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Nutrient requirement of Kadaknath chicken during the finisher phase to optimize the growth and economic performance

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Abstract
The present experiment was carried out after completion of an earlier experiment of nutrient requirement of Kadaknath chicken during starter phase (0-6 weeks) was continued for finisher phase (7-14 weeks) to optimize the growth and economic performance. The 270 Kadaknath chickens were distributed into five treatment groups having three replicates containing 18 birds in each. The different dietary treatment groups were viz., control group A: birds fed diet CP- 18%, ME- 2700 kcal/kg, Methionine- 0.38%, Lysine- 0.85%; B: birds fed diet CP- 17%, ME- 2900 kcal/kg, Methionine- 0.45%, Lysine- 0.95%; C: birds fed diet CP- 18%, ME- 3000 kcal/kg, Methionine- 0.45%, Lysine- 0.90%; D: birds fed diet CP 19%, ME- 3100 kcal/kg, Methionine- 0.40%, Lysine- 1.00%; E: birds fed diet CP- 20%, ME- 3200 kcal/kg, Methionine- 0.38%, Lysine- 1.10%. The live body weight and weight gain in treatment groups C, D and E were significantly (P<0.01) higher as compared to control group at the 14th week. The feed intake and feed conversion ratio showed non-significant differences among all treatment groups. The treatment group D was recorded highest live body weights and lowest cost of production rupees per kg live body weights as compared to other treatment groups. The results of the present experiment suggested that Kadaknath birds fed with finisher diet containing a CP-19%, ME- 3100 kcal/kg, Methionine- 0.40%, Lysine- 1.00% from 7th to 14th week of age recorded better growth performance and lowest cost of production of Kadaknath chicken.

Keywords: Kadaknath, finisher phase, nutrients, growth performance, economics

1. Introduction
Presently nineteen poultry breeds are registered at the National level, ICAR- National Bureau of Animal Genetic Resources [1]. Out of these breeds, one well known native breed is 'Kadaknath' meaning a fowl having black flesh. The bird is native of Jhabua and Dhar districts in Western parts of Madhya Pradesh. As per available literature Kadaknath lays around 80-90 eggs annually [2] and the bird is not a good brooder. Ability to adapt to local climatic conditions, breed specific criteria, meat qualities and disease resistant are the factors responsible for the popularity of Kadaknath bird. The Kadaknath breed contains a high percentage of protein and believed to have aphrodisiac properties [3]. The last couple of years the demand for Kadaknath bird is increased tremendously. To grab the demanding market of Kadaknath farmers started rearing Kadaknath bird intensively. Scare information was available on nutrient requirement of Kadaknath birds. The base of the nutrient requirement for Kadaknath was considered on the basis of data available in the book Nutrient requirements of Animals published by the Indian Council of Agriculture Research (ICAR), New Delhi [4]. Hence, the experiment was planned to know the nutrient requirement of Kadaknath chicken during the finisher phase (7-14 weeks) to optimize the growth performance.

2. Materials and Methods
The present experiment was carried out after completion of an earlier experiment of nutrient requirement of Kadaknath chicken during starter phase (0-6 weeks) was continued for finisher phase (7-14 weeks). The present experiment was carried out to investigate the nutrient requirement of Kadaknath chicken during the finisher phase from 7 to 14th week age of Kadaknath birds. The experiment was conducted on 270 Kadaknath chicken of age of 7th week on ward were distributed into five treatment groups A, B, C, D and E having three replicates containing 18 birds in each. While initiating the experiment the live body weight at the 6th week of age was considered as initial live body weight for the experiment (7-14 weeks).

The different dietary treatment groups for the earlier experiment were control group A birds fed on diet containing crude protein (CP)- 18%, Metabolizable energy (ME)- 2700 kcal/kg, Methionine- 0.38%, Lysine- 0.85%, group B birds fed on diet containing CP- 19%, ME- 2800 kcal/kg, Methionine- 0.40%, Lysine- 0.90%, group C diet containing CP- 20%, ME- 2900 kcal/kg, Methionine- 0.48%, Lysine- 1.00%, group D Birds fed on diet containing CP- 21%, ME- 3000 kcal/kg, Methionine- 0.45%, Lysine- 1.10% and group E diet containing CP- 22%, ME- 3100 kcal/kg, Methionine- 0.50%, Lysine- 1.20%.

