



Effect of Adding Different Levels of Dried Eggshell Powder on Diet upon The Biochemical Characteristics of Blood Serum of Lohman Chicken



Essam T. Dawoodi ^{1*} and Rashid H. Dalawi ²

¹ Animal Production Department, Directorate of Agriculture, Kirkuk, Iraq.

² Animal Production Department, College of Agriculture, Kirkuk University, Kirkuk, Iraq.

Abstract

THIS study was conducted in the fields of the Department of Animal Production, College of Agriculture, University of Kirkuk, for the period from 7/24/2023 until 10/1/2023, with the aim of adding different levels of chicken egg shell powder to diet of Lohman laying hens and its effect on the blood characteristics. 100 hens with 28-weeks-old were used, and divided randomly into five treatments, 20 birds for each treatment (T1=0% egg shell powder, T2=25% egg shell powder, T3=50% egg shell powder, T4=75% eggshell powder, T5=100% eggshell powder). Fresh blood samples were withdrawn from the wing vein from the chicken and placed in test tubes devoid of anticoagulants and left for 6 hours to analyse some blood serum characteristics (Calcium, phosphor, LDL, HDL, AST, ALT, total protein, uric acid, and total cholesterol). SAS version 4.9 and the CRD method were used to analyse data, Duncan's multi-range test was employed to determine how much the means of the coefficients for each attribute under study varied from one another. The present study indicates, using of eggshell powder in the diet of the laying hens decrease the AST liver enzyme, and the total cholesterol on the blood, and did not effect on the other blood parameters.

Keywords: eggshell, powder, layer, blood, characteristics.

Introduction

The eggshell's chemical makeup is made up of 98% dry matter and 2% water. Conversely, the dry matter is composed of 5% crude protein and 93% ash [1].

Calcium carbonate, calcium phosphate, and magnesium carbonate crystals are bonded together with some organic matter and water to form the network of protein fibers that makes up an eggshell [2]. Additionally, high in calcium (98.2%) are eggshells. In minuscule levels, approximately 0.9% of each element is made up of magnesium and phosphorus [3]. Eggshells also contain a few other trace elements, including boron, copper, iron, molybdenum, sulfur, silicon, and zinc [4]. Numerous factors, including food [5, 6, 7], ovoposition time [8], and hen age [9], have an impact on calcium levels. There is a growing global need to identify new, pure sources of calcium due to the rising calcium deficit. The calcium carbonate that comes from artificial sources is more bioavailable than the calcium carbonate found in bone meal [10]. In addition to calcium carbonate, oyster shells contain lead,

aluminum, mercury, and cadmium, among other hazardous metals. [11]

But eggshells do not do this, as they do not contain any of these toxic elements. Eggshell is a mixture of shell, membranes and a small amount of egg. The shell is obtained by drying the remains in an egg processing plant [12]. The eggshell must be processed in the producing factories to reduce microbial contamination [13].

The blood concentration of calcium starts to establish a correlation, accounting for the absence of a relationship between calcium intake and blood concentration [14]. PTH and calcitonin are two hormones that often regulate blood calcium levels [15]. Body part imaging stops all blood loss through bone resorption, whereas PTH stops all blood loss through bone resorption [16]. Several factors affect calcium absorption: site of absorption, vitamin D3, calcium to phosphorus ratio, lipids, pH, feed calcium level, feed phosphorus level, feed salt level, mycotoxins, phytates and oxalates, fibre, magnesium and iron [17]. The aim of current study is to find the

*Corresponding authors: Essam T Dawoodi, E-mail: essamtaseen@gmail.com, Tel.: +9647705652949

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effect of adding different levels of eggshell powder on the biochemical characteristics of blood serum of Lohman chicken.

Material and Methods

The experiment was conducted in the fields of the Department of Animal Production, College of Agriculture, University of Kirkuk, for the period from 7/24/2023 to 10/1/2023, with the aim of adding different levels of chicken egg shell powder to diet of Lohman laying hens and its effect on the blood characteristics. 100 hens with 28-weeks-old were used, and divided randomly into 5 treatments, 20 birds for each treatment, and placed in production batteries inside a hall with dimensions of 5 meters by 15 meters. The egg shell was boiled for an hour in water, then the shell was washed well and cleaned of impurities. Once the washing was completed, the eggshell was dried in the sun for 3 days, stirring constantly. After the end of the drying period, the eggshell was broken and crushed using a grinder, after which it was ready to be mixed with the feed. Five parameters were used for the duration of the experiment, and the diets were used in this study are shown in Table 1 [18]. In the end of the experiment, Fresh blood samples were withdrawn from the wing vein from the chicken and placed in test tubes devoid of anticoagulants and left for 6 hours, after which the serum was separated by a centrifuge at a speed of 3000 rpm for 15 minutes, and the serum was stored at -20°C until biochemical tests were performed [19, 20] to analyse some blood serum characteristics (Calcium, phosphor, LDL, HDL, AST, ALT, total protein, uric acid, and total cholesterol. SAS version 4.9 and the CRD method were used to analyse data, Duncan's multi-range test [21] was employed to determine how much the means of the coefficients for each attribute under study varied from one another

