The effect of the addition of nano selenium and vitamin E on productive performance and the characteristics of the physical and chemical carcass of broilers

Abdulkreem Saran Abdullah Aljumaily¹ and Tareq Khalaf Hasan Aljumaily¹

¹Department of Animal Production, College of Agriculture, Tikrit University, Iraq.
Email : krem1988abd@gmail.com

Abstract
This experiment was conducted in private poultry farms / Sharqat district during the period from 8/15/2020 to 19/9/2020. The aim of this study was to find out the effect of adding two levels of nano-selenium and securing E in the diet on productive, physiological and immunological performance in addition to the carcass’s physical and chemical characteristics. For meat broilers (Ross 308), 234 birds of broiler meat were used in the experiment (Ross 308), one day old, not nationalized and equipped from the Mardin company hatchery / Erbil governorate and distributed randomly into 6) factors for each treatment (3) replicates of (13) birds for each Duplicate. The first treatment was the control treatment and the second treatment was a basic diet to which a supplement of nano-selenium was added at a concentration of 0.25 mg / kg, and the third treatment was a basic diet to which a supplement of nano-selenium was added at a concentration of 0.35 mg / kg, and the fourth treatment was a basic diet to which a supplement was added with a supplement with a vitamin E at a concentration of 300 mg / kg. The fifth and sixth are basic diets to which add nano-selenium at a concentration of 0.25 and 0.35 mg / kg + insurance E at a concentration of 300 mg / kg, respectively. The results of the statistical analysis indicated that there were no significant differences in the production performance at this level of nano-selenium and vitamin E, while it showed The fifth treatment was significantly higher in the amount of feed consumed in the first and fourth weeks. As for the physical characteristics of the meat, there were significant differences in favor of the nano-selenium treatments, where the sixth treatment recorded the highest concentration of selenium in the breast meat tissue, while the second, fourth and fifth treatments recorded a significant decrease in the pH of the meat compared with the control treatment. This reduces the microbial activity and prolongs the storage and preservation period of meat, and in the chemical properties the results indicated the presence of significant differences in the percentage of protein, moisture, fat and ash, and therefore our results showed that the use of nano-selenium and vitamin E led to the improvement of most of the biochemical and immunological properties of blood, in addition to To improve the physical and chemical properties of broiler carcasses.

Key words : Broiler, vitamin E, nano selenium, the Nano technique, production.

1. Introduction
The components of the diet used in feeding broilers are one of the important basics that have been taken into consideration by researchers in terms of their proportions and types in addition to the main components. The mineral elements are an important part, as they have a role in the metabolic processes that occur inside the bird’s body and are considered as major assistive factors to complete the metabolic pathways. Taking place inside living cells [1]. When the active oxygen varieties (ROS) exceed the permissible limit, they may cause damage to these cells and damage some of their vital components, and what limits the activity of free radicals and the active oxygen varieties is the content of the body and its cells of antioxidants, which work to stop the destructive activity of free radicals by cutting chains Their interactions and eliminate their products or limits the activity of free radicals and the active oxygen varieties is the content of the body and its cells of antioxidants, which work to scavenge them to provide protection for body cells [2]. Selenium is one of the additives that researchers have paid attention to, as it is a substance that is used in all cells and tissues of the body, and its distribution ratios are different. The highest percentage is in the kidneys, liver and adrenal glands, as selenium is an important component of the enzyme glutathione...
peroxidase that protects cells from the influence of free radicals that form during the representation and absorption of food by [3]. As for nanotechnology, it is the great scientific progress during the recent decades and it is qualified to enter various fields of life during the next few years, because of the unique properties of nanoparticles, large surface area, surface activity, high stimulating efficiency, great absorption capacity, low toxicity, ease of transport and directing to the target organ. With the possibility of loading and wrapping them with other materials [4], and when using antibiotics as a treatment for pathogenic infections in poultry became insufficient due to the resistance of pathogens to them, the demands for the production of nanoparticles and their use as a suitable alternative increased [5,6]. Selenium is among the most important mineral elements to which nanotechnology has been applied and its production in nanoscale form with molecular sizes estimated from (0.2-100 nanometers). Studies have shown that the nanoscale form of selenium is more efficient in preparing body tissues with selenium compared to selenium compounds Selenomethionine and Methylselenocycocine are from their organic and inorganic sources with low toxicity compared to them, and this is due to several advantages, the most important of which are increased surface area, high catalytic efficiency and high absorption through the intestine, similar to the absorption of amino acids and the arrival of the target organ at the highest speed and low toxicity, and these and other factors affected vital readiness Nanoselenium [7,8]. As for vitamin E, it is an effective and fat-soluble natural antioxidant and is used in bird feeding, which reduces oxidative stress [9], as it works to prevent the oxidation of long-chain polyunsaturated fatty acids in [21], as a breaker. The breaking chain universe (free radicals) is characterized by its ability to initiate a series of reactions leading to amplification of its activity, which leads to the destruction of cell components and the oxidation of unsaturated fatty acids in them, causing a change in the composition of cell membranes and their functions [11], as it works to remove roots Free Hydroxylate and thus is considered an antioxidant as it provides protection for the liver during the oxidative processes that occur in it, especially the so-called peroxidation lipid. The use of antioxidant vitamins and minerals such as selenium and vitamin E alone or together in feeding broilers can reduce the effects of oxidative and thermal stress due to high temperatures and thus improve most of their physiological properties and production performance [12]. Based on the above, the present study aimed to demonstrate the effect of adding levels of nano-selenium and vitamin (E) on production performance and the physical and chemical carcass characteristics of broilers.

