Effect of in ovo - injection with Nano-Selenium on hatchability and post-hatch biological parameters in quail

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Effect of in ovo - injection with Nano- Selenium on hatchability and post-hatch biological parameters in quail

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ABSTRACT

The selenium considered main element for animals and humans and inter in many biological functions that play important rule in maintenance metabolism in thyroid gland and cell growth and antioxidant, also considered of most important element to immune system by activation of the body immune system. The aim of the present study is investigating effects of nano-selenium in-ovo injection on some hatchability indicators , chick quality and its biological parameters for quail egg . One thousand and fifty fertile quail eggs from flock of department of Tikrit Agriculture Research randomly divided into five treatments (210 eggs each). First was normally without injection (negative control), second was injected with demineralized water (positive control) third, fourth and fifth treatments were injection by 10, 20 and 30 µg Nano-Selenium / egg respectively. The result show significantly improvement in hatchability percentage redaction in early and middle embryonic mortality percentage in addition to this significantly amelioration in hatched Chick quality for third treatment that in- ovo injection with (10 µg Nano-Selenium / egg). While showed fifth treatment in- ovo injection with (30 µg Nano-Selenium / egg) redaction in incubation duration accompany with significant increasing in hatched body weight. It is summarized that, in-ovo injection of different levels of nano-selenium can improve hatchability and chick quality

Keywords: Nano-selenium, performance, in- ovo injection, quail.

1.INTRODUCTION

The selenium considered main element for animals and humans and inter in many biological functions that play important rule in maintenance metabolism in thyroid gland and cell growth and antioxidant, also considered of most important element to immune system by activation of the body immune system [1]. Food rich in selenium lead to support immune response in poultry [2] [3]. There are wide worried in animal industry that the recommendation of national research council [4] of selenium element may not enough to prevent presence of losses in production due to deficiency of selenium, so there are continues research on alternative source and selenium supplement [5].The nano technology known as the branch that study of materials at atomic level or molecular, and the nano-molecule have positive rule when use in nutrition as alternative to traditional metallic material. And the nano-metal use as mineral food supplement for quail chicks batter than traditional biological and non-biological also when use in low doses. Moreover, the egg injection with nanoparticles [6] [7]. Considered good way for nutrition that work on supplementation of embryo with additive amount of nutritional materials [8].

With up to date development of Nano-technology, the Nano-selenium have special important in poultry due to have special properties like large surface area and high surface activity high activation efficiency and high ability to absorption and low toxicity [9] [10]. That increase its attention and distribution fast and high biological presence [11]. In addition, Nano-selenium limited in case of oxidation and reduction zero and its production to use in food supplement and developed to introduce in medical therapy application [11]. The aiming of study to influence the injection of quail eggs with different levels of Nano selenium on hatchability indicators, chick quality and its biological parameters for quail egg.

2.MATERIALS AND METHODS:

One thousand and fifty fertile quail eggs from Tikrit agriculture research parents flock were used to investigate to effect of *In -ovo* injection by Nano selenium on some hatchability indicators , chick quality and its biological parameters. The eggs were randomly divided into five treatments (210 eggs per treatment) with three replicates (70 per each). First treatment was without injection and serves as control, second treatment was injected with demineralized water. Third, fourth and fifth treatments were injection by 10, 20 and 30 µg Nano-Selenium / egg respectively .The eggs were set in a local hatchery in Samaraa south of Salah Aldeen province.

3.Prepare Nano selenium solution:

Nano form of selenium was prepared by using ultra sound wave system (Uni- Sonic) adopting the procedure of [12] .

3.1. In ovo supplementation:

On zero day of embryonic age, the eggs were injected with prepared solution using a insulin syringe 31 -gauge hypodermic needle (25 mm long), with handling temperature about 30- 35 °C [13] . The *in ovo* injection of each treatment was completed same time for any treatment. Before injection, the site was suitably sterilized and the injection was done at the broad end of the egg. Following *in ovo* feeding, the injection site was sealed with a sterile paraffin and the eggs were transferred [14].

3.2. Parameter of the study:

Hatchability and embryonic mortality:

Hatchability% : calculated according to [15].

Embryonic mortality %: this percentage estimated as method of [16].

Chick Quality and biological parameters:
chick quality; included physical conditions, such as activity, feathering, eyes, conformation of legs, aspect of navel area, yolk absorption, these characteristics were scored according [17] .

2.3. STATISTICAL ANALYSIS

All data were analyzed for normal distribution using the normal option procedure of [18] . Data were analyzed as a completely randomized design by the GLM procedure of SAS software. Statistical differences were established using a Multiple Duncan's Range Test at the level of ($P \leq 0.05$) .

