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EFFECTS OF ADDING DIFFERENT LEVELS OF ORGANIC ZINC ON THE PRODUCTION OF BROILER CHICKENS

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Abstract

The study was conducted in the Poultry Field, Department of Animal Resources, College of Agriculture, University of Baghdad over the period from 10/09/2017 to 11/11/2017 with a view to checking the effects of adding different levels of organic zinc to the poultry feed on the production and immunity response of broiler chickens at the age of 42 days.

300 broilers of 36.64g (308 Ross) were used to conduct the study. The broilers were randomly divided into five treatments. Each treatment was also divided into three replicates (20 broilers each). The broilers were fed with the starting feed for the breeding period from 1-20 days with 21% protein at metabolism energy of 2934.80/cl/kg. The final feed was fed for the breeding period from 21-42 days at a protein ratio of 19% and metabolism energy of 3143.05 cl/kg where organic zinc was added at levels of 0, 20, 40, 60 and 80 mg to T1, T2, T3, T4 and T5 treatments respectively. T3 and T5 treatments showed significant increase in both live and body weight in comparison with T1 treatment. As regards the feeding conversion coefficient, there was significant increase of($P< 0.05$) for T2 and T3 treatments in comparison with T1 treatment. With regard to feed consumption rate, there was no difference between the experiment treatments and the control treatment T1.

Key words : Organic zinc, broiler, body weight, feed conversion.

Introduction

Effective elements are of utmost importance in the poultry feeding because of their vital impact on fast growth, metabolism, productive performance, biological, genital and immune functions in both broilers and eggs production (Yatoo *et al*., 2013). These elements play important role in poultry industry because they are enzyme incentive substances, which contribute to the building of body cells (Swiatkiewicz *et al*., 2014).

As for zinc, it plays significant role in creating the erythropoietin which activate alfa-aminolevunilic and dehydratase enzyme (Aksu *et al*., 2010). It also contributes to protein building by increasing the thyroid hormones (Park *et al*., 2011) and creating DNA and RNA, tissue growth and reconstruction, mineral deposition in bones and blood clotting (Salim, 2008). Moreover, it plays important role in weight increase and improving metabolism coefficient for broilers and contributes to increasing egg production and thickness (Sahin *et al*., 2002 and Rouhalamini *et al*., 2014). Furthermore, it is indispensible mineral for all animals because of its anti-oxidant importance in metabolism functions and disease avoidance by decreasing the production of oxides which undermine the DNA, cellular membranes and immune system (Rahman *et al*., 2014).

Since, there are few studies on the effect of adding organic zinc to the broiler feeds, this study was conducted to verify these effects on the productive performance of broilers and the most effective level to be added to the broiler feeds.

Materials and Methods

This study was conducted in the Poultry Field, Department of Animal Resources, College of Agriculture, University of Baghdad over the period from 10/09/2017 to 11/11/2017. 300 broilers of 40g (308 Ross) were used to conduct the study. The broilers were randomly divided into five treatments. Each treatment was also divided into three replicates (20 broilers each) and they were treated with all the vaccines for 42 days. The hosting hall was divided into pens of 1.5-2 m2 each and the replicates were distributed to the pens. The hall was fully ventilated and lightened 24h/d and the water was freely supplied.

As regards the feed, it was weighted and supplied to the chicken and the remaining feed was weighted weekly to check the consumed quantity. The chickens were also fed with nutritional feeds as shown in Table 1. The production indicators of every replicate were measured weekly, including feed inputs (FI), feed conversion rate (FCR), body weight (BW) and body weight growing (BWG). The production indicator was used as a connective factor for economic characteristics at the end of the breeding period, and it was measured according to the equation mentioned by Naji (2006). The data of this study was statistically analyzed by the general linear model of statistic program (SAS 2001) and the effects on the characteristics were measured by complete randomly design (CRD) and the averages of every characteristic were compared by multi-dimension Duncan at a ($P<0.05$) probability to determine the differences between them. (Duncan, 1995).

Table 1 : % Diet Composition.

