International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2024; 9(2): 108-111

www.veterinarypaper.com
Received: 10-01-2024
Accepted: 13-02-2024

Seema Pathan
Department of Animal Nutrition, College of Veterinary & Animal Sciences, Parbhani, Maharashtra, India

Suneet Wankhede
I/c, Professor, Department of Animal Nutrition, College of Veterinary & Animal Sciences, Parbhani, Maharashtra, India

Vitthal Munde
Department of Animal Nutrition, College of Veterinary & Animal Sciences, Parbhani, Maharashtra, India

Suhas Amrutkar
Department of Animal Nutrition, College of Veterinary & Animal Sciences, Parbhani, Maharashtra, India

Kakasaheb Khose
Assistant Professor, Department of Poultry Science, College of Veterinary & Animal Sciences, Parbhani, Maharashtra, India

S Sajid Ali
Assistant Professor, Department of Animal Genetics and Breeding, College of Veterinary & Animal Sciences, Parbhani, Maharashtra, India

Corresponding Author:
Suneet Wankhede
I/c, Professor, Department of Animal Nutrition, College of Veterinary & Animal Sciences, Parbhani, Maharashtra, India

Effect of supplementation of different forms of selenium along with vitamin E on performance of broiler chicken

Seema Pathan, Suneet Wankhede, Vitthal Munde, Suhas Amrutkar, Kakasaheb Khose and S Sajid Ali

Abstract
An experiment entitled "Comparative efficacy of different forms of selenium along with vitamin E on performance of broiler chicken" was conducted to evaluate the growth performance, biochemical profile, carcass traits, meat quality, immunity, antioxidant status, metabolizability of nutrients, mortality rate and economics of broiler production. Two hundred and forty, day old (Vencobb-430Y) straight run commercial broiler chicks were distributed randomly into three treatment groups (T_1, T_2 and T_3) and control group (T_0). The experimental birds were fed standard broiler diet as per BIS (2007) without selenium along with vitamin E @ 100 mg/kg of feed (T_0) and basal diet supplemented with inorganic Se @ 0.2 mg/kg of feed (T_1), organic Se @ 0.2 mg/kg of feed (T_2) and Nano-Se @ 0.2 mg/kg of feed (T_3). At the end of 6th week that parameters *viz*., FI, live body wt and weight gain were found to be non-significant. However, weekly feed conversion ratio were significantly (p<0.01) improved in T_3 group. Net profit per bird and economic efficiency were highest in T_3 treatment group followed by T_2, T_1 and T_0 group. It was concluded that nano-selenium and vitamin E supplementation improved growth performance, carcass traits, meat quality, immunity, antioxidant status and thus found to be economical.

Keywords: Selenium along, vitamin E, broiler chicken

1. Introduction
Nano-Se has promising effects as a supplement in poultry diets due to its multiple health benefits as compared to other sources. The comparative effectiveness and efficacy of nanoparticles stems from their small size and large surface area, which gives enhanced mucosal permeability, and increased intestinal absorption, as a result of nanoemulsion formation. Vitamin E is essential for the growth of broiler chickens. It was reported that the use of Nano-Se has improved the performance of growth and the weight gain as compared to other treatments (Maryam *et al.*, 2014) [12]. Vitamin E enhances the productive and physiological performance for the birds. The use of Nano-Se and vitamin E may reduce the effect of thermal stress on the birds, where the nano-selenium protects tissues against cell damage and prevents the excess free radical oxygen generation through the pathway of glutathione peroxidase, by protecting the tissues against oxidation of fat and proteins. There has been very scanty research work done using Nano-Se for studying growth performance, hence the present research has been designed to examine the effect of Nano-Se on the performance of broiler chicken.

2. Materials and Methods
One day old broiler chicken birds were grouped as per completely randomized design in four experimental groups i.e., T_0, T_1, T_2 and T_3 which were having four replicates of 15 birds in each group. Diet computed as per BIS (2007) [7] standards (without Se), additionally diet supplemented with inorganic Se @ 0.2 mg/kg of feed, organic Se @ 0.2 mg/kg of feed, Nano-Se @ 0.2 mg/kg of feed and vitamin E @ 100 mg/kg of feed in T_0, T_1, T_2 and T_3 treatment groups, respectively. The performance of broiler chicken was assessed through performance traits (weekly feed intake, weekly body weight gain, weekly feed conversion ratio, performance index), and economics of broiler production.

