J. of Animal and Poultry Production, Mansoura Univ., Vol. 14 (6): 39-42, 2023

Journal of Animal and Poultry Production

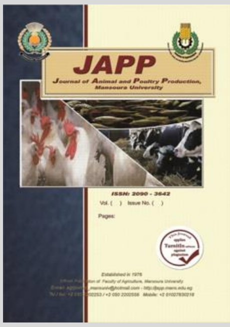
Journal homepage & Available online at: www.jappmu.journals.ekb.eg

Effect of Dietary Level of DL-Methionine on Growth Performance and Some Blood Parameters in Japanese Growing Quails

El-Gogary, M. R.*; Hayam M. A. Abo Elmaaty; M. Attia; M. Helal ; M. Tariq; M. Ashraf; A. Essam; A. Hassan; A. Kamel; M. Magdy; I. Ramadan and H. T. H. Tag El-Din

Cross Mark

Department of Poultry Production, Faculty of Agriculture, Mansoura University, Mansoura, 35516. Egypt



ABSTRACT

One-day-old Japanese quail birds totaling 900 were divided into five groups, with six replicates in each group. Five doses of DL-methionine supplementation were used in a one-way arrangement for the experimental treatments. At concentrations of 0.0, 0.9, 1.65, 2.15, and 2.65 g/kg feed, DL-methionine was included in a basal diet. Dietary methionine values ranged from 0.41 (inadequate), to 0.50 (sufficient; 100% NRC), to 0.58, 0.63, and 0.68 (excess), compared to the current NRC standards. Dietary methionine levels did not significantly affect performance at 32 days of life. DL-methionine has no significant effect on total protein, albumin, globulin, creatinine, uric acid, total antioxidant capacity (TAC), or malondialdehyde (MDA). In contrast, serum high-density lipoprotein (HDL-c) levels significantly increased ($P \leq 0.05$) in response to DL-methionine supplementation, and serum immunoglobulin G (IgG) levels significantly varied between groups ($P \leq 0.05$) in response to DL-methionine supplementation, with the highest level occurring at 0.68% (exceeding) the NRC (1994) recommended concentration. Our findings imply that production performance, immunity, or antioxidant status can be improved by dietary supplementation with DL-methionine levels at 0.68% (excess) of the NRC (1994) recommended levels. However, a high methionine intake has a beneficial impact on enhancing serum HDL levels.

Keywords: Japanese quail, DL-methionine, production performance, blood parameters

INTRODUCTION

Because of their tender, heart-friendly, and nutrient-rich flesh, Japanese quails (Coturnix coturnix japonica) are becoming more and more popular as a variety of poultry species. The species' shortened life cycle, rapid growth rate, innate capacity for environmental adaptation and early sexual maturation make it a useful tool for biological research. Moreover, quails are raised because they are more resistant to common poultry diseases due to the high mortality rate caused by the advent of new and re-emergence of old diseases in chickens. Quail genetic makeup has also undergone significant recent modification. Quails, therefore, require ideal environmental conditions, including nutrient and feeding levels, to fully realize the production potential of their upgraded genetic makeup.

East Asia is home to the Japanese quail (Coturnix coturnix japonica), an ancient world species. Since the 12th century, the Japanese quail has actively contributed to human life. It also has a significant impact on business and academic study. Due to quails' early sexual maturity, quick development rate, and tiny body size, which leads to a reduced need for housing space and feed, quail production has gained prominence in recent years. Japanese quail have a very high percentage of edible meat. The birds are quite simple to raise and rarely get sick. For healthy bodily tissue growth, the synthesis of macromolecules involved in structural, metabolic, and functional activities, animal reproduction, and disease resistance, proteins and amino acids are crucial. Commercial poultry feeding often uses vegetable protein diets based on maize and soybean.

Methionine is a necessary amino acid that has at least four major functions that may be directly or indirectly related to enhancing quail performance. Methionine first takes a role in the production of proteins. The second is a precursor of glutathione. Third, the production of polyamines requires methionine. Fourth, the most crucial source of methyl groups for methylation events involving DNA and other molecules is methionine Wen *et al.* (2016).

