EFFECT OF HEAT STRESS AND ORGANIC SELENIUM SUPPLEMENTATION ON SOME PHYSIOLOGICAL TRAITS IN TWO STRAINS OF DEVELOPED LAYING HENS

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Abstract

A total number of 168 hens at 22 weeks of age from two strains Silver Montazah and Matrouh (84 female each) were housed in floor pens. At 24 weeks of age, birds of each strain were randomly distributed to 4 treatments, 21 hens/ treatment (3 replicates 7 hens/ each). The first treatment was served as the control, the second treatment was subjected to heat stress, the third was supplemented with anti stress (organic selenium) at yeast selenium concentration of 0.4 mg/kg diet, and the last treatment was subjected to heat stress and anti stress. The heat exposure treatment was applied at 24 and 38 wks of age, where birds were exposed to 39± 1ºC for 4 hours / day for 4 consecutive days from 10.00A.M. to 2.00 P.M. using gas heaters. Results showed that: Body weight (BW) and growth rate (GR) of Silver Montazah strain were significantly higher than Matrouh strain. Heat stress had negative effect on BW and GR. Addition of Se-yeast as an anti stress improved BW and GR insignificantly. Body temperature (BT) and respiration rate (RR) in heat stressed hens were significantly higher than those of control. Data also illustrated that, BT and RR were higher in Silver Montazah than Matrouh strain, but this increase was not significant. Addition of anti stress as Selenium yeast exerted positive effect by reducing both body temperature as well as respiration rate under heat stress condition. Mortality rate (MR) was significantly higher in heat stressed hens compared with control and also in Silver Montazah than Matrouh strain. The anti stress reduced MR, but this reduction was not significant. Feed intake (FI) reduced in heat stressed hens compared with control, which was higher when anti stress added. Also, FI was higher in Silver Montazah than Matrouh strain. Heat stress caused a reduction in both Plasma total protein and globulin concentration, elevation in the albumin concentration, but the differences were not significant. Calcium and phosphorus in plasma also reduced under heat stress, but total cholesterol was increased. The anti stress improved this reduction keeping total cholesterol in normal level. It could be concluded that, selenium yeast as an anti stress can be recommended in both strains of developed laying hens diets to alleviate the negative effects of heat stress on laying performance under the condition of this study.

Key words: Heat stress, organic selenium, blood, physiological traits, laying performance.

INTRODUCTION

One of the problems challenging the poultry industry is the high ambient temperature, which persist for almost five months of the year in Egypt. High ambient temperature depresses live body weight, weight gain, feed intake, feed efficiency, egg production, egg weight, egg quality and increases mortality (Pavlik , *et al*. 2009 and Ezzat, *et al*. 2011).

Hanan,. (2006) reported that heat stress significantly increased respiration rate and body temperature in stressed chickens compared with control and in Inshas strain than Matrouh strain. The heat treatment caused a decline in both Plasma total protein and globulin concentration, but an elevation in the albumin concentration was observed. These differences were not significant. Heat stress caused an elevation in the Glucose concentration, but this rise was not significant. Shamoon *et al*. (2005) reported that heat stress impaired the feed conversion ratio (FCR) of birds. El-Tantawy *et al*. (2003) and *(*Abd-El-Hameid and Yousefs 2003) demonstrated that there was a significant decrease in weight gain and total plasma proteins of broiler chicks and a significant increase in mortality rate, body temperature and respiration rate corresponding to heat stress.

In stressed birds, free radical generation is responsible for the development of various diseases as well as for a decrease in bird's productivity and product quality (Surai and Dvorska 2001). In this respect, antioxidants play an important role in maintaining bird health, productive and reproductive performance (Hassan, *et al*. 2011).Sense of the known antioxidants within animal cells, are vitamin E, vitamin C and selenium which considered the most important to alleviate the deleterious effect of heat stress (Abd-El-Hameid, *et al*. 2001). Selenium acts in the metabolism of Cys and Met, and in the synthesis of thyroid hormones (Dahlke *et al*. 2005).