Observations of various parameters recorded during experimental period were tabulated and data were statistically analyzed as per Completely Randomized Design (CRD) method with treatment as factor following statistical procedure of Snedecor and Cochran (1994) [14]. Means were compared as per Duncan's multiple range test and data were processed for statistical analyses using SPSS Software package (26.0).

3. Results & Discussion

3.1 Weekly feed intake (g) of experimental birds

The weekly feed intake (g) of experimental birds fed different forms of Selenium along with vitamin E in diet was calculated from 0-6 week period and presented in Table 1. At the end of 1st, 2nd, 3rd and 4th week, the weekly feed intake (g) per bird in all dietary treatment groups were non-significant. At the end of 5th week, average feed intake (g) was found non-significantly (P>0.05) higher in T_0 (1003±14.59) group as compared to T_1 (985.2±18.16), T_2 (980.4±19.84) and lowest in T_3 (969.8±7.42) group. At the end of finisher phase (6th week), average weekly feed intake (g) per bird was found non-significantly higher in T_0 (1281±40.66) group as compared to T_1 (1207±40.98), T_3 (1211±18.40) and lowest in T_2 (1195±23.50) group. From the table it was observed that, different forms of Selenium along with vitamin E had no significant effect on average weekly feed intake of birds but at the finisher phase, numerical values exhibited that Selenium supplemented groups consumed less feed as compared to control group. The findings of this present experiment regarding the average weekly feed intake of experimental birds are in agreement with Cai *et al.*, (2012) [8] who reported that feed intake did not differ significantly (P>0.05) in different treatment groups. Li *et al.*, (2018) [11] observed no significant (P>0.05) differences in FI. Bami *et al.*, (2022) [6] also found no significant effect on feed intake in different groups. On contrary to the findings of Alian *et al.*, (2020) [3] who found that, nanoselenium at a level of 0.3 mg/kg diet achieved the improved FE with lower FI significantly (p<0.05)

Table 1: Weekly feed intake (g) of experimental birds

Age in week	Treatment				SEM	P
	T_0	T_1	T_2	T_3		
1	155.8±7.71	156.3±10.15	156.5±4.86	157.7±6.31	3.36	0.998
2	374.2±24.47	376.3±14.66	371.4±12.35	369.5±11.10	7.41	0.991
3	591.9±16.31	582.8±12.68	575.3±10.88	576.8±10.28	5.95	0.789
4	803.4±15.99	803.0±11.37	805.3±15.62	802.8±17.41	6.83	0.999
5	1003±14.59	985.2±18.16	980.4±19.84	969.8±7.42	7.72	0.512
6	1281±40.66	1207±40.98	1195±23.50	1211±18.40	16.93	0.282

3.2 Weekly live body weight (g) of experimental birds

Table 2 showed that the body weight of broiler birds have showed non-significant differences at the 1st day of experiment. At the end of 1st week, weekly live body weight (g) was found non-significantly higher in T_3 (118.1±3.30) group as compared to T_0, T_1, and T_2 groups. At the end of 2nd and 3rd week (starter period) live body weight was non-significantly higher in T_3 (423.2±6.55; 718.7±7.00) group as compared to other treatment groups. At the end of finisher phase, weekly body weight (g) was non-significantly increased in T_3 group as compared to the different treatment groups. The average weekly body weight (g) at the end of 6th week were T_0 (2343±27.04), T_1 (2355±12.54), T_2 (2378±10.34), and T_3 (2393±9.57) respectively. From the Table 1, it was revealed that T_3 group supplemented with Nano-Se (0.2 mg/kg of feed) along with vitamin E (100 mg/kg of feed) gained numerically higher weekly body weight as compared to other treatment groups. Moreover, the experimental birds in all the treatment groups i.e., T_1, T_2, and T_3 recorded numerically higher weekly body weight gain than the control (T_0) group. The data pertaining to weekly body weight (g) of experimental birds, are in agreement with the results of Bami *et al.*, (2022) [6] who reported that for the entire experimental period (1–42 days), there was no significant effect on body weight of different dietary treatments. Similarly, Bakhshalinejad *et al.*, (2019) [5] also observed that average body weight was not affected by dietary treatments. Increase in live body weight might be attributed to the increase protein digestibility and energy utilization (Soliman *et al.*, 2020) [15]. These results of the present study are in disagreement with Skrivan *et al.*, (2008) [13] who reported that dietary supplementation with SM significantly (p<0.05) increased body weight, but only by about 3%. Jiang *et al.*, (2009) [10] found final BW of birds significantly (p<0.05) increased by Se-Met supplementation.