2. Materials and Methods

The field experiment was conducted in the private poultry halls - Sharqat district for the period from 08/15/2020 to 09/19/2020, with the aim of studying the effect of adding nanosilinium and securing E with the feed on production performance and the physical and chemical carcass characteristics of broilers (Ross 308).

2.1. Experience design

In the experiment, 234 broiler chickens (Ross 308) were used, not naturalized, at the age of one day, and were raised in a room with dimensions of 6 x 8 x 3 m. The study included (6) treatments, each treatment contained (3) replicates, and the chicks were distributed randomly on the transactions, and the transactions were as follows:

1. The first treatment: a control diet (a standard diet without addition).
2. The second treatment: control diet + nano selenium at a concentration (0.25 mg / kg).
3. The third treatment: control diet + nano selenium at a concentration of (0.35 mg / kg).
4. The fourth treatment: a control diet + with vitamin E at a concentration of 300 mg / kg
5. The fifth treatment: control diet + (nano selenium at a concentration of 0.25 mg / kg + vitamin E at a concentration of 300 mg / kg of feed).
6. The sixth treatment: control diet + (nano selenium at a concentration of 0.35 mg / kg + vitamin E at a concentration of 300 mg / kg of feed).

The hall was cleaned of dirt with water and detergents, then it was left open for the purpose of drying. The hall was divided into cages with dimensions (1 mx 1.5 m), then disinfected with formalin as a viral preventive measure, and then spread with sawdust at a depth of 4 cm. And activate the cooling used (desert cooling) to reduce the temperature of the hall to 32.5 m to provide a suitable temperature for the chicks, then gradually reduce the temperature at a rate of 2 to 3 m per week. As for the lighting, it was continuous inside the hall for 24 hours, and 9 watt yellow lamps were used for this purpose. Water and feed for the chicks are free, as it was used in each cage upside down of a capacity of 5 liters, and was used to feed birds small circular dishes feeders for the first ten days, then they were replaced by vertical circular feeders with one feeder for each refiner.

2.2. Nutrition

The birds were fed from the first day until (21) days of their life on the starter's diet, then they were fed on a growing diet for up to (35) days. The feed was prepared from Mardin Feed Factory / Erbil Governorate in addition to its components and the premix used in its composition, and table (1) shows the components These relationships with the chemical analysis of the two:
Table 1. the components of the relationships with their chemical analysis

| Feed material                      | Starter diet% | Dietary growth% |
|------------------------------------|---------------|-----------------|
| yellow corn                        | 36            | 49.3            |
| Wheat                              | 13            | 13.2            |
| Wheat bran                         | 9             | ........        |
| Soybean cake (48% protein)         | 34.7          | 31.29           |
| Premix*                            | 2.5           | 2.5             |
| Sunflower oil                      | 3             | 1.91            |
| Calcium carbonate                  | 1.5           | 1.5             |
| Salt                               | 0.3           | 0.3             |
| Total summation                    | 100           | 100             |