Methionine is also known to protect nutrients like choline, sulfate, and selenium, as well as to counteract the harmful effects of copper sulfate It also functions as a methyl donor and a sulfur donor for trans-methylation and trans-sulphuration processes Beck *et al.* (1998). Total antibodies significantly increased in relation to the dose following methionine supplementation in the diet Swain and Johri (2000). Our study's objective was to ascertain the impact of dietary DL-methionine levels on the production performance and blood status of Japanese growing quails.

MATERIALS AND METHODS

This study was carried out in the Faculty of Agriculture, Teaching and Research Farm, Department of Poultry Production, Poultry Unit, Mansoura University, Mansoura, Egypt.

Birds and treatments

One-day-old Japanese quail chicks (n=900) were separated into five treatment groups, with six cages in each. Five levels of dietary DL-methionine were used in a one-way configuration for the experimental treatments. Except for methionine, an experimental meal was created to fulfill or surpass the NRC (1994) dietary requirements for aged one to 32 days, (Table 1). In order to achieve the dietary methionine level at 0.41 (deficient), 0.50 (adequate), 0.58, 0.63, and 0.68% (excess) of the NRC (1994)

* **Corresponding author.**
E-mail address: melgogary@mans.edu.eg
DOI: 10.21608/jappmu.2023.209694.1074

recommended, crystalline DL-methionine was added to the base diet at 0.0, 0.9, 1.65, 2.15, and 2.65 g/kg diet, (80, 100, 115, 125, and 135% of NRC requirements of Japanese quails) of birds were raised in battery cages, respectively. The current investigation was conducted in the months of March and April 2023. At 32 days old, the birds had been raised and fed a diet that contained 2900 kcal of ME/kg of feed and 24% CP (Table 1). Water drinkers and mash-style food were readily available.

Table1. Composition and Chemical Analysis of growing Japanese quail diets:

Ingredients (%)	Experimental treatment groups T1	T2	T3	T4	T5
Yellow corn	56.8	56.71	56.835	56.835	57.035
Soybean meal, 44% CP	33.2	33.2	33	32.95	32.7
Corn Gluten Meal, 60.2% CP	7	7	7	7	7
Dicalcium Phosphate	0.9	0.9	0.9	0.9	0.9
Limestone	1.3	1.3	1.3	1.3	1.3
DL-methionine	0.0	0.09	0.165	0.215	0.265
L-Lysine HCL	0.2	0.2	0.2	0.2	0.2
Sodium chloride	0.3	0.3	0.3	0.3	0.3
Vit. + Min. Premix[1]	0.3	0.3	0.3	0.3	0.3
Total	100	100	100	100	100
Chemical analysis: (As-fed)					
Metabolizable energy, kcal/kg	2900	2900	2900	2900	2900
Crude protein, %	24	24	24	24	24
Crude Fiber, %	3.66	3.66	3.65	3.64	3.63
Ether extract, %	2.6	2.6	2.6	2.6	2.6
Calcium, %	0.8	0.8	0.8	0.8	0.8
Nonphytate Phosphorus, %	0.31	0.31	0.31	0.31	0.31
Methionine, %	0.412	0.50	0.576	0.625	0.675
Meth. + Cys. (TSAA, %)	0.81	0.90	0.973	1.022	1.070
Lysine, %	1.31	1.31	1.30	1.3	1.3

"[1] **Premix Contained per kg diet: VA 2654 µg; VD3 125 µg; VE 9.9 mg; VK3 1.7 mg; VB1 1.6 mg; VB12 16.7 µg; riboflavin, 5.3 mg;niacin 36mg; calcium pantothenate, 13mg; folic acid,0.8 mg; d-biotin,0.1mg; choline chloride,270; BHT, 5.8; Fe 50 mg; Cu 12 mg; I 0.9mg; Zn 50mg; Mn 60 mg; Se 0.2mg; Co 0.2mg.**

crystalline DL-methionine was added to the base diet at T1 (0.0), T2 (0.9), T3 (1.65), T4 (2.15), and T5 (2.65) g/kg diet

Broiler performance parameters

Every week, based on replication, live body weight (BW) and feed intake (FI) were measured. Throughout the trial period, weekly calculations of body weight growth (BWG) and feed conversion ratio (FCR) were computed.