Table 2: Weekly live body weight (g) of experimental birds

Age in week	Treatment				SEM	P
	T_0	T_1	T_2	T_3		
0	45.92±0.209	47.41±0.478	47.25±0.597	46.58±0.642	0.274	0.202
1	111.9±4.28	113.8±6.06	116.0±1.86	118.1±3.30	1.96	0.742
2	411.3±9.40	417.1±12.2	421.5±6.52	423.2±6.55	4.19	0.789
3	763.1±15.73	770.6±13.89	778.1±9.45	781.7±7.00	5.69	0.708
4	1211±20.22	1221±14.93	1232±8.09	1237±5.63	6.57	0.545
5	1736±24.22	1747±14.83	1761±10.09	1767±7.15	7.62	0.497
6	2343±27.04	2355±12.54	2378±10.34	2393±9.57	8.94	0.186

3.3 Weekly feed conversion ratio of experimental birds

From the Table 3 it is revealed that, at the end of 1st, 2nd and 4th week the weekly FCR recorded non-significantly better in T_3 followed by T_2, T_1 and poor in T_0 group. At the end of 3rd week, FCR was significantly (p<0.05) better in T_3 (1.60±0.01) group followed by T_2 (1.61±0.01), T_1 (1.64±0.02) and T_0 (1.68±0.01) groups, respectively. The average FCR at the end of 5th (P=0.05) and 6th (p<0.05) week was found statistically significant. The average FCR at the end of 6th week was found to be significantly (p<0.05) similar in T_3 (1.93±0.02) and T_2 (1.93±0.02) group followed by T_1 (1.98±0.05) and T_0 (2.11±0.05) group. The results of present experiment in terms of FCR showed that experimental birds in T_3 group supplemented with Nano Selenium (0.2 mg/kg of feed) along with vitamin E (100 mg/kg of feed) and T_2 group supplemented with Organic selenium i.e. Seleno-Methionine (0.2 mg/kg of feed) along with vitamin E (100 mg/kg of feed) had significantly improved weekly feed conversion ratio (FCR) than other treatment groups. Similarly, all the treatment groups that is T_1, T_2 and T_3 exhibited better feed conversion ratio than the T_0 (control) group. Nano-selenium and organic Se (Sel-Plex) feeding leads to increased intestinal villus height and decrease crypt depth which results in enhanced nutrient absorption, gastrointestinal tract secretion reduction, and increased growth performance (Eid *et al.*, 2022) [9].

Results of the present findings are in accordance with the findings of Wang (2009) [16] who reported that as compared with the control, Se supplementation significantly (p<0.05) improved feed conversion ratio. Similarly, Zhou and Wang (2011) [17] reported significant difference (p<0.05) in FCR of groups supplemented with Nano-Se as compared with the control groups. On the contrary to the present findings, Bami

et al., (2022) [6] reported that for the entire period (1–42 days), there was no significant effect on FCR in different groups fed diets supplemented with nano-selenium. Aljumaily and Aljumaily (2021) [4] observed that there were non-significant differences in FCR supplemented with nano-selenium and vit E.

