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THE EFFECT OF DIFFERENT LEVELS OF ORGANIC ZINC ON SOME PRODUCTIVE TRAITS OF LAYING HENS

Jassim K.M. Al-Gharawi and Jaafar H.N. Al-Mosuwy

Animal Production Department, Agriculture College, Al-Muthanna University, Iraq.

Abstract

This experiment was conducted in the laying hens field, the Agricultural Research and Experiments Station, College of Agriculture, Al-Muthanna University, from 6/12/2019 to 28/2/2020 (12 weeks). A total of 84 ISA Brown hens, 21 weeks age, distributed to four treatments, spread at four pens (3 × 3 m), the pen was divided into three equal sections, each section contains 7 laying hens (21 laying hens per treatment), the treatments were as follows; T_1: feed the laying hens on a basic diet (Basal diet) without adding the zinc methionine source. T_2: feed the laying hens on a basal diet with zinc methionine (50 mg / kg feed). T_3: feed the laying hens a basal diet with zinc methionine (75 mg / kg feed). T_4: feed the laying hens on a basal diet with zinc methionine (100 mg / kg feed). The results show that the addition of zinc to laying hens diets has led to a significant increase ($P \leq 0.05$) in T4 on the egg production ratio compared to other treatments, with a significant improvement ($P \leq 0.05$) for T_4 compared to T_2 and T_3 treatments, which showed a significant improvement ($P \leq 0.05$) compared to the control treatment on the characteristics of egg weight ratio and feed conversion factor.

Key words : organic zinc, productive traits, laying hens.

Introduction

The poultry industry is currently experiencing a major challenge due to the large increase in the population, international specialized companies have started to develop commercial camels, whether for broilers or laying hens to face these challenges, these hybrids have special requirements for energy, protein, and other elements, researchers were interested in using some mineral elements as nutritional additives to meet the needs of birds for requirements (Thieme *et al.,* 2014; Al-Gharawi *et al.,* 2018). The mineral elements form the ash of the remaining organic matter after oxidation, although most inorganic elements (minerals) were concentrated in the body skeleton, however, there were important amounts found in the soft tissue of the body, as the inorganic elements represent about 5-3% of the bird's body weight, about 10% of the weight of a whole egg, including the solid outer shell of the egg, since inorganic elements cannot be synthesized in the body, therefore it must be provided through food (Al-Yaseen and Abdul Abbas, 2010). The use of trace elements in poultry feed is important in terms of its apparent impact on productive performance (Yatoo *et al.,* 2013). In addition, they are enzyme catalysts and a raw material for building enzymatic systems in a number of cells in the body, it is also necessary for the growth and permanence of vital activities and metabolic processes (Swiatkiewicz *et al.,* 2014). Due to the rapid growth and rate of modern hybridization of laying hens due to their high egg production, so need increased metallic elements in their diets (Aksu *et al.,* 2012). Zinc is a basic mineral found naturally in legumes and grains, such as wheat, certain foods, available as a dietary supplement, found in many cold tablets and some medications that are sold as a cold remedy, plays an important role in the immune function by protein synthesis and DNA making (Solomons, 1998). This study aims to know the effect of using levels of zinc loaded with methionine on some productive characteristics of laying hens.

Materials and Methods

Design the experiment

This experiment was conducted in the laying hens field, the Agricultural Research and Experiments Station, College of Agriculture, Al-Muthanna University, from 6/12/2019 to 28/2/2020 (12 weeks). A total of 84 ISA Brown hens, 21 weeks age, distributed to four treatments, spread at four pens (3 × 3 m), the pen was divided into three equal sections, each section contains 7 laying hens (21 laying hens per treatment), the treatments were as follows T_1: feed the laying hens on a basic diet (Basal diet) without adding the zinc methionine source. T_2: feed the laying hens on a basal diet with zinc methionine (50 mg / kg feed). T_3: feed the laying hens a basal diet with zinc methionine (75 mg / kg feed). T_4: feed the laying hens on a basal diet with zinc methionine (100 mg / kg feed).

Studied traits

Egg Production Percent

Eggs were collected at two o'clock throughout the experiment, the egg production ratio for each hen was calculated on the basis of the number of chickens present at the end of each period for each treatment (Hen Day Production), for three times, the following formula (North, 1984):

$$\text{Egg production percent} = \frac{\text{Egg production}}{\text{hen number}} \times 100$$

Egg Weight

Eggs were weighed weekly and collectively for each of the treatments repeat, by a balance Type Muttler 2000 was sensitive to the nearest gram, the average egg weight was extracted during each trial period.

