A STUDY ON THE PROTEIN AND ENERGY REQUIREMENTS OF MUSCOVY DUCKLINGS

M. A. Ali[1] and G. A. Sarker

Department of Poultry Science, Bangladesh Agricultural University
Mymensingh 2202, Bangladesh

Summary

Two experiments were conducted with one-day-old straight run Muscovy ducklings to determine their protein and energy requirements. In the 1st experiment, isoenergetic diets (2800 kcal ME/kg) with three dietary proteins, 18, 20 and 22% in the starter period (1-28 days) and 16, 18 and 20% in the grower and finisher period (29-84 days) were used to determine the optimum protein requirement. While, in the 2nd experiment, isonitrogenous diets (20% C.P.) with three dietary energy, 2700, 2800 and 2900 kcal ME/kg in the starter period (1-28 days) and (18% C.P.) with 2800, 2900 and 3000 kcal ME/kg in the grower-finisher period (29-84 days) were used to determine the optimum energy requirement. It was observed that 20% C.P. in the starter period and 18% C.P. in the grower and finisher period was adequate for optimum performance, while, 2900 kcal ME/kg was sufficient to meet the optimum energy requirement in both the starter, grower-finisher period as regards body weight, feed efficiency, protein efficiency and caloric efficiency are concerned.
(Key Words : Muscovy Duckling, Protein, Energy)

Introduction

Muscovy (*Catrina moschata*) is a meat-type duck, locally known as chinahash. Information on duck nutrition is very limited compared to that of chicken. It is still more limited in meat-type Muscovy duck. Protein and energy are of major importance in duck nutrition. A few contradictory statement in meat-type duck nutrition is available in literature. Wilson (1975) suggested 22% protein during the 1st two week and 18% protein afterwards in the pekin type male duck. He further reported that diet with energy level of 10.88 MJ ME/kg produce significantly lighter ducks at 28 and 56 days and have significantly less feed conversion efficiency up to 14 days than 12.55 MJ ME/kg. Siregar et al. (1982) reported that Australian meat type ducklings given 19% and 16% protein with 12.70 MJ ME/kg is adequate to meet the growth rate and feed conversion efficiency up to 2 week and 3-8 weeks respectively. Pilla and Quilici (1975) stated that in Muscovy duck 16% protein and 2200 kcal productive energy per kg during 3-12th week of age attained the best weight gain and feed conversion efficiency. Leclercq and Carville (1976) studied the protein requirement of female Muscovy ducklings during the period of 4-11 weeks. They suggested 15% protein between 4-6 weeks, 14.5 % protein between 6-8 weeks and below 13% after 8 weeks. The diet had energy level of 12 to 13 MJ ME/kg. So, the present investigation was undertaken to study the protein and energy requirements of straightrun Muscovy ducklings in the starter (1-28 days), and grower-finisher periods (29-84 days).

Materials and Methods

A total of two experiments were done. In the 1st experiment, 60 one-day-old straightrun Muscovy ducklings were used to estimate the protein requirement, while in the 2nd experiment, 57 one-day-old straightrun Muscovy ducklings were used to estimate the energy requirement. In the 1st experiment, Isocaloric diets having three levels of protein, 22, 20 and 18% in the starter period (1-28 days) and 20, 18 and 16% in the grower-finisher period (29-84 days) were used are shown in table 1. The ducklings were distributed into three treatments on equal number and weight basis. While, in the 2nd experiment, iso-nitrogenous diets having 2700, 2800 and 2900 kcal ME/kg

[1]Address reprint requests to Dr. M. A. Ali, Department of Poultry Science, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh.
Received April 20, 1990
Accepted December 5, 1991

TABLE 1. COMPOSITION OF THE RATIONS USED TO STUDY THE PROTEIN REQUIREMENT IN THE STARTER, GROWER & FINISHER PERIOD

Ingredients	Starter (C.P. %)			Grower & finisher (C.P. %)		
(%)	22	20	18	20	18	16
Wheat	44	51	59	51	59	63
Wheat bran	5	5	5	5	5	7
Rice polish	10	10	10	10	10	10
Til oil cake	21	17.50	13	17.50	13	10
Fish meal	14.50	12	10	12	10	7
Bone meal	2	2	2	2	2	2
Oyster shell	0.50	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50	0.50
Soybean oil	2.50	1.50	–	1.50	–	–
Premix	*	*	*	*	*	*
Calculated composition :						
C.P. (%)	21.90	19.95	17.95	19.95	17.95	15.91
ME (kcal/kg)	2788	2793	2780	2793	2780	2800
Cystine (%)	0.41	0.41	0.40	0.41	0.40	0.39
Lysine (%)	1.16	1.02	0.86	1.02	0.86	0.70
Methionine (%)	0.63	0.52	0.45	0.52	0.45	0.37
Tryptophane (%)	0.33	0.29	0.26	0.29	0.26	0.20

