Effect of Dietary Supplementation with L-Arginine and Vitamin C on Egg Production Performance for Matrouh Strain Hens

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Abstract

The present work was aimed to study the effect of dietary L-arginine level, vitamin C, and their interaction between them on some productive performance of Matrouh laying hens during the summer season. A 4X3 factorial treatment arrangement was carried out including four levels of dietary L-Arg (0.0, 0.4, 0.8, and 1.2 g/kg diet) and three VC concentrations (0, 150, and 300 mg/kg diet). A total number of 108 Matrouh hens (Egyptian local strain) aged 64 weeks were randomly distributed into twelve treatment groups (three replicate each). The results obtained showed a significant ($p<0.05$) effect in live body weight due to dietary L-Arg and VC supplementation at 72 weeks of age only. Significant ($p<0.05$) differences were observed in feed intake and feed conversion ratio due to dietary L-Arg levels during all periods of estimation. Dietary L-Arg levels had significant ($P<0.05$) effects on the rate of egg prodction during the periods from 68-71 and 64-75 weeks of birds age. Significant ($p<0.05$) differences were observed in egg weight due to dietary L-Arg and VC levels during all periods of estimation except at 72-75 weeks of age. Dietary L-Arg levels had significant ($P<0.05$) effect on egg mass during the periods from 68-71,72-75 and 64-75 weeks of bird's age. The VC supplementation didn't have any significant effects on feed conversion ratio, egg production rate, egg weight, and egg mass. The interaction effects between dietary L-Arg and VC levels had a major influence ($p<0.05$) on body weight, feed consumption, feed conversion ratio, egg production rate, egg weight and egg mass. In conclusion, it could be concluded that Matrouh laying hens supplemented diet with L-Arg at a level of 1.2 g or VC at a level of 300 mg/kg diet, seemed to be adequate to achieve the favorite results and is recommended.

Keywords: L-arginine, vitamin C, laying hens, egg production, feed conversion

Introduction

Several studies showed a close correlation between the level of some amino acids in the blood and reproductive performance of poultry at various stages of the production cycle in poultry (**Gabr, 2009**). The L-arginine (L-Arg) is one of the 20 most common natural amino acids and classified as an essential amino acid for birds due to their inability to synthesize it. L-Arg is a biosynthesis substrate for several molecules, including protein, nitric oxide, creatine, ornithine, glutamate, polyamine, proline, glutamine, agmatine and dimethylarginine, thus serving a range of essential biological and physiological roles in poultry development (**Khajali and Wideman, 2010**). Arginine is also known to induce ovulation by enhancing luteinizing hormone (LH) release (**Basiouni et al., 2006**). Besides the requirement for L-Arg ranged from less than 0.70% of the diet for realistic diets to almost 1.8% for distilled diets, in which casein was the source of protein (**Khajali and Wideman, 2010**). Dietary supplementation of L-Arg above NRC (**NRC, 1994**) improved egg production, reproduction performance, enhanced cellular immunity and most semen parameters (**Silva et al., 2012 and Youssef et al., 2015**). Also increased body weight in Fayoumi and Golden Montazah laying hens (**Youssef et al., 2016**) also body weight was significantly increased in the

commercial broiler (**Zampiga et al., 2018**). As well feed conversion significantly improved, as the dietary L-Arg level increased in laying hens (**Youssef et al., 2015**). **Fouad et al (2012) and Yuan et al., (2015)** said that L-Arg supplementation in poultry diets increases the production and the weight of eggs. Also, egg production traits were markedly improved by L-Arg supplemented in Silver Montazah chickens (Sabry et al 2016).

Hens reared under thermal conditions and hens reared under chronic heat stress and fed a diet supplemented with ascorbic acid had the greatest body weight and feed conversion rate compared with hens reared under chronic heat stress without supplementation (**Attia et al., 2016**). Also, laying Japanese quail the diet had 300 mg ascorbic acid recorded the best ($P< 0.05$) feed conversion (**Abou-Kassem et al., 2020**) while, **Kadhim et al., (2019)** reported no significant differences in average between control and experimental groups in feed conversion efficiency. **Chung et al., (2005)** found that supplemented birds of the vitamins C tended to maintain a better egg production rate. Also, dietary supplementation by 125 mg vitamin E plus 200 mg vitamin C/kg of diet may increase egg production and improve egg quality in laying hens during heat stress (**Çiftçi et al., 2005**)

Therefore, the objective of the present study was to study the effect of dietary supplementation of

L-arginine and ascorbic acid on some productive performances during the summer seasons for Matrouh chickens as local strain hens.

