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Effect of Feeding Different Dietary Protein Levels on Meat Characteristics of Kadaknath Chicken

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Abstract

The effect of feeding different levels of crude protein on meat composition and fatty acid profile of Kadaknath chicken meat at 12th week of age was studied. The bird fed with four different dietary treatment groups with different crude protein levels (14, 16, 18and 20%) with constant metabolizable energy (2800 kcal/kg). Among different parameters of meat characteristics, crude protein showed highly significant ($P \leq 0.01$) difference between treatments. The other parameters viz. per cent moisture, ether extract, crude fibre, total ash and gross energy of meat did notfoundsignificant difference due to different dietary treatments. Significantly ($P \leq 0.01$) lower muscle protein was observed at 14% CP diet than other dietary treatments. The saturated fatty acids, monounsaturated fatty acids, and polyunsaturated fatty acids showed non-significant difference due to different dietary treatments. The results concluded that Kadaknath chicken fed diet with 16% CP was adequate for higher muscle protein.

Key words: Meat composition, Fatty acids profile, Kadaknath chicken.

In India there are 19 registered breeds of native chicken as per ICAR-National Bureau of Animal Genetic Resources; Kadaknath is one among them. The specialty of the breed is the flesh and internal organs of this chicken that are black in colour. Kadaknath black meat

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has an intense and distinctive taste, and it contains more protein (24-25%) than commercial chicken (18-20%) meat (Rao and Thomas, 1984). Black meat is also considered healthier as it contains 24% linoleic acid, as against to the 21% in commercial chicken (Singh and Singh, 1980). Furthermore, the cholesterol content in Kadaknath chicken is only 184.75 mg/100 gm as against to the 218.12 mg/100 gm level present in other chicken varieties (Kumar *et al.,* 2018). Literature showedthat the performance of indigenous chicken can be improved by nutrition (Kingori *et al*., 2007). It is well known that dietary protein and fatty acid profiles are reflected in tissue protein and fatty acid. Poultry meat quality is reflected mostly on consumption features viz. appearance, flavour, juiciness, tenderness (Mir *et al*., 2017).Very little research work has been carried out on nutrient requirement and meat characteristics of Kadaknath chicken. Hence, the present research is designed to study the effect of different levels of dietary protein on meat characteristics of Kadaknath chicken.

Materials and Methods

A study was carried out to assess the effect of feeding different dietary protein levels on meatcomposition of Kadaknath chicken at 12 weeks of age.A total of 240-day old kadaknath chicks was wing banded and weighed individually. Four dietarytreatments groups with three replicates of 20 chicks each were allocated by randomization based on body weight. Four dietary different treatment groups with varying crude protein levels (T1-14, T2-16, T3-18 andT4-20% CP) with constant ME level (2800 kcal/kg) were prepared. During the initial period of first two weeks, the chicks were housed in cages and later shifted to deep litter system. The feed and water were provided, *ad libitum* and reared under standard managemental conditions. At the end of 12th week of age, 4 birds/ replicate were randomly selected formeat characteristics study. The collected meat samples from different treatment group wereanalyzed for moisture, crude protein, crude fibre, ether extract, total ash, gross energy and fatty acid profile. The data collected on various parameters were grouped and subjected for statistical analysis of variance (ONE WAY ANOVA) as per the procedure of statistical analysis system (SPSS, version 20.0 for windows) with Duncan's multiple range test for interpretation (Duncan, 1955).