Table 3: Weekly feed conversion ratio (FCR) of experimental birds

Age in (Week)	Treatment				SEM	P
	T_0	T_1	T_2	T_3		
1	1.39±0.01	1.37±0.02	1.34±0.02	1.33±0.01	0.009	0.182
2	1.47±0.03	1.46±0.02	1.43±0.02	1.42±0.02	0.013	0.586
3	1.68^{b}±0.01	1.64^{ab}±0.02	1.61^{a}±0.01	1.60^{a}±0.01	0.010	0.033
4	1.79±0.01	1.78±0.01	1.77±0.01	1.76±0.02	0.009	0.707
5	1.91^{b}±0.02	1.87^{ab}±0.01	1.85^{ab}±0.02	1.82^{a}±0.01	0.011	0.05
6	2.11^{b}±0.05	1.98^{ab}±0.05	1.93^{a}±0.02	1.93^{a}±0.02	0.026	0.042

*Means bearing different superscripts 'a' and 'b' in a row differ significantly (p<0.05)

3.4 Cost economics of production of experimental birds

From the Table 4 it is observed that, The net profit per Kg live weight of bird was higher in T_3 treatment group followed by T_2, T_1 and lowest in control group T_0. The net profit per Kg live weight was Rs. (0.59), (3.23), (4.45) and (4.57) for T_0, T_1, T_2 and T_3 group, respectively. The value for economic efficiency was highest in T_3 (4.74) followed by T_2 (4.61), T_1 (3.31) and T_0 (0.58) respectively. The economic efficacy of Nano Selenium and vitamin E supplemented group T_3 was higher than all other treatment groups. Increased net profit per kg live weight of bird and economic efficiency in nano-selenium and seleno-methionine supplemented birds could be related to the fact that the treatments to which nano-selenium and seleno-methionine was added were heavier in body weight, higher in livability rate and better feed conversion ratio compared to other treatments (Abou–Ashour *et al.*, 2022) [2].

Table 4: Cost economics of production of experimental birds

Sr. No	Particulars	T_0	T_1	T_2	T_3
1	Cost of day-old chick (Rs.)	32	32	32	32
2	Cost of feed (Rs/Kg)	46.52	46.52	46.52	46.52
3	Cost of Selenium source (Rs/Kg of feed)	0	0.00026	0.011	0.18
4	Cost of Vit E (Rs/Kg of feed)	0.12	0.12	0.12	0.12
5	Total cost of feed (Rs/Kg) (sr. no.2+3+4)	46.64	46.64026	46.651	46.82
6	Average total feed consumed Kg per bird	4.21	4.111	4.084	4.088
7	Cost of feed consumed per bird (Rs) (Sr. no. 5x6)	196.3544	191.7381	190.5227	191.4002
8	Average live body weight at the end of 6th week (Kg)	2.334	2.35	2.367	2.379
9	Feed consumption per Kg live weight gain (Kg) (Sr. no. 6÷8)	1.80377	1.749362	1.725391	1.718369
10	Cost of feed per Kg live weight gain (Rs) (Sr. no. 7÷8)	84.12785	81.59068	80.49121	80.45404
11	Miscellaneous (vaccines, medicines and litter material) cost Per bird (Rs)	6	6	6	6
12	Total cost of production (Rs) (Sr. no. 1+7+11)	234.3544	229.7381	228.5227	229.4002
13	Average price realized @ Rs. 101 per Kg live weight (Rs) (Sr. no. 8×101)	235.734	237.35	239.067	240.279
14	Net profit per bird (Rs) (Sr. no. 13-12)	1.3796	7.611891	10.54432	10.87884
15	Net profit per Kg live weight of birds (Rs.) (sr. no.14/8)	0.591088	3.239103	4.454717	4.572863
16	Economic efficiency EE% ((14/12) *100)	0.588681	3.313291	4.614122	4.742298

4. Conclusion

It was concluded that nano-selenium and vitamin E supplementation improved growth performance, carcass traits, meat quality, immunity, antioxidant status and thus found to be economical.

