

Table (4). Influence of dietary antioxidant on productive and reproductive performance (X $\pm$ SE) of Mandara strain reared during summer season from 24to 36 weeks of age

Items	Control	Vitamin C	Vitamin E	Vitamin C + E	Rosemary oil	Oregano oil	Rosemary +Oregano oil	Sig.
Body weight changes (g)	158.62 $\pm$ 22.2 ^b	155.25 $\pm$ 17.68 ^b	162.64 $\pm$ 14.64 ^b	181.39 $\pm$ 20.39 ^b	213.24 $\pm$ 27.06 ^{ab}	266.75 $\pm$ 28.2 ^a	206.12 $\pm$ 25.5 ^{ab}	*
Feed consumption (g. / hen/ day)								
24-28Wk	95.20 $\pm$ 3.46	92.64 $\pm$ 3.39	94.97 $\pm$ 4.44	92.87 $\pm$ 3.69	93.64 $\pm$ 1.06	96.2 $\pm$ 3.64	94.97 $\pm$ 4.58	NS
28-32Wk	103.64 $\pm$ 0.75	102.54 $\pm$ 3.44	103.54 $\pm$ 4.1	104.64 $\pm$ 2.62	105.64 $\pm$ 5.01	106.87 $\pm$ 3.47	105.3 $\pm$ 4.81	NS
32-36Wk	114.64 $\pm$ 4.8	112.54 $\pm$ 3.81	116.87 $\pm$ 2.93	115.3 $\pm$ 2.46	116.3 $\pm$ 5.67	115.54 $\pm$ 3.75	112.97 $\pm$ 6.81	NS
24-36Wk	104.49 $\pm$ 0.57	102.57 $\pm$ 1.17	105.13 $\pm$ 1.83	104.27 $\pm$ 1.66	105.19 $\pm$ 3.3	106.2 $\pm$ 3.43	104.42 $\pm$ 3.9	NS
Feed conversion (g. feed/ g. egg mass)								
24-28Wk	4.69 $\pm$ 0.39 ^a	3.45 $\pm$ 0.15 ^b	3.01 $\pm$ 0.26 ^b	3.09 $\pm$ 0.17 ^b	3.34 $\pm$ 0.26 ^b	3.22 $\pm$ 0.03 ^b	3.88 $\pm$ 0.58 ^{ab}	*
28-32Wk	4.85 $\pm$ 0.2	3.66 $\pm$ 0.43	4.59 $\pm$ 0.69	4.23 $\pm$ 0.28	3.39 $\pm$ 0.24	3.54 $\pm$ 0.15	4.52 $\pm$ 0.26	NS
32-36Wk	5.01 $\pm$ 0.42	4.03 $\pm$ 0.25	4.79 $\pm$ 0.46	4.3 $\pm$ 0.21	3.98 $\pm$ 0.28	4.73 $\pm$ 0.53	4.87 $\pm$ 0.18	NS
24-36Wk	4.85 $\pm$ 0.27 ^a	3.72 $\pm$ 0.11 ^c	4.13 $\pm$ 0.22 ^{bc}	3.87 $\pm$ 0.13 ^{bc}	3.57 $\pm$ 0.26 ^c	3.83 $\pm$ 0.21 ^{bc}	4.42 $\pm$ 0.08 ^{ab}	*
Egg production(%)								
24-28Wk	50.45 $\pm$ 4.57 ^b	66.65 $\pm$ 4.40 ^a	74.82 $\pm$ 4.47 ^a	72.25 $\pm$ 4.2 ^a	63.15 $\pm$ 5.51 ^{ab}	71.94 $\pm$ 4.43 ^a	60.30 $\pm$ 5.13 ^{ab}	*