Results and Discussion

Meat composition

The effect of different levels of feed CP on meat composition of Kadaknath chicken at 12th week of age is presented in Table I. Among different parameters, meat crude protein showed highly significant ($P \leq 0.01$) difference between treatments. The other parameters viz. per cent moisture, ether extract, crude fibre, total ash and gross energy of the meat did not have any significant influence between treatment groups. The meat crude protein percentage in T1, T2, T3 and T4 were 22.60 ± 0.07, 23.41 ± 0.28, 23.50 ± 0.09, and 23.45 ± 0.66 respectively. The meat protein percentage in Kadaknath chicken fed with 16 to 20 % CP was found significantly higher protein than diet fed with 14% crude protein. Hidayat and Iskandar (2019) found that 19 % CP in feed increased protein retention of body flesh (24.32 %) in SenSi-1 Agrinak chicken. Similarly, Marcu *et al.* (2013) found that diet with high protein (262.3 g CP/kg feed) had a positive influence in protein content of pectoral muscle in broiler chicken. Further, Miah *et al.* (2016) also found highest crude protein per cent in breast (22.39), thigh (22.51) and drumstick (19.66 %), when broiler fed with 195.9 g CP and 2904 kcal/kg ME. On contrary, Darsi *et al.* (2012) and Iqbal *et al.* (2014) in broiler chicken and Ravivarman (2021) in crossbred chicken found non-significance effect on muscle protein, when birds fed with various level of CP.Further, in our study the other parameters viz. moisture, ether extract, crude fibre and total ash and gross energy of the Kadaknath chicken meat did not have significant difference between treatment groups and this result are in agreement with work reported by Javaid *et al.* (2011) and Ravivarman (*loc cit*) in other chicken varieties. The present results showed that high CP content in feed had higher muscle protein level in Kadaknath chicken, might be due to better utilization of protein by kadaknath chickens.

Table I: Effect of different levels of crude protein on meat composition of Kadaknath chicken at 12 weeks of age (Mean ± SE), n=12

Treatment (Feed CP level)	Moisture (%)	Meat crude Protein (%)	Ether Extract (%)	Crude fibre (%)	Total Ash (%)	Gross Energy (kcal/kg)
T_1 (14%)	72.94 ± 0.56	22.60^{a} ± 0.07	1.59 ± 0.02	1.01 ± 0.01	1.85 ± 0.02	1575.53 ± 3.92
T_2 (16%)	72.10 ± 0.47	23.41^{b} ± 0.28	1.59 ± 0.02	1.09 ± 0.01	1.81 ± 0.06	1547.60 ± 16.97
T_3 (18%)	72.10 ± 0.75	23.50^{b} ± 0.09	1.53 ± 0.06	1.04 ± 0.03	1.82 ± 1.12	1585.56 ± 4.33
T_4 (20%)	72.44 ± 0.37	23.45^{b} ± 0.66	1.47 ± 0.01	1.01 ± 0.01	1.63 ± 0.11	1572.61 ± 11.85
F value	1.92^{NS}	18.37**	1.50^{NS}	0.02^{NS}	0.43^{NS}	35.38^{NS}

^{NS} Not significant, **Significant (P ≤ 0.01).Means bearing different superscripts within a column differ significantly (P ≤ 0.01).

Fatty acid profile of meat

The effect of different levels of feed CP on fatty acid profile of Kadaknath chicken meat at 12th week of age is presented in Table II. The saturated fatty acids (Myrestic, palmitic, stearic and behenic acid), Monounsaturated fatty acids (Oleic and palmetoleic acid), Polyunsaturated fatty acids (Archidic, linoleic, eicosapentaenoic, docosahexaenoic and linolenic acid) showed non-significant difference among treatment groups. In our experiment, the Kadaknath chicken fed with 20 % CP resulted in 17.78 % total polyunsaturated fatty acid which is higher than the value reported by Barteczko and Lasek, (2008) in broiler chicken (16.41%) and Sarwar *et al.* (2015) on broiler chicken (16.78%) fed with 18.94% and 21% CP respectively. Similarly, monounsaturated fatty acid of the present study (43.15%) is higher than Barteczko and Lasek (*loc cit*) who obtained 39.72% and 38.51% on broiler meat fed with 19.04 and 23.01% CP diet respectively. The present study proved that Kadaknath chicken meat is having higher quantity of polyunsaturated fatty acids than other chicken, which is more important in human health conscious.

