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Effect of different levels of sugar mud substituted with oyster shell on laying hen performances

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An experiment was conducted to evaluate the effect of different levels of SM (0, 15, 30, 45 and 60 percent) substituted with oyster shell (OS) on the performances of laying hens. Two hundred ten (210) commercial white leghorn laying hens, 42 week old were placed into 30 pens, seven hens per each pen in a complete randomized block design with five treatments and 6 blocks. The trail lasted for 16 weeks. The results showed that there were no significant differences between treatments for egg production, feed intake and feed efficiency ($P>0.05$), but when more than 30% SM replaced with OS, eggs became thinner with a poor index, which might be due to high solubility of SM and its fast passage from the gut. Therefore it is suggested that up to 30% of SM could be substituted with OS for providing calcium in the diet of laying hens.

Key words: Sugar mud- Oyster shell- Laying hen

Introduction

In Khuzestan province which is located in south part of Iran annually about 100000 hectare of lands are under cultivation of sugarcane and sugar beet. In sugar factories after extracting sugar juice from these crops, lime is added to the syrup for its purification. The precipitates (3-5%) are called sugar mud. Chemical composition of SM (32-35% ca. 0.05%p) indicates that it might be useful as a source of ca in the diet of laying hens. The best source of ca is oyster shell which has 32% ca, low solubility and slow passage from the tract (Scott *et al.*, 1971; Roland, 1988; Guinote and Nys, 1991; Nakajima *et al.*, 1995).

The main problem of OS is the high cost of transportation and poor quality of ca which sometimes mixed with sand and is the cause of ca reduction (25% ca). Roland (1988) reported that low quality OS has an economical loss of about 13-20% of total egg production in poultry industry. Therefore the

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objective of this study was to determine the proper percentage of SM substituted with OS and also its effect on laying hen performances.

Materials and methods

In this experiment 210 commercial white leghorn laying hens, 42 weeks old (second phase of production) were used in a complete randomized block design with five treatments of 0, 15, 30, 45 and 60% (T1, T2, T3, T4 and T5) of SM substituted with OS in six replications of 7 hens per each replication. Feed and water were given ad libitum and diets were isonitrogenous and isocaloric.

Table 1. Ingreduants and Chemical analysis of different diets

	Treatments (Composition %)				
	0	**15**	**30**	**45**	**60**
Ingredients					
Maize	58.00	58.00	58.00	58.00	58.00
Soyabean meal	20.00	20.00	20.00	20.00	20.00
Wheat	10.00	10.00	10.00	10.00	10.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Oyster shell	6.00	5.10	4.20	3.30	2.40
Sugar mud	-	0.90	1.80	2.70	3.60
Dicalcium phosphate	0.70	0.70	0.70	0.70	0.70
Salt	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100
Analysis					
ME (Kcal/kg)	2844.16	2844.16	2844.16	2844.16	2844.16
Crude protein (%)	16.75	16.75	16.75	16.75	16.75
Calcium (%)	3.40	3.30	3.30	3.20	3.20
Phosphorous (%)	0.35	0.35	0.35	0.36	0.36
Methionin (%)	0.99	0.99	0.98	0.86	0.86
Lysine (%)	0.72	0.70	0.72	0.71	0.71

The enough amount of SM was transferred from sugar industries to the safyabad research station and they were sun dried for 1 to 3 days.

In the main trail all treatments were allocated to the groups according to the design and different traits such as egg number, egg production, feed intake, feed efficiency, egg weight, egg mass (Koelkebeck, 1993), egg shell weight and thickness and egg index were determined (Taylor, 1964). All data were analyzed statistically by SAS (1988) procedure. Differences between means were tested by Duncan's multiple range test.

Results and discussions

Number of eggs, egg production, feed intake and feed efficiency are given in Table 2.