28-32Wk	48.34 $\pm$ 1.04 ^c	62.15 $\pm$ 3.67 ^{ab}	51.91 $\pm$ 5.97 ^{bc}	52.86 $\pm$ 2.51 ^{bc}	65.72 $\pm$ 1.10 ^a	65.24 $\pm$ 3.34 ^a	52.15 $\pm$ 4.65 ^{bc}	*
32-36Wk	53.25 $\pm$ 1.42	65.45 $\pm$ 3.09	56.3 $\pm$ 4.28	58.66 $\pm$ 0.56	60.90 $\pm$ 0.85	58.72 $\pm$ 3.37	56.10 $\pm$ 3.26	NS
24-36Wk	50.68 $\pm$ 1.80 ^c	64.75 $\pm$ 0.94 ^a	61.01 $\pm$ 1.94 ^a	61.26 $\pm$ 1.02 ^a	63.26 $\pm$ 2.42 ^a	65.3 $\pm$ 0.85 ^a	56.18 $\pm$ 1.06 ^b	**
Egg weight (g)								
24-28Wk	40.84 $\pm$ 0.42 ^b	40.54 $\pm$ 0.21 ^b	42.59 $\pm$ 0.93 ^b	41.93 $\pm$ 0.8 ^b	45.10 $\pm$ 1.20 ^a	41.67 $\pm$ 0.96 ^b	41.74 $\pm$ 0.67 ^b	*
28-32Wk	44.34 $\pm$ 0.67	45.82 $\pm$ 0.89	45.05 $\pm$ 0.63	47.17 $\pm$ 0.69	47.66 $\pm$ 1.04	46.57 $\pm$ 1.13	45.18 $\pm$ 0.42	NS
32-36Wk	43.34 $\pm$ 2.17	42.89 $\pm$ 0.4	43.99 $\pm$ 0.16	45.91 $\pm$ 1.09	48.13 $\pm$ 0.78	42.38 $\pm$ 2.25	41.47 $\pm$ 1.2	NS
24-36Wk	42.84 $\pm$ 1.09 ^b	43.08 $\pm$ 0.32 ^b	43.88 $\pm$ 0.49 ^b	45.00 $\pm$ 0.73 ^{ab}	46.97 $\pm$ 0.28 ^a	43.54 $\pm$ 1.38 ^b	42.80 $\pm$ 0.70 ^b	*
Egg mass (g/hen)								
24-28Wk	20.63 $\pm$ 2.01 ^c	27.01 $\pm$ 1.77 ^{ab}	31.81 $\pm$ 1.47 ^a	30.36 $\pm$ 2.35 ^{ab}	28.42 $\pm$ 2.25 ^{ab}	29.91 $\pm$ 1.38 ^{ab}	25.19 $\pm$ 2.27 ^{bc}	*
28-32Wk	21.45 $\pm$ 0.77 ^d	28.54 $\pm$ 2.21 ^{abc}	23.44 $\pm$ 2.9 ^{cd}	24.96 $\pm$ 1.48 ^{bcd}	31.33 $\pm$ 1.11 ^a	30.38 $\pm$ 1.71 ^{af}	23.53 $\pm$ 1.97 ^{cd}	*
32-36Wk	23.05 $\pm$ 1.04 ^c	28.05 $\pm$ 1.10 ^{ab}	24.76 $\pm$ 1.87 ^{bc}	26.94 $\pm$ 0.75 ^{ab}	29.31 $\pm$ 0.62 ^a	24.91 $\pm$ 2.09 ^{bc}	23.24 $\pm$ 1.23 ^c	*
24-36Wk	21.73 $\pm$ 1.17 ^c	27.90 $\pm$ 0.61 ^a	26.76 $\pm$ 0.74 ^{ab}	27.58 $\pm$ 0.87 ^a	29.71 $\pm$ 1.21 ^a	28.42 $\pm$ 0.84 ^a	24.05 $\pm$ 0.72 ^{bc}	**

