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EVALUATION OF USING NANO AND INORGANIC FORMS OF SELENIUM IN FEED OF PARENTS AND GROWING CHICKS OF SILVER MONTAZAH REARED DURING WINTER SEASON

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ABSTRACT: The present study amid to evaluate the effect of feeding Silver Montazah parents reared in open system house during winter season on different selenium sources and levels on the fertility of cocks, performance and mortality % of hatched chicks. The examined two selenium sources were nano selenium (Nano-Se) and sodium selenite (SS), and the three supplemental levels of each source were 0.10, 0.25 and 0.40 ppm. 180 females and 90 males of Silver Montazah chickens divided into 6 treatments of three replicates of each. Males and females located in separate battery cages in open system house. Semen characterization was carried out, then hens were artificially inseminated by semen from cocks with the same dietary treatment. A total number of 90 eggs/treatment were incubated and fertility and hatchability were calculated. Hatched chicks fed on control diet containing 0.10 mg SS /kg diet up to 2 wks of age then chicks of each treatment received the same Se treatments of their parents. Growth performance of chicks was recorded up to 8 wks of age. The obtained Results showed that: - Using Nano Se improved semen ejaculate volume, sperm motility, growth performance of hatched chicks during first 2 wks of age and their dressing % and PCV% at 8 wks of age, also it improve significant the activities of antioxidant system and liver functions. , using levels 0.25 mg Se/kg enhance the overall semen quality, fertility and hatchability chick performance and their physiological statues.

- The overall results of all experiment treatments showed superior effect of using Nano-Se at level 0.25 mg Se /kg diet to enhance the overall reproductive performance of cocks and growth and physiological status of their hatched chicks up to 8 wks. In addition, the examination of blood cells and plasma biochemical measurements showed positive effect on antioxidant system and overall immune status. Based on the obtained results we could recommend using 0.25 mg Nano Se/kg diet to enhance the reproductive performance of Silver Montazah cocks and decrease mortality rate of growing chicks during winter season.

Keyword: Nano selenium-Inorganic selenium-Parents-Growing chicks- winter season.

INTRODUCTION

Many scientists proved the necessary of including selenium (S) in the nutritional program of both humans and animals to ensure that the processes of biological functions running efficiently (Surai, 2006). Selenium deeply involves in many biological functions like growth, general health status, immunity, antioxidant status, production and reproductive performance (Saad et.al., 2009; and Pappas and Zoidis, 2012).These effects of S made it very necessary to be included in poultry feed. The role of supplemental S in enhancing fertility of laying hens, embryonic development and hatched chicks % were proved in many reports (Edens, 2002; Davtyan et al., 2006 and Petrosyan et al., 2006). On the other side the strong effect of balanced nutrition, including vitamins and minerals, on the fertility of cocks is commonly known (Gallo et al., 2003). Furthermore, S plays important roles for spermatogenesis, and maintaining adequate viability of spermatozoa and decreasing the abnormalities of spermatozoa throw its direct effect on increasing antioxidant status especially activity of glutathione peroxidase (GPx) enzyme (Edens, 2002; Ebeid, 2009). Increasing activity of GPx enzyme suggested for protection testicular spermatozoa from the harmful effect of free radicals (Klotz et al., 2003). Some researchers (Edens, 2002; Hassan et al., 2003 and Hanafy et al., 2009) evaluated the organic form of Se and proved its biological efficacy compared with the inorganic form (sodium selenite) in different path ways in the physiological functions in chicken, and reported increased sperm motility % and decreased the abnormalities of spermatozoa. Recently, there are some minerals and vitamins produced by nanotechnology technique (Hu, et.al, 2012 and Rezvanfar et.al, 2013). Those products have especial properties leading to better efficacy like smaller particle size, increased surface area, and high catalytic efficiency, which effect on absorption and efficacy in the body (Xia, M.S., 2012). The nano selenium showed good efficacy in improving chicken overall performance when compared with other sources of S (Zhang et al., 2005, 2008; and Radwan et al., 2015). In this trend, Zhou and Wang (2011) evaluate a dose of 0.3mg Nano selenium/kg and reported better performance and general antioxidant status. The same effect of Nano selenium was reported when applied in broiler or turkey diets (Yaroshenko et al. 2004, and Selim et al., 2015 a and b).

In Egypt, rearing local and developed Egyptian chicken strains in different governorates based on using open system houses. Based on the general observations in Delta governorates, significant % of production produced in open houses without heaters. This situation cause increasing the stress on flocks during cold season which reflect on decreasing their productive and reproduction performance and may increase the overall mortality % during the production cycle.

The objective of this study was to evaluate the effect of feeding Silver Montazah parents reared in open system house during winter season on different Se sources and levels on the fertility of cocks and the performance and mortality % of hatched chicks up to 8 wks of age.

MATERIALS AND METHODS

The experimental procedures of this study was carried out at Inshas Poultry Research Station (Sharkya governorate), Animal Production Research Institute, Agricultural Research Center, Egypt, during winter season A total number of two hundred and seventy 32 weeks old Silver Montazah Laying hens and cocks (180 female +90 Males) were randomly divided into six treatments of 30 females and 15 males in each treatment and then subdivided into three replicates (10 females and 5 males in each replicate). Birds were fed a basal diet containing vitamins and minerals mixture supplemented with either 0.10, 0.25 or 0.40 ppm Se from sodium selenite (T1, T2 and T3) or Nano-Se (T4, T5 and T6) sources, respectively. All birds were housed in open poultry house without heaters using individual battery cages and receiving similar managerial procedures and environmental conditions with a photoperiod length of 17 h daily

The minimum and maximum surround temperatures and relative humidity % were recorded daily during the experiment. . The recorded minimum temperature inside cocks' house during the experimental period was 20.5, and 19.4℃ in November and December, respectively while the maximum value ranged from 27.9 ℃ and 24.3 ℃ during November and December, respectively the relative humidity % ranged from 42.4 % to 70.4%. Feed and water were provided ad libitum throughout the experimental period (32-45 weeks of age). The basal diet was formulated to cover the nutrients requirements (Table 1) recommended by Agriculture Ministry Decree (1996). Nano Se form was prepared according to Zhang et al. (2004) with modification and characterization described by Radwan et al. (2015).

