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RESPONSE OF CRESTED AND NONCRESTED DANDARAWI CHICKENS TO EXCESS L-ARGININE SUPPLEMENTATION DURING WINTER MONTHS.

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ABSTRACT: The present study was carried out during winter months to estimate response of two Dandarawi chicken phenotypes (crested (Cr) and non-crested (cr)) to extra L-arginine (Arg) supplementation. Seventy two female from each of Cr and cr layer Dandarawi hens were chosen when egg production(EP) reached 50 %. The Cr and cr layer Dandarawi hens were distributed randomly into 3 experimental groups; each group includes 24 layer hens divided randomly into 3 replicates with 8 hens each. The 1st group from each phenotype fed control basal diet that satisfied recommendations of NRC. Groups 2 and 3 from each type fed basal diet supplemented with 2% and 4% L- arginine over NRC requirements respectively for three winter months. Arginine supplemented by 14gm/100kg diet and 28gm/100kg to perform levels 2% and 4% respectively.

The following results were obtained:-

Crested phenotype had higher significantly EP% and egg mass per hen per day than cr during 2nd month and overall period moreover Cr laying hen consumed significantly lower diets than cr during the first month of EP and improved significantly feed conversion during the second month of EP. Significant decrease was observed in yolk percent of egg laid by Cr hens but significant increase was observed in shell thickness. Body temperature of Cr phenotype during chronic cold condition was lower by about 0.38°C than cr phenotype and had low significantly respiration rate.

Diets supplemented with excess Arg recorded significantly ($P \leq 0.05$) higher EP% than control diet during 2nd month, 3rd month and for overall period. Excess Arg supplementation reduced significantly feed intake during the 1st month of EP, but increased significantly feed intake during the 3rd month. Increasing Arg level to 4% increased significantly ($P \leq 0.05$) yolk percent and decreased significantly ($P \leq 0.05$) albumin percent.

Key Words: Crest, Dandarawi, arginine, cold stress and egg production.

INTRODUCTION

Overcoming cold stress is one of the most important challenges in poultry production. Many procedures were examined for this purpose may be by selecting resistant breeds, using anti cold stress agents or feed additives. Chicken phenotype involves body shape, feather model, eyes color and comb type. The Crest phenotype is characterized by a bunch of outspread feathers upper the head (Wang et al., 2012) and found in many bird species (Price, 2002). The appearance of the Crest depends on the length and shape of the cranial feathers (Wang et al., 2012).Crest is controlled by autosomal incompletely dominant gene (Fathi and Galal, 2001) and classical genetics experiments suggest that the head crest segregates as a simple Mendelian recessive trait(Wang et al., 2012).Feather mass of crest phenotype chickens increased by about 12% (Galal, 2003) and crested chickens may be a good layer(Thomas et al., 2010).Dandarawi chicken was developed in Upper Egypt and could be simply sexed by feather color. Many authors studied crest in Dandarawi chicken where Fathi et al. (2000) reported that crest gene in Dandarawi chicken remarkably improved the abnormality and viability of spermatozoa.

L-arginine is an essential amino acid for poultry where they cannot synthesize it nevertheless chickens have the highest Arg requirement of all animals (Ball et al., 2007). Many molecules, including glutamate, ornithine, creatine, and nitric oxide created from Arg (Khajali and Wideman, 2010).Nitric oxide production increased in the duodenum of chronically chicks reared under chronic cold stress (Zhang et al., 2011). Arginine supplementation improves cardiovascular when birds exposed to cold stress (Ruiz-Feria, 2009) and may reduce the undesirable effects of cold stress (Al-Daraji and Salih,2012). Arginine requirements of NRC may inadequate to overcome cold stress (Khajali and Wideman, 2010) and Arg supplementation had positive effects on cold stress (Bozakova and Gerzilov, 2014). Beside Arg effects on cold stress, Arg with methionine supplementation play an important role in increasing feather weight, so it required for feather growth and feather development (Nazem et al., 2015). In general Cold stress occurs when the ambient temperature was lower than 18°C (Zhang et al., 2011).

