanoparticles alone and with Alimet methionine (Ali *et al.,* 2020).

One of the common health problems is the occurrence of anemia, and it has been found that one of the best ways to solve this problem is to add iron to food. (Stoltzfus, 2001). Much of the organic iron in the body is found in the structure of hemoglobin, in muscles as myoglobin, and in liver, it is in the form of reserved ferritin and hemosiderin Hemoglobin and myoglobin are important determinant agents of the meat quality (Suttle, 2010).

It is worth noting that birds on farms are exposed to high stress resulting from vaccinations, temperatures, food withdrawal and etc. Therefore, there has recently been a trend towards using nano-iron to reduce the stress that birds are exposed to. (Attia *et al.*, 2016 & 2018). So it uses iron nanoparticle to relieve the stress the birds are exposed lay hens. These particles have features, such as large surface area (increasing physical chemical and biological activities) and higher solubility and mobility (Toyooka, *et al.,* 2009 and Diman *et al*., 2018). Nano-particles have many novel properties compared with the bulk materials. Thus, inorganic nano-particle elements are widely used to enhance the productive performance of livestock, Ma *et al.,* (2006). Iron nanoparticles have physical and chemical properties different from the original metal in its original, nano form, which increases the efficiency of its absorption in the intestine and improves the nutritional efficiency of birds. (Raje *et al*., 2018).

Hira *et al* (2016) showed that birds were fed ration containing 0, 20, 40, 60 and 80 mg Fe/kg feed respectively was more effective to produce higher live body weight gain compared to control. There was a positive effect on Fe level in blood. The dose of 80 mg/kg feed Fe was most effective to maximize the net profit of broiler.

Therefore, the aim of this study is to study the effect of in ovo injection with iron nanoparticles or iron methionine, also with their studies when adding them as nutritional supplements to diets on productive and physiological performance of Maamaura chickens strain.

MATERIALS AND METHODS

Experimental design:

A total number of 540 eggs from Maamaura strain were divided randomly into 6 groups (90 eggs / each group) in three replicates, (30 eggs / each). All eggs were incubated at 37.6 ˚ C and relative humidity of 55 to 60% during the first 18 days of incubation, then temperature was decreased to 36.2˚ C and 65-70% relative humidity in the setter until hatching. At the seventh day of hatching eggs were treated as follows.

1- The first group (T1) eggs without any injection and considered as control group.
2- The second group (T2) eggs were injected with 0.1 ml saline solution (9.0%).
3- The third group (T3) eggs were injected, 0.1 ml with 25 ppm iron methionine nano particles).
4- The fourth group (T4) eggs were injected with 0.1 ml (25 ppm iron methionine).
5- The fifth group (T5) hatched chicks from uninjected eggs were fed dietary supplementation with 5 mg/ iron methionine nano-particles /1kg diet
6- The sixth group (T6) hatched chicks from uninjected eggs were fed diet supplemented with 20 mg/ iron methionine /1kg diet.

A total number of hatched chicks were kept under similar environmental conditions. Chicks were fed on a commercial starter and grower basal rations until 56 day of age.

Growth performance

Body weights were recorded in grams for each bird at the following at 1, 14, 28, 42 and 56 day of ages. Feed intake (FI) in each treatment was recorded per two weeks and then calculated every two weeks during the trial period.

Blood collection for biochemical studies

At the 56th day of the experiment (8 weeks), 10 ml of blood samples were collected from three birds per treatment group through neck slitting into sterile

disposable hypodermic syringes. About 5 ml of blood samples were transferred immediately into plastic tubes containing anti-coagulant Heparin. Blood samples were centrifuged at 2500 rpm for (15- min). Plasma samples were stored in deep freezer at approximately 20 ^{0}C until the time of chemical analysis. The chemical analysis of blood samples were carried out by colorimeter method using commercial kits for determination of plasma total protein, albumin, globulin, cholesterol, triglyceride, HDL, LDL, liver enzymes (ALT and AST) and iron (Fe).

Carcass characteristics

At 56 day of age three birds were randomly selected from each treatment individually weighed and slaughtered after they have been fasted for 12 h. Measurements were made of bird live weight, carcass weight and its percentage of live weight, heart, liver and gizzard weights and their percentages of carcass weight. The relative spleen and bursa of fabricius weights were determined.

