Influence of incorporating organic trace minerals (SQM zinc, SQM copper and SQM manganese) in diets of laying hens from 40 to 51 weeks of production compared to sulfate alternatives

Introduction

Trace mineral supplementation is essential to optimizing production in all facets of livestock production. This also includes layer operations in the poultry industry. With egg production exceeding 280 million layers nationwide, it is essential their trace mineral nutrition be the best possible to assure a high quality product is produced. The objective of this study was to evaluate the use of inorganic versus organic (SQM) sources of zinc, copper and manganese in the diets of laying hens on bird performance and quality of eggs produced.

Materials and methods

Lohmann LSL-Classic hens (40 weeks of age) were the bird of choice for this study. The study was conducted with birds from 40 weeks of age until 51 weeks of age. Two different systems of egg production were utilized in this study. The first system was individually housed layers. There were 20 birds assigned to individual cages per treatment group (inorganic or SQM). Cage dimensions were 1.5 ft x 1.5 ft x 1.5 ft with 1 hen/cage. The second system was colony pens. There were two pens per treatment initially containing 52 hens/pen. Pen dimensions were 4 – 8 x 16 ft pens for 2.5 ft^2/hen. The trace mineral supplementation rates were 40 ppm for zinc, 25 ppm for copper and 40 ppm for manganese either using an inorganic source from sulfates or SQM polysaccharide organic source. All birds were fed the same composition diet (Table 1).

Table 1. Diet Composition[a]

Item	Amount
Dry matter, %	89.15
Protein, %	15.15
Fat, %	4.36
Fiber, %	2.27
Ash, %	12.59
Poultry ME, kcal	1272.10

[a]Ground corn, distillers grains w/s, SBM, limestone, ca chips, dical, fat blend, sodium bicarb, salt, TM premix, vit premix, aa premix.

Feed consumption was determined daily for colony pens and weekly for individually caged birds. Egg production and egg weights were measured daily. At 14-day intervals, 30 eggs were randomly collected from each colony pen and one egg from each housed hen. Eggs were candled for downgrades (cracks, blood spots and meat spots), eggshell strength using force pressure compression, egg shell thickness to determine Haugh units, egg weight and grade of egg. These eggs were then separated into albumen and yolk, weighed, dried and weighed again. All pens and cages were observed daily for bird health, water and temperature

Results and discussion

Table 2 shows the results of the bird performance in this study. Total feed consumption was significantly reduced by the inclusion of SQM trace minerals in the diet for the individually caged birds. However, feed intake was maintained in the colony pens, thus

Table 2. Bird Performance

Item	Inorganic	SQM	p-value
Birds, #			
Caged	20	20	
Colony	103	102	
Total feed consumed, lb			
Caged	384.9	370.6	0.008
Colony	1092.0	1092.0	NA
Total egg count			
Caged	1524	1577	0.064
Colony	4011	4090.5	0.0002
Total egg weight, lbs			
Caged	193.10	211.83	0.004
Colony	585.97	630.10	<0.0001
Weight/egg, g			
Caged	61.48	61.64	0.327
Colony	66.26	69.87	<0.0001
Feed conversion, feed/doz (lb)			
Caged	3.031	2.820	0.006
Colony	3.268	3.204	0.0002
Production, %			
Caged	90.70	92.74	0.0010
Colony	95.50	97.39	NA
Egg Mass, %Prod*Wt			
Caged	55.76	57.19	0.0019
Colony	63.3	68.0	NA

no influence on treatments on layer consumption could be determined. Total egg numbers produced were significantly increased for both individually caged birds and colony pens when birds received SQM minerals in their diet. Total weight of eggs produced was significantly increased by 18.73 lbs for caged production and 44.13 lbs for colony production with the inclusion of SQM, resulting in overall greater individual egg weight for both production systems. Feed conversion per dozen eggs was significantly improved in both production systems by nearly 5% overall, averaged over both production systems. Production percentage was improved by feeding SQM in both systems with statistically significant improvement in the caged birds by 2 percentage points. Egg mass was also improved for those birds receiving SQM.

Individual egg quality measurements are presented in Table 3. Eggs from both the individually caged hens and colony pens were combined in this evaluation. Egg strength and egg shell thickness was significantly improved with the incorporation of SQM into the layers diet. Yolk color and albumen height were not statistically affected by dietary treatment but numerically favored the organic trace mineral source. The percentage of eggs grading AA or greater was significantly higher for hens receiving SQM. When eggs were separated into their individual components (yolk, albumen and shell), the only measurement that was significantly improved was the egg shell weight which favored the SQM treatment group.

Table 3. Egg Quality (Combined for all eggs)

Item	Inorganic	SQM	p-value
Egg weight[A], g	61.48	61.73	0.4023
Egg strength, lbs	10.889	11.344	0.0007
Egg shell thickness, mm	0.355	0.364	0.0138
Yolk color	4.370	4.389	0.4498
Albumen height, mm	6.090	6.101	0.4766
Grade (AA)	76.374	76.507	0.0001
Yolk wt.[B], g			
Wet	18.34	18.28	0.3363
Dried	9.81	9.62	0.1684
Albumen wt.[B], g			
Wet	36.55	36.47	0.4048
Dried	5.27	5.18	0.3572
Shell wt.[B], g	8.64	9.03	0.0026

[A]Weight of eggs used in the egg quality analysis.
[B]Colony eggs only.

Study location
This study was conducted at the Virginia Diversified Research Center, Harrisonburg, VA.

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