The productive performance of layers and the oxidative stability of table eggs were described at the first part of this study Radwan et al., (2015). Individually live body weight and feed intake of cocks was recorded at 32 and 45 weeks of age. While, weight gain (g), and feed conversion (g feed/g gain) was calculated at the end of experimental period.

Semen characteristics:

At 45 wks of age, semen samples collected using massage technique according to Lake and Stewart (1978), and the ejaculated volume were measured by graded tube then samples of each treatment were mixed before applying artificial insemination. Both motility % and dead sperm % were determined according to Hackett and Macpherson (1965), while the percentage of abnormal morphological characterizations sperms was determined as described by Blom (1983). Sperm cell concentration ($x10^9$/ml) was determined according to Lake and Stewart (1978). Acrosomal damage (%) was determined according to Watson (1975). Total sperm output ($x10^9$/ejaculate) was calculated by multiplying both the ejaculated volume sperm cell concentration.

Fertility and hatchability:

After semen collection at 45 weeks or age, the semen which collected from 15 cocks of each treatment were pooled and mixed before using in artificial insemination. Laying hens were artificially inseminated once every three days with 0.05 ml undiluted semen from 15 cocks that received the same dietary treatment. Fertile eggs were collected daily from each experimental female groups and stored for one week in refrigerator before incubation. Eggs were maintained at room temperature for 12 hours before incubation. The relative humidity and temperature in the incubator was 55% and 37.5 ℃ during the period from 1-17 day. On the 18th day of incubation, the eggs were moved separately into hatching nests and then placed in the hatchery for the remainder of the incubation period at 65%

relative humidity and 37.2 °C. At the 14 days of incubation period, infertile eggs was recorded.

Fertility rate was calculated as a number of fertile eggs relative to the total number of incubated eggs, while the hatchability % of eggs from each experimental group was also calculated by the number of chicks hatch from fertile eggs relative to the total number of fertile eggs.

Upon hatch, 45 chicks from each treatment were individually weighed and randomly divided into three equal replicates (15 chicks each) in wire batteries under similar management and hygienic conditions. Artificial lighting was maintained continuously during night without interruption. The average initial live body weights (BW) of chicks in all replicates were nearly similar (32.5 – 33.5g). Chicks of each treatment were fed on control diet (0.10 Se from sodium selenite, SS) up to 2 weeks of age to study the effect of treatments of cocks and laying hens on chicks performance and mortality rate. Chicks of each treatment were fed on the same dietary treatment of their parents during the period from 3 to 8 weeks of age. Feed and water were provided ad libitum throughout the experimental period. The experimental diets were supplied to meet the requirements according to the Ministry of Agriculture Decree, 1996 (Table 1). Chicks were individually weighed and feed consumption was recorded from and 3 – 8 weeks intervals. Mortality was recorded daily during the experimental period.

At the end of experiment period at (8 weeks of age), three chicks from each treatment group, were chosen (one / replicate) to slaughter test. After slaughter and complete bleeding, feathers were removed. The chicks were weighed after removing heads, legs and viscera to determine the percentage of carcass weight included wings and necks (dressing %). The liver, spleen, heart and gizzard were weighed and their percentages to live body weights were calculated.

During slaughter, 2 blood samples were collected from the same birds. The first complete blood sample was used to determine blood hematological parameters such as packed cell volume (PCV), hemoglobin (Hb) and red blood cell (RBCs) and white blood cell (WBCs), Heterophils, and Lymphocytes. While the second one was centrifuged at 3000 rpm for 10 minutes to separate the plasma. The collected plasma was kept at -20°C until the time of biochemical analyses of Creatinine, Aspartate transaminase activity (AST), Alkaline Phosphatase activity (ALk), Total antioxidant capacity (TAOC), and Alanine transaminase activity (ALT). by using analytical kits produced by Bio Diagnostic Company.

Data of experimental treatments was subjected to two-way analysis of variance (SAS, 1999) to detect the main effects of both Se source and Se level, while data of all experimental treatments were subjected to one-way analysis of variance to detect the most efficient treatment. Variables showed significant differences were subjected to Duncan's Multiple Range test (Duncan, 1955).

RESULTS AND DISCUSSION

Semen characteristics:

The presented results in Table (2) shows the effects of main factors (selenium sources and levels) and experimental treatments on semen characteristics of cocks at 45 week of age. The recorded values clearly shows improvement of both volume of ejaculated semen and sperm motility while, dead spermatozoa, sperm abnormalities and acrosomal damage were significantly decreased when cockerels fed diet contained Nano Se as compared with those fed SS. However, neither sperm cell concentration nor total ejaculated sperms was affected significantly due to selenium source (numerical improvements recorded). This may be due to more effective antioxidant effect and higher bioavailability of Nano Se than SS. Klotz et al., (2003) showed that selenium, as a component of glutathione peroxidase enzyme, can decrease the oxidative stress which may be protect testicular spermatozoa from toxic effect of free radicals. The same trend of results were reported by (Edens, 2002; Hanafy et al., 2009; and Hassan et al.., 2009) when organic Se used in feeding of cocks. On the other side, Karthika et al (2014) could not detect significant difference in semen ejaculated volume, sperm motility % and dead spermatozoa % of White Leghorn cocks when used 0.5mg of inorganic Se /kg diet. Regarding to main effect of selenium level, semen ejaculated volume, sperm motility, dead sperms % and sperm abnormalities % were significantly affected by different **s**elenium levels. The dietary level of 0.25 mg S resulted the best sperm characteristics compared to other tow examined levels 0.1 and 0.40 mg S/kg diet. While acrosomal damage, sperm concentration and total ejaculated sperm were insignificantly affected by different **s**elenium levels. Among experimental treatments, it the results showed that using Nano-S at level of 0.25 mg /kg diet resulted the best overall sperm characteristics compared with the other treatments. That improvement may be due to the role of selenium in cocks reproduction and spermatogenesis throw enhancing antioxidant defenses which required for production of normal and active sperms. The recorded results are in agreement with those reported previously by Renema (2006) and Hassan et al (2009) when applied organic Se in feed of both male broiler breeder and Matrouh developed Egyptian strain. Also Sowiñska et al. (2011) recorded the same trend when examined Se at level of 0.3 mg/kg turkey diet and reported improving sperm motility.