Salwa, *et al*. (2004) studied the effect of selenium on performance, hatchability immune response and some blood constituents under hot conditions in laying hens, they reported that, adding Se had a positive effect on the egg production, egg weight, feed efficiency, weight gain, and mortality rate of hens.

Selenium yeast is produced by the fermentation of yeast (Saccharomyces Cerevisiae) in a high Se medium (Maysa, *et al*. 2009) and also, Selenium yeast is the most bioavailable and less toxic source of selenium to be used in poultry diets. It does contribute to improve growth performance in commercial conditions and appears to reduce the impact of stress in commercial farming, lowering mortality rates and improving flock uniformity.

The supplementation of hen's food with organic selenium not only improves their health and productivity, but can also be a natural way to produce functional food, respectively the production of eggs enriched with selenium (Sara, *et al*. 2008).

Maysa, *et al*. (2009) reported that, Sel-Plex™ supplementation significantly increased live body weight, growth rate; the concentrations of total protein, globulin, glutathione peroxidase, selenium, triiodotherionine (T3), hemoglobin(Hb), red blood cells and white blood cells. Relative weights of ovary, testes, spleen, thymus and thyroid gland were significantly increased in selenium treated groups.

Therefore the present study was conducted to elucidate the effect of heat stress and organic selenium supplementation on the productive performance and some physiological traits for two developed strains of laying hens under environmental conditions of this study.

MATERIALS AND METHODS

The present study was carried out at the poultry research station "Inshas station", belonging to Animal Production Research Institute "APRI", Agricultual Research Center, Ministry of Agriculture, Giza, the experiment was conducted during the period from June to October. A total number of 168 hens aged 22 weeks of Silver Montazah and Matrouh strains (84 female each) were housed in floor pens were 2.5 matter height, 2 matter length and 2 matter width. They were well ventilation and supplied with constant florescent light with intensity of 40 Lux. At 24 weeks of age, hens of each strain were randomly distributed to 4 treatments (21 hen/ treatment), each treatment was divided into 3 replicates (7 hens/ replicate), and the treatments were as follow: control; heat stress; selenium yeast and heat stress + Se, groups. The birds were kept under normal brooding conditions in floor brooder pens and Wheat Straw was used as a litter in the pens. The heat stress (heat treatment) was applied at 24 and 38 wks of age, where birds were exposed to 39 ± 1ºC for 4 hours/day for 4 consecutive days from 10.00 A.M. to 2.00 P.M. using gas heaters. The temperature of control room was natural temperature (from 23 to 24ºC), the relative humidity was measured (RH= 55-60 %). Selenium Yeast (Organic Selenium) as an anti stress was added to ration with a concentration of 0.4 mg/kg diet from 22-42 wks of age. The composition of the basal diets is shown in Table (1).

Studied traits:

Growth performance:

Live body weight (g), growth rate (GR), feed intake (g) and mortality rate for each bird were recorded each four weeks.

Where: **GR=** [(final body weight–initial body weight) / {(final body weight + initial body weight) / 2}]*100

Body temperature (C):

Body temperature was measured using digital thermometer by inserting the hand-held thermometer into the cloaca (with depth 4 cm) at "24 to 38" weeks of age during the treatment.

Respiration Rate (RR):

The respiration rate was counted by observing the abdominal movements for one minute at 38 week of age.

Plasma constituents:

At "38" weeks of age three blood samples from each treatment were drown from brachial vein in heparinized tube and centrifuged at 3000 rpm for 10 minutes to obtain the plasma then stored at -20 ºC until the analysis. The plasma samples were used in the analysis to measure total protein (T.P.)**,** albumin (Alb),total Cholesterol, **,** Calcium and Phosphorus by available commercial kits. Blood analysis was done by using available commercial kits.

Statistical analysis

Collected data were statistically analyzed using the multiple way analyses of variance using the general linear models (GLM) statistical analysis (SAS) software package (2003).

Table 1. Composition and calculated chemical analysis of the basal diet.