Statistical analysis:

Data collected were analyzed by one way analysis using SAS program (SAS, 2006) as following the statistical model:

$$Y_{ij} = \mu + a_i + e_{ij}.$$

Yij = An observation, μ= General means, a_i = Effect of *in ovo* injection Nano Iron methionine particles and dietary supplementation, e_{ij} = Experimental error.

In order to determine significant differences between all possible mean comparisons Duncan`s multiple range test(Duncan,1955) was applied. Statistical significance was accepted at a probability level of 0.05.

RESULTS AND DISCUSSION:

Productive performance:

Body weight:

Results presented in Table (1) showed highly significant (p>0.0001) effect of *in-ovo* injection of different iron methionine sources and dietary supplementation of powder on live body weight at different ages. Birds produced from T3 and T4 which injected with 0.1 ml of Nano iron methionine and methionine Iron had significantly the higher live body weight than other treatments applied at all estimated periods.

These results are consistent with Ali Saki *et al* (2020) they stated that in *ovo* feeding with nutrients, especially iron, provides the embryos with the nutrients necessary for optimum post-hatch growth.

Table 1. Effect of treatments on body weight (g) at different ages.

Body weight (g) at day					
Treatment groups	(1day)	(14day)	(28day)	(42day)	(56day)
T1	37.3[b]	135.5[e]	315.5[d]	460.4[c]	715.5[e]±
T2	38.9[a]	135.5[e]	315.5[d]	458.7[c]	699.7[f]±
T3	40.1[a]	154.3[a]	372.3a	550.4[a]	821.4[a]±
T4	39.1[a]	145.3[b]	352.3[b]	475.7[bc]	791.5[b]
T5	36.9[b]	143.3[c]	342.3[c]	492.2[b]	775.5[c]
T6	36.1[b]	141.5[d]	315.4[d]	478.7[bc]	757.2[d]
SEM	0.5	0.2	1.9	6.1	1.8
Pr > F	0.0005	0.0001	0.0001	0.0001	0.0001

[a, b] Means within a column with different superscripts are significantly different (P< 0.05).

Despite the dependence of embryo growth on nutrients especially iron, data on the mineral content of the egg during incubation is limited. The injection of methionine was an important amino acid effective on performance. Iron sulfate nanoparticles alone and with methionine (Alimet) used to increase the growth during embryonic and post-hatch periods. This result may be returned to due to circulatory activity and increasing secretion of digestive enzyme, the metabolic rate is increased, and therefore the conversion rate is increased, resulting in an increase in live body weight at different age. Also, El-Said and El-Gogary (2019) showed that in ovo injection with 0.1 ml 0.1 ml of 75 ppb of iron nanoparticles (FeNPs), and injected with 0.1 ml of 75 ppb organic iron (Fe- meth). Results showed that in-ovo injection of different iron sources significantly improved live body weight and weight gain of broiler chicks. Amal (2018) suggest that the in-ovo injection of 20-ppm iron nanoparticles (fe-nps), 20-ppm iron nanoparticles alimet chelate (fe-nps-alimet chelate) and 20-ppm fe-alimet chelate as-alimet chelate and fe-alimet chelate improved embryonic growth and development. Zhai *et al.* (2015) The results showed that injecting eggs with nano-iron at a concentration of 20-150ppm were improved the productive performance of chicks. Also Iron nanoparticles and compounds may be considered a good alternative to existing treatments.

Feed intake:

Results presented in Table (2) showed highly significant (P>0.0001) effect of *in-ovo* injection and dietary supplementation of powder of different iron methionine sources on feed intake at different ages. T3 and T4, which injected eggs with 0.1 ml of either Nano iron methionine or methionine iron

Table 2. Effect of treatments on feed intake (g/bird) at different ages

Feed intake (g / bird)				
Treatment groups	(1:14day)	(14:28day)	(28:42day)	(42:56day)
T1	284^{e}	440^{d}	733^{e}	1316^{ab}
T2	287de	439^{d}	728^{e}	1318^{ab}
T3	329^{a}	495^{a}	804^{a}	1333^{a}
T4	310^{b}	468^{b}	777^{b}	1320^{ab}
T5	289^{c}	456^{c}	761^{c}	1303^{b}
T6	290^{d}	443^{d}	747^{d}	1313^{ab}
SEM	1.2	1.6	1.7	7.8
Pr > F	0.0001	0.0001	0.0001	0.0001

$^{a, b}$ Means within a column with different superscripts are significantly different (P< 0.05).

significantly increased feed intake than the other treatments, which noting that the best effect in T3 as compared to other treatments at different ages.

