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Article

Effect of Supplementation with Various agents of Antioxidants at low Protein level on Productive and Reproductive Performance of Laying Hen on the Summer Session

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Abstract

This study aimed to evaluate the effect of various agents of antioxidants on productive and reproductive performance of local strain fed (corn-soybean diet) with low protein 14%, on the summer session. A total of 189 hens and 27 cocks, 35 wk of age were used. The birds were randomly divided into 9 treatments (T1: Cont1 16% CP, T2: Cont2 14% CP, T3, T4, T5, were fed Cont2 diet supplied with 1g Met/kg diet, 0.5g SeMet/kg diet or 75mg vit. E/kg diet, respectively, T6, T7 and T8 were fed Cont2 diet supplied with two from the previous agents at the same mentioned level, and T9 was fed Cont2 diet supplied with the combination of the three agents)., The experimental period lasted 12 weeks (till for 46 weeks of age). The obtained results showed that during the period 35-46 wks of age, there were no significant effects on BW, egg production and FI compared to the control group. However, the best FCR was recorded during the trial period for the birds of T1 and T6. Besides, there were no significant effects on egg quality, fertility and hatchability traits. In addition, serum glutathione peroxidase and total antioxidant capacity were not significantly different among all dietary treatments. However, MDA in yolk after 30 days storage was significantly decreased in T2. It could be concluded that layer hens fed diets supplied with methionine, selenomethionine, vitamin E and there combination with 14% CP did not complete improved the layer performance under the summer session.

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1. Introduction:

Among its many roles in the body, methionine (1) participates in protein synthesis and production of other sulfur-containing amino acids (e.g. homocysteine – a sulfur-containing AA which is an indirect product of methylation and transsulfuration), (2) is a precursor to carnitine, which protects cells from oxidative stress, (3) is a precursor to glutathione which protects cells from (Troen et al, 2003; Fang et al., 2002; Li et al., 2007). According to the specific needs of birds, the meth content of poultry diets should be adjusted in order to maintain AA balance in the body, which is essential for growth, carcass output, and feed intake,

Selenomethionine (SeMet) is a dietary supplement in poultry diets which perform some benefit effects. Moreover, dietary supplementation of L-SeMet was more effective transferred to the egg than Se-yeast (Delezie et al., 2014). In addition, SeMet is considered the only seleno-amino acid that can be stored in organs and tissues of poultry (Schrauzer, 2000, 2001, 2003, 2006; Schrauzer and Surai, 2009).

Vitamin E as a dietary supplement is an effective way to decrease the negative effects of stress on laying hens. The main role of vitamin E as an antioxidant is to prevent lipid peroxidation which largely affects the deterioration of food products and has adverse effects on color, flavor, nutritive value and even safety of food products (Burlakova et al., 1998; Moak and Christensen, 2001).

The main objective of the present study was to evaluate the effect of methionine, selenomethionine and vitamin E as antioxidants agents on the productive and reproductive performance of Golden Sabahia strain fed a low protein diet under the summer session.

2. Materials and Methods:

One hundred and eighty-nine laying hens and twenty-seven cocks with 35 wk of age Golden Sabahia strain (Ghanem et al., 2017) was employed in the experiment. Birds were leg -banded, weighed and divided randomly into 9 treatment groups (T1: Cont1 16% CP, T2: Con2 14% CP, T3: Con2 + 1g Met/kg diet, T4: Con2 + 0.5 g SeMet/kg diet, T5: Con2 +75mg vit.E/kg diet, T6: Con2 +1g Met + 0.5g SeMet/kg diet, T7: Con2 + 0.5g SeMet +75mg vit. E/kg diet, T8: Con2 + 1g Met + 75mg vit. E/kg diet and T9: Con2 + 1g Met + 0.5g SeMet+ 75mg vit. E/kg diet).The experimental was dune during the summer session from June to September for 46 weeks of age. Birds were housed in floor pens as replicates (27 replicates) (1♂: 7♀). The composition and calculated analysis of the basal diet are presented in Table (1). For 35-46 week old birds, food and water were available ad-libitum throughout the experiment, while the birds were subjected to a 15-9 hour light-dark cycle. Birds under the supervision of a veterinarian were vaccinated and given a medical treatment based on their Isocaloric and nutrient-complete diets were provided except for crude protein. Listed below are the experimental diet components (Table 1).