Ingredients	%
Yellow corn	63.50
Soybean meal (44%)	24.57
Wheat bran	2.0
Limestone (CaCo3)	7.77
Premix *	0.30
NaCl	0.30
Di-Calcium phosphate	1.50
DL- methionine	0.06
Total	100.00
Calculated analysis **	
CP% Crude protein (%)	16.00
M.E., Kcal/kg diet	2703
Crude fiber %	3.47
Crude fat %	2.86
Calcium %	3.32
Available Phosphorus %	0.406
Lysine %	0.889
DL-Methionine %	0.350
Methionine + Cystine	0.620
Sodium	0.135

***** Premix provides by 3 Kg: Vit. A, 10000000 IU; Vit.D3, 2000000 IU; ; Vit. E,10000 IU ; Vit K3 1000 mg; Vit.B1 1000 mg; Vit. B2 5000 mg; Vit. B6 1500 mg; Vit. B12**,** 10 mg, Pantothenic acid 10000 mg; Niacin 30000 mg; Biotin 50 mg; Folic acid 1000 mg; Choline 250 mg; Selenium 100 mg; Copper 4000 mg; Iron 30000 mg; Manganess 60000 mg; Zinc 50000 mg; iodine 1000 mg; Cobalt 100 mg and CaCo3 3000 g.

** According to feed composition tables for animal and poultry feedstuffs used in Egypt (2001).

RESULTS AND DISCUSSION

Effect of heat stress and selenium yeast on live body weight and growth rate:

Tables (2 and 3) showed the live body weight and growth rate of Silver Montazah and Matrouh strains respectively. Where, Silver Montazah hens were significantly ($p \leq 0.05$) higher than Matrouh strain in their body weight and growth rate at all ages. Since heat stress had negative effect on body weight (BW) and growth rate (GR). The addition of Se yeast increased BW and GR, but this improvement was not significant. Similar results were reported by Enaiat, *et al*. (2009) who reported that, Silver Montazah strain had significantly higher body weight and feed consumption than Matrouh strain, while there were no significant differences between both strains in age at sexual maturity. Hanan (2006) reported that, body weight and growth rate decreases when environmental temperature increases, resulting in a reduction of feed intake. Also, Sahin and Kucuk (2007) concluded that, there is considerable evidence that, growth rate of chickens was reduced during the hot environmental temperature. Moreover, Maysa, *et al*. (2009) reported that, Sel-Plex™ supplementation significantly increased live body weight and growth rate compared with control.

Effect of heat stress and selenium yeast on feed intake:

Table (4) represented the effect of heat stress on feed intake, where it showed that, feed intake (FI) was reduced in heat stressed hens compared with control, but FI was higher when anti stress was added. Also, FI was higher in Silver Montazah than Matrouh strain, but this increase was not significant. These results are supported by Enaiat, *et al*. (2009) who reported that, Silver Montazah strain had significantly higher body weight and feed consumption than Matrouh strain; Abd-El-Hameid, *et al*. (2001) who found that, high environmental temperatures have deleterious effects, reducing the feed intake; live weight gain and feed efficiency of poultry. Also, Bartlett and Smith (2003) reported that, feed intake is depressed in hot environments in order to reduce the metabolic rate and hence body heat load. Mashaly, *et al*. (2004) reported that, concomitant with reduce feed intake caused reductions in growth rate and body weight, also, the temperature above 28ºC had negatively effects on feed: gain ratio in broilers.

Effect of heat stress and selenium yeast on body temperature and respiration rate:

Table (5) showed the effect of heat stress on body temperature and respiration rate, where body temperature (BT) (ºC) and respiration rate (RR) (breath/ minute) in heat stressed hens were significantly higher than controls. Also, it was observed that,

BT and RR were higher in Silver Montazah strain than Matrouh strain, but this increase was not significant. The addition of anti stress (Selenium yeast) had a positive effect, where it reduced body temperature and respiration rate under heat stress. These results agree with Hanan (2006) who reported that, exposing chickens to high environmental temperature produces an initial increase in the temperature of peripheral tissues and subsequently increase in body temperature.

