Egypt Poult. Sci. Vol (26) (III): (857-872)

# PERFORMANCE OF LAYING JAPANESE QUAIL FED LOW PROTEIN DIETS SUPPLEMENTED WITH MENTIONING AND LYSINE.

By

A. M. Ali

Anim. Prod. Dept. Fac. Of Environmental Agric., Sci., Suez Canal Univ., El-Arish, Egypt.

Received: **17/4/2006** Accepted: **29/5/2006**

**Abstract:** *A total number of 420 female Japanese quail 8 weeks of age were randomly distributed into 7 treatments, each containing 60 laying quail hens in three equal replicates. Four dietary crude protein levels were used in this work to study the effect of different levels of crude protein on the performance of laying quail hens. Crude protein levels were optimum level (22 %, T1), medium level (20 %, T2) and low levels (18 %, T3 and 16 %, T4). The diet contained 22 % CP and optimal levels of amino acids (T1) represents the control group . While, the other three diets were deficient in essential amino acids. Therefore, synthetic methionine and lysine were supplemented to these diets in order to maintain constant recommended levels of both methionine and lysine and considered as T5, T6 and T7, respectively. Laying quail hens were kept in cleaned and fumigated cages of wire floored batteries under similar conditions of management. Water and feed were offered ad – libitum under total of 16 hours light / day regimen up to 25 weeks of age.*

*The overall results showed that feeding laying quail hens on diets containing medium or low levels of crude protein recorded significant decrease in egg production, egg weight and egg mass and increase in feed conversion values compared to the control group. Howevre , feed intake values significantly increased gradually with decreasing dietary crude protein levels . Supplementing both methionine and lysine to laying quail hen diets which containing medium or low levels of crude protein improved their performance of laying quail hens especially with medium protein diet . There was no improvement in economic efficiency values due to feeding laying quail hens on medium or low protein diets either with or without supplemental methionine and lysine.*

## INTRODUCTION

High-protein diets (22% CP) are recommended for Japanese quail breeder for optimizing performance ***(NRC 1994)***. Recently, there is a tendency, to feed poultry corn-soy diets low in crude protein and

supplemented with essential amino acids. This is not only because they are safe and profitable diets but also to reduce nitrogen pollution related to poultry manure. However , diets formulated based on corn and soybean meal and low in crude protein are limited in some essential amino acids i.e., in order Methionine ( Met ), Lysine (Lys) , Threonine (Thr), Valine and Arginine ***( Han et al ., 1992 and Fernandez , 1994)*** . There are attempts that have been made to feed broiler chicks low protein diets supplemented with amino acids . ***Bornstein and Lipstein( 1975)*** compared a 19.7%CP diet (supplemented with Met and Lys) to a 23.1% CP diet supplemented with Met and found that chick growth and feed efficiency were equal for these two diets . Similar results were observed by ***Waldroup et al. (1976)***. Also , ***Parr and Summers ( 1991) ; Han et al . ,( 1992 )*** and ***Abd – Elsamee (2001 and 2002)*** reported that chicks fed low protein diets ( ranged from 21 to 17 % CP) supplemented with essential amino acids had similar growth rate and feed efficiency as those fed 23 % CP diet . The same observation was reported by ***Harms and Russell (1993)*** on laying hens . They found that maximum performance of laying hens can be obtained from low-protein diet supplemented with essential amino acids. ***Minoguchi et al . ( 2001 )*** reported that in Japanese quails , it is possible to reduce the feed CP level to 22% during the growing period without significant effects on growth and laying performance . Also it is possible to decrease the feed CP level to 20 % after 21 weeks of age . In another study conducted by ***Yakout et al. (2004)*** indicated that body weight and feed conversion values of growing Japanese quail improved significantly as dietary lysine increased from 1.13 to 1.53 % . Also, ***Abdel – Azeem et al .( 2005 )*** found that when dietary protein level reduced up to 16 %, the performance values of laying quail hens were decreased .

The present study was carried out to determine the effect of different levels of dietary protein and amino acids methionine and lysine on the performance of laying Japanese quail hens .

## MATERIALS AND METHODS

The present work was conducted at Animal Production Department, Faculty of

Environmental Agricultural Sciences, Al-Arish, North Sinai, Suez Canal University. The experiment was designed to study the performance of laying Japanese quail when fed low-protein diets supplemented with amino acids. Laying quail hens were housed in electric heated batteries. They were provided with 16 hr artificial light daily. A total number of 420 females Japanese quail were assigned into 7 experimental treatments each of three

replicates (20 bird per replicate). The experimental diets consisted of medium ( 20 % CP ) or low ( 18 or 16 % CP ) protein diets supplemented with methionine and lysine to meet the requirements recommended by ***NRC ( 1994 )*** , simultaneously and compared with high protein diet ( 22 % CP ) which served as control (Table 1) .The experimental groups were fed on one of the following diets :-

T1) 22 % CP with no amino acids supplementation.

T2) 20 % CP with no amino acids supplementation .

T3) 18 % CP with no amino acids supplementation .