Fertility and hatchability:

Results in Table (3) showed that values of hatchability/ fertile eggs % were not significantly changed by using different selenium sources. While values of fertility and hatchability % from the total number of incubated eggs were significantly increased by using Nano-Se compared to using SS in the diet.

These results showed that the main affected parameter is % of fertile due to using different sources of Se (81.48% vs 78.27% for Nano vs SS). The obtained results are compatible with the increased number of viable sperms concentration produced from cocks of Nano-Se group which recorded decreased mortality of sperms during incubation and maintaining sperm quality long time when stored in sperm storage tubules after artificially inseminated. The obtained values of fertility and hatchability showed lower effect of supplemental SS than Nano-Se to improve those parameters. This finding are in agreement with the reported results by many researchers who found poorer efficacy of supplemental SS- to enhance fertility and hatchability when compared with other organic Se sources (Renema and Sefton 2004; Surai, 2006; Hassan et. al., 2009 and Maysa et al., 2009). On the other side Karthika, et al (2014) failed to report any improvement of fertility % in

White Leghorn strain due to using supplemental Se sources.

Among supplemental Se levels, the recorded results showed significant improvement of fertility %, hatchability % from total eggs and hatchability % from fertile eggs by using Se at level 0.25 mg/kg diet compared to levels of 0.1 and 0.40 mg Se/kg diet. That result in match with those reported by many previous reports which showed increased overall physiological status by increasing the supplemental Se over 0.10 mg/kg diet in poultry rations (Leeson et al., 2008; Hassan et al., 2009; Zhou and Wang, 2011; and Selim et al., 2013 a, b). These proved the previous reported role of Se supplemental in decreasing oxidation damage to cell membrane and DNA by free radicals which cocequently led to increase the sperm quality and activity and that reflection the fertility egg % (Sowinska et al., 2011; and Renema, 2006;). Surai, (2002) and Gallo et al., (2003) stated that increasing level of Se in the diets led to enhancing the activity of the main enzyme in antioxidant system, glutathione peroxidase, , in which reflected on decreasing the oxidative stress and improving male fertility.

Regarding to the recorded results of interactions between supplemental Se sources and levels in the current study, the fertility it is clear that the highest percentages of the fertility and hatchability of all eggs were recorded group that fed on diet containing of 0.25mg Nano Se/kg diet than the other treatments. These results are in agreement with those reported by Leeson et al. (2008) 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 Surai, (2006) stated that inclusion organic Se at levels of 0.25 and 0.40 ppm resulted in significant improvement of hatchability %.

Growth performance of cocks:

The presented results in Table 4 showed growth changes of cocks during the experimental period. The final body weight was significantly increased in cockerels fed diet contained Nano-selenium as compared with those fed diet contained SS during experimental period. Regarding of main effect of Se level, using 0.25 ppm of Se increased the final body weight of Silver Montazah cocks compared to both levels of 0.25 and 0.40 mg Se/kg diet. Cock fed on diet with 0.25mg of Nano- Se/ kg diet recorded heavier ($P \leq 0.01$) final body than other any levels of selenium. While feed intake did not change due to supplemental Se source, level, or their interaction. Our reported results are in agreement with those reported by Hanafy et al., (2009); Maysa et al., (2009); and Zhao et al., (2013) who recorded increased body weight of cocks fed on diet supplement with different sources and levels of Se. While Hassan et al., (2009) and Salwa et al., (2004) examined the supplemental Se levels 0.10 or 0.20 mg Se/kg diet and could not detect any significant differences in feed intake In addition, the superior effect of Nano Se may be due to its effect on enhancing the effect of thyroid gland and increasing the effect of metabolisable energy of feed as described by (Zhang et al., 2001).

Growth performance of hatched chicks:

The obtained result of using different selenium sources, levels and their interaction and their effects on body weight ((BW), weight gain (BWG), mortality %, feed intake (FI), and feed conversion ratio (FCR) are presented in Tables (5 and 6). The presented results showed that BW at (2 and 8weeks) of age, BWG and FCR from 0-2 and 0-8 weeks of age were significantly improved by using Nano-Se. The improvement of BWG, FCR in overall period (0-8 wk.) by using Nano-Se due to the significant improvement during the first 2 wks. of age while the rest of the growth trail period (3-8wks of age) did not show any significant effect due to using different forms of Se. Supplementation of Nano-Se in chicks diets showed better effect on BW of chicks than SS during the experimental period. While, FI and mortality rate insignificantly affected by adding different Se sources at all of experimental stages.

Regarding to effect of selenium levels on parameters of growth performance and mortality rate. The results shows that BW of chicks at (2 and 8 weeks of age), BWG, FCR and mortality rate from (0-2, 2-8 and 0-8 weeks of age) were significantly ($P \leq 0.05$) improved by of both selenium supplementation levels of 0.25 and 0.40 ppm to the diet. While feed intake did not affected by Se levels. The interaction between Se sources and Se levels had significant effect as the main trend of Se sources. The best BW, BWG, FCR and mortality rate during the experimental periods (0-2 and 0-8 wks. of age) were recorded by chicks fed on diet containing Nano-Se at level of 0.25 mg/ kg.

These results of the interaction between Se sources and levels showed no difference in mortality % due to Se supplementation, which is in agreement with the results of Edens et al. (2001). In addition, the recorded results of the current study agreed with those of Choct et al. (2004) who, found that inclusion organic Se for broilers enhance the overall performance including improvement of broiler growth, growth rate, feed efficiency and FCR. The reported improvement attributed to Se supplementation may be due to the important auxiliary effect of Se on enzyme of 5-deiodinase which involve in conversion the pro-hormone thyroxine (T4) to the active form triiodothyronine (T3) and controlling the metabolism of all nutrients (Arthur et al., 1999).

Our results agreed with those recorded by Mohapatra, et al. (2014) who showed significant differences of layers chicks fed on 0.3 mg nano selenium/kg diet compared to sodium selenite chicks. On the same trend, Zhou and Wang (2011) reported the same recommendation (0.3 mg nano selenium/kg diet) when they examined graded levels of nano selenium (0.0 up to 0.5mg/kg diet) in feed on Chinese chicken. In addition, Upton et al. (2008) recommended 0.2 organic Se /kg of broiler diet to get the best growth performance parameters broilers at 40 days of age.