2.1. Studied traits:

Body weight (BW) was measured at 35 weeks of age again at the end of the experimental period (46 wks of age). Feed intake (FI), egg production (EP). Eggs laid on three successive days, from each treatment at 46 wks of age, were used for measuring the egg quality. Also, the eggs laid at 46 wk of age were hatched in an automatic computerized hatchery at El-Sabahia Poultry Research

Station. Eggs were candled on day 7th of incubation for determination of infertile eggs. Blood serum samples were collected from 3 female in each treatment of at the end of the experimental period and stored at -20 0C for analyses. Glutathione Peroxidase (GPX) was determined according to Levander et al., (1983) and total antioxidant capacity (TAC) was assessed according to Koracevic et al., (2001). Moreover, yolk samples from three eggs from each treatment of the eggs collected at the last week of the experiment were taken to evaluate malondialdehyde (MDA) as indicator of oxidative stability in fresh eggs and those stored for 30 days at refrigerator temperature (4±2°C) by the TBA method of Salih et al. (1987).

Statistical Analysis

All data were statistically analyzed by one-way analysis of variance procedure of SPSS for Windows (2008). All Comparisons between means were made by Duncan's multiple range test (1955). The statistical significance for all data was considered to be p<0.05.

3. Results and Discussions:

Results of Golden Sabahia laying hen's body weight at the end of experimental period (46 wks) of age are presented in Table (2). The statistical analysis showed no significant difference between the initial and final body weight, which related to the random distribution of the birds at the beginning of the experiment. Results indicated that, BW was statistically equal among all experimental groups. These results are in agreement with those of Zduńczyk et al. (2013) who reported that body weights of hens were similar under dietary two levels of vitamin E (30, 60 mg / kg of diet) . Also, Zeweil et al. (2011) reported that feed Baheij laying hen on different levels of methionine (1.673, 2.000, 2.327 and 2.754% of crude protein) had insignificant effect on BW (28 – 48 wks of age).

Results of egg production (egg/hen/day) for Golden Sabahia laying hens during whole period (35-46 wks) of age are shown in Table (2). During the period, 35-46wks, laying hens fed 16% CP (Cont1) had significantly highest EP (71.4%) compared with those fed on 14% CP or 14% CP supplemented with 0.5 g SeMet (T4), 0.5g SeMet +75mg VE (T7), 1g Met + 75mg VE (T8),or 1g Met + 0.5g SeMet+ 75mgVE (T9). In addition, the control group 14% CP (Cont2) and the group 14% CP supplemented with 1g Met + 0.5g SeMet (T6), or (75mg VE) and 1g Met (T3) were statistically equal in EP. Our results are in disagreement with those reported by Reda et al. (2020) who found that supplementation of 1.5 g/kg DL-Methionine level indices the best egg production from 8-16 week of age of Japanese quails breeders and Khan et al. (2018) who showed that egg production was significantly affected (p<0.05) by selenium treatments (0.25, 2.5 and 25.0 ppm of Se /kg diet). On the contrary, Nasiri et al. (2019) showed that three levels of methionine supplementation (0.23, 0.31 and 0.33 %) did not influence (P > 0.05) egg production of Iranian native broiler breeders from 64-74 wks.

Egg weight (EW, g) results of Golden Sabahia laying hens during whole period (35-46 wks) of age were flocculated and numerically equals among the experimental groups (Table (2). These results are in agreement with the results of Liu et al. (2019) who indicated that no difference (P > 0.05) was observed in egg weight between treatments supplemented with (30 IU/kg of VE) in laying hens. However, Ruan et al. (2018) demonstrated that dietary six levels of Met (2·00, 2·75, 3·50, 4·25, 5·00 and 5·75 g/kg) of laying duck breeders for 24 weeks significantly affected ($P<0·05$) the egg weight. These improvements may be due to methionine supplement in Low-CP diet could reduces the negative effect of amino acids imbalance (Bunchasak and Silapasorn (2005).

