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THE EFFECT OF DIFFERENT SOURCES OF CALCIUM IN THE DIET ON SOME PRODUCTIVE TRAITS OF LAYING HENS

Hassan F.A. Al-Ziyadi, Ibrahim F.B. Al-Zamili and Jassim K.M. Al-Gharawi

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: T1: The first treatment: the diet contained 8% of limestone, T2: The second treatment: the diet contained 8% of the eggshell powder, T3: The third treatment: the diet contained 8% of oyster powder. The results indicated that no significant differences among the sources of calcium on egg production ratio (H.D%), egg weight ratio, feed conversion between all treatments.

Key words: calcium sources, productive traits, laying hens.

Introduction

The great development of laying hens in recent years is represented in the development of the body and digestive system of these birds, reflected in the herd requirements and nutritional needs (Gerald, 2006; Al-Gharawi *et al.,* 2018). Calcium is an important nutrient in the production and production of laying hens eggs, which is obtained from many sources, including limestone and oyster shell, widely used in laying hens diets and the calcium utilization rate in limestone powder is lower than the calcium utilization rate in seashell powder by laying hens (Al-Fayyad and Naji, 2012). The size of the granules of the rich sources have a significant impact, as the grinding of these granules is a very finely ground, the speed of which passes through the gut, and not keeping enough amounts of calcium needed by the body in the process of forming an egg shell, which usually occurs during the night hours, so the source of calcium that contains large granules is kept for a longer period in the giblets and snipers, will extend its stay in the gut, therefore, quantities will remain until night time to prepare the uterus with the calcium needs to make the egg shell (Lesson and Summers, 1997). Roland (1986) indicated that adding calcium of different sizes, whether large or small, to the laying of chicken, no significant effect on the quality and quality of the egg shell, when levels added to food were sufficient, whereas when the added levels were insufficient, it will reduce the quality of the egg shell and the quality of the eggs produced, as well as increasing the proportion of broken eggs, as a result of the formation of a light shell, especially in the advanced ages of laying hens. The different sources of calcium may lead to the difference in the amount of calcium that must be provided to meet the needs of laying hens of calcium needed to obtain high-quality quality shells in the eggs produced (Osman *et al.,* 2010). The absorbed calcium from the intestine is the main source in processing the amount of calcium needed to form egg shells, but the efficiency of chicken in the process of calcium metabolism decreases with age (Al-Batshan *et al.,* 1994). Therefore, the study aimed to determine the effect of different sources of calcium on productive performance of laying hen (ISA Brown).

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 T1: The first treatment: the diet contained 8% of limestone, T2: The second treatment: the diet contained 8% of the eggshell powder, T3: The third treatment: the diet contained 8% of oyster powder.

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):

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

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):

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

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

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 using different sources of calcium in diets on egg production (H.D%), the table indicates that there were no significant differences in the ratio of egg production among all treatments in the experiment and in all periods in which the measurement was done in this capacity from 22 weeks to 32 weeks of production period, in addition to the absence of significant differences in the ratio of cumulative egg production among all treatments, agreed with Brister *et al.,* (1981); Cheng and Coon, (1990); Lichovnikova (2007); Olgun *et al.,* (2015), concluded that there were no significant differences in the percentage of egg production when using different sources of calcium in the diets and feeding the laying hens, they explained that it was due to the fact that the quantities used in diets from calcium sources were sufficient to meet the needs of the crust of calcium, although calcium utilization and absorption efficiencies differ in these sources.

Table 1: The effect of different sources of calcium in the diet on weekly egg production (H.D%) of laying hens (mean ± standard error).

Treat-ments	Age (weeks)			Total
	22	28	32	
T1	0.33±77.86	0.63±90.15	1.16±92.60	0.06±85.29
T2	0.02±78.25	0.65±90.33	1.23±92.75	0.17±85.61
T3	1.15±78.55	0.64±90.23	1.06±92.60	0.37±85.45
Sig.	N.S	N.S	N.S	N.S

T1: The first treatment: the diet contained 8% of limestone, T2: The second treatment: the diet contained 8% of the eggshell powder, T3: The third treatment: the diet contained 8% of oyster powder. N.S no significant differences.

Egg Weight

Table 2 shows the effect of using different sources of calcium in diets on the average egg weight, the table indicates that there were no significant differences in the average egg weight between all treatments in the experiment and in all periods during which the measurement was done in from the age of 22 weeks to 32 weeks of the production period, in addition to the significant differences in the cumulative egg weight rate between all treatments, agreed with Muir *et al.,* (1975); Makled and Charles (1987); Keshavarz and Nakajima (1993); Safaa *et al.,* (2008; Erol and Yusuf (2015), noticed no significant differences in the average weight of eggs when feeding laying hens on diets containing different sources of calcium, the reason is that the quantities deposited in the digestion when the egg shell is formed

Table 2: The effect of different sources of calcium in the diet on egg weight (g) of laying hen (mean ± standard error).

Treat-ments	Age (weeks)			Total
	22	28	32	
T1	53.97 ± 0.28	55.50 ± 0.68	57.41 ± 0.51	55.84 ± 0.17
T2	54.15 ± 0.03	56.69 ± 0.66	58.44 ± 1.23	56.51 ± 0.13
T3	54.40 ± 0.80	56.22 ± 0.58	57.61 ± 0.41	56.18 ± 0.44
Sig.	N.S	N.S	N.S	N.S

T1: The first treatment: the diet contained 8% of limestone, T2: The second treatment: the diet contained 8% of the eggshell powder, T3: The third treatment: the diet contained 8% of oyster powder. N.S no significant differences.

Table 3: The effect of different sources of calcium in the diet on weekly feed conversion(g diet/g egg mass) of laying hen (mean ± standard error).

Treat-ments	Age (weeks)			Total
	22	28	32	
T1	2.737±0.027	2.300±0.044	2.164±0.008	2.431±0.010
T2	2.714±0.001	2.246±0.010	2.123±0.016	2.394±0.002
T3	2.695±0.080	2.266±0.006	2.145±0.049	2.410±0.030
Sig.	N.S	N.S	N.S	N.S

T1: The first treatment: the diet contained 8% of limestone, T2: The second treatment: the diet contained 8% of the eggshell powder, T3: The third treatment: the diet contained 8% of oyster powder. N.S no significant differences.

are equal, so there is no effect on the egg weight, as there were similar environmental conditions during the productive period of laying hens.

Feed Conversion Coefficient

Table 3 shows the effect of using different sources of calcium in diets on feed conversion factor, the table indicates that no significant differences emerged between all the treatments in the experiment and in all the periods in which the measurement was conducted, which ranges from 22 weeks to 32 weeks of the production period, in addition to the absence of significant differences between all transactions in the cumulative nutritional conversion rate, agreed with Watkins *et al.,* (1977); Ahmed and Balander (2003); Saunders-Blades *et al.,* (2009); Wang *et al.,* (2014), did not notice any significant differences in the conversion factor between all treatments that contained different sources of calcium, while results did not agree with Ahmed *et al.,* (2013); Koreleski and Swiaqtiewies, (2004), noticed a significant effect on the conversion factor between groups of birds that fed different diets in their calcium sources.

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