Materials and Methods

The latest research was conducted at the Inshas Poultry Breeding Research Station, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Giza, Egypt, during the period from May 2018 to August 2018. The chemical analysis was carried out at the Laboratories of the Animal Production Research Institute, Ministry of Agriculture. A 4 x 3 factorial arrangement design was used in this experiment including four levels of L-Arg (0, 0.4, 0.8 and 1.2 g/kg diet), three levels of VC (0, 150 and 300 mg/kg diet) and the interaction between them. A total number of 108 laying hens aged 64 weeks, were randomly selected from the farm flock and used in this experiment. All selected birds were randomly distributed into 12 treatments equal in number (9 hens / each treatment). Laying hens of each treatment were of nearly an equal average body weight and similar average daily egg production with no statistical differences. All birds of the experimental treatments were individually housed in wire-caged batteries (45×30×35cm), and kept under the similar managerial, hygienic and environmental conditions. Birds were located in a temperature controlled room, and the photoperiod during the experimental period was fixed at 16 hrs daily. Hens were fed ad-libitum, and during the experimental period, fresh water was available all the time (12 weeks). Birds were fed a basal laying diet formulated to cover the nutrient requirements of M laying hens recommendations according to **Feed Composition Tables For Animal and Poultry Feedstuffs Used In Egypt (2001)**. Layers were fed either the basal diet with no supplementation (control) or supplemented with 0, 0.4 ,0.8 or 1.2 g L-Arg /kg diet and 0, 150 or 300 mg VC /kg diet.

Feed components and chemical analysis of the experimental basal diet are presented in table (1). Birds of each experimental treatment were individually weighed to the nearest gram at the start of the experiment, and then every four weeks during the experimental period (64, 68, 72 and 76 weeks of age). Feed intake (FI) for birds within each treatment group was weekly recorded, and then it was averaged for each treatment and expressed as grams per bird per day during the periods from 64-68, 68-72 and 72-76 weeks of bird's age. Feed conversion (FC) of birds was calculated as the number of grams of FI required to produce one gram of eggs during each experimental period as follows: -

$$FC = \frac{Average\ \ FI\ \ (g)}{Average\ \ egg\ \ mass\ (g)}$$

During the whole experimental period, egg numbers and egg weight were individually recorded daily for hens within each experimental group. The weight of eggs was registered to the nearest gram. Egg production rate (%) was calculated for each experimental group as follows: -

$$Egg\ production\ rate,\ (\%)\ /\ hen\ /day = \frac{Number\ of\ eggs\ \ produced}{Number\ of\ live\ hens} \times 100$$

By multiplying the total number of eggs by the mean egg weight for each group, egg mass was determined as follows: -

Egg mass, g/day =

Egg number/ hen /day X avergage egg weight (g)

For each experimental procedure, the egg number, average egg weight and egg mass were calculated every four weeks.

Data were statistically analyzed according to ANOVA procedures of **SAS (SAS, 2012)**. Means differences were compared using Duncan's multiple range test **(Duncan, 1955).**

Table 1. Feed ingredients and chemical analysis of the basal laying diet.

Ingredients	%
Yellow corn (8.5 %)	62.80
Wheat Bran (15.7%)	10.00
Corn gluten meal (60%)	9.40
Soybean meal (44 %)	8.00
Limestone (CaCo₃)	6.70
Di-calcium phosphate	3.32
Salt (NaCl)	0.34
Dl-Methionine 99%	0.03
L-Lysine HCL	0.11
Vit + Min. premix*	0.30
Total	100
Chemical analysis: -	
a-Calculated analysis **:-	
ME, Kcal/kg.	2728
Crude protein, %	16.00
Crude fiber, %	3.14
EE	3.05
Calcium, %	3.33
Ash %	3.14
Available phosphorus, %.	0.73
Lysine, %.	0.53
Methionine, %	0.72
Arginine	0.75
b- Designed analysis *:-**	
Crude protein, %.	16.00
Crude fiber, %.	3.14
Ash %.	3.14