Results of egg mass (EM, g) for Golden Sabahia laying hens during whole period (35-46 wks) of age are presented in Table (2). Egg mass was significantly differed among different groups (T1- T9). The significantly lowest EM was recorded for the group that fed the combination of Met, SeMet and VE (T9), and most of EM for the other experimental groups was statistically equals. These results agree with Mohapatra et al. (2018) found that with 13% CP significantly higher egg mass (g/day) ($P<0.05$) was observed in the dietary group containing lowest essential amino acid EAAs (0.65% Lys and 0.28% Met) compared to highest EAAs (0.80% Lys and 0.40% Met) of Vanaraja laying hens of 30 weeks of age. However, Lu et al. (2020) reported that selenium-enriched yeast levels (0.1, 0.2, 0.3, or 0.4 mg/kg of Se) had no significant effect on egg mass between the treatment and control groups of Hy-Line Brown hens for two weeks.

Results of feed intake (FI, g/hen/day) in Golden Sabahia laying hens for the whole period (35-46 wks) of age are shown in Table (2). Regarding FI, data indicated non-significant effect for dietary protein level (16% vs. 14%) or for supplementing 14% protein diet with different antioxidants agents (T2 vs. T3 – T9).These results are in accordance with those reported by Meng et al. (2017) who stated that dietary methionine supplementation (0.23%, 0.27%, 0.31%, 0.35% and 0.39% Met) did not significantly affect average daily feed intake, ($p > 0.05$) of Jing Brown layer hens from 9 to 17 weeks of age. Moreover, Lu et al. (2020) reported that selenium-enriched yeast (SY, 0.1, 0.2, 0.3, or 0.4 mg/kg of Se) had no significant effect on daily feed consumption between the treatment and control groups of Hy-Line Brown hens for two weeks.

Results of feed conversion ratio (FCR) in Golden Sabahia laying hens for whole period (35-46 wks.) of age are shown in Table (2). The best ratios were recorded during the affirmation period were (3.35 and 3.34) respectively, for birds fed control diet 16% CP and that fed 14% CP supplemented with 1g Meth + 0.5g SeMeth. However, the other antioxidant agents understudy did not prove any significant effect on FCR. These findings agree with those of Reda et al. (2020) reported that dietary DL-methionine levels (1.5, 2.5 and 3.5 g/kg) recorded a better FCR in all periods than the control group of Japanese quails breeders from 8-16 weeks of age. As well as, Rizk et al. (2017) showed that dietary supplementation of organic selenium source (0.3mg/kg diet) FCR was significantly improved by organic selenium source (0.3mg/kg diet) in Sinai hens diets compared with control diet during overall experimental period 22-34 wks.

Results presented in Table (3) show the results of yolk weight (%), yolk index, albumen weight (%), Haugh units, shell weight (%), shell thickness (mm) and egg shape index. These results revealed insignificant differences in egg traits between T1 and T2 or among T2 and T3-T9.

Accordingly, Zeweil et al. (2011) showed that wet and dry yolk weight percentage were insignificantly affected by adding methionine on Baheij laying hens diets from 28 – 48 wks of age. Also, El Sherif et al. (2020) reported that egg yolk index was not significantly affected

($P > 0.05$) by 13% CP diet supplemented with lysine plus methionine at 46 weeks of age of Sinai laying hens. Moreover, Zhang et al. (2020) noted that dietary organic selenium supplementation (0.05, 0.15, and 0.25mg Se/kg) via Se yeast had no apparent effects on albumen proportion, albumen height, eggshell thickness, egg shape index and Haugh units in laying ducks for 28 days. Similarly, Abd El-Hack et al. (2017) reported that dietary 250 and 500 mg vitamin E/kg did not significantly effect on egg quality traits of Bovans laying hens. Similar result was reported by El-Husseiny et al. (2018) who indicated that dietary two levels of methionine (0.25, 0.35%) had no significant effects on HU% of the local broiler breeder female line (CairoB-2) from 53-64weeks. Also, Lu et al. (2020) reported that selenium-enriched yeast (SY) levels (0.1, 0.2, 0.3, or 0.4 mg/kg of Se, respectively had no significant effect on egg shell index of Hy-Line Brown hens.

