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Effect Of Protein And Lysine Levels On Performance Of Grwoing Japanese Quail

Sonbol, S.M., El-Hindawy, M.M., Attia, A.I., and El-Agawany, M.M.
Poult. Dep., Fac. of Agric., Zagzig Univ. Zagazig, Egypt .

ABSTRACT

This work was carried out to study the effect of different levels of protein (22, 24 and 26%) and lysine (1.15, 1.30 and 1.45%) on growth performance and carcass traits.

A total number of 540, three days old Japanese quail chick were distributed into nine treatment groups, each group subdivided into three replicates (each contains 20 chicks). Chicks of all groups had nearly the same intial body weight.

Results obtained indicated that, at 24 days of age, the different protein levels studies showed consistent higher ($p<0.05$) body weight and body weight gain of quail chicks received 26% compare to 22 and 24% CP diet. The different protein levels had no significant influence on feed intake and feed conversion ratio during the different experimental periods .The different lysine levels had no significant effect on all growth performance and carcass traits studied during the different experimental periods. The results obtained did not show any significant effect on carcass %, giblets % and dressing % of growing Japanese quail due to protein and lysine levels or their interaction .Chicks fed diet contained 22% crude protein with 1.15% lysine recorded the best economical effeciency (EEf.) value during the whole experimental period (from 3- 42 days of age). From the nutritional and economical point of view it can be concluded that, using 22% crude protein was enough to get the best performance and economical efficiency of growing Japanese quail. Also the best chicks performance could be obtained using 1.15% lysine the diets. Morever, a dietary level of 22% CP with 1.15% lysine is recommended for the feeding growing Japanese quail from 3-42 days of age.

INTRODUCTION

The nutrient requirements of Japanese quail are not celar *(1)*, although several relevant reports have been published. Reports have suggested a requirement for early growth of 25% CP *(2, 3)*. Some studies indicated that coturnix quail can be started on diets containing 25 to 26% crude protein *(2-5)* and this level can be reduced to 20% after 3 weeks of age *(2, 6)*. Recent studies indicated that growth did not differ in the 24% and 20% protein level *(7)*.

Lysine is the second limiting amino acid for poultry fed corn-soy bean diets, and because it is not only used for protein synthesis. Several studies have been carried out to determine the lysine requirements of modern fast growing broiler chicks. Formulating broiler diets that are not deficient in lysine is crucial because lysine is the second limiting amino acid and reference amino acid for the ideal protein concept *(8)*. Modern statistical methods have been applied in most of these to obtain estimates of the requirements based on growth rate, feed efficiency and other measures. The positive relationships of the lysine requirements to dietary protein level has been confirmed *(9,10)*. The studies demonstrated the linearity of the relationships between lysine requirement and dietary protein level. The mechanism of this actions is unknown, but the amino acid imbalance may be the most important factor for amino acid needs. It is well known that protein and lysine and its interaction is considered as an important factor which affects performance and carcass quality of growing chicks and so, dietary requirements of protein is actually a requirement for the lysine contained in the protein.

Therefore, the present study was conducted to study the effect different levels of protein and lysine on growth performance of growing Japanese quail.

MATERIALS AND METHODS

Experimental chicks

A total number of 540 unsexed, three days old japanese quail chicks were distributed into nine treatment groups of 60 chicks each with 3 replicate (each subgroup contains 20 chicks). Chicks of all experimental groups had nearly the same initial average weight.

Experimental design

A 3×3 factorial design experirement was conducted to study the effect of three levels of crude protein (22,24 and 26%) and three levels of lysine (1.15, 1.30 and 1.45%) on growth performance of Japanese quail during the growing period (3-42days of age). Nine experimental diets were formulated to have three levels of crude protein (22, 24, and 26) and three level of lysine (1.15, 1.30 and 1.45). Each diet was assigned to quails of one of the experimental groups at random. Composition and calculated analysis of the experimental diets are shown in Table 1. Chicks were grown in Battery brooders with raised wire floors and exposed to 24 hours of constant light. Feed and water were supplied ad libitum throughout the experimental period. Individual body weight was recorted at 3, 24 and 42 days of age, feed consumption and mortality rate were recorded during the periods of 3-24, 24-42 and 3-42 days of age.

Determination of carcass traits

At the termination of the experiment, three birds from each treatment group were randomly chosen having average body weight around the treatment mean to study carcass traits. Quails were deprived overnight from feed, weighed and slaughtered. After complete bleeding, feather was removed, then weighed. The carcass traits studies were giblets (liver,gizzard and heart),carcass and dressed weights (dressed weight = carcass weight plus giblets weight) /100g pre- slaughter weight.