Therefore the present experiment was carried out to evaluate response of crested (Cr) and non crested (cr) Dandarawi laying hens and excess Arg supplementation during winter months on productive and reproductive performance.

MATERIALS AND METHODS

This experiment was conducted during the period from 21 November to 21 February at Fayoum poultry research station. Ambient temperature and relative humidity were recorded daily and the average of high and low ambient temperature and relative humidity were summarized in Table 1.

Experimental design and productive performance:

Seventy two female from each of Cr and cr Dandarawi laying hens were chosen when theyreached50% egg production percent (EP%). The Cr and cr phenotypes were distributed randomly into 3 experimental groups; each group consists of 24 hens divided randomly into 3 replicates (8 hens each).Groups 1 from each type were fed control basal diet (Table 2) that satisfied recommendations of NRC (1994). Groups 2 and 3 from each type fed basal diet supplemented with 2 and 4% from L- arginine of NRC (1994) requirements respectively. Arginine supplemented by 14gm/100kg and 28gm/100kg to basal diet to perform levels 2% and 4% respectively.

Each bird was housed separately in single cage for three months. Eggs from each replicate were collected, numbered and weighed daily. Egg production percent, average egg weight and egg mass per hen per day were calculated according to Murugesan and Persia (2013). All birds fed ad libitum consequently feed consumption was recorded and feed conversion was calculated. Ten eggs from each replicate were chosen and egg quality was measured during the third month of egg production.

Rectal temperature and respiration rate:

At the end of 3rd month of egg production two hens from each replicate were chosen randomly while, respiration rate and rectal temperature were recorded. Rectal temperature (°C) was measured by inserting thermometers approximately 5 cm into rectal. Respiration rate was recorded by counting the wave cycles of breast up and down per minute. The ambient temperature was 15°Cwhen these items were measured.

Fertility and hatchability percentages:

After three months of EP each replicate transferred from its single cage to floor pen to determine reproductive performance. One male from either Cr or cr was added to each replicate according to female phenotype. Twenty hatching eggs from each replicate within each arginine level and head feather style were selected and hatched in chick master incubator. At 7 day of incubation eggs were examined by candling to recognize infertile eggs and fertility percent was calculated. Unhatched eggs were counted and hatchability percent per total and fertile eggs were computed.

Statistical analysis:

For data analysis, general linear model "univariate model" procedure of SPSS (2007) was used. Significant scales ($P \leq 0.05$) were tested using Duncan's Multiple Range Test **(Duncan, 1955).**

RESULTS AND DISCUSSION

Egg production (EP)

The data presented in Table3showed that EP% of Cr was significantly higher than cr during second month and for the overall period. These results agree with those of Galal and Fathi(2002) who reported that presence of Cr allele increased egg mass and EP% by about 4.2% and 2.7% respectively compared with cr genotype. The Cr hens at 1stmonth of EP exhibited lower EP% and egg mass (gm) per hen per day. Later results agree with Hussein (2002) and El-Safty (2006) who observed that cr hens produced higher egg mass and number than Cr hens. The conflicting results of EP during successive months may be due to Cr phenotype able to tolerate cold stress than cr where Cr possesses deep feather coat than cr. This may be due to the ambient temperature during 1stmonth of egg production was slightly higher than 2nd and 3rd months of egg production (Table, 1).

Diets supplemented with different arginine levels above (NRC 1994) recorded significantly ($P \leq 0.05$) higher EP% than control diet during 2nd, 3rdmonth and for overall period. This result is in agreement with Youssef et al. (2015) who reported that Arg supplementation significantly increased EP%. Increasing EP% may be due to Arg stimulate secretion of luteinizing hormone (Basiouni, 2009).Moreover Arg is an essential amino acid for chickens because they cannot biosynthesize arginine (Allen, 1999).Crested hens that treated with 4% Arg above NRC recorded the highest egg production percent and egg mass per hen per day during the second month of egg production. This is may be due to Arg required for feather growth and feather development (Nazem et al., 2015) on the other hand crested chicken possess more feather mass(Fathi and Galal, 2001). The lowest ambient temperature was recorded in the 2nd month of egg production (Table, 1). So feather coat may be play important role in cold condition, where Mason, et al., 2007 reported that increases in feather mass may aid in cold tolerance of birds. Hens that fed diet supplemented with 2% and 4% recorded significantly ($P \leq 0.05$)higher egg mass per hen per day than hens fed basal diet. This result was in full agreement with Youssef et al. (2015). This may be due to increasing EP% that increase egg yields nevertheless control treatment recorded significantly ($P \leq 0.05$)higher average egg weight than Arg treatments for overall period.