Results of fertility and hatchability traits in Golden Sabahia laying hens are shown in Table (4). These results revealed insignificant differences in fertility or hatchability traits between T1 and T2 or among T2 and T3-T9. Similar results were reported by Attia et al. (2010) reported that feeding Gimmizah laying hens (50 wks) on organic Se (0.25 and 0.40 Se/kg diet) had no significant effect on fertility compared with those in hens fed the control diet (0.10 Se/kg diet). Moreover, Nasiri et al. (2019) showed that different levels of methionine (0.23, 0.31 and 0.33 % of diet) had insignificant effect on the hatchability of Iranian native broiler breeders from 64-74 wks. Also, Urso et al., (2015) reported that hatchability of fertile eggs of breeders was not influenced by dietary vitamin E levels (30,120mg/kg diet) and organic selenium (0.4 mg/kg of zinc-L-selenomethionine) at 29, 33, 46, 48 wk. Similarly, El-Husseiny et al. (2018) indicated that dietary two levels of methionine (0.25, 0.35%) had no significant effect on new hatch chick weight while low level recorded better ($p \leq 0.05$) fertility% and hatchability% compared to higher level of the local broiler breeder female line (CairoB-2) from 53to 64 weeks. However, Oso et al. (2020) showed that Guinea fowl breeder's diet supplemented with 30 IU/kg diet of vit. E + 0.3 mg /kg diet of Se yeast had higher ($P< 0.05$) hatchling weights compared with their control group.

Results of activity of serum glutathione peroxidase (GPX), serum total antioxidant capacity (TAC), and MDA concentration in fresh yolk presented in Table (5) indicate that neither of them was significantly affected by protein level or antioxidants supplementations. In this context, Ghazalah et al. (2020) showed there was no significant effect on GPX activity of broiler at 35 day of age by supplementing diet with 100 ppm/ kg of organic selenium (SeMeth). Also, Li et al. (2018) showed that levels of organic selenium (0.15 and 0.30 mg/ kg) had no significant effect on total antioxidant capacity in serum ($p>0.05$) of broiler breeders for 8 weeks. On the other hand, Ghazalah et al. (2020) showed that supplemented diet with 100 ppm/ kg of organic selenium (SeMeth) had significantly higher TAC activity of broiler at 35 days of age. On the contrary, our results disagree with those of Lin et al. (2020) who found that the yolk MDA values significantly decreased in the 0.3mg/kg selenium enriched yeast (SY) group in comparison with the control group of Hyline Sophie hens. Moreover, Asadi et al. (2017) stated that dietary supplementation of 200 mg vit. E / kg diet decreased MDA content of the egg yolks in the fresh eggs of Lohmann LSL-White laying hens.

Results presented in Table (5) reveal that the MDA concentration in yolk after 30 days storage was slightly affected by T5 (14%protein + 75 mg vit. E), however, no significant differences were detected due to the all other supplemenations. In this respect, Cimrin et al. (2019) found that there was no significant effect of dietary treatment of vit. E (200 mg/kg diet) or storage conditions (p>0.05) on TBARS values of fresh eggs (d 0 of storage) of Bovans layers (48 weeks).

Finally, it could be concluded that supplementing 14% CP diet of Golden Sabahia hens with different antioxidant agents (1gm methionine, 0.5gm selenomethionine, 75 mg vitamin E or their combinations) during their laying period does not have any enhancing impact on egg production performance, egg quality, fertility, hatchability, or antioxidants traits under the summer session.

Table 1. Composition and analysis of the experimental basal diets (Kg/Ton).

