

Evaluation of the tryptophan requirement of small-framed first cycle laying hens

J. Wen^{1,*}, A. Helmbrecht², M. Elloit³, J. Thompson² and M.E. Persia¹

¹ Virginia Tech, Blacksburg, VA, USA, ² Evonik, Kennesaw, GA, USA, ³ A&E Nutrition Services LLC, Lancaster, PA, USA

Tryptophan is an essential amino acid, required for protein synthesis, and several metabolic processes in laying hens. Although required, the literature is mixed if tryptophan is considered the third or fourth limiting amino acid for laying hens and research on the tryptophan requirement in laying hens has been limited. The purpose of this experiment was to evaluate the tryptophan requirement of first cycle laying hens from 41 to 60 weeks of age. In total, 270 Hy-line W36 laying hens were randomly allocated to 6 treatments with 15 replicates of 3 birds for each experimental unit. Hens were maintained 3 to a cage (72 sq in/bird) in a multi-teared A-frame cage system within an environmentally controlled building. Hens were provided a 16:8 light schedule and 70 to 80 °F temperature program. A tryptophan deficient basal diet was formulated with corn, corn gluten meal and soybean meal with determined tryptophan, lysine and crude protein concentration of 0.096, 0.873, and 15.0%, respectively. Synthesized L-tryptophan was supplemented to the basal diet in 0.020% increments to generate experimental diets containing 0.096, 0.116, 0.136, 0.156, 0.176, and 0.196% tryptophan respectively. Hens were provided a controlled amount of feed daily resulting in approximately 95g/hen/d. The diet containing the lowest concentration of tryptophan resulted in reduced egg production and was halted at 45 weeks due to low performance with all other dietary treatments reaching the conclusion of the experiment at 60 weeks of age. Hen-housed egg production (HHEP) and mortality were monitored daily. Eggs were collected on two continuous days each week for feed conversion ratio (FCR) calculations and egg quality analysis. Single-slope broken line, multi-slope broken line and quadratic regression were used to estimate tryptophan requirement based on HHEP of the remaining five dietary treatments. Based on HHEP, optimum tryptophan requirement was 154.0, 142.8 and 193.7 mg/hen/d (single-slope broken line regression: $Y=80.86+0.4871(X-154.02)$, $R^2=0.85$; multi-slope regression: $Y=3.127+0.5135X-0.3997(X-142.8)$, $R^2=0.85$; quadratic regression: $Y=-0.003046X^2+1.1802X-32.33$, $R^2=0.85$).

KEYWORDS

Laying hen; tryptophan; egg production; first cycle