Blood sampling and laboratory analyses

At the conclusion of the trial, three birds from each treatment were slaughtered and blood samples were taken. Vena cava punctures were used to draw blood samples, which were then collected in tubes and centrifuged for 15 minutes at 4000 rpm. The collected serum was kept at -20°C until analysis. For the analysis of total protein, albumin, globulin, creatinine, uric acid, high-density lipoprotein (HDL), immunoglobulin G (IgG), total antioxidant capacity (TAC), and malondialdehyde (MDA), serum samples were examined using commercial kits.

Statistical analysis:

The obtained data were statistically analyzed using a one-way analysis of variance (SAS, 2006). The Tukey multiple range test was employed to distinguish between means with significant differences (Tukey, 1977).

RESULTS AND DISCUSSION

Live body weight:

According to the data, dietary methionine levels had no discernible influence on LBW over the entire trial period, as shown in Table 2. The highest group (T3) had a supplemental methionine ratio of 115% compared to other groups, except for the LBW for the 14- and 21-day-old age being a significant difference across groups. this result agreed with Parvin *et al.* (2010) who referred that live body weight at day 35 rose (P < 0.0001) up to 5.0 g/kg dietary DL-methionine levels but did not further rise at 5.5 and 6.0 g/kg. It was discovered that a meal supplemented with methionine and containing 240 g/kg of crude protein was sufficient to support the rapid growth Serafin (1982). A dietary level of 240 g/ kg protein with 5.0 g/ kg Met has also been specified NRC (1994). Alagawany *et al*. (2014) found that dietary levels of total sulfur amino acids had no significant effect on body weight at 42 days and total body weight gain. Shrivastav and Panda (1986) found that the maximum value of body weight gain was achieved in Japanese quail with 0.75% total sulfur amino acid during 0-6 weeks of age. Perine *et al*. (2023) found that in the quail chick throughout 42 days of age, no significant effects (P>0.05) regarding (0.52, 0.64, 0.76, 0.88, and 1.00% of digestible methionine + cystine) levels were observed for live body weight.

Table 2. Effect of methionine supplementation on live body weight, g (LBW) in growing Japanese quails from 0-32 days of age

Main effects	LBW 0-d-old	LBW 7-d-old	LBW 14-d-old	LBW 21-d-old	LBW 28-d-old	LBW 32-d-old
Dietary methionine supplementation levels,%						
T1 (0.0)	9.611	19.30	50.90^{c}	101.9^{b}	141.7	189.5
T2(0.09)	9.611	19.91	51.37^{bc}	103.0^{b}	143.5	180.0
T3 (0.165)	9.522	1.361	57.46^{a}	110.9^{a}	145.4	187.6
T4 (0.215)	9.538	0.527	55.56^{abc}	109.1^{a}	139.3	181.7
T5 (0.265)	9.589	0.527	56.65^{ab}	111.4^{a}	139.9	185.4
Pooled SEM	0.0415	0.8929	1.358	2.616	2.417	3.292
P- value	0.426	0.5680	0.00040	0.0394	0.3726	0.2478

Means in the same raw with no superscript letters after them or with a common superscript letter following them are not significantly different (*p*<0.05).

Body weight gain:-

Table 3 displays the findings of the impact of methionine levels on body weight gain at 32 days of age.