T4) 16 % CP with no amino acids supplementation .

T5) as T2 but supplemented with 0.02 % methionine and 0.17 % lysine .

T6) as T3 but supplemented with 0.05 % methionine and 0.33 % lysine .

T7) as T4 but supplemented with 0.07 % methionine and 0.48 % lysine .

All diets were iso-caloric containing 2900 kcal ME / kg diet ( Table 1 ) .|Feed and water were provided ad libtium . Feed intake , egg number., and egg weight were recorded every two weeks . Also, feed conversion (g feed : g egg mass ) was calculated every two weeks .

Data were subjected to ANOVA using the procedure of the general linear models (GLM) of SAS® software ***( SAS , 1990 )*** . One way analysis of variance was carried out using the following model :

$$Y = U + T + E$$

Where:

Y = the observation of the parameter .
U = overall mean .
T = the effect of the treatment.
E = the random error term .

Differences among means were tested by Duncan's multiple ranged test ***(Duncan , 1955 )*** at the probability of $\leq 0.05$ were considered significant .

## RESULTS AND DISCUSSION

**Egg production :**

The effects of treatments on egg production percentage ( EP % ) are presented in Table 2 . Regardless of adding amino acids, results showed that the average values of egg production significantly decreased gradually as dietary protein decreased especially with feeding laying quail hens on diets

containing low levels of crude protein ( 18 or 16 % CP ) and deficient in essential amino acids . However, there were no significant differences in egg production values at feeding laying quail hens diet containing medium level of crude protein (20 % CP) and deficienl in essential amino acids compared to control group which fed diet containing optimum level of crude protein (22 % ) and amino acids during the almost experimental periods . These differences perhaps due to the differences in diets composition or nutritional deficiencies , especially crude protein and amino acids , which reduce the normal egg production rate . These results are consistent with those of ***Lopez and Leeson (1995)*** who found that egg production decreased with feeding broiler breeders on low protein diets . Also , ***Annaka et al . (1993 and 1994 ) ; Shrivastav et al . (1994) ; Ohguchi et al . ( 1997 ); Minoguchi et al . ( 2001 )*** and ***Abdel – Azeem et al . ( 2005 )*** showed that egg production decreased when laying Japanese quails were given low protein diets ( up to 16 % CP ) .

Data presented in Table ( 2 ) showed that supplementing both methionine and lysine to laying quails diets which containing medium or low levels of crude protein in order to cover the recommended levels of amino acids (according to ***NRC, 1994*** ), slightly increased egg production but without significant differences compared to those fed diets containing medium or low levels of crude protein and deficient in amino acids . However, there was no significant difference between the control group and those fed on diet containing medium level of crude protein and supplemented with methionine and lysine during the experimental period . This may be due to covering the requirement of amino acids which has a favorable effect on egg production . The present results are in harmony with those reported by ***Ravikiran and Devegoweda ( 1998 )*** and ***Abd – Elsamee ( 2005 )*** who found that egg production increased with supplemental methionine to laying hen diets.

**Egg weight:**

The average values of egg weight are presented in Table ( 3 ) . Results showed significant decrease in egg weight values when laying quail hens were fed diets containing medium or low levels of crude protein and deficient in essential amino acids compared to control group . This may be due to the important role of protein and essential amino acids on egg composition and weight. These results are in agreement with those obtained by ***Lopez and Leeson (1995 )*** who found significant decrease in egg weight values when they fed broiler breeders on low protein diets compared to those fed on optimal dietary protein level . Similar results were obtained by ***Annaka et al . ( 1993 )*** and ***Abdel – Azeem et al . ( 2005 )*** who showed that

when laying quail hens were fed on low protein diets the average values of egg weight significantly decreased compared to control group. On the other hand, ***Shrivastav et al . ( 1994 )*** noticed significant increase in egg weight with feeding laying quails on low protein diets ( 22 or 19 % CP ) compared to those fed on high protein diet ( 25 % CP ) .

Data in Table (3) showed improvement in egg weight values when laying quail hens fed on diets containing medium or low levels of crude protein and supplemented with both methionine and lysine compared to those fed on diets containing the same level of crude protein and deficient in essential amino acids. Similarly, ***Kita et al . (1997 )*** and ***Abd – Elsamee ( 2005 )*** reported that adding methionine to laying hen diets increased egg weight values .

**Egg mass:**

Egg mass data are presented in Table (4). Results showed that the average values of egg mass were significantly decreased when laying quails were fed diets containing different levels of crude protein ( 20 , 18 or 16 % CP) and deficient in amino acids compared to control group (22 % CP ) during the almost experimental periods and overall period. Although, adding both methionine and lysine to laying quails diets which containing medium or low levels of crude protein improved the average values of egg mass comparing to those fed on diets containing medium or low levels of crude protein without amino acids supplementation. Data showed no significant difference between the control group and that fed on diet containing 20% CP with amino acids supplementation. This may be due to the parallel improvements in both egg production and egg weight. These results are in agreement with those of ***Abdel – Azeem ( 2005 )*** who found that egg mass significantly increased with increasing crude protein level in laying quails diet .

