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Effect of substituting synthetic methionine and lysine with herbal, with adding thyronine by 120% in low-protein diets of laying hens on productive and some blood traits.

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Abstract

A total of 160 Lehman Brown layer 45 weeks dy completely randomized with five replicates (cages in battery system) each replicates contain of four birds and the period of this experiment was 112 days, The nutritional treatments were , T1: basal diet (control) contained 16.32% cruds protein (C.P) with 0.41% synthetic methionine (S.Thrionine) , T2: basal diet (16.32% C.P) with (0.41%) herbal methionine (H.M) and (0.106% S.Thironine) . T3 : basal diet (16.18%C.P) with (0.42%S.Mthionine), (0.05% herbal lysine :H.L) and (0.106% S.Thrionine) T4: basal diet (16.18% C.P) with (0.42% H.methionine), (0.05%H.Lysine) and (0.106% S.Thrionine) , T5: basal diet (15.45%C.P) with (o.42% S .methionine) , 0.12% S.Lysine) and (0.116% S.thronine) T6: basal diet (15.46% C.P) with (0.42% H.methionine),(0.045% H.Lysine) and S. threonine), T7: basal diet (15.12%C.P) With (0.148% S.methionine , (0.150% S.lysine) and (0.130% S.thrionine) ,T8: basal diet (15.12%C.P) with (0.148% H.methionine) , (0.150%H.lysine) and (0.130% S.thrionine , The experiment showed that there were no differences in egg production and egg mass between treatments, while significant differences were found in egg weight between treatments. , While no differences appeared between the treatments for the characteristic of shell thickness, specific weight of shell, and egg shape index, nor did significant differences appear in the biochemical properties of blood serum..

Key words: ***Herbal-Met , DL-Lysine , layers , Threonine ,egg quality.*** .
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Introduction

The role of amino acids, especially the essential ones, is very important because they play vital roles in synthesis different proteins in the body and they have several functional and synthesis roles in addition to important protein tissues (growth) and the formation of white proteins (egg albumen) and their yolks (Igbasah et al., 2012) [1] and there are five essential amino acids: The first determinant is methionine, the second is lysine, the third is thyronine, the fourth is tryptophan, the fifth is valine (Binder, 2003 and Bhutyal et al., 2019). [2] Theronine, as the third specific essential amino acid, has important vital roles in the synthesis of protein in the body and is involved in the synthesis of growth hormone, noting that the vital activity of this hormone is to regulate the important food metabolism processes in the growth and production of eggs (Alagawany et al , 2021). [3] soybean meal is poor in its content of one or more specific essential amino acids and the second is high in its requirement in one or more of the five identified essential amino acids (Fancher and Jensen, 1989, NRC, 1994, cheeke, 1999, Baker et al., 2002, Makinde et al., 2017) [4] Reducing the percentage of protein diets for laying hens and broilers requires an increase in the level of one or more of these five specific essential amino acids to compensate for the deficiency in the protein percentage. In the diets of domestic birds (Al-Nuaimy, 1980, Kamran et al., 2008, Saki et al., 2010), [5] and given the general trend towards the production of what is called organic poultry, including finding alternatives to food additives for the diets of domesticated birds naturally, which are parts of the plants of the plant kingdom, which is called the Photobiotic (Halder and Roy, 2007 and Kalbande et al., 2009 , Saeed , 2020), [6] Reducing the percentage of protein in the diets of laying hens (production of table eggs) by 1-3% by reducing the percentage of soybean powder, which is the main source of protein in the diet, in order to reduce the cost of feeding by increasing the percentage of grains that are the source of energy (corn or Wheatgrass) can increase the level of essential amino acids by up to 30% more than dietary requirements without negatively affecting productive performance. (Schoitysk et al., 1991, Sumimers, 1993, and Tripathi, 2016). [7] Therefore, the study aimed at the effect of substituting herbal methionine and lysine instead of the synthetic source on the productive performance of laying hens and the qualitative characteristics of laying hens' eggs , [8]