5. References

1. AOAC, Association of Official Analysis Chemist. Official method of analysis. 18th edition. Washington D.C. Published by A.O.A.C., Washington D.C.
2. Abou–Ashour A, Zanaty G, El-Naga A, Manal K, Yassin A, Hussein EA. Effect of dietary sources and levels of selenium supplements on growth performance, carcass characteristics, tissues selenium deposition, blood biochemical parameters, antioxidant activity, and immune responses of broiler chicks. Menoufia Journal of Animal Poultry and Fish Production. 2022;6(3):55-71.
3. Alian HA, Samy HM, Ibrahim MT, Mahmoud M. Nanoselenium effect on growth performance, carcass traits, antioxidant activity, and immune status of broilers. Environmental Science and Pollution Research. 2022;27(31):38607-38616.
4. Aljumaily ASA, Aljumaily TKH. 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. In: IOP Conference Series: Earth and Environmental Science. Vol. 735(1). IOP Publishing; c2021 Apr. p. 012017.
5. Bakhshalinejad R, Hassanabadi A, Swick RA. Dietary sources and levels of selenium supplements affect growth performance, carcass yield, meat quality, and tissue selenium deposition in broilers. Animal Nutrition. 2019;5(3):256-263.
6. Bami MK, Afsharmanesh M, Espahbodi M, Esmaeilzadeh E. Effects of dietary nano-selenium supplementation on broiler chicken performance, meat selenium content, intestinal microflora, intestinal morphology, and immune response. Journal of Trace Elements in Medicine and Biology. 2022;69:126897.
7. Bureau of Indian Standards. Indian Standards. Poultry feed – specification (fifth revision), 2007, 3-5.
8. Cai SJ, Wu CX, Gong LM, Song T, Wu H, Zhang LY. Effects of nano-selenium on performance, meat quality, immune function, oxidation resistance, and tissue selenium content in broilers. Poultry Science. 2012;91(10):2532-2539.
9. Eid YZ, Zomara M, Tawfeek FA. Effect of the Biologically Produced Nanoselenium Dietary Supplementation on Growth Performance, Carcass Characteristics, Blood Parameters, and Economic Efficiency in Broiler Chickens. Alexandria Journal of Veterinary Sciences. 2022;73(2):47-47.
10. Jiang Z, Lin Y, Zhou G, Luo L, Jiang S, Chen F. Effects of dietary selenomethionine supplementation on growth performance, meat quality, and antioxidant property in

yellow broilers. Journal of Agricultural and Food Chemistry. 2009;57(20):9769-9772.
11. Li JL, Zhang L, Yang ZY, Zhang ZY, Jiang Y, Gao F, *et al*. Effects of different selenium sources on growth performance, antioxidant capacity, and meat quality of local Chinese Subei chickens. Biological Trace Element Research. 2018;181(2):340-346.
12. Maryam C, Parmiss ZM, Hamid RK, Shahab G. Influence of dietary selenium sources on thyroid hormone activation, tissue selenium distribution, and antioxidant enzymes status in broiler chickens. Trends in Life Sciences an International Peer-Reviewed Journal. 2014;2319–4731:2319-5037.
13. Skrivan M, Dlouha G, Mašata O, Ševčíková S. Effect of dietary selenium on lipid oxidation, selenium and vitamin E content in the meat of broiler chickens. Czech Journal of Animal Science. 2008;53(7):306-311.
14. Snedecor GW, Chochran WS. Statistical Methods. 8th Edition. New Delhi: Oxford and IBH Publication; 1994:591.
15. Soliman ES, Mahmoud FF, Fadel MA, Hamad RT. Prophylactic impact of nano-selenium on performance, carcass quality, and tissues' selenium concentration using reversed-phase high-performance liquid chromatography during microbial challenge in broiler chickens. Veterinary World. 2020;13(9):1780.
16. Wang Y. Differential effects of sodium selenite and nano-Se on growth performance, tissue Se distribution, and glutathione peroxidase activity of avian broiler. Biological Trace Element Research. 2009;128(2):184-190.
17. Zhou X, Wang Y. Influence of dietary nano elemental selenium on growth performance, tissue selenium distribution, meat quality, and glutathione peroxidase activity in Guangxi Yellow chicken. Poultry Science. 2011;90(3):680-686.