These results may be leads to increase of secretion many enzyme systems including catalase, peroxidase, and phenylalanine hydroxylase. The results agreement with Amal (2018), she found that, significantly (P<0.05) increased feed intake when *in ovo* injection by nano forms of Fe Nano particles. Diman *et al.*, (2018) reported that, these particles have features, such as large surface area (increasing physical, chemical, and biological activities) and higher solubility and mobility. On other vie Ghada and Abdalla (2019) injected 0.1ml /egg of iron solution at a rate of 75 ppm of different iron sources (nano Organic and organic) and conclude that, injection with 0.1 ml of Nano iron methionine improve feed intake in Maamaura local strain. El-Said and El-Gogary (2019) showed that *in ovo* injection with 0.1 ml 0.1 ml of 75 ppb of iron nanoparticles (FeNPs), and injected with 0.1 ml of 75 ppb organic iron (Fe- meth).

Hatching parameter:

Results presented in Table (3) showed highly significant (P < 0.0001) effect on hatchability percentage, chick weight at hatch, and embryonic mortality were found due to T3 and T4 treatments applied. Egg of T3 which injection 0.1 of Nano iron methionine significantly (P<0.0001) increased hatchability and chicks weight at hatch and significantly decrease embryos mortality. This result agreement with those of Amal (2018) she reported *in ovo* injection with 0.1 ml solution into the air sac had highly significant(p<0.0001) effect on hatchability in treatments 0.1 ml of 20 ppm Fe-NPs, 0.1 ml of 20-ppm Fe-NPs- Alimet chelate, 0.1 ml of 20 ppm Fe-Aliment chelate and 0.1 ml of 20-ppm Fe-Aliment chelate.

Table 3: Effect of treatments on hatching percentage, hatching chicks weight, early mortality and late mortality .

Treatment groups	Hatching %	Hatched Chick weight(g)	Early mortality %	Late mortality %
T1	85.00 ^{b}	28.60^{d}	1.00^{ba}	3.00^{a}
T2	85.06 ^{b}	29.60^{dc}	2.00^{ba}	4.00^{a}
T3	88.67 ^{a}	37.20^{a}	0.00^{b}	1.00^{b}
T4	88.33^{a}	33.40^{b}	0.00^{b}	1.30^{b}
T5	86.00^{b}	28.90^{dc}	1.33^{ba}	3.00^{a}
T6	85.00^{b}	30.10^{c}	1.00^{ba}	3.00^{a}
SEM	0.3	0.4	0.4	0.5
Pr > F	0.0001	0.0001	0.0006	0.0001

$^{a, b}$ Means within a column with different superscripts are significantly different (P< 0.05).

In addition, chick body weight to egg weight ratio in controls, Fe-Nano organic and FeNPs- inorganic was higher (P < 0.01) than in the other groups. T3 has shown the highest (P< 0.01) relative weight compared to the other treatments. Moghaddam *et al.* (2014) reported that the positive results obtained may be related to the increased amino acids content of yolk or the possibility that amino acids administration heightened the amino acids utilization of the embryo. Instead Thaysa *et al* (2023) found that *in ovo* injection of methionine in the levels of (0.5, 1.0, 1.5, 2.0 and 2.5%) + 0.5% NaCl, All embryos submitted to *in ovo* injection with methionine presented a decrease in the hatchability results and an increase in the results of intermediary embryonic mortality. Chicks hatched from eggs injected with until to 1.0% MET were heavier than control groups.

Some blood parameters:

Results presented in Table (4) showed no significant effect of *in-ovo* injection of different iron methionine sources and dietary supplementation on some blood parameter (AST, ALT). *In-ovo* injection of different iron methionine sources T3 and T4, respectively, significantly increase total protein ,albumen, globulen and Fe in blood compared to other treatments. This results agreement with (Yair and Uni, 2011) which suggested that plasma proteins profile given birds is a reflection of the metabolic activities related to protein synthesis and /or degradation, this support the findings of many authors who observed that iron has the ability to bind protein and enhanced DNA synthesis which in turn affect plasma protein level at different growth periods.