Feed intake and feed conversion

Crested chicken consumed significantly ($P \leq 0.05$) lower diets than cr during the first month of EP (Table, 4). Excess L-Arg supplementation reduced significantly feed intake during the 1st month of EP, but increased significantly feed intake during the 3rd month. The conflicting results of feed intake may be due to the pattern of EP as discussed later. The results of 3rd month agree with Yang et al. (2016) who reported that Arg induced a strong reduction of feed intake.

During the first three months of EP and overall period phenotypic Cr improved feed conversion that becomes significant during the 2nd month of EP. This is may be due to the birds carrying Cr gene may be need less energy for maintenance of body temperature compared to non-crested birds under low ambient temperatures (Galal, 2003 and El-Safty, 2006).

Crested hens that treated with 4% Arg above NRC recorded the best feed conversion ratio. This is may be due to Cr phenotype possesses more feather than cr phenotype and 4% Arg improved feather growth. In regardless this point Leeson and Morrison (1978) reported that there was a significant correlation between feather weight and feed efficiency.

Egg quality

Most egg quality parameters were not affected significantly by Cr phenotype except for yolk percent and shell thickness (Table 5). Significant decrease was observed in yolk percent of egg laid by Cr hens but significant increase was observed in shell thickness. Results of shell thickness and shell weight percent were not harmonious. Galal and Fathi (2002) demonstrated that crest allele decreased shell percent and increased shell thickness. This led us supposed that the eggshell ultrastructure may be differ between Cr and cr therefore additional study may needed to explain this point.

Increasing dietary Arg level by 4% higher than NRC(1994) increased significantly ($P \leq 0.05$) yolk percent and decreased significantly ($P \leq 0.05$) albumin percent. Similar results obtained by Najib and Basiouni (2004). Increasing yolk percent may be due to increasing Arg level decreased body fat content especially abdominal fat where, Wu et al. (2011) found that increasing Arg by1.0% above NRC (1994) requirements decreased abdominal fat. Decreasing body fat may be increase the ability of laying hens to released fat in egg yolk.

Rectal temperature and respiration rate

Crest phenotype had no significant effect on rectal temperature during cold stress

(Table, 6).Rectal body temperature of Cr phenotype during cold stress was lower by about 0.38°Cthan cr phenotype. This result in agreement with Galal and Fathi(2002) who reported that Cr recorded lower rectal temperature by about 0.26°C than cr. This may be due to Cr phenotype had higher feather mass by about 11.8% compared with cr (Fathi and Galal, 2001).Feather mass associated positively with body temperature under high ambient temperature (Deeb and Cahaner, 1999) and reduction in feather mass was associated with an increase in body temperature(Boothet al.,1993).

Crested phenotypic hens had lower significantly respiration rate than cr during chronic cold stress (15°C) this may be due to increasing feather mass of Cr improved performance of respiratory system during growing periods. Prum (1999) reported that early feathers play function in thermal insulation.

Different Arg levels had no significant effect on respiration rate nevertheless it decreased respiration rate numerically during chronic cold stress. Decreasing numerically respiration rate by increasing Arg level during cold stress may be due to Nitric oxide synthesized from Arg (Khajali and Wideman, 2010) moreover Nitric oxide and its derivatives inhibit mitochondrial respiration (Brown, 2001).

Fertility and hatchability percentages:

Insignificant improvement of fertility and hatchability percent were observed for Cr phenotype compared with cr phenotype (Table, 7). Fertility%, hatchability per fertile eggs% and per total eggs% of Cr hens increased by 2.2, 1.8 and 3.7 respectively than cr hens. The results agree with Paul (2017) who demonstrated that Cr has higher hatchability percent by about 3% than normal cr.