Carcass Traits:

Results presented in (Table 7) summarized the effect of Se sources, Se levels and their interactions on some carcass characteristics of Silver Montazah growing chicks at 8 wks. of age. The presented results proved that using Nano-S in feed of both parents and chick diets resulted significant increase of dressing and heart % compared to using SS while % of liver, gizzard and spleen did not affected. On the other track, among the examined selenium supplementation levels spleen % did not affected. Inclusion 0.25 mg selenium / kg diet led to record the best % of dressing Se sources and levels, chicks fed on diets contained 0.25 mg Nano-Se/kg diet and produced by parents received the same treatment, showed the best values of carcass characteristics. These results confirmed those reported by Selim et al. (2015) who showed significant increase in liver and dressing % by chicks fed on Nano Se compared with SS and organic Send reported significant increase in dressing% by chicks fed Se supplementation from 0.15 to 0.30 ppm. While Hegazy and Adachi (2000) and Hussain et al., (2004) detected superior effect of organic Se on increasing weight of spleen compared with SS. On the other side, Ševčikova et al. (2006) and Generally Yang et al. (2012) who failed to detect significant effect of different Se sources on carcass treats of broiler chicks

Hematological parameters:

Results of some hematological parameters (Table 8) showed no significant effect of Se source, levels, or their interaction on RBCs, Hb and WBCs while PCV%, heterophil% and lymphocytes% were improved due to using Nano-Se or applying level of 0.25 mgs/kg diet. Bside that, Silver Montazah chicks received diet containing 0.25mg Nano Se/kg diet recorded the highest significant value of PCV%, heterophils% and lymphocytes%, and highest numerical values RBCs, Hb% and WBCs compared with other treatments. These results agreed with those reported by Fu-xiang et al. (2008) who found that lymphocytes significantly increased when Nano-Se supplemented compared with control. Selim et al (2015) detected adverse effect of inclusion Nano-Se in broiler diets on values of RBCs and Hb of broiler chicks at 40 days of age compared with other organic and inorganic Se sources. They reported significant increase of lymphocytes % and significant decrease of heterophils % by using organic or Nano forms of Se compared with inorganic form. While the examined hematological traits did not changed due to increasing Se up to 0.30 ppm Previous reports of El-Sebai (2000); Abaza (2002); and Ihsan and Qader (2012) showed increased levels of RBC's, PCV % and Hb concentration by increase Se in broiler diets. In the same side, El-Sheikh et al. (2010) reported the same trend in Bandarah strain. It was also observed that both cellular and humoral immunity were significantly increased in chicks fed on diet containing 0.3 ppm Nano Se after 8 weeks of post feeding (Mohapatra, et al., 2014).

Biochemical parameters:

The recorded results of effect of selenium sources, levels and their interactions of some biochemical measurements in plasma of Silver Montazah chicks at 8 wks of age are presented in Table 9. Using Nano-Se increased levels of TAOC, ALK.ph activity and ALT activity, while AST activity and creatinine concentration did not affect compared to using SS. Among supplemental Se levels recorded by using level of 0.25 mg Se/kg diet compared to levels of 0.10 and 0.40 mg Se/kg diets. Chicks fed diet with 0.25 mg S/kg diet showed the highest overall performance of antioxidant system (TAOC) and highest activity of ALK.ph, and ALT companied with the lowest numerical creatinine concentration. These results agree with (Fu-xiang et al., 2008) who recorded increase total antioxidant capacity (TAOC) in 28d old chicks by increasing Nano-Se level between 0.3 to 1.2 mg/kg compared with the control. In addition, Yang et al (2012) and Chen et al. (2014) showed the same trend by using organic Se. Mohapatra, et al. (2014) reported that significant increase of SGOT and decreased of ALK than the control group. While, Selim et al., (2015) reported the same overall conclusion when examined Se levels between 0.15 and 0.30 ppm of Nano-Se and organic Se. The authors detected significant increase of

TAOC and Creatinine by used organic or Nano forms of Se compared with inorganic form. While Creatinine and Aspartate transaminase (AST) did not affected by selenium levels.The overall obtained results showed clear positive effect of using Nano-Se at level 0.25mg/kg diet of Silver Montazah hens cock during winter season and their hatched chicks up to 8 wks of age. Also the reproductive performance of Silver Montazah cocks reared in open system house during winter could be enhanced by replacing the inorganic form of selenium (SS) at the level of 0.10 mg Se/kg diet by Nano-Se form at level of 0.25 mg/ kg

The nutritional treatment of parents feed with Nano-Se 0.25 gm./ kg diet not only increase their productive performance (the first part of our study, Radwan et al., 2015), but also enhanced the semen quality of cocks, fertility%, hatchability% and the growth performance of hatched chicks during the first 2 wks of age. In addition applying 0.25 mg Nano- Se/kg chicks diet during winter season improved the overall hematological and plasma biochemical parameters at 8 wks of age which increasing the immune status and decreasing the mortality% during this very sensitive period.

According to the overall results, we recommended using Nano-Se at level of 0.25mg / kg diet of parents and chicks of Silver Montazah strain during winter season. Also further studies are needed to investigate the cumulative effect of Nano-Se applying in poultry feed of parents reared in close system house

Table (1): composition and calculated analysis of the basal diet

Ingredients	Layer diet	tarter diet 0- 8 wk
Yellow corn	63.15	62.70
Soybean meal (44%)	23.29	20.80
Corn gluten meal (60% CP)	3.02	8.20
Wheat bran	2.50	3.80
mono calcium phosphate	1.39	2.10
Limestone	8.40	1.68
Common salt (Na Cl)	0.30	0.39
Vitamins and minerals mixture*	0.30	0.30
DL-Methionine	0..05	0.03
Total	100.00	100.00
Calculated analysis		
Crude protein (%)	17.00	20.00
Metabolizable energy (Kcal ME/kg diet)	2748	2918.73
Crude fiber %	3.09	2.5
Calcium %	3.41	1.00
Av. Phosphorus %	0.42	0.45
Lysine %	0.868	1.00
Methionine %	0.377	0.38

Each 3 kg of Vitamins and Minerals mixture * contains: Vit. A 10000,000 IU; Vit. D3 2000,000 IU; Vit. E 10,000 mg; Vit. K3 1000 mg; Vit. B1 1000mg; Vit.B2 5000 mg; Vit. B6 1500 mg; Vit. B12 10.mg; Pantothenic acid 10,000 mg; Niacin 30,000 mg; Folic acid 1000 mg; Biotin 50 mg; Choline 250,000 mg; Iron 30,000 mg; Iodine 300 mg; Cobalt 100 mg; $CaCO_3$ to 3,000gm

Table (2): Effect of different sources and levels of dietary selenium and their interactions on semen quality of Silver Montazah cocks at 45 weeks of age.