Sensory evaluation

The effect of different levels of feed CP on sensory evaluation of Kadaknath chicken at 12 week of age is presented in Table III. The sensory parameter like appearance, flavor, juiciness and tenderness did not showed significant difference between treatment groups. The overall acceptance also found to be non-significant among all treatment groups. This result are comparable with the finding of Choo *et al.* (2014) in Korean local chicken and silky fowl fed with 21% CP and 3050 kcal/kg ME at 5 weeks of age. However, Hascik *et al.* (2014) had juiciness of 4.15 at 6th week of age in Hubbard JV chicken fed with 19% CP and 2905 kcal/kg ME during finisher phase. Similarly, Khan *et al.* (2019) recorded meat juiciness of 5.23 and over all acceptance of sensory evaluation of 5.54 in Aseel chicken fed with 20% CP and 2800 kcal/kg ME, which is lesser than in our study. The present study, it is inferred that the sensory parameters such as appearance, flavor, juiciness, tenderness and overall acceptance vary with breed, age, nutrition and rearing system.

Table II : Effect of different levels of crude protein on meat fatty acid profile of Kadaknath chicken at 12 weeks of age (Mean ± SE), n = 12

Treatment (CP level)	Saturated fatty acids (SFA)^{NS}				Monounsaturated fatty acids (MUFAs)^{NS}		Polyunsaturated fatty acids (PUFAs)^{NS}					Others (%) ^{NS}
	Myristic acid (%)	Palmitic acid (%)	Stearic acid (%)	Behenic acid (%)	Oleic acid (%)	Palmitoleic acid (%)	Archidic acid (%)	Linoleic acid (%)	Eicosa-pentae-noic acid (%)	Docosa-hexaenoic acid (%)	Linolenic acid (%)	
T_1 (14%)	2.51 ± 0.14	27.32 ± 0.27	7.04 ± 0.06	2.24 ± 0.36	36.45 ± 0.06	6.65 ± 1.83	0.27 ± 0.04	15.72 ± 0.09	0.23 ± 0.02	0.38 ± 0.04	0.57 ± 0.01	0.62 ± 0.12
T_2 (16%)	2.46 ± 0.02	27.18 ± 0.04	6.30 ± 0.05	2.15 ± 0.35	36.59 ± 0.79	6.68 ± 0.60	0.33 ± 0.02	16.52 ± 0.54	0.27 ± 0.02	0.38 ± 0.05	0.47 ± 0.01	0.67 ± 0.09
T_3 (18%)	2.38 ± 0.07	27.17 ± 0.09	6.77 ± 0.07	2.25 ± 0.26	36.41 ± 0.40	6.36 ± 1.08	0.31 ± 0.03	16.36 ± 0.44	0.25 ± 0.03	0.44 ± 0.02	0.55 ± 0.47	0.75 ± 0.09
T_4 (20%)	2.55 ± 0.000	27.34 ± 0.06	6.01 ± 0.06	2.43 ± 1.25	36.84 ± 0.24	6.31 ± 1.04	0.34 ± 0.01	16.20 ± 0.39	0.24 ± 0.01	0.50 ± 0.16	0.50 ± 0.05	0.74 ± 0.26
F value	0.490	0.930	0.17	0.824	0.928	0.118	0.613	0.992	0.341	0.174	0.970	0.991

^{NS} Not significant.

Table III : Effect of different levels of crude protein on sensory evaluation (Hedonic scale value of 9) of Kadaknath chicken at 12 weeks of age (Median score), n=12

Treatment (CP level)	Appearance	Flavour	Juiciness	Tenderness	Over all acceptance
T_1(14%)	7	7	7	7	6
T_2(16%)	7	7	6	7	6
T_3(18%)	8	8	6	7	7
T_4(20%)	7	7	6	7	6
Kruskal- Wallis H value	0.349^{NS}	0.349^{NS}	1.744^{NS}	0.538^{NS}	2.114^{NS}

^{NS} Not significant

Conclusion

The Kadaknath chicken fed with 16 to 20% CP was found significantly higher muscle protein than diet fed with 14% CP and the study concluded that16% CP protein is optimum for Kadakanath chicken.

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