

*Original Research***Influence of Different Levels of Energy and Protein Diets on Immunity Status of Swarnadhara Grower Parent Stock****N. Suma^{1*} and B. S. Venkatarami Reddy²**¹Assistant Professor, Department of Animal Nutrition, Veterinary College, KVAFSU, Bengaluru 560 024, Karnataka, INDIA²Former Dean, Veterinary College, KVAFSU, Bengaluru 560 024, Karnataka, INDIA***Corresponding author:** sumavet@gmail.com

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Abstract

The present study was designed to standardize the energy and protein levels in diet of Swarnadhara female parent stock during growing period. An experiment was conducted using 384 Swarnadhara female parent stock (13–20 weeks age) for 56 days. Four grower mash diets were formulated to inter-relate energy (2500/2400 kcal ME/kg) with protein (16/15% CP) at variable levels (2500kcal ME/kg/16 % CP –T₁; 2500kcal ME/kg/15 % CP –T₂; 2400kcal ME/kg/16 % CP –T₃ and 2400kcal ME/kg/15 % CP –T₄). Birds were divided into 32 replicates of 12 birds each and the above said four diets were offered randomly to 8 replicate groups. All the experimental birds were maintained under deep litter system with identical managemental conditions. Serum was separated from the blood collected in two birds of each replication at every 28-day interval. Results revealed that overall mean antibody titers against Newcastle disease ranged significantly ($P < 0.05$) from 103 (T₂) to 328 (T₄). However, pooled mean ELISA titers varied non-significantly ($P < 0.05$) from as low as 6411 (T₃) to as high as 7594 (T₄). Results concluded that 2400kcal ME/kg/15 % CP –T₄ in the diet (T₄) tended to enhance the antibody titers against Newcastle disease as well as against infectious Bursal disease.

Key words: Antibody Titers, Deep Litter System, Grower Mash Diets, Serum, Swarnadhara**How to cite:** Suma, N., & Reddy, B. (2020). Influence of Different Levels of Energy and Protein Diets on Immunity Status of Swarnadhara Grower Parent Stock. International Journal of Livestock Research, 10(3), 184-189. doi: 10.5455/ijlr.20200129054132**Introduction**

Poultry production has got a spectacular explosion leading to high profile industry in the recent years. Which is being the fastest growing sector of Indian agriculture having long history of backyard farming. Fewer genetic stocks have been developed recently for promoting rural poultry production and marketed under different names. One among such is Swarnadhara. Optimization of the nutrients' density of a ration for parent stock in terms of energy as well as protein is of prime importance. Keeping these points in view

an experiment was designed to find optimum energy: protein ratio for better immunity in growing Swarnadhara poult.

Materials and Methods

The experimental grower mash diets (T₁ to T₄) were formulated to inter relate energy with protein at variable levels using yellow maize, deoiled rice bran, soybean meal, sunflower extractions, salt, mineral mixture and additives. Experimental dietary design has been described in Table 1.

Table 1: Dietary description of experimental grower diets

Treatment		Metabolizable Energy (kcal/kg)	Crude Protein (%)
No.	Description		
T ₁	High Energy High Protein	2500	16
T ₂	High Energy Low Protein	2500	15
T ₃	Low Energy High Protein	2400	16
T ₄	Low Energy Low Protein	2400	15

The ingredient composition of each formulated diet in detail is being given in Table 2 and all these diets were subjected for chemical analysis according to standard procedures (AOAC, 2005).

Table 2: Ingredient composition of experimental diets compounded during feeding trial of growers

Ingredient, kg	T ₁	T ₂	T ₃	T ₄
Maize	444	440	374	373
De-oiled rice bran	270	305	330	350
Soybean meal	60	28	25	0
Sunflower extractions	188	189	233	239
Salt	3	3	3	3
Mineral mixture ¹	35	35	35	35
Total	1000	1000	1000	1000
Additives, g/ton				
AB ₂ D ₃ K ²	150	150	150	150
B complex ³	200	200	200	200
DL-Methionine ⁴	500	500	500	500
Coxistat ⁵	750	750	750	750
Albac ⁶	300	300	300	300

¹Mineral mixture contained: Moisture – 3 %, Ca – 32 %, P – 9 %, Mn – 0.27 %, Zn – 0.26 %, I – 0.01 %, Cu – 0.01 %, Fe – 0.10%, Fl – 0.03% (Max).

²Each gram contained: Vitamin A - 82,500 IU, Vitamin B₂ - 50 mg, Vitamin D₃ - 12,000 IU, Vitamin K - 10 mg, Organic Nutritive Carrier – Q.S.

³Each gram contained: Vitamin B₁ - 4 mg, Vitamin B₆ - 8 mg, Vitamin B₁₂ - 40 µg, Vitamin E - 40 mg, Calcium-d-pantothenate - 40 mg, Niacin - 60 mg, Organic Nutritive Carrier – Q.S.

⁴Each gram contained: DL-Methionine - 980 mg.