Items		Semen Ejaculate Volume(mml)	Sperm motility%	Dead Sperm%	Sperm abnormalities%	Acrosomal damage	Sperm cell concent. ($X10^9$ \ ml)	Total ejaculated Sperm- (X109\ej)
Effect of selenium sources								
SS		0.58±0.03 ᵇ	79.17±1.35 ᵇ	20.58±0.71 ᵃ	12.50±0.61ᵃ	11.17±0.47ᵃ	2.88±0.10	1.27±0.09
Nano-Se		0.68±0.02 ᵃ	84.08±1.31 ᵃ	18.00±0.51 ᵇ	9.83±0.37ᵇ	9.42±0.42ᵇ	3.15±0.09	1.37±0.08
significant		**	**	**	**	**	NS	NS
Effect of selenium levels (ppm)								
0.10		0.58±0.03 ᵇ	78.63±1.69 ᵇ	21.25±0.84 ᵃ	12.75±0.84 ᵃ	11.38±0.60	2.90±0.14	1.24±0.12
0.25		0.68±0.04 ᵃ	85.00±1.34 ᵃ	17.88±0.61 ᵇ	9.88±0.48 ᵇ	9.50±0.57	3.13±0.11	1.39±0.10
0.40		0.65±0.03ᵃᵇ	81.25±1.83ᵃᵇ	18.75±0.75 ᵇ	10.88±0.64 ᵇ	10.00±0.57	3.01±0.13	1.36±0.09
Significant		*	*	**	**	NS	NS	NS
Interaction between selenium sources and levels								
sources	**levels**							
SS	0.10	0.53±0.05ᵇ	76.25±2.39ᶜ	23.00±0.91ᵃ	14.75±0.63ᵃ	12.50±0.65ᵃ	2.73±0.20	1.19±0.14
	0.25	0.63±0.05ᵃᵇ	82.50±1.44ᵃᵇᶜ	18.75±0.63ᵇᶜ	10.50±0.65ᵇᶜ	10.50±0.65ᵇᶜ	3.03±0.11	1.37±0.19
	0.40	0.60±0.04ᵃᵇ	78.75±2.39ᵇᶜ	20.00±1.08ᵇ	12.25±0.48ᵇ	10.75±0.85ᵃᵇ	2.88±0.21	1.27±0.16
Nano-Se	0.10	0.63±0.03ᵃᵇ	81.00±1.96ᵃᵇᶜ	19.50±0.65ᵇᶜ	10.75±0.48ᵇᶜ	10.25±0.63ᵃᵇ	3.08±0.17	1.29±0.20
	0.25	0.73±0.05ᵃ	87.50±1.44ᵃ	17.00±0.91ᶜ	9.25±0.63ᶜ	8.75±0.85ᵇ	3.23±0.19	1.41±0.11
	0.40	0.70±0.04ᵃ	83.75±2.39ᵃᵇ	17.50±0.65ᵇᶜ	9.50±0.65ᶜ	9.25±0.63ᵇ	3.15±0.14	1.42±0.10
Significant		*	*	**	**	*	NS	NS

Means having different letters at the same column differ significantly (P≤0.05) * = P<0.05; ** = P<0.01;
NS= Not significant SS = Sodium Selenite Nano-Se = Nano-Selenium

Table (3): Effect of different sources and levels of dietary selenium and their interactions on fertility and hatchability percentages of Silver Montazah at the end of experiment period.

Items		Fertile eggs (%)	Hatchability/total eggs (%)	Hatchability/fertile eggs (%)
Effect of selenium sources				
SS		78.27±1.42^{b}	71.11±1.92 ^{b}	90.75±1.03
Nano-Se		81.48±1.61^{a}	74.81±1.92 ^{a}	91.76±0.96
significant		*	*	NS
Effect of selenium levels (ppm)				
0.10		75.19±1.06^{c}	66.67±1.28^{c}	88.67±1.16 ^{b}
0.25		84.07±1.66^{a}	78.52±1.59^{a}	93.41±0.85 ^{a}
0.40		80.37±0.89^{b}	73.70±1.21^{b}	91.69±0.74^{ab}
Significant		**	**	*
Interaction between selenium sources and levels				
sources	**levels**			
SS	0.10	73.33±1.28 ^{c}	64.44±1.28^{d}	87.90±1.63
	0.25	81.48±1.48 ^{b}	76.30±1.96^{ab}	93.62±0.98
	0.40	80.00±1.28 ^{b}	72.59±1.48^{bc}	90.74±0.93
Nano-Se	0.10	77.04±0.74b^{c}	68.89±1.28^{cd}	89.44±1.86
	0.25	86.67±2.22 ^{a}	80.74±1.96 ^{a}	93.20±1.60
	0.40	80.74±1.48 ^{b}	74.81±1.96 ^{b}	92.64±0.99
Significant		**	**	NS

Means having different letters at the same column differ significantly ($P\leq0.05$) * = $P<0.05$; ** = $P<0.01$;
NS= Not significant SS = Sodium Selenite Nano-Se = Nano-Selenium

Table (4): Effect of different sources and levels of dietary selenium and their interactions on Body weights and feed consumption of Silver Montazah cocks from 32 to 45 weeks of age.