Materials and methods

The study was conducted in the poultry field at the Al-Sayadah of the Department of Animal Production / College of Agriculture - University of Kirkuk for the period from 20/2/2022 to 11/6/2022 for (112) days, except for the introductory period of ten days, in which 160 laying hens of Lohmann Brown were used at the age of (45) weeks, divided in to 8 treatments in the experiment, with 5 replications and 4 birds for each replicate. Rasied In battery cages consisting of four floors, each floor consists of two cages, and the dimensions of one cage were (60 x 50 x 45) cm,. Water is constantly available in front of the chickens, and the lighting period is 17 hours a day. The birds were fed on the diets of the experiment shown in Table (1). The cumulative amount of feed consumed, the feed conversion coefficient, were calculated, and the daily egg production was recorded basis of (HD%) and the egg mass was calculated, and the egg weight was measured every 28 days and the qualitative characteristics of the egg were studied by using (Verinia) And using 8 eggs/treatment, and some qualitative characteristics of the egg were recorded according to the treatments mentioned by Saki et al., (2010), and the results were analyzed statistically using the SAS program, (2001) and Duncan's choice, (1955) to choose the significance among the treatments at the level of probability 5%. [2].

Table 1. Ingredients and nutrients composition in basal diets

Ingredient %	Dietary Treatment							
	T1	T2	T3	T4	T5	T6	T7	T8
Wheat	62.39	62.4	64.97	64.97	64.55	64.615	65	65
Corn	6.63	6.63	6.78	6.78	6	6	-	-
Barley	-	-	-	-	4.47	4.47	9.868	9.868
Wheat bran	-	-	-	-	-	-	2	2
Soybeans 44%	-	-	-	-	-	-	7	7
Soybeans 47%	16	16	14.97	14.97	12.63	12.63	4	4
Oil	2.75	2.75	1	1	-	-	-	-
Limestone	9.26	9.26	9.26	9.26	9.26	9.26	9.26	9.26
Di – calcim phosphate	2	2	2	2	2	2	2	2
Salt	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Vitmins and minerals	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DL-Lysine	-	-	0.05	-	0.12	-	0.15	-
H-Lysine	-	-	-	0.05	-	0.045	-	0.15
DL – methionine	0.41	-	0.42	-	0.42	-	0.148	-
H - methionine	-	0.41	-	0.42	-	0.42	-	0.148
Threonine	0.106	0.106	0.106	0.106	0.116	0.116	0.130	0.130
Choline chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100	100	100	100
Calculated chemical composition %								
ME, kcal/kg	2796.27	2796.27	2699.13	2699.13	2629.65	2631.67	2571.43	2571.43
CP	16.32	16.32	16.18	16.18	15.45	15.46	15.12	15.12
Lysine	0.68	0.68	0.71	0.71	0.73	0.66	0.74	0.74
Methionine	0.66	0.66	0.67	0.67	0.66	0.66	0.38	0.38
Threonine	0.4	0.4	0.38	0.38	0.36	0.36	0.35	0.35
Phosphorus available	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Calcium	4.01	4.01	4.01	4.01	4.01	4.01	4.01	4.01

Results

Table 2 shows the comparison of supplementation of two sources of methionine and lysine (synthetic and herbal) in low-protein diets on the productive performance of laying hens, indicating that there were no statistically significant differences in the percentage of egg production and egg mass between all treatments. The results agree with what was found by Kumari (2011) and Al Hashmi (2020), in which they indicated that egg production was not affected by herbal rather than synthetic methionine replacement in laying hens diets, while this result differed with what was obtained. By Reothia et al. (2016) who indicated that egg production significantly improves when grass-fed methionine is added at a rate of 0.5% kg/t of feed compared to synthetic methionine, as well as Reothia et al. (2016) indicated that there were no significant differences between the treatments in egg mass characteristics, while these results are inconsistent with what was obtained by

Vankrimpen et al. (2014) who indicated that the ratio of methionine 3.5 g / kg of feed to the ration led to significant differences in eggs, while he found significant differences in the weight of eggs, where the first treatment was superior to the rest of the treatments, the results did not agree with what was obtained by Agric (2015), where it was found that there was no significant. Differences in mean egg weight when herbal methionine was added as a substitute for synthetic methionine.

