EFFECTS OF DIETARY LEVELS OF METHIONINE AND LYSINE ON PERFORMANCE OF GROWING JAPANESE QUAIL

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ABSTRACT:

The experimental work was designed to study the effects of supplemental methionine (Met) and lysine (Lys) on performance of growing japanese quail. Two hundred and seventy, 1day - old unsexed birds were allotted to 5 treatments and were fed the experimental diets. The composition of the experimental diets were as follows:

1. D1, corn-soybean meal diet with an animal protein source containing methionine and lysine levels as recommended by NRC, 1994.
2. D2, corn-soybean meal diet without any source of animal protein or supplemental methionine and lysine. The diet has a deficiency of methionine and lysine and considered as the negative control.
3. D3 is the same composition of D2 and supplemented with methionine and lysine as recommended by NRC, and considered as the control.
4. D4 is the same composition of D3 with supplemental methionine and lysine to the level of 120% of NRC, recommendations.
5. D5 is the same composition of D3 with supplemental methionine and lysine to the level of 140% of NRC, recommendations.

The results obtained indicated that there were insignificant effects of increasing dietary Met and Lys levels on Japanese quail growth performance. The diet containing no more than 1.12% Lys and 0.42% Met (D2) was enough for satisfactory live body weight (LBW), growth rate (GR), performance index (PI) and feed intake (FI). With respect of the whole period, there were insignificant effects of increasing dietary Met and Lys levels on Japanese quail feed conversion (FC), crude protein conversion (CPC), and caloric conversion ratio (CCR), also the dietary 1.12% Lys and 0.42% Met levels were sufficient to obtain the optimum values of FC, CPC and CER for Japanese quail. From the economical point of view, it can be recommended that the diet containing no more than 1.12% Lys and 0.42% Met levels were the best diet for feeding the growing Japanese quail.

Key Words: Quail Nutrition, Amino Acid, Methionine and Lysine, Performance.

INTRODUCTION

Methionine is the first limiting amino acid followed by lysine in most poultry diets. Therefore, supplementation of methionine (Met) and lysine (Lys) to practical poultry diets should increase the efficiency of protein utilization and result in a reduction of N excretion. Extensive literature have been published that document the efforts to optimize the balance of amino acids in poultry diets in order to decrease costs, reduce need for animal or fish proteins, replace soybean meal with less expensive or more locally available plant proteins, and utilize plant proteins more efficiently (D´Mello

1994). Results of Shrivastav *et al.,* (1984). indicated that 1.3% dietary lysine was adequate for maximum growth and feed efficiency during the growing periodof growing quails. Studies on the total sulfur-containing amino acid requirements of starting and growing quail indicated that about 0.48% methionine and 0.27% cyctine were adequate for optimum performance for quail of both 0-3 and 4-5 weeks of age (Shrivastav and Panda, 1987).

The NRC (1994) recommened 0.5% methionine requirement of diet for growing japanese quail. A moderate growth depression was observed by Tamimie (1967) when supplemented a conventional diet with 1.2% L-methionine. However, supplementing an adequate dietary protein for Bobwhite quail with up to 2.0% methionine did not significantly depress growth or influence feed consumption and feed utilization. Growth was significantly depressed in quail fed diets supplemented with 2.25% or 2.5% methionine. Feed consumption was significantly depressed and feed/gain was significantly elevated by a dietary level of 2.5% methionine, which supplied up to 1.35% excess methionine in the diet but it had no effect on growth or feed utilization (Serafin, 1982). Shrivastav *et al* (1984) studied the performance of growing quail from 0 to 3 weeks of age as influenced by graded concentrations of lysine and they found that when the level of lysine increased from 0.9% up to 1.3% optimum body weight gain was obtained. Feed conversion ratio decreased from 2.59g feed/g gain with lysine level of 0.9% to 1.88g/gain with 1.7% lysine. The protein efficiency ratio increased from 1.43 to 2.08 with the same increasing levels of lysine (0.9% to 1.7%). Nitrogen absorbability % decreased with the same levels of lysine from 70.1% to 63.2%. Svacha *et al.* (1970) found that during the first and second period(0-3 weeks and 0-5 weeks) of quail age when the dietary lysine increased from 0.64% up to 1.46%, all the performance mesurments of quail improved