Items		Initial body weight (g)	Final body weight (g)	Feed intake (g/cooks/day)
Effect of selenium sources				
SS		1519.08±6.15	2010.65±7.23[b]	120.37±0.68
Nano-Se		1527.88±3.91	2043.79±7.37[a]	118.72±0.81
significant		NS	*	NS
Effect of selenium levels (ppm)				
0.10		1521.72±7.69	2012.28±11.30[c]	119.57±0.98
0.25		1526.58±6.90	2041.31±10.06[a]	118.71±1.08
0.40		1522.15±4.69	2028.06±8.04[b]	120.37±0.75
Significant		NS	2012.28±11.30[c]	NS
Interaction between selenium sources and levels				
sources	**levels**			
SS	0.10	1518.17±14.48	1999.55±15.41[e]	120.43±1.41
	0.25	1521.47±11.98	2021.19±13.60[cd]	119.76±1.20
	0.40	1517.61±6.41	2011.21±8.26[d]	120.93±1.11
Nano-Se	0.10	1525.26±7.06	2025.01±16.00[bc]	118.70±1.40
	0.25	1531.69±7.58	2061.44±8.23[a]	117.65±1.80
	0.40	1526.69±6.88	2044.91±8.97[b]	119.82±1.07
Significant		NS	**	NS

Means having different letters at the same column differ significantly (P≤0.05) * = P<0.05; ** = P<0.01;
NS= Not significant SS = Sodium Selenite Nano-Se = Nano-Selenium

Table (5): Effect of different sources and levels of dietary selenium and their interactions on body weight, weight gain and mortality rate of Silver Montazah chicks from 0-8 weeks of age.

Items		**Body weight (g)**		**Weight gain (g)**			**Mortality rate**		
		2 Weeks	8 Weeks	0-2 Weeks	3-8 Weeks	0-8 Weeks	0-2 Weeks	3-8 Weeks	0-8 Weeks
Effect of selenium sources									
SS		111.7±0.92 ^{b}	524.00±7.43^{b}	78.74±0.94 ^{b}	273.09±6.95	503.82±7.19 ^{b}	6.17±0.90	4.32±0.82	10.49±1.29
Nano-Se		113.4±0.92 ^{a}	541.61±5.44 ^{a}	80.75±0.94 ^{a}	282.80±4.49	524.92±7.84 ^{a}	5.25±0.86	3.40±0.90	8.64±1.26
Significant		*	*	*	NS	*	NS	NS	NS
Effect of selenium levels (ppm)									
0.10		111.1±1.19 ^{b}	517.80±4.55 ^{b}	78.61±1.29 ^{b}	263.20±2.57 ^{b}	492.46±6.33 ^{b}	7.87±0.85 ^{a}	6.02±0.85 ^{a}	13.89±0.72 ^{a}
0.25		114.1±1.01 ^{a}	545.80±6.46 ^{a}	80.81±1.00^{a}	285.15±6.79 ^{a}	531.37±8.11 ^{a}	4.17±0.95^{b}	2.31±0.85 ^{b}	6.48±1.17 ^{b}
0.40		112.4±1.18 ^{b}	534.20±4.72^{a}	80.00±1.136^{ab}	285.48±7.79 ^{a}	519.29±8.60 ^{a}	5.09±0.85^{ab}	3.24±0.85^{ab}	8.33±0.72 ^{b}
Significant		*	*	*	*	**	*	*	**
Interaction between selenium sources and levels									
Sources	**Levels**								
SS	0.10	109.6±1.63 ^{c}	516.60±6.00^{c}	77.00±1.81 ^{b}	258.76±2.89	483.47±7.59 ^{c}	8.33±1.60	6.48±0.93	14.81±0.93 ^{a}
	0.25	113.2±1.34^{ab}	530.30±5.12^{ab}	79.70±1.32^{ab}	282.50±14.26	519.49±9.78^{ab}	4.63±0.93	2.78±1.60	7.41±1.85^{c}
	0.40	112.3±1.77 ^{b}	525.91±4.29^{bc}	79.89±1.73^{ab}	277.99±14.47	508.51±11.21^{bc}	5.56±1.60	3.70±0.93	9.26±0.93^{bc}
Nano-Se	0.10	112.7±1.71 ^{b}	519.00±6.91^{c}	80.22±1.83^{ab}	267.65±2.23	501.44±7.88^{bc}	7.41±0.93	5.56±1.60	12.96±0.93^{ab}
	0.25	115.0±1.52 ^{a}	561.70±11.5^{a}	81.92±1.51 ^{a}	287.79±4.50	543.25±9.57 ^{a}	3.70±1.85	1.85±0.93	5.56±1.60^{c}
	0.40	112.6±1.57 ^{b}	543.60±8.27^{ab}	80.12±1.56^{ab}	292.97±6.13	530.07±11.29^{ab}	4.63±0.93	2.78±1.60	7.41±0.93^{c}
Significant		*	*	*	NS	**	NS	NS	**

Means having different letters at the same column are differ significantly. * = ($P<0.05$); ** = ($P<0.01$);
NS= Not significant. SS = Sodium Selenite Nano-Se = Nano-Selenium

Table (6): Effect of different sources and levels of dietary selenium and their interactions on feed intake and feed conversion ratio of Silver Montazah chicks from 0-8 weeks of age

Items		Feed intake			Feed conversion ratio		
		0-2 Weeks	**2-8 Weeks**	**0-8 Weeks**	**0-2 Weeks**	**2-8 Weeks**	**0-8 Weeks**
Effect of selenium sources							
SS		223.89±0.45	1232.78±6.13	1889.44±3.95	2.85±0.05^{a}	4.54±0.12	3.76±0.06^{a}
Nano-Se		224.33±0.41	1233.33±6.97	1896.11±2.61	2.72±0.05^{b}	4.37±0.08	3.61±0.06^{b}
significant		NS	NS	NS	*	NS	*
Effect of selenium levels (ppm)							
0.10		223.83±0.60	1237.50±8.73	1893.33±4.01	2.89±0.05^{a}	4.70±0.05^{a}	3.86±0.05^{a}
0.25		224.33±0.67	1233.33±8.23	1892.50±4.79	2.67±0.05^{b}	4.34±0.13^{b}	3.56±0.06^{b}
0.40		224.17±0.31	1228.33±7.38	1892.50±4.61	2.79±0.06^{ab}	4.32±0.12^{b}	3.62±0.06^{b}
Significant		NS	NS	NS	*	*	**
Interaction between selenium sources and levels							
sources	**levels**						
SS	0.10	223.67±0.88	1236.67±13.33	1890.00±5.77	2.95±0.10^{a}	4.78±0.02	3.93±0.07^{a}
	0.25	223.67±1.20	1233.33±10.93	1888.33±8.82	2.77±0.03^{ab}	4.39±0.27	3.64±0.10^{bc}
	0.40	224.33±0.33	1228.33±11.67	1890.00±8.66	2.84±0.09^{a}	4.44±0.21	3.70±0.07^{abc}
Nano-Se	0.10	224.00±1.00	1238.33±14.24	1896.67±6.01	2.84±0.05^{a}	4.63±0.09	3.79±0.08^{ab}
	0.25	225.00±0.58	1233.33±14.81	1896.67±4.41	2.56±0.05^{b}	4.29±0.08	3.48±0.03^{c}
	0.40	224.00±0.58	1228.33±11.67	1895.00±5.00	2.75±0.07^{ab}	4.20±0.10	3.55±0.07^{c}
Significant		NS	NS	NS	*	NS	**

