

## **DETERMINE OF LEVEL CRUDE PROTEIN FOR HOA LAN DUCK**

*Phan Van Sy, Hoang Tuan Thanh, Nguyen Thi Hong Trinh, Bui Thi Phuong, Dinh Thi Quynh Lien and Pham Ngoc Thao*

**Institute of Animal Sciences for Souther Vietnam**

Corresponding author: Phan Van Sy cellphone 0919146329, email; sythuias2004@yahoo.com

### **ABSTRACT**

A study to determined crude protein requirements for Hoa Lan duck at difference age satges. The completely randomized design (CRD) with 1 factor (crude protein in the diet) x 3 treatments x 3 replications. The dietary nutrient content and feeding regimens were the same between treatment groups exception of crude protein levels. A total of 1.800 1-day-old ducklings (360 males + 1.440 females) period 0-8 weeks of age; 1.350 ducks (270 males + 1.080 females) period 9-20 weeks of age and 1.080 ducks (180 males + 900 females) priedod 21-72 weeks of age. The result that using ME and crude protein levels for Hoa Lan duck period 0-8: 9-12 and 21-72 age weeks were 2.900; 2,750, and 2,700 kcal/kg and 20; 15 and 17%; crude protein, respectively. They were not significant in production yield and feed conversion ratio/10 eggs, but they had tended to improve 2,37% when applying this nutritional diet in treatment 2 as compared to treatment1.

**Keywords:** *Hoa Lan duck, crude protein, requirement, , production yield and FCR*

### **INTRODUCTION**

The duck farming in our country is a traditional profession, which associated with wet rice agriculture. This is an important livelihood for farmers especially in the Mekong Delta river. Therefore, the number of waterfowl (most of which are ducks) has continuously increased over the years. According to the General Statistics Office, in 2018 the total duck population in the country reached 71.5 million. In 2019 it reached 76.9 million and by April 2024 it will reach 87,6 million. Output of duck meat for slaughter in 2018 reached 116,46 thousand tons. In 2019 it reached 197,99 thousand tons, by April 2024 it reached 387, 633 tons. Egg production in 2018 reached 2.3 million eggs, in 2019 reached 4.5 million eggs and as of April 2024 reached 12.9 million eggs.

The Mekong Delta is a key area in agricultural production. In addition to rice and aquatic products with export value, livestock and poultry production also has great potential for development. Products from pigs, chickens, ducks, etc.. have significantly contributed to providing food for consumers and improving people's quality of life. The animal husbandry is also one of the effective solutions to be able to take advantage of a large amount of idle labor in the countryside, creating jobs for working people (Nguyen Thi Ngoc Hoa and Mai Van Nam, 2010).

Now day, along with the introduction of high-yielding duck breeds into the cabinet, the conservation of local duck breeds, which has precious genetic resources is essential. The Hoa Lan duck is a local duck breed often kept in small numbers by farmers in the Mekong Delta. They is interesting by government for development on a large scale. In the past, in order to save costs on raising livestock local people often used duck feed of the wrong type and quantity. Only provide the amount of feed that meets about 60-70% of the duck's needs or use the adult duck's feed for the ducklings. They not only has greatly affected the productivity and quality of products but also did not brought into full play the potential of the breed. Thus, along with the implementation of selection to improve the productivity of the Hoa Lan ducks the development

of procedures for care, nurturing and veterinary medicine for this duck breed, including the determination of protein requirements for it is essential. Object of study to determine protein requirements for Hoa Lan duck at difference age satges.

## MATERIALS AND METHODS

### Materials

Research were Hoa Lan ducks breeding from 01 day old to 72 weeks old.

### Location and time of study

Location: The study was carried out in duck farming households in Tan Phuoc - Tien Giang.

Research period: From 2018 - 2020.

### Experimental design

The experiment was conducted on Hoa Lan ducks at 1 day of age and arranged in a completely randomized design (CRD) with 1 factor x 3 treatments x 3 replications. The dietary nutrient content and feeding regimens were the same between treatment groups exception of crude protein levels. A total of 1.800 1-day-old ducklings (360 males + 1.440 females) period 0-8 weeks of age; 1.350 ducks (270 males + 1.080 females) period 9-20 weeks of age and 1.080 ducks (180 + 900 females) priewood 21-72 weeks of age. The experimental design was shown in Table 1.