Table 2. Effect of different levels of SM replaced with OS on laying hen performances

Treatments (%)	Traits			
	Egg number/hen (in 112 days)	**Egg production (%)**	**Feed intake g/kg/day**	**Feed efficiency**
T1 (0)	$82.80^{a} \pm 1.32$	$73.92^{a} \pm 1.1$	$117.00^{a} \pm 1.76$	$0.361^{a} \pm 0.014$
T2 (15)	$82.53^{a} \pm 1.14$	$73.68^{a} \pm 1.02$	$117.60^{a} \pm 1.2$	$0.353^{a} \pm 0.014$
T3 (30)	$82.27^{a} \pm 0.92$	$73.45^{a} \pm 0.82$	$118.82^{a} \pm 1.60$	$0.354^{a} \pm 0.009$
T4 (45)	$82.10^{a} \pm 0.82$	$73.30^{a} \pm 0.73$	$116.82^{a} \pm 1.94$	$0.350^{a} \pm 0.007$
T5 (60)	$81.56^{a} \pm 0.61$	$72.81^{a} \pm 0.81$	$115.83^{a} \pm 1.16$	$0.348^{a} \pm 0.01$

Means within each column with the same superscripts are not significant ($P>0.05$)

Effect of different percentages of SM on total number of eggs were not significant ($P>0.05$) and replacing SM with OS up to 60% showed similar results with the control group, and it was ranging from 82.8 ± 1.32 (Control) to 81.56 ± 0.61% (T5). Cheng and Coan (1997) reported that the use of lime with high solubility and ground form instead of oyster shell didn't show any significant differences for egg production. Guinotte and Nys in 1991 also reported that egg production was not affected either by origin of calcium source or particle size.

In the present study feed intake and feed efficiency were not affected by the type of diet and Calcium sources, and it is in conflict with the results of Guinotte (1991) who reported that feed consumption was higher in hens fed with particulate oyster shells. Feed efficiency which is very important factor was 0.361, 0.359, 0.354, 0.350 and 0.348 for T1, T2, T3, T4 and T5 respectively.

Mean egg weight, egg mass, shell weight and thickness and egg index are given in Table 3.

Table 3. Effect of different percentage of SM Substituted with OS on egg quality

Treatments (%)	Traits				
	Egg weight (g)	Egg Mass (g)	Shell weight (g)	Shell thickness (mm)	Egg index
T1	$57.33^{a} \pm 2.36$	$42.39^{a} \pm 1.97$	$4.76^{a} \pm 0.08$	$0.30^{a} \pm 1.42$	$75.53^{a} \pm 0.43$
T2	$56.50^{a} \pm 2.42$	$41.61^{ab} \pm 1.42$	$5.70^{a} \pm 0.15$	$0.29^{a} \pm 0.83$	$75.22^{a} \pm 0.48$
T3	$56.33^{a} \pm 1.21$	$41.38^{ab} \pm 1.25$	$5.68^{a} \pm 0.13$	$0.28^{ab} \pm 0.40$	$74.95^{a} \pm 0.41$
T4	$56.00^{a} \pm 0.63$	$41.04^{a} \pm 0.73$	$5.28^{b} \pm 0.09$	$0.28^{bc} \pm 0.63$	$73.64^{a} \pm 0.59$
T5	$55.50^{a} \pm 1.48$	$40.41^{b} \pm 0.96$	$5.36^{b} \pm 0.22$	$0.27^{c} \pm 1.32$	$73.60^{b} \pm 0.6$

a-c: Means within each column with different superscripts are significantly different. (P<0.05)

Different percentages of SM replaced with os didn't effect the egg weight but the egg mass was effected, and differences were significant (P<0.05). Guinotte (1991) observed that coarse limestone (which is somewhat similar to SM) had a positive effect on egg weight.

Egg shell quality, as measured by egg shell weight, thickness and index was influenced by dietary treatments and there were significant differences (P<0.05) between different treatments. The best shell weight, thickness and egg index were in T1, T2 and T3. But in T4 and T5 the egg index which show the shape of egg was similar and eggs were a it longer than other groups, and in addition to low weight in these two groups eggs became thinner than other groups. The low thickness of eggs in T4 and T5 might be due to high. Level of substitution and high solubility of SM and its fast passage from the gut. Scott *et al.* (1971) reported that at night when birds normally are not receiving any calcium from the feed (high soluble source of calcium), they may not have enough calcium during calcification.

Roland (1988) reported that 13-20% of total eggs due to thinner shell crack before reaching their final destination. Egg breakage represents a large economic loss (2 dollars/bird/year) to the poultry industry.

It is concluded that effect of different treatments on hen performance was the same but egg quality such as shell weight and thickness was effected at high level of replacement. As these factors are important for producers so the best amount of replacement is 30%.

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