Effect of heat stress and selenium yeast on mortality rate:

The effect of heat stress on mortality rate is presented in Table (6), heat stress caused an increase in the average mortality rate compared with control and Silver Montazah strain which was higher than Matrouh strain in their mortality rate, these results agree with Mashaly *et al*. (2004) who found that, mortality rate was higher in the heat stressed group compared with the cyclic and control groups. El- Tantawy *et al*. (2003) concluded that, there was a significant decrease in weight gain and total plasma proteins of broiler chickens and a significant increase in mortality rate, adrenaline hormones, body temperature and respiration rate corresponding to heat stress. Also, Mujahid *et al.* (2005) pointed that, heat stress is of major concern for poultry, especially in the hot regions of the world because of the resulting poor growth performance, immune suppression and high mortality.

Effect of heat stress and selenium yeast on some plasma constituents:

The effect of heat stress on plasma constituents is presented in Table (7), where it showed that, heat stress caused a reduction in both Plasma Total Protein and Globulin concentration, and elevation in the Albumin concentration, but these differences were not significant. Calcium and phosphorus in plasma were reduced under heat stress, but total cholesterol was increased. The anti stress elevated all of them but caused reduction in total cholesterol. These results agree with Enaiat, *et al*. (2009) who reported that, Silver Montazah strain had recorded a significant increase in plasma concentrations of Calcium, Cholesterol, total protein and T3 hormone than Matrouh strain. Hanan (2006) also found that, heat stress caused decline in both Plasma Total Protein and Globulin concentration, and elevation in the Albumin concentration, but these differences were not significant, also, Abd-El-Hameid, *et al*. (2001) and Maysa, *et al*., (2009) reported that, Sel-Plex™ supplementation significantly increased the concentrations of total protein, globulin, glutathione peroxidase, selenium, triiodotherionine (T3), hemoglobin(Hb), red blood cells and white blood cells.

Table 2. Effect of heat stress and Selenium yeast on live body weight (gm) for two strains of developed laying hens.

Main effect		26 wk. age	30 wk. age	34 wk. age	38 wk. age	42 wk. age
1-Strain	1- Silver Montazah	1187.89 ± 9.0 [a]	1228.40 ± 8.8 [a]	1280.61 ± 9.1 [a]	1340.21± 9.59 [a]	1400.50 ± 9.73[a]
	2- Matrouh	1050.98 ± 9.0 [b]	1140.70 ± 8.7 [b]	1200.98 ± 8.9 [b]	1255.94 ± 9.59 [b]	1320.37 ± 9.71 [b]
2-Temperature	1- Control	1112.54 ± 9.0 [a]	1188.35 ± 8.7 [a]	1246.45 ± 8.9 [a]	1308.19 ± 9.50 [a]	1396.81± 9.75 [a]
	2-Heat stress	1108.32 ± 9.0 [a]	1182.75 ± 8.8 [a]	1237.14 ± 9.1 [a]	1278.96 ± 9.63 [b]	1368.06± 9.69 [b]
3- Anti-stress	1-with	1140.39 ± 9.0 [a]	1200.42 ± 8.7[a]	1264.83 ± 8.9 [a]	1301.75 ± 9.54 [a]	1390.43± 9.74 [a]
(Selenium Yeast)	2-without	1100.48 ± 9.0 [a]	1154.59 ± 8.8 [a]	1210.76 ± 9.1 [a]	1234.40 ± 9.60 [a]	1300.44 ± 9.71[a]

a,b …, means within column with different superscripts are significantly different (P≤ 0.05).

Table 3. Effect of heat stress and Selenium yeast on growth rate (%)for two strains of developed laying hens.

