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Performance of laying birds offered diets containing different energy and protein levels with supplementary methionine and lysine

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Abstract
India is world's fifth largest egg producer. The great constraints of the poultry industry are the high cost of feed ingredients. Therefore, with the aim of reducing the cost of feed per dozen egg production, this experiment was conducted on 80 laying birds for a period of 12 wks with different level of energy and protein. There were 4 dietary treatments T1: 14% CP+2600 kcal/kg ME+10g methionine+20g L-lysine; T2:16% CP+2600 kcal/kg ME+8g Methionine; T3: 14% CP+2700 kcal/kg ME+15g methionine+15g L-lysine; T4: 16% CP, 2700 kcal/kg ME. Lysine and methionine supplementation was over and above requirement. Feed intake (daily, per egg, per dozen and per kg eggs) was significantly (p<0.05) higher in groups allotted T1 diet (122.4, 140.4, 1685 & 2680). The hen day egg production (HDP %) was maximum in birds allotted T4 diet (87.33). Considering the overall performance of the birds, it has been concluded that diet (T3) containing 14 percent crude protein and 2700 kcal ME/kg, is optimum.

Keywords: Energy, laying birds, lysine, methionine & protein

Introduction
Poultry is one of the very important segments of the agricultural sector in India today. It is growing very rapidly and accounts for 100 billion rupees to the Gross National Product (GNP). The egg production is growing at a compounded annual growth rate of over 8 percent in the country. India is the world's fifth largest egg producer. However, its per capita egg consumption is very poor i.e. 37 eggs per annum in comparison to developed countries [7]. Further, in comparison to the world average of 147 eggs on per capita basis it is still very poor. The great constraints of the poultry industry are the high cost of feed ingredients which accounts to over 70 percent of the total production cost and variability in their availability. Corn plays important role in poultry production, as it accounts to 50 to 55 percent of poultry feed. Presently, only about 50 percent of the maize is available as per their requirement of poultry feed industry. Similarly, the second important component of poultry feed is protein supplement. Vegetable proteins constitute around 30 percent of total compounded poultry diet. The major part of vegetable protein supplement is soybean meal. It has been reported that majority of the vegetable protein sources are deficient in one or more critical amino acids like methionine, lysine and threonine, etc [2]. On account of it, only one protein supplement cannot be used as a sole source of protein in layer ration. Hence, balanced diet should be formulated for each stage of a bird's life as per their need. Since there is no single source of protein that will provide all the amino acids in the ration, a combination of proteins from different feed-stuffs can be formulated to contain all the necessary amino acids. Many times deficient amino acids need to be supplemented in the diet. Although studies have been undertaken on the energy and protein requirements of laying birds but it needs evaluation in different conditions. Hence, present studies were conducted to study the performance of laying birds fed diets containing different energy and protein levels along with supplementary methionine and lysine

Material and Methods
The experiment was conducted in 80 laying birds for a period of 12 weeks including 3 days metabolic trail. Eighty birds were randomly distributed to eight different groups offered different diets. Thus, each diet was offered to ten layer birds. The house was fumigated and sprayed with disinfectant before the start of the experiment. The feed ingredients used in the experiment were maize, soybean meal and deoiled rice polish (DORP). The analysed chemical composition of feed ingredients is given in table 1.

Table 1: Chemical composition of feed ingredients (% DM basis)

	Maize	Deoiled rice polish	Soybean meal	Fish meal
Moisture*	9.35	11.88	10.36	11.55
Dry matter*	90.65	88.12	89.64	88.45
Crude protein*	8.90	13.0	44.9	53.8
Ether extract*	3.80	1.30	1.10	7.00
Crude fiber*	2.20	18.10	7.80	0.90
NFE*	72.1	40.3	28.0	4.4
ME	3312	1808	2205	2464
Calcium	0.02	0.05	0.29	4.45
Phosphorus	0.27	1.19	0.64	2.47
Lysine	0.26	0.44	2.66	3.29
Methionine	0.18	0.31	0.62	1.30
Cystine	0.19	0.28	0.65	0.53
Tryptophane	0.06	-	0.73	0.48
Arginine	0.43	1.02	3.11	2.54

*Chemical composition of feed ingredients analysed in the laboratory

The soybean oil was used to balance the energy level in the diet wherever it was required. The mineral supplements used in the diets were dicalcium phosphate, lime stone, manganese sulphate, zinc sulphate and potassium iodide. Various commercial vitamin supplements were used as per the requirement. The ingredients and nutrients composition of layer diets are furnished in table 2.

