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EFFECT OFBETAINE LEVELS ON BROILER PERFORMANCE UNDER CYCLIC HEAT STRESS

El-Sheikh, T. M[1] *; M. M. Ahmed[2] and M. A. Fouad[1]

[1] Dep. of Poult. Prod., Fac. of Agric., Sohag Uni., Sohag, Egypt.

[2] Dep.t of Poult. Prod., Fac. of Agric., Assiut Uni., Assiut, Egypt.

Corresponding author: Talaat Mostafa Elsheikh; E-mail: talaatm2@yahoo.com.

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ABSTRACT: This study was carried out at the Research Poultry Farm, Faculty of Agriculture, Sohag University,Egypt. It was designed to study the effect of betaine supplementation on broilers performance under cyclic heat stress. A total number of 375 Ross, one day-old were equally divided into five groups (75 birds/group) with three replicates (25birds / replicat). In the first group, birds were fed a commercial ration produced with ALWADI Company without any betaine supplementation and served as control group. While, birds in the 2nd, 3rd, 4th and 5th groups were fed the same diet with supplemented betaine at different levels of 100, 150, 200 and 250% i.e. 2, 3, 4 and 5kg betaine/1000 kg diet, respectively compared to the company recommendations. All birds were daily exposed to cyclic heat stress (35°C) from 8 AM to 4 PM and then from 4 PM to 7 AM , they were exposed to natural ambient temperature. Chicks in all groups were housed in partitioned litter floor. Each pen was used as a replicate (25chicks) of the treatment, provided with a feeder and one nipple for supplementing water. Feed and water were available ad-libitim throughout the experimental period. All chicks were exposed to traditional continuous lighting programs with 60 watt from incandescent lamb at the height of 2.4 m from the floor up to the marketing age. The results showed that the BW and BWG significantly improved in treated groups. Feed consumption and feed conversion ratio significantly improved in treated groups. Rectal temperature significantly increased at 42 days of age and respiration rate significantly increased at 14, 21 and 42 days of age in treated groups. Heart percentage significantly increased in treated groups compared to control group. Chemical composition of meat was no significantly affected with betaine levels compared to control group.

Key words: Betaine levels, cyclic heat stress, performance, broilers.

INTRODCUTION

Betaine is the trimethyl derivative of the amino acid glycine and it is a compound which naturally occurs in animal and plant tissues (Kidd et al., 1997and Lipiński et al., 2012). Common sources of betaine are sugar beets and their by-products such as molasses and condensed molasses soluble (Eklund et al., 2005).Several researchers reported that betaine improved performance of broilers. Abhay et al. (2015) found that the level of 2g betaine / kg diet under thermal stress, significantly increased body weight from one day old to 16 days of age by about 2.3% compared to the control group. Nofal et al. (2015) used 1.3 and 2g betaine/kg diet in broilers chicks , they found a significant increase in body weight gain by about 28 and 43%, respectively, During the age of 8 to 12 weeks of age without heat stress compared to control group. While under heat stress the same two levels from 13 to 16 weeks of age significantly increased body weight gain by about 8.3 and 9.3%, respectively compared to the control group. Alahgholi et al. (2014) stated that supplementation of betaine at 1.5g/kg diet significantly increased feed consumption from 14 to 28 days of age by about 7.37% compared to the control group. Slive et al . (2013) found that the feed conversion ratio was significantly increased in the groups fed betaine supplementation at 0.092, 0.096, 0.065 and 0.05% of the diet compared to control group. Abhay et al. (2015) found that the broilers supplemented with 1.3 and 2 g betaine / kg diet significantly decreased mortality rate under heat stress by about 3.4 and 6.2%, respectively compared to the control group. Attia et al. (2009) found that broilers fed 1g betaine /kg diet had increased giblets percentage and increased liver percentage compared to control group. Li andHaijun (2006) found that the liver weight in the group supplemented 1g betaine/kg diet was heavier compared to control group from 48 to 57 days. Therefore, this study aimed to study the effect of betaine supplementation on broilers performance under cyclic heat stress.