Heartland (1999) indicated that the NRC (1994) recommended lower levels of methionine for the growing period of broilers. Increasing methionine by 12% improved growth, feed efficiency, carcass yield and breast meat yield. However, El-Deek *et al.,* (2002) reprted insignificant effects of increasing methionine level on carcass % or intestinal length of broilers. Si *et al.* (2001) studied the relationship of dietary lysine level to the concentration of all essential amino acids (EAA) in broiler diets. They found no significant interactions between level of lysine and the other EAA for live performance and carcass characteristics. Additional lysine of 0.1% above NRC (1994) recommendations increased the body weight at 21-42 days of age. The objective of this work was to study the effect of different supplemental levels of methionine and lysine on the performance of growing Japanese quail

MATERIALS AND METHODS

The experimental work of the present study was carried out at the Poultry Research Station, Poultry Production Department, Faculty of Agriculture, El-Fayoum University. Chemical analyses were performed according to the procedures outlined by A.O.A.C (1990). Two hundred and seventy one day old unsexed Japanese quail birds were used in the experiment and were initially fed diet 1(D1) for 10 days (Table 1) and the (D1) contenued as the first treatment. Birds were individually weighed, wingbanded and randomly allotted to five dietary treatments. Each dietary treatment contained 54 birds in 3 replicates of 18 quail each. Birds were reared in electrically heated batteries with raised wire mesh floors and had free access to feed and water. Batteries were placed into a room provided with a continuous lighting and fans for ventilation. The birds were reared under similar environmental conditions, and were given the experimental diets from the end of the first 10 days of age until 38 days of age (growing period). Live body weight (LBW) and feed intak (FI) values were recorded weekly. Besides, records of daily mortality were obtained.

Live body weight gain (LBWG), growth rate (GR), feed conversion (FC), crude protein conversion (CPC) and caloric conversion ratio (CCR) were calculated. Also performance index (PI) was calculated according to North (1981).

The composition of the experimental diets were as follows:

D1, corn-soybean meal diet with an animal protein source containing methionine and lysine levels as recommended by NRC, 1994.

D2, corn-soybean meal diet without any source of animal protein or supplemental methionine and lysine. The diet has a deficiency of both methionine and lysine and is considered as the negative control.

D3 is of the same composition as D2 but supplemented with both methionine and lysine as recommended by NRC 1994, and is considered as the control.

D4 is of the same composition as D3 but supplemented with both methionine and lysine to the level of 120% of NRC, 1994 recommendations (20% above NRC).

D5 is of the same composition of D3 but supplemented with both methionine and lysine to the level of 140% of NRC, 1994 recommendations (40% above NRC)

Analysis of variance was conducted on the data in accordance with procedures described by Steel and Torrie (1980) using general linear model procedure of SPSS program (1997). Significant differences among treatment means were determined using Duncan's multiple range test (Duncan, 1955).

Table 1. Composition and analysis of the experimental diets.

Item	Diet No				
	D_1	D_2	D_3	D_4	D_5
Yellow corn, ground	59.00	56.00	55.92	55.56	55.20
Soybean meal (44% CP)	30.00	33.50	33.50	33.50	33.50
Herring fish meal (72% CP)	8.00	0.00	0.00	0.00	0.00
Corn gluten meal(65% CP)	0.00	7.50	7.50	7.50	7.50
Calcium cabonte	1.86	1.70	1.60	1.60	1.60
Di calcium phosphat	0.50	0.70	0.62	0.62	0.62
Sodium chloride	0.30	0.30	0.30	0.30	0.30
Vit.& Min. Premix[1].	0.30	0.30	0.30	0.30	0.30
DL-Methionine	0.04	0.00	0.08	0.18	0.28
L-Lysine	0.00	0.00	0.18	0.44	0.70
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis (%):-[2]					
Crud protein	24.11	24.32	24.31	24.91	24.41
Ether extract	3.28	2.58	2.58	2.57	2.55
Crud fiber	3.45	3.67	3.67	3.66	3.66
Calcium ash	1.11	1.05	0.98	0.98	0.98
Available P	0.37	0.24	0.23	0.23	0.23
Methionine	0.52	0.42	0.50	0.60	0.70
Cystine	0.37	0.45	0.45	0.45	0.45
Lysine	1.48	1.12	1.30	1.56	1.82
ME, kcal/kg	2902	2904	2912	2918	2923
Determined analysis(%):-					
Moisture	7.30	7.19	6.97	7.20	7.30
Crud fiber	23.97	23.48	24.09	24.09	24.22
Ether extract	3.50	2.40	2.88	2.90	2.80
Crud fiber	3.51	3.80	3.76	3.71	3.70
Ash	6.13	6.22	5.80	5.62	6.32
Methionine	0.33	0.29	0.37	0.47	0.57
Cystine	0.35	0.31	0.32	0.32	0.32
Lysine	0.97	0.72	0.92	1.18	1.44
Cost (L.E./ton); [3]	935.6	747.3	788.7	818.2	859.6
Relative cost*	125.2	100	105.5	109.5	115
Relative cost**	118.6	94.7	100	103.7	109