2.1 Experimental diets and nutrient composition

The feed formulation of the experimental diet, the control diet was prepared as per Singh [4] standard available in Nutrient requirement of animals-poultry book published by Indian council of Agriculture Research (ICAR), New Delhi. Considering the same standards for the control diet as basal feed and other dietary treatment groups feed was formulated. The experimental diet feed was formulated to prepare the finisher phase (7-14 weeks) diets for different treatment groups (Table 1). The diet was prepared by using major ingredients as maize, soybean meal, wheat bran and maize gluten. The experimental feed formulation and calculated nutritional composition is given in the Table 1.

Table 1: Feed ingredients (%) and nutrient composition of different treatment groups

Feed Ingredients (%)	Treatments groups				
	A	B	C	D	E
Maize	58.13	71.86	67.67	63.28	62.48
Soya DOC (45%)	24.30	23.35	18.80	18.00	0.00
Soya DOC Hypro	0.00	0.00	7.00	8.50	24.30
Wheat bran	13.00	0.00	0.00	0.00	0.00
Maize glutean (65%)	0.00	0.00	0.00	1.60	3.50
Vegetable oil	0.00	0.00	1.80	3.90	4.90
Monocalcium phosphate	1.50	1.53	1.60	1.58	1.65
Limestone powder (LSP)	2.10	2.10	2.10	2.11	2.10
Salt (NaCl)	0.40	0.40	0.40	0.40	0.40
Trace mineral mixture	0.12	0.12	0.12	0.12	0.12
Vitamin premix	0.05	0.05	0.05	0.05	0.05
DL- Methionine	0.10	0.18	0.18	0.11	0.07
L-Lysine	0.02	0.13	0.00	0.07	0.15
Choline chloride (75%)	0.05	0.05	0.05	0.05	0.05
Toxin binder	0.10	0.10	0.10	0.10	0.10
Coccidiostat	0.03	0.03	0.03	0.03	0.03
Sodium bicarbonate	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Nutrient Composition					
Metabolizable energy (Kcal/kg)	2700	2910	3006	3105	3203
Crude protein (%)	18.1	17.12	18.09	19.12	20.13
Ether extract (%)	2.5	2	3.56	3.59	4.86
Crude fibre (%)	5.06	4.25	4.24	4.2	4.15
Total lysine (%)	0.85	0.95	0.9	1.01	1.11
Total methionine (%)	0.38	0.45	0.46	0.4	0.38
Calcium (%)	1.12	1.11	1.11	1.11	1.10
Available phosphorous (%)	0.46	0.49	0.47	0.47	0.49

2.2 Management of birds and parameters studied

The experimental Kadaknath chicks were reared on deep litter system and all the groups were provided similar environmental and managemental condition throughout the experimental period (7-14 weeks). Each bird provided 1 square feet of floor space. Mortality was recorded as and when it occurred. The birds were offered *ad-lib* fresh and clean drinking water throughout the experiment. The birds were vaccinated against Ranikhet disease (Lasota strain) at the 8th week of age. The data were recorded collectively replicate wise to calculate the mean live body weight per bird, weight gain in each treatment and the feed intake to calculate feed consumption per bird. The recorded data of feed intake and gain in body weight were used to calculate feed conversion ratio. The cost of rearing the Kadaknath birds for the experiment was calculated by considering the prevailing costs of Kadaknath birds up to 6th week of age, feed, litter and vaccine etc. The economics were calculated by considering all the input and output of rearing Kadaknath birds.

2.3 Statistical analysis

Data obtained from the experiment were subjected to one way analysis of variance (ANOVA) using the using Complete Randomized Design of Snedecor and Cochran [5].