Table 2 shows a comparison of the addition of two sources of methionine and lysine (Synthetic and herbal) in low-protein diets on the productive performance of laying hens

Nutritional Treatment	Egg production	Egg weight	Egg mass
T1	77.50±2.47	65.95±1.05 a	51.30±2.23
T2	77.75±2.32	61.28±1.09 b	47.63 ±1.52
T3	79.00±3.08	62.41 ±1.51 ab	49.40 ±2.48
T4	77.66±4.75	62.54±1.02 ab	48.69 ±3.57
T5	76.58±1.06	64.58±1.26 ab	49.34 ±1.41
T6	77.08±3.79	61.61±1.61 b	47.08 ±1.89
T7	80.66 ±2.76	63.50± 1.46 ab	51.24 ±2.19
T8	75.58 ±3.04	64.40± 0.82 ab	48.63 ±1.84
Severity Level	N.S	**	N.S

* Different letters within one column indicate significant differences (P<0.05).
N.S * There were no significant differences between the mean values of one column

Notes from the results shown in Table 3 that there are significant differences (P<0.05) in the average of feed consumed, as the eighth treatment recorded the lowest amount of feed consumed, which amounted to 87.45 g/bird/day, while the first treatment recorded the highest amount of feed consumed, which amounted to 101.57. g/bird/day, , while no significant differences were observed in food conversion factor between experimental treatments, the results agreed with Al-Hashemi (2020) when replacing herbal methionine as a substitute for industrial methionine, while The results differed with Igbasan et al. (2012), where significant differences were found between the experimental treatments when two sources of industrial and herbal methionine were added. As for the rate of protein conversion and the rate of conversion of methionine, there were significant differences between the experimental treatments. These results agreed with what was found by Karla (2012) who found differences Significant in protein conversion rate and methionine conversion rate between treatments, while no significant differences were observed between experimental treatments in the characteristic of lysine conversion ratio, the results agreed with Al-Khafaji and Al-Naimi (2021) indicated that there were no significant differences between for experimental transactions

Table 3 shows a comparison of the addition of two sources of methionine and lysine (Synthetic and herbal) in low-protein diets on the productive performance of laying hens(mean±S.E)

Nutritional Treatment	Feed intake (g)	Feed conversion ratio (g:g)	Protein conversion ratio	Methionin conversion ratio	Lysine conversion ratio
T1	101.57±1.71 a	1.99±0.07	0.335±0.01 ab	13.43±0.50 a	13.84±0.51
T2	92.62±1.93 bc	1.95±0.06	0.353±0.00 a	14.13±0.30 a	14.56±0.31
T3	96.77±0.72 ab	1.98±0.11	0.3601±0.0 a	15.09±0.76 a	15.99±0.81
T4	97.75±2.83 ab	2.05±0.18	0.337±0.03 ab	14.13±1.26 a	14.97±1.34
T5	99.46±0.93 a	2.02±0.07	0.336±0.00 ab	14.34±0.39 a	15.86±0.44
T6	100.02±1.62 a	2.13±0.06	0.337±0.01 ab	14.36±0.68 a	14.368±0.6
T7	99.13±3.50 a	1.94±0.08	0.310±0.01 ab	7.86±0.27 b	15.31±0.53
T8	87.45±1.86 c	1.81±0.10	0.2960±0.0 b	7.50±0.25 b	14.60±0.48
Severity Level	**	N.S	**	*	N.S

* Different letters within one column indicate significant differences (P<0.05)
N.S * There were no significant differences between the mean values of one column