*Vit. Min. premix: Each 2 kg of vitamin and mineral premix (Commercial source AGRIVET Co.) contains Vit. A. 12000000 IU, Vit. D₃ 2000000 IU, Vit. E. 10000 mg, Vit. K₃ 2000 mg, Vit. B₁ 100 mg, Vit. B₂ 5000 mg, Vit. B₆ 1500 mg, Vit. B₁₂ 10 mg, Biotin 50 mg, Choline chloride 250000 mg, Pantothenic acid 10000 mg, Nicotinic acid 3000 mg, Folic acid 1000 mg, Manganese 60000 mg, Zinc 50000 mg, Iron 30000 mg, Copper 10000 mg, Iodine 1000 mg, Selenium 100 mg, Cobalt 100 mg, Carrier (Ca CO₃) add to 2kg.
** Calculated in accordance with **NRC (1994).**
*** Designed according to the styles of **AOAC (2005).**

Results and Discussion

3.1 Live body weight (LBW)

Results in Table (2) revealed that dietary L-Arg or VC levels had non-significant effects on LBW during all the experimental periods except at 72 weeks of age only which showed significant ($P<0.05$) variations. Birds fed of control group recorded the highest average of LBW (1611.5 g). While, dietary 300 mg/kg diet VC recorded the highest average of LBW (1583.7 g) during the period from (64-75wks). Whereas, the interaction between dietary L-Arg and VC levels had a significant ($P<0.05$) effect on LBW of layer hens at all periods of estimation. The best average of LBW (1721.3 g) was recorded in the interaction between dietary L-Arg (1.2 g/kg diet) and VC levels (0 mg/kg diet). The previous results disagree with the findings of **Abou-Kassem et al., (2020)** who showed that the final body weight of laying Japanese quail fed diet supplemented with ascorbic acid or clay was significantly ($P< 0.05$ or 0.01) increased compared to the control diet. Improving weight performance particularly during the starter period may be due to L-Arg, especially during the starting process, is considered an important amino acid for poultry since chicks do not have a functional biochemical urea cycle, are unable to synthesize L-Arg and thus need this amino acid to be supplied in the diet (**Murakami et al., 2014**).

3.2 Feed intake (FI)

Dietary L-Arg and the interactions between dietary L-Arg and VC levels had a significant ($P<0.05$) effects on average daily feed intake (FI) of layers (Table, 2). The lowest average of feed intake was recorded in birds fed a diet supplemented with 0.8 L-Arg ,150mg V.C/kg diet and the interaction between 0.8 L-Arg and 150 mg/kg VC diet during the period from (64-75 wks) of age when compared with different treatments applied. Dietary VC supplementation showed a significant ($P<0.05$) effect on average FI during the period from 64-67 wks of age only. The results obtained disagree with the findings of **Youssef et al., (2015)** who confirmed

that feed intake did not generally differ significantly

due to L-Arg supplementation.

Table 2. Least square means and standard error $\left(\overline{X}\pm SE\right)$ for live body weight and feed intake of Matrouh strain hens as affected by studied factors.