METRAILES AND METHODS

The experimental work was carried out at the Research of Poultry Farm, Faculty of Agriculture, Sohag University, Sohag, Egypt. It aimed to study the effect of betaine supplementation on broilers performance under cyclic heat stress. A total number of 375 Ross, one day -old were equally divided into five groups (75 birds/each) with three replicates (25birds/each) for each group. In the first group, birds were fed a commercial ration produced with ALWADI Company without any betaine supplementation and served as control group. While, birds in the 2nd, 3rd, 4th and 5th groups were fed the same diet and supplemented with betaine at different levels of 100, 150, 200 and 250%i.e. 2, 3, 4 and 5kg betaine/1000 kg diet, respectively accordingto the company recommendations as showen in Tabele (1).All birds were daily exposed to cyclic heat stress (35◦C) from 8 AM to 4 PM and then from 4 PM to 7AM, they were exposed to natural ambient temperature. Chicks in all groups were housed in partitioned litter floor; each of them with (200cm ×100 cm). Each pen was used as a replicate (25chicks) of the treatment, provided with a feeder and one nipple for supplementing water. Feed and water were available ad-libitim throughout the experimental period. All chicks were exposed to continuous lighting programs (24L: 0 D, 23 L: 1D, 22L: 2D, 21L: 3D) during 1, 2, 3 and 4 weeks as well as (21L: 3D) with 60 watt light density from incandescent source lamb at the height of 2.4 m from the floor up to the marketing age.

The birds were weight individually every week and the weight was recorded to the nearest 1 gram. Feed consumption was recorded weekly then body weight gain and feed conversion were calculated weekly to the end of the experiment at 42 day of age. Body temperature (BT/ºC) and respiration rate (RR/rpm) were measured third weekly (3 chicks / rep) by using a medical thermometer and stopwatch, respectively.

At the end of the experiment, 3 birds from each replicate were selected weight of the replicate randomly for slaughter and determine of carcass quality. Samples of carcass meat were taken for chemical analysis using the procedures of A.O.A.C. (2000).

Statistical analysis of the obtained data was carried out according to SAS (1996). Significant differences of means were tested using Duncans multiple range test (Duncan,1955).

RESULTES AND DISUUCION

The results of body weight (Table 2) showed that the body weight of birds were significantly (P≤0.05) affected by betaine supplementation at 1, 3, 4, 5 and 6 weeks of age. The body weight for birds in the (100 and 150%) groups were significantly higher by about 2.8, 2.1% respectively, than those of the control group at one week of age. At marketing age (6 week of age), the body weight of birds in the treatment at 100% betaine was significantly higher by about 1% than those of the control group. The improvement in the body weight in treated groups could be attributed to the positive effect of betaine through more efficiency on the digestibility of energy and fat in the body. These results may be explained according to Eklund et al. (2005) who found that the potential functions of betaine improve the digestibility of specific nutrients of broilers under heat stress.

The obtained results are an agreement with Zulkifi et al. (2004) who noted that betaine levels supplementation at 50 and 100g/kg for broilers diet significantly (P≤0.05) increased body weight by about 2.7 and 1.3% respectively, at 7 days under heat stress compared to the control group.

They added that both levels of betaine significantly increased body weight at 35 days by about 0.46 and 3.3% respectively, than those of the control group. Similarly, the results of Jafer et al. (2015) showed that broiler chicks supplemented with betaine at 0.5, 0.25 and 0.375 mg/kg diet significantly (P≤0.05) increased body weight by about 39.03, 37.97 and 38.05% respectively, as compared with the control group.

Results of body weight gain (Table 3) showed that the body weight gain of birds was significantly (P≤0.05) affected during the period from 1-7, 21-28, 28-35, 35-42 and 1- 42 days of age.

Body weight gain for birds supplemented with (100%) was significantly higher by about 4.2% from 1-7days of age than those of the control group. Also, body weight gain for treated birds at 100 and 200% were significantly higher than those of control group by about9 and 1.2% respectively, during the period from 21-28 days of age. While the body weight gain for birds in the 100, 150,200, and 250% groups during the period from 35-42 days of age were highly significant than the control group by about 5.55, 2.90, 0.77 and 6.88% , respectively. The body weight gain of birds at the level of 100% was highly significant than the control group by about 1% during the period from 1-42 days of age. The body weight gain for birds in the 100, 150,200, 250% groups during the period from one day old to 42 days of age were highly significant than the control group by about 9, 5and 1 %, respectively. The current results agree withthose of Shaojun et al.,(2015) who found a significant (P≤0.05) increase in body weight gain for broilers treated with betaine at 0.1 , 0.2 and 0.4% betaine / kg diet from 28 days to 42 days of age by about 3.3 and 19.1% compared to the control group. Also, Moghadam et al., (2010) found that the broilers supplemented with 33, 66, 100% betaine/kg diet significantly (P≤0.05) increased body weight gain by about 4.48, 4.48, 3.1 % respectively, compared to the control group at days from one day old to 21 days.