**Feed Intak :**

The effect of treatments on feed intake is shown in Table (5). Results obtained revealed that when laying quail hens were fed on diets containing medium (20 % CP) or low (18 or 16 % CP) levels of crude protein and deficient in essential amino acids the average values of feed intake were significantly increased. These differences of feed intake values perhaps as an attempt to cover the requirements of crude protein and EEA .Similar results were obtained by ***Ali et a . (2000a)*** who found that when growing Japanese quails fed on a 22% protein diet significantly consumed more feed compared to 24 % CP. Also, **Abdel – Azeem et al. (2005)** showed that feed intake of laying Japanese quails increased with decreased dietary crude

protein levels. On the contrary of these results, ***Abd – Elsamee (2001 and 2002 )*** found that broiler chicks consumed less feed when they fed on low dietary protein level compared to control group , which fed on optimal dietary protein level . Data showed that there was no improvement in average values of feed intake due to supplementing both methionine and lysine to laying quail hen diets which containing medium or low levels of crude protein. In this respect, ***Ali et al. ( 2000 a )*** found no significant effect in feed intake values due to adding methionine and lysine to growing Japanese quail diets which containing lower levels of crude protein ( 20 or 22 % CP ) compared to higher level ( 24 % CP ) . Also, ***Abd – Elsamee (2005)*** showed no significant differences in feed intake values due to the use of different levels of methionine in laying hen diets .

**Feed conversion ratio:**

The effects of different levels of crude protein and amino acids on the average values of feed conversion ratio are presented in Table (6). Results showed that when laying quail hens were fed on diets containing medium or low levels of crude protein and deficient in essential amino acids, the average values of feed conversion ratio were significantly increased compared to control group. This due to the increase in feed intake and the decrease in egg mass with feeding laying quail hens on diets containing medium or low levels of crude protein. The results of feed conversion ratio are confirmed by those of Abdel – Azeem et al. (2005) who noticed that feed conversion values were significantly increased with feeding laying quail hens on diets containing low levels of crude protein ( 20 , 18 or 16 % CP ) . Concerning the data presented in Table (6) , it is observed that adding both methionine and lysine to laying quails diets improved the average values of feed conversion ratio especially those containing 20 or 18 % crude protein . In this regard , ***Ali et al . (2000 a )*** and ***Yakout et al . ( 2004 )*** indicated that feed conversion ratio was improved when they supplemented growing Japanese quail diets with synthetic amino acids .

**Economic efficiency:**

Data presented in Table (7) showed the economic efficiency of the different formulated diets and money returned per laying quail hens at the end of experimental period as affected by different levels of crude protein and amino acids. Egg production (egg No. /quail hen) and feeding cost are generally among the most important factors involved in achieve maximum profit from egg production. The economic efficiency values were calculated according to the prevailing market (selling) price of egg , which was 0.15 LE on average during the experimental period . Results showed that the

highest values of net revenue and economic efficiency were recorded for the control group (5.56 and 1.12, respectively .) . While , the average values of net revenue and economic efficiency were lower with feeding laying quail hens on medium or low protein diets either with or without supplemental methionine and lysine . This finding is in agreement with that obtained by **Ali et al . ( 2000 b )** who found that feeding growing Japanese quails on low protein diets decreased the average values of net revenue and economic efficiency .

On the basis of the results of this study , it could be concluded that laying quail hens could be fed diets containing medium level of crude protein ( less than the optimal level by 2 % ) conditioning with supplemental methionine and lysine without adversely effect on laying quails performance .

**Table (1): Composition of the experimental diets.**

| Ingredients | Experimental diets | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Yellow corn | 45.90 | 48.92 | 53.31 | 59.92 | 48.73 | 52.93 | 59.37 |
| Soybean meal (44%) | 41.81 | 35.70 | 29.70 | 23.85 | 35.70 | 29.70 | 23.85 |
| Vegetable oil | 4.39 | 4.34 | 3.93 | 3.21 | 4.34 | 3.93 | 3.21 |
| Wheat bran | 0.50 | 3.60 | 5.60 | 6.50 | 3.60 | 5.60 | 6.50 |
| Limestone | 5.70 | 5.74 | 5.76 | 5.78 | 5.74 | 5.76 | 5.78 |
| Dical . Phos . | 1.10 | 1.10 | 1.10 | 1.14 | 1.10 | 1.10 | 1.14 |
| Na Cl | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Min & Vit . premix * | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| DL - methionine | - | - | - | - | 0.02 | 0.05 | 0.07 |
| HCl – lysine | - | - | - | - | 0.17 | 0.33 | 0.48 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Calculated analysis ** | | | | | | | |
| CP % | 22.00 | 20.01 | 18.01 | 16.00 | 20.01 | 18.01 | 16.00 |
| ME Kcal / Kg | 2900 | 2900 | 2900 | 2900 | 2900 | 2900 | 2900 |
| Ca % | 2.51 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| Available P % | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
| Lys . % | 1.35 | 1.19 | 1.04 | 0.89 | 1.35 | 1.35 | 1.35 |
| Meth . % | 0.36 | 0.34 | 0.31 | 0.29 | 0.36 | 0.36 | 0.36 |
| Meth . + Cys . % | 0.72 | 0.67 | 0.62 | 0.56 | 0.72 | 0.72 | 0.72 |
| Price ( LE ) / ton | 1230 | 1180 | 1140 | 1090 | 1210 | 1200 | 1180 |