1-Each 3.0 kgs of premix supplies one ton of the diet with :- Vit. A, 12000000IU; Vit.E,10g; Vit.D3, 2500000 IU; Vit.K_3,2.5g; Vit.B_1 ,1g;Vit.B2,5g; Vit.B6,1.5g; Vit.B12,10mg; Biotin,50mg; Folic acid, 1g; Nicotinic acid, 30g; Ca pantothenate,10g, Choline chloride, 1050g;Zn, 55g;Cu,10g; Fe,35g; Co,250mg; Se,150mg; I, 1g; Mn, 60g and antioxidant, 10g

2-According to tables of NRC,1994. **3-According to the market prices of 2001**

* Assuming diet 2 as a negative control ** Assuming diet 3 as a corn- soybean control.

RESULTS AND DISCUSSION

1- Effect of Met and Lys supplementations on Japanese quail performance:

Data in Table 2 show the effects of dietary Met and Lys supplementations on LBW, LBWG, GR and FI of Japanese quail. Met and Lys significantly affected LBW (P ≤0.05) at the 17d of age. Quails fed the higher supplements of Met and Lys, (diets 4 and 5) and those fed diet 1 containing fish meal had the highest LBW at that age (17d). The lowest LBW values were observed in the birds fed the diets deficient in Met and Lys (D2) or those fed the recommended level of NRC (D3). It appears that quail birds at this young age (10-17) are sensetive to the levels of Met and Lys. However, insignificant effects were observed at the final age of 38d. The final LBW of quails fed the diffrerent experimental diets ranged between 164.46 and 167.64g. It can be noticed that as the birds grew older, less differences in LBW were observed among the different treatments. Leclercq (1998) found that Lys deficiency decreased growth in broilers. Also Heartland (1999) reported that increasing Lys levels from 0.85 to 1.05% in broiler diets had no effect on final body weight. Generally, as the birds grew older, the levels of Met and Lys became ineffective. This may be due to the mild levels of Met and Lys (deficient or excess) which were not sufficient to produce the effect of Met and Lys levels on body weight. Moreover, Met% by calculation was found to be higher than that determind in the 5 experimental diets ranging between 23 and 57%. Similarly, it was founed that calculated Lys in the experimental diets was higher than that determined by 26 to 56% (Table 1). Also Hicklinig *et al* (1990) found that the small negative effect of Lys (1.51% of diet) on 21 days broiler body weight may be due to the decrease in feed consumption and this depressed LBW. Significant differences existed during the growth periods:10-17, 24-31 and 31-38 d. However, these differences did not persist and varied during the growing period. This led evidently to the observed result of no significant differences among the different groups of the final body weight at 38d. The same observetion was noted in LBWG data. The responses of growing poultry to an amino acid are influenced by a wide range of factors which include: immunological stress, environmental temperature, sex, age, species and several dietary factors (D'Mello, 1994). Critical evaluation indicates that these factors readily resolve into those which influence feed intake, and those which reduce the efficiency of utilization of an amino acid. With respect of LBWG or LBW during the whole experimental period, the effect of Met and Lys levels (excess or deficient) are approximately equal in LBWG or LBW. This may be explained depending upon the quantity of Met and Lys intake and efficiency of their utilization. No significant differences of GR among birds fed the experimental diets at all periods studied were noted, except of 24-31d period where groups fed D4 showed the lowest value of GR. This supports the previous results which indicated that D2 was enough for getting satisfactory LBW, LBWG and GR of Japanese quail used in the present experiment. The results reported herein indicated that there was an insignificant effect of increasing Met and Lys levels on Japanese quail growth performance, and the diet containing no more than 0.42% Met and 1.12% Lys (by calculation) was enough for satisfactory LBW, LBWG, GR, and FI. Excess Met is extremely toxic when fed to quails;as little as 0.5 to 0.6%, excess Met depressed growth and with continuous excess of Met (1-1.5%), feed intake was reduced and GR was depressed to nearly 60% (Tamimie, 1967).