The results of feed consumption (Table 4) showed that the feed consumption was significantly (P≤0.05) affected during the period from 1-7, 7-14, 14-21 and 21-28.

The results of feed conversion ratio (Table 5) showed that means of FCR of broilers

significantly (P≤0.05) effected by betaine supplementation during the period from one day old to 7, However the average values of FCR for broilers in the 2nd (100%), 3rd (150%) ,4th (200%) and 5th (250%) groups significantly decreased (P≤0.05) compared to 1st control group by about 6.1, 10.9, 7.4 and 4.1%respectively, during the period from one day old to 7 days of age . The improvement in FCR of broilers chicks in treated2nd (100%), 3rd (150%) ,4th (200%) and 5th (250%) groups may be explained by amore efficient utilization of dietary protein for lean accretion which is support by reduced blood urea–N levels, increased N retention, energy and reduced requirements for metabolisable energy (Eklund et al .,2006). These obtained results agree with Lukic et al.(2012) who found that the betaine supplementation at2g /kg diet significantly decreased feed conversion by about 1.5% compared to control group. Farina et al. (2012) found that the chicks supplemented with 1200mg/kg betaine with a diet had significantly decreased feed conversion ratio by about 24% compared to control group.

The results of rectal temperature (Table 6) showed that birds had insignificant effect by betaine supplementation during the periods 7, 14, 21, 28 and 35 days of age, while it was significantly increased (P≤0.05) at 42 days of age by about 0.14, 1.5, 1.4 and 1.6% respectively, compared to the control group. The increase in rectal temperature of broiler chicks in the treated groups at the end of the experimental period may be due to the increase in vitality and some physiological body reactions (Attia et al., 2009). These results agree with those of Nofal et al. (2015) who found that the from 8 to 12 weeks of age broilers supplemented with betaine at 1 and 2 g betaine /kg diet under heat stress significantly increased rectal temperature by about 0.91 and 1.9%, respectively. In contrast, the authors indicated that from 13 to 16 weeks of age the chicks supplemented with betaine at 1 and 2 g betaine /kg without heat stress decreased rectal temperature by about 1.4 and 2.8%, respectively. Abhay et al. (2015) showed a significant decrease in rectal temperature in broilers supplemented betaine at 1.3 and 2 g betaine /kg diet by about 0.47 and 0.49% respectively, compared to the control group at 21 days of age. While, it reached at35 days of age to 3.1 and 4.1%, respectively compared to the control group. The results of respiration rate (Table 7) showed that the means of respiration rate of broilers chicks significantly (P≤0.05) affected by betaine supplementation at 14, 21 and 42 days of age , However the means of respiration rate for broilers in the 3rd (150%),4th (200%)and 5th (250%) groups significantly increased (P≤0.05) compared to 1st control group at the 14 days of age by about12.2, 16.9 and 18.5% respectively, Also at 21 days of age the means of respiration rate for broilers in the 3rd (150%) ,4th (200%) and 5th (250%) groups significantly increased (P≤0.05) compared to 1st control group by about 6.5 ,7.2 and 8.8% respectively , At 42 days of age the means of respiration rate for broilers in the 3rd (150%) ,4th (200%) and 5th (250%) significantly increased (P≤0.05) compared to 1st (control) by about 13.9, 5.5 and 10.2%,respectively.The increase respiration rate for broiler chicks in treated groups at 14,21 and 42 days of age may be due to increased in panting, which results in loss of $Co_2$and an increase in blood pH where elevation of blood pH and consequently increase respiration rate (Balnave and Gorman ., 1993).These obtained results agree with Nofal et al. (2015) who found that the broilers supplemented betaine at 1 and 2 g betaine /kg diet under heat stress significantly increased respiration rate by about 27.5 and 36.7% respectively, compared to the control group.

