APRI FACTS
Atlantic Poultry Research Institute

PO Box 550
25 Farm Lane
Truro, NS B2N 5E3
(902) 893-6657
laurie.eagles@dal.ca
http://www.dal.ca/sites/apri.html
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AMINO ACID SUPPLEMENTATION OF LOW PROTEIN DIETS FOR LAYING HENS

Introduction

Feed cost represents the single largest operating cost for egg producers nationally. To optimize production and health of laying hens, adequate dietary nutrients are required. Hens cannot store excess dietary amino acids so feeding excess nutrients can be costly and wasteful. However, there is the common practice of over-formulating laying hen diets for protein and amino acids with the objective of increasing egg production and egg size (1). Methionine, lysine and tryptophan, all essential amino acids, are routinely used for laying hens especially those fed corn/soybean meal diets. It has been suggested that both essential and nonessential amino acids need to be taken into consideration when formulating balanced diets (2). Several synthetic amino acids, including methionine, lysine, tryptophan, threonine, isoleucine, arginine and valine, glycine, and proline are now commercially available drawing attention towards lowering the protein content of laying hen diets and formulating based on meeting amino acid requirements.

Objective

Investigation of the effects of feeding white and brown egg laying strains low protein diets supplemented with synthetic essential amino acids and nonessential amino acids that met the breeder requirements of laying hens over a 52 week production cycle on performance.

Trial

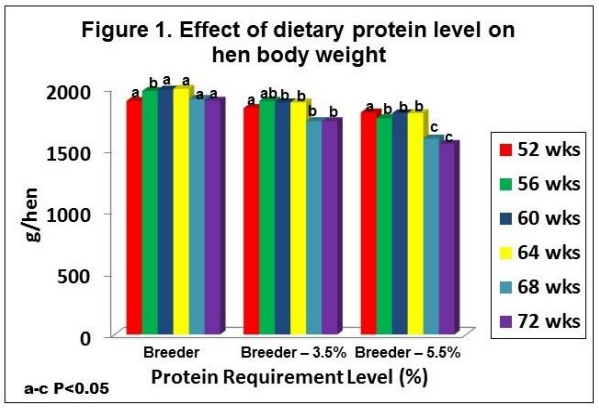
The experiment was a 3 X 2 factorial analysis with diets formulated for each phase of production using a Lohmann LSL White and Lohmann Brown Lite strain of hen. Three experimental diets were formulated for each production phase: meeting breeder recommended level (3), breeder recommended level minus 3.5% crude protein with amino acids requirements met with synthetic amino acids (lysine, methionine, threonine, tryptophan, arginine, valine, glycine, proline and isoleucine), and breeder recommended minus 5.5% crude protein with amino acids requirements met with synthetic amino acids (similar to the second treatment). Hens were fed the diets from 20 to 72 weeks of age. Initial diets were formulated to contain 20.0, 16.5 and 14.5% crude protein and the final diets were formulated to contain 14.0, 10.5 and 8.5% crude protein. Feed consumption, body weight, egg production and egg quality were determined for every 28-day period.

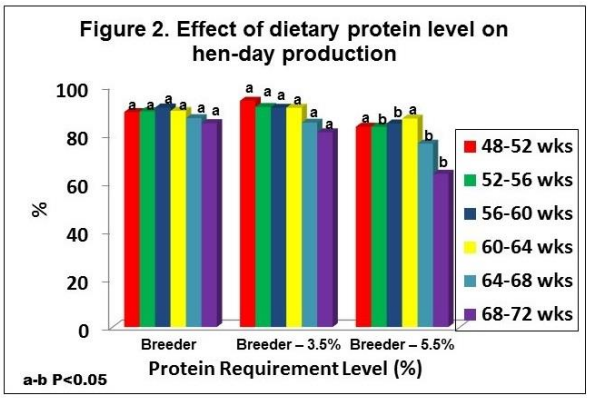
Results

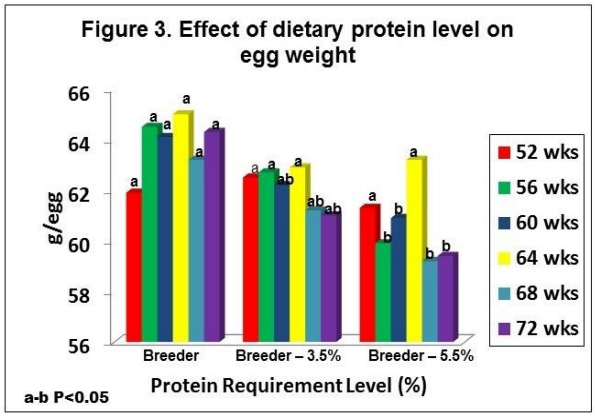
Production performance was not affected by dietary crude protein level until 52 weeks of age. There was no interaction between crude protein level and strain of hens on production performance for the entire trial. From 56 weeks of age through to the end of the trial, the hens fed the lowest crude protein level had significantly lower weights than those fed the breeder recommended protein level treatment (Figure 1). From 60 weeks of age through to the end of the trial, body weights of the hens fed 3.5% less crude protein had significantly lower body weights than those fed the breeder recommended level (Figure 1). Only body weights for the hens fed the breeder recommended crude protein level were within target weights.

However, egg production was similar for the hens fed the breeder recommended protein level and the hens fed 3.5% less crude protein throughout the entire duration of the trial (Figure 2). Egg production was significantly lower from 52 weeks through to the end of the trial for the hens fed 5.5% less crude protein (Figure 2).

Similar to the reduction in body weights, egg weight was significantly lower from the hens fed 5.5% less crude protein compared to the eggs from the hens fed the breeder recommended crude protein level from 56 weeks of age through to the end of the trial, except for 64 weeks of age (Figure 3). Egg weights were not significantly different between the breeder recommended crude protein level and the 3.5% less crude protein level treatments (Figure 3). Egg shell quality as measured indirectly by specific gravity did not differ amongst the three crude protein level treatments. Eggs from all treatments were acceptable in size to be graded Large.







Industry Impact

Further research is required to determine if maximum production performance can be obtained from both white and brown laying hens during each phase of production, when low-protein diets formulated to meet specific amino acids requirements with synthetic sources are fed for a long-term production cycle. This work indicates that in terms of egg production, and egg weights, the crude protein content of the diet can be reduced by 3.5% units compared to the breeder recommendations for the entire laying cycle when supplemented with synthetic essential and non-essential amino acids without negative effects.

Researchers: J. L. MacIsaac and D.M. Anderson

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For more information on this project or any other project please contact laurie.eagles@dal.ca or phone 902-893-6657