3.RESULTS

Hatchability percentage, embryonic mortality percentage at different periods and hours number of incubation duration it is clearing from the data illustrated in the table(1) that hatchability% were no significantly affected by *inovo* injection Nano– Selenium (T3,T4,T5) as compared with first treatment, despite of significantly increasing in 3rd treatment compared with positive control. About the early embryonic mortality, we noted significant improvement in third treatment when compare with negative control (T1) and (T5) that supplemented with 30 µg of Nano-selenium/egg. As well as that, there were no significantly differences between Nano-selenium treatments compared with the first treatment in middle embryonic mortality percentage. No significantly, differences were observed in later embryonic mortality among all treatments groups. Regarding total embryonic mortality percentage there were no significantly differences in-group that supplemented with Nano-selenium and first treatment except if significantly amelioration in third treatment as compared with positive control (T2). *in ovo* administration quail egg with 30 Nano-selenium lead to Earlier in incubation duration comparison with (T1,T2 and T3) .

From the result of table (2) showed no significant differences in body weight at hatch, relative weight of hatched: egg, length of hatching chicks, length of chicks from head to tail, length of leg and body mass among Nano-selenium treatments groups (T3,T4 and T5) corporation with negative control(T1). From same table we can also note moral rise ($P \leq 0.05$) in body weight at hatch in fifth treatment compared with the positive control (T2). For Length of hatching chicks

No significant differences in ovo injection were recorded compared to control group, while the exceed T4 on T2, about the Length of leg fifth treatment show significantly surprised on the first treatment. To show the effect of *in ovo* injection of with different levels of Nano- selenium in quail eggs on chick quality degree we depended in the following criteria were selected for inclusion in the estimation of chick quality; these included physical conditions, such as activity, feathering, eyes, conformation of legs, aspect of navel area, yolk absorption. From table (3) we find significant increasing in hatched chick activity in third treatment compared with negative control , While no significantly differences in others treatments. No significant differences were observed *in ovo* injection groups with positive and negative control in in the following attributes: Downs and appearance, Leg statues, Retracted yolk and Remaining membrane. For eye, statues and naval statues oobserved significant rising in (T2, T3, T4 and T5) Compared with the first treatment. Remaining membrane recorded significant reduction in fourth treatment (injection of 20 µg of Nano-selenium/egg) corporation with third and fifth treatment (injection of 10 and 30 µg of Nano-selenium/egg respectively), although not different with the first and second treatment. All supplemented of Nano- selenium treatment lead to significantly improvement in Chick quality degree compared with first treatment (negative control (without injection), However, no significant differences were recorded compared to second treatment positive control (injection of demineralized water /egg) .

Table 1. Effect of *in ovo* injection of with different levels of Nano- selenium on some hatchability indicators of quail eggs.

Treatments	Hatchability %	Early embryonic mortality %	Middle embryonic mortality %	later embryonic mortality %	total embryonic mortality %	incubation duration (hours)
T1	68.94 3.03 ± AB	11.47 2.37 ± A	4.13 1.44 ± B	15.44 0.29 ± A	31.04 3.03 ± AB	389 1.00 ± AB
T2	62.27 1.75 ± B	7.66 1.46 ± AB	13.37 2.00 ± A	16.68 3.36 ± A	37.71 1.75 ± A	391 0.00 ± A
T3	73.39 2.18 ± A	2.86 1.43 ± B	5.80 1.75 ± B	17.93 2.50 ± A	26.59 2.18 ± B	389 1.00 ± AB
T4	68.30 3.59 ± AB	6.48 0.95 ± AB	6.41 0.65 ± B	18.80 3.10 ± A	31.69 3.59 ± AB	384 1.00 ± BC
T5	68.82 3.07 ± AB	8.07 0.83 ± A	3.47 1.83 ± B	19.63 0.63 ± A	31.17 3.07 ± AB	380 4.00 ± C

[a,b] Means in the same column with different superscripts differ significantly level ($P \leq 0.05$)

T1 treatment one: negative control (without injection). T2 treatment two: positive control (injection of demineralized water /egg). T3 treatment three: injection concentration 10 µg of Nano-selenium/egg. T4 treatment four: injection of 20 µg of Nano-selenium/egg. T5 treatment five: injection of 30 µg of Nano-selenium/egg.

Table 2. Effect of in ovo injection of with different levels of Nano- selenium on some body hatch characteristics of quail eggs.