Economical efficiency (EEf.)

Economical efficiency (EEf.) of growth rate was calculated from the input and output analysis based upon the differences in growth rate and feeding cost.

Statistical analysis

Data were statisticaly analyzed on a 3×3 factorial basis ***(12)***, using the following model :

$$Yijk= M+Ai+Sj+ASij+eijk$$

Where Yijk =an observation, M=the overall mean, Ai=effect of protein level (i=1 to 3,Sj effect of lysine level, ASij= the interaction between crude protein level and lysine level and eijk = random error. Differences among means within the same factor were tested using Duncans new multiple range test ***(13)***.

Table 1.Composition and calculated analysis of the experimental diets.

Protein levels %	22			24			26		
Lysine levels %	**1.15**	**1.30**	**1.45**	**1.15**	**1.30**	**1.45**	**1.15**	**1.30**	**1.45**
Ingredients %									
Yellow corn	63.00	63.15	63.19	58.50	58.70	59.20	51.69	50.00	49.60
Soybean meal 44%	24.00	24.00	24.00	25.70	25.50	25.00	30.50	33.00	34.64
Corn gluten meal	9.38	9.08	8.88	12.36	12.19	12.08	13.5	11.70	10.26
Cotton seed oil	-	-	-	-	-	-	1.00	1.90	2.08
Nacl	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Premix*	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Dicalcium phosphate	1.60	1.70	1.70	1.70	1.62	1.65	1.50	1.60	1.60
Limestone	0.90	0.80	0.80	0.80	0.89	0.81	1.00	0.90	0.80
L- lysine	0.21	0.36	0.52	0.14	0.30	0.46	-	0.10	0.22
Dl- Methionine	0.10	0.10	0.10	-	-	-	-	-	-
Choline chloride 50%	0.21	0.21	0.21	0.20	0.20	0.20	0.21	0.20	0.20
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis**									
Crude Protein%	22.03	22.03	22.08	24.03	24.03	24.00	26.07	26.05	26.02
ME K. cal / Kg	3007	3006	3009	3006	3006	3009	3000	3008	3000
Calcium%	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
P.% Available	0.45	0.45	0.45	0.46	0.45	0.45	0.45	0.45	0.46
Lysine %	1.15	1.30	1.45	1.15	1.30	1.45	1.15	1.30	1.45
Methionine +cystene%	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Choline mg / Kg	2000	2000	2000	2000	2000	2000	2000	2000	2000
Price / ton diet, L.E***	1312	1334	1349	1351	1358	1383	1416	1450	1457

* Grower vit.and Min. Premix: Each 3 Kg consists of : Vit. A 12000.000 IU; Vit. D3, 2000.000 IU, Vit.E 10g; Vit. K3, 2000Mg ; Vit. B1, 1000 Mg; Vit. B2, 5000 Mg; Vit. B6, 1500Mg, Vit. B12, 10Mg ; Biotin 50 Mg; Pantothenic acid , 10 g; Niacin, 30 g; Folic acid, 1000Mg; Mn, 60 g; Zn, 50 g; Cu; 10g; I, 1000Mg; Si, 100Mg; Co.100Mg.

** Calculated analysis *(11)*.

*** Caculated according to the price of feed ingredients when the experiment was started.

RESULTS AND DISSCUSION

Growth performance

Effect of protein levels

Average of growth triats of Japanese quail chicks as affected by dietary protein are presented in Table 2. At 24 days of age, the different protein level studies showed consistent higher ($p<0.05$) body weight of quail chicks received 26% compare to 22 and 24% CP diet (Table 2). Moreover, body weight at 42 and body weight gain(3-24, 3-42 days of age were significantly ($p<0.05$) improves as chicks were fed the diet containing 22 and 26% compare to 24% crude protein. These results agreed with several previously cited investigations ***(14-16)*** which reported that feeding growing Japanese quail on a diet contained a high protein level (24%) showed a remarkable improvement in body weight and feed conversion ratio as compared with quail received the lower protein level (21%). On contrary other work ***(17,18)*** indicated that it is possible to reduce CP feed

level to 22% in Japanese quail diet during the growing period without significant effects on growth and laying performance. It is also, reported *(7)* that growth rate did not differ in the 24% and 20% dietery protein level. Broiler chicks showed insignificant differences among the three protein levels tested on male weight gains from 6-10 weeks of age ***(19)***.