Items		Live body weight (g) at weeks					Feed intake (g/hen/day) at weeks			
		64	68	72	75	Average (64-75)	64-67	68-71	72-75	Average (64-75)
LA		NS	NS	*	NS	NS	*	*	*	*
0.0		1524.7±18.2	1627.6±39.7	1675.8±46.8ᵃ	1617.5±69.7	1611.5±39.6	87.18±2.77ᵇ	107.68±6.14ᵃ	110.75±2.10ᵃ	101.87±2.97ᵃ
0.4		1462.2±30.1	1561.2±50.3	1511.7±63.6ᵇᶜ	1562.8±53.2	1524.5±44.3	88.66±2.13ᵃ	102.88±4.99ᵃᵇ	96.73±2.07ᵇ	96.09±2.43bᵃ
0.8		1420.7±36.9	1537.1±45.6	1473.1±44.5ᶜ	1566.5±48.5	1499.4±37.5	80.75±1.29ᵈ	91.93±3.12ᵇ	93.65±3.06ᵇ	88.78±1.46ᶜ
1.2		1512.0±44.5	1609.6±52.3	1631.3±55.1ᵃᵇ	1679.6±74.1	1608.1±54.8	83.56±2.49ᶜ	94.02±2.87bᵃ	94.91±2.46ᵇ	90.83±1.85ᵇᶜ
VC		NS	NS	*	NS	NS	*	NS	NS	NS
0		1511.0±25.5	1592.9±37.3	1579.5±33.4ᵃᵇ	1627.8±63.1	1577.8±35.1	83.81±2.39ᵇ	99.33±3.50	98.46±2.68	93.86±1.85
150		1452.1±30.4	1557.8±37.6	1512.5±52.5ᵇ	1562.4±41.7	1521.1±36.6	86.18±1.48ᵃ	95.32±3.66	96.87±2.66	92.79±2.66
300		1476.5±35.1	1601.0±48.2	1626.9±59.3ᵃ	1629.7±55.6	1583.7±47.1	85.13±2.32ᵃ	102.73±5.21	101.69±3.26	96.51±3.04
Interaction effects:										
LA	**VC**	*	*	*	*	*	*	NS	*	*
0.0	0	1512.6±15.5ᵃᵇ	1541.6±50.2ᵃᵇ	1561.0±36.3ᵇᶜ	1466.6±155.0ᵇ	1520.6±50.8ᵃᵇ	76.15±0.69ᶠ	102.42±3.32	107.94±0.53ᵃᵇ	95.50±0.78ᵇᶜᵈ
	150	1509.3±53.7ᵃᵇ	1602.0±61.7ᵃᵇ	1661.0±80.6ᵃᵇ	1627.6±105.3ᵃᵇ	1600.0±72.1ᵃᵇ	93.16±0.62ᵃ	103.87±11.08	107.74±4.29ᵃᵇ	101.59±5.07ᵃᵇ
	300	1552.3±16.9ᵃ	1739.3±48.7ᵃ	1805.6±58.0ᵃ	1758.3±42.8ᵃᵇ	1714.0±40.5ᵃ	92.24±0.13ᵃ	116.74±16.03	116.57±2.96ᵃ	108.52±6.07ᵃ
0.4	0	1435.0±41.3ᵃᵇ	1549.3±49.3ᵃᵇ	1546.6±49.9ᵇᶜᵈ	1589.0±61.7ᵃᵇ	1529.6±44.9ᵃᵇ	93.53±0.45ᵃ	106.07±8.06	93.65±4.20ᶜ	97.75±4.08ᵃᵇᶜᵈ
	150	1423.3±38.6ᵃᵇ	1437.0±72.8ᵇ	1305.6±61.3ᵈ	1461.0±11.0ᵇ	1407.0±25.3ᵇ	80.20±0.16ᵉ	93.61±9.76	94.84±2.58ᵇᶜ	89.55±3.81ᶜᵈ
	300	1528.3±66.0ᵃᵇ	1697.3±75.0ᵃ	1683.0±76.3ᵃᵇ	1638.6±147.0ᵃᵇ	1637.0±87.6ᵃᵇ	92.24±0.53ᵃ	108.95±8.49	101.69±2.89ᵇᶜ	100.96±2.24ᵃᵇᶜ
0.8	0	1495.6±51.7ᵃᵇ	1540.3±99.9ᵃᵇ	1511.0±72.2ᵇᶜᵈ	1611.0±131.2ᵃᵇ	1539.6±74.3ᵃᵇ	75.99±0.88ᶠ	89.09±9.34	99.40±6.87ᵇᶜ	88.16±4.95ᵈ
	150	1429.3±64.4ᵃᵇ	1642.0±52.0ᵃᵇ	1544.6±64.0ᵇᶜᵈ	1594.3±33.8ᵃᵇ	1552.3±44.9ᵃᵇ	84.27±0.86ᵈ	93.31±2.07	90.08±4.10ᶜ	89.22±0.46ᶜᵈ
	300	1337.3±57.1ᵇ	1429.0±30.6ᵇ	1363.6±65.3ᶜᵈ	1493.4±77.0ᵃᵇ	1406.2±53.5ᵇ	82.00±0.56ᵉᵈ	93.39±4.41	91.47±4.77ᶜ	88.96±0.65ᶜᵈ
1.2	0	1601.0±51.5ᵃ	1740.3±34.7ᵃ	1699.6±72.6ᵃᵇ	1844.6±72.2ᵃ	1721.3±56.1ᵃ	89.56±0.69ᵇ	99.72±5.09	92.86±4.40ᶜ	94.05±.90ᵇᶜᵈ
	150	1446.6±97.6ᵃᵇ	1550.3±86.4ᵃᵇ	1539.0±114.0ᵇᶜᵈ	1566.6±134.5ᵃᵇ	1525.3±107.3ᵃᵇ	87.08±1.67ᶜ	90.49±4.56	94.84±5.26ᵇᶜ	90.80±3.35ᵇᶜᵈ
	300	1488.3±72.2ᵃᵇ	1538.3±106.5ᵃᵇ	1655.3±106.5ᵃᵇ	1627.6±146.0ᵃᵇ	1577.6±105.2ᵃᵇ	74.02±1.09ᶠ	91.85±5.24	97.02±4.50ᵇᶜ	87.63±3.35ᵈ