Supplemented Arg above NRC requirements improved fertility%, hatchability per fertile eggs% and hatchability per total eggs%. These results were in disagreement with Youssef et al. (2015) who found significant improvement of the same Arg levels on hatchability parameters. This may be due to breed difference where Dandarawi chicken was small size breed that may be need less requirement.

CONCLUSION

In conclusion Cr phenotype may be posses ability to overcome cold stress and able to improve productive and reproductive performance than cr phenotype. On the other hand excess Arg supplementation may be reduce side effects of cold stress during winter months.

Table (1): average ambient temperature and relative humidity during experimental months.

Month of egg production	Average ambient temperature °C		Average relative humidity%
	High	Low	
First month	19	14	51
Second month	16	11	56
Third month	17	12	58

Table (2): Composition and calculated analysis of basal diet.

Ingredients	Basal diet
Yellow corn	65.00
Soybean meal (44% CP)	5.30
Corn gluten (60% CP)	9.00
Wheat bran	12.00
Di-calcium phosphate	2.39
Lime stone	5.63
Salt	0.37
Premix	0.30
DL- methionine	0.01
L-Arg	0
Total	100
Calculated analysis	
CP	15.14
ME.	2786.49
Ca	3.45
Av.P	0.37
Lys.	0.70
Met.	0.31
SAA	0.61
Na	0.17
L-Arg	.70

Arginine supplemented by 14gm/100kg and 28gm/100kg to basal diet to perform levels 2% and 4% respectively.

Premix contain per 3kg vit A 12 000 000, vit D3 3000 000 IU, vit E 50000mg, vit K3 3000mg , vit B1 2000mg, vit B2 7500mg, vit B6 3500 mg, vit B12 15mg, Pantothenic acid 12000mg, Niacin 30000mg, Biotin 150mg, Folic acid 1500mg, Choline 300gm, Selenium 300mg, Copper 10000mg, Iron 40000mg, Manganese 80000mg, Zinc 80000mg, Iodine 2000mg, Cobalt 250 mg and $CaCO_3$ to 3000g.

Table (3): Effect of crest phenotypes of Dandarawi laying hens, arginine levels and their interaction on egg production traits.

Traits	Egg production%				Egg mass / hen / day (gm)				Average egg weight (gm)			
Main effects	1st month	2nd month	3rd month	Overall period	1st month	2nd month	3rd month	Overall period	1st month	2nd month	3rd month	Overall period
Phenotype												
cr	67.06	45.04^{b}	49.89	54.18^{b}	27.95	18.43^{b}	21.01	22.53^{b}	41.75	41.15^{b}	42.20	41.67^{b}
Cr	63.69	56.15^{a}	51.70	57.42^{a}	26.56	23.70^{a}	21.93	24.16^{a}	41.74	42.31^{a}	42.47	42.15^{a}
SE±	2.45	2.50	2.39	1.57	1.02	1.05	1.02	0.66	0.24	0.56	0.27	0.15
Probability	N.S.	0.002	N.S.	0.042	N.S.	0.001	N.S.	0.045	N.S.	0.002	N.S.	0.022
Arg levels												
Zero	66.67	44.35^{b}	37.08^{c}	49.90^{b}	28.20	18.81	15.71^{c}	21.13^{b}	42.25	42.49^{a}	42.65	42.45^{a}
2%	65.18	52.98^{a}	52.38^{b}	57.04^{a}	26.78	21.65	21.97^{b}	23.53^{a}	41.41	40.87^{b}	41.98	41.39^{b}
4%	64.29	54.46^{a}	62.93^{a}	60.46^{a}	26.79	22.72	26.74^{a}	25.36^{a}	41.58	41.84^{a}	42.37	41.91^{c}
SE±	3.01	3.07	2.93	1.92	1.25	1.28	1.25	0.81	0.29	0.32	0.33	0.18
Probability	N.S.	0.045	0.001	0.001	N.S.	N.S.	0.001	0.001	N.S.	0.002	N.S.	0.001
Interaction												
cr × Arg 0%	70.83	35.72^{d}	32.65	47.00	29.92	14.98^{c}	13.85	19.83	42.14	42.20^{a}	42.53	42.27^{ab}
cr × Arg 2%	63.10	57.14^{ab}	51.02	57.35	25.70	22.70^{ab}	21.07	23.25	41.15	39.33^{b}	41.50	40.62^{c}
cr × Arg 4%	67.26	42.26^{cd}	65.99	58.18	28.22	17.59^{bc}	28.13	24.50	41.96	41.92^{a}	42.56	42.13^{ab}
Cr × Arg0%	62.50	52.98^{bc}	41.50	52.80	26.48	22.64^{ab}	17.57	22.43	42.36	42.77^{a}	42.77	42.62^{a}
Cr × Arg2%	67.26	48.81^{bc}	53.74	56.73	27.86	20.61^{b}	22.87	23.82	41.66	42.41^{a}	42.46	42.15^{ab}
Cr × Arg4%	61.31	66.67^{a}	59.87	62.73	25.35	27.85^{a}	25.36	26.22	41.20	41.75^{a}	42.19	41.69^{b}
SE±	4.25	4.34	4.14	2.71	1.76	1.81	1.77	1.14	0.41	0.45	0.47	0.26
Probability	N.S.	0.001	N.S.	N.S.	N.S.	0.002	N.S.	N.S.	N.S.	0.001	N.S.	0.001