The results of slaughter traits (Table 8) showed no significant difference on carcass traits expect on heart percentage of birds in the groups supplemented with betaine at

100, 150, 20 and 250% significantly increased (P≤0.05) by about 7.5, 17.5, 20 and 30%, respectively compared to the control group. The increased heart weight could be attributed to increase in blood pressure under heat stress. These obtained results agree with those of Nofal et al. (2015) who found that the broilers supplemented with betaine at levels of 1 and 2%/kg diet significantly increased giblets % by about 11.6 and 11.9% respectively, compared to the control group. Similarly, Attia et al. (2009) found that broilers fed 1g betaine /kg diet had increased giblets percentage and increased liver percentage compared to the control group.

Jafer et al. (2015) found a significantly decreased gizzard % by about 2.8% for broilers supplemented with betaine at levels of 0.25 and 0.375% respectively, compared to the control group. Similarly, Rao et al. (2011) reported that the broilers supplemented with 800 mg betaine /kg diet significantly decreased liver weight compared to the control group from 21 to 42 days of age. Moghadam et al. (2010) reported that the broilers supplemented with betaine levels significantly decreased liver weight by about 1.2 and 2.9 % at levels 33 and 100% /kg diet but it reached at levelof66%/kg to 0.42% respectively, compared to control group. Similarly, Nofal et al. (2015) found that the broilers supplemented with betaine levels at 1 and 2%/kg diet significantly increased dressing percentage by about 12.7and 16.2%, respectively without heat stress.

Shaojun et al. (2015) found that the broilers supplemented betaine levels 1, 2 and 4 % betaine/kgdietunder heat stress significantly increased abdominal fat by about 1, 2.2 and 1.5%; 14.6, 6.1 and 5.4% as well as 16.8, 6.8 and 6.8% at days 28,35 and 42 of age respectively ,compared to the control group.

The results of carcass chemical composition in Table (9) showed no significant effects of betaine supplementation on the percentage of moisture, crude protein, crude fat, crude fiber and crude ash of carcass in chicks under different levels of betaine. These results agree with those of Hassan et al. (2005) who found that betaine supplementation in growing chicks at 0.072 and 0.0144% betaine /kg diet was did not significantly affect of chemical composition of carcass compared to control group.

Finally, the research concluded that body weight, body weight gain,feed consumption and feed conversion ratio were significantly improved in treated groups100, 200, 150 and 250% respectively, all over the experimental period expect initial body weight. Slaughter traits of birds were no significantly affected with betaine levels expect heart percentage significantly increased in treaded groups 100, 150, 200 and 250% respectively compared to control group.

Table (1): Ingredients and chemical analysis of the experimental diets.

Chemical analysis	Betaine levels (Kg betaine / 1000 kg diet)														
	Control (0Betaine)			100 %(2kgbetaine)			150% (3kg betaine)			200%(4kgbetaine)			250%(5kg betaine)		
Diet	St	Gr	Fh	St	Gr	Fh	St	Gr	Fh	St	Gr	Fh	St	Gr	Fh
Moisture (%)	4.4	6.4	7.4	5.5	4.3	6.6	3.7	5.1	6.7	8.1	6.4	7	11.2	5.3	5.2
Crude protein(%)	22.7	17.5	19.3	23.6	17.5	14.7	24.5	19.3	12.3	24.5	19.3	21	21	17.5	14
Crude fat (%)	1.8	2.1	2.2	2.1	8.2	3.6	2.1	3.7	7.5	3.1	6.6	3.1	7.2	5.4	6.2
Crude fiber (%)	4.5	4.5	4.8	5.4	4.4	4.3	4.7	3.6	6.2	2.1	4	3.1	6.6	4.3	3.8
Crude ash (%)	4.3	6.5	5.4	4.4	5.4	6.3	5.2	6.5	5.3	3.8	6.5	5.2	5.1	6.4	5.9

*St = Starter diet, Gr= Grower diet, Fs = Finisher diet, ** (100,150,200 and 250% i.e 2, 3, 4 and 5Kg betaine/1000 diet) respectievley.