Results and Discussion

Table (2) shows the levels of liver enzymes that affected by different levels of eggshell powder. the current study showed that there were no significant differences in the enzyme (AST), While the ALT enzyme was significantly different between the treatments, as it was at a high level in the second treatment (25.06), and its lowest value was in the third treatment (4.90). The current study agreed with the findings of [22] when he added egg shell powder to the diet of laying hens, as it was concluded from

the study that there were no significant differences in liver enzymes (ALT and AST) and cholesterol.

Table (3) shows the levels of ca, and P that affected by different levels of eggshell powder. The study showed that there were no significant differences between the treatments in terms of the percentage of phosphorus, but the level of calcium in the blood was high in the first and second treatments, and low in the fourth and fifth treatments. The current study agreed with the findings of [23], he found in his study in which he used egg shell powder in the diet of laying hens that there was a highly significant difference in the levels of calcium and phosphorus in the blood.

Table (4) shows the level of effect of total cholesterol, HDL, and LDL that affected by different levels of eggshell powder. The study showed that there were no significant differences between the treatments in the level of HDL, and LDL. The current study agreed with the findings of [22] when he added egg shell powder to the diet of laying hens, as it was concluded from the study that there were no significant differences in the HDL and total cholesterol.

Table (5) shows the level of total protein, uric acid, and glucose that affected by different levels of eggshell powder. The current study showed that there were no significant differences in the three traits.

Conclusion

Present study indicates, using of eggshell powder in the diet of the laying hens decrease the AST liver enzyme, and the total cholesterol on the blood, and did not effect on the other blood parameters.

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Authors contributions:

The experiment has made design by the second author, and the other works was done by the first author, and both have critically reviewed its content and have approved the final version submitted for publication.

Conflicts of interest

The authors declared no competing interests

TABLE 1. The percentage (%), and chemical composition of fed materials fed to experiment birds.

Ingredients	Control	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Wheat	16.30	16.30	16.30	16.30	16.30
Yellow corn	47.07	47.07	47.07	47.07	47.07
Soybean meal (48%)	20.00	20.00	20.00	20.00	20.00
Barley	4.00	4.00	4.00	4.00	4.00
Oil	0.60	0.60	0.60	0.60	0.60
Limestone	9.00	6.75	4.5	2.25	0
Eggshell powder	0	2.25	4.5	6.75	9.00
Table Salt	0.20	0.20	0.20	0.20	0.20
Methionine	0.07	0.07	0.07	0.07	0.07
Lysine	0.01	0.01	0.01	0.01	0.01
Laymix 2.5	2.50	2.50	2.50	2.50	2.50
Colin Chloride	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Energy / protein ratio	167.03	167.03	167.03	167.03	167.03
Energy	2753	2753	2753	2753	2753
Protein%	16.08	16.08	16.08	16.08	16.08
Lysine%	0.81	0.81	0.81	0.81	0.81
Methionine%	0.44	0.44	0.44	0.44	0.44
Calcium%	3.76	3.76	3.76	3.76	3.76
Phosphors%	0.41	0.41	0.41	0.41	0.41

TABLE 2. The levels of liver enzymes that affected by different levels of eggshell powder.

Treatments	Traits	AST U/L	ALT U/L
	0% eggshell powder	182.80±10.30 ^a	11.84±3.48 ^b
	25% eggshell powder	160.60±7.33 ^a	25.06±6.89 ^a
	50% eggshell powder	174.50±11.73 ^a	4.90±1.70 ^a
	75% eggshell powder	167.72±9.26 ^a	5.98±0.56 ^b
	100% eggshell powder	166.02±3.76 ^a	5.62±0.60 ^b
	Sig.	N.S.	**

*Mean values of logarithmic count for different products with different superscript letters in the same column are significantly different at (P<0.05). AST= Aspartate transaminase, ALT= Alanine transaminase.