Cr: crested Dandarawi chicken cr: non-crested Dandarawi chicken

*^{a,b},...= Means in the same column within each main effect with different superscripts, differ significantly (P<0.05);

N.S. = Not Significant (P>0.05).

Table (4): Effect of crest phenotypes of Dandarawi laying hens, arginine levels and their interaction on feed intake and feed conversion.

Traits **Main effects**	**Feed intake (hen/day) gm**				**Feed conversion (gm feed/gm egg)**			
	1st month	**2nd month**	**3rd month**	**Overall period**	**1st month**	**2nd month**	**3rd month**	**Overall period**
Phenotype								
cr	86.89^{a}	76.56	78.00	80.48	3.16	4.46^{a}	4.06	3.89^{a}
Cr	82.56^{b}	78.56	80.78	80.63	3.12	3.40^{b}	3.84	3.45^{b}
SE±	1.44	2.34	1.93	1.45	0.10	0.28	0.24	0.16
Probability	0.05	N.S.	N.S.	N.S.	N.S.	0.02	N.S.	0.045
Arg levels								
Zero	88.67^{a}	73.50	73.33^{c}	78.50	3.16	4.14	4.83^{a}	4.04^{a}
2%	83.50^{b}	81.33	78.83^{b}	81.22	3.18	3.91	3.73^{b}	3.61^{ab}
4%	82.00^{b}	77.83	86.00^{a}	81.94	3.07	3.75	3.28^{b}	3.37^{b}
SE±	1.76	2.87	2.37	1.77	0.12	0.34	0.29	0.20
Probability	0.04	N.S.	0.009	N.S.	N.S.	N.S.	0.007	0.049
Interaction								
cr × Arg 0%	93.67	71.00	71.67	78.78	3.14	4.87	5.32	4.44
cr × Arg 2%	83.67	83.67	77.67	81.67	3.37	3.92	3.83	3.71
cr × Arg 4%	83.33	75.00	84.67	81.00	2.96	4.59	3.01	3.52
Cr × Arg 0%	83.67	76.00	75.00	78.22	3.18	3.40	4.34	3.64
Cr × Arg 2%	83.33	79.00	80.00	80.78	300	3.89	3.63	3.51
Cr × Arg 4%	80.67	80.67	87.33	82.89	3.18	2.90	3.55	3.21
SE±	2.49	4.05	3.34	2.50	0.18	0.48	0.41	0.28
Probability	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Cr: crested Dandarawi chicken cr: non-crested Dandarawi chicken

*^{a,b},...= Means in the same column within each main effect with different superscripts, differ significantly (P<0.05); N.S. = Not Significant (P>0.05).

Table (5): Effect of crest phenotypes of Dandarawi laying hens, arginine levels and their interaction on egg quality parameters.