Results in Table 2 showed that the different protein levels had no significant influence on feed intake and feed conversion ratio during the different experimental periods. These results are consistent with that which showed that the different protein levels (22, 24 and 26%) had no significant influence on feed intake and feed conversion ***(18)***. Broiler chicks fed 17% protein diet during 3-6 weeks of age showed insignificant differences in feed intake as compared to 20.5% CP level ***(20,21)***. Contradicting study, showed that, increasing protein content in the quail grower diets gradually improved feed conversion ratio and decreased feed intake ***(22)***.

Effect of Lysine levels

Results in Table 2 showed that the different lysine levels had no significant effect on all growth performance traits studied (body weight, daily body weight gain, daily feed intake and feed conversion ratio) during the different experimental periods.

Similary results were previously reported *(23)* indicating that the feeds having increased dietary EAA did not improve body weight gain or feed conversion through any part of the 49 days of experimentation or on total for broilers. Body weight gain increased and feed conversion ratio improved significantly ($p<0.05$) when dietary lysine increased up to 1.53%lysine in growing Japanese quail ***(24)***. Broiler chicks, the average dialy gain and gain:feed increased as dietary lysine increased from 0.8 to 1.3% ***(25)***. Lysine requirement of 0 to 3 weeks old chicks was 1.2% total lysine for maximum weight gain and feed intake and 1.41%for maximum feed efficiency ***(26)***. Also lysine requirement, of 1.15% and 1.41% have been reported for maximum weight gain and feed efficiency respectively ***(27)***. Furthermore, increasing total lysine from 1.1 to 1.2% improved average daily gain and feed efficiency of 1 to 18 day old chicks ***(28)***.

Interaction effects

Results obtained this study revealed that all growth performance traits studied except live body weight at 42 days of age were not significantly affected by interaction between protein and lysine levels during all the experimental periods (Table 3). Therefore, when taking live body weight into consideration, it could be concluded that the level of 22% crude protein along with 1.15% lysine would be suitable till 42 days of age.

Carcass traits

Results in Table 4 did not show any significant effect on carcass%, giblets% and dressing % of growing Japanese quail due to protein and lysine levels or their interaction. Similar results were reported previously ***(18)***, and indicating that protein levels (22, 24 and 26%) had insignificant effect on carcass %, giblets %, and dressing %. Several investigators ***(30.31)*** reported that CP had no significant effect on carcass dressing percentage of 56-day -old broiler chicks. Morever, it has been found that CP level had insignificant effect on giblets and viscera percentages ***(32)***.

Economical efficiency (EEf.)

Data presented in Table 2 showed that chicks fed the diet contained 22% crude protein recorded the best EEf. value as compared with other protein levels. The EEf. value tend to decrease with increasing dietary protein level from 22 to 26% ***(33)***. Results in Table 2 indicated that chicks fed the diet contained 1.15% lysine provided higher EEf value during the whole experimental period than those fed diet contained 1.30 and 1.45% lysine. However chicks fed the diet contained 22% crude protein with 1.15% lysine recorded the best EEf value during the whole experimental period (3-42 days of age).

Table 2. Effect of different levels of protein and lysine in the diet of Japanese quail chicks on growth performance during the experimental period (3-24 days of age).

Traits	Protein levels %			sign	Lysine levels %			sign
	22	24	26		1.15	1.30	1.45	
Live body weight (g) at:								
3 Days	20.35±0.04	20.22±0.08	20.30±0.06	NS	20.32±0.05	20.26±0.05	20.32±0.06	NS
24 Days	128.47±1.70^{b}	123.16±1.73^{c}	133.08±0.88^{a}	**	130.39±1.62	127.65±2.01	126.67±2.29	NS
42 Days	221.97±2.63^{a}	212.01±1.20^{b}	224.06±2.18^{a}	**	220.87±2.99	219.32±2.97	217.86±2.25	NS
Daily body weight gain(g) From:								
3-24 Days	5.40±0.08^{a}	5.13±0.08^{b}	5.59±0.04^{a}	**	5.50±0.08	5.32±0.09	5.30±0.11	NS
24-42 Days	5.19±0.08	4.93±0.08	5.02±0.08	NS	5.02±0.12	5.08±0.06	5.03±0.08	NS
3-42 Days	5.30±0.06^{a}	5.04±0.03^{b}	5.34±0.05^{a}	**	5.27±0.07	5.23±0.07	5.18±0.05	NS
Daily Feed intake(g)from:								
3-24 Days	14.20±0.23	13.84±0.20	14.55±0.16	NS	14.38±0.19	14.20±0.24	14.01±0.22	NS
24-42 Days	29.82±0.38	28.70±0.39	29.15±0.51	NS	29.71±0.44	29.2±0.49	28.75±0.38	NS
3-42 Days	22.01±0.30	21.27±0.25	21.85±0.31	NS	22.05±0.30	21.70±0.31	21.38±0.27	NS
Feed conversion (g feed / g gain) from:								
3-24 Days	2.62±0.02	2.69±0.02	2.59±0.03	NS	2.61±0.03	2.66±0.03	2.64±0.03	NS
24-42 Days	5.74±0.08	5.98±0.09	5.81±0.09	NS	5.93±0.11	5.74±0.07	5.87±0.10	NS
3-42 Days	4.14±0.02	4.21±0.04	4.08±0.05	NS	4.17±0.04	4.14±0.04	4.12±0.04	NS
Economical efficiency %	0.446	0.424	0.410		0.430	0.427	0.42	