2-Effect of Met and Lys supplementation on FC, PI,CPC and CCR:

The data in Table 3 showed the effect of Met and Lys levels on FC, CPC, PI and CCR. During the period from 10 to 17 d of age, there were

significant differences (P≤0.01) among treatments with respect to FC. Also, better values of FC were related to quails fed the highest levels of Met and Lys supplemented diets (D4 and D5), followed by those fed D1, meanwhile, the worst FC value was obtained by those fed D2. Similar findnigs were reported by Leclercq (1998) and Shrivastav and Panda (1987). During the interval of 17-24d, the best FC was obtained in quail fed D4 while FC of other treatments being almost equal in this respect. During the interval of 24-31d, there were no significant differences among quail groups fed D1, D2, D3 and D5. The birds fed these diets had the better FC values. The worst FC was obtained by quail birds fed D4. During the interval of 31-38d, the best FC value was obtained with the birds fed D2, while D3 and D5 had the highest (worst) values of FC. There were no significant differences in FC values among quail groups fed the different diets during the whole period of age (10-38 d). There were insignificant differences among groups in respect of PI during the whole period (10-38).

This indicates that increasing dietary Met and Lys levels had no effect on PI values, and D2 was sufficient for Japanese quail PI. This again may lead to the opinion that severity of excess or deficiency of Met and Lys was mild and did not produce a clear effects on performance of quail fed such diets. With respect to CPC during the interval from 17 to 24d and the whole period (10-38), there were insignificant differences among groups. The same trend was observed with FC data.

The data in Table 3 revealed that the levels of Met and Lys supplementation significantly affected CCR during the period of 10–17, 24-31 or 31-38 days of age. However, there were insignificant differences among groups at 17-24d and 10-38d. It has been reported that quail birds respond to a moderate deficiency of Met by increasing feed intake compared with LBWG causing a decrease in the efficiency of FC (Carew and Hill, 1961). But in this study the levels of Met and Lys (deficient or excess) apparently were not severe enough therefore when the FC, CPC or CCR were calculated, the results obtained were not significant. It is worthy to note that Leclercq (1998) found that the Lys requirement for broilers for FC was always higher than that for gain. Also, Schutte and Pack 1995 reported that the recommendations of sulphur-containing amino acids were sufficient for optimal GR but not for FC.

Table (2): Effect of Met and Lys supplementation on LBW, LBWG,GR and FI of japaese quail fed the exprimental diets

Item		Treatment				
	Age interval	D1	D2	D3	D4	D5
LBW	10	30.52+ 0.921	30.48± 0.91	30.57± 0.98	30.43±0.95	30.54±0.89
	17	63.69±1.75[a]	60. 47±1.74[b]	60.79±1.68[b]	64.82±1.60[a]	64.94±1.68[a]
	24	100.34±2.42	95.90±1.95	98.24±2.26	102.51±1.95	101.25±2.04
	31	139.89±2.67	135.59±2.50	138.45±2.49	137.37±2.53	143.29±2.12
	38	166.04±2.69	166.90±2.42	164.46±2.34	167.43±2.57	167.64±2.12
LBWG	10-17	32.86±0.99 [A]	29.84±1.10[B]	29.86±0.97[B]	34.02±0.87[A]	34.00±0.98[A]
	17-24	36.65±1.23	35.43±1.06	37.02±1.06	37.69±0.79	36.31±1.16
	24 –31	39.54±1.01[A]	39.69±1.06[A]	40.22±0.86[A]	35.15±1.042[B]	42.04±0.86[A]
	31-38	26.15±0.84[B]	31.31±0.99[A]	25.22±0.91[B]	29.18±0.91[A]	24.35±0.67[B]
	10 -38	135.21±3.62	136.27±5.45	133.12±5.831	136.49±4.50	136.71±2.24
GR	10-17	0.70±0.071[1]	0.65±0.085	0.65±0.070	0.72±0.072	0.71±0.073
	17-24	0.45±0.013	0.46±0.015	0.47±0.049	0.46±0.011	0.44±0.015
	24 –31	0.34±0.010[A]	0.34±0.008[A]	0.34±0.009[A]	0.29±0.010[B]	0.29±0.010[B]
	31-38	0.17±0.006	0.21±0.007	0.17±0.043	0.19±0.043	0.16±0.005
	10 -38	1.38±0.088	1.38±0.107	1.36±0.122	1.38±0.107	1.38±0.090
FI	10-17	66.21±1.63[1]	66.44±0.81	65.40±0.25	68.38±1.95	67.27±2.87
	17-24	107.45±1.76	108.10±1.01	108.01±1.43	105.21±2.68	107.05±0.18
	24 –31	142.11±2.44[b]	143.96±0.53[ab]	145.01±0.71[ab]	140.73±1.75[b]	147.89±0.35[a]
	31-38	155.08±2.66[b]	160.66±0.53[ab]	161.37±2.44[a]	161.87±0.34[a]	154.95±0.94[b]
	10 -38	470.86±4.45	479.33±2.91	479.81±2.20	476.21±4.21	477.15±3.20