Calculated chemical analysis**

| Energy (kcal energy represented / kg feed) | 2942.7 | 3096.1 |
| Crude protein(%)                        | 23.02  | 21.12  |
| Crude fiber(%)                          | 4.66   | 3.67   |
| Methaionine(%)                          | 0.56   | 0.54   |
| Lysine(%)                              | 1.32   | 1.21   |
| Methaionine + cysteine(%)              | 0.91   | 0.86   |
| Calcium(%)                             | 0.97   | 0.95   |
| Available phosphorous(%)               | 0.44   | 0.34   |

(*) The used premix is a product from a European company (maxcare) that contains 16% crude protein, 3897 kilocalories / kg represented energy, 12.4% calcium, 7.2% phosphorus, 8.1% lysine, 9.6% methionine, 9.6% methionine + cysteine, 6.4 Sodium%, 1.5% Threonine.

(**) According to the chemical composition based on [13].

2.3. The studied qualities

At the end of the experiment period, at the age of 35 days, blood was drawn from 18 birds for the purpose of conducting chemical and physical tests on them and slaughtered after cutting the feed for a period of (3) hours by a bird / repetition and after weighing individually, the process of removing the feathers, cutting the legs, and removing the edible and non-edible internal entrails, according to the method [14]. Samples were collected from the chest muscle and thigh muscle for each repeat for the purpose of conducting the required tests, as the total concentrations of selenium were estimated according to the method reported by [15], using the flame atomic absorption spectroscopy (SHIMADZU Model AA7000) with graphite technology as well as the degree of meat acidity (PH) Which represented the physical properties of the meat. As for the chemical properties of minced breast and thigh meat, it was estimated according to the method [16]. The edible viscera was extracted after the process of slaughtering and cleaning, which is the heart, liver and gizzard. It was separated from all other intestines. Then the carcasses were cleaned well and weighed individually to calculate the percentage of dressing without the edible internal viscera. The relative weight of the eaten entrails was also calculated on the basis of live weight using a sensitive electronic scale with the ability (500 grams) accurately Two places after the sorting, where percentages were calculated according to the method [14].

2.4. Statistical analysis

The experiment data were analyzed statistically using the complete random design (CRD) to study the effect of the experiment coefficients on the studied traits, and the significant differences between the averages were compared using the [17], test. The statistical program [18], was used in the statistical analysis according to the following mathematical model:

\[ Y_{ij} = M + T_i + e_{ij} \]

3. Results

3.1. Productive performance

Table (2) shows the results of the statistical analysis of the production performance of the treated birds that were fed at two levels of nanoselenium and the vitamin E added to the feed ± the standard error, as the results indicate that there are no significant differences in production performance and for all experimental parameters, as these results are in agreement with the findings of [19,20].
Table 2. Effect of adding two levels of Nano selenium and vitamin E to the feed on the production performance of broilers (mean ± standard error).

| Particulars | Total feed consumption | Total weight gain | Food conversion factor | Productive guide | Clearance ratio |
|-------------|------------------------|-------------------|------------------------|------------------|----------------|
|             |                        |                   |                        |                  |                |
| T1 0.00 ppm v.tE Nano Se 2885.54a | 2102.3a | 1.38a | 405.66 a | 21.95 a | 76.94 a |
| T2 0.25 ppm Nano Se 2850a | 2192.33a | 1.30a | 440.66 a | 76.80 a |
| T3 0.35 ppm Nano Se 2925.80a | 2214.67a | 0.032 | 450.66 a | 78.59 a |
| T4 0.000 ppm Nano Se 2907.05a | 2112.67a | 1.37a | 408 a | 76.13 a |
| T5 0.25 ppm Nano Se 2980.85a | 2232a | 1.34a | 380.66 a | 74.39 a |
| T6 0.35 ppm Nano Se 2835.29a | 2139.67a | 0.029 | 448.66 a | 76.10 a |
| Sig N.S N.S N.S N.S N.S |

- The different letters within the one column indicate the presence of significant differences at the level (P≤0.05).
- The common letters within the single column indicate that there are no significant differences.