Means in the same raw within each classification bearing different letters are significantly ($p<0.05$) different .

Table 3. Effect of different levels of dietary protein and lysine in the diet of Japanese quail chicks on growth performance and their interaction during the experimental period (3-24 day of age).

Protein levels %	22			24			26			sign
Lysine levels %	1.15	1.30	1.45	1.15	1.30	1.45	1.15	1.30	1.45	
Live body weight (g)at:										
3 Day	20.32± 0.06	20.40±0.06	20.33±0.09	20.33±0.11	20.06±0.13	20.26±0.17	20.31±0.12	20.31±0.13	20.28±0.09	NS
24 Day	132.19±3.41	126.83±1.81	126.40±3.12	125.71±1.67	122.08±2.99	121.69±4.41	133.29±0.55	134.04±0.46	131.93±2.78	NS
42 Day	229.28±3.92^{a}	218.09±4.08^{ef}	218.53±3.34^{cef}	211.58±2.55^{bd}	211.43±3.12^{bd}	213.05±0.68^{bd}	221.75±2.68^{cc}	228.43±2.60^{a}	220.34±5.38^{cc}	*
Body weight gain (g) from:										
3-24 Day	5.59±0.16	5.31±0.08	5.30±0.15	5.26±0.08	5.09±0.15	5.03±0.21	5.64±0.02	5.56±0.09	5.57±0.13	NS
24-42 Day	5.39±0.19	5.06±0.12	5.11±0.05	4.76±0.05	4.96±0.02	5.07±0.25	4.91±0.16	5.24±0.12	4.91±0.09	NS
3-42 Day	5.49±0.09	5.20±0.10	5.21±0.08	5.03±0.07	5.03±0.07	5.07±0.01	5.29±0.07	5.47±0.07	5.26±0.10	NS
Feed intake (g) from:										
3-24 Day	14.86±0.40	13.91±0.26	13.84±0.34	14.08±0.18	13.91±0.54	13.54±0.26	14.20±0.31	14.79±0.24	14.65±0.24	NS
24-42 Day	30.57±0.47	29.88±0.60	29.01±0.76	29.45±0.80	28.09±0.33	28.57±0.76	29.13±0.97	29.65±1.20	28.67±0.75	NS
3-42 Day	22.71±0.43	21.89±0.43	21.42±0.54	21.76±0.48	21.00±0.27	21.05±0.51	21.66±0.57	22.22±0.71	21. 66±0.49	NS
Feed conversion from:										
3-24 Day	2.65±0.06	2.61±0.02	2.60±0.03	2.66±0.01	2.72±0.05	2.69±0.07	2.51±0.04	2.65±0.06	2.62±0.05	NS
24-42 Day	5.67±0.17	5.90±0.10	5.67±0.16	6.17±0.10	5.66±0.05	6.12±0.19	5.94±0.22	5.68±0.17	5.83±0.11	NS
3-42 Day	4.12±0.01	4.20±0.05	4.10±0.05	4.32±0.03	4.17±0.05	4.14±0.09	4.08±0.09	4.06±0.10	4.11±0.07	NS
Economical efficiency % 0.45		0.43	0.44	0.41	0.43	0.42	0.42	0.41	0.40	

Means in the same raw within each classification bearing different letters are significantly ($p<0.05$) different .
*$p<0.05$ ** $p<0.01$ NS=not significant

Table 4. Effect of different levels of dietary protein, lysine on Some carcass traits (g/100g pre-slaughter weight) of growing japanese quail and their interaction.