3. Results and Discussion

3.1 Live body weights and weight gain

In continuation to earlier experiment the mean initial live weights in treatment groups A to E at the beginning of 7t^{h} week of age (i.e. at the end of 6th week) were 251.74, 303.92, 266.76, 322.44 and 282.64, respectively. The significantly (P<0.01) higher mean live body weight was observed in treatment groups B, D and E as compared to control group A from 7th to 14th weeks of age (Table 2). At 13 and 14th week, the live body weight was significantly (P<0.01) higher in treatment group C compared to control group, whereas, there was non-significant differences during 7th to 12th weeks. At the 14th week of age, the mean live body weight was significantly (P<0.01) higher in all other treatment groups as compared to control group. The present findings are accordance with a researcher who reported that increased dietary protein (19-21% CP) and energy (3000 kcal/kg) levels in Betong chicken significantly improved growth performance Nguyen *et al.* [6]. However, Tandekar [7] reported that the diet containing 20% of CP have higher average live body weight and average weight gain compared to treatment containing CP 18% and 16%, respectively.

The cumulative weight gain was significantly (P<0.01) higher in treatment groups C, D and E compared to control group at the 14th week (Table 2). However, there was non-significant difference in control group and treatment group B at 14th week. The non-significant difference for cumulative weight gain was recorded in all treatment groups from 7th to 13th weeks. The non-significantly difference for weight gain in different dietary treatments was in agreement with the result of Magala *et al.* [8] who reported that two protein levels (18 and 20% CP) and three energy levels (2800, 2900 and 3000kcal/kg ME) in cockrel diets were not significantly affected body weight gain by the dietary regimes. However, Nguyen *et al.* [6] reported that the increase in dietary protein and energy levels did not significantly affect feed intake in Betong chickens.

Table 2: Weekly live body weight (g/bird) and weight gain (g/bird) of Kadaknath chicken in different dietary treatment groups

Age (weeks)	Treatment groups					CD	CV
	A	B	C	D	E		
Live body weights (g/bird)							
7th	317.92^{c} ±8.87	366.7^{ab} ±11.74	328.07^{c} ±4.28	394.21^{a} ±15.23	340.80^{b} ±6.82	45.81**	5.06
8th	398.67^{d} ±8.51	443.3^{b} ±2.03	410.67^{cd} ±5.36	480.00^{a} ±15.28	432.66^{bc} ±8.11	40.30**	3.59
9th	485.67^{d} ±6.89	541.33^{ab} ±10.84	501.66^{cd} ±4.84	568.00^{a} ±15.72	524.66^{bc} ±7.80	44.64**	3.29
10th	579.66^{d} ±6.98	636.33^{ab} ±11.33	597.00^{cd} ±4.51	661.33^{a} ±15.60	620.33^{bc} ±7.80	44.89**	2.80
11th	680.33^{d} ±5.78	741.33^{ab} ±11.84	704.00^{cd} ±4.00	766.00^{a} ±15.72	727.33^{bc} ±8.09	44.90**	2.39
12th	786.33^{d} ±5.36	848.00^{ab} ±12.1	812.00^{cd} ±4.51	871.33^{a} ±15.51	835.66^{bc} ±8.09	44.78**	2.08
13th	901.00^{c} ±5.51	963.00^{ab} ±12.50	935.66^{b} ±6.36	990.33^{a} ±15.43	960.00^{ab} ±8.50	46.46**	1.89
14th	1025.00^{c} ±4.36	1089.33^{b} ±12.84	1072.66^{b} ±7.42	1124.66^{ab} ±15.84	1096.66^{ab} ±8.19	47.29**	1.69
Body weight gain (g/bird)							
7th	66.17 ±10.28	62.80 ±1.95	61.31 ±2.80	71.77 ±10.25	58.16 ±5.02	NS	19.03
8th	146.92 ±9.94	139.41 ±9.66	143.91 ±0.98	157.56 ±9.83	150.02 ±4.23	NS	9.21
9th	233.92 ±8.70	237.41 ±1.85	234.91 ±0.91	245.55 ±10.33	242.02 ±4.80	NS	4.69
10th	327.92 ±8.54	332.41 ±2.05	330.24 ±0.87	338.89 ±10.17	337.69 ±5.08	NS	3.34
11th	428.59 ±7.50	437.41 ±1.81	437.24 ±1.28	443.55 ±10.33	444.69 ±4.50	NS	2.42
12th	534.59 ±6.93	544.08 ±2.69	545.24 ±0.87	548.89 ±10.18	553.02 ±5.06	NS	1.93
13th	649.25 ±6.56	659.08 ±2.58	668.91 ±1.88	667.89 ±10.22	677.36 ±5.99	NS	1.62
14th	773.25^{c} ±5.73	785.4^{bc} ±2.26	805.9^{a} ±2.79	802.22^{ab} ±10.51	814.02^{a} ±5.95	27.74**	1.35