Traits Main effects	Shape index	Yolk index	Haugh unit	Yolk%	Albumin%	Shell%	Shell thickness	Sa	Sw/ Sa
Phenotype									
cr	77.29	41.67	94.70	32.75[a]	56.78	11.58	39.02[b]	55.59	88.15
Cr	77.38	41.88	95.06	32.10[b]	57.04	10.87	40.65[a]	56.12	82.84
SE±	0.53	0.35	0.62	0.23	0.25	0.80	0.39	0.31	6.01
Probability	N.S.	N.S.	N.S.	0.046	N.S.	N.S.	0.003	N.S.	N.S.
Arg levels									
Zero	77.18	40.99	94.28	32.19[b]	57.06[a]	10.75	40.76	56.13	81.66
2%	77.06	42.17	96.12	31.88[b]	57.55[a]	10.56	39.57	55.97	81.06
4%	77.76	42.18	94.24	33.20[a]	56.10[b]	12.36	39.17	55.47	93.77
SE±	0.65	0.42	0.76	0.28	0.31	0.98	0.47	0.38	6.47
Probability	N.S.	N.S.	N.S.	0.003	0.003	N.S.	N.S.	N.S.	N.S.
Interaction									
cr × Arg 0%	77.11	40.87	94.56	32.56	57.10	10.35	40.31	56.60	78.77
cr × Arg 2%	76.44	41.99	95.52	31.99	57.53	10.48	38.94	55.69	81.00
cr × Arg 4%	78.31	42.16	94.01	33.70	55.70	13.92	37.80	54.48	104.68
Cr × Arg 0%	77.25	41.10	94.00	31.81	57.03	11.16	41.21	55.66	84.55
Cr × Arg 2%	77.68	42.34	96.72	31.78	57.57	10.65	40.19	56.24	81.13
Cr × Arg 4%	77.22	42.20	94.47	32.70	56.50	10.80	40.53	56.46	82.86
SE±	0.91	0.60	1.07	0.39	0.43	1.39	0.67	0.54	10.57
Probability	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Sa: Surface area – Sw/Sa: shell weight/unit of surface area -Cr: crested Dandarawi chicken -cr: non-crested Dandarawi chicken
*[a,b],...= Means in the same column within each main effect with different superscripts, differ significantly ($P<0.05$);
N.S. = Not Significant ($P>0.05$).

Table (6): Effect of crest phenotypes of Dandarawi laying hens, arginine levels and their interaction on body temperature and respiration rate during cold stress (15 °C).

Traits Main effects	BT	R.R.
Phenotype		
cr	42.18	37.67^{a}
Cr	41.80	29.00^{b}
SE±	0.160	1.054
Probability	N.S.	0.001
Arg levels		
Zero	42.08	34.00
2%	41.75	33.50
4%	42.15	32.50
SE±	0.196	1.291
Probability	N.S.	N.S.
Interaction		
cr × Arg 0%	42.15	37.00
cr × Arg 2%	42.10	38.00
cr × Arg 4%	42.30	38.00
Cr × Arg 0%	42.00	31.00
Cr × Arg 2%	41.40	29.00
Cr × Arg 4%	42.00	27.00
Probability	0.278	1.829
SE±	N.S.	N.S.

BT: boy temperature R.R.: respiration rate

Cr: crested Dandarawi chicken cr: non-crested Dandarawi chicken

*[a,b],...= Means in the same column within each main effect with different superscripts, differ significantly (P<0.05); N.S. = Not Significant (P>0.05).

Table (7) : Effect of phenotype of Dandarawi chickens, arginine levels and their interaction on fertility and hatchability percent.

Traits Main effects	Fertility%	Hatch. F. eggs%	Hatch. T. eggs%
Phenotype			
cr	88.15	88.79	78.52
Cr	90.37	90.58	82.22
SE±	1.960	2.582	3.629
Probability	N.S.	N.S.	N.S.
Arg levels			
Zero	85.56	84.28	72.22
2%	88.89	91.09	81.11
4%	93.33	93.68	87.78
SE±	2.400	3.162	4.444
Probability	N.S.	N.S.	N.S.
Interaction			
cr × Arg 0%	84.44	84.19	71.11
cr × Arg 2%	86.67	87.12	75.56
cr × Arg 4%	93.33	95.06	88.89
Cr × Arg 0%	86.67	84.37	73.33
Cr × Arg 2%	91.11	95.06	86.67
Cr × Arg 4%	93.33	92.31	86.67
SE.	3.395	4.472	6.285
Probability	N.S.	N.S.	N.S.