Table (2): Effect of betaine levels on body weight

Age (days)	Betaine levels (%)					P-Value
	Control	100	150	200	250	
One	62.3±0.5	62.02±0.5	61.61±0.6	61.03±0.6	61.11±0.1	NS
7	206.59^{ab}±2.9	212.49^{a}±2.9	210.96^{a}±2.9	205.49^{ab}±2.6	201.29^{b}±2.7	*
14	496.78±6.8	479.04±7.4	495.46± 6.3	484.60±9.1	485.24±7.12	NS
21	958.40^{a}±15.7	954.01^{ab}±14.5	929.08^{ab}±12.2	910.17^{b}±17.4	936.37^{ab}±13.2	*
28	1466.48^{ab}±21.3	1495.14^{a}±24.5	1414.37^{bc}±21.0	1430.7^{abc}±4.6	1393.44^{c}±19.5	*
35	1998.75^{a}±33.5	1950.59^{ab} ±30.6	1877.31^{b}±33.6	1877.59^{b}±35.3	1754.35^{c}±32.9	**
42	2503.50^{a}±39.9	2524.75^{a}±46.37	2432.21^{ab}±43.1	2435.81^{ab}±52.1	2332.13^{b}±47.9	*

Means with different superscript (a, b, c) in the same row are significantly different (P≤0.05). *p≤0.05;
** p≤0.01; NS, not significant.

Table (3): Effect of betaine levels on daily body weight gain**.**

Age (days)	Betaine levels (%)					P-value
	Control	100	150	200	250	
1-7	24.01^{ab}±0.4	25.04^{a}±0.4	24.84^{a}±0.4	24.08^{ab}±0.3	23.32^{b}±0.4	*
7-14	41.30±0.8	40.64±0.8	40.65±0.7	39.95±1.1	40.65±0.7	NS
14-12	65.94±1.9	65.28±1.6	61.62±1.4	61.92±1.6	64.44±1.1	NS
21-28	71.47^{ab} ±2.2	77.91^{a} ±2.9	81.51^{b}±2.9	72.36^{ab}±2.7	65.29^{b}±2.1	*
28-35	75.34^{a}±3.7	65.25^{b}±2.3	64.74^{b}±3.1	62.44^{b}±2.5	56.64^{b}±2.3	**
35 -42	77.03^{b}±4.1	81.65^{a}±4.1	79.27^{a}±4.6	77.63^{ab}±5.7	81.72^{a}±3.9	*
1-42	59.53^{a}±0.1	60.06^{a}±1.1	57.81^{b}±1.1	57.93^{b}±1.3	55.40^{b}±1.2	*

Means with different superscript (a, b, c) in the same row are significantly different (P ≤ 0.05). *p≤0.05;** p≤0.01; NS, not significant.

Table (4): Effect of betaine levels on daily feed consumption (g/bird/day)

Age (days)	Betaine levels (%)					P-value
	Control	100	150	200	250	
1-7	33.7^{a}± 0.4	33.56^{a}±0.3	31.1^{c}±0.1	32.22^{b}±0.2	32.47^{b}±0.1	**
7-14	82.99^{a}± 0.7	79.45^{a}±0.2	76.21^{b}±0.2	77.15^{b}±0.2	77.31^{b}±0.1	**
14-12	100.70^{a}± 2.1	88.56^{b}± 0.3	94.79^{c}±0.3	89.19^{c}±0.5	95.63^{c}±0.2	**
21-28	113.24^{a}± 1.3	100.01^{b}±0.9	97.07^{c}±0.2	98.79^{bc}±0.4	97.38^{c}±0.2	**
28-35	138.20±1.1	135.51± 1.1	135.29±1.5	137.36±1.2	137.82±0.7	NS
35-42	127.57±0.7	120.37±1.1	116.76±2.1	111.34±3.3	104.57±3.2	NS

Means with different superscript (a, b, c) in the same row are significantly different (P ≤ 0.05).*p≤0.05;
** p≤0.01; NS, not significant.

Table (5): Effect of betaine levels on feed conversion ratio (gfeed/g gain)

Age (days)	Betaine levels (%)					P-Value
	Control	100	150	200	250	
1 – 7	1.47[a]±0.1	1.38[ab]±0.1	1.31[b]±0.1	1.36[ab]±0.1	1.41[ab]±0.1	*
7 - 14	2.21±0.2	2.11±0.1	1.96± 0.1	1.87±0.1	1.98±0.1	NS
14-21	2.67±1.1	1.46±0.1	1.61± 0.1	1.56±0.1	1.52±0.1	NS
21-28	2.31±0.6	1.77± 0.3	1.75± 0.1	1.51±0.1	1.74±0.1	NS
28-35	2.18±0.1	2.36±0.1	2.67±0.3	2.46±0.1	2.67±0.2	NS
35-42	2.34±0.3	2.05±0.3	1.99±0.2	2.30±0.4	1.97±0.5	NS

Means with different superscript (a, b, c) in the same row are significantly different (P≤0.05).*p≤0.05; NS, not significant.

