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Amino Acid Supplementation of Low Protein Layer Diets With Glycine, Glutamic Acid, Threonine and Valine

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Previous studies have shown near maximum performance from laying hens when a 16% protein diet diluted to 10% protein with glucose was supplemented with 0.15% DL-methionine, 0.19% L-lysine and 0.04% DL-tryptophan. A supplement of 0.20% DL-isoleucine caused the hens to produce a small but significantly increased number of eggs. Glycine at 0.5% tended to favor the response from isoleucine, suggesting its requirement for maximum utilization of amino acids.

A further study was conducted this year utilizing glutamic acid as well as glycine to further check on this enhancing effect. DeKalb 161 pullets were fed the 10.8% protein basal diet from 24 to 40 weeks of age containing the additional methionine, lysine, tryptophan and isoleucine. Following this depletion period, 0.05% DL-valine and 0.10% DL-threonine with glycine alone and in all combinations with glycine and glutamic acid each at 0.25, 0.5 and 1% levels were fed for an additional 16 weeks. A total of 16 pullets received each diet with the individual treatments and results as indicated in Table 1. It was apparent that the basal diet was quite adequate for supporting good egg production and that none of the treatments significantly improved performance. The apparent response from 1% glycine and glutamic acid suggests that these hens may have needed additional nonspecific amino nitrogen with this diet. Further work will be necessary to clarify this point.

Previous studies from this station had not shown any response from ammonium citrate. However, studies in New York, Arizona and Wisconsin have indicated that under some conditions hens will respond with improved performance from nonprotein nitrogen (NPN) supplements. It remains to be clearly established whether or not NPN is of importance in this present work. However, from the standpoint of attempting to find other essential amino acids or establishing more adequate levels of the ones presently used, the chances are rather remote that much progress can be attained by this type of an assay because of the good performance being experienced with the basal diets.

Although apparent performance of hens fed these low protein diets has been good, the amino acid composition of eggs produced does not appear to be the same. The amounts of several essential amino acids have been shown to be from one-third to one-half less in the eggs from these hens as compared to eggs from hens receiving a 16% protein diet. This large difference would be important and awaits confirmation.

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Table 1. Effect of Amino Acid Additions to a 10% Protein Layer Diet with Added Methionine, Lysine, Tryptophan and Isoleucine

		Egg production	Feed per dozen	Egg weight	Mortality	Body weight
		%	kg	gm	%	kg
1.	Basal	72.3	1.68	56.8	0.0	1.63
2.	0.1% Threo[1] + 0.5% Glyc[2]	68.7	1.75	55.0	4.2	1.75
3.	0.05% Val[3] + 0.25% Glyc	73.1	1.67	57.3	0.0	1.57
4.	0.25% Glyc + 0.25% Glut[4]	68.6	1.88	55.0	0.0	1.68
5.	As 4 + 0.1% Threo	72.3	1.71	56.2	0.0	1.66
6.	As 4 + 0.05% Val	70.6	1.75	56.2	0.0	1.58
7.	0.5% Glyc + 0.5% Glut	70.2	1.70	57.3	8.3	1.71
8.	As 7 + 0.1% Threo	74.4	1.58	55.3	4.2	1.65
9.	As 7 + 0.05% Val	69.4	1.84	57.1	0.0	1.71
10.	1% Glyc + 1% Glut	75.3	1.65	57.2	8.3	1.71
11.	As 10 + 0.1% Threo	74.3	1.58	54.8	0.0	1.60
12.	As 10 + 0.05% Val	71.6	1.69	58.8	2.1	1.71

[1]Threonine (DL).
[2]Glycine.
[3]Valine (DL).
[4]Glutamic acid (L).