3.2. Results of physiological characteristics of blood
It is evident from the results shown in Table (3) that there were no significant differences between the study parameters in PCV%, Hb and RBC. As for the number of WBC, the results of the same table indicated that the treatment (T3) was significantly superior (P≤0.05) over the rest of the trial treatments, followed by the treatment (T2, T4, T5, T6) without significant differences between them and with a significant superiority (P≤0.05) over the first treatment. (Control), and with regard to lymphocyte white blood cells, the results of the same table indicated significant differences, as the sixth treatment (T6) recorded a significant superiority (P≤0.05) over the treatment (T1, T5) without significant differences with the treatment (T2, T3, T4). These results are in agreement with the results of the researcher [21,22]. As for the results of the statistical analysis shown in Table (4), it indicates significant differences in the biochemical characteristics of blood, as the treatment (T3) and (T5) for total protein and albumin, respectively, was superior to the treatment (T3 for globulin) significantly (P≤0.05) over the remaining treatments without Significant differences between them. As for the concentration of cholesterol and triglycerides, the results of Table (4) indicated significant differences (P≤0.05) in each of the treatment (T4) and (T2), respectively, while the low density lipoproteins did not record any significant differences. For all the experimental parameters, these results were consistent with the findings [22-25].

Table 3. The effect of adding two levels of nano-selenium and vitamin E to the diet on some of the physical blood tests (white blood cell count, red blood cell count, compressed blood cell volume, hemoglobin ratio and lymphocyte) (mean ± standard error)

| Particulars | Total leucocyte count (10^3/mm³) | Total erythrocyte count (10^6/mm³) | Hb (g/100ml) | PCV (%) | Lymphocyte (%) |
|-------------|----------------------------------|-----------------------------------|--------------|---------|----------------|
|             |                                  |                                   |              |         |                |
| T1 0.0 ppm v.tE Nano Se 15.65C | 2.13a | 9.83a | 29.76a | 55.63c |
| T2 0.25 ppm Nano Se b 17.84 | a 2.50 | a 9.33 | a 38.26 | a 6.94 | ab 57.74 |
| T3 0.35 ppm Nano Se a 19.28 | a 2.20 | a 9.53 | a 38.26 | a 6.94 | ab 57.33 |
significant differences in pH when using more than one source of selenium at different levels. Experimental treatments, on the other hand, the results of the current study differed with [26,27], who did not find any differences, while the treatment (T6, T3) did not show any significant differences between them on the one hand. And with the rest of the treatments, the results of the same table indicated significant differences (P≤0.05), where the treatment (T1) with a score of (6.1) followed by the treatment (T5, T3, T2 and T4), where the following concentrations were recorded (0.45, 0.41 and 0.34). And the rest of the trial treatments, compared with the two control treatments in the concentration of selenium. In chest muscle, where the treatment (T6) with a concentration of 0.25 ppm / g / muscle, respectively, was significant (P≤0.05) over the first treatment (control). The acidity of the meat, as the food addition coefficients recorded a significant decrease (P≤0.05) compared with the control treatment without significant differences between them, and the treatment (T6, T3) did not show any significant differences between them on the one hand. And with the rest of the experimental treatments, on the other hand, the results of the current study differed with [26,27], who did not find any significant differences in pH when using more than one source of selenium at different levels.

Table 4. The effect of adding two levels of nano-selenium and vitamin E to the diet on some biochemical characteristics of broiler blood serum (mean ± standard error)