Ingredients	Diet1 (Kg/Ton) 16% CP	Diet 2 (Kg/Ton) 14%Cp
Yellow corn	610	651
Wheat bran	26.9	46.8
Soybean meal	247	185
Vit. and Min. Premix[1]	3	3
Sodium chloride (NaCl)	3	3
Dicalcium phosphate	17.5	17.5
Limestone	80	80
Veg. oil	12	9
Lysine	0	1.6
DL – Methionine	1	1.5
Sand	0	1.6
Total	1000	1000
Calculated values[2]		
Crude protein (%)	16.46	14.38
ME(Kcal/Kg diet)	2752	2750
Ether extract (%)	2.71	2.89
Crude fiber (%)	2.97	2.88
Calcium (%)	3.13	3.13
Phosphorus available (%)	0.45	0.45
Methionine (%)	0.34	0.37
Arginine (%)	1.03	0.88
Lysine (%)	0.82	0.82
TSAA (%) Diet	0.62	0.62
Chemical analysis [3]		
Crude protein (%)	15.6	13.5
Ether extract (%)	8.1	7.1
Crude fiber (%)	1.8	2.0

Vit+Min mixture provides per Kilogram of diet: Vit. A, 1200 IU; Vit. E, 10 IU; menadione, 3 mg; Vit.D_3, 2200 ICU; riboflavin, 10mg; Ca pantothenate, 10mg; nicotinic acid, 20 mg; Choline chloride,500mg, Vit. $B_{12,}$ 0.01mg; Vit.$B_{6,}$ 1.5mg; Vit.$B_{1,}$ 2.2mg; Folic acid, 1mg; Biotin, 0.05mg. Trace mineral (milligrams per kilogram of diet) Mn.55; Zn. 50; Fe. 30; Cu. 10; Se. 0.10; Antioxidant. 3mg.

Table 2. Effect of dietary Methionine, Selenomethionine and Vitamin E supplementation on Golden Sabahia laying hens performance during the whole period (35-46 wks)

Treatments	Initial and Final body weight (g)		Laying rate (hen/day) (%)	Egg weight (g)	Egg Mass (g/hen/day)	Feed Intake (g/hen/day)	Feed Conversion rate (g feed/ g eggs)
	Initial body weight	Final body weight	35-46 Wk.	35-46 Wk.	35-46 Wk.	35-46 Wk.	35-46 Wk.
T1: Con_1 (16% CP)	1548	1678	71.38[a]	49.93[abc]	35.63[a]	118	3.35[c]
T2: Con_2 (14% CP)	1660	1759	64.20[ab]	50.40[ab]	32.80[abc]	123	3.81[abc]
T3: Con_2 + 1g Met	1650	1747	63.28[ab]	49.55[bc]	31.80[abcd]	116	3.73[cd]
T4: Con_2 + 0.5 g SeMet	1679	1723	56.50[b]	49.98[abc]	28.75[cd]	115	4.08[ab]
T5: Con_2 +75mg VE	1597	1759	65.78[ab]	49.38[abc]	33.50[ab]	118	3.60[cd]
T6: Con_2 +1g Met + 0.5g SeMet	1560	1729	68.50[ab]	49.90[abc]	34.80[ab]	115	3.34[c]
T7: Con_2 + 0.5g SeMet +75mg VE	1548	1733	58.30[b]	49.13[bc]	29.03[cd]	112	4.00[ab]
T8: Con_2 + 1g Met + 75mg VE	1650	1795	58.10[b]	51.48[a]	30.35[bcd]	115	3.92[abc]
T9: Con_2 + 1g Met + 0.5g SeMet + 75mgVE	1620	1737	57.03[b]	48.60[c]	28.18[d]	117	4.38[a]
SEM	**21.121**	**20.808**	**1.25**	**0.200**	**0.596**	**0.992**	**0.078**
P Value	**0.741**	**0.980**	**0.014**	**0.047**	**0.004**	**0.511**	**0.011**

SEM=Standard error of means. P value= probability level

Table 3. Effect of dietary Methionine, Selenomethionine and Vitamin E supplementation on egg quality traits of Golden Sabahia laying hens