Feed Conversion Coefficient

The feed conversion factor was calculated by the following formula (North, 1984):

$$\text{Feed Conversion Coefficient} = \frac{\text{Feed consumption}}{\text{Egg mass}}$$

$$\text{Egg mass} = \frac{\text{Egg production percent}}{100} \times \text{Egg weight mean}$$

Statistical analysis

Completely Randomized Design (CRD) was used to study the effect of different treatments on the studied traits, comparison of the mean differences between the means of the Duncan (1955) multiples test under a significant level of 0.05 and 0.01, SAS (2001) was used in statistical analysis.

Results and Discussion

Egg Production Percent

(Table 1) shows the effect of different levels of zinc methionine to the laying hens diet on the percentage of weekly egg production H.D% during production weeks (22-32 weeks), there were significant differences ($P \leq 0.05$) between T_1, T_2 and T_3 treatments compared to T4 at the start of the trial (at 22 weeks of age), as for the age of 28 weeks, there were significant differences ($P \leq 0.05$) between all the treatments where the T_2 treatment outperformed the T_1 and the T_3 treatment significantly increased ($P \leq 0.05$) compare with the T_2 and T_1 treatments, whereas the T_4 treatment was significantly different ($P \leq 0.05$) on all the treatments, at the age of 32 weeks, there were no significant differences between treatment T_1 and treatment T_2, while there were significant differences ($P \leq 0.05$) between treatment T_3 and treatments T_1 and T_2, and treatment T_4 was significantly different ($P \leq 0.05$) on the rest of the treatments, as for the overall rate, there were significant differences ($P \leq 0.05$) between treatment T_4 and all other treatments where T_4 treatment significantly ($P \leq 0.05$) over all transactions, whereas T_1, T_2 and T_3 treatments, there was no significant difference between them, and it is clear from results Zinc oxide and zinc methionine, when added to the diet as a supplement, increase egg production.

Egg Weight

(Table 2) shows the effect of different levels of zinc methionine to laying hens on egg weight during production weeks (22-32 weeks), different zinc methionine levels had a significant effect ($P \leq 0.05$) on egg weight in all ages, as the results indicate the superiority of the egg weights of the birds to which zinc methionine was added at the levels 50, 75 and 100 mg / kg compared to the eggs of the birds whose eggs were added to the zinc methionine at a level of 0 mg / kg *i.e.* control treatment and at the age of 32 weeks *i.e.* age of the end of the experiment, which is realistic evidence for the success or failure of the experiment, the concentration of 100 mg / kg of zinc methionine achieved the highest weight, as it significantly outperformed ($P \leq 0.05$) over the control treatment T_1 and the treatment T_2 and the treatment T_3 as the treatments T_2 and T_3 over the first treatment T_1 significantly outperformed ($P \leq 0.05$).

Feed Conversion Coefficient

(Table 3) shows the effect of different levels of zinc methionine to the laying hens diet in the feed conversion factor during production weeks (22-32 weeks), at the beginning of the experiment, there were significant differences ($P \leq 0.05$) among all treatments. The second treatment, T_2, was significantly superior ($P \leq 0.05$) to the first treatment, T_1, and the third treatment, T_3, was significant ($P \leq 0.05$) on the first treatments, T_1 and the second T_2, while there was significant superiority

Table 1: The effect of different levels of zinc methionine in laying hens on weekly egg production H.D% (mean ± standard error).

Treatments	Age (weeks)			Total
	22	28	32	
T_1	0.83±45.97b	0.68±82.44c	0.64±84.90c	0.62±71.99b
T_2	0.68±45.50b	0.05±83.92b	0.67±85.32c	0.35±72.99b
T_3	0.18±45.94b	0.26±84.66ab	0.69±87.80b	0.18±73.13b
T_4	0.15±48.20a	0.33±85.66a	0.04±89.96a	0.77±75.30a
Sig.	0.05	0.05	0.05	0.05

T_1: feed the laying hens on a basic diet (Basal diet) without adding the zinc methionine source. T_2: feed the laying hens on a basal diet with zinc methionine (50 mg / kg feed). T_3: feed the laying hens a basal diet with zinc methionine (75 mg / kg feed). T_4: feed the laying hens on a basal diet with zinc methionine (100 mg / kg feed). The different letters within the same column indicate significant differences between the totals at the probability level of 0.05.