Means having different letters at the same column are differ significantly. * = ($P<0.05$); ** = ($P<0.01$);
NS= Not significant. SS = Sodium Selenite Nano-Se = Nano-Selenium

Table (7): Effect of different sources and levels of dietary selenium and their interactions on Carcass traits of Silver Montazah chicks at 8 weeks of age.

Items		Carcass % dressing	Heart %	Liver %	Gizzard %	Spleen %
Effect of selenium sources						
SS		64.66±0.52^{b}	0.46±0.01^{b}	2.29±0.02	3.25±0.03	0.20±0.01
Nano-Se		65.85±0.30^{a}	0.47±0.01^{a}	2.31±0.03	3.28±0.03	0.20±0.01
significant		**	**	NS	NS	NS
Effect of selenium levels (ppm)						
0.10		64.90±0.79^{b}	0.46±0.01^{b}	2.26±0.03^{b}	3.20±0.03^{b}	0.19±0.01
0.25		65.99±0.43^{a}	0.47±0.01^{a}	2.36±0.02^{a}	3.32±0.03^{a}	0.21±0.01
0.40		64.88±0.32^{b}	0.47±0.01^{a}	2.28±0.03^{b}	3.28±0.05^{a}	0.20±0.01
Significant		*	**	*	*	NS
Interaction between selenium sources and levels						
sources	**levels**					
SS	0.10	63.98±1.19^{c}	0.46±0.01^{b}	2.26±0.03^{b}	3.20±0.06^{b}	0.19±0.02
	0.25	65.76±0.93^{ab}	0.47±0.01^{a}	2.32±0.02^{ab}	3.30±0.05^{ab}	0.21±0.01
	0.40	64.25±0.02^{bc}	0.46±0.01^{b}	2.28±0.05^{b}	3.25±0.07^{ab}	0.20±0.02
Nano-Se	0.10	65.83±0.92^{ab}	0.46±0.02^{b}	2.26±0.05^{b}	3.20±0.02^{b}	0.19±0.01
	0.25	66.22±0.09^{a}	0.47±0.02^{a}	2.39±0.03^{a}	3.35±0.04^{a}	0.21±0.01
	0.40	65.51±0.32^{ab}	0.47±0.01^{a}	2.28±0.04^{b}	3.30±0.07^{ab}	0.20±0.02
Significant		*	**	*	*	NS

Means having different letters at the same column are differ significantly. * = ($P<0.05$); ** = ($P<0.01$);
NS= Not significant. SS = Sodium Selenite Nano-Se = Nano-Selenium

Table (8): Effect of different sources and levels of dietary selenium and their interactions on Hematological parameters of Silver Montazah chicks at 8 weeks of age.

Items		RBC,s (10^6/mn)	Hb (g/dl)	PCV (%)	WBC,s (10^3 /mn)	Heterophil (%)	Lymphocytes (%)
Effect of selenium sources							
SS		4.55±0.17	9.59±0.23	27.89 ± 0.42^{b}	24.69±0.83	31.00 ± 0.47^{b}	59.33 ± 1.09^{b}
Nano-Se		4.97±0.10	9.93±0.22	29.33 ± 0.33^{a}	25.03±0.65	32.67 ± 0.33^{a}	64.11 ± 1.30^{a}
significant		NS	NS	**	NS	**	**
Effect of selenium levels (ppm)							
0.10		4.71 ± 0.20^{b}	9.62±0.25	28.00 ± 0.52^{b}	24.23 ± 0.81^{b}	31.17 ± 0.65^{b}	61.00 ± 1.65^{b}
0.25		4.75 ± 0.21^{b}	9.95±0.36	29.33 ± 0.61^{a}	25.73 ± 0.78^{a}	32.33 ± 0.56^{a}	63.67 ± 2.06^{a}
0.40		4.82 ± 0.19^{a}	9.72±0.24	28.50 ± 0.43^{ab}	24.62 ± 1.09^{b}	32.00 ± 0.58^{ab}	60.50 ± 1.48^{b}
Significant		*	NS	*	*	**	*
Interaction between selenium sources and levels							
sources	**levels**						
SS	0.10	4.51±0.39	9.53±0.52	27.33 ± 0.88^{c}	24.37±1.57	30.00 ± 0.58^{c}	58.00 ± 1.53^{c}
	0.25	4.46±0.27	9.60±0.31	28.33 ± 0.88^{ab}	25.80±0.95	31.667 ± 0.88^{bc}	60.67 ± 2.19^{bc}
	0.40	4.68±0.36	9.63±0.52	28.00 ± 0.58^{bc}	23.90±1.99	31.33 ± 0.88^{bc}	59.33 ± 2.33^{bc}
Nano-Se	0.10	4.92±0.04	9.70±0.21	28.67 ± 0.33^{ab}	24.10±0.90	32.33 ± 0.67^{ab}	64.00 ± 1.53^{ab}
	0.25	5.04±0.25	10.30±0.65	30.33 ± 0.33^{a}	25.67±1.45	33.00 ± 0.58^{a}	66.67 ± 2.73^{a}
	0.40	4.95±0.21	9.80±0.12	29.00 ± 0.58^{ab}	25.33±1.20	32.667 ± 0.67^{ab}	61.67 ± 2.03^{b}
Significant		NS	NS	*	NS	*	**

Means having different letters at the same column are differ significantly. * = ($P<0.05$); ** = ($P<0.01$);
NS= Not significant. SS = Sodium Selenite Nano-Se = Nano-Selenium

Table (9): Effect of different sources and levels of dietary selenium and their interactions on biochemical parameters of Silver Montazah chicks at 8 weeks of age.