	Egg quality traits						
Treatments	**Yolk weight (%)**	**Yolk index**	**Albumen weight (%)**	**Haugh units**	**Shell weight (%)**	**Shell thickness (mm)**	**Shape index**
T1: Con_1 (16% CP)	31.73	42.17	55.86	85.98	12.41	0.381	77.62
T2: Con_2 (14% CP)	31.51	42.33	55.50	86.66	12.99	0.379	75.71
T3: Con_2 + 1g Met	31.60	42.41	54.94	87.09	13.45	0.382	77.36
T4: Con_2 + 0.5 g SeMet	31.01	41.43	56.38	81.56	12.60	0.369	74.83
T5: Con_2 +75mg VE	29.86	43.34	57.15	83.83	12.99	0.383	76.18
T6: Con_2 +1g Met + 0.5g SeMet	31.32	42.44	56.22	83.78	12.46	0.380	76.69
T7: Con_2 + 0.5g SeMet +75mg VE	31.90	42.00	55.62	83.87	12.48	0.374	76.60
T8: Con_2 + 1g Met + 75mg VE	33.32	42.90	54.31	85.38	12.36	0.369	75.54
T9: Con_2 + 1g Met + 0.5g SeMet + 75mgVE	33.35	42.82	53.94	85.85	12.71	0.382	77.12
SEM	**0.273**	**0.267**	**0.295**	**0.525**	**0.124**	**0.002**	**0.335**
P Value	**0.073**	**0.880**	**0.224**	**0.264**	**0.482**	**0.273**	**0.577**

SEM=Standard error of means. P value= probability level.

Table 4. Effect of dietary Methionine, Selenomethionine and Vitamin E supplementation on fertility and hatchability of Golden Sabahia laying hens

Treatments	Fertility (%)	Hatchability of total eggs (%)	Hatchability of fertile eggs (%)	Pip of total eggs (%)	Non-hatched of total eggs (%)	Chick weight (g)
T1: Con_1 (16% CP)	93.24	82.93	88.93	1.86	7.20	32.58
T2: Con_2 (14% CP)	92.20	77.41	83.86	1.39	12.88	32.80
T3: Con_{2+} 1g Met	86.84	75.48	86.88	1.51	8.37	32.61
T4: Con_2 + 0.5 g SeMet	81.88	65.62	79.58	0.00	16.04	33.03
T5: Con_2 +75mg VE	89.67	70.28	78.12	0.74	12.58	32.52
T6: Con_2 +1g Met + 0.5g SeMet	85.93	67.81	78.90	4.55	9.47	32.61
T7: Con_2 + 0.5g SeMet +75mg VE	88.91	73.85	83.04	0.64	10.56	35.93
T8: Con_2 + 1g Met + 75mg VE	90.65	75.84	83.62	0.58	11.42	33.73
T9: Con_2 + 1g Met + 0.5g SeMet+ 75mgVE	93.74	77.53	82.35	2.03	13.98	34.98
SEM	**1.136**	**1.819**	**1.304**	**0.366**	**1.264**	**0.414**
P Value	**0.244**	**0.495**	**0.615**	**0.133**	**0.871**	**0.476**

SEM=Standard error of means. P value= probability level

Table 5. Effect of dietary Methionine, Selenomethionine and Vitamin E supplementation on yolk and serum antioxidant traits of Golden Sabahia laying hen

Treatments	**Glutathione peroxidase in serum. (mmol/ml)**	**Total antioxidant capacity in serum (nmol/L)**	**MDA In Fresh Yolk (mg/ kg)**	**MDA In Yolk after 30 day storage (mg/ kg)**
T1: Con$_1$ (16% CP)	0.423	421	0.420	0.313^{bc}
T2: Con$_2$ (14% CP)	0.450	416	0.413	0.267^{b}
T3: Con$_{2+}$ 1g Met	0.433	420	0.427	0.373^{ab}
T4: Con$_2$ + 0.5 g SeMet	0.420	425	0.310	0.367^{ab}
T5: Con$_2$ +75mg VE	0.437	418	0.470	0.387^{a}
T6: Con$_2$ +1g Met + 0.5g SeMet	0.417	413	0.360	0.380^{ab}
T7: Con$_2$ + 0.5g SeMet +75mg VE	0.437	413	0.480	0.367^{ab}
T8: Con$_2$ + 1g Met + 75mg VE	0.437	416	0.380	0.360^{ab}
T9: Con$_2$ + 1g Met + 0.5g SeMet + 75mgVE	0.427	417	0.367	0.337^{ab}
SEM	**0.005**	**1.136**	**0.016**	**0.009**
P Value	**0.846**	**0.236**	**0.233**	**0.015**