Table (6): Effect of betaine levels on rectal temperature**.**

Age (days)	Betaine levels (%)					P-value
	Control	100	150	200	250	
7	41.05±0.1	41.04±0.2	41.05±0.2	41.05±0.1	41.07±0.3	NS
14	41.07±0.1	41.00±0.1	41.01±0.1	41.06± 0.1	41.04±0.1	NS
21	41.04±0.1	41.21±0.1	41.55±0.1	41.44±0.3	41.40±0.1	NS
28	41.05±0.1	41.04±0.1	41.40±0.2	41.49± 0.1	41.51±0.1	NS
35	41.49±0.2	41.36±0.2	41.81±0.1	41.67± 0.2	41.74±0.4	NS

Means with different superscript (a, b, c) in the same column are significantly different (P≤0.05).** p≤0.01;
NS, not significant.

Table (7): Effect of betaine levels on respiration rate (r.p.m)**.**

Age (days)	Betaine levels (%)					P-value
	Control	100	150	200	250	
7	52.88±0.1	54.22±2.5	55.33±0.1	51.11±1.8	56±0.4	NS
14	52.66^{b}±1.3	52.0^{b}±1.7	59.11^{a}±1.6	61.55^{a}± 1.4	62.44^{a}± 1.9	**
21	58.0^{ab}±0.6	55.77^{b}±1.9	61.77^{ab}±2.3	62.22^{ab}±1.1	63.11± 3.1	*
28	61.55±1.1	62.22±1.5	66.22±1.5	61.11±0.5	62.66±1.2	NS
35	66.22±2.1	68.66±2.1	68.00±2.1	68.44±1.8	70.44± 2.1	NS
42	52.44^{b}±0.8	52.88^{b} ± 1.8	59.77^{a}±1.7	55.33^{a}±4	57.77^{a}±2.5	*

Means with different superscript (a, b, c) in the same column are significantly different ($P \leq 0.05$).*$p \leq 0.05$;
** $p \leq 0.01$; NS, not significant

Table (8): Effect of betaine levels on slaughter traits**.**

Parameters	Betaine levels (%)					P-value
	Control	100	150	200	250	
Blood %	3.31± 0.4	4.91±0.3	3.35±0.7	3.0± 0.3	4.2±0.9	NS
Feather%	4.65± 0.5	5.13±0.3	99.6±5.3	5.4±1.9	4.3±1.8	NS
Shank+ Foot%	3.23± 0.1	3.42±9.9	3.55± 0.1	3.70± 0.2	3.60±0.1	NS
Head%	1.93± 0.1	2.18± 0.2	1.97± 0.1	2.1± 0.2	2.00±0.2	NS
Digestive tract %	13.43±0.8	12.03±0.8	13.05±0.4	12.2±0.6	12.0±0.2	NS
Crop%	0.76± 0.1	0.79±0.1	0.93± 0.2	1.1± 0.2	0.1±0.1	NS
Spleen %	0.11±0.1	0.11±0.1	0.15±0.1	0.1±0.1	0.1±0.1	NS
Bursa%	0.05±0.1	0.07±0.1	0.09±0.1	0.1±0.2	0.1±0.4	NS
Abdominal fat%	1.42±0.1	1.11±0.1	1.34±0.1	1.3±0.2	1.5±0.1	NS
Tracheae+ lung%	0.50±0.1	0.50±0.1	0.59±0.1	0.6±0.1	0.6±0.1	NS
Liver%	2.55±0.1	2.15±0.1	2.47±0.1	2.5±0.1	2.5±0.1	NS
Gizzard%	1.3±0.4	0.9±0.2	1.3±0.3	1.1±0.3	1.4±0.3	NS
Heart %	0.40^{c}±0.2	0.43^{bc}±0.1	0.47^{abc}±0.1	0.5^{ab}±0.1	0.5^{a}±0.1	*
Dressed%	75.42±0.8	74.78±0.7	75.32±2.3	78.7±2.5	77.5±1.1	NS

Means with different superscript (a, b, c) in the same column are significantly different (P≤0.05).* p≤0.05;
NS, not significant.

Table (9): Effect of betaine levels on chemical compositions of meat.