Table 4: Effect of treatments on plasma total protein, albumin, globulin AST and ALT affected by different treatments applied.

Plasma blood parameters						
Treatment groups	AST (U/l)	ALT (U/l)	T.P. (g/dl)	ALB (g/dl)	GLU (g/dl)	(Iron) Fe (mg /dl)
T1	46.3	6.7	3.5^{b}	1.3^{b}	2.2^{b}	34.9^{f}
T2	44.7	5.3	5.0^{a}	1.8^{a}	3.2^{a}	91.9^{e}
T3	45.5	6.2	$4.7a^{b}$	1.5^{ab}	3.2^{a}	116.4^{a}
T4	45.3	5.6	4.6^{b}	1.3^{b}	3.2^{a}	110.6^{b}
T5	45.3	5.3	4.3^{b}	1.8^{a}	2.5^{b}	105.9^{c}
T6	44.7	5.7	4.4^{b}	1.4^{b}	2.9^{a}	102.8^{d}
SEM	0.6	0.5	0.1	0.1	0.2	0.33
Pr > F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

[a, b] Means within a column with different superscripts are significantly different (P< 0.05). AST= Aspartate transaminase, ALT = Alanine transaminase, TP: total protein, ALB: Albumin,. GLU: Globulin

Amal (2018) who suggest that the *in-ovo* injection of 20-ppm iron nanoparticles (Fe-NPs), 20-ppm iron nanoparticles Alimet chelate (Fe-NPs-Alimet chelate) and 20-ppm Fe-Alimet chelate as-Alimet chelate and Fe-Alimet chelate improved Serum Fe content and liver function were significantly and also, she added that, the iron injection significantly (P<0.01) enhanced different blood parameters. On other vie, Effects of *in-ovo* injection on broiler eggs on plasma iron definitions in chicks on 35 day of age.

Recently, Showed major variations between treatments which plasma iron were increased in the treatment by *in-ovo* injection iron- nano particle while it was decreased and lowest value in other treatment with no significant difference. Hira *et al* (2016) showed that birds were fed ration containing 0, 20, 40, 60 and 80 mg Fe/kg feed respectively was a positive effect on Fe level in blood . The dose of 80 mg/kg feed Fe was most effective to maximize the net profit of broiler.

The results obtained disagree with those of Ghada *et al* (2019) they reported that, plasma total protein was significantly increased in all the control groups compared to the different forms of Iron in nano particle or in the organic or inorganic forms injected groups. The previous result indicates that in ovo injection it has no harmful effect on different plasma protein parameters, this means that iron injection has a positive impact on protein synthesis.

Results presented in Table (5) showed significant (P>0.0001) decrease *in* cholystrol, triglyceride and low density lipoprotein (LDL), in addition to

Table 5: Effect of treatments on plasma lipid profile at 56 days of age**.**

Plasma blood parameter (mg/dl)					
Treatment groups	T. Cholesterol	Triglycerides	HDL	LDL	VLDL
T1	3.3^{a}	1.3^{a}	2.09^{b}	0.97^{a}	0.26
T2	3.1^{b}	1.3^{a}	2.1^{b}	0.7^{b}	0.3
T3	3.2^{bc}	1.24^{bc}	2.3^{a}	0.5^{c}	0.25
T4	3.0^{bc}	1.2^{abc}	2.2^{a}	0.6^{c}	0.24
T5	3.0^{c}	1.2^{bc}	2.3^{a}	0.4^{c}	0.24
T6	3.0^{c}	1.1^{c}	2.2^{a}	0.5^{c}	0.25
SEM	0.02	0.01	0.03	0.04	0.01
Pr > F	0.0001	0.0001	0.0001	0.0001	0.0001

$^{a, b}$ Means within a column with different superscripts are significantly different (P< 0.05).
HDL= High density lipoprotein, LDL= Lower density lipoprotein**,**

increase in high density lipoprotein (HDL) when injected with different iron methionine sources or dietary supplementation compared to control groups. These results agree with those of Amal (2018) these results suggest that the *in-ovo* injection of 20-ppm iron nanoparticles (Fe-NPs), 20-ppm iron nanoparticles Alimet chelate (Fe-NPs-Alimet chelate) and 20-ppm Fe-Alimet chelate as-Alimet chelate and Fe-Alimet chelate improved blood parameters. Azza *et al* (2019) These suggest that, 75 ppm Fe inorganic or75 ppm Fe-Nano injection at the 7th day of incubation improved embryonic growth and development as well as decreasing post hatched chick's plasma cholesterol.