SEM=Standard error of means. P value= probability level MDA: Malonaldehyde

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الملخص العربى

تأثير اضافة مصادر مختلفة لمضادات الأكسدة عند مستوى منخفض من البروتين على الأداء الأنتاجى والتناسلى للدجاج البياض

تهدف هذه الدراسة الى تقييم تأثير الميثيونين والسيلينوميثيونين وفيتامين هـ كمصادر مضادة للأكسدة على الأداء الانتاجى وجودة البيض و صفات الخصوبة و الفقس والصفات المضادة للأكسدة فى سيرم الدم والصفار فى دجاجات الصبحية ذهبى التى غذيت على العليقة المنخفضة البروتين والتى (تحتوى على 14% بروتين خام) وتم امدادها بـ 1جم ميثيونين أو 0.5 جم سلينوميثيونين أو75 مللجم من فيتامين هـ ، أو الخلط بينهم خلال فترة الصيف في 9 مجموعات تجريبية ، لذا تم استخدام 189 دجاجة و 27 ديك (1 ديك : 7 دجاجات) ،عن عمر 35 أسبوعًا من سلالة الصبحية الذهبى المحلية. المجموعة الأولى أستخدمت كمعاملة مقارنة تحتوى على 16 % بروتين خام و المعاملات الثمانية الأخرى تحتوى على نسبة منخفضة من البروتين خام (14%) . المجموعة الثانية المنخفضة البروتين (14%) لا يتم أمدادها باى من الأضافات الغذائية . المجموعات التجريبية السبعة التالية تحتوى غلى بروتين منخفض و يتم أمداده بـ 1جم ميثيونين أو 0.5 جم سلينوميثيونين أو75 مللجم من فيتامين هـ كل منهم بصورة منفردة أو كذلك بالخلط بينهم وذلك بـ 1جم ميثيونين و 0.5 جم سلينوميثيونين و مجموعة اخرى ب 1جم ميثيونين و 75 مللجم فيتامين هـ و اخرى ب0.5 جم سلينوميثيونين و75 مللجم من فيتامين هـ ، و المجموعة الأخيرة بالخلط بينهم جميعا.، استمرت الفترة التجريبية لمدة 12 اسبوع -35-46 أسبوعًا). أوضحت النتائج المتحصل عليها أنه خلال الفترة الكلية لم يكن هناك تأثير معنوي على وزن الجسم مقارنة بالمجموعة الكنترول وأعلى نسبة لأنتاج البيض في المجموعة الكنترول الاولى 16% بروتين خام ،لم يتأثر معدل الغذاء المأكول خلال الفترات (35-46 أسبوعًا) بشكل معنوي بتغذية مجموعات مختلفة مقارنة بالكنترول 16% بروتين خام . سجلت الطيور التي غذت على المعاملات الاولى والسادسة أفضل كفاءة غذائية . لم يكن هناك تأثير معنوي في صفات جودة البيض وصفات الخصوبة و الفقس ،كذلك لا يوجد تأثر لكل من تركيز انزيم الجلوتاثيون بيروكسديز ومضادات الأكسدة الكلية بين المعاملات المختلفة. كما وجد انخفاض فى المالونلدهيد فى صفار البيض المخزن لمدة 30 يوم فى المعاملة الكنترول. لخلصت الدراسة الى ان الدجاجات المغذاه على عليقة منخفضة البروتين (14% بروتين خام) ومضاف اليها الميثيونين والسلينوميثيونين وفيتامين ه لم يكن هناك تأثير ملحوظ على الاداء الانتاجى وجودة البيض وصفات الخصوبة والفقس و صفات مضادات الأكسدة خلال فصل الصيف.