* Supplied per kg of diet;Vit.A,12,000 IU; Vit D3, 2,000 IU ; Vit E , 40 mg ; Vit , K3 , 4 mg ; Vit , B1,3 mg ; Vit, B2 , 6 mg ; Vit, B6, 4 mg ;Vit.B12 , 30 micro g ; Niacin , 30 mg ; Folic Acid , 1.5 mg ;Bioten , 80 micro g ;Pantothenic Acid , 13.2 mg ; Choline Chloride, 700 mg ; Iron , 40 mg ; Copper , 10 mg ; Zinc , 70 mg ; Selenium , 0.2 mg ; Iodine ,1.5 mg ; Coabalt , 0.25 mg.

** According to ***NRC , 1994*** .

**Table ( 2 ): Effect of experimental Treatments on laing percentage egg production ( EP % ) .**

| Periods | Treatments | | | | | | | Sig. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 1 (55-69)day | a 49.02 ± 0.33 | a 48.83 ± 0.51 | bc 47.29 ± 0.33 | c 46.91 ± 0.76 | ab 48.64 ± 0.51 | abc 48.25 ± 0.19 | bc 47.29 ± 0.33 | * |
| 2 (70-84)day | 60.90 ± 0.59 | 59.39 ± 1.51 | 59.79 ± 0.58 | 58.05 ± 0.36 | 60.69 ± 1.01 | 60.92 ± 0.18 | 58.28 ± 0.93 | No |
| 3 (85-99)day | a 65.17 ± 0.89 | abc 63.68 ± 0.24 | c 61.81 ± 0.60 | d 59.56 ± 0.43 | ab 64.18 ± 0.84 | abc 63.69 ± 0.64 | bc 62.26 ± 0.23 | ** |
| 4 (100-114)day | ab 63.94 ± 0.88 | ab 62.49 ± 0.23 | ab 62.28 ± 1.01 | c 58.92 ± 0.57 | a 64.41 ± 0.65 | ab 62.97 ± 0.47 | b 61.80 ± 0.46 | ** |
| 5 (115-129)day | ab 63.99 ± 1.66 | bc 62.03 ± 0.40 | dc 60.44 ± 0.22 | d 58.69 ± 0.37 | a 64.90 ± 0.43 | c 61.36 ± 0.79 | d 58.70 ± 0.37 | ** |
| 6 (130-144)day | b 62.96 ± 0.23 | c 61.35 ± 0.39 | d 58.91 ± 0.21 | d 58.91 ± 0.21 | a 64.16 ± 0.42 | cb 62.03 ± 0.40 | d 59.13 ± 0.43 | ** |
| 7 (145-159)day | a 52.56 ± 1.50 | ab 49.80 ± 1.08 | bc 48.45 ± 0.88 | c 46.15 ± 0.87 | bc 48.26 ± 1.01 | c 46.53 ± 0.19 | c 45.57 0.33 | ** |
| 8 (160-174)day | 46.34 ± 2.11 | 45.38 ± 0.38 | 44.24 ± 0.19 | 42.71 ± 0.33 | 45.19 ± 0.51 | 43.28 ± 0.88 | 42.21 ±0.56 | No |
| Overall (55-174)day | a 57.71 ± 0.21 | bc 56.30 ± 0.22 | c 55.40 ± 0.25 | d 53.53 ± 0.13 | ab 57.08 ± 0.05 | bc 55.73 ± 0.32 | d 52.87 ± 1.05 | ** |

a. b ... Values with no common superscripts within the same row are significantly different (p>0.05).