Items	Betaine levels (%)					P-value
	Control	100	150	200	250	
Moisture%	68.79± 1.29	70.64±1.7	68.60±1.4	69.68±1.5	68.87±1.1	NS
Crude protein%	22.90± 2.10	21.98±1.2	20.01±5.3	22.9±1.9	17.5± 1.8	NS
Crude fat%	14.83± 3.27	15.85±1.2	15.0±0.4	18.91±0.6	19.81± 0.8	NS
Crude fiber %	5.15± 1.41	3.65±1.2	3.50± 0.2	3.03±3.5	3.85±4.1	NS
Crude ash %	7.96±0.22	8.60± 0.1	8.34± 0.8	9.08± 0.2	8.85± 0.4	NS

NS= not significant

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الملخص العربي

تأثير مستويات البياتين المختلفة على أداء بداري التسمين تحت الإجهاد الحراري الدوري

طلعت مصطفى الشيخ [1]، محمد متولى احمد [2]، محمد احمد فؤاد محمد

[1] قسم انتاج الدواجن – كليه الزراعه جامعه سوهاج

[2] قسم انتاج الدواجن – كليه الزراعه جامعه اسيوط

أجريت هذه الدراسة بمزرعة الدواجن البحثية بكلية الزراعة جامعة سوهاج، مصر.هدفت هذه التجربة لدراسة تأثير إضافة مستويات مختلفة من البيتاين على أداءبداري التسمين تحت ظروف الجو الحار.

اشتملت هذه التجربة على عدد375 كتكوت روص، عمر يوم، قسمت بالتساوي إلى خمس معاملات بكل منها 75 كتكوت وبكل معاملة ثلاث مكررات (25 كتكوت/ مكررة) وقسمت على النحو التالي :-

غذيت الكتاكيت في المجموعة الأولى على العليقة التجارية المنتجة بواسطة شركه الوادي بدون أي إضافة للبيتاين واعتبرت مجموعة الكنترول، بينما غذيت كتاكيت المجموعة الثانية ، الثالثة ،الرابعة والخامسة على نفس العليقة الأساسية مع إضافة البيتاين بمستويات 100 ، 150، 200و250%والتي تساوي 3، 4 و 5 كجم بيتاين / 1000 كجم عليقه على التوالي مقارنه بتوصيات الشركه . تم تعريض جميع الكتاكيت يومي الى35مº درجه مئوية (إجهاد حراري) من الساعة 8 صباحا حتى الرابعة عصراً، وتم تسكينها بعشش منفصلة بإبعاد (2م طول ×1 متر عرض) على فرشة من التبن ، وربيت تربية أرضية.

اشتملت كل عشه على 25 كتكوت، تم تزويد العشش بالتغذية والماء اللازمين حتى حد الشبع خلال فترة التجربة. عرضت جميع الطيور للإضاءة المستمرة كالتالي (24 إضاءة)،(23 إضاءة:1 أظلام)، (22 إضاءة: 2 إظلام)، (21 إضاءة: 3 إظلام) خلال الأسبوع الأول،الثاني، الثالث و الرابع من العمر على التوالي، بينما تم الاستمرار على البرنامج (21 إضاءة: 3 إظلام) حتى عمر التسويق باستخدام لمبات كمثريه (60 وات) مثبتة على ارتفاع 2.40 متر من الأرض.

أوضحت النتائج أن وزن الجسم ومعدل الزيادة اليومية فى وزن الجسم تحسنا فى المجموعات المعاملة. استهلاك العلف ومعدل التحويل الغذائي تحسنا فى المجموعات المعاملة . درجه حرارة الجسم زادت فى 42 يوم من العمر ومعدل التنفس زاد فى العمر 14، 21 ،42 يوم من العمر. نسبه القلب زادت فى المجموعات المعاملة مقارنه بمجموعه الكنترول. التحليل الكيماوي للذبيحة لم يتأثر معنويا بمستويات البيتاين المختلفة مقارنه بمجموعه الكنترول.

الخلاصة :-

1- نوصى فى هذه الدراسة بأنه أفضل مستوى للبيتاين لتقليل الإجهاد الحراري فى بداري التسمين هو مستوى 100% وهو المستوى الموصى به من قبل الشركة.

الكلمات الافتتاحيه : مستويات البيتاين ، الاجهاد الحرارى الدورى ، الاداء ، بدارى التسمين.