Body weight, carcass weight, absolute and relative weight of giblets:

Results presented in Tables (6 & 7) showed highly significant (P< 0.0001) effect of *in-ovo* injection of different iron methionine sources on carcass weights absolute and relative weight of giblet (liver, gizzard and heart). T3and T4 injected with 0.1 ml of either Nano iron methionine or methionine Iron respectively significantly increased (P >0.0001) carcass weight, absolutely and relative weights of giblets than the other treatments. The results obtained disagree with El-Said and Gogary (2019). Who reported that, carcass parameters could be detected that inclusion of *in-ovo* injection of different iron sources and supplementations of folic acid in the broiler diet did not have significant effect on gizzard and heart. However, the experimental group's *in-ovo* injection of different iron sources achieved significantly higher LBW and the proportions of carcass and liver or immunity organs (spleen and thymus). Azza, *et al.*, (2018), they report that, the

Table 6: Effect of treatments on some carcass traits at 56 days of age.

Absolute and relative weight of carcass traits							
Treatment groups	Body	Carcass.		Liver.		Gizzard	
	(g)	(g)	(%)	(g)	(%)	(g)	(%)
T1	745^{d}	434.7^{c}	58.4^{f}	22.8^{e}	3.1^{c}	22.5^{f}	3.02^{d}
T2	735^{d}	469.0^{cd}	63.8^{bc}	22.8^{e}	3.1^{c}	22.0^{f}	2.99^{d}
T3	880^{a}	578.7^{a}	65.8^{a}	28.4^{a}	3.2^{b}	28.5^{a}	3.24^{c}
T4	805^{b}	515.0^{b}	64.0^{b}	27.4^{b}	3.4^{a}	27.5^{b}	3.4^{a}
T5	775^{c}	485.0^{cb}	62.6^{d}	26.3^{c}	3.3^{a}	26.4^{c}	3.4^{a}
T6	761^{c}	466.7^{cd}	61.3^{e}	25.4^{d}	3.3^{a}	25.4^{d}	3.3^{b}
SEM	4.4	14.0	14.0	0.12	0.03	0.14	0.03
Pr > F	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001

[a, b] Means within a column with different superscripts are significantly different (P< 0.05).

Table 7: Effect of treatments on some carcass traits at 56 days of age.

Absolute and relative weight of carcass traits						
Treatment groups	Bursa		. Spleen		Heart	
	(g)	(%)	(g)	(%)	(g)	(%)
T1	2.2^{d}	0.29^{c}	2.2^{c}	0.29^{b}	3.86^{e}	0.52^{d}
T2	2.3^{cd}	0.30^{c}	2.3^{cb}	0.31^{b}	3.80^{e}	0.51^{d}
T3	3.3^{a}	0.38^{a}	3.0^{a}	0.35^{a}	5.7^{a}	0.65^{a}
T4	2.7^{b}	0.34^{b}	2.5^{b}	0.31^{b}	4.8^{b}	0.59^{b}
T5	2.5^{c}	0.32^{bc}	2.3^{cb}	0.31^{b}	4.5^{c}	0.58^{bc}
T6	2.3^{cd}	0.31^{bc}	2.2^{c}	0.29^{b}	4.2^{d}	0.55^{c}
SEM	0.06	0.009	0.06	0.3	0.04	0.008
Pr > F	0.0001	0.0008	0.0001	0.02	0.0001	0.0001

[a, b] Means within a column with different superscripts are significantly different (P< 0.05).

effect of treatments on dressed carcass abdominal fat and relative weights of some edible organs such as gizzard, liver, heart. There were no significantly differences among all experimental groups in dressed carcass, gizzard, and heart, liver . Also,showed that significant effect of *in ovo* injection dietary methionine iron on absolute and relative weights of bursa and spleen at different ages . The birds of (T3) and (T4) groups injected with either nano iron methionine or methionin iron had significantly increase in obtained and relative weights of spleen and bursa compared to control. These results are agreement