| Particulars | Total P. g/100ml | Albumin g/100ml | Globulin g/100ml | CHO Mg/100ml | VLD Mg/100ml | T.G Mg/100ml |
|-------------|------------------|-----------------|------------------|-------------|-------------|-------------|
| 0.0 ppm v.tE |                  |                 |                  |             |             |             |
| 0.00ppm Nano Se | 0.14 ± 0.14 ± 0 ± 9.20 ± 0.67 ± 3.38 ± |             |                  |             |             |             |
| T1          | 3.33 b 1.93 ab 1.40 b 94.33 bc 10.13 a 50.66 b |             |                  |             |             |             |
| 0.25ppm Nano Se | 1.53 ± 0.17 ± 0.31 ± 17.13 ± 3.71 ± 18.27 ± |             |                  |             |             |             |
| T2          | 3.26 b 1.73 ab 1.53 b 116.66 ab 15.20 a 91.33 a |             |                  |             |             |             |
| 0.35ppm Nano Se | 0.25 ± 0.10 ± 0.30 ± 4.66 ± 1.84 ± 9.23 ± |             |                  |             |             |             |
| T3          | 3.90 a 1.50 b 2.40 a 69.33 c 11 a 55 b |             |                  |             |             |             |
| 300 ppm v.tE |                  |                 |                  |             |             |             |
| 0.00ppm Nano Se | 0.05 ± 0 ± 0.05 ± 0.88 ± 0.06 ± 0.33 ± |             |                  |             |             |             |
| T5          | 3.66 ab 2.13 a 1.53 b 94.33 bc 13.33 a 74.33 ab |             |                  |             |             |             |
| 0.25 ppm Nano Se | 0.08 ± 0.20 ± 0.27 ± 2.33 ± 0.96 ± 0.88 ± |             |                  |             |             |             |
| T6          | 3.50 ab 1.86 ab 1.63 b 127 a 13.10 a 65.33 ab |             |                  |             |             |             |
| 0.35ppm Nano Se | 0.15 ± 0.03 ± 0.12 ± 11.78 ± 2.93 ± 14.84 ± |             |                  |             |             |             |

- The different letters within the one column indicate the presence of significant differences at the level (P<0.05).
- The common letters within the single column indicate that there are no significant differences.

3.3. Selenium concentration results in chest muscle and pH

Table (5) shows the effect of adding two levels of nano-selenium and vitamin E to the diet on the concentration of selenium in the chest muscle and the pH of the meat, as the food addition coefficients recorded a significant superiority (P<0.05) compared with the two control treatments in the concentration of selenium. In chest muscle, where the treatment (T6) with a concentration (0.51) ppb / g / pectoral muscle was significantly superior to (P<0.05) over the rest of the trial treatments, followed by the treatment (T5, T3, T2 and T4), where the following concentrations were recorded (0.45, 0.41 and 0.34). And 0.25 ppb / g / muscle, respectively, was significant (P<0.05) over the first treatment (control). The acidity of the meat, as the results of the same table indicated significant differences (P<0.05), where the treatment (T1) with a score of (6.1) outperformed significantly (P<0.05) on the treatment (T4, T2, T5) with a score of (5.76, 5.66, 5.76), respectively, which recorded a significant decrease (P<0.05) compared with the control treatment without significant differences between them, while the treatment (T6, T3) did not show any significant differences between them on the one hand. And with the rest of the experimental treatments, on the other hand, the results of the current study differed with [26,27], who did not find any significant differences in pH when using more than one source of selenium at different levels.
Table 5. The effect of adding two levels of nano-selenium and vitamin E to the diet on the concentration of selenium in the chest muscle and the pH of the meat (mean ± standard error)

| Particulars | Se (mg/kg muscle) | pH          |
|-------------|-------------------|-------------|
| T1 0.0 ppm v.tE | 0.008 ± 0.203F    | 0.057 ± 6.1 a |
| T2 0.00 ppm Nano Se | 0.0057 ± 0.34 d  | 0.13 ± 5.66 b |
| T3 0.25 ppm Nano Se | 0.0057 ± 0.41 c  | 0.06 ± 5.83 ab |
| T4 0.35 ppm Nano Se | 0.0057 ± 0.25 E  | 0.088 ± 5.76 b |
| T5 300 ppm v.tE | 0.0033 ± 0.45 b  | 0.033 ± 5.76 b |
| T6 0.35 ppm Nano Se | 0.0057 ± 0.51 a  | 0.14 ± 5.96 ab |

* The different letters within the one column indicate the presence of significant differences at the level (P≤0.05).
- The common letters within the single column indicate that there are no significant differences.

3.4. Immunomodulatory results

The results of the statistical analysis of the relative weight of the lymphoid organs from the body weight (%) in Table (6) indicated significant differences (P≤0.05) between the experimental treatments and the control treatment at the age of 5 weeks. With regard to the relative weight of the Fabrishia gland, we note the superiority of the treatment (T5, T6) significant (P≤0.05) over the treatment (T2, T3), which recorded the lowest relative weight compared with the trial treatments, while the treatment (T1, T4) did not show any significant difference with the trial treatments. As for the relative weight of the gland, we may notice the superiority The treatment (T4) was significant (P≤0.05) on all the experimental treatments without significant differences between them.