1 Mean ± standard error of the mean.
a and b: values in the same row with different superscripts are significantly different at P≤ 0.05.
A, B, C and D: values in the same row with different superscripts are significantly different at P≤ 0.01.
LBW=Live body wight, LBWG=Live body wighgain, GR= Growth rate and FI =Feed intake

Table (3): Effect of Met and Lys supplementation on FC, PI,CPC and CCR of japaese quail fed the exprimental diets

Item		Treatment				
	Age interval	D1	D2	D3	D4	D5
FC	10-17	2.12±0.074$^{1\ AB}$	2.43±0.125^{C}	2.34±0.098^{BC}	2.09±0.062^{AB}	2.08±0.073^{A}
	17-24	3.15±0.137^{b}	3.20±0.102^{b}	3.05±0.100^{b}	2.84±0.057^{a}	3.16±0.146^{b}
	24 –31	3.72±0.106^{A}	3.77±0.120^{A}	3.68±0.075^{A}	4.47±0.283^{B}	3.58±0.068^{A}
	31-38	6.25±0.212^{BC}	5.38±0.165^{A}	6.89±0.311^{D}	5.82±0.192^{AB}	6.64±0.213^{CD}
	10 -38	3.52±0.056	3.54±0.047	3.64±0.056	3.53±0.057	3.51±0.004
PI	10-17	1.58± 0.085	1.41±0.083	1.45±0.080	1.56±0.075	1.60±0.08
	17-24	2.2±0.102^{ab}	2.0±0.084^{b}	2.1±0.10^{ab}	2.3±0.083^{a}	2.2±0.10^{ab}
	24 –31	2.8±0.103	2.6±0.106	2.7±0.09	2.6±0.116	2.8±0.08
	31-38	2.3±0.082^{bc}	2.6±0.084^{a}	2.2±0.0801^{c}	2.5±0.081^{bc}	2.2±0.065^{c}
	10 -38	4.82±0.149	4.80±0.134	4.60±0.128	4.80±0.146	4.80±0.116
CPC	10-17	0.51±0.018$^{1\ ab}$	0.57±0.030^{b}	0.56±0.022^{ab}	0.50±0.015^{a}	0.50±0.018^{a}
	17-24	0.76±0.033	0.75±0.024	0.74±0.024	0.69±0.014	0.77±0.036
	24 –31	0.89±0.025^{A}	0.89±0.028^{A}	0.89±0.018^{A}	1.08±0.068^{B}	0.87±0.016^{A}
	31-38	1.50±0.051^{BC}	1.26±0.039^{A}	1.66±0.075^{D}	1.40±0.046^{AB}	1.61±0.052^{CD}
	10 -38	0.84±0.014	0.83±0.011	0.73±0.152	0.74±0.108	0.85±0.010
CER	10-17	6.16±0.216$^{1\ A}$	7.06±0.365^{B}	6.71±0.267^{AB}	6.08±0.181^{A}	6.06±0.215^{A}
	17-24	9.14±0.399	9.29±0.296	8.90±0.292	8.30±0.169	9.22±0.429
	24 –31	10.81±0.308^{A}	10.97±0.349^{A}	10.73±0.219^{A}	13.02±0.826^{B}	10.46±0.198^{A}
	31-38	18.15±0.616^{B}	15.63±0.479^{A}	20.08±0.907^{D}	16.98±0.56^{AB}	19.38±0.62^{CD}
	10 -38	10.23±0.164	10.30±0.137	10.61±0.164	10.30±1.301	10.25±0.117