Main effect		26-30 wk	30-34 wk	34-38 wk	38-42 wk
1-Strain	1- Silver Montazah	4.94 ± 0.23 [a]	5.18 ± 0.30 [a]	6.92 ± 0.07 [a]	7.09 ± 0.30 [a]
	2- Matrouh	4.42 ± 0.23 [a]	4.68 ± 0.30 [a]	6.48 ± 0.07 [a]	6.38 ± 0.30 [a]
2-Temperature	1- Control	4.85 ± 0.23 [a]	5.15 ± 0.30 [a]	6.78 ± 0.07 [a]	7.09 ± 0.30 [a]
	2-Heat stress	4.51 ± 0.23 [a]	4.71 ± 0.30 [a]	6.62 ± 0.07 [a]	6.38 ± 0.30 [a]
3- Anti-stress	1-with	4.80 ± 0.30 [a]	5.18 ± 0.23 [a]	6.70 ± 0.30 [a]	6.93 ± 0.07 [a]
(Selenium Yeast)	2-without	4.56 ± 0.30 [a]	4.68 ± 0.23 [a]	6.40 ± 0.30 [a]	6.54 ± 0.07 [a]

a,b …, means within column with different superscripts are significantly different (P≤ 0.05).

Table 4. Effect of heat stress and Selenium yeast on feed intake (gm/bird/day) for two strains of developed laying hens.

Main effect		24-28 wk	28-32 wk	32-36 wk	36-40 wk
1-Strain	1- Silver Montazah	114.50± 3.51 [a]	118.45 ± 3.43 [a]	119.50 ± 3.54 [a]	121.61 ± 3.29 [a]
	2- Matrouh	111.07± 3.51 [a]	112.30 ± 3.43 [a]	112.52 ± 3.54 [a]	113.92 ± 3.29 [a]
2-Temperature	1- Control	116.60 ± 3.51 [a]	117.86 ±3.43 [a]	118.10 ± 3.54 [a]	120.90 ± 3.29 [a]
	2-Heat stress	108.96 ± 3.51 [a]	112.89 ± 3.43 [a]	113.92 ± 3.54 [a]	114.62 ± 3.29 [a]
3- Anti-stress	1-with	114.89 ± 3.51 [a]	117.38 ± 3.43 [a]	119.52 ± 3.54 [a]	120.85 ± 3.29 [a]
(Selenium Yeast)	2-without	110.70 ± 3.51 [a]	113.37 ± 3.43 [a]	112.50 ± 3.54 [a]	114.68± 3.29 [a]

a,b …, means within column with different superscripts are significantly different (P≤ 0.05).

Table 5. Effect of heat stress and Selenium yeast on body temperature (BT) (ºC) and respiration rate (RR) (breath/ minute) for two strains of developed laying hens.

Main effect		24 wk of age		38 wk of age	
		BT	RR	BT	RR
1-Strain	1- Silver Montazah	43.6 ± 0.08 [a]	94.3 ± 1.08 [a]	42.0 ± 0.05 [a]	92.9 ± 0.93 [a]
	2- Matrouh	42.4 ± 0.08 [b]	90.1 ± 1.08 [b]	41.8 ± 0.05 [a]	92.1 ± 0.93 [a]
2-Temperature	1- Control	41.22 ± 0.08 [b]	94.4 ± 1.08 [b]	40.5 ± 0.05 [a]	92.7 ± 0.93 [a]
	2-Heat stress	43.3 ± 0.08 [a]	100.0 ± 1.08 [a]	40.9 ± 0.05 [a]	95.0 ± 0.93 [a]
3- Anti-stress	1-with	41.4 ± 0.08 [b]	90.4 ± 1.08 [b]	41.5 ± 0.05 [a]	91.6 ± 0.93 [a]
(Selenium Yeast)	2-without	43.5 ± 0.08 [a]	93.9 ± 1.08 [a]	41.8 ± 0.05 [a]	93.3 ± 0.93 [a]

a,b …, means within column with different superscripts are significantly different (P≤ 0.05).

Table 6. Effect of heat stress and Selenium yeast on mortality rate (%) for two strains of developed laying hens.

