ARTICLE / INVESTIGACIÓN

Effect of adding natural zeolite and vitamin E to diets of laying hens (*Lohman Brown*) on some physiological traits and productive per-formance during hot weather

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Abstract: This study was conducted in a poultry farm of the Department of Animal Production / College of the Agriculture/ University of Anbar, from 20/7/2021 to 12/10/2021, aiming to study the effect of adding zeolite to the diets on productive performance and some physiological qualities character-istics of laying hens. Seventy-two laying hens of Lohman Brown were used in this experiment at the age of 43 weeks and distributed randomly to six treatments with four replications (3 hens/ replicate). The birds were fed with the diet with the additives, and the treatments were as follows: T1 (Vit E 0.06), T2, T3, T4 and T5 with an addition of 0.25, 0.50, 0.75 and 1.0% relay, normal zeolite and T6 control treatment. Results showed moral differences (P≤0.05) in the egg mass, the ratio of egg production and the number of cumulative eggs for T3, T4 and T5 treatments during the productive duration of the experiment.

Key words: Natural zeolites, productive performance, heat stress, laying hens.

Introduction

Eggs are considered an essential food item worldwide as they provide the human body with good quality proteins, fats, vitamins and minerals compared to other protein sources.

However, modern and intensive breeding has led to the emergence of many problems, in-cluding heat stress, which leads to oxidative stress as a result of high concentrations of Free radi-cals inside the bird's body which leads to weak resistance to diseases, deterioration of production, and then death. In the end, the production performance of hens is soft, so researchers must find solutions to these problems. Zeolite is one of the natural volcanic minerals that was formed after the eruption of lava millions of years ago. The basic building unit of the zeolite structure has a central atom of tetravalent silicon and trivalent aluminum. This leads to a negative charge on aluminum and silicon that is saturated with a positive ion. Replacing it with another positive ion, in this way, the zeolite acquires the well-known ion exchange property. It carries a negative charge consisting of hydrated aluminum silicate and alkaline earth elements. Silica, aluminum and oxygen are linked together to make the tetrahedra unit. The zeolite is light in weight and is brittle with a very light yellow or green hue[20]. Many stressors impair the growth performance and health status of chickens. Redox homeostasis is the usual denominator of responses to these stresses that is maintained through a balance between the production of reactive oxygen species (ROS) and reactive nitrogen species and the antioxidant defense system. Oxidative stress results when ROS production exceeds the ability of the antioxidant defense system to remove these tox-ic molecules[13,22]. Several studies have shown that there is a significant difference in the presence of zeolite in the diet[5], the effect of zeolite improves digestion and intestinal absorption, which contributes to weight gain and the provision of feed use as well as reducing production costs[21] as well as noted[7] significant differences in production Eggs, average egg weight, egg mass, and the amount of feed consumed in the zeolite treatment compared to the control treatment, (16) indicat-ed a positive effect of zeolite on the characteristics of production performance and eggshell qual-ity. Therefore, the study aimed to show the impact of adding natural zeolite as an antioxidant on the productive performance of laying hens and some physiological characteristics.

Materials and methods

This study was conducted on the farm of the poultry Department of Animal Production/College of the Agriculture/ University of Anbar from 20/7/2021 to 13/10/2021 to study the effect of add-ing zeolite to the diet on the productive performance and some physiological characteristics of laying hens. 72 hens were used in this experiment(Lohman Brown), 43 weeks old. They were randomly distributed to six treatments and four replicates per treatment (3 hens/ replicate). The birds were fed a normal diet (Table 1) with supplements, and the treatments were as follows: T1(Vit E 0.06), T2, T3, T4 and T5 by adding 0.25, 0.50, 0.75 and 1.0% sequentially natural zeo-lite and T6 to the control treatment. At the same time, water was provided according to the water nipple system, and the illumination period was given to 15.5 hours per day. The percentage of egg production was calculated According to HD%, the average weight of eggs,

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feed consumed, the mass of eggs produced and provided conversion factor (gm feed/gm egg). The data were statistically analyzed using the statistical program for (4) to study the effect of different treatments on the traits studied in the experiment according to a completely randomized design (CRD) and comparison of significant differences between means with Duncan's polynomial test[16].