Table 4 indicates that the addition of two sources of methionine and lysine (Synthetic and herbal) and synthetic threonine in low-protein diets in the average of some external characteristics of the egg indicates that there are no significant differences between treatments in shell thickness, strength of shell resistance to breaking, Egg specific gravity,shape index, percentage of shell weight, The results agreed with Karia (2012) who observed that there were no significant differences in the relative weight of the egg shell and Egg specific gravity, and the results agreed with Al-Khafaji and Al-Naimi (2021) they indicated that there were no significant differences in the characteristics of the egg shape index, the relative weight of the shell, the thickness of the shell, and the weight of the shell at The use of herbal methionine and lysine as a substitute for methionine and lysine synthesized in the diet of quail females, and the results did not agree with Hadidy (2018), who found a significant improvement in the weight of the shell and the thickness of the shell in favor of the addition treatments with herbal methion

Table (4)effect of addition two sources of methionine and lysine (artificial and herbal) in low-protein diets in the rate of external egg traits (mean ± S. E)

Nutritional Treatment	Shell thickness (mm)	Egg Specific gravity %	Shape index%	Percentage of shell weight
T1	0.43±0.01	1.08±0.00	76.75±0.56	9.67 ±0.17
T2	0.42±0.01	1.09±0.00	74.10±2.06	11.19±0.64
T3	0.41±0.01	1.08±0.00	77.03±1.73	10.14±0.53
T4	0.39±0.04	1.08 ±0.00	75.98±1.06	9.50±1.08
T5	0.41±0.01	1.08±0.00	76.95±1.80	10.16±0.60
T6	0.40±0.01	1.09±0.00	76.64±0.83	10.78±0.44
T7	0.42±0.01	1.09±0.00	77.41±1.31	11.07±0.51
T8	0.41±0.01	1.08±0.00	74.63±1.22	9.88±0.83
Severity Level	N.S	N.S	N.S	N.S

* Different letters within one column indicate significant differences (P<0.05).
N.S * There were no significant differences between the mean values of one column

The results of the statistical analysis in Table (4) showed that there were no significant differences in blood glucose and blood serum cholesterol among all feed birds, as well as in blood

cholesterol and total protein in the blood among feed birds. The blood serum of birds of experimental treatments, as well as in the concentration of GPT in blood serum, there were no significant differences between the experimental treatments. These results were agree with what was obtained by the[2].

Table (5) Comparison of two sources of methionine and synthetic and herbal lysine or synthetic thyronine in low-protein diets on some biochemical characteristics of blood in laying hens (mean ± S.E)

Nutritional Treatment	Glucose Mg/mm	Cholesterol Mg/mm	Total protein Gm/mm	GOT IU/mm	GPT IU/mm
T1	11.31 ±217.51	9.62±139.52	0.41±4.23	0.54±3.99	0.64±9.38
T2	9.86±218.13	7.27±141.33	0.58±3.91	0.43±3.34	0.52±8.27
T3	13.54±216.42	9.63±138.81	0.73±3.87	0.57±2.71	0.72±8.07
T4	9.79±218.43	9.82±137.61	0.41±3.82	0.77±3.61	0.58±6.48
T5	11.22±219.08	8.55±136.73	0.53±3.69	0.73±2.78	0.48±8.74
T6	9.43±217.33	9.43±137.64	0.59±3.88	0.77±3.62	0.22±8.54
T7	11.38±217.55	8.76±140.22	0.34±3.82	0.63±4.12	0.18±7.07
T8	9.56±216.24	7.85±137.39	0.42±3.68	0.64±3.31	0.37±8.46
Severity Level	N.S	N.S	N.S	N.S	N.S

* Different letters within one column indicate significant differences (P<0.05).
N.S * There were no significant differences between the mean values of one column

Discussion

1- The addition of herbal amino acids (methionine and lysine) to the diets did not have a negative effect on productive performance, blood characteristics and some qualitative characteristics of laying hens eggs.

2- The use of the herbal amino acids methionine and lysine in laying hens diets led to the complete replacement of industrial sources.