**Table ( 3 ) : Effect of experimental treatments on egg weight ( g ) .**

| Periods | Treatments | | | | | | | Sig. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 1 (55-69)day | abc 10.64 ±0.05 | abc 10.64 ±0.01 | c 10.37 ±0.18 | c 10.54 ±0.01 | ab 10.67 ±0.04 | a 10.85 ±0.09 | ab 10.81 ±0.10 | * |
| 2 (70-84)day | a 11.24 ±0.03 | bc 11.03 ±0.03 | c 10.91 ±0.01 | d 10.61 ±0.05 | ab 11.14 ±0.09 | a 11.33 ±0.05 | ab 11.19 ±0.09 | ** |
| 3 (85-99)day | a 11.78 ±0.20 | c 11.23 ±0.18 | dc 11.06 ±0.09 | d 10.79 ±0.07 | ab 11.64 ±0.08 | bc 11.34 ±0.03 | cd 11.17 ±0.09 | ** |
| 4 (100-114)day | a 11.53 ±0.08 | c 11.03 ±0.03 | c 10.91 ±0.03 | d 10.73 ±0.03 | b 11.31 ±0.11 | b 11.24 ±0.03 | c 11.03 ±0.03 | ** |
| 5 (115-129)day | a 11.21 ±0.11 | a 10.96 ±0.02 | b 10.54 ±0.10 | b 10.31 ±0.16 | a 11.03 ±0.05 | a 11.05 ±0.07 | b 10.36 ±0.04 | ** |
| 6 (130-144)day | a 11.11 ±0.11 | a 11.02 ±0.10 | bc 10.50 ±0.05 | c 10.39 ±0.11 | a 10.96 ±0.02 | bc 10.64 ±0.06 | b 10.70 ±0.11 | ** |
| 7 (145-159)day | a 10.86 ±0.07 | bc 10.58 ±0.06 | c 10.48 ±0.14 | bc 10.52 ±0.01 | a 10.94 ±0.04 | ab 10.73 ±0.02 | bc 10.59 ±0.07 | ** |
| 8 (160-174)day | a 10.96 ±0.02 | a 10.86 ±0.03 | abc 10.69 ±0.07 | dc 10.48 ±0.01 | ab 10.79 ±0.10 | bcd 10.58 ±0.03 | d 10.37 ±0.17 | ** |
| Overall (55-174)day | a 11.17 ±0.03 | b 10.92 ±0.04 | d 10.68 ±0.04 | e 10.55 ±0.01 | ab 11.06 ±0.02 | bc 10.97 ±0.01 | cd 10.78 ±0.01 | ** |

a. b ... Values with no common superscripts within the same row are significantly different .

**Table (4) : Effect of experimental treatments on egg mass ( g/hen/day ).**

| Periods | Treatments | | | | | | | Sig. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 1 (55-69)day | a 6.06 ± 0.07 | a 6.03 ± 0.03 | b 5.60 ± 0.15 | b 5.62 ± 0.13 | a 6.01 ± 0.11 | a 6.04 ± 0.03 | ab 5.84 ± 0.06 | * |
| 2 (70-84)day | ab 8.58 ± 0.09 | bc 8.12 ± 0.27 | bc 8.14 ± 0.10 | d 7.64 ± 0.02 | abc 8.46 ± 0.09 | a 8.65 ± 0.16 | c 8.09 ± 0.09 | ** |
| 3 (85-99)day | a 9.70 ± 0.17 | bcd 9.03 ± 0.18 | d 8.59 ± 0.08 | e 8.02 ± 0.10 | ab 9.43 ± 0.18 | bc 9.11 ± 0.10 | cd 8.75 ± 0.08 | ** |
| 4 (100-114)day | a 9.31 ± 0.19 | c 8.68 ± 0.05 | c 8.54 ± 0.17 | d 7.87 ± 0.08 | ab 9.20 ± 0.03 | bc 8.92 ± 0.80 | c 8.57 ± 0.06 | ** |
| 5 (115-129)day | a 9.04 ± 0.25 | b 8.56 ± 0.06 | c 8.00 ± 0.08 | d 7.52 ± 0.06 | a 9.04 ± 0.10 | b 8.50 ± 0.07 | d 7.56 ± 0.03 | ** |
| 6 (130-144)day | a 8.81 ± 0.07 | b 8.48 ± 0.11 | c 7.70 ± 0.07 | c 7.62 ± 0.11 | a 8.89 ± 0.04 | b 8.30 ± 0.03 | c 7.89 ± 0.15 | ** |
| 7 (145-159)day | a 6.84 ± 0.23 | b 6.17 ± 0.23 | bc 5.87 ± 0.22 | c 5.47 ± 0.15 | b 6.09 ± 0.21 | bc 5.65 ± 0.05 | c 5.40 ± 0.06 | ** |
| 8 (160-174)day | 5.71 ± 0.41 | 5.50 ± 0.08 | 5.21 ± 0.06 | 4.82 ± 0.06 | 5.43 ± 0.01 | 4.97 ± 0.15 | 4.91 ± 0.04 | not |
| Overall (55-174)day | a 7.98 ± 0.03 | bc 7.56 ± 0.01 | d 7.19 ± 0.01 | e 6.82 ± 0.02 | ab 7.79 ± 0.02 | c 7.49 ± 0.05 | d 7.12 ± 0.19 | ** |

a. b ... Values with no common superscripts within the same row are significantly different .