Ingredient	%
Yellow corn	35.4
Wheat	30
Soybean meal (44% CP)	23
Premix*	2.5
Vegetable Oil	0.5
Limestone	7.5
Salt	0.1
Di calcium phosphate	1
Total	100
Chemical analysis **	
ME, kcal/kg	2737
CP, %	17.527
Fat %	2.287
Fib.%	2.553
Ca, %	3.153
Ava. Phosphor %	0.518
Lysine, %	0.825
Met.%	0.294
Cys. %	0.305
Met. + Cys. %	0.599
*premix provided per kilogram of diet:7.8 % crude protein, 2930 kcal metabolizable energy, 23.1% Ca, 3.8% Ava. P %,7.7% Methionine+ Cysteine , 2.4% Lysine. **Chemical analysis according to NRC (1994)[15]	

Table 1. Shows the components of the ratio used in the experiment.

Results and discussion

Productive traits

Table 2 showed no significant differences (P<0.05) in the average egg weight for the total produc-tion period when different levels of zeolite and vitamin E were added to the laying hens' diets. It is also noted from the table that there are significant (P<0.05) differences between the experi-mental treatments in the mass of eggs produced for the total period, where the treatments T3, T4 and T5 were significantly (P<0.05) superior compared to the rest of the experimental treatments. The table also shows a significant superiority (P<0.05) for the T5 addiction treatment (1% zeolite) in the percentage of egg production on the remaining experimental treatments compared to the control treatment, and we notice a significant superiority (P<0.05) for the T5 addiction treatment over the rest of the experimental treatments during the productive period. In the cumulative number of eggs compared to the control treatment T6, We also note from the same table that there is a significant improvement for the treatment T5 (1% natural zeolite) compared with T2 and T6 in the feed conversion factor. These results are in agreement with findings[1,9,11]. The re-sults of the experiment did not agree with the findings of (18) and (8), which indicated no significant differences when adding zeolite to laying hens' diets. It played an indirectly effective role in pre-serving liver cells from oxidative damage caused by heat stress[7]. Zeolite improves digestion and intestinal absorption, which contributes to saving the use of feed, as well as reducing production costs[6]. The discrepancy in the content of these effective vehicle transactions and their influence is in restraining free radicals, increasing antioxidant activity in the body, inhibiting lipid peroxida-tion and reducing oxidative stimuli. Antioxidants work to perpetuate the raw materials needed for the growth of ovarian follicles, most of which are fatty substances.

The role of treatments as antioxidants in poultry diets works to protect lipoproteins and fat-ty compounds. The other substances enter into the yolk formation from oxidation, which leads to an abundance of these substances, and then the maturation of the ovarian follicles in a short-er time than those in chickens that did not take levels of antioxidants in the diet. The role of anti-oxidants is to reduce the formation of free radicals and protect the membranes. Thus, the cells have preserved them from exposure to harmful damage due to free radicals, protecting lipopro-teins from breakdown, regulating the representation of body fats and encouraging the deposition of materials necessary for ovarian follicle growth. Thus the cells continue to carry out vital activi-ties, which results in higher production performance and quality improvement[3,12,14].

Blood traits

Measurement of PCV

The results are illustrated in Figure 1. There are statistically significant differences between the experi-mental treatments for cellular blood traits at the end of the experimental period. We note the superiority of the T6 control treatment in the volume of compressed blood cells, which amounted to 30.1% over the rest of the ad-ditional treatments.