$\left(\overline{X}\pm SE\right)$ = Average ± standard error, LA = L-arginine levels (g/kg diet), VC = Vitamin C levels (mg/kg diet).
ᵃ,ᵇ,ᶜ,ᵈ ᵃⁿᵈ ᵉ the meaning of having different letters in the same column is substantially different (P≤0.05).
NS= Not significant. * = (P≤0.05) and ** = (P≤0.01).

3.3 Feed conversion (FC)

The results of feed conversion (FC) and egg production rate (EPR %) are presented in Tables (3). Significant (P<0.05) difference in FC and EPR % were observed due to L-Arg level and the interaction between L-Arg and VC at all periods of estimation except the period from (64-67) and (72-75 wks) of age for FCR and EPR, respectively, While the insignificant difference due to the interaction was found during (64-71 wks) of age for EPR only. The results obtained agree with the findings of **Youssef et al., (2015)** who reported that the addition of L-Arg had a significant effect on FI and FC. The results show a numerical decrease in FI and improvement in FC by increasing L-Arg level especially after starter periods. Also, **Youssef et al., (2016)** reported that crested hens that treated with 4% Arg above NRC recorded the best feed conversion ratio.

3.4 Egg production (EP), egg weight (EW) and egg mass (EM)

In the experimental period, egg production rate and egg mass were significantly (P≤0.05) improved by feeding diets supplemented with L-Arg. Hens fed a 0.8 g L-Arg kg diet significantly increased egg production rate and egg weight, while these fed diet supplemented with 0.4 g L-Arg/kg diet significantly (P≤0.05) increased egg mass compared with the control group. Birds fed diets supplemented with different levels of VC insignificantly increased averages of egg production rate and egg mass. While,

the interaction between 0.4 g L-Arg x150 mg VC and between 1.2 g L-Arg x 300 mg VC/kg diet increased significantly averages of EW and EM, respectively, when compared with different interactions applied. Arginine is also known to be a potent secretagogue, increasing the bloodstream release of insulin, growth hormone, and IGF-A. It is part of the hormone vasotocin, which is involved in oviposition and uterine contraction (**Rueda et al 2003**).These results were in agreement with the findings of **Youssef et al (2015)** who noticed that adding Arg to the diet of two local strains Fayoumi and GM at levels 0.14 and 0.28 g /kg of diet resulted in a significant increase (P≤0.05) in EP % and egg mass at 75 wks of age, as well as, increasing Arg level to local Saudi laying hens to 9 g/kg of diet over that required for the Leghorn breed requirements was found to improve hen day production percent (**Silva et al 2012; Basiouni et al 2006 and Najib and Basiouni 2004**). In this context, the stimulatory effect of Arg on luteinizing hormone (LH) secretion may be mediated through the stimulation of GnRH neurons in the hypothalamus and consequently, LH release. (**Basiouni, 2009**). On the other hand, **Sharideh et al (2015**) found that dietary supplementation of Arg (from 7.3 to 16.3 g/kg diet) failed to change the rate of egg production. The present results show that the egg production traits were markedly improved in Arg supplemented group throughout the experimental period from 64 to 75 wks of age. Dietary L-Arg level

had a significant (P<0.05) effect on EM values at 68-71, 72-75 and 64-75 weeks of layers age. The best average of EM value (25.16 g/hen/day) was observed in hens fed the diet supplemented with 0.4 g L-Arg when compared with other treatments applied. The interactions between dietary L-Arg levels and VC had a significant effect (P≤0.05) on EW and EM at all periods of estimation except at 72-75 wks for EW and 64-67 wks for EM, respectively.

Table 3. Least square means and standard error $\left(\overline{X} \pm SE\right)$ for feed conversion and egg production rate of Matrouh strain hens as affected by studied factors.