* Premix supplied the following (per kg diet): Vit. A , 1200 I.U.; Vit. D_3, 2000 I.U.; Vit. E , 15 I.U.; Vit. K_3, 2 mg; Vit. B_1, 1 mg; Vit. B_2, 4 mg; Vit. B_6, 3 mg; Nicotinic acid, 25 mg; Pantothenic acid, 12 mg; Vit. B_{12}, 10 mg; Folic acid, 0.50 mg; Co , 0.04 mg; Cu, 8 mg; Fe, 32 mg; I, 0.80 mg; Mn, 64 mg; Zn, 40 mg; Se, 0.16 mg; DL-Methionine, 50 mg; Choline chloride, 250 mg.

diet in the starter period (1-28 days) and 2800, 2900 and 3000 kcal ME/kg diet in the grower finisher periods (29-84 days) were used. are shown in table 2. The ducklings were distributed into three treatments on equal weight basis and had 9-10 ducklings in each replication. The treatments had two replications in both the experiments. The ducklings were reared in the battery brooders in the starter period, while, on sawdust litter floor in the grower and finisher period. Housing temperatures recorded during the experimental periods were 33-24°C. Whenever needed the ducklings were given additional heat with electric bulb for 1-2 week depending on the housing temperature. All mash dry feed was supplied *ad-libitum* throughout the experiment. Cold clean water was available all the times. 24 hours light was given in both the trials. The body weight and feed consumption of the replicate group was recorded each week.

The data collected were statistically analysed for analysis of variance (Steel and Torrie, 1980). Significant differences between treatment means were identified by Duncan's New Multiple Range Test.

Results and Discussion

Effects of dietary protein

Performance during 1-28 d.: The effects of dietary protein of live weight, feed efficiency, protein efficiency and calorie efficiency are shown in table 3. It is evident that live weight increased as the dietary protein level was increased from 18% to 20% in the starter period. With further increase of dietary protein in the starter period body weight was not improved but rather reduced.. Live weight at different protein levels differ significantly from each other. The results agree with the findings of Wilson (1975) who also observed similar trend in pekin type male ducklings. Feed efficiency was significantly improved as the dietary protein level increased from 18% to 20% in the starter period. With further increase

TABLE 2. COMPOSITION OF THE RATIONS USED TO STUDY THE ENERGY REQUIREMENT IN THE STARTER, GROWER & FINISHER PERIOD

Ingredients	Starter (ME kcal/kg)			Grower & finisher (ME kcal/kg)		
(%)	2700	2800	2900	2800	2900	3000
Wheat	47	52	49.50	56	54	56.50
Rice polish	15	15	15	15.50	16	14
Til oil cake	26	16	15	17	16.5	13
Fish meal	9	14	15.50	8.50	9	11
Bone meal	2	2	2	2	2	2
Oyster shell	0.50	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50	0.50
Soybean oil	–	–	2	–	1.50	2.50
Premix	*	*	*	*	*	*
Calculated composition						
C.P. (%)	20	20	20.14	18.12	18.02	17.99
ME (kcal/kg)	2691	2794	2912	2812	2900	2999
Cystine (%)	0.40	0.40	0.40	0.36	0.36	0.36
Lysine (%)	1.10	1.25	1.29	0.99	1.01	1.06
Methionine (%)	0.64	0.61	0.60	0.52	0.52	0.51
Tryptophane (%)	0.32	0.30	0.30	0.26	0.26	0.25

* Premix supplied the following (per kg diet): Vit. A, 1200 I.U.; Vit. D_3, 2000 I.U.; Vit. E, 15 I.U.; Vit. K_3, 2 mg; Vit. B_1, 1 mg; Vit. B_2, 4 mg; Vit. B_6, 3 mg; Nicotinic acid, 25 mg; Pantothenic acid, 12 mg; Vit. B_{12}, 10 mg; Folic acid, 0.50 mg; Co, 0.04 mg; Cu, 8 mg; Fe, 32 mg; I, 0.80 mg; Mn, 64 mg; Zn, 40 mg; Se, 0.16 mg; DL-Methionine, 50 mg; Choline chloride, 250 mg.

