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# Amino Acid Supplementation of Low Protein Layer Diets

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# AMINO ACID SUPPLEMENTATION OF LOW PROTEIN LAYER DIETS

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Previous studies at this experiment station have shown that a typical corn-soy diet diluted with glucose to 9.4% protein and supplemented with 0.19% lysine, 0.25% DL-methionine and 0.04% tryptophane could support about 60% hen-day egg production over a 9-month period. An approach was therefore made to determine which amino acids besides methionine, lysine and tryptophane are further limiting production in this low protein diet.

DeKalb 131 pullets, housed in 8-inch cages were fed the above ration at 24 weeks of age and their production was recorded. After about 20 weeks of depletion, individual supplementation of valine and threonine at 0, 0.05 and 0.1% levels and isoleucine at 0 and 0.1% levels and their combinations were studied in a factorial design. Each treatment was replicated four times using two hens per replicate fed for a 16-week period. Results obtained in this study are presented in Tables 1 and 2.

The basal diet when supplemented with both low and high levels of valine and threonine alone did not show any improvement in percent hen-day egg production or grams of egg produced per day. Feed consumption and feed efficiency in terms of dozen eggs produced showed similar effects. Isoleucine supplements at the 0.1% level showed a highly significant improvement ($P < .01$) in percent hen-day egg production, grams of eggs produced per day, feed consumption and feed efficiency. Both high and low levels of valine and threonine when supplemented

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in equal proportions showed a significant improvement ($P < .01$) over the basal diet. The results obtained from the combination of isoleucine and threonine showed marked improvement over the basal. Threonine at both levels added to this combination showed a significant improvement ($P < .05$), and the combination of valine at the high level with isoleucine showed a highly significant ($P < .01$) improvement (Table 1).

Data obtained for average egg weight, average haugh units and shell thickness (Table 2) did not show any marked improvement from single supplements when compared to the basal diet. Comparing the egg weights in general, a highly significant increase ($P < .01$) was observed when isoleucine and valine at the high and threonine at the low level supplemented the basal ration. Egg quality as measured by Haugh Units and egg shell thickness were not influenced by dietary differences.

Results from this study indicate that isoleucine additions to a low protein diet supplemented with methionine, lysine and tryptophane could be highly beneficial. Addition of different levels of valine or threonine with isoleucine did not show any marked improvement over the supplementation of isoleucine alone.

TABLE 1. AMINO ACID SUPPLEMENTATION OF LOW PROTEIN DIETS: EFFECTS ON EGG PRODUCTION AND FEED EFFICIENCY

| Treatments | Hen-Day Egg Production | | Hen-Day Feed Consumption | Feed Consumption Per Dozen of Eggs |
|---|---|---|---|---|
| | % | gm | gm | kg |
| Basal[1] | 61.0 | 35.3 | 75.8 | 1.5 |
| Threonine[2] | 42.0 | 24.3 | 92.8 | 4.9 |
| Threonine[3] | 57.7 | 32.6 | 78.2 | 1.8 |
| Valine[2] | 59.8 | 34.8 | 77.0 | 1.7 |
| Threonine[2], Valine[2] | 64.5 | 39.8 | 84.1 | 1.7 |
| Threonine[3], Valine[2] | 59.5 | 34.6 | 74.1 | 1.5 |
| Valine[3] | 58.3 | 33.6 | 73.0 | 1.5 |
| Threonine[2], Valine[3] | 56.9 | 32.6 | 77.1 | 1.7 |
| Threonine[3], Valine[3] | 68.5 | 38.8 | 81.1 | 1.5 |
| Isoleucine[3] | 69.3 | 40.7 | 78.5 | 1.4 |
| Threonine[2], Isoleucine[3] | 67.0 | 38.3 | 81.5 | 1.5 |
| Threonine[3], Isoleucine[3] | 67.7 | 40.3 | 84.1 | 1.5 |
| Valine[2], Isoleucine[3] | 58.4 | 34.8 | 78.4 | 1.6 |
| Threonine[2], Valine[2], Isoleucine[3] | 65.4 | 38.6 | 76.9 | 1.4 |
| Threonine[3], Valine[2], Isoleucine[3] | 64.2 | 38.2 | 74.5 | 1.4 |
| Valine[3], Isoleucine[3] | 68.2 | 38.6 | 77.9 | 1.4 |
| Threonine[2], Valine[3], Isoleucine[3] | 59.5 | 36.8 | 75.9 | 1.7 |
| Threonine[3], Valine[3], Isoleucine[3] | 61.2 | 36.7 | 73.2 | 1.5 |

[1] 9.4 percent protein diet with 0.25 percent Methionine, 0.19 percent Lysine and 0.04 percent Tryptophane.
[2] 0.05 percent
[3] 0.1 percent

TABLE 2. AMINO ACID SUPPLEMENTATION OF LOW PROTEIN DIETS: EFFECTS ON EGG QUALITY:

| Treatments | Average Egg Weight | Average Haugh Unit | Eggshell Thickness |
|---|---|---|---|
| | gm | | mm |
| Basal[1] | 58.1 | 77.1 | 33 |
| Threonine[2] | 56.7 | 71.6 | 30 |
| Threonine[3] | 56.9 | 75.8 | 31 |
| Valine[2] | 58.5 | 72.3 | 31 |
| Threonine[2], Valine[2] | 61.8 | 77.1 | 32 |
| Threonine[3], Valine[2] | 58.3 | 75.9 | 34 |
| Valine[3] | 57.6 | 76.9 | 33 |
| Threonine[2], Valine[2] | 57.6 | 78.5 | 31 |
| Threonine[3], Valine[3] | 56.6 | 71.3 | 29 |
| Isoleucine[3] | 58.5 | 77.6 | 31 |
| Threonine[2], Isoleucine[3] | 57.2 | 74.6 | 33 |
| Threonine[3], Isoleucine[3] | 59.6 | 73.7 | 34 |
| Valine[2], Isoleucine[3] | 59.5 | 76.6 | 30 |
| Threonine[2], Valine[2], Isoleucine[3] | 59.1 | 76.8 | 31 |
| Threonine[3], Valine[2], Isoleucine[3] | 59.9 | 76.9 | 31 |
| Valine[3], Isoleucine[3] | 56.7 | 72.8 | 29 |
| Threonine[2], Valine[3], Isoleucine[3] | 62.1 | 75.5 | 29 |
| Threonine[3], Valine[3], Isoleucine[3] | 60.1 | 77.2 | 31 |

[1] 9.4 percent protein diet with 0.25 percent Methionine, 0.19 percent Lysine and 0.04 percent Tryptophane.
[2] 0.05 percent
[3] 0.1 percent