Items		Feed conversion (g. feed/g. egg mass) at weeks				Egg production (%/hen/day) at wks rate			
		64-67	68-71	72-75	Average (64-75)	64-67	68-71	72-75	Average (64-75)
LA		NS	*	*	*	NS	*	NS	*
0.0		4.15±0.24	5.12±0.34[a]	5.23±0.33[a]	4.76±0.16[a]	43.39±1.98	43.39±1.43[b]	44.31±2.30	43.69±1.02[b]
0.4		3.74±0.26	3.91±0.16[b]	4.01±0.20[b]	3.87±0.16[b]	48.41±2.88	51.85±2.28[a]	48.41±2.03	49.56±2.13[a]
0.8		3.55±0.16	3.74±0.17[b]	4.10±0.17[b]	3.78±0.11[b]	45.50±2.23	48.55±1.34[a]	45.11±1.52	46.38±1.35[ab]
1.2		3.63±0.16	3.69±0.14[b]	3.80±0.21[b]	3.70±0.14[b]	46.16±1.84	50.93±2.00[a]	50.00±2.79	49.03±1.82[a]
VC		NS	NS	NS	NS	NS	NS	NS	NS
0		3.71±0.13	4.29±0.23	4.48±0.28	4.13±0.16	45.14±1.99	46.43±1.75	44.74±1.69	45.44±1.49
150		3.86±0.21	3.85±0.18	4.15±0.18	3.93±0.14	45.73±2.02	49.5±1.69	46.83±1.48	47.36±1.34
300		3.73±0.22	4.21±0.32	4.24±0.3	4.03±0.22	46.73±1.99	50.1±1.86	49.31±2.48	48.71±1.68
Interaction effects:									
LA	**VC**	NS	*	*	*	NS	*	*	*
	0	3.68±0.25	5.15±0.53[ab]	5.48±0.64[a]	4.72±0.36[ab]	41.67±2.38	40.08±2.6[b]	41.27±3.46[b]	41.01±1.84[c]
0.0	150	4.47±0.44	4.69±0.39[abc]	4.80±0.51[ab]	4.60±0.16[abc]	44.45±4.57	46.03±1.73[ab]	47.22±3.78[ab]	45.9±1.34[abc]
	300	4.29±0.53	5.51±0.91[a]	5.41±0.69[a]	4.97±0.32[a]	44.05±4.29	44.05±2.38[ab]	44.44±5.34[b]	44.18±1.08[abc]
	0	3.58±0.21	4.22±0.27[bcd]	3.75±0.38[bc]	3.84±0.22[cde]	51.98±2.86	50.4±2.86[ba]	50.79±3.46[ab]	51.06±2.52[ab]
0.4	150	3.54±0.58	3.45±0.08[cd]	3.84±0.23[bc]	3.59±0.26[de]	45.63±5.93	51.19±5.87[a]	48.02±3.53[ab]	48.28±4.71[abc]
	300	4.10±0.57	4.06±0.22[bcd]	4.44±0.36[abc]	4.18±0.33[bdc]	47.62±6.77	53.97±4.03[a]	46.43±4.51[b]	49.34±4.9[abc]
	0	3.80±0.48	3.81±0.47[cd]	4.61±0.22[ab]	4.04±0.29[bcde]	39.68±4.97	45.64±2.21[ab]	41.67±2.06[b]	42.33±1.84[bc]
0.8	150	3.51±0.09	3.52±0.11[cd]	3.84±0.27[bc]	3.61±0.03[de]	47.62±1.19	51.59±1.73[a]	46.03±2.21[b]	48.41±0.4[abc]
	300	3.34±0.14	3.90±0.28[bcd]	3.86±0.19[bc]	3.69±0.15[de]	49.21±2.78	48.41±2.21[ab]	47.62±2.99[ab]	48.41±2.42[abc]
	0	3.76±0.12	3.98±0.26[bcd]	4.07±0.50[bc]	3.92±0.24[cde]	47.22±1.43	49.6±3.78[ab]	45.24±2.38[b]	47.35±1.92[abc]
1.2	150	3.94±0.33	3.72±0.10[cd]	4.11±0.11[bc]	3.90±0.10[cde]	45.24±5.46	49.21±3.53[ab]	46.03±3.91[b]	46.82±3.64[abc]
	300	3.21±0.17	3.36±0.22[d]	3.23±0.08[c]	3.26±0.12[e]	46.03±2.78	53.97±3.78[a]	58.73±3.91[a]	52.91±3.4[a]

$\left(\overline{X} \pm SE\right)$ = Average ± standard error, LA = L-arginine levels (g/kg diet), VC = Vitamin C levels (mg/kg diet).
[a,b,c,d and e] the meaning of having different letters in the same column is substantially different (P≤0.05). NS= Not significant. * = (P≤0.05).