Table 1. Experiment design

Period	Items	Treatment 1	Treatment 2	Treatment 3
<i>0-8 age weeks</i>	ME (kcal/kg)	2,900	2,900	2,900
	Crude protein (%)	19	20	21
	Birds/replication (bird)	200	200	200
	Male/female ratio	1/4	1/4	1/4
	Replication (time)	3	3	3
<i>9-20 age weeks</i>	ME (kcal/kg)	2,750	2,750	2,750
	Crude protein (%)	14	15	16
	Birds/replication (bird)	150	150	150
	Replication (time)	3	3	3
<i>21-72 age weeks</i>	ME (kcal/kg)	2,700	2,700	2,700
	Crude protein (%)	16	17	18
	Birds/replication (bird)	120	120	120
	Replication (time)	3	3	3

***Diet for 0-8 age week***

No	Ingredients	unit	T1	T2	T3
1	Corn	%	58,50	57,00	54,47
2	Gluten corn	%	6,29	6,36	6,72
3	Soymeal	%	17,67	19,32	20,87
4	Meat and bone meal	%	5,00	5,00	5,00
5	DCP	%	1,25	1,28	1,14
6	Stone meal	%	8,51	8,41	8,65
7	Basa fish fat	%	2,38	2,27	2,67
8	Salt	%	0,03	0,03	0,03
9	L-Lysine	%	0,04	0,03	0,04
10	DL_Methionine	%	0,04	0,03	0,09
11	L-Threonine	%	0,04	0,02	0,07
12	Premix	%	0,25	0,25	0,25
<b>Total</b>			<b>100</b>	<b>100</b>	<b>100</b>
<b>Nutrition compositions</b>					
1	DM	%	88,70	88,50	88,50
2	ME	kcal/kg	2.900	2.900	2.900
3	Crude Protein	%	19,00	20,00	21,00
4	Crude fat	%	4,09	4,18	4,10
5	Canxi	%	3,79	3,80	3,80
6	Total Phospho	%	0,44	0,45	0,45
7	Lysine	%	0,85	0,84	0,84
8	Methionine + Cystine	%	0,74	0,74	0,75

***Diet for 9-20 age weeks***

No	Ingredients	unit	T1	T2	T3
1	Corn	%	59,00	58,90	61,00
2	Gluten corn	%	6,11	4,32	3,43
3	Rice brand	%	5,98	6,53	4,25
4	Soymeal	%	13,17	14,23	15,52
5	Meat and bone meal	%	5,00	5,00	5,00
6	DCP	%	1,14	1,28	1,28
7	Stone meal	%	8,65	8,72	8,59
8	Basa fish fat	%	0,47	0,42	0,35
9	Sail	%	0,03	0,03	0,03
10	L-Lysine	%	0,04	0,11	0,10
11	DL_Methionine	%	0,09	0,10	0,09
12	L-Threonine	%	0,07	0,11	0,11
13	Premix	%	0,25	0,25	0,25
<b>Total</b>			<b>100,00</b>	<b>100,00</b>	<b>100,00</b>

No	Ingredients	unit	T1	T2	T3
<b>Nutrition compositions</b>					
1	DM	%	88,50	88,30	88,20
2	ME	kcal/kg	2.750	2.750	2.750
3	Crude Protein	%	14,00	15,00	16,00
4	Crude fat	%	4,10	4,18	4,17
5	Canxi	%	3,80	3,80	3,79
6	Total Phospho	%	0,45	0,45	0,45
7	Lysine	%	0,84	0,84	0,84
8	Methionine + Cystine	%	0,71	0,71	0,71

*Diet for 21-72 age weeks*

No	Ingredients	unit	T1	T2	T3
1	Corn	%	63,91	58,84	57,26
2	Gluten corn		-	2,12	3,24
3	Rice brand	%	6,70	6,53	5,98
4	Soymeal	%	13,27	16,39	17,78
5	Meat and bone meal	%	5,00	5,00	5,00
6	DCP	%	1,28	1,28	1,14
7	Stone meal	%	8,71	8,72	8,65
8	Basa fish fat	%	0,57	0,51	0,47
9	Sail	%	0,03	0,03	0,03
10	L-Lysine	%	0,03	0,07	0,04
11	DL_Methionine	%	0,15	0,15	0,09
12	L-Threonine	%	0,10	0,11	0,07
13	Premix	%	0,25	0,25	0,25
	Total		100,00	100,00	100,00