Table 2: The effect of different levels of zinc methionine in laying hens on weekly egg weight (g)(mean ± standard error).

Treatments	Age (weeks)			Total
	22	28	32	
T_1	47.38± 0.58b	59.23±0.60b	60.90±0.63c	55.96±0.55c
T_2	57.07±0.58a	63.13±1.57b	66.38±2.19b	62.40±1.32b
T_3	58.00±0.57a	63.69±2.42b	65.76±1.39b	63.54±0.73b
T_4	59.33±1.72a	73.71±0.99a	77.20±1.02a	69.91±0.78a
Sig.	0.05	0.05	0.05	0.05

T_1: feed the laying hens on a basic diet (Basal diet) without adding the zinc methionine source. T_2: feed the laying hens on a basal diet with zinc methionine (50 mg / kg feed). T_3: feed the laying hens a basal diet with zinc methionine (75 mg / kg feed). T_4: feed the laying hens on a basal diet with zinc methionine (100 mg / kg feed). The different letters within the same column indicate significant differences between the totals at the probability level of 0.05.

Table 3: The effect of different levels of zinc methionine in laying hens on weekly feed conversion (g diet/ g egg mass) (mean ± standard error).

Treatments	Age (weeks)			Total
	22	28	32	
T_1	5.28±0.16a	2.35±0.040a	2.22±0.030a	3.10±0.06a
T_2	4.43±0.85b	2.17±0.050ab	2.03±0.060b	2.74±0.05b
T_3	4.31±0.51bc	2.13±0.080b	1.99±0.020b	2.65±0.03b
T_4	4.02±0.11c	1.82±0.030c	1.65±0.020c	2.36±0.04c
Sig.	0.05	0.05	0.05	0.05

T_1: feed the laying hens on a basic diet (Basal diet) without adding the zinc methionine source. T^2: feed the laying hens on a basal diet with zinc methionine (50 mg / kg feed). T_3: feed the laying hens a basal diet with zinc methionine (75 mg / kg feed). T_4: feed the laying hens on a basal diet with zinc methionine (100 mg / kg feed). The different letters within the same column indicate significant differences between the totals at the probability level of 0.05.

($P \leq 0.05$) for the fourth treatment T_4 on all trial coefficients, at the age of 28 weeks, there were significant differences between all trial treatments, the second treatment, T_2, was significantly superior ($P \leq 0.05$) to the first treatment, T_1, and the third treatment, T_3, was significantly superior ($P \leq 0.05$) to the first treatment, T_1 and the second T_2, whereas, there was a significant superiority ($P \leq 0.05$) for the fourth treatment, T4, over all trial treatments, at the age of 32 weeks, there were significant differences between all treatments except for the second treatments T_2 and the third T_3, where the second treatments T_2 and the third T_3 were significantly superior ($P \leq 0.05$) over the first treatment T_1 while the fourth treatment T_4 excelled significantly ($P \leq 0.05$) over all the trial treatment, as for the general average, there were significant differences ($P \leq 0.05$) among all treatments except for the second treatments T_2 and the third T_3, whereas, the second treatments T_2 and the third T_3 significantly ($P \leq 0.05$) were superior to the first treatment T_1, whereas the fourth treatment T_4 significantly ($P \leq 0.05$) was significantly superior to all trial treatments.

The significant improvement in egg production, egg weight ratio and feed conversion factor in all parameters of zinc supplementation carried on methionine, because of the basic need for zinc birds that did not reach the actual need in the main diet for laying hens (Kucuk *et al.,* 2008), or it may be due to the entry of zinc as a co-enzyme in a number of enzymes, the most important of which is the carbonic anhydrase, which works to dissolve carbon dioxide gas in water and thus produces carbonic acid, as well as the bicarbonate ion, which helps in metabolic processes inside the body, which plays an important role in the synthesis of digestive juices, calcification of bones and the formation of egg shells, as well as the presence of this enzyme with a high concentration in the egg channel (Chen *et al.,* 2017). The reason may be that zinc is included in the composition of some types of fatty acids, which improves the immune response, improves all physiological aspects, including the digestive system. This increases its food conversion factor (Sharideh *et al.,* 2018).

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