Table 2: Ingredients and nutrients composition of layer diets (%)

Diet	T1	T2	T3	T4
Maize (Kg)	61.50	59.80	67.85	64.09
DORP (Kg)	10.65	6.00	3.40	-
SBM (Kg)	16.85	23.2	17.75	24.1
Soybean oil (g)	-	-	-	520
Methionine (g)	10	8	15	-
L-lysine (g)	20	-	15	-
DCP (Kg)	1.80	1.80	1.80	1.80
LSP (Kg)	3.30	3.30	3.30	3.30
Shell grit (Kg)	5.50	5.50	5.50	5.50
Common salt (g)	300	300	300	300
ZnSo4 (g)	10.65	10.65	10.65	10.65
MnSo4 (g)	6.50	6.50	6.50	6.50
KI (mg)	150	150	150	150
Vit. A, B_2, D_3, K (g)	30	30	30	30
Vit. B Complex (g)	15	15	15	15
Selinomycine (g)	50	50	50	50
Total	100	100	100	100
CP (%)	14	16	14	16
ME (kcal/kg)	2600	2600	2700	2700
Cost (Rs) / kg	18.16	19.80	18.69	20.56

Treatments containing two different levels of energy (2600 and 2700 kcal ME/kg) and protein (14 and 16%) with or without supplementation with essential amino acids. In all the diets, level of lysine and methionine amino acids were maintained at least as per [8]. Feed was offered *ad libitum* in feeders. It was offered twice in a day. An ample supply of clean and fresh drinking water was made all the time.

Feed ingredients as well as diets used in the study and excreta collected during the metabolic trial were analysed for proximate composition using A.O.A.C method [1]. The data obtained during the experiment was analysed statistically using completely randomized design [11] and differences among the treatments were tested for significance [3].

Results and Discussion

Cumulative performance of birds on diets with different energy and protein levels during 0-12 weeks of the experiment is presented in table 3. Feed intake (daily, per egg, per dozen and per kg eggs) was significantly (p<0.05) higher in groups allotted T1 diet. Hen day egg production (HDP %) was maximum in birds allotted T4 diet. The egg weight in birds assigned T3 and T4 diet was significantly higher than those allotted T1 and T2 diet.

Findings clearly revealed that low energy-protein diet (14% CP and 2600 Kcal ME/kg) was responsible for higher feed consumption while, higher energy-protein diets (16% CP and 2700 kcal ME/kg) reduced the feed intake of birds significantly. It may be attributed to supply of nutrients as per body need. The findings were in confirmation with the reports [5] that increase in the energy content of the diet from 2680 to 2810 kcal/kg, decreased the feed intake of birds by 5.0 percent. It was also observed by some scientists that protein had a significant effect on egg production, feed intake and feed conversion in birds [6].

Table 3: Cumulative performance of laying birds on diets with different energy and protein levels (0-12 wks. of experiment)

Trts	CP/ME	Feed intake (g/bird/ day)	Feed intake (g/egg)	Feed intake (g/dozen eggs)	Feed intake (g/kg eggs)	HDP (%)	Egg weight (g)
T1	14/2600	122.4^{a}	140.4^{a}	1685^{a}	2680^{a}	87.33^{d}	52.59^{b}
T2	14/2700	118.7^{abc}	132.9^{b}	1596^{b}	2537^{b}	89.33^{bcd}	52.67^{b}
T3	16/2600	117.3^{ab}	132.5^{b}	1591^{b}	2454^{cd}	88.55^{cd}	54.11^{a}
T4	16/2700	115.0^{cd}	126.5^{c}	1518^{c}	2380^{de}	90.89^{ab}	53.37^{a}
	LSD	5.124	4.229	48.31	68.35	2.812	1.259

$^{a, b, c, d, e}$ values with similar superscript did not differ significantly (P>0.05)

Critical perusal of the results indicated that 16 percent protein and 2700 kcal ME/kg diet was responsible for maximum hen day egg production. It was directly related to supply of nutrients to the birds. Probably, 16 percent CP and 2700 kcal ME/kg diet was able to supply the required quantity of nutrients for optimum productivity in birds. There are reports which indicate that when the dietary energy is increased from lower to higher level, it increases the egg production in birds. The results were in agreement with the findings of [9] who observed significantly higher egg production at higher dietary

energy levels. They concluded that 2850 to 2900 kcal ME/kg diet was sufficient for optimum egg production. Similar to present findings, [4] also observed highest egg production in birds with 16 percent protein diet.

It was observed in commercial layers, different levels of energy and protein had no significant effect on egg production, feed consumption, feed efficiency and egg weight and suggested that 15 percent protein and 2800 kcal ME/kg diet was optimum for layers in winter [12]. Recently, [10] also reported that dietary concentrations of CP had no effect on egg production (EP), feed intake (FI), feed efficiency (FE) and body weight (BW) in layers fed 15 percent CP. They observed higher rate of EP and higher FE and EM in groups fed 2600 kcal ME/kg compared with those fed 2350 kcal ME/kg.

Conclusion

Considering the overall performance of the birds, it has been concluded that diet (T3) containing 14 percent crude protein and 2700 kcal ME/kg, along with lysine and methionine supplementation was providing optimum amount of nutrients for egg production in layers with better economics for the farmers. Thus, by increasing slight energy we can reduce the protein content of diet with additional supplementation of limiting amino acids without any adverse effect on egg production.

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