Article in the Bush	Bush initiator 1-21% days	The Bush 21-42% final days
Yellow corn	30.6	40.5
Soy	31.7	24.9
Wheat	28	22.7
Centre for animal protein	5	5
Vegetable oil	2.5	4.7
Salt	0.3	0.3
Lime stone	1	1
BI-calcium phosphate	0.7	0.7
B vitamins	0.2	0.2
Total	100	100
* Chemical analysis calculated		
Representative power		
(kilo price/kg)	2934.80	3143.05
C.P Crude protein (%)	21.77	19.01
Phosphorus (%)	0.52	0.51
Lysine (%)	1.21	1.04
Almithionin (%)		
Almithionin + alsstin (%)	0.83	0.75
Calcium (%)	0.88	0.81

Results and Discussion

Body weight average

Table 2 shows the effects of adding different levels of organic zinc to broilers feed on the live body weight. No significant differences were seen in body weight of all the test treatments at the age of 7, 14, 21, 28 days. However, at the age of 35 days, significant improvement of ($p<0.05$) in the values of live body weight was seen in treatment T4, T5. Moreover, significant improvement of($p<0.05$) in the values of live body weight was seen at the age of 42 days in treatment T3 and T5 which indicated 2541 and 2598 g respectively in comparison with T1 which indicated 2373g.

Weight increase

Table 3 shows no significant differences in weight increase between the control treatment T1 and the test treatments T2, T3, T4 and T5 at the age of 7, 14, 21, 28 days. However, at the age of 35 days, T4 indicated significant increase ($p<0.05$) in comparison with T2 where the weight increase average was 547.67g, against 391.25 g respectively. Moreover, at the age of 42 days T3 and T4 indicated significant increase in comparison with T1 where the weight increase average was 1037.5g against 785.33g and 783.67g, respectively. As regards the accumulated weight increase, T3 and T5 indicated significant increase in ($p<0.05$) comparison with T1 where they registered 2558.70g and 2501.70g and 2334.04, respectively. The results did not show significant differences between other test treatments.

Feed consumption average

Table 4 shows the results of statistics analysis of feed consumption average, where there were no significant differences in feed consumption between T1, T2, T3, T4 and T5 at age of 42, 21 and 14 days. However, at the age of 7 days, there was significant increase of ($P< 0.05$) in T1 in comparison with T3 and T4 where it registered 158.83g/chick against 137.08 and 138.83g/

Table 2 : Effect of organic zinc on body weight, from broiler chickens in 42 days.

Treatments	Body weight (g/bird)					
	7	14	21	28	35	42
T1	160.67±4.92	446.02±17.57	743.17±16.85	1105.75±25.20	1588.33± 16.10b	2373.67±42.64b
T2	153.75±1.89	439.17±3.32	747.33±10.83	1169.33±42.85	1560.58± 46.18b	2502.33±65.26ab
T3	157.25±1.26	435.25±5.92	756.50±17.79	1117.33±39.56	1560.83± 22.56b	2598.33±49.43a
T4	157.83±5.80	430.33±6.51	747.92±24.04	1173.33±15.90	1721.00±89.91a	2504.67±52.67ab
T5	158.67±2.35	452.25±3.36	770.42±7.22	1181.83±18.34	1654.62± 2.56ab	2541.33±30.72a
Moral value	NS	NS	NS	NS	0.05	0.05

Table 3 : Effects of Adding Different Levels of Organic Zinc on the Weight Increase, from broiler chickens in 42 days.

Treatments	Weight Increase .Body weight gain (g/bird)						
	1-7	8-14	15-21	22-28	29-35	36-42	1-42
T1	121.04±4.92	285.35±14.31	297.15±13.74	362.58±11.80	482.58±31.47ab	785.33±57.47b	2334.04±42.64b
T2	114.12±1.89	285.42±3.67	308.17±13.34	422.00±32.10	391.25±3.70b	941.75±19.10ab	2462.70±65.26ab
T3	117.62±1.26	278.00±6.14	321.25±11.91	360.83±23.70	443.50±61.16ab	1037.50±31.16a	2558.70±49.43a
T4	118.20±5.80	272.50±8.96	317.58±21.28	425.42±11.12	547.67±22.00a	783.67±92.42b	2465.04±52.67ab
T5	119.04±2.35	293.58±1.10	318.17±3.90	411.42±11.11	472.78±17.32ab	886.72±32.94ab	2501.70±30.72a
Moral value	NS	NS	NS	NS	0.05	0.05	0.05

Table 4 : Effects of adding different levels of organic zinc on the of feed consumption average, from broiler chickens in 42 days.