Means bearing different superscript within a row differ significantly. **P<0.01, NS- Non- significant.

3.2 Feed Intake, feed conversion ratio (FCR) and mortality (%)

There was non-significant difference for cumulative feed intake in all treatment groups from 8th to 14th weeks (Table 3). The treatment group C was recorded significantly (P<0.05) higher feed intake as compared to control at 7th week, whereas, there was non-significant difference in treatment groups B, D and E as compared to control group. The studies are agreement with a researcher who stated that the birds fed on diet containing 160 and 180 g CP/kg showed non-significant (P>0.05) difference in feed intake Kingori *et al.* [9]. However, Nguyen *et al.* [6] who reported that no significant difference was observed for feed intake at different dietary protein and energy levels in Betong chickens. The results are accordance to the findings of Mandal *et al.* [10] and Elangovan *et al.* [11] who reported no significant influence of feed intake in Naked Neck x CARI Red chicks due to dietary treatments with crude protein of 18, 16, 14 and 12 per cent.

The cumulative weekly feed conversion ratio showed non-significant differences among all treatment groups from 7 to 14th weeks of age (Table 3). However, at the 14th week of age poor FCR was recorded in treatment group E as compared to other treatment groups, but statistical difference was non-significant. The findings are accordance with Reddy [12] reported that the birds fed on low protein diet viz. 18, 19 and 20% showed the similar feed efficiency but had non-significant (P>0.05) effect with birds fed on a diet containing 16% CP. However, the dietary energy levels (3000-3200 ME kcal/kg) did not show significant effect on FCR in Betong chicken Nguyen *et al.* [6]. Magala *et al.* [8] reported that the feed conversion ratio was not significantly affected by the two dietary protein levels (18 and 20% CP) and three energy levels (2800, 2900 and 3000 ME kcal/kg) in cockerels.

The mortality (%) in all treatment groups was within normal range (Table 3). The post mortem examination revealed that the mortality occurred could not be attributed due to dietary treatment. The present findings are in accordance with reporter who observed that there was no significant mortality percentage due to different dietary protein and energy ratio in indigenous chickens Mohammad and Sohail [13]. Similarly, in cockerels the mortality percentages were within the limits during the experimental period in cockerel birds. There was no significant mortality due to dietary nutrient level difference Tandekar [7].

Table 3: Feed Intake (g/bird), feed conversion and mortality (%) ratio of Kadaknath chicken in different dietary treatment groups