1 Mean ± standard error of the mean.
a and b: values in the same row with different superscripts are significantly different at P≤ 0.05.
A, B, C and D: values in the same row with different superscripts are significantly different at P≤ 0.01.
FC= Feed conversion, PI = Performance index, CPC= Crud protein cnversion and CCR= caloric conversion ratio

3-Economical efficiency (E Ef):-

Table 4 showed that the best E Ef was found in quails fed D2 (negative control diet) followed by D3, D4 and D5 respectively. Diet 2 was formulated to be free from animal protein sources and synthetic amino acids. Therefore, it was the cheapest diet since animal protein sources and synthetic amino acids are known to be expensive. The poorest diet for net revenue was D1 which had the smallest value in this respect than any experimental diet. Table

4 showed that feeding quail D2 resulted in the greatest value for E.Ef followed by D3, D4, D5 and D1, respectively. It can be concluded that E.Ef revealed the adequancy of this diet to be fed to growing Japanese quail.In respect of mortality rate, the lowest value was found in birds fed D1 which was 3.70% followed by those fed diets D2,D4 and D5 which had the same value (5.56%). The highest value of mortality rate was found to be 7.41% in birds fed diet 3 which was considerd as the control diet. The relatively higher mortality rates in some groups are certainly not related to the feeding treatment. From the above mentioned discussion it can be noted that D2 was the best diet from the economical point of view.

CONCLUSIONS

The results reported herein indicated that there were insignificant effect of increasing dietary Met and Lys levels on Japanese quail growth performance, and the diet containing no more than 1.12%Lys and 0.42%Met is enough for satisfactory LBW,GR,PI and FI during 10-38 days of age. Results also indicated that, with respect of the whole period, there were insignificant effects of increasing dietary Met and Lys levels on Japanese quail concerning FC, PER, and CCR, and D2 which contained 0.42% Met and 1.12% Lys was sufficient to obtain the optimum values of FC, PER and CCR for grwoning Japanese quail.

Table 4. Effect of Met and Lys supplementation on economical efficiency of Japanese quail fed the experimental diets.

Item	D_1	D_2	D_3	D_4	D_5
Average feed intake kg/bird a	0.47	0.48	0.48	0.48	0.48
Price/kg feed (PT)* b	93.56	74.73	78.87	81.82	85.96
Total feed cost (a x b) c	43.97	35.87	37.86	39.27	41.26
Price/one quail (PT)**d	225	225	225	225	225
Net revenue (PT) = d-c=e	181.05	189.13	187.14	185.73	183.73
Economical efficiency e/c***	4.12	5.27	4.94	4.73	4.45
Mortality rate, %	3.70	5.56	7.41	5.56	5.56

* Based on average prices of diets during the experiment

** According to the local market price at the experimental time.

*** Net revenue per unit feed cost.

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تأثير التغذية بمستويات مختلفة من الميثيونين والليسين على الأداء الإنتاجي للسمات الياباني

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تم تصميم هذة التجربة بهدف دراسة تأثير مستويات مختلفة من الميثيونين والليسين على الأداء الإنتاجي للسمان الياباني. استخدم في هذا البحث ٢٧٠ كتكوت من السمان اليابانى غير المجنس عمر يوم وعند عمر ١٠ ايام وزنت فرديا ورقمت في الجناح ووزعت عشوائيا فى نهاية اليوم العاشر على المعاملات التجريبية وكان من أهم النتائج المتحصل عليها ما يلي:

لم يلاحظ اى تأثير معنوى لزيادة الحمضين الأمينيين على نمو السمان اليابانى وتعتبر العليقة الثانية (٠.٤٢% ميثيونين، ١.١٢ ليسين %) كافية لإعطاء قياسات مرضية من الوزن الحى، معدل النمو، الدليل الأنتاجى، والمأكول من العلف كذلك لا يوجد تأثير معنوى لزيادة الميثيونين والليسين على كل من التحويل الغذائى وكفاءة تحويل بروتين وطاقة الغذاء المأكول وتعتبر العليقه الثانية (٠.٤٢% ميثيونين، ١.١٢ ليسين %) كافية لإعطاء اعلى معدل للتحويل الغذائى ومعدل تحويل بروتين وطاقة الغذاء المأكول للسمان اليابانى.

ومن وجهة النظر الأقتصادية يمكن التوصية بأن العليقه المحتوية على ٠.٤٢% ميثيونين و١.١٢% ليسين هى افضل عليقة لتغذية السمان اليابانى خلال ١٠-٣٨ يوم من العمر.