Items		TAOC mm\l)(	Creatinine (U\L)	ALK .Ph (U\L)	ALT (U\L)	AST (U\L)
Effect of selenium sources						
SS		0.80 ± 0.04^{b}	1.09 ± 0.02	35.81 ± 0.18^{b}	36.33 ± 0.30^{b}	63.55 ± 1.98
Nano-Se		0.90 ± 0.05^{a}	1.04 ± 0.03	36.41 ± 0.23^{a}	37.42 ± 0.30^{a}	65.69 ± 2.07
significant		**	NS	**	*	NS
Effect of selenium levels (ppm)						
0.10		0.82 ± 0.06^{b}	1.09 ± 0.03	35.90 ± 0.30^{b}	36.42 ± 0.43^{b}	64.29 ± 2.13
0.25		0.88 ± 0.05^{b}	1.05 ± 0.02	36.37 ± 0.28^{a}	37.63 ± 0.38^{a}	65.40 ± 2.75
0.40		0.85 ± 0.07^{ab}	1.04 ± 0.04	36.06 ± 0.25^{ab}	36.58 ± 0.34^{b}	64.17 ± 2.84
Significant		*	NS	*	*	NS
Interaction between selenium sources and levels						
sources	**levels**					
SS	0.10	0.77 ± 0.03^{d}	1.14 ± 0.01	35.73 ± 0.50^{c}	35.50 ± 0.19^{c}	62.62 ± 3.37
	0.25	0.83 ± 0.09^{cd}	1.07 ± 0.03	36.01 ± 0.27^{ab}	37.00 ± 0.37^{bc}	64.07 ± 4.20
	0.40	0.80 ± 0.10^{d}	1.05 ± 0.05	35.69 ± 0.21^{bc}	36.50 ± 0.57^{bc}	63.96 ± 4.19
Nano-Se	0.10	0.87 ± 0.12^{bc}	1.04 ± 0.06	36.07 ± 0.42^{ab}	37.34 ± 0.18^{ab}	65.96 ± 2.93
	0.25	0.93 ± 0.03^{a}	1.03 ± 0.03	36.73 ± 0.44^{a}	38.27 ± 0.44^{a}	66.72 ± 4.30
	0.40	0.90 ± 0.12^{ab}	1.04 ± 0.08	36.43 ± 0.37^{a}	36.67 ± 0.48^{bc}	64.38 ± 4.78
Significant		**	NS	*	*	NS

Means having different letters at the same row are differ significantly. * = ($P<0.05$); ** = ($P<0.01$);
NS= Not significant. SS = Sodium Selenite Nano-Se = Nano-Selenium

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الملخص العربي

تقييم استخدام صور السيلينيوم النانومتريه والغير عضويه في علائق الأباء والكتاكيت الناميه لسلالة المنتزه الفضي خلال فصل الشتاء

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تهدف الدراسة الحالية إلى تقييم تأثير تغذية دجاج من سلالة المنتزه الفضي المرباه في عنابر مفتوحه خلال فصل الشتاء على مصادر و مستويات مختلفة من السيلينيوم على خصوبة الديوك والأداء الانتاجي ونسبة النفوق من الكتاكيت الناتجه. وقد تم اختبار اثنين من مصادر السيلنيوم هما نانو سيلينيوم و سلينات الصوديوم
بمستويات ثلاثة لكل مصدر وهي 0.10 ، 0.25 و 0.40 جزء في المليون.. 180 من الإناث و 90 ذكورًا من سلاله المنتزه الفضي مقسمة إلى 6 معاملات مكونة من ثلاث مكررات لكل منها.تم تربية الذكور والاناث في بطاريات منفصله في عنابر مفتوحه تم إجراء فحص جودة السائل المنوي ، ثم تم التلقيح الاصطناعي للدجاج بواسطة السائل المنوي من الديوك من نفس المعاملة. تم تفريخ عدد إجمالي 90 بيضة / معامله وتم حساب نسبة الخصوبة والفقس. الكتاكيت الناتجه تمت تغذيتها علي عليقه كنترول تحتوي علي 0.10.ملجم من الغذاء حتى 2 أسابيع من العمر ثم غذيت الكتاكيت من كل معاملة بنفس المعاملات للامهات.تم تسجيل اداء نموالكتاكيت حتي عمر 8 اسابيع.
أظهرت النتائج التي تم الحصول عليها:باستخدام النانو سيلينيوم تحسن حجم السائل المنوي ، حركة الحيوانات المنوية ، وأداء نمو الكتاكيت خلال أول أسبوعين من العمر أيضا نسبة الاجزاء المأكوله عند عمر 8 اسابيع بالاضافه الي تحسين نظام مضاد الاكسده ووظائف الكبد. ادي استخدام 0.25 ملجم نانو سيلينيوم / كجم عليقه ، تحسين الأداء الكلي لنوعية السائل المنوي ، الخصوبة والفقس والحاله الفسيولوجيه للكتاكيت الناتجه.اظهرت النتائج الاجماليه لجميع المعاملات ايضا استخدام المستوي 0.25 مجم نانو سيلنيوم /كجم عليقه ادي الي تحسين الأداء التناسلي الكلي للديوك وتحسين نموالكتاكيت الناتجه والحاله الفسيولوجيه لها حتي عمر 8 اسابيع. بالإضافة إلى ذلك ، أظهر فحص خلايا الدم والقياسات البيوكيميائية للبلازما تأثيرا إيجابيًا على نظام مضاد الأكسدة والحالة المناعية العامة.استناداً إلى النتائج التي تم الحصول عليها ، يمكن أن نوصي باستخدام 0.25 مجم نانوسيلينيوم / كجم عليقه لتحسين الأداء التناسلي للديوك "منتزه فضي" والكتاكيت الناتجه لمواجه موسم الشتاء عند تربيتها بنظام العنابر المفتوح .