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DIETARY METHIONINE REQUIREMENT OF LAYING HENS

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A 10 week experiment was conducted on 120 Babcock commercial layers of 30 weeks age, in a completely randomized design to study the effect of supplementation of methionine to a normal layer ration on the production performance of caged layers. A ration containing 0.32 % methionine (all from natural feedstuffs used) served as control, while the latter was supplemented with 15, 30 or 45g synthetic methionine per 100 kg ration, to obtain experimental rations having ultimately 0.335, 0.350 or 0.365 % total methionine. A significant linear improvement in egg production and feed efficiency was observed with increasing levels of supplemental methionine. However, feed consumption, egg shell thickness, albumen thickness and yolk index remained unaffected. The results showed that methionine requirement, under local conditions, for better egg production of layers ranged from 388 to 406 mg/day and a routine layer ration with 16 % protein needed to be supplemented with about 30g methionine per 100 kg ration, to obtain a level of 0.35 % methionine in the feed.

INTRODUCTION

Protein nutrition of the birds actually means amino acid nutrition. It is, therefore, very important that accurate dietary needs of various amino acids are known and the same are supplied in the ration of birds for achieving optimum performance. Although, all amino acids are equally important and none can be stated as unimportant, yet some being relatively more indispensible than others, are known as critical amino acids. Of the various critical amino acids, methionine is particularly the one, which has a great influence on the performance of birds, in terms of egg production (Jensen et al., 1974; Scott, 1979) and egg weight(Petersen et al., 1983) and is considered to be the first limiting amino acid in a common laying hen ration (Patrick and Schaible, 1980). In Pakistan, the quality of feed stuffs used in practical rations is generally low. Moreover, unrefined processing techniques and a variety of stressful factors may further necessitate the use of synthetic amino acids for optimum performance of laying birds in Pakistan. However, the addition of methionine in excess of the requirement also gives no extra improvement in egg production(Schutte et al., 1983.,). Since synthetic methionine is very expensive, it is wasteful to supplement the layer rations over and above the levels actually required. The present project, was, thus, planned to study whether a practical layer ration in Pakistan needed to be supplemented with synthetic methionine for better performance of birds, and if so what ought to be its most suitable level.

MATERIALS AND METHODS

The experiment, based on completely randomized design, was conducted on 120 Babcock commercial layers of 30 weeks age. These birds were reared on floor, on a commercial stock ration before the start of experiment. At 30 weeks of age, the birds were wing banded and then randomly distributed into 12 experimental units of 10 birds each and assigned to separate

single deck cages fitted in a thermostatically controlled layer house. The temperature of the room was maintained between 20 - 24°C during the 10 weeks experimental period while 16 hours daily lighting was provided with the help of natural and artificial sources.

A control ration containing approximately 16 % crude protein and 2875 Kcal metabolizable energy per kg ration was prepared and designated as ration A (Table1). It contained 0.32 % methionine (all from the natural feedstuffs used in the ration). The nutrient composition of the ration was calculated by using the individual nutrient levels of the ingredients (Anonymous,1987). To constitute experimental rations B,C and D, the control ration A was supplemented with 15, 30 or 45 g of synthetic methionine, per 100 kg of feed, respectively. The ingredient and nutrient composition of rations is shown in Table 1. Each experimental ration was randomly allotted to three experimental units of 10 birds each. The birds were offered ad libitum feed, twice a day, with continuous supply of fresh water throughout the experimental period of 10 weeks. A fly control programme was also practised twice a week by using a fly killer.

Records of weekly feed consumption, daily egg production and egg weight were maintained and used to compute feed efficiency. The egg quality traits like shell thickness, albumen thickness and yolk index (Nesheim et al.,1979)were also studied by using a random sample of 9 eggs from each group on the last day of each fortnight and results were pooled for 10 weeks period. The data obtained on various parameters were analyzed using analysis of variance technique and significant differences were compared by Duncan's Multiple Range Test (Steel and Torrie, 1981).

Table 1. Ingredient and nutrient composition of control ration

a) Ingredients	**Percentage**
Maize	28.0
Wheat	21.0
Rice	12.0
Rice polishings	10.0
Corn gluten meal (60%)	2.0
Cotton seed meal (decor.)	6.0
Fish meal	8.0
Blood meal	2.0
Molasses (cane)	3.5
Limestone	7.0
Premix	0.5
b) Nutrients	
Crude protein	(%)15.8
Crude fiber	(%)2.93
Metabolizable energy (Kcal / kg)	2875
Calcium	(%) 3.39
Available phosphorus	(%) 0.50
Methionine	(%) 0.32
Lysine	(%) 0.73
Cystine	(%) 0.26
Arginine	(%) 1.03
Tryptophan	(%)0.19

RESULTS AND DISCUSSION

The results of the experiment in terms of average feed consumption, egg production, feed efficiency, egg mass, egg shell thickness, albumen thickness and yolk index have been summarised in Table 2