**Table (5): Effect of experimental treatments on feed intake (g/hen/day) .**

| Periods | Treatments | | | | | | | Sig. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 1 (55-69)day | d 25.76 ±0.34 | cd 26.41 ± 0.05 | bcd 26.50 ± 0.23 | bc 26.73 ± 0.19 | cd 26.40 ± 0.39 | ab 27.32 ± 0.19 | a 27.88 ± 0.28 | ** |
| 2 (70-84)day | d 27.37 ±0.18 | bc 27.82 ± 0.09 | b 28.03 ± 0.03 | a 28.74 ± 0.11 | cd 27.54 ± 0.13 | bcd 27.72 ± 0.14 | b 28.12 ± 0.09 | ** |
| 3 (85-99)day | d 28.67 ±0.18 | cd 28.91 ± 0.21 | cd 29.33 ± 0.33 | b 31.63 ± 0.26 | cd 28.77 ± 0.23 | c 29.80 ± 0.35 | a 32.73 ± 0.59 | ** |
| 4 (100-114)day | d 29.32 ±0.21 | c 30.42 ± 0.16 | b 31.76 ± 0.23 | a 34.29 ± 040 | cd 29.98 ± 0.06 | c 30.50 ± 0.20 | b 32.59 ± 0.45 | ** |
| 5 (115-129)day | e 30.24 ±0.12 | d 31.06 ± 0.06 | c 32.95 ± 0.23 | a 35.49 ± 0.20 | d 31.04 ± 022 | c 32.88 ± 0.25 | b 33.93 ± 0.16 | ** |
| 6 (130-144)day | d 29.83 ±0.26 | c 31.24 ± 0.05 | b 33.09 ±0.26 | a 35.07 ± 0.07 | c 31.30 ± 0.72 | b 33.70 ± 0.45 | a 35.32 ± 0.16 | ** |
| 7 (145-159)day | e 34.26 ±0.17 | cd 34.37 ± 0.24 | cd 34.93 ± 0.03 | bc 35.23 ± 0.18 | de 34.47 ± 0.31 | b 35.75 ± 0.12 | a 36.40 ± 0.15 | ** |
| 8 (160-174)day | b 35.33 ±0.38 | ab 35.92 ± 0.07 | ab 35.60 ± 0.20 | ab 36.04 ± 0.03 | c 34.54 ± 0.28 | ab 35.61 ± 0.21 | a 36.24 ± 0.24 | ** |
| Overall (55-174)day | d 30.09 ±0.09 | c 30.74 ± 0.02 | b 31.53 ± 0.07 | a 32.90 ± 0.07 | c 30.51 ± 0.12 | b 31.66 ± 0.17 | a 32.90 ± 0.22 | ** |

a. b Values with no common superscripts within the same row are significantly different .

**Table ( 6 ) : Effect of experimental treatments on feed conversion ratio (g feed / g egg ) .**

| Periods | Treatments | | | | | | | Sig. |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 1 (55-69)day | b 4.24 ± 0.10 | b 4.38 ± 0.07 | a 4.74 ± 0.14 | a 4.76 ± 0.11 | b 4.40 ± 0.12 | ab 4.52 ±0.01 | a 4.78 ± 0.07 | ** |
| 2 (70-84)day | d 3.19 ± 0.05 | bc 3.41 ± 0.11 | bc 3.44 ± 0.04 | a 3.76 ± 0.02 | cd 3.25 ± 0.05 | d 3.21 ± 0.05 | b 3.48 ± 0.03 | ** |
| 3 (85-99)day | f 2.96 ± 0.04 | de 3.21 ± 0.07 | c 3.42 ± 0.07 | a 3.95 ± 0.04 | ef 3.05 ± 0.04 | cd 3.27 ± 0.01 | b 3.74 ± 0.03 | ** |
| 4 (100-114)day | e 3.15 ± 0.05 | c 3.51 ± 0.01 | b 3.72 ± 0.10 | a 4.36 ± 0.04 | de 3.26 ± 0.01 | cd 3.42 ± 0.05 | b 3.80 ± 0.08 | ** |
| 5 (115-129)day | f 3.35 ± 0.09 | e 3.63 ± 0.03 | c 4.13 ± 0.05 | a 4.72 ± 0.06 | f 3.43 ± 0.06 | d 3.87 ± 0.05 | b 4.49 ± 0.03 | ** |
| 6 (130-144)day | e 3.39 ± 0.04 | d 3.66 ± 0.04 | b 4.30 ± 0.05 | a 4.60 ± 0.06 | de 3.52 ± 0.06 | c 4.06 ± 0.07 | a 4.48 ± 0.06 | ** |
| 7 (145-159)day | d 5.02 ± 0.19 | c 5.58 ± 0.17 | bc 5.96 ± 0.22 | ab 6.45 ± 0.15 | c 5.68 ± 0.20 | ab 6.33 ± 0.05 | a 6.74 ± 0.09 | ** |
| 8 (160-174)day | d 6.23 ± 0.55 | cd 6.53 ± 0.09 | bcd 6.84 ± 0.08 | b 7.45 ± 0.09 | cd 6.36 ± 0.03 | bc 7.18 ± 0.26 | a 8.32 ± 0.13 | ** |
| Overall (55-174)day | f 3.77 ± 0.03 | d 4.07 ± 0.01 | b 4.38 ± 0.01 | a 4.82 ± 0.01 | e 3.91 ± 0.02 | c 4.23 ± 0.05 | a 4.81 ±0.10 | ** |

a. b ... Values with no common superscripts within the same row are significantly different .