Cr: crested Dandarawi chicken   cr: non-crested Dandarawi chicken
Hatch.F. eggs%: hatchability per fertile eggs   Hatch.T. eggs%: hatchability per total eggs
[a,b,...]= Means in the same column with within each main effect different superscripts, differ significantly (P<0.05); N.S. = Not Significant (P>0.05).

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الملخص العربى

إستجابة الدجاج الدندراوي ذو القلنسوة وبدون القلنسوة لإضافة زيادة من لـ -ارجينين خلال شهور الشتاء.

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اجريت هذه التجربة خلال فصل الشتاء لتقدير استجابة خطين مختلفين ظاهرياً من دجاج الدندراوي ذوالقلنسوة وبدون القلنسوة لإضافةزيادة من الحامضالاميني. تم اختيار72 دجاجة من سلالة الدجاج الدندراوي ذوالقلنسوة واخرى بدون القلنسوة ووزعت عشوائيا عندمال وصلت 50% انتاج بيض الى 3 مجموعات تجريبية. كل مجموعة تشمل 24 الدجاج مقسمة عشوائيا إلى 3 مكررات بكل مكرر 8 دجاجات. وقد عوملت المجموعه الاولى من كل شكل مظهري على انها مجموعة المقارنة حيث تم تغذيتها من عليقة المقارنة "القاعدية" والتي تغطي احتياجات (NRC 1994) اما بالنسبه للمجموعه الثانيه و الثالثه فقد تم اضافةالحامضالامينيارجينينلعليقة المقارنة بنسبة 2 ٪أو 4٪اعلىمنالمستوىالموصىبهفي (NRC 1994) على التوالي خلال فصول الشتاء الثلاثة. ومن تم الحصول على النتائج التالية:

اعطى دجاج الدندراوي ذوالقلنسوة نسبة إنتاج البيض مئويةاعلى معنوياً مقابل دجاج الدندراوي بدون القلنسوة خلال الشهر الثاني وخلال الفترة التجميعية للتجربة. استهلك الدجاج ذو القلنسوة علف اقل معنوياً من الدجاج بدون القلنسوة وتحسن معامل التحويل الغذائي للدجاج الدندراوي ذوالقلنسوة معنوياً مقارنة بالدجاج الدندراوي بدون القلنسوة خلال الشهر الثاني من انتاج البيض. انخفضت نسبة صفار في البيض الناتج من دجاج الدندراوي ذوالقلنسوة معنوياً ولكن زاد سمك قشرة البيض لهمعنوياً. انخفضت درجة حرارة جسم الدجاج الدندراوي ذوالقلنسوة المربى تحت ظروف البرودة بمقدار 0.38 درجة مئوية عن الدجاج الدندراوي بدون القلنسوة. انخفض معدل التنفس معنوياً للدجاج الدندراوي ذوالقلنسوة تحت ظروف البروده مقارنه بالدجاج الدندراوي بدون القلنسوة.

زادت نسبة انتاج البيض المئوية معنوياً($p \leq 0.05$) في المجاميع المغذاة على عليقة مضاف اليها الحامضالامينيارجينين خلال الشهر الثاني والثالث و الفترة التجميعية للتجربة مقارنة بعليقة المقارنة. لوجظ عند اضافة الحامضالامينيارجينين في العليقه انخفاض الاستهلاك الغذائي في الشهر الاول من الانتاج و لكن خلال الشهر الثالث كانت هناك زيادة معنوية في الاستهلاك الغذاء. زادت معنويا ($P<0.005$) نسبة صفار البيض في الدجاج المغذى على عليقة مضاف لها الحامضالامينيارجينين بنسبة 4% وانخفض معنوياً ($P <0.05$) الألبيومين مقارنة بالدجاج المغذى على عليقة الكنترول.