Table 3. Effect of methionine supplementation on body weight gain, g (BWG) of growing Japanese quails from 0-32 days of age

Main effects:	BWG 0-7 day	BWG 7-14 day	BWG 14-21 day	BWG 21-28 day	BWG 28-32day	TBWG 0-32 day
Dietary methionine supplementation levels,%						
T1 (0.0)	9.694	31.59^{b}	51.00	39.88^{a}	47.70^{a}	179.8
T2(0.09)	10.30	31.45^{b}	51.67	40.53^{a}	36.43^{b}	170.4
T3 (0.165)	11.83	36.10^{a}	53.50	34.51^{b}	42.19^{ab}	178.1
T4 (0.215)	10.98	35.03^{a}	53.62	30.15^{bc}	42.40^{ab}	172.2
T5 (0.265)	11.00	36.06^{a}	54.75	28.51^{c}	45.50^{ab}	175.8
Pooled SEM	0.8817	1.304	2.214	3.134	2.529	3.297
P- value	0.512	0.028	0.750	0.035	0.046	0.248

Means in the same raw with no superscript letters after them or with a common superscript letter following them are not significantly different (*p*<0.05).

Throughout the whole experiment, dietary methionine levels had no discernible effect on BWG (P > 0.05), however from days 28 to 32, Japanese quail chicks supplemented with 80% methionine (T1) had the highest BWG compared to other groups. Our result is an agreement with Alagawany *et al.* (2014) the dietary level of total sulfur amino acids had no significant effect on body weight gain during 21-24 and 7-42 days of age. In addition, Khosravi *et* *al.* (2016) the body weight gains increased with incremental levels of methionine and reached to a maximum value at 6.30 g/kg methionine and then dropped with more increasing dietary methionine.

Feed intake: -

Table 4 shows the impact of feeding methionine-supplemented diets to Japanese quail chicks over the whole study period on feed consumption. Between all methionine supplementation groups, there were no appreciable differences in the feed consumption of Japanese quail chicks during the whole period of study. Our result is an agreement with Parvin *et al.* (2010) who stated that at 21 days of age, there was a difference in feed intake (P <0.024) and it was higher in the methionine-supplemented birds (5.5 g/ kg; methionine + cysteine, 9.5 g/ kg), whereas there was no variation in feed intake because of dietary levels of methionine at any growth phase.

Table 4. Effect of methionine supplementation on feed intake, g (FI) of growing Japanese quails from 0-32 days of age.

Main effects:	FI 0-7day	FI 7-14 day	FI 14-21 day	FI 21-28 day	FI 28-32 day	TFI 0-32 day
Dietary methionine supplementation levels,%						
T1 (0.0)	20.22	29.61	125.7	157.8	162.1	475.3
T2(0.09)	19.99	33.00	122.3	157.2	145.2	457.8
T3 (0.165)	21.44	32.27	139.8	158.7	161.3	492.2
T4 (0.215)	20.27	29.61	131.5	156.4	159.0	476.7
T5 (0.265)	21.777	33.194	112.8	150.8	161.2	458.1
Pooled SEM	0.6317	1.490	10.62	4.104	9.151	15.76
P- value	0.197	0.248	0.474	0.680	0.663	0.513

Means in the same raw with no superscript letters after them or with a common superscript letter following them are not significantly different (*p*<0.05).

Feed conversion ratio:

Table 5 shows the impact of methionine supplementation treatments on the feed conversion ratio throughout 32-day-old Japanese quail chicks. The feed conversion ratio of Japanese quail chicks did not substantially differ between treatments that included methionine throughout the whole study period (0-32 days of age). Parvin *et al.* (2010) found that at 5.5 g/kg Met level (Methionine + Cystine 9.0 g/kg), a feed conversion ratio was statistically comparable to that at 5.0 g kg1 Met level (Methionine + Cystine g/kg) during 0-14 days of age was obtained. Similar to FCR between 0-21 days of age, FCR at 5.0 g/kg Met (Methionine + Cystine 9.5 g/kg) was decreased but remained similar to that at 5.5 g/kg Met (P <0.0001). FCR did not, however, differ between dietary Met levels during 0-28 and 0-35 days of age. Alagawany *et al.* (2014) for the diets containing 0.8 over 0.9% total Sulphur amino acids (TSAA) throughout 7-21 days of age, a significant improvement in feed conversion was seen. However, there was no discernible change between TSAA levels between 21 or 42 and 7 and 42 days of age. These results agreed with those obtained by Shrivastav and Panda (1986) who found that at 3 weeks of age, the feed efficiency in Japanese quail was maximized at 0.75 and 0.83 % TSAA respectively.