with those obtained by Goel et al., (2013), who found that *in ovo* feeding of iron may influence the embryonic development, while iron can play an important role in post hatch growth. Akshat *et al.,* (2012) reported that the trace minerals are important nutritional components for imparting immunity and *in ovo* injected of iron during incubation into the yolk sac/amnion of the broiler embryos can be a way for improving the immune system of the birds. Ghada and Abdalla, (2019) noticed that injected with dose of each iron solution is 0.1ml/egg containing 75 ppm of different iron sources (nano organic and organic) increased of the relative weights of spleen, bursa and thymus, and stimulated some histological change in the immune related organs which may result in improvement of chick immunity. Inversely, Azza, *et al.,* (2018), reported that, no variation was observed in the weight of bursa and spleen, however thymus weight was significantly higher in both Fe inorganic and Fe nano inorganic injected groups than un-injected control group.

Conclusively, it could be recommended by using in ovo injection with iron methionine and iron methionine nano particles to improving the productive and physiological performance of chickens specially local breeds of layer chicks. Also the use of Iron nano-particles *in ovo* injection gave the best results under the prevailing conditions.

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تأثير استخدام جسيمات الحديد النانوية أو ميثيونين الحديد بالتغذية الجنينية أو المكملات الغذائية على الأداء الإنتاجي والفسيولوجي في سلالة دجاج المعمورة

مجدي حسن*؛ ياسر رزق*؛ إبراهيم السيد، شيرين عبد الرازق*(١)؛ رحاب محمد*؛ وائل عيسى* وكمال عيد***

* قسم تربية الدواجن، معهد بحوث الإنتاج الحيواني، مركز البحوث الزراعية، الدقي، الجيزة ١٢٦١١، مصر.

** قسم إنتاج الدواجن، كلية الزراعة، جامعة عين شمس، شبرا الخيمة، القاهرة، مصر

تهدف هذه التجربة دراسة تأثير التغذية المبكرة لأجنة الدجاج عن طريق حقن البيض بمعدن الحديد المرتبط بالميثايونين و جزيئات الحديد متناهية الصغر ومقارنتها بالإضافة العلفية بعد الفقس على الأداء الأنتاجى والفسيولوجى لسلالة دجاج المعمورة .حيث نقوم بتقسيم عدد ٤٥٠ بيضة من سلالة المعمورة إلى عدد ٦ معاملات وكل معاملة يتم تقسيمها إلى ٣ مكررات ويتم تصميم التجربة كالتالى :-

(T1) معاملة الكنترول السلبي.، (T2) معاملة الكنترول الايجابي يتم حقن البيض بتركيز ٠.١ مل محلول ملحى كنترول ايجابي ، (T3) تغذية جنينيه يتم حقن البيض بتركيز ٠.١ مل نانو ميثونين الحديد، (T4) تغذية جنينيه يتم حقن البيض بتركيز ٠.١ مل ميثونين حديد، (T5) تغذية بعد الفقس بإضافة ٥ ملجم/ نانو ميثونين حديد / كيلو جرام علف للكتاكيت بعد الفقس ، (T6) تغذية بعد الفقس بإضافة ٢٠ ملجم ميثونين حديد / كيلو جرام علف للكتاكيت بعد الفقس، بالترتيب.

يتم تربية الطيور حتى ٥٦ يوم تحت الظروف الملائمة للتربية وبرامج الرعاية الصحية المناسبه وتمت دراسة الاستجابات الفسيولوجية وقياسات النمو والذبيحة ومانت اهم النتائج المتحصل عليها هي:-

١.سجلت المعامله الثالثة زيادة وزنية في معدل الاوزان مقارنة بباقي مجموعات الدراسة بصورة معنوية يليها المعاملة الرابعة ثم الخامسة والسادسة على التوالي.

٢.هناك تحسن معنوي في محتوى الدم من البروتينات الكلية والألبيومين والجلوبيولين فى جميع المعاملات مقارنة بالكنترول وخاصة المعاملة الثالثة والتى تفوقت على كل المعاملات.

٣.إنخفاض الكويسترول والدهون الثلاثية والدهون الضارة فى كل المعاملات مقارنة بالكنترول.

التوصية: يمكن التوصية باستخدام حقن البيض بجزيئات الميثيونين والحديد النانوية لتحسين الأداء الإنتاجي والفسيولوجي للدجاج وخاصة السلالات المحلية من الدجاج البياض، كما أعطى استخدام جزيئات الحديد النانوية في حقن البيض أفضل النتائج في ظل الظروف السائدة.