⁵Anticoccidial contained Maduramycin Ammonium – 1%

⁶Antibiotic growth promoter contained Zinc Bacitracin - 15%

Female Swarnadhara birds (384 number) of about 9 weeks age from two different hatches of 10 days difference were selected and were stabilized for 21 days feeding with a practical grower mash diet. At the age of 12 weeks, they were divided into 32 groups of 12 birds each and each of the above mentioned four diets was offered randomly to eight replicate groups. A completely randomized design was used to carry out the experiment. The birds of four replicate groups out of eight from each treatment were housed in adjacent pens and remaining four replicates were housed exactly in opposite of other side of the poultry house. All the birds were reared under deep litter system provided with paddy husk as the litter material. Feed restriction programme was followed throughout the experimental period (13-20 weeks) to maintain the ideal body weight of the breeder flock. Each pen was provided with a tubular type of feeder and a continuous channel type of waterer on both sides of the house for clean and fresh water. By and large, the distribution of replications of treatments was essentially uniform. The experimental birds at the age of 10th week of age were beak trimmed (upper 1/3rd) using electrical debeaker to prevent cannibalism and during 11th week, they were dewormed using levamisole (@ 13 mg/kg BW) through feed. Subsequently, during 12th week, all the birds were vaccinated against New Castle disease using live vaccine through subcutaneous route. Apart from these, all the birds were maintained under uniform standard managerial conditions including lighting programme, preventive or therapeutic disease control schedule, feeding frequency, watering methods and other routine bio-security aspects. The experiment was conducted for 56 days which was divided into four 14-day interval periods.

Two birds from each replication were selected randomly at the start of the experiment (12th week of birds' age) and they were bled to collect blood of 1 ml each from its wing vein. The blood collected from each bird was transferred into a clean, sterilized and labeled test tube for separation of serum. The test tubes were held in a slanting position to facilitate serum separation as per the standard procedures (Calnek *et al.*, 1992) and the clear non-haemolysed serum was then transferred into a clean, sterilized and labeled vial. The separated serum samples were stored at -20^oC for further estimation of immunity titers. Further, the same birds (with appropriate random substitution in cases of mortality, if any), were bled to collect the serum at subsequent 28-day intervals. Immunological titers (ND and IBD) were estimated from serum samples thus collected at M/s. Venkateshwara Hatcheries Private Limited Laboratory, Bangalore. The data pertaining to various parameters obtained during the experimental trial were analyzed in completely randomized design according to the procedures described by Snedecor and Cochran (1989).

Results and Discussion

The proximate composition including that of calcium and phosphorus of experimental grower diets were analysed on different occasions of the 56-day experimental period is given in Table 3.

Table 3: Analysed chemical composition of experimental diets compounded during grower phase of the experiment

Treatment		Proximate Composition (%) ¹						Minerals (%)		ME ² (kcal/kg)
No.	Description	Dry matter	Crude Protein	Ether Extract	Crude Fiber	Total Ash	NFE	Ca	P	
T ₁	High Energy High Protein	91.23	16.42	2.28	10.12	8.84	62.34	1.31	1.14	2534
T ₂	High Energy Low Protein	91.14	15.02	2.33	10.56	9.12	62.97	1.26	1.21	2524
T ₃	Low Energy High Protein	90.79	15.96	2.01	10.87	8.32	62.84	1.27	1.15	2448
T ₄	Low Energy Low Protein	90.54	15.23	1.98	12.11	9.41	61.27	1.3	1.19	2441

¹ Average values of samples on 4 occasions; ² Calculated value

The per cent dry matter (DM) content of experimental diets ranged from 90.54 (T₄) to 91.23 (T₁) while that of analyzed crude protein (CP) content was 16.42, 15.02, 15.96 and 15.23 per cent, respectively in T₁, T₂, T₃ and T₄ diets. The ether extract (EE), crude fiber (CF), total ash (TA) and nitrogen free extractives (NFE) of diets were ranging from 1.98 (T₄) to 2.33 (T₂); 10.12 (T₁) to 12.11 (T₄); 8.32 (T₃) to 9.41 (T₄) and 61.27 (T₄) to 62.97 (T₂) per cent, respectively. The mineral composition for calcium and phosphorus analysed for the said diets ranged from 1.26 (T₂) to 1.31 (T₁) and 1.14 (T₁) to 1.21 (T₂), respectively. The calculated metabolizable energy (ME) values were found to be 2534 (T₁), 2524 (T₂), 2448 (T₃) and 2441 (T₄) kcal/kg. The chosen levels of protein in the two test diets (T₂ and T₄) of the present study were close to the value as recommended by Reddy and Rajendiran (2002). However, the other two diets (T₁ and T₃) were selected with slightly higher protein values to see the counter effect, if any. Contrarily, the metabolizable energy values were much lower than the values recommended by Reddy and Rajendiran (2002).

Immunological Assay

The status of antibody titers in birds against Newcastle disease (ND) by HI test as well as against Infectious Bursal disease (IBD) by ELISA at the start of experiment and on two more succeeding 28-day intervals in various dietary groups estimated is presented in Table 4 and 5, respectively.