Main effect		24-28 wk	28-32 wk	32-36 wk	36-40 wk
1-Strain	1- Silver Montazah	1.04 ± 0.49 [a]	1.00 ± 0.15 [a]	0.40 ± 0.77 [a]	0.30 ± 0.33 [a]
	2- Matrouh	0.42 ± 0.49 [a]	0.30 ± 0.15 [a]	0.00 ± 0.77 [a]	0.00 ± 0.33 [a]
2-Temperature	1- Control	0.42 ± 0.49 [a]	0.21 ± 0.15 [a]	0.21 ± 0.76 [a]	0.00 ± 0.33 [a]
	2-Heat stress	1.25 ± 0.49 [a]	0.83 ± 0.15 [a]	0.63 ± 0.76 [a]	0.42 ± 0.33 [a]
3- Anti-stress	1-with	0.30 ± 0.49 [a]	0.21 ± 0.15 [a]	0.00 ± 0.77 [a]	0.00 ± 0.33 [a]
(Selenium Yeast)	2-without	1.20 ± 0.49 [a]	1.00 ± 0.15 [a]	0.63± 0.77 [a]	0.55 ± 0.33 [a]

a,b …, means within column with different superscripts are significantly different (P≤ 0.05).

Table 7. Effect of heat stress and Selenium yeast on blood measurements for two strains of developed laying hens.

Main effect		Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	Calcium (mg/dl)	Phosphorus (mg/dl)	Total cholesterol (mg/dl)
1-Strain	1- Silver Montazah	6.03 ± 0.18 [a]	3.63 ± 0.08 [a]	2.40 ± 0.18 [a]	13.76 ± 0.13 [a]	3.38 ± 0.16 [a]	136.02 ± 4.94 [a]
	2- Matrouh	5.37 ± 0.18 [b]	3.59 ± 0.08 [a]	1.78 ± 0.18 [b]	13.42 ± 0.13 [a]	3.04 ± 0.16 [a]	93.75 ± 4.94 [b]
2-Temperature	1- Control	5.80 ± 0.18 [a]	367± 0.08 [a]	2.13 ± 0.18 [a]	13.72 ± 0.13 [a]	3.23 ± 0.16 [a]	114.18 ± 4.94 [a]
	2-Heat stress	5.60 ± 0.18 [a]	3.56 ± 0.08 [a]	2.04± 0.18 [a]	13.45 ± 0.13 [a]	3.20 ± 0.16 [a]	115.59 ± 4.94 [a]
3- Anti-stress	1-with	5.90 ± 0.18 [a]	3.62± 0.08 [a]	2.28 ± 0.18 [a]	13.64 ± 0.13 [a]	3.27 ± 0.16 [a]	108.40 ± 4.94 [a]
(Selenium Yeast)	2-without	5.49 ± 0.18 [a]	3.58 ± 0.08 [a]	1.91 ± 0.18 [a]	13.53 ± 0.13 [a]	3.16 ± 0.16 [a]	121.37 ± 4.94 [a]

a,b …, means within column with different superscripts are significantly different (P≤ 0.05).

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تأثير الاجهاد الحرارى واضافة السيلينيوم العضوى على بعض القياسات الفسيولوجيه فى سلالتين من الدجاج البياض المستنبط

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١. *قسم بحوث تربية الدواجن – معهد بحوث الانتاج الحيوانى – مركز البحوث الزراعيه – الدقى – الجيزه – مصر*
٢. *قسم إنتاج الدواجن – كلية الزراعه – جامعة عين شمس– شبرا الخيمه – القاهره – مصر*

أجريت هذه الدراسه بمحطة بحوث تربية الدواجن بأنشاص معهد بحوث الانتاج الحيوانى. و ذلك بهدف دراسة تأثير الاجهاد الحرارى و أضافة السيلينيوم العضوى على بعض القياسات الفسيولوجيه فى سلالتين من الدجاج البياض (المنتزه الفضى و مطروح) من عمر ٢٢ – ٤٢ إسبوع. حيث تم إستخدام ١٦٨ دجاجه من كلا السلالتين (٨٤ من كل سلاله) و تمت التربيه على الارض. عندما وصلت الدجاجات لعمر ٢٤ إسبوع تم توزيع كل سلاله عشوائيا إلى ٤ معاملات تجريبيه (٢١ دجاجه/ معامله) ، كل معامله تم توزيعها إلى ٣ مكررات (٧ دجاجات / مكرر). و كانت المعاملات كالاتى:- المعامله الاولى (كنترول)، المجموعه الثانيه تعرضت لمعاملة الاجهاد الحرارى عند عمرى ٢٤ و ٣٨ إسبوع فقط (٣٨-٤٠ (٣٩ ±١) °م / ٤ ساعات يوميا / ٤ أيام متتاليه من الساعه ١٠ صباحا- ٢ ظهرا) ، المجموعه الثالثه تم إضافة مضاد الاجهاد الحرارى و هو السيلينيوم العضوى بنسبة ٠.٤ ملليجرام/كجم عليقه و تمت إضافته طول فترة التجربه (من ٢٢ – ٤٢ إسبوع) ، المجموعه الرابعه تعرضت للاجهاد الحرارى مع إضافة مضاد الاجهاد الحرارى.