Treatments	body weight at hatch (g)	relative weight of hatched /egg	Length of hatching chicks (cm)	Length of Chicks from head to tail (cm)	Length of leg (cm)	Body mass
T1	7.96 0.08 ± Ab	71.03 0.85 ± A	9.56 0.09 ± Ab	6.28 0.09 ± A	2.70 0.04 ± B	0.090 0.00 ± A

T2	7.78 0.10 ± B	68.78 0.72 ± A	9.34 0.10 ± B	6.28 0.11 ± A	2.76 0.07 ± Ab	0.090 0.00 ± A
T3	8.14 0.16 ± Ab	71.78 2.40 ± A	9.50 0.10 ± Ab	6.39 0.21 ± A	2.87 0.02 ± Ab	0.086 0.00 ± A
T4	8.03 0.05 ± Ab	70.66 0.99 ± A	9.79 0.17 ± A	6.56 0.13 ± A	2.86 0.05 ± Ab	0.083 0.00 ± A
T5	8.25 0.15 ± A	70.72 1.59 ± A	9.66 0.08 ± Ab	6.33 0.07± A	2.88 0.05 ± A	0.090 0.00 ± A

[a,b] Means in the same column with different superscripts differ significantly level ($P \leq 0.05$)

T1 treatment one: negative control (without injection). T2 treatment two: positive control (injection of demineralized water /egg). T3 treatment three: injection concentration 10 µg of Nano-selenium/egg. T4 treatment four: injection of 20 µg of Nano-selenium/egg. T5 treatment five: injection of 30 µg of Nano-selenium/egg.

4.DISCUSSION

Although hatching eggs are equipped with all the biological elements necessary for embryo growth and development, However, these elements cannot be taken advantage of without going through many metabolic processes, this processes result many reactive oxygen species(ROS) [19]. It is often, considered the primary source of free radical production, As well as fatty acids in egg one of the types of long-chain polyunsaturated fatty acids [20] , In light of these data, the embryo needs a substance increases the activity of the anti-oxidant action as well as, glutathione peroxidase (GSH-Px), super-oxide dismutase (SOD), and catalase (CAT). Selenium is an essential trace element that up regulates a major component of the antioxidant defense mechanism by controlling the body's glutathione pool and its major selenium containing antioxidant enzyme. Approximately 30–40% of selenium exist in the form of GSH-Px in animal body tissue, and lots of animal diseases and dysfunction were caused by GSH-Px activity change that aroused by selenium deficiency [21]. [22] stated that increasing level of Se in the diets led to improvement the activity of the main enzyme in antioxidant system, glutathione peroxidase, in which reflected on decreasing the oxidative stress. These results are in agreement with those reported by [23] who recorded poorer hatchability of eggs when hens fed on 0.1 Se mg/kg diet than using organic Se at level of o.3 mg/kg. This may be the reason for the improvement in the incidence of hatching and the hatching chicks quality. The improvement in hatched body weight may be to selenium was act as a co-factor and activator of 5′ deiodinase enzyme that was a key of tri-iodothryonine (T3) synthesis, and T3 was the growth control component of poultry by controlling the body's energy and protein assimilation, and thus could regulate embryo growth [24].

Table 3. Effect of in ovo injection of with different levels of Nano- selenium on some chick quality parameter of quail eggs.

Treatments	**Chick quality parameter**								
	Activity statues	**Fuzz and body shape**	**Eye statues**	**Leg statues**	**Naval statues**	**Shrinkage yolk**	**Residual membranes**	**Residual yolk**	**Chick quality (100) degree**
T1	4.80 0.00 ± B	9.60 0.23 ± A	13.33 0.53 ± B	14.40 0.92 ± A	8.80 0.40 ± B	8.80 0.80 ± A	10.13 0.26 ± A	13.60 0.46 ± BC	83.46 3.06 ± C
T2	5.60 0.40 ± AB	9.33 0.13 ± A	15.46 0.53 ± A	14.93 0.53 ± A	11.20 0.40 ± A	10.40 0.80 ± A	10.93 0.53 ± A	14.40 0.00 ± ABC	92.25 0.35 ± AB

T3	6.00 0.00 ± A	9.73 0.13 ± A	16.00 0.00 ± A	15.46 0.53 ± A	11.20 0.40 ± A	11.20 0.80 ± A	11.46 0.53 ± A	15.46 0.26 ± A	96.51 1.04 ± A
T4	5.20 0.40 ± AB	9.33 0.13 ± A	14.93 0.53 ± A	14.93 0.53 ± A	10.80 0.00 ± A	10.40 1.60 ± A	10.66 0.26 ± A	13.06 0.70 ± C	89.31 1.53 ± B
T5	5.20 0.40 ± AB	9.33 0.13 ± A	14.93 0.53 ± A	14.93 1.06 ± A	11.20 0.40 ± A	9.60 0.00 ± A	10.66 0.70 ± A	14.66 0.53 ± AB	90.51 1.48 ± B

[a,b] Means in the same column with different superscripts differ significantly level ($P \leq 0.05$)

T1 treatment one: negative control (without injection). T2 treatment two: positive control (injection of demineralized water /egg). T3 treatment three: injection concentration 10 µg of Nano-selenium/egg. T4 treatment four: injection of 20 µg of Nano-selenium/egg. T5 treatment five: injection of 30 µg of Nano-selenium/egg.

5. CONCLUSION

We concluded from this study *in ovo* feeding has established a new science of neonatal nutrition, and used Nano-selenium in-ovo injection at different levels can improvement hatchability, chick quality and number of incubation duration.

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