Table 4. Least square means and standard error $\left(\overline{X} \pm SE\right)$ for egg weight and egg mass of Matrouh strain hens as affected by studied factors.

Items		Egg weight (g) at weeks				Egg mass (g/hen/day) at wks			
		64-67	68-71	72-75	Average (64-75)	64-67	68-71	72-75	Average (64-75)
LA		NS	NS	NS	NS	NS	*	*	*
0.0		49.33±0.60	49.03±0.80	49.02±0.80	49.17±0.55	21.44±1.11	21.23±0.65[b]	21.74±1.19[b]	21.47±0.50[b]
0.4		50.57±0.71	50.98±0.88	50.62±0.84	50.74±0.76	24.53±1.57	26.43±1.26[a]	24.53±1.20[ab]	25.16±1.20[a]
0.8		50.91±0.61	50.96±0.54	50.98±0.52	50.94±0.51	23.08±0.97	24.71±0.62[a]	22.99±0.78[ab]	23.59±0.57[ab]
1.2		50.35±0.60	50.48±0.56	50.99±0.69	50.59±0.54	23.16±0.72	25.65±0.85[a]	25.45±1.34[a]	24.75±0.77[a]
VC		NS	NS	NS	NS	NS	NS	NS	NS
0		50.80±0.57	50.74±0.62	50.43±0.87	50.67±0.62	22.90±1.00	23.53±0.85	22.61±1.04	23.01±0.78
150		50.10±0.66	50.50±0.63	50.43±0.61	50.34±0.57	22.90±1.04	25.02±0.99	23.60±0.75	23.84±0.76
300		49.98±0.39	49.85±0.67	50.34±0.44	50.07±0.43	23.36±1.01	24.96±0.97	24.81±1.25	24.38±0.84
Interaction effects:									
LA	**VC**	*	*	NS	*	NS	*	*	*
	0	50.08±1.30[ab]	50.41±1.36[ab]	48.84±2.45	49.82±1.38[ab]	20.91±1.62	20.27±1.88[c]	20.23±2.24[b]	20.47±1.43[c]
0.0	150	47.91±0.32[b]	47.95±0.49[b]	48.27±0.88	48.10±0.37[b]	21.32±2.35	22.05±0.60[abc]	22.82±2.01[b]	22.07±0.47[abc]
	300	50.02±1.01[ab]	48.73±2.01[b]	49.94±0.54	49.58±0.88[ab]	22.11±2.53	21.38±0.69[bc]	22.16±2.51[b]	21.88±0.22[bc]
	0	50.58±1.68[ab]	50.00±2.18[ab]	49.90±2.46	50.18±2.07[ab]	26.29±1.69	25.07±0.35[abc]	25.43±2.67[ab]	25.60±1.49[ab]
0.4	150	51.87±1.16[a]	53.08±0.39[a]	51.86±1.04	52.29±0.82[a]	23.79±3.46	27.22±3.31[a]	24.94±2.18[ab]	25.31±2.80[abc]
	300	49.26±0.40[ab]	49.88±1.05[ab]	50.09±0.44	49.73±0.36[ab]	23.50±3.53	26.99±2.58[a]	23.21±2.04[b]	24.57±2.62[abc]
	0	52.02±1.23[a]	51.67±1.06[ab]	51.77±0.98	51.80±0.99a	20.54±2.26	23.56±1.08[abc]	21.59±1.36[b]	21.90±0.74[bc]
0.8	150	50.52±0.82[ab]	51.43±0.37[ab]	51.19±0.41	51.03±0.33[ab]	24.04±0.45	26.52±0.69[ab]	23.55±0.95[b]	24.70±0.04[abc]
	300	50.19±1.17[ab]	49.79±1.13[ab]	49.99±1.13	49.99±1.10[ab]	24.64±1.02	24.06±0.71[abc]	23.83±1.79[b]	24.18±1.09[abc]
	0	50.51±0.45[ab]	50.88±0.24[ab]	51.20±1.08	50.88±0.44[ab]	23.86±0.88	25.22±1.81[abc]	23.20±1.59[b]	24.09±0.95[abc]
1.2	150	50.09±1.89[ab]	49.55±0.93[ab]	50.41±1.58	49.92±1.24[ab]	22.45±1.96	24.31±1.26[abc]	23.08±1.20[b]	23.28±1.19[abc]
	300	50.46±0.72[ab]	51.00±1.49[ab]	51.37±1.34	50.97±1.21[ab]	23.19±1.11	27.41±1.12[a]	30.06±1.26[a]	26.89±1.12[a]