**Table (7) : Effect of experimental treatments on economic efficiency .**

| Item | Treatments | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| FI /quail hen (Kg) | 3.61 | 3.69 | 3.78 | 3.95 | 3.66 | 3.80 | 3.95 |
| Price / Kg feed (LE) | 1.23 | 1.18 | 1.14 | 1.09 | 1.21 | 1.20 | 1.18 |
| Cost of feed (LE) | 4.44 | 4.35 | 4.31 | 4.30 | 4.43 | 4.56 | 4.66 |
| Fixed cost (LE) | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Total cost (LE) | 4.94 | 4.85 | 4.81 | 4.80 | 4.93 | 5.06 | 5.16 |
| Egg No. / quail hen | 70 | 68 | 67 | 65 | 69 | 67 | 66 |
| Price of egg (LE ) | 10.50 | 10.20 | 10.05 | 9.75 | 10.35 | 10.05 | 9.90 |
| Net revenue | 5.56 | 5.35 | 5.24 | 4.95 | 5.42 | 4.99 | 4.74 |
| Economic efficiency* | 1.12 | 1.10 | 1.09 | 1.03 | 1.10 | 0.99 | 0.92 |
| Relative economic efficiency ** | 100 | 98 | 97 | 92 | 98 | 88 | 82 |

* Net revenue per unit cost .
** Assuming that the group number 1 represent the control .

## REFERENCES

**Abdel – Azeem , F.A.; Nematallah, G. M. ; and Faten, A.A.Ibrahim . (2005 ).** *Effect of dietary protein level with some natural biological feed additives supplementation on productive and physiological performance of Japanese quails . Egypt . Poult . Sci ., 25 : 497 – 525 .*

**Abd – Elsamee, M .O. (2001) .** *Broiler performance as affected by crude protein, lysine and a probiotic . Egypt . Poult . Sci ., 21 : 943 – 962 .*

**Abd – Elsamee, M . O. ( 2002) .** *Effect of different levels of crude protein , sulphur amino acids , microbial phytase and their interaction on broiler chick performance . Egypt . Poult . Sci ., 22 : 999 – 1021 .*

**Abd – Elsamee, M . O.( 2005 ) .** *Effect of different levels of methionine and vitamin E on laying hen performance under heat stress conditions . 3 rd International Poultry Conference 4–7 Apri . 2005 Hurghada. Egypt.*

**Ali, A. M.; Abdallah, A.G.; and AbouEl–Wafa, S. (2000 a).** *Performance of Japanese quail fed low protein corn – soy diets supplemented with synthetic amino acids. J. Agri . Sci. Mansoura Univ., 2 : 6721 – 6729.*

**Ali, A. M.; El – Nagmy , K . Y .; and Abd – Elsamee , M. O. (2000 b ) .** *The effect of dietary protein and yeast culture levels on performance of growing Japanese quails . Egypt . Poult . Sci ., 20 : 777 – 787 .*

**Annaka, A .; Tomizawa, K .; Mosoe, Y.; Watanabe, E.; and Ishibashi, T. (1993).** *Effects of dietary protein levels on performance of Japanese quail . Anim . Sci . and Technology ., 64 : 797 – 806 .*

**Annaka, A.; Yamaoto, A.; Ishibashi, T.; Djajanegara, A.; and Sukmawati , A . ( 1994 ) .** *Protein and metabolizable energy requirements in Japanese quail . Proc . of the 7 th AAAP of Anim . Sci. Congress , 11 – 16 July , 1994 . Bali , Indonesia .*

**Bornstein , S .; and Lipstein, B. ( 1975 ).** *The replacement of some soybean meal by the first limiting amino acids in practical broiler diets . 1 – The value of special supplementation of chick diets with methionine and lysine . Br . Poult . Sci ., 16 : 177 – 188 .*

**Duncan, D . B. ( 1955 ) .** *Multiple range and F tests . Biometrics 11 : 1 42.*

**Fernandez, S. R.; Aoyagi , S .; Han , Y .; Parsons, C . M.; and Baker , D . H . ( 1994 ) .** *Limiting order of amino acids in corn and soybean meal for growth of chick . Poult . Sci ., 73 : 1887 – 1896 .*

**Han, Y.; Suzuki, H.; Parsons, C. M .; and Baker, D. H . ( 1992 ) .** *Amino acid fortification of a low - protein corn and soybean meal diet for chicks . Poult . Sci ., 71 : 1168 – 1178 .*

**Harms, R. H.; and Russull, G. B. ( 1993 ).** *Optimizing egg mass with amino acids supplementation of low – protein diet . Poult . Sci ., 72 : 1892 – 1896 .*

**Kita, K .; Hohmura, I .; and Okumura, J . ( 1997 ) .** *Influence of dietary zinc methionine supplementation on egg shell quality in laying hens under hot climate environment . Japanese . Poult . Sci ., 34 : 21 –26 .*

**Lopez , G .; and Lesson, S . ( 1995 ).** *Response of broiler breeders to low protein diets . 1 – Adult breeder performance . Poult . Sci., 74 : 696 – 701 .*