Table 5. Effect of methionine supplementation on feed conversion (FCR) of growing Japanese quails from 0-32 days of age

Main effects	FCR 0-7 day	FCR 7-14 day	FCR 14-21 day	FCR 21-28 day	FCR 28- 32 day	TFCR 0- 32 day
Dietary methionine supplementation levels,%						
T1 (0.0)	2.111	0.939	2.493	4.030	3.517	2.647
T2(0.09)	1.957	1.058	2.401	4.022	4.003	2.686
T3 (0.165)	1.819	0.904	2.643	4.893	3.897	2.762
T4 (0.215)	1.847	0.850	2.440	5.344	3.757	2.760
T5 (0.265)	2.715	0.921	2.069	6.128	3.553	2.607
Pooled SEM	0.419	0.0496	0.226	0.649	0.227	0.0697
P -value	0.555	0.077	0.497	0.138	0.617	0.442

Means in the same raw with no superscript letters after them or with a common superscript letter following them are not significantly different (*p*<0.05).

Table 6 shows the impact of methionine levels on serum chemicals of Japanese quails at 32 days of age. DL-methionine has no appreciable impact on total protein, albumin, globulin, creatinine, urea, TAC, or MDA. In contrast, serum HDL levels significantly increased (P≤ 0.05) in response to DL-methionine supplementation, and serum immunoglobulin G (IgG) levels significantly varied between groups (P≤ 0.05) in response to DL-methionine supplementation, with the highest level occurring at 0.68% (exceeding) the NRC (1994) recommended level.

Table 6. Effect of methionine supplementation on blood parameters of growing Japanese quails from 0-32 days of age

Main effects:	T.P (g/dl)	Alb (g/dl)	Globulin (g/dl)	Cr (mg/dl)	Uric acid (mg/dl)	HDL-c (mg/dl)	IgG (mg/dl)	TAC (mM/l)	MDA (nmol/ml)
Dietary methionine supplementation levels,%									
T1 (0.0)	2.66	1.00	1.666	0.400	12.66	103.0^{d}	131.6^{ab}	0.400	51.66
T2(0.09)	2.33	1.06	1.266	0.300	10.33	125.33^{c}	155.3^{a}	0.433	43.13
T3 (0.165)	2.66	1.03	1.633	0.400	12.33	140.6^{bc}	122.3^{bc}	0.566	46.03
T4 (0.215)	2.66	0.96	1.700	0.300	12.00	153.0^{ab}	122.0^{bc}	0.333	46.96
T5 (0.265)	2.33	1.10	1.233	0.333	9.33	165.6^{a}	110.0^{c}	0.466	37.00
Pooled SEM	0.33	0.121	0.238	0.069	1.043	4.03	4.35	0.074	3.75
P- value	0.87	0.93	0.48	0.72	0.18	0001	0.0003	0.32	0.16

Means in the same raw with no superscript letters after them or with a common superscript letter following them are not significantly different (*p*<0.05).

T.P (Total protein), Alb (Albumin), Cr (creatinine), HDL-c (High- density lipoprotein), IgG (immunoglobulin G), TAC (total antioxidant capacity) , MDA (malondialdehyde)