TABLE 3. EFFECTS OF DIETARY PROTEIN ON THE PERFORMANCE OF MUSCOVY DUCKLINGS

Parameters	Crude protein (%)			Level of
	18/16	20/18	22/20	significance
28 d body weight (g)	382^a	506^c	455^b	0.01
Feed efficiency (1-28 d)	2.59^b	1.96^a	2.21^a	0.05
Protein efficiency (1-28 d)	2.14^a	2.53^b	2.05^a	0.05
Calorie efficiency (1-28 d)	13.86^a	18.14^b	16.15^b	0.05
56 d body weight (g)	1269^a	1485^c	1340^b	0.01
Feed efficiency (1-56 d)	2.60^b	2.25^a	2.50^b	0.01
Protein efficiency (1-56 d)	2.32^b	2.39^b	1.98^a	0.01
Calorie efficiency (1-56 d)	13.71^a	15.90^b	14.27^a	0.05
84 d body weight (g)	1877^a	1964^b	1863^a	0.05
Feed efficiency (1-84 d)	3.61^b	3.30^a	3.69^b	0.05
Protein efficiency (1-84 d)	1.70^c	1.63^b	1.33^a	0.01
Calorie efficiency (1-84 d)	9.89	10.77	9.70	N.S.

The values having common superscripts in the row do not differ significantly ($p < 0.05$) from each other.

of dietary protein feed efficiency was not improved.

Protein efficiency significantly improved as the dietary protein was increased from 18% to 20%. With further increase of dietary protein, protein efficiency was significantly reduced. The results partially agree with Siregar et al. (1982).

Caloric efficiency was significantly improved as the dietary protein was increased from 18% to 20%. With further increase of dietary protein

calorie efficiency was not improved.

It was observed that 20% C.P. had the optimum performance during the starter period as regards body weight, feed efficiency, protein efficiency and calorie efficiency are concerned.

Performance during 1-56 d.: The effects of dietary protein on the performance of Muscovy ducklings are shown in table 3. It is evident that 56 day body weight, feed efficiency and calorie efficiency significantly improved as the dietary protein level was increased from 16% to 18% in the growing period. With further increase of dietary protein body weight, feed efficiency and calorie efficiency was significantly reduced. Protein efficiency was significantly better at lower protein levels.

Performance during 1-84 d.: It is evident from table 3 that 84 day body weight significantly improved as the dietary protein was increased from 16% to 18% in the grower and finisher period. With further increase of dietary protein body weight was significantly reduced. The results are similar with Siregar et al. (1982). Isoenergetic diets high in protein are less efficiently utilized for growth than low protein diets because the surplus protein is used particularly inefficiently as an energy source (Brody, 1945) may explain, in part the lower body weight at higher protein level.

Feed efficiency significantly improved as the dietary protein level was increased from 16 to 18% in the grower and finisher period. With further increase of dietary protein feed efficiency was significantly reduced.

Protein efficiency consistantly improved as the dietary protein was decreased. Protein efficiencies at different protein levels differ significantly from each other. The rusults are consistant with Siregar et al. (1982).

Calorie efficiency was not influenced by dietary protein. The results agree with Siregar et al. (1982).

It was observed that in Muscovy ducklings after 28 day did not need more than 18% C.P. in the diet during the grower and finisher period.

Effects of dietary energy

Performance during 1-28 d.: The effects of dietary energy on the performance of Muscovy ducklings are shown in table 4. The 28 day body weight increased as the dietary energy level was increased. The highest body weight was obtained at 2900 kcal ME/kg which differ significantly from that of 2700 kcal ME/kg but not from 2800 kcal ME/kg. Feed efficiency, protein efficiency and calorie efficiency consistantly improved as the dietary energy level was increased in the starter period. Best feed efficiency, protein efficiency and calorie efficiency were obtained at energy level of 2900 kcal ME/kg which differ significantly from that of 2800 and 2700 kcal ME/kg. The results are consistant with Wilson et al. (1975) and Siregar et al. (1982) but disagree with Leclercq and Carville (1976).