**Nutrition compositions**

1	DM	%	87,59	88,50	88,50
2	ME	kcal/kg	2.700	2.700	2.700
3	Crude Protein	%	16,00	17,00	18,00
4	Crude fat	%	3,92	4,18	4,10
5	Canxi	%	0,39	3,80	3,80
6	Total Phospho	%	0,45	0,45	0,45
7	Lysine	%	0,84	0,84	0,84
8	Methionine + Cystine	%	0,71	0,71	0,71

**Data collection**

Survival rate

Body weight at 4, 8, 12, 16 and 20 weeks old; Ducks were randomly weighed 30 ducks/relication in the morning.

Feed intake the period 1-20 and 21-72 weeks of age;

Age at laying first egg and at laying 5% and body weight at first egg and laying 5%;

Average laying rate/duck/year, egg yield/duck/year, FCR/10 eggs, egg hatching rate.

Egg weight at 4,8,12,16,20,24,28,32,36,40,44,48,and 52 weeks laying: Individually egg was weighted by electronic scale on the 5th day of the monitoring week.

**Statistical analysis**

Data collection from experiment was subjected to one way analysis of variance (ANOVA) using the Minitab statistical software verision 16. Turkey’s one – way multiple comparisions were used for identifying differences among means in the requied cases. when the analysis of variance was significant ( $p < 0.05$ ).

**RESULTS AND DISCUSSIONS**

**Survival rate Hoa Lan**

Table 2. The survival rate of Hoa Lan duck

Period	items	Treatment 1		Treatment 2		Treatment 3	
		Male	Female	Male	Female	Male	Female
0-8 age	n (bird)	600		600		600	
week	Survival rate (%)	95.00	96.46	95.00	97.08	95.83	96.67
9-20 age	n (bird)	90	360	90	360	90	360
week	Survival rate (%)	95.56	95.28	94.44	95.00	95.56	94.72

The results of survival rate showed in table 2. The survival rate of Hoa Lan ducks in all experimental had high , which was similar among trial groups ( $P > 0.05$ ). The results of this study are agreement to Hoa Lan ducks raised in conservation in Tien Giang with an average survival rate of 96 - 97.7% (Hoang Tuan Thanh et al. 2016). When comparing the survival rate of Hoa Lan ducks at 0-8 weeks of age with other local duck breeds. the survival rate of Hoa Lan ducks in the present study was higher than those of Dom ducks and Bau Ben ducks, which has a survival rate of only 90.0 - 90.9% (Nguyen Duc Trong et al. 2006). This is equivalent to the survival rate of 96 - 97% of local Moc ducks raised to conserve genetic funds in Binh Dinh (Pham Viet Anh et al. 2004) or 97.2% of Ky Lua duck (Nguyen Thi Minh Tam. 2005). However, they are lower than that of the Grass duck, have a survival rate of 98.95% and a cross between the Co-Zhejiang Duck and the Co-duck reached 97.8 - 98.4% (Nguyen Duc Trong et al. 2011).

Up to 9-20 weeks of age. The survival rate of male and female ducks did not change much between the experiments. It was from 94.4 - 95.6%.

**Body weight of Hoa Lan duck**

The body weight were showed in table 3. The body weight at 4 old week were similar among

trials ( $p > 0.05$ ). The highest body weight of the trial male and female duck at 8 old week with using diet 21% protein, which was 1,539 and 1,366 g/head. , They became significant difference compared to that of the diet 19% protein content. This result is higher than other local duck such as: Dom 1,238 g/head; Bau 1,210 ( Nguyen Duc Trong et al., 2006); Co and Triet giang were 1,078 and 1,085 g/head, respectively, (Nguyen Duc Trong et al., 2011). However, the body weight at this present are lower than Ky Lua (Male 1,545; female 1,509 g/head) (Nguyen Thi Minh Tâm, 2005) and Bau Quy 1,670 g/head (Nguyen Minh Anh Tuan, 2002)