Reda *et al.* (2020) discovered that while the treatment groups' levels of blood total protein, albumin, and albumin/globulin (A/G) ratio did not alter in response to DL-methionine levels, the group administered DL-methionine (except 3.5 g/kg) had higher serum globulin than the control group. Serum total protein in the current study was like the results of Hadinia *et al.* (2014) who showed that dietary Met levels enhanced globulin levels without changing the quantities of total protein. AL-Neemi *et al.* (2018) added creatine and increased methionine had no discernible impact on some blood biochemical quail readings (total protein, globulin, and glucose). Reda *et al.* (2020) showed the lowest levels of creatinine and urea were found in the groups that received DL-methionine at 0.5 and 1.5 g/kg, respectively, whereas the highest levels of creatinine and urea were found in the group that received DL-methionine at 3.5 g/kg. Xiao *et* *al.* (2016) claimed that Met decreased serum uric acid levels. This might be explained by DL-methionine's antioxidant and anti-hepatotoxic properties. Reda *et al.* (2020) found that the inclusion of all concentrations of DL-methionine in the laying quail diet resulted in an increase in HDL levels. Reda *et al.* (2020) in comparison to the control group, the DL-methionine-treated groups had considerably higher levels of IgG, IgM, and IgA. It has been demonstrated that birds' cellular immunity was enhanced by dietary methionine additions above NRC recommendations Xiao *et al.* (2016).

CONCLUSION

Dietary DL-methionine concentration influenced production performance and blood parameters. During the whole growth period (0–32 days) there were no significant differences in production performance. Therefore, it was concluded that the 0.50 (adequate) of the NRC for maximum cellular immune response. Moreover, serum HDL level significantly increased ($P < 0.05$) in response to DL-methionine supplementation.

REFERENCES

Alagawany, M. , M.M. El-Hindawy , A. I. Attia (2014). Impact of Protein and Certain Amino Acids Levels on Performance of Growing Japanese Quails. Universal Journal of Applied Science 2(6): 105-110, 2014

AL-Neemi, M. I., Q. H. Ameen, M. A. Mohammed and M. S. Bahaal-deen (2018). Effect of adding Creatine and Methionine on Japanese Quails Performance. JZS (2018) Special Issue, 2ndInt. Conference of Agricultural Sciences.

Beck, C.R., R.H. Harms and G.B. Russell (1998). Is the cystine content of the dietof concern for broilers from 0 to 21 days of age?J Appl Poultry Res7:233–238 (1998).

Hadinia, S., M. Shivazad, H. Moravej, M. Alahyari-Shahrasb and M. M. Nabi (2014). Bio-Efficacy Comparison of Herbal-Methionine and DL-Methionine Based on Performance and Blood Parameters of Broiler Chickens. *Veter. Res. Forum Int. Q. J.* 2014;5:81–87.

Khosravi, H., M. Mehri, F. Bagherzadeh-Kasmani and M. Asghari-Moghadam (2016). Methionine requirement of growing Japanese quails. Animal Feed Science and Technology 212 (2016) 122–128.

National Research Council,(1994). Nutrient Requirements of Poultry (9th rev. edn). National Academy Press, Washington, DC (1994).

NRC, National Research Council (1994). Nutrient Requirements of Poultry. 9th rev. ed., National Academy Press, Washington, DC

Parvin , R. , A. B. Mandal, S. M. Singh and R. Thakur (2010). Effect of dietary level of methionine on growth performance and immune response in Japanese quails (Coturnix coturnix japonica). J Sci Food Agric 2010; 90: 471–481

Perine, T. P., D. O.Grieser, P. C. Pozza, C. E. Stanquevis, E. M. Finco, M. I. Benites, T. M. Oliveira-Bruxel, and S. M. Marcato (2023). Requirement of digestible methionine + cystine for growing Japanese quail and its subsequent effects on laying phase. Revista Brasileira de Zootecnia 52: e20220023. https://doi.org/10.37496/rbz5220220023

Reda, F.M., A.A. Swelum, E.O.S. Hussein, S.S. Elnesr, A.R. Alhimaidi and M. Alagawany (2020). Effects of Varying Dietary DL-Methionine Levels on Productive and Reproductive Performance, Egg Quality, and Blood Biochemical Parameters of Quail Breeders. Animals (Basel). 2020 Oct 9;10(10):1839. doi: 10.3390/ani10101839. PMID: 33050290; PMCID: PMC7601574.