L/H . ratio

We notice from Figure 2. A significant decrease (P<0.05) in treatment T1, T2, T3 and T5 compared to treatment T4 and control treatment T6 in the ratio of heterophil to lymphocytes L H^{-1}. The reason for the superi-ority of the additional treatments may be due to the variation in the content of these treatments from the active compounds and their effect in reducing the impact of heat stress through restricting free radicals, increasing the activity of antioxidants in the body, inhibiting lipid peroxidation and reducing oxidation catalysts[12].

Treatment	average egg weight (gm)	egg mass (gm)	Egg production% HD%	HD (egg)	feed conversion ratio
T1 VitE 0.06%	56.3	14562 b	86.4 abc	72.6 abc	1.37 abc
T2 Zeo 0.25%	58.9	14046 b	79.1 c	66.4 c	1.51 a
T3 Zeo 0.50%	60.6	16542 a	90 ab	76.8 ab	1.27 c
T4 Zeo 0.75%	59.6	1350 a	91.6 ab	77.0 ab	1.29 bc
T5 Zeo 1.0%	59.2	16755 a	94.1 a	79.0 a	1.27 c
T6 Control	56.30	14358 b	84.4 bc	69.3 ab	1.44 ab
SEM	58.527	97.61	1.497	1.346	0.0275
Adj. average	58.527	5137.2	87.77	73.56	1.36
Morale level	NS	*	*	**	**
*The different letters within the same columns are significant differences at (P<0.05). **The different letters within the same columns are significant differences at (P<0. 05). NS = Non-Significant.					

Table 2. Effect of adding different levels of Natural Zeolite and vitamin E to the diets Of laying hens (*Lohman Brown*) on productive performance of laying hens.

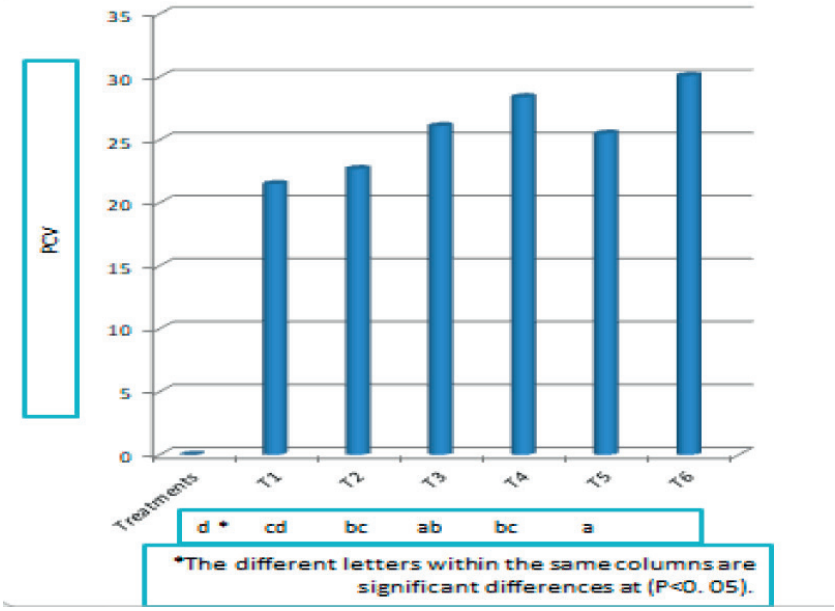

Figure 1. Effect of adding different levels of natural zeolite and vitamin E to the diets of laying hens (*Lohman Brown*) on the volume of packed blood cells.

Glucose and blood proteins

The results of Table 3. indicated that there were no significant differences (P<0.05) between the experi-mental treatments at the end of the total experimental period, as the table shows that there was no significant difference in the concentrations of (glucose, total protein and globulin) for all the different experimental treat-ments. These results agreed with what was reached by (2,5,10,17), who indicated no significant differences when adding zeolite to chicken diets. The results of the statistical analysis in the same table showed that there was a significant (P<0.05) superiority for the T4 supplement (0.75% natural zeolite) treatment in the serum albumin concentration, which did not differ significantly from the T3 supplement (0.5% natural zeolite) treatment com-pared to the rest of the experimental treatments. These results agreed with the findings[17]. Albumin is the main part of the total protein in the blood. It is manufactured by the liver and is considered an indicator of the liver's ability to produce proteins. Low albumin is evidence that the liver's manufacturing function has decreased as a result of damage to liver tissues and cells. As for globulin, which includes antibodies present in blood plasma, it is considered an indicator of immunity and gives evidence of the extent of liver tissue damage[13]. Therefore, the T4 addition treatment showed a significant improvement in liver function during hot weather, followed by the T3 treatment, which did not differ significantly from T4.