Table 3. Body weight of Hoa Lan Duck

Week	Items	Male				Female			
		T1	T2	T3	P-value	T1	T2	T3	P-value
4	n (bird)	60	60	60		60	60	60	
	Mean (g)	690.6	696.3	708.6	0,872	613.5	625.7	630.0	0,913
	SD (g)	84.5	92.2	85.6		72.0	74.3	73.8	
8	n (bird)	60	60	60		60	60	60	
	Mean(g)	1.481 <sup>a</sup>	1.508 <sup>ab</sup>	1.539 <sup>b</sup>	0,037	1.325 <sup>a</sup>	1.357 <sup>ab</sup>	1.366 <sup>ab</sup>	0,043
	SD (g)	103.6	103.7	103.1		80.6	82.0	90.0	
12	n (bird)	60	60	60		60	60	60	
	Mean (g)	1600.2	1622.2	1628.0	0,067	1429.8	1474.2	1487.8	0,098
	SD (g)	101.3	80.9	88.2		84.8	66.6	93.2	
16	n (bird)	60	60	60		60	60	60	
	Mean (g)	1.626 <sup>a</sup>	1.671 <sup>ab</sup>	1.681 <sup>ab</sup>	0,041	1.548 <sup>a</sup>	1.631 <sup>ab</sup>	1.659 <sup>b</sup>	0,036
	SD (g)	115.4	76.9	86.1		87.7	86.6	111.2	
20	n (bird)	60	60	60		60	60	60	
	Mean (g)	1.777 <sup>a</sup>	1.806 <sup>ab</sup>	1.838 <sup>ab</sup>	0,034	1.621 <sup>a</sup>	1.717 <sup>ab</sup>	1.738 <sup>b</sup>	0,028
	SD (g)	99.7	68.4	75.5		74.6	86.5	100.2	

where: - n: Number of duck.

Value within row indicated by different letters significant differ at ( $P < 0.05$ ).

Similarly, the highest the body weight of male and female at 20 week old were 1,838 and 1,738 g/head at diet using 21% protein, which was significant diffence compared to the diet using 19% protein.

### Feed intake

The feed intake of the Hoa Lan duck was presented in Table 4. The feed intake was similarly among trail. At the 9-20 week stage, the feed intake for male in the treatment 1, 2 3 were 10,327; 10,325 and 10,326 g/head, respectively, for female were 9,809; 9,810 and 9,818 g/head, respectively.

Table 4. Feed intake of Hoa Lan Duck (g/bird)

Stages (week)	Treatment 1		Treatment 2		Treatment 3	
	Male	Female	Male	Female	Male	Female
<b>0 - 8</b>	<b>3.935</b>		<b>3.928</b>		<b>3.918</b>	
9-12	3.012	2.984	3.014	2.985	3.017	2.986
13-16	3.420	3.220	3.415	3.224	3.418	3.222
17-20	3.895	3.605	3.896	3.601	3.891	3.610
<b>9 - 20</b>	<b>10.327</b>	<b>9.809</b>	<b>10.325</b>	<b>9.810</b>	<b>10.326</b>	<b>9.818</b>

**Age at laying first egg, and at laying 5% and body weight at laying 5%.**

The age at laying firrts egg were highest 148 days at the treatment1 and followi 147 days at the treatment 2 and lowest 145 days at the treatment 3. Those parameters of Hoa Lan ducks in the experiment were later compared to conservation ducks in Tien Giang with the age of first egg laying was 121 days (Hoang Tuan Thanh and Duong Xuan Tuyen , 2016).

The body weight when laying the first egg and laying 5% in T1, T2, and T3 were 1,621g, 1,717g, 1,738g, and 1,663g, 1,788 g, and 1.838g, respectively. They were significant different between T1 and T3 (P<0.05). This result was on experimental Khaki Campbell ducks whose body weight when laying the first egg was 1,652g (Nguyen Hong Vi et al.. 2007; Co duck was 1,263g (Nguyen Thi Minh et al., 2008); Triet Giang duck was 1,083g (Nguyen Duc Trong et al.. 2008). The body weight of Hoa Lan ducks at laying first in this study smaller than Dom ducks and Bau ducks at 2,125g and 2,008g, respectively (Nguyen Duc Trong, 2007).