و كانت أهم النتائج المتحصل عليها كما يلى: وزن الجسم فى سلالة المنتزه الفضى كان أعلى معنويا عن سلالة مطروح فى كل الاعمار، كما لوحظ أن معاملة الاجهاد الحرارى سببت إنخفاض وزن الجسم ، بينما مضاد الاجهاد سبب زيادته. معدل النمو فى سلالة المنتزه الفضى كان أعلى من سلالة مطروح بينما كانت الزياده غير معنويه ، كما أن الاجهاد الحرارى سبب إنخفاض فى معدل النمو ، بينما إضافة مضاد الاجهاد سببت زيادة معدلات النمو. درجة حرارة الجسم و معدل التنفس فى الطيور المعرضه لمعاملة الاجهاد الحرارى كان أعلى معنويا من الكنترول و ذلك عند عمر ٢٤ إسبوع بينما كانت الزياده فى كلاهما غير معنويه عند عمر ٣٨ إسبوع. سلالة المنتزه الفضى كانت درجة حرارة جسمها و معدل التنفس فيها أعلى معنويا من سلالة مطروح و ذلك عند عمر ٢٤ إسبوع بينما كانت الزياده فى كلاهما غير معنويه عند عمر ٣٨ إسبوع. مضاد الاجهاد الحرارى (السيلينيوم العضوى) كان له تأثير إيجابى حيث أنه سبب إنخفاض معنوى فى كلا من درجة حرارة الجسم و معدل التنفس و ذلك عند ٢٤ إسبوع ، بينما الانخفاض كان غير معنوى عند ٣٨ إسبوع. كمية العلف المأكوله كانت أعلى فى سلالة المنتزه الفضى بالمقارنه بسلالة مطروح و لكن الزياده

كانت غير معنويه، كما لوحظ أن الاجهاد الحرارى خفض كمية العليقه المأكوله بينما إضافة مضاد الاجهاد زودت استهلاك العليقه. لوحظ أن معدل النفوق كان أعلى فى سلالة المنتزه الفضى بالمقارنه بسلالة مطروح و لكن الزياده كانت غير معنويه، كما أن الاجهاد الحرارى سبب زيادة معدلات النفوق بالمقارنه بالمجموعه الكنترول و كانت الزياده غير معنويه بينما إضافة مضاد الاجهاد قلل معدلات النفوق و لكن بشكل غير معنوى. لوحظ أن البروتين الكلى و الجلوبيولين و الكولستيرول الكلى فى بلازما الدم فى سلالة المنتزه الفضى كان أعلى معنويا من سلالة مطروح ، بينما الالبيومين و الكالسيوم و الفوسفور كان فى المنتزه الفضى اعلى بشكل غير معنوى عن سلالة مطروح. كذلك لوحظ أن الاجهاد الحرارى سبب إنخفاض غير معنوى فى كل من البروتين الكلى و الجلوبيولين و الكالسيوم و الفوسفور بينما سبب زيادة غير معنويه فى كلا من الالبيومين والكولستيرول الكلى فى بلازما الدم، بينما مضاد الاجهاد أدى إلى زيادة هذه المعدلات و لكن بشكل غير معنوى.

- توصى الدراسة بإضافة السيلينيوم العضوى لعلائق الدجاج البياض المستنبط لخفض تأثير الإجهاد الحرارى ولتحسين الأداء الانتاجى والفسيولوجى لسلالة المنتزة الفضى والمطروح البياضه.