3- Addition of essential amino acids in both herbal and synthetic forms at a level of 10% more than the standard recommended nutritional requirement according to the production guide for chickens (Luhmann brown) had no significant effect on egg production, egg weight and egg mass.

4-No significant differences were observed in the biochemical characteristics of blood between the transaction birds.

5- The sensory characteristics of eggs were not affected significantly in the sources of methionine and lysine (artificial and herbal.(

6- The results showed that the seventh treatment achieved the best results in terms of productivity.

Conclusion

1- The use of the herbal amino acids methionine and lysine in laying hens diets led to the complete replacement of industrial sources.

2-No significant differences were observed in the biochemical characteristics of the blood of birds

3- The addition of thyronine, 10% more than the requirement, improved the average egg weight (1).

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تأثير استبدال المثيونين الاصطناعي والليسين بالأعشاب بإضافة الثيرونين بنسبة 120٪ في العلائق منخفضة البروتين للدجاج البياض على الإنتاجية وبعض صفات الدم.

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- البحث مستل من اطروحة الدكتوراه للباحث الاول.

المستخلص

في هذه التجربة تم تقييم تأثير إضافة مصدرين لإضافة مصدرين من الميثيونين والليسين (الصناعي والعشبي) إلى العلائق منخفضة البروتين على الصفات الخارجية والداخلية والتركيب الكيميائي للبيض وبعض المتغيرات الكيميائية الحيوية في الدم بإجمالي 160 دجاجة. في عمر 45 أسبوعًا ، تم توزيعه عشوائيا الى ثمانية معاملات مع خمسة مكررات **الاولى:** نسبة c.p 16.5% سد احتياج من المثيونين باضافة 0.41% من المثيونين الصناعي مع اضافة 0.106% الثيرونين. **الثانية:** نسبة c.p 16.5% سد احتياج من المثيونين باضافة 0.41% من المثيونين العشبي مع اضافة 0.106% الثيرونين. **الثالثة:** نسبة c.p 16% سد احتياج من المثيونين واللايسين باضافة 0.42%من المثيونين الصناعي واضافة 0.05%من اللايسين الصناعي مع اضافة 0.106% الثيرونين. **الرابعة:** نسبة c.p 16% سد احتياج من المثيونين واللايسين باضافة 0.42% من المثيونين العشبي واضافة 0.05% من اللايسين العشبي مع اضافة 0.106% الثيرونين **الخامسة:** نسبة c.p 15.5% سد احتياج من المثيونين واللايسين باضافة 0.42% من المثيونين الصناعي واضافة 0.12% من اللايسين الصناعي مع اضافة 0.116% الثيرونين. **السادسة:** نسبة c.p 15.5% سد احتياج من المثيونين واللايسين باضافة 0.42% من المثيونين العشبي واضافة 0.045% من اللايسين العشبي مع اضافة 0.116% الثيرونين. **السابعة:** نسبة c.p 15 % سد احتياج من المثيونين واللايسين باضافة 0.148% من المثيونين الصناعي واضافة 0.150% من اللايسين الصناعي مع اضافة 0.130% الثيرونين. **الثامنة:** نسبة c.p 15% سد احتياج من المثيونين واللايسين باضافة 0.148% من المثيونين العشبي واضافة 0.150% من اللايسين العشبي مع اضافة 0.130% الثيرونين، أظهرت التجربة عدم وجود فروق في إنتاج البيض وكتلة البيض بين المعاملات، بينما وجدت فروق معنوية في وزن البيض بين المعاملات، بينما لم تظهر فروق بين المعاملات الخاصة بسمك القشرة ، والوزن النوعي للقشرة ، ومؤشر شكل البيضة ، ولم تظهر فروق معنوية في الخواص البيوكيميائية لمصل الدم.

الكلمات المفتاحية: مثيونين العشبي، لايسين الصناعي، الثيرونين ، جودة البيض ، الدجاج البياض