Table 5. Age at laying first egg, age at laying 5% and body weight at laying 5%

Items	unit	Treatment 1		Treatment 2		Treatment 3		P
		Mean	SD	Mean	SD	Mean	SD	
At fisrt egg age	Day	142	-	141	-	139	-	
Age at laying 5%	Day	148	-	147	-	145	-	
BW at fisrt laying egg (n=30 bird)	G	1.621 <sup>a</sup>	74.6	1.717 <sup>ab</sup>	86.5	1.738 <sup>b</sup>	100.2	0,031
BW at laying 5% (n=30 bird)	G	1.663 <sup>a</sup>	36.5	1.788 <sup>ab</sup>	40.5	1.838 <sup>b</sup>	41.9	0,006

Note: BW= Body Weight. Value within row indicated by different letters significant differ at (P<0.05).

**Egg product and feed conversion for 10 eggs product**

Table 6. Egg product and feed conversion ratio for 10 eggs product

Stage (age week)	Stage (laying week)	Treatment 1			Treatment 2			Treatment 3		
		Egg rate (%)	Egg product (egg/ Hen)	FCR/10 egg (kg)	Egg rate (%)	Egg product (egg/ Hen)	FCR/10 egg (kg)	Egg rate (%)	Egg product (egg/ Hen)	FCR/10 egg (kg)
21-24	1-4	25.64	7.18	6.13	26.25	7.35	5.72	26.29	7.36	5.67
25-28	5-8	65.25	18.27	3.95	68.21	19.10	3.85	67.93	19.02	3.79
29-32	9-12	74.64	20.90	2.76	75.54	21.15	2.75	75.18	21.05	2.82
33-36	13-16	68.93	19.30	2.99	74.29	20.80	2.98	70.18	19.65	2.98
37-40	17-20	68.57	19.20	3.11	70.54	19.75	3.10	70.00	19.60	3.15
41-44	21-24	65.71	18.40	3.23	68.64	19.22	3.20	66.07	18.50	3.22
45-48	25-28	62.86	17.60	3.16	66.71	18.68	3.08	66.07	18.50	3.20
49-52	29-32	62.79	17.58	3.17	63.57	17.80	3.11	64.00	17.92	3.02
53-56	33-36	62.93	17.62	3.15	63.07	17.66	3.08	63.43	17.76	3.11
57-60	37-40	62.14	17.40	3.21	62.64	17.54	3.02	62.50	17.50	3.06

Stage (age week)	Stage (laying week)	Treatment 1			Treatment 2			Treatment 3		
		Egg rate (%)	Egg product (egg/Hen)	FCR/10 egg (kg)	Egg rate (%)	Egg product (egg/Hen)	FCR/10 egg (kg)	Egg rate (%)	Egg product (egg/Hen)	FCR/10 egg (kg)
61-64	41-44	52.93	14.82	3.34	53.29	14.92	3.31	56.50	15.82	3.29
65-68	45-48	51.29	14.36	3.36	51.25	14.35	3.32	52.43	14.68	3.35
69-72	49-52	50.79	14.22	3.42	51.14	14.32	3.40	52.57	14.72	3.42
<i>Total</i>		-	216.85	-	-	222.64	-	-	222.08	-
<i>Average</i>		<b>59.57</b>	-	<b>3.46</b>	<b>61.16</b>	-	<b>3.38</b>	<b>61.01</b>	-	<b>3.39</b>

The results showed that the laying rate of Hoa Lan ducks rapidly increased from the 4th week of laying and highest at 12th week 1. The highest laying rate were from 74.64 to 75.54%, which equivalent to the Bau Quy duck at 71.1 - 77.3% (Pham Cong Thieu.2004), but lower than Ky Lua ducks raised in Lang Son with 83.45% (Nong Quy Thoan.2002).