**Minoguchi, N.; Ohguchi, H.; Ohguchi , H .; Yamamoto, R.; and Hanaki , Y . ( 2001 ) .** *Low protein diets for Japanese quail and the reduction in nitrogen excretion . Research . Bulletin . of the Aichi – Ken – Agric., 33 : 319 – 324 .*

**National Research Council , NRC. (1994).** *Nutrition Requirement of Poultry . 9 th Ed . National Academy Press , Washington , DC .*

**Ohguchi, H .; Kato , S .; Goto , T .; and Nagata, S . ( 1997 ) .** *The effect of low protein diets on growth , laying performance and nitrogen excretion of Japanese quail . Research . Bulletin . of the Aichi – Ken – Agric., 29 : 349 – 353 .*

**Parr, J . F.; and Summers, J. D.(1991).** The effects of minimizing amino acid excesses in broiler diets . Poult . Sci ., 70 : 1540 – 1549 .

**Ravikiran , D.; and Devegowda, G . ( 1998 ) .** *Effect of DL– methionine supplementation in the ration of commercial layers during summer . Indian . J . Poult . Sci ., 33 : 279 – 283 .*

**SAS Institute ( 1990 ) .** *SAS Institute User's Guide : Statistics , 1990 . Edition SAS Institute Inc., Cary , NC .*

**Shrivastav, A. K.; Johari, T. S.; and Raju, M .V . ( 1994 )** . *Dietary protein and energy requirements of laying quails reared under different nutrient schedule during starting and growing period . Indian . J . of Anim . Sci ., 64 : 173 – 177 .*

**Waldroup, P. W.; Mitchell, R. J .; Payne , J . R.; and Hazen, K. R. (1976) .** *Performance of chicks fed diets formulated to minimize excess levels of essential amino acids . Poult . Sci ., 55 : 243 – 253 .*

**Yakout, H. M.; Mona Osman .; Abo – Zeid, A . E ; and Amber , Kh. (2004 ) .** *The lysine requirement and ratio of total sulfur amino acids to lysine for growing Japanese quails fed adequate or inadequate lysine. Egypt . Poult . Sci ., 24 : 497 – 507 .*

**الملخص العربى**

## الأداء الإنتاجى للسمان البياض المغذى على علائق منخفضة فى محتواها من البروتين الخام والممدة بالمثيونين والليسين .

**أحمد محمد على**

قسم الإنتاج الحيوانى ، كلية العلوم الزراعية البيئية بالعريش ، جامعة قناة السويس ، مصر .

أجريت هذه الدراسة على عدد ٤٢٠ سمانة بياضة عمر ٨ أسابيع . قسمت الطيور عشوائيا إلى ٧ مجاميع متساوية العدد بحيث تشمل كل مجموعة ٦٠ سمانة ( قسمت كل مجموعة إلى ثلاث مكررات بكل منها ٢٠ طائر ) وذلك لدراسة تأثير المستويات المختلفة من البروتين والأحماض الأمينية الضرورية على الأداء الإنتاجى للسمان البياض وكذلك الكفاءة الإقتصادية لإنتاج البيض . تم إستخدام ٤ مستويات من البروتين الخام وهى ٢٢ % ( مجموعة المقارنة ) ، ٢٠ % ( مستوى متوسط ) ، ١٨ ، ١٦ % ( مستوى منخفض ) مع الأخذ فى الإعتبار أن المستوى المتوسط والمنخفض من البروتين لا يحتويان على الإحتياجات الموصى بها من الأحماض الأمينية الضرورية . لذلك تم إضافة كل من المثيونين والليسين إلى هذه العلائق لكى تصل إلى الإحتياجات الغذائية

المطلوبة من الأحماض الأمينية . تم تربية الطيور تحت نفس الظروف من الرعاية والمعاملات البيطرية طوال فترة التجربة التى أستمرت حتى ٢٥ أسبوع من العمر .

أوضحت نتائج هذه التجربة أن تغذية السمان البياض على علائق تحتوى على مستوى متوسط أو منخفض من البروتين الخام والفقيرة فى الأحماض الأمينية أدى إلى إنخفاض معنوى فى كل من إنتاج البيض ، وزن البيضة ، كتلة البيض الناتج وكذلك زيادة كمية الغذاء المأكول ومعامل التحويل الغذائى مقارنة بمجموعة المقارنة المغذاة على المستوى الأمثل من البروتين الخام والأحماض الأمينية .

وقد ادت إضافة كل من المثيونين والليسين إلى العلائق المحتوية على المستوى المتوسط أو المنخفض من البروتين الخام للوصول إلى الإحتياجات الغذائية من الأحماض الأمينية الضرورية إلى تحسن الأداء الإنتاجى للسمان البياض وخاصة فى المجموعة المغذاة على المستوى المتوسط من البروتين الخام .

هذا ولم يكن هناك انخفاض فى قيم الكفاءة الإقتصادية نتيجة تغذية السمان البياض على علائق تحتوى على مستوى متوسط أو منخفض من البروتين الخام سواء كانت فقيرة فى محتواها من الأحماض الأمينية أو مضاف إليها كل من المثيونين والليسين .