$\left(\overline{X} \pm SE\right)$ = Average ± standard error, LA = L-arginine levels (g/kg diet), VC = Vitamin C levels (mg/kg diet).

a,b and c the meaning of having different letters in the same column is substantially different (P≤0.05). NS= Not significant. * = (P≤0.05).

Conclusion

In conclusion, dietary supplementation Arg from 64 to 75 wks of age might have the potential to improve feed intake, feed conversion, egg production, egg weight and egg mass. The results of this study indicate that diets containing 0.4 g L-Arg or 150 mg/kg VC/kg diet, and the interaction between dietary 1.2 g/kg L-arginine with 300 mg/kg diet VC improved the productive performance of Matrouh laying hens.

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تأثير التغذية بإضافة الأرجنين وفيتامين C للعليقة على الكفاءة الانتاجيه لدجاج سلالة مطروح.

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أجري هذا البحث لدراسة تاثير اضافة مستويات الحمض الأميني ال–أرجنين وفيتامين ج للعليقة والتداخل بينهم على الكفاءة الإنتاجية لدجاج سلالة مطروح خلال فصل الصيف.

صممت التجربة كتصميم عاملي (3x4) ويتضمن أربع مستويات من ال–أرجنين (صفر 0.4& 0.8& 1.2&جم/كجم عليقة) وثلاث مستويات من فيتامين ج (حمض الاسكوربيك) هي (صفر 150& 300& مليجرام/ كجم عليقة). واستخدم عدد 108 دجاجه مطروح (كسلاله محليه) عمر 64 أسبوع اختيرت عشوائيا ووزعت الى 12 مجموعه (بكل مجموعة ثلاث مكررات).

أوضحت النتائج وجود تأثيرات معنوية (P<0.05) في وزن الجسم الحي عند عمر 72 أسبوع من العمر فقط نتيجة إضافة ال–أرجنين وفيتامين ج للعليقة. أدت إضافة ال–أرجنين للعليقة الي ظهور تأثير معنوي (P<0.05) على معدل استهلاك العلف وكفاءة التحويل الغذائي طوال فترات التقدير. كان لإضافة ال–أرجنين للعليقة تأثير معنوي (P<0.05) على معدل انتاج البيض خلال الفترات من 68–71 و64– 75 أسبوع من العمر. كان للتداخل بين إضافة ال–أرجنين وفيتامين ج تأثير معنوي (P<0.05) على وزن البيضة طوال فترات التقدير فيما عدا الفتره من72– 75 أسبوع. كان لإضافة ال–أرجنين للعليقة تأثير معنوي (P<0.05) على كتلة البيض خلال الفترات من 68–71، 72–75 و64– 75 أسبوع من عمر الطيور. ولم يكن لإضافة فيتامين ج للعليقة أي تأثير معنوي على كفاءة التحويل الغذائي، معدل انتاج البيض ،وزن البيضة وكتلة البيضة. كان للتداخل بين إضافة ال–أرجنين وفيتامين ج للعليقة تأثير معنوي (P<0.05) على كل من وزن الجسم الحي، معدل استهلاك العلف، كفاءة التحويل الغذائي، معدل انتاج البيض، وزن البيضة وكتلة البيضة. خلصت هده الدراسة الي ان تغدية دجاج سلالة مطروح على عليقة مضاف اليها الحمض الاميني ال– أرجنين بمعدل 1.2 جم / كجم او فيتامين ج بمعدل 300 مليجرام / كجم عليقة قد سجلت أفضل النتائج ويمكن التوصية باستخدامها.

الكلمات الدالة: ال–أرجنين، فيتامين C، الدجاج البياض، انتاج البيض، العلف المستهلك.