Means having different letters in the same row differ significantly (P<0.05). * = (P<0.05), ** = (P<0.01), NS= Not significant.

Table (5). Influence of dietary antioxidant on reproductive performance and some constituents of the egg yolk extract ($\bar{X} \pm \text{SE}$) of laying hens reared during summer season at the end of the experimental period

Items	Control	Vitamin C	Vitamin E	Vitamin C + E	Rosemary oil	Oregano oil	Rosemary +Oregano oil	Sig.
Fertility eggs, %	82.23 $\pm 1.29^b$	87.20 $\pm 1.77^a$	87.41 $\pm 0.75^a$	89.63 $\pm 1.49^a$	88.15 $\pm 0.75^a$	87.51 $\pm 0.47^a$	89.63 $\pm 1.49^a$	*
Hatchability/Total eggs, %	70.38 $\pm 0.75^c$	75.03 $\pm 0.87^b$	74.82 $\pm 0.75^b$	78.52 $\pm 1.96^{ab}$	75.56 $\pm 1.29^b$	75.74 $\pm 0.18^b$	80.00 $\pm 2.23^a$	**
Hatchability/Fertility eggs, %	85.61 ± 0.71	86.10 ± 1.70	85.62 ± 1.56	87.60 ± 1.43	85.71 ± 0.91	86.56 ± 0.79	89.23 ± 1.03	NS
Yolk cholesterol, mg/dl	20.95 $\pm 0.61^a$	19.54 $\pm 0.61^{ab}$	19.35 $\pm 0.93^{ab}$	18.00 $\pm 0.56^b$	18.42 $\pm 0.74^b$	18.27 $\pm 0.59^b$	17.54 $\pm 0.48^b$	*
Total lipids (mg/g)	288.12 ± 6.23	273.76 ± 7.11	271.69 ± 4.39	269.19 ± 7.45	280.50 ± 7.37	277.36 ± 5.65	265.13 ± 5.62	NS

Means having different letters in the same row differ significantly ($P < 0.05$). * = ($P < 0.05$), ** = ($P < 0.01$), NS= Not significant.

Table (6). Influence of dietary antioxidant on body temperature and respiration rate ($\bar{X} \pm \text{SE}$) of laying hens reared during summer season at the end of the experimental period

Items	Control	Vitamin C	Vitamin E	Vitamin C + E	Rosemary oil	Oregano oil	Rosemary +Oregano oil	Sig.
Rectal temperature	42.00 $\pm 0.16^a$	41.10 $\pm 0.12^c$	41.70 $\pm 0.16^{ab}$	41.40 $\pm 0.16^{bc}$	41.67 $\pm 0.13^{ab}$	41.57 $\pm 0.18^{ab}$	41.77 $\pm 0.13^{ab}$	*
Respiratory rate	82.34 $\pm 1.46^a$	75.34 $\pm 0.89^c$	80.00 $\pm 1.53^{ab}$	77.67 $\pm 1.21^{bc}$	80.67 $\pm 1.21^{ab}$	80.34 $\pm 1.46^{ab}$	81.00 $\pm 1.53^{ab}$	*

Means having different letters in the same row differ significantly ($P < 0.05$). * = ($P < 0.05$), ** = ($P < 0.01$), NS= Not significant.

Table (7). Influence of dietary antioxidant on blood pH and antibody titer against SRBC ($\bar{X} \pm SE$) of laying hens reared during summer season at the end of the experimental period

Items	Control	Vitamin C	Vitamin E	Vitamin C + E	Rosemary oil	Oregano oil	Rosemary +Oregano oil	Sig.
Blood pH	7.80 $\pm$ 0.03 ^a	7.20 $\pm$ 0.06 ^d	7.54 $\pm$ 0.04 ^c	7.57 $\pm$ 0.07 ^{bc}	7.74 $\pm$ 0.09 ^{ab}	7.67 $\pm$ 0.04 ^{abc}	7.70 $\pm$ 0.06 ^{abc}	**
<i>Days post immunization</i>								
3 days	3.60 $\pm$ 0.189 ^b	4.30 $\pm$ 0.150 ^a	4.29 $\pm$ 0.192 ^a	4.45 $\pm$ 0.173 ^a	4.40 $\pm$ 0.200 ^a	4.37 $\pm$ 0.142 ^a	4.57 $\pm$ 0.203 ^a	*
6 days	4.10 $\pm$ 0.189 ^b	4.67 $\pm$ 0.130 ^a	4.64 $\pm$ 0.192 ^a	4.75 $\pm$ 0.126 ^a	4.85 $\pm$ 0.229 ^a	5.00 $\pm$ 0.161 ^a	5.05 $\pm$ 0.087 ^a	*
9 days	3.30 $\pm$ 0.252 ^c	3.74 $\pm$ 0.219 ^{bc}	3.90 $\pm$ 0.257 ^{ac}	4.20 $\pm$ 0.150 ^{ab}	4.15 $\pm$ 0.150 ^{ab}	4.32 $\pm$ 0.300 ^{ab}	4.54 $\pm$ 0.249 ^a	*