SAS, 2006. Statistical Analysis System. SAS User's Guide: Statistics SAS institute Inc., Cary, NC, USA.

Serafin, J.A.,(1982). Influence of protein level and supplemental methionine in practical rations for young endangered masked bobwhite quail. Poultry Sci 61:988–990

Shrivastav, A.K. and , B. Panda (1986). Sulfur Amino Acid Requirement Of Growing Japanese Quail. Indian Journal Of Animal Science, 57:1303-1305

Swain, B. K. and T. S. Johri (2000). Effect of supplemental methionine, choline and their combination on the performance and immune response of broilers. Br Poultry Sci 41: 83–88 .

Tukey, J.W. (1977). Exploratory data analysis. Addison-Wesley, Reading

Wen, Z.G., J. Tang, M. Xie, P. L. Yang and S. S. Hou (2016). Effect of dietary methionine levels on choline requirements of starter white pekin ducks. Asian Australis. J. Anim. Sci., Vol. (29), No.12, pp.1742- 1747.

Xiao, X., Y. Wang , W. Liu, T. Ju and X. Zhan (2016). Effects of different methionine sources on production and reproduction performance, egg quality and serum biochemical indices of broiler breeders. *Asian-Australasian J. Anim. Sci.* 2016;30:828–833.

تاثير مستويات المثيونين علي الأداء الإنتاجي وبعض مقاييس الدم لكتاكيت السمان الياباني

محمد رأفت الجوجري، هيام محمد أبو المعاطي، محمد عطية لطفي، محمد هلال علي الله، محمود طارق توفيق، محمود اشرف بديع، احمد عصام محمد، عبد الرحمن حسن محمد، احمد محمد كامل، محمد مجدي محمد، اسلام محمد رمضان و حسن تاج الدين حسن تاج الدين

قسم إنتاج الدواجن، كلية الزراعة، جامعة المنصورة، مصر

الملخص

تم اجراء هذه التجربة علي كتاكيت السمان عمر يوم حيث تم تربية ٩٠٠ طائر من السمان لدراسة تاثير المستويات المختلفة من الحمض الاميني المثيونين. تم استخام خمس علائق تجريبية تحتوي علي خمس مستويات من الحمض الاميني المثيونين وهي ٠،٠، ٠،٩، ١،٦٥، ٢،١٥ و ٢،٦٥ جرام/كيلوجرام. حيث كانت قيمة المثيونين في العليقة الاولي ٠،٤١% اقل من الموصي بة في NRC والعليقة الثانية ٠،٥٠% الموصي به في NRC و العليقة الثالثة و الرابعة و الخامسة ٠،٥٨، ٠،٦٣ و ٠،٦٨% اعلي من الموصي بة في NRC، علي التوالي.وتم تربية كتاكيت السمان حتي عمر ٣٢ يوم.أظهرت النتائج انه لا يوجد اختلاف معنوي بين العلائق التجريبية علي الأداء الإنتاجي لكتاكيت السمان. كما انه لا يوجد اختلاف معنوي بين العلائق التجريبية في بعض مقاييس الدم مثل البروتين الكلي، الالبيومين، الجلوبيولين، حمض اليوريك ، TAC و MDA. ولكن أظهرت النتائج انه يوجد اختلاف معنوي بين العلائق التجريبية في تركيز الكوليسترول مرتفع الكثافة وكان اعلي تركيزفي العليقة التي تحتوي علي ٠،٥٠% من المثيونين في العليقة الموصي بها في NRC. كما اظهرت النتائج ان هناك اختلاف معنوي في الجلوبيولين المناعي IgG حيث انه كلما زاد تركيز المثيونين زاد تركيز الجلوبيولين المناعي. ولذلك توصي هذه التجربة بان استخدام مستويات عالية من المثيونين اظهر تحسن في الأداء الإنتاجي وكذلك المناعي ومضادات الاكسدة، وان المستويات العالية من المثيونين أدت الي زيادة الكولستيرول عالي التركيز.