Table 2. Average egg production, feed consumption, feed efficiency, egg weight and quality characteristics of egg produced by birds fed various rations

Description	Rations			
	A	B	C	D
Average egg production per replicate per week (No.)	55.96	56.63^{ab}	57.43^{bc}	58.73^{c}
Average feed consumption per replicate per week (kg)	7.59	7.69	7.78	7.80
Average feed efficiency (kg of feed / dozen eggs)	1.69^{a}	1.65^{b}	1.63^{bc}	1.60^{c}
Average egg wt. per dozen eggs (kg)	0.68^{a}	0.69^{b}	0.70^{c}	0.71^{c}
Average egg shell thickness (mm)	0.38	0.38	0.38	0.38
Average albumen thickness (mm)	7.09	7.85	7.09	7.09
Average yolk index	0.47	0.48	0.47	0.47

Means having the same superscripts are significantly different.

Egg production: The birds fed on experimental rations A, B, C and D produced on an average 55.96, 56.63, 57.43 and 58.73 eggs per week per replicate. There was a significant linear increase in the egg production with increasing levels of methionine supplementation in the ration. Since the protein and energy contents of all the rations were the same therefore it could be stated from these results that increase in the egg production was due to the effect of supplemental methionine. These findings are substantiated by the earlier work of Jensen et al. (1974) and Scott (1979). who reported an increase in egg production with corresponding increase in methionine level. The findings of the present experiment support the idea of local feed manufacturers that rations compounded in Pakistan out of local feed stuffs need to be supplemented with synthetic methionine. However, it is suggested that supplementation with lower levels than 30 g/100 kg may not give significant results. In terms of daily requirement of this amino acid it was observed that the birds needed about 388 to 406 mg methionine for optimum egg production.

Feed consumption : Average weekly feed consumption per replicate, during 10 weeks period, on rations A,B,C and D was found to

be 7.59, 7.69, 7.76 and 7.80 kg, respectively. The differences in respect of feed consumption among various rations were non-significant which led to the inference that supplemental methionine did not affect the feed consumption. Since the energy level of the control and experimental rations was the same (2875 Kcal/ kg), hence insignificant differences in respect of feed consumption are somewhat understandable. It may be pointed out that the birds essentially eat to meet their energy requirement and try to regulate their feed intake largely on the basis of caloric content of the diet (Patrick and Schaible, 1980).

Feed efficiency : Feed efficiency values as represented by 1 kg of feed required to produce one dozen of eggs, in respect of rations A,B,C and D were calculated to be 1.69, 1.65, 1.63 and 1.60. There was a significant linear improvement, similar to egg production, in respect of feed efficiency values of the rations supplemented with increasing levels of methionine. Feed efficiency of the birds on ration A (control) was significantly poor as compared to all the rations which were supplemented with methionine, while there was non-significant difference between rations B and C as well as between rations C and D. These results are supported by the findings of Schutte et al. (1983) who reported an improvement in feed efficiency value by the addition of DL-methionine at the rate of 0.5 to 3.5 mg per kg of the layer ration in excess of the requirement. In the present study when the magnitude of difference in the supplemental methionine was about 30 g per 100 kg of feed, significant improvement in results was noticed but when this magnitude was small , the improvement was masked.

Egg weight per dozen : The average weight per dozen of eggs per replicate, calculated on weekly basis, on rations A,B,C and D was found to be O.68, 0.69, 0.70 and 0.71 kg, respectively. There was a highly significant improvement in the egg weight due to methionine supplementation of the rations. Comparison of means of the egg weights of rations, containing supplemental methionine revealed that egg weight was better on ration supplemented with 30 and 45 g methionine per 100 kg of feed as compared to the same on control or ration supplemented with 15 g methionine/100 kg feed. Jensen et al. (1974) and Petersen et al. (1983) also reported that there occurred an improvement in egg mass by the supplementation of rations containing 16 % protein with synthetic methionine.

Egg quality traits : The shell thickness of the eggs remained unaffected by the supplementation of methionine at various levels in the rations of layers. This indicated non-involvement of methionine in calcium metabolism or its mobilization. Similar was the case with albumen thickness of the eggs produced by the birds fed various experimental rations. The results fairly agreed with those reported by Biely and March (1964) that albumen and shell quality remained unaffected due to methionine supplementation of layer rations. The quality of yolk, measured in terms of yolk index, by dividing the height of the yolk by its average diameter (Nesheim et al., 1979) also remained unaffected by methionine supplementation. This indicated that protein of yolk and albumen required a level that was available in the control ration and hence no added advantage was observed due to supplemental methionine.

The overall picture indicated that for better egg production and feed efficiency, methionine requirement of the layers ranged from 388 to 406 mg per day, under prevalent conditions. The results suggested that routine layer rations with 16 % protein needed to be supplemented with synthetic methionine at the rate of at least 300 g per tonne of feed. It was further observed that shell thickness and the interior quality of the eggs

was not influenced by the supplementation of synthetic methionine.

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