The results of our current study are in agreement with [22,28].

Table 6. Effect of adding two levels of nano-selenium and vitamin E to the diet on some immune organs (mean ± standard error).

| Particulars | Bursa % | Thymus % |
|-------------|---------|----------|
| T1 0.0 ppm v.tE | 0.01 ± 0.49 ab | 0.03 ± 0.57 b |
| T2 0.00 ppm Nano Se | 0.01 ± 0.32 b | 0.03 ± 0.52 b |
| T3 0.25 ppm Nano Se | 0.01 ± 0.31 b | 0.01 ± 0.58 b |
| T4 0.35 ppm Nano Se | 0.15 ± 0.47 ab | 0.02 ± 0.73 a |
| T5 300 ppm v.tE | 0.03 ± 0.56 a | 0.05 ± 0.48 b |
| T6 0.35 ppm Nano Se | 0.03 ± 0.53 a | 0.02 ± 0.47 b |

- The different letters within the one column indicate the presence of significant differences at the level (P≤0.05).
- The common letters within the single column indicate that there are no significant differences.

4. Discussion

The results of Table (2) obtained in the treatment of addition of nano-selenium and vitamin E have completely agreed with each of [8,19,17], who did not find any significant effect of adding nano-selenium and organic selenium particles to broiler diets on the production performance of birds compared to the control treatment. The type of feed, the rate of feed consumption, the added quantity, in addition to the type of feeding programs used. As for the results of Table (3), they are in agreement with the results of the researcher [14,21], and it states that there are no significant differences in each of the
number of red blood cells, the blood stack and hemoclopin, and it is inconsistent with the same researcher in the number of white blood cells + and the percentage of cells that are recorded in white blood cells and the percentage of cells that are recorded in white blood cells. With regard to the results of serum proteins, Table (4), these results are in agreement with the findings [22-24]. Through the results of the study, it can be said that treatment with vitamin E and nano-selenium led to an increase in the concentration of total protein and albumin globulin. This, in turn, increases (glutathione peroxidase), Selenium proves its role in working as one of the most important antioxidants, a mineral that is included in the synthesis of the cell enzyme (glutathione peroxidase). As for the results of lipid concentrations in blood serum, the results are in agreement with the findings [25,29]. The effectiveness of antioxidants and their effect on the thyroid glands and the hormones secreted from them, which increase the formation of cholesterol in the liver and increase the ability of the liver to excrete cholesterol in the bile [29]. Table (5) shows the results of selenium concentration in chest muscle tissue, which were consistent with the findings [15,24]. We conclude from the results of the current study and previous studies that the greater the concentration of nano-selenium added to the feed as supplements Dietary sedimentation increases in tissues and this increase in selenium concentration is due to the ability of selenium nanoparticles to easily saturate the seleniums and thus significantly increase the retention of selenium [30], as well as increasing the amount of selenium absorbed from the mucous membrane of the small intestine increases its deposition in the tissues [31]. As for Table (5), it shows the reason for the variation in the pH between the experimental parameters to the mechanism of action of antioxidants in maintaining the integrity of the muscle membranes after death and thus increases the ability of meat to retain water and adjust the pH [32], or it may be the result of the difference in The method of treating birds before slaughtering and exposing them to stress, and this is reflected in the characteristics of the carcass [14]. As for the reason for the significant differences in the relative weight of the Fabrichia gland in the treatments of nano-selenium and the E insurance, as well as the significant difference in the relative weight of the gland for the second treatment of vitamin E compared to the first treatment Control) to the role of nano-selenium and vitamin E being effective antioxidants and working to improve the antioxidant system of chicks and this leads to enhancing the functions of the immune system which is It is very important at this stage of physiological development as it works to remove the stray particles known as (free radicals) and thus maintain the course of metabolic reactions in the body and continue to maintain vital functions that lead to maintaining the physical balance of the body and gives birds health and prevention of diseases as well as a role Improving the efficiency of the immune system Table (6) [33].

Conclusions

Supplementation of nano-selenium and vitamin E improved most of the biochemical characteristics of the blood, most of the physical and chemical properties of the dibha, as well as improved the immunological characteristics and the relative weight of the Fabrichia and the gland. While not even the supplementation of nano-selenium and vitamin E within the following levels had a clear effect on the production traits.

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