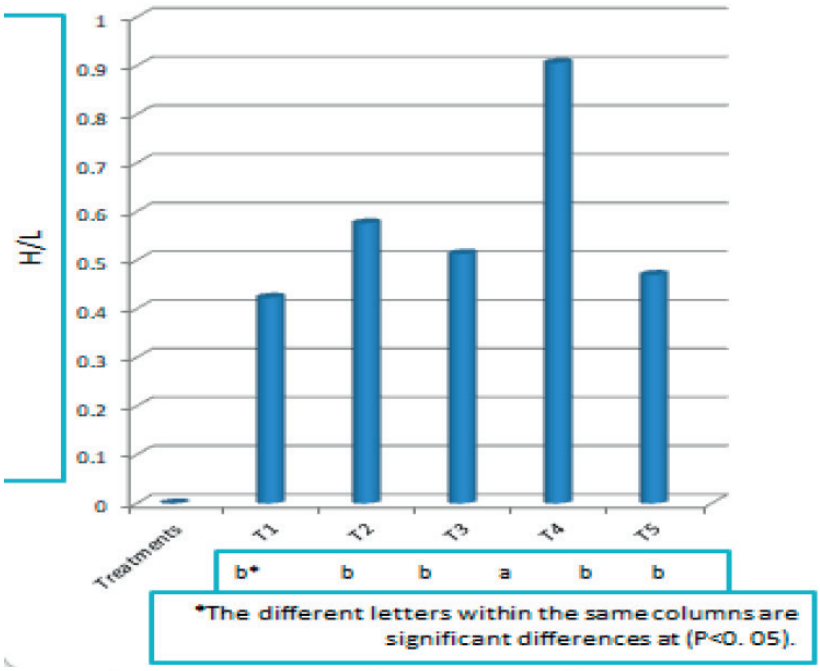

Figure 2. A significant decrease (P<0.05) in treatment T1, T2, T3 and T5 compared to treatment T4 and control treatment T6 in the ratio of heterophil to lymphocytes

Treatment	Glucose	Total protein	Albumins	Globulin
T1 VitE 0.06%	281	4.5	2.25 b*	**1.95**
T2 Zeo 0.25%	179	4.5	2.09 b	**2.11**
T3 Zeo 0.50%	167	4.61	2.51 ab	**2.09**
T4 Zeo 0.75%	87.5	6.38	3.06 A	**3.31**
T5 Zeo 1.0%	160	4.24	2.19 B	**2.05**
T6 Control	157	4.06	2.17 B	**1.89**
SEM*	21.4	2.45	0.103	**2.474**
Adj. average	172.3	4.23	2.38	**6.84**
morale level	Ns**	Ns	0.029	**Ns**

*** SEM: Standard Error Mean.**

**** GM: It means that there are no significant differences between the mean of the transactions at the level of significance (P≤0.05).**

a, b, c: the different letters within the same row indicate the presence of significant differences between the treatments at the level of significance (P≤0.05).

Table 3. The effect of adding different levels of natural zeolite and vitamin E to the diets of laying hens (*Lohman Brown*) on blood biochemical characteristics (HD) during the productive period (43-54) weeks (20/7/2021-13). 10/2021).

Conclusions

We conclude from this study that adding zeolite to laying hens' diets at a rate of 1% led to an in-crease in egg production, egg mass and a decrease in the feed conversion ratio (gm of feed/gm of eggs).

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