Treatments	Feed Consumption Average (g / h): in production stages						
	1-7	8-14	15-21	22-28	29-35	36-42	1-42
T1	158.83±10.84a	355.42±28.60	534.25±21.18	697.83±17.23B	1036.33±5.38A	1490.92±53.69	4273.58±87.84
T2	141.67±4.43ab	372.08±7.36	507.25±16.02	741.00±10.11Ab	906.00±16.63D	1478.00±16.28	4146.00±51.24
T3	137.08±2.62b	381.08±14.12	536.92±2.96	795.58±3.00A	945.33±30.24cd	1504.50±37.90	4300.50±56.86
T4	138.83±4.62b	365.33±3.05	557.08±44.55	781.50±23.38A	1008.75±19.54ab	1530.00±55.19	4381.50±144.39
T5	143.00±1.75ab	374.83±2.35	523.58±15.71	760.58±23.00A	968.08±11.01bc	1521.67±15.15	4291.75±35.50
Moral value	0.05	NS	NS	0.05	0.05	NS	NS

Table 5 : Effects of adding different levels of organic zinc on the of feed conversion coefficient, from broiler chickens in 42 days.

Treatments	Weekly food conversion coefficient						
	7-1	14-8	21-15	28-22	35-29	42-36	42-1
T1	1.32±0.14	1.24±0.05	1.81±0.15	1.93±0.07ab	2.16±0.12	1.92±0.14ab	1.83±0.04A
T2	1.24±0.05	1.30±0.01	1.65±0.08	1.77±0.11B	2.32±0.06	1.57±0.03ab	1.69±0.05B
T3	1.17±0.02	1.37±0.07	1.68±0.06	2.22±0.15A	2.22±0.32	1.45±0.04b	1.68±0.04B
T4	1.18±0.02	1.34±0.05	1.75±0.02	1.84±0.10B	1.92±0.28	2.01±0.26a	1.78±0.03Ab
T5	1.20±0.01	1.28±0.01	1.65±0.03	1.85±0.08A	2.05±0.09	1.72±0.08ab	1.72±0.03Ab
Moral value	NS	NS	NS	0.05	NS	0.05	0.05

chick. Moreover, at the age of 28 days, the results indicated that T3, T4 and T5, with the addition of 40, 60 and 80mlg of zinc, registered (P <0.05) significant increase in comparison with T1, where they registered 760.58, 781.50 and 795.58g/chick respectively against 697.83g/chick for T1. At the age of 35 days, T1 trespassed T2, T3 and T5 in consumption average where it registered 1036.33g/chick against 906.00, 945.33 and 968.08g/chick for T2, T3 and T5, respectively. There were no significant differences between the test treatments in regard to accumulated feed consumption for the period from 1-42 days.

Feed conversion coefficient

Feed conversion coefficient is one of the important economic indicators demonstrating bird efficiency in converting the feed to live body weight. Table 5, which shows the statistics data of feed conversion coefficient, the results did not show any significant differences by adding different ratios of organic zinc to T2, T3, T4 and T5 and the control treatment T1 at age of 7, 14, 21 and 25 days. At age of 28 days, there was significant increase of (P<0.05) in T2, T4 and T5, which registered conversion coefficient of 1.77, 1.84 and 1.85, respectively in comparison with T3, which registered 2.22. However, the results did not show any significant differences between T2, T4 and T5 on the one hand and T1 on the other hand. But, at the age of 42 days, there was significant increase of (P<0.05) in T3 in comparison with T4 where they registered conversion coefficient of 1.45 and 2.01, while the results did not show any significant differences between T3 and T1, T2 and T5 and between T4 and T1, T2 and T5. At the final accumulated conversion coefficient, there was significant increase of (P<0.05) for T2 and T3 which registered 1.69 and 1.68 in comparison with T1, which registered 1.83.

Table 6 : The effects of adding different levels of organic zinc to chicken feed on the productivity index.