TABLE 3. The levels of ca, and P that affected by different levels of eggshell powder.

Treatment	Traits	Ca. mg/dL	Phos. mg/dL
	0% eggshell powder	27.42±1.06 ^a	5.01±0.24 ^a
	25% eggshell powder	27.12±1.04 ^a	4.69±0.44 ^a
	50% eggshell powder	24.72±1.62 ^{ab}	5.24±0.70 ^a
	75% eggshell powder	21.70±1.56 ^a	3.93±0.36 ^a
	100% eggshell powder	23.10±0.61 ^b	5.22±0.34 ^a
	Sig.	*	N.S.

*Means with different superscript in the same column differs significantly at (p<0.05)

TABLE 4. The levels of total cholesterol, HDL, and LDL that affected by different levels of eggshell powder.

Traits	T-Chol	HDL	LDL
Treatment	mg/dL	mg/dL	mg/dL
0% eggshell powder	126.60±10.98 ^{ab}	32.84±1.64 ^a	33.53±1.66 ^a
25% eggshell powder	162.00±25.33 ^a	35.32±5.01 ^a	36.08±4.99 ^a
50% eggshell powder	136.60±18.88 ^{ab}	33.34±2.77 ^a	33.99±2.73 ^a
75% eggshell powder	101.80±14.02 ^b	26.34±2.80 ^a	27.19±2.79 ^a
100% eggshell powder	140.60±7.77 ^{ab}	34.02±2.27 ^a	34.75±2.27 ^a
Sig.	*	N.S.	N.S.

**Means with different superscript in the same column differs significantly at (p<0.05)

TABLE 5. The level of total protein, uric acid, and glucose that affected by different levels of eggshell powder.

Traits	Total protein	Ureic acid	GLU-G
Treatment	g/L	mg/dL	mg/dL
0% eggshell powder	5.42±0.12 ^a	4.40±0.75 ^a	218.40±4.48 ^a
25% eggshell powder	5.52±0.29 ^a	4.20±0.38 ^a	219.20±12.86 ^a
50% eggshell powder	5.74±0.52 ^a	6.20±1.46 ^a	232.40±8.65 ^a
75% eggshell powder	4.96±0.22 ^a	7.00±1.23 ^a	244.40±3.41 ^a
100% eggshell powder	5.84±0.11 ^a	6.20±0.80 ^a	233.80±7.77 ^a
Sig	N.S.	N.S.	N.S.

*Means with different superscript in the same column differs significantly at (p<0.05)

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تأثير إضافة مستويات مختلفة من مسحوق قشر بيض الدجاج المجفف على الخصائص البيوكيميائية لمصل الدم لدجاج لوهمان

عصام تحسين الداودي^{1*} و رشيد حسن الدلوي²

¹ قسم الإنتاج الحيواني - مديرية الزراعة - كركوك - العراق.

² قسم الإنتاج الحيواني - كلية الزراعة - جامعة كركوك - كركوك - العراق.

الملخص

اجريت تجربة في حقول قسم الانتاج الحيواني كلية الزراعة جامعة كركوك للمدة من 2023/7/24 ولغاية 2023/10/1 بهدف اضافة مستويات مختلفة من مسحوق قشرة بيض الدجاج الى عليقة الدجاج والبيض وتأثيره على صفات الدم. تم استخدام مائة طائر بعمر 28 أسبوع، وزعت عشوائياً على خمس معاملات، عشرين طائراً لكل معاملة (0% مسحوق قشر البيض، 25% مسحوق قشر البيض، 50% مسحوق قشر البيض، 75% مسحوق قشر البيض، 100% مسحوق قشر البيض). تم سحب عينات الدم من الوريد الجناحي من الدجاج ووضعها في أنابيب اختبار خالية من مضادات التخثر وتركت لمدة 6 ساعات لتحليل بعض خصائص مصل الدم (الكالسيوم، الفوسفور، ALT، AST، HDL، LDL، البروتين الكلي، حمض البوليك، وتم استخدام اختبار SAS الإصدار 4.9 وطريقة CRD لتحليل البيانات، وتم استخدام اختبار دنكان متعدد المدى لتحديد مدى اختلاف متوسطات المعاملات لكل سمة قيد الدراسة عن بعضها البعض. إن استخدام مسحوق قشر البيض في علائق الدجاج البيض يخفض إنزيم الكبد AST والكوليسترول الكلي في الدم، ولم يؤثر على باقي مؤشرات الدم.

الكلمات الدالة: قشر البيض، مسحوق، الدجاج البيض، الدم، الخصائص.