Table 4: ND titer values of experimental birds fed different diets during different time intervals of grower trial

Treatment		ND titers			
No.	Description	1 st Day ^{NS}	28 th Day [*]	56 th Day [*]	Mean [*]
T ₁	High Energy High Protein	52±13	216±50 ^{ab}	116±24 ^b	128±20 ^b
T ₂	High Energy Low Protein	126±62	56±5 ^b	128±30 ^b	103±27 ^b
T ₃	Low Energy High Protein	132±61	170±59 ^b	210±74 ^b	171±26 ^b
T ₄	Low Energy Low Protein	100±25	372±110 ^a	512±158 ^a	328±65 ^a
CD		-	93.39	123.95	53.79
F-value		0.63	3.78	4.28	6.76

^{*} Within column, means bearing at least one common superscript are statistically similar ($P \geq 0.05$); ^{NS} Non-significant

Table 5: IBD titer values of experimental birds fed different diets during different time intervals of grower trial

Treatment No.	Description	IBD titers			
		1 st Day*	28 th Day ^{NS}	56 th Day*	Mean ^{NS}
T ₁	High Energy High Protein	5994±325 ^{ab}	6695±551	6645±562 ^b	6444±353
T ₂	High Energy Low Protein	5893±721 ^{ab}	7680±636	7231±482 ^{ab}	6935±466
T ₃	Low Energy High Protein	5301±453 ^b	6661±848	7270±407 ^{ab}	6411±336
T ₄	Low Energy Low Protein	6732±375 ^a	7793±913	8258±687 ^a	7594±486
CD		683.9	-	755.61	-
F-value		1.42	0.66	1.51	1.78

* Within column, means bearing at least one common superscript are statistically similar ($P \geq 0.05$); ^{NS} Non-significant

The mean HI titer values were by and large quite uniform ($P \geq 0.05$) at the start, while the effect of diets on HI titer was evident at 28th day and persisted till the end of the experiment (56th day). The mean HI titers ranged from 52 (T₁) to 132 (T₃) on 1st day; 56 (T₂) to 372 (T₄) on 28th day and 116 (T₁) to 512 (T₄) on 56th day. The results reveal that, 2400kcal ME/kg/15 % CP in the diet (T₄) tended to enhance the antibody titers against Newcastle disease throughout the experimental period over other diets. The overall mean values ranged significantly ($P \leq 0.05$) from 103 (T₂) to 328 (T₄). Contrarily, *In vivo* supplementation of tryptophan (0.5%) on 18th day incubation of eggs has showed increased HI titer against ND virus on 4th day of post-hatch in broilers (Nayak *et al.*, 2018). However, inclusion of turmeric at 2.5, 5 and 7.5 g / kg in broiler diets resulted in higher immunity status (Emadi and Kermanshahi, 2007).

The mean values of ELISA titers under different dietary groups varied from 5301 (T₃) to 6732 (T₄); from 6661 (T₃) to 7793 (T₄) and from 6645 (T₁) to 8258 (T₄) on 1st day, 28th day and 56th day, respectively. These mean titers were significantly ($P \leq 0.05$) different at initial day as well as on 56th day while they were non-significant ($P \geq 0.05$) on 28th day. Here also, 2400kcal ME/kg /15 % CP (T₄) recorded highest antibody titers from start till the end of the experiment. The pooled mean value varied non-significantly ($P \geq 0.05$) from as low as 6411 (T₃) to as high as 7594 (T₄). The mean ND titers ranged from 52 (T₁) to 132 (T₃) on 1st day ($P \geq 0.05$); 56 (T₂) to 372 (T₄) on 28th day ($P \leq 0.05$) and 116 (T₁) to 512 (T₄) on 56th day ($P \leq 0.05$). The results reveal that, 2400kcal ME/kg/15 % CP in the diet (T₄) tended to enhance the antibody titers against Newcastle disease. The mean values of IBD titers under different dietary groups varied from 5301 (T₃) to 6732 (T₄); from 6661 (T₃) to 7793 (T₄) and from 6645 (T₁) to 8258 (T₄) on 1st day ($P \leq 0.05$), 28th day ($P \geq 0.05$) and 56th day ($P \leq 0.05$), respectively. The low 2400kcal ME/kg/15 % CP diet (T₄) boosted the immunity status of birds. It had been shown that CP reduction (from 21 % to 19 %) no way influenced immunity against ND and IBD in a trial conducted by Joseph *et al.* (2017) in Swarnadhara chicks. However, supplementation of lutein at 40 mg / kg DM in the diet of captive golden pheasants has improved antioxidant and cellular immunity levels (Yogi *et al.*, 2018). Similarly, Galal *et al.* (2016) fed oregano essential oil at

50 ppm and 100 ppm to broilers through drinking water have recorded higher antibody titer against NDV and avian influenza virus.

Conclusion

The suggested optimum level of energy and protein in grower phase of Swarnadhara female parent stock is 2500 kcal ME / kg and 15% CP, respectively for better immunity.

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