Age (weeks)	Treatment groups					CD	CV
	A	B	C	D	E		
Feed intake (g/bird)							
7th	348.53^{bc} ±14.56	388.04^{ab} ±5.82	395.08^{a} ±2.46	385.85^{ab} ±25.89	337.54^{c} ±6.26	43.962*	6.513
8th	684.19 ±27.81	739.0 ±8.98	641.41 ±12.07	737.84 ±41.28	646.54 ±37.45	NS	7.196
9th	954.53 ±24.25	1040.70 ±15.65	862.41 ±42.82	967.84 ±97.93	951.87 ±37.75	NS	9.482
10th	1269.53 ±36.67	1371.37 ±28.03	1183.41 ±61.48	1318.84 ±121.10	1259.21 ±21.90	NS	8.778
11th	1511.19 ±3985	1639.03 ±47.33	1464.08 ±48.45	1574.18 ±125.23	1513.54 ±24.59	NS	7.537
12th	1795.19 ±38.39	1928.70 ±6109	1788.08 ±53.25	1874.84 ±126.44	1817.21 ±44.19	NS	6.784
13th	2166.53 ±36.31	2252.03 ±85.80	2155.75 ±26.12	2250.18 ±200.98	2321.54 ±37.02	NS	7.857
14th	2560.14 ±35.30	2590.13 ±129.71	2529.75 ±35.53	2623.51 ±201.62	2804.65 ±38.18	NS	7.324
Feed conversion ratio							
7th	5.60 ±1.10	6.19 ±0.18	6.47 ±0.29	5.48 ±0.43	5.86 ±0.37	NS	16.758
8th	4.69 ±0.34	5.35 ±0.39	4.45 ±0.09	4.69 ±0.06	4.30 ±0.17	NS	9.140
9th	4.09 ±0.16	4.38 ±0.06	3.66 ±0.17	3.92 ±0.22	3.93 ±0.10	NS	6.584
10th	3.87 ±0.13	4.12 ±0.07	3.58 ±0.18	3.87 ±0.23	3.72 ±0.03	NS	6.659
11th	3.52 ±0.09	3.74 ±0.10	3.35 ±0.11	3.53 ±0.20	3.40 ±0.05	NS	5.790
12th	3.35 ±0.07	3.54 ±0.10	3.28 ±0.09	3.41 ±0.16	3.28 ±0.08	NS	5.502
13th	3.33 ±0.09	3.41 ±0.12	3.22 ±0.03	3.36 ±0.25	3.42 ±0.06	NS	6.853
14th	3.31 ±0.07	3.29 ±0.16	3.14 ±0.04	3.26 ±0.21	3.44 ±0.04	NS	6.459
Mortality (%)							
7-14th	3.70	3.70	5.55	3.70	3.70		

Means bearing different superscript within a row differ significantly. *P<0.05, NS- Non- significant.

3.4 Economics of production

It was found that the production cost of Kadaknath chickens expressed in terms of rupees per kg live weight in treatment groups A, B, C, D and E was 313.89, 257.33, 301.03, 257.35 and 308.02 respectively (Table 4). The low cost of production was observed in treatment group B followed by treatment groups D, C, E and A. These results are in agreement with earlier researcher Perween *et al.* (2016) who reported that the higher energy with medium protein diet positively reflects to obtain desirable performance economically in Vanaraja chicken [14].

Table 4: Production cost of Kadaknath chickens from 7th to 14th week of age

Particulars	Treatments				
	A	B	C	D	E
Bird cost at the end of 6th week (Rs./bird)	261.11	218.62	255.39	217.56	256.23
Feed cost(Rs./kg)	21.73	21.89	23.83	25.49	27.30
Average live body weight (g/bird)	1025.00	1089.33	1072.67	1124.67	1096.67
Cumulative weight gain (g/bird)	773.26	785.42	805.91	802.22	814.03
Feed intake/ bird (g/bird)	2560	2590	2623	2623	2804
FCR	3.31	3.30	3.14	3.26	3.45
Mortality (%)	3.70	3.70	5.55	3.70	3.70
Total Feed cost (Rs./ bird)	55.63	56.70	62.52	66.87	76.57
Medicine, Vaccine, Litter, Miscellaneous cost.(Rs./bird)	5	5	5	5	5
Production cost (Rs./bird)	321.74	280.32	322.91	289.44	337.80
Production cost (Rs./kg live weight)	313.89	257.33	301.03	257.35	308.02

4. Conclusion

The results of the present experiment suggested that Kadaknath birds fed with finisher diet a containing CP-19%, ME- 3100 kcal/kg, Methionine- 0.40%, Lysine- 1.00% from 7th to 14th week of age recorded better growth performance and lowest cost of production of Kadaknath chicken.

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