Treatments	Productivity indicator
T1	308.906154± 9.9793253b
T2	354.470525 ± 19.1552409a
T3	368.471815 ± 14.8296567a
T4	335.707872 ± 6.6897997ab
T5	352.964271 ± 10.8298706a
Moral value	0.05

Productivity indicator

Table 6 shows the effects of adding different levels of organic zinc to the broiler feeds. It was noted that there were significant differences of ($P<0.05$) for treatments T2, T3 and T5 which registered productivity of 352.96, 368.47 and 354.47 respectively in comparison with T1, which registered 308.90. There were no differences between T2, T3 and T5 on the one hand and T4 on the other hand. Zinc is one of the most important minerals for the growth and development of living beings because of the significant role it plays in immunity improvement and its connection with vital enzymes that protect broiler body cells (Valco *et al*., 2016; Naz *et al.*, 2016). There was significant increase in body weight average, weight increase and feed conversion average, a matter that was demonstrated in the productivity yields.

Results and Discussion

The productivity results, including body weight average, weight increase, feed consumption average and feed conversion efficiency after adding different levels of Availa-Zn/120 to broiler feeds, show that there is improvement of productivity characteristics, namely body weight average, weight increase and feed conversion at a rate of 40, 80 mlg/kg Aalila-Zn/120 and that organic zinc improved the broiler performance in respect of live body weight because of the abundance of organic zinc resources (Feng *et al*., 2010). Moreover, zinc-methoinin is more abundant than non-organic zinc as a complementary biological element feeding the broilers because its amino acids can be easily absorbed by the intestines (Star *et al*., 2012). The Zinc methonin can help digest and absorb the nutritional elements. This will increase the absorption of zinc by the broiler tissues, a matter that increases the poultry growth. (Swiatkiewicz *et al*., 2014). The increase in body weight may be attributed to the role zinc plays in mineral metabolism taken from nutritional elements because of the enzymes it contains. As regards the significant increase in broiler weight for T3 and T5, it is attributed to the role zinc plays in body tissues building (Morley *et al*., 1980) and the increase in metabolism because of thyrokcin hormone is improved by adding zinc to the feeds (Salim *et al*., 2012). Zinc also plays important role in organizing protein metabolism and protecting the body against destruction by preventing oxidation in cellular membrane (Xiao *et al*., 2012; Park *et al*., 2011).

This demonstrates the role zinc plays in improving the health status of broilers, leading to higher weight increase in comparison with the consumed feed. This means that the feed conversion efficiency is higher in broilers at the age of 42 days. Domneze *et al*. (2002) mentioned that organic zinc largely contributed to increasing feed conversion efficiency of broilers because it was more effective than non-organic zinc and other minerals in cell building.

Many studies have mentioned that organic minerals are important source of the finer elements in poultry feed, and they reduce mineral rates in broilers (Dozier *et al*., 2003). Hudson *et al*. (2004) noted that the chickens, which were fed with higher zinc mineral, suffered from higher microbe rates in their intestine, a matter that increased their need for more feed (Liu *et al*., 2011). The results indicated that the chickens fed with feeds fortified with zinc contained higher levels of ADG and ADFI. Moreover, Saenmahayak *et al*. (2010) mentioned that regardless of zinc type, zinc nutritional supplements of more than 40mlg/kg did not improve broilers growth. Anil *et al*. (2012) mentioned that organic zinc supplements of 20, 40, 60 and 80 ppm did not reduce the quantities of feed consumed by broilers. Jahanian *et al*. (2008) mentioned that adding organic zinc sources did not increase broilers feeding efficiency. However, the performance itself may not be good indicator of zinc requirements for broilers, especially when the feed is fortified with soybean because these components may have the minimum level of zinc required for broilers growth (Huang *et al*., 2007).

The productivity improvement of broilers fed with Zn is attributed to the bio-activity of these minerals in broiler intestine because these minerals resist in environment of low IP such as chopper and compass, a matter that protects these minerals and helps transfer them completely to the intestine to be fully absorbed after merging with other elements of the feed (Dibner *et al*., 2007). This improves the broiler productivity (Leeson and Summer, 2001).

The results of this study in respect of broiler productivity are identical to the findings of other studies such as Kucuk *et al*. (2003, Burrel (2004), Ao *et al*. (2006), who noted that there was growth improvement, weight increase and feed efficiency of broilers after adding Zn to levels more than the recommended 40mlg/kg.

Thus, the improved productivity, including body weight average, weight increase, feed conversion coefficient, the quantity of consumed feed and productivity indicators of broilers of the treatments used organic zinc, is attributed to the improvement of broilers health. Moreover, some researchers noted that broilers increased immunity resulted in the improvement of feed conversion and body weight increase (Al-Mahdawi, 2003; and Al-Hiyali, 2005).

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