Items		Pre- slaughter weight (g)	Carcass (%)	Giblets (%)	Dressing (%)
Protein levels(P)%					
22		220.72± 3.02[a]	76.38±1.23	6.04± 0.23	82.43±1.24
24		210.90± 1.89[b]	77.70± 0.72	5.54± 0.27	83.25±0.74
26		224.23± 2.48a	76.83± 0.35	5.36± 0.20	82.19±0.44
Sign		**	**NS**	**NS**	**NS**
Lysine levels(L)%					
1.15		220.74± 3.19	77.54±0.69	5.75±0.27	83.30±0.80
1.30		217.73±3.65	76.95±0.61	5.77±0.27	82.74±0.66
1.45		217.37±2.54	76.41±1.15	5.42±0.20	81.84±1.07
Sign		**NS**	**NS**	**NS**	**NS**
Interaction between protein and lysine levels					
(P)	**(L)**				
	1.15	230.86± 2.13[a]	78.81±1.35	6.44±0.50	85.25±1.55
22	**1.30**	213.06± 2.87[bd]	75.84±0.72	6.07±0.26	81.93±0.90
	1.45	218.23±3.58[cb]	74.49±3.31	5.62±0.42	80.12±2.91
	1.15	211.10± 3.30[d]	76.65±1.63	5.31±0.27	81.96±1.44
24	**1.30**	211.10±5.52[d]	78.00±1.30	6.01±0.63	84.03±1.33
	1.45	210.50±1.27[d]	78.44±0.98	5.31±0.47	83.76±1.25
	1.15	220.26±3.30[ce]	77.16±0.28	5.51±0.47	82.68±0.57
26	**1.30**	229.03±4.95[a]	77.03±1.02	5.22±0.43	82.25±1.16
	1.45	223.40±4.56[ce]	76.29±0.37	5.35±0.28	81.64±0.64
Sign		*	**NS**	**NS**	**NS**

Means in the same column within each classification bearing different letters are significantly($p<0.05$) different . (*$p<0.05$) (**$p<0.01$) NS=not significant

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الملخص العربى
تأثير مستويات البروتين والليسين على أداء السمان اليابانى النامى

شريف محمد سنبل - محمد محمد الهنداوى
عادل إبراهيم عطيه - محمود محمد العجوانى
قسم الدواجن - كلية الزراعة - جامعة الزقازيق

تم تصميم تجربة (٣ ×٣) لدراسة تأثير ثلاث مستويات من البروتين (٢٢، ٢٤، ٢٦%) وثلاث مستويات من الليسين (١,١٥، ١,٣٠ ، ١,٤٥%) على أداء النمو للسمان اليابانى حيث تم إستخدام ٥٤٠ كتكوت سمان يابانى عمر ثلاث أيام و قسمت هذه الكتاكيت عشوائيا إلى ٩ مجاميع تجريبية بكل مجموعة تجريبية ٦٠ طائر، قسمت كل مجموعة إلى ثلاث مكرارات بكل مكرر ٢٠طائر.

وكانت أهم النتائج كالتالى:

- سجلت المجاميع المغذاه على ٢٦% بروتين زياده معنوية($p<0,05$) فى الوزن الحى و الزيادة الوزنية مقارنة بالمجاميع المغذاه على ٢٢% ، ٢٤% بروتين عند ٢١ يوم.
- لم يتأثر الغذاء المأكول ومعامل التحول الغذائى عند مستويات المختلفة للبروتين.
- عدم و جود أى معنويه على معدل الاداء بصفة عامه عند مستويات الليسين المختلفة .
- عدم و جود تأثير معنوى لمستويات البروتين أو الليسين أو التداخل بينهم على صفات الذبيحة (نسبة الذبيحة-نسبةالأحشاء المأكولة –نسبة التصافى).
- سجلت الطيور المغذاه على٢٢% بروتين مع ١,١٥% ليسين أعلى كفاءة إقتصادية أثناء الفترة التجريبية .
- من خلال هذه الدراسة من الناحية الغذائية والاقتصادية يمكن التوصية باستخدام ٢٢% بروتين وهذا المستوى كافى لإعطاء أعلى معدل أداء وأعلى كفاءة إقتصادية للسمان اليابانى النامى .أيضا يمكن التوصية باستخدام ١,١٥ % ليسين كافى لإعطاء معدل أداء عالي.
- يوصى باستخدام ٢٢% بروتين مع ١,١٥ ليسين لتغذية السمان اليابانى طوال فترة النمو.