Calculating for a total of 52 weeks of laying, the crude protein in the diet increased from 16% (T1) to 17% (T2), which tended to improve the average laying rate of experimental ducks (59.57 to 61.16%). However, when the CP level was at 18% (T3), it tended to slightly reduce the laying rate (61.01%). The difference in average laying rate between T1 and T2 was not statistically significant ( $P > 0.05$ ). Egg yield indicators/hen/year in 3 experimental treatments showed that: T2 was highest (222.64 eggs), followed by T3 (222.08 eggs), and lowest by T1 at 216.85 eggs and the difference was not statistically significant ( $p > 0.05$ ). Our study results were much higher than the results of a survey of the current status of duck farming in some Mekong Delta provinces by Nguyen Thi Lan Anh et al. (2018) with an egg yield of 195 eggs/hen/year. This difference may be because the Hoa Lan ducks in the experiment were raised with a reasonable diet and feeding level.

### Feed conversion ratio for 10 eggs of the experiment ducks

At 1 - 4 weeks of laying, the feed conversion ratio (FCR) for 10 eggs was high (5.72-6.13kg), because at this stage the ducks had just begun the laying cycle, and the duck's laying rate was low. Following stages, this indicator was below 4 FCR, and at period highest laying (9 - 12 weeks of laying), The FCR/10 eggs was the lowest compared with other periods, it was from 2.75 to 2.82 kg.

During the experiment, the feed conversion ratio per 10 eggs in T2 was the lowest (3.38 kg), followed by T3 (3.39 kg), and the highest in T1 (3.46 kg). They were not significant difference among trial ( $p > 0.05$ ). Compared to research results on other duck breeds such as: Bau Quy ducks, the feed conversion ratio of 10 eggs was 2.58 kg; in Bau Ben duck 2.36 kg (Pham Cong Thieu et al., 2004); or 2.20 - 2.30 kg in Co ducks and Triet Giang ducks (Nguyen Duc Trong et al., 2011b). Thus, the Hoa Lan ducks in this study had a higher feed conversion ratio/10 eggs compared to other ducks. However, it was lower than other super meat duck lines/breeds such as the V12 duck line, which was 4.05 - 4.54 kg (Duong Xuan Tuyen et al., 2011)

### Egg weight

The average egg weights of T1, 2, and 3 were 72.9, 73.0, and 73.7 g/egg, respectively. Thus, egg weight tends to increase gradually with the level of CP in the diet, but the difference between the 3 treatments was not statistically significant ( $p > 0.05$ ).



Table 7. Egg weight

Week	Treatment 1			Treatment 2			Treatment 3		
	n (egg)	Mean (g)	SD (g)	n (egg)	Mean (g)	SD (g)	n (egg)	Mean (g)	SD (g)
4	30	69.3	8.1	30	69.0	8.0	30	69.3	8.1
8	30	70.3	6.7	30	70.6	6.7	30	71.3	6.7
12	30	71.2	4.4	30	72.0	6.1	30	72.2	4.4
16	30	72.5	4.9	30	72.8	6.2	30	72.9	5.4
20	30	72.8	4.2	30	73.4	5.4	30	73.1	4.5
24	30	73.2	5.3	30	72.8	5.4	30	74.4	5.7
28	30	73.7	5.4	30	73.3	5.1	30	74.0	6.3
32	30	73.2	5.3	30	74.1	5.3	30	74.3	5.9
36	30	73.5	4.9	30	73.7	5.3	30	74.6	4.7
40	30	74.2	5.2	30	73.9	5.4	30	75.3	5.2
44	30	74.5	5.6	30	74.2	5.9	30	75.6	5.3
48	30	74.4	5.9	30	74.0	6.2	30	75.6	5.8
52	30	74.9	6.7	30	74.7	6.5	30	74.9	6.7
<b>Total</b>	<b>390</b>	-	-	<b>390</b>	-	-	<b>390</b>	-	-
<b>Average</b>	-	<b>72.9</b>	<b>5.8</b>	-	<b>73.0</b>	<b>6.1</b>	-	<b>73.7</b>	<b>6.0</b>

### CONCLUSIONS

Using ME and crude protein levels for Hoa Lan duck period 0-8: 9-12 and 21-72 age weeks were 2.900; 2,750, and 2700 kcal/kg and 20; 15 and 17 % crude protein, respectively. They were not significant in production yield and feed conversion ratio/10 eggs, but they had tended to improve when applying this nutritional diet in treatment 2, which had a higher 2,37% the livestock efficiency as compared to treatment 1

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**Opponent: Assoc. Prof. Tran Thi Bich Ngoc**