Means having different letters in the same row differ significantly (P<0.05). * = (P<0.05), ** = (P<0.01), NS= Not significant

Table (8). Influence of using dietary antioxidant on some blood parameters ($\bar{X} \pm SE$) (within normal range) at the end of the experimental period.

Items	Control	Vitamin C	Vitamin E	Vitamin C + E	Rosemary oil	Oregano oil	Rosemary +Oregano oil	Sig.
Total Protein (g/dl)	5.12 $\pm$ 0.13 ^b	5.97 $\pm$ 0.17 ^a	5.41 $\pm$ 0.14 ^b	5.49 $\pm$ 0.17 ^b	5.22 $\pm$ 0.13 ^b	5.43 $\pm$ 0.16 ^b	5.47 $\pm$ 0.11 ^b	*
Albumen (g/dl)	2.76 $\pm$ 0.13	3.00 $\pm$ 0.07	2.83 $\pm$ 0.13	2.77 $\pm$ 0.14	2.65 $\pm$ 0.12	2.83 $\pm$ 0.05	2.81 $\pm$ 0.18	NS
Cholesterol (mg/dl)	88.17 $\pm$ 3.19 ^a	85.72 $\pm$ 2.28 ^{ab}	81.50 $\pm$ 3.76 ^{abc}	70.21 $\pm$ 2.9 ^c	77.28 $\pm$ 4.82 ^{abc}	78.64 $\pm$ 1.92 ^{abc}	75.92 $\pm$ 4.64 ^{bc}	*
Glucose (mg/dl)	95.12 $\pm$ 1.12 ^a	89.21 $\pm$ 0.60 ^{ab}	85.21 $\pm$ 0.18 ^b	69.38 $\pm$ 0.60 ^c	71.90 $\pm$ 3.59 ^c	75.30 $\pm$ 0.77 ^c	71.60 $\pm$ 0.52 ^c	**
Aspartate-aminotransferase, (AST) (U/mL)	141.5 $\pm$ 0.58 ^a	128.84 $\pm$ 1.88 ^b	115.5 $\pm$ 2.03 ^c	96.84 $\pm$ 2.17 ^d	83.5 $\pm$ 2.03 ^e	69.84 $\pm$ 1.31 ^f	61.5 $\pm$ 1.45 ^g	**
Alanine-aminotransferase, ALT (U/mL)	156.34 $\pm$ 1.54 ^a	144.56 $\pm$ 2.41 ^b	127.89 $\pm$ 1.26 ^c	118.56 $\pm$ 0.87 ^d	106.67 $\pm$ 1.93 ^e	91.67 $\pm$ 2.5g ¹	78.56 $\pm$ 2.22 ^g	**
Total antioxidant capacity, (TAOC) (U/L)	0.71 $\pm$ 0.01 ^c	0.74 $\pm$ 0.01 ^c	0.81 $\pm$ 0.02 ^b	0.82 $\pm$ 0.02 ^b	0.82 $\pm$ 0.01 ^b	0.84 $\pm$ 0.02 ^{ab}	0.87 $\pm$ 0.01 ^a	**
Malondialdehyde, (MDA) (mol/L)	2.20 $\pm$ 0.02 ^a	2.03 $\pm$ 0.06 ^b	1.79 $\pm$ 0.02 ^c	1.66 $\pm$ 0.03 ^d	1.55 $\pm$ 0.03 ^d	1.43 $\pm$ 0.03 ^e	1.32 $\pm$ 0.02 ^e	**

Means having different letters in the same row differ significantly (P<0.05). * = (P<0.05), ** = (P<0.01), NS= Not significant.