TABLE 4. EFFECTS OF DIETARY ENERGY ON THE PERFORMANCE OF MUSCOVY DUCKLINGS

Parameters	M.E. kcal/kg			Level of significance
	2700/2800	2800/2900	2900/3000	
28 d body weight (g)	501[a]	578[ab]	653[b]	0.05
Feed efficiency (1-28 d)	2.38[b]	2.22[b]	1.75[a]	0.01
Protein efficiency (1-28 d)	2.09[a]	2.25[a]	2.82[b]	0.05
Calorie efficiency (1-28 d)	15.55[a]	16.07[a]	19.59[b]	0.05
56 d body weight (g)	1267[a]	1477[b]	1406[b]	0.01
Feed efficiency (1-56 d)	3.27[b]	2.74[a]	2.77[a]	0.01
Protein efficiency (1-56 d)	1.63[a]	1.95[b]	1.93[b]	0.01
Calorie efficiency (1-56 d)	10.98[a]	12.69[c]	12.12[b]	0.01
84 d body weight (g)	1969[a]	2237[c]	2076[b]	0.01
Feed efficiency (1-84 d)	3.79[b]	3.25[a]	3.36[a]	0.05
Protein efficiency (1-84 d)	1.43[a]	1.67[b]	1.62[b]	0.01
Calorie efficiency (1-84 d)	9.43[a]	10.66[b]	9.95[a]	0.05

The values having common superscripts in the row do not differ significantly ($p < 0.05$) from each other.

Although the optimum upper limits of dietary energy could not be defined by this experiment, it appears that a dietary energy of 2900 kcal ME/kg having calorie to protein ratio of 145 is adequate during the starter period for Muscovy ducklings.

Performance during 1-56 d.: The effects of dietary energy of the performance of Muscovy ducklings are shown in table 4. The 56 day body weight, feed efficiency, protein efficiency and calorie efficiency were significantly improved as the dietary energy level was increased from 2800 kcal ME/kg to 2900 kcal ME/kg. With further increase of dietary energy level body weight, feed efficiency, protein efficiency and calorie efficiency were not improved.

Performance during 1-84 d.: The effects of dietary energy on body weight, feed efficiency, protein efficiency and calorie efficiency are shown in table 4. The 84 day body weight, feed efficiency, protein efficiency and calorie efficiency were significantly improved as the dietary energy level was increased from 2800 kcal ME/kg to 2900 kcal ME/kg. With further increase of dietary energy in the grower and finisher period body weight, feed efficiency, protein efficiency and calorie efficiency were not improved. The results partially agrees with Wilson (1975) and Siregar et al. (1982).

It appears from this experiment that for Muscovy ducklings dietary energy of 2900 kcal ME/kg having calorie to protein ratio of about 161 is adequate for maximum performance during the grower and finisher period.

Literature Cited

Brody, S. 1945. Bioenergetics and growth. Reinheld, New York.

Leclercq, B. and H. de Carville. 1976. Protein requirement of Muscovy ducklings between 4 and 11 weeks. Old. Poultry Abstr. 2:316.

Pilla, A. M. and R. Quilici. 1975. Influence of different diets and some slaughter characteristics of ducks. I. Domestic ducks (*Anas platyrhynchos*), white pekin breed 2. Muscovy duck (*Cairina moschata*). Poultry Abstr. 1:32.

Siregar, A. P., R. B. Cumming and D. J. Farrell. 1982. The nutrition of meat-type ducks. I. The effects of dietary protein in isoenergetic diets on biological performance. Aust. J. Agric. Res. 33:857.

Siregar, A. P., R. B. Cumming and D. J. Farrell. 1982. The nutrition of meat-type ducks. II. The effects of variation in the energy and protein contents of diets on biological performance and carcass characteristics. Aust. J. Agric. Res. 33: 865.

Steel, R. G. D. and J. H. Torrie. 1980. Principles and procedures of Statistics. McGraw-Hill International Book Co., London.

Wilson, B. J. 1975. The performance of male ducklings given starter diets with different concentrations of energy and protein. Br. Poult. Sci. 16:617.