Table (9). Influence of using dietary antioxidant on semen quality ($\bar{X} \pm SE$) of cocks reared during summer season at the end of the experimental period

Items	Control	Vitamin C	Vitamin E	Vitamin C + E	Rosemary oil	Oregano oil	Rosemary +Oregano oil	Sig.
Semen ejaculate-volume(ml)	0.50±0.12	0.64±0.04	0.70±0.10	0.64±0.04	0.67±0.07	0.34±0.14	0.70±0.26	NS
Hydrogen-ion concentration (pH)	7.30±0.06 ^{bc}	7.37±0.03 ^{bc}	7.20±0.10 ^c	7.30±0.10 ^{bc}	7.50±0.06 ^{ab}	7.60±0.03 ^a	7.67±0.03 ^a	**
Sperm motility (%)	80.00±2.89 ^b	86.67±3.34 ^{ab}	88.34±1.67 ^{ab}	90.00±2.89 ^a	91.67±1.67 ^a	86.67±3.34 ^{ab}	95.00±2.89 ^a	*
Dead spermatozoa (%)	23.34±4.67 ^a	20.00±2.00 ^{ab}	16.67±0.67 ^{bc}	15.67±0.88 ^{bc}	13.34±1.34 ^{bcd}	11.34±0.67 ^{cd}	8.00±0.58 ^d	**
Sperm abnormalities (%)	18.34±4.64 ^a	14.34±1.86 ^{ab}	12.67±1.77 ^{abc}	11.00±1.15 ^{bcd}	9.34±0.67 ^{bcd}	7.34±0.67 ^{cd}	5.34±0.34 ^d	*
Sperm-cell concentration (x 10⁹/ml)	2.78±0.03 ^b	2.96±0.09 ^b	3.81±0.06 ^a	3.91±0.03 ^a	3.84±0.21 ^a	3.99±0.03 ^a	4.07±0.03 ^a	**
Acrosomal damage (%)	6.67±0.34 ^a	5.34±0.89 ^a	5.34±1.67 ^a	6.67±0.34 ^a	4.00±1.16 ^{ab}	4.67±0.67 ^{ab}	2.00±0.58 ^b	*

Means having different letters in the same row differ significantly ($P < 0.05$). * = ($P < 0.05$), ** = ($P < 0.01$), NS= Not significant.

Table (10). Inputs- output analysis and economic efficiency of laying hens reared during summer season at the end of the experimental period

Items	Control	Vitamin C	Vitamin E	Vitamin C + E	Rosemary oil	Oregano oil	Rosemary +Oregano oil	Si g.
Egg production	50.68	64.74	61.01	61.25	63.25	65.30	56.18	
Price/egg (LE)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	
Total revenue hen (LE)	63.35	80.93	76.26	76.57	79.07	81.62	70.22	
Total feed intake/ hen(kg)	8.78	8.62	8.83	8.76	8.84	8.92	8.77	
Price/Kg feed (LE)	5.250	5.255	5.265	5.260	5.310	5.290	5.300	
Total feed cost/ hen (LE)	46.08	45.27	46.49	46.07	46.92	47.19	46.48	
Fixed hen (LE)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
Total cost hen (LE)	49.08	48.27	49.49	49.07	49.92	50.19	49.48	
Net revenue/hen (LE)	14.27 ^c	32.65 ^a	26.77 ^{ab}	27.50 ^{ab}	29.15 ^a	31.43 ^a	20.74 ^{bc}	**
Economical efficiency (E.Ef.)	29.07 ^c	67.64 ^a	54.08 ^{ab}	56.04 ^{ab}	58.39 ^{ab}	62.62 ^a	41.91 ^{bc}	**

Means having different letters in the same row differ significantly ** = (P<0.01)

The price of Vit. C =50 LE/Kg. The price of Vit. E = 150 LE/Kg. The price of rosemary oil =300 LE/K, The price of oregano oil = 200 LE/Kg, Net revenue/hen(LE) = Total revenue - Total cost/hen, EEf= Net revenue/hen(LE) / Total cost/hen (LE)