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EFFECT OF DIFFERENT LIGHTING REGIMES ON THE PERFORMANCE OF BROILER CHICKS RAISED ON RATIONS CONTAINING LOW AND OPTIMAL LEVELS OF PROTEIN

BY

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Abstract: *Four hundreds one-day old unsexed broiler chicks (Arbor Acres) were lasted for 42 days to investigate the effect of lighting programs and protein levels in diet on chick's performance. Chicks were randomly divided into equal two groups according to two light regimes: continuous had 23 hours of light (L) then one hour darkness (D) (23 L: 1 D) and intermittent light regime had 4 hours light then 8 hours darkness then 4 hours light then 8 hours darkness (4 L: 8 D: 4 L: 8 D). Chicken each light program was divided into two groups according to protein level in diet, the optimum level of crude protein (23 and 20 % at growing and finishing periods) and low level of crude protein (20 and 18 % at growing and finishing periods***)**. *Live body weight for chicks exposed to continuous lighting showed significant (P<0.01) increase by (7.86 %) compared to that exposed to intermittent lighting at 6 weeks of age. Body weight gain for chicks exposed to continuous lighting showed significant (P<0.01) increase by (17.99 and 8.14 %), respectively compared to that exposed to intermittent lighting during periods (3-6 and 1-6 weeks of age). Final live body weight for chicks received optimum protein diet significantly (P<0.05 or P<0.01) increased by (7.30 and 3.84 %), respectively compared to that fed on low protein diet at 3 and 6 weeks of age. Chicks received optimum protein diet had body weight gain higher than that fed on low protein diet during periods 1-3 and 1-6 weeks of age by (6.61 and 3.39 %), respectively. Feed consumption of continuous lighting was greater than that of intermittent lighting treatment at all periods studied. The feed conversion ratio was lower for intermittent than continuous lighting treatment during 3-6 and 1-6 wk periods. Feed consumption for chicks received low protein diet was high compared to that fed on optimum* *protein diet at all periods studied. Chicks fed on low protein diet had higher feed conversion ratio than that fed on optimum protein diet at all periods studied. Plasma total protein, albumin, inorganic phosphor (IPh), IPh / Ca ratio and cholesterol showed increased for chicks exposed to continuous lighting program with compared to intermittent lighting regime. While, plasma globulin, glucose and cholesterol were insignificantly higher in chicks exposed to intermittent than continuous lighting regime. Plasma calcium (Ca) showed significant ($P<0.05$) increment for chicks exposed to intermittent lighting program by compared to continuous lighting regime. The chicks fed on optimum protein had generally plasma proteins, glucose, cholesterol and total lipids insignificantly higher than that fed on low protein diet. Intestinal and carcass weights were significantly ($P<0.05$ or $P<0.01$) increased for birds exposed to continuous lighting program compared to intermittent lighting regime. Intestinal length and weights of liver, heart, gizzard and carcass for chicks fed on low protein diet showed increased compared to that fed on optimum protein diet.*

INTRODUCTION

Modern broilers are intensively selected for fast growth rate combined with improved efficiency of feed conversion ratio (FCR). These showed adverse selection responses such as augmented fat deposition and increased incidence of metabolic diseases as ascites or sudden death syndrome (Scheele *et al*., 1992; Julian, 1993 and Maxwell *et al*., 1995). The long-term solution for ascites in broilers are found in selection programs as well as the short-term solution; much research has focused on the possible beneficial effects of different management strategies in reducing the incidence of ascites (Buys et al., 1998).

Intermittent lighting programs (IL) consisting of repeated cycles of 1 h light and 3 h darkness (1 L : 3 D) improved FCR and reduced abdominal fat content relative to these parameters in broiler chickens raised under nearly continuous illumination (Buyse *et al*., 1994a and 1996). Additionally, during the dark period of each dark-light cycle, heat production is markedly decreased (Buyse *et al*., 1994b). Because it is claimed that all factors that increase metabolic rate will predispose birds to develop ascites (Albers and Frankenhusi, 1990). Therefore, using of intermittent light programs may be offset this tendency.

Feeding cost for broiler chicks especially dietary protein sources are the most expensive component of broiler chick diets. Therefore, more studies were made to reduce feeding cost to the minimum level by reducing the level of crude protein or supplementing low protein diets with synthetic amino acids (Cable and Waldroup, 1991). Garcia Neto *et al*. (2000) found that, feeding 17 vs. 24 % crude protein in broiler diet for 21 days showed significant decreased in body weight gain as well as increased both of feed consumption and abdominal fat bad weight.

The purpose of this study was to investigate the effect of different lighting regimes with a diet containing optimum and low levels of protein on the growth, blood plasma constituents and carcass traits of broiler chicks.

MATERIALS AND METHODS

Four hundreds one-day old unsexed broiler chicks (Arbor Acres) obtained from a commercial hatchery lasted for 42 days to investigate the effect of lighting programs and / or protein level in diet on chick's performance. Chicks were wing-banded and weighed individually. Chicks were randomly divided into equal two groups according to two light regimes with three replicates, the continuous had 23 hours of light (L) then one hour darkness (D) (23 L: 1 D) and intermittent light regime had 4 hours light then 8 hours darkness then 4 hours light then 8 hours darkness (4 L: 8 D: 4 L: 8 D). Each light program during both growing (0-3 wk) and finishing (3-6 wk) periods was divided into two groups according to protein level in diet, the optimum level of crude protein (23 and 20 % at growing and finishing periods, respectively) and the low level of crude protein (20 and 18 % at growing and finishing periods, respectively). The composition of the experimental diets is shown in Table (1). Diets and water were offered *ad libitum* throughout the experimental period. Chicks of all groups were vaccinated against common diseases. Electric heaters were used during brooding period. Live body weight and feed consumption were biweekly recorded and body weight gain and feed conversion were then calculated. At the end of experiment, five birds from each treatment were randomly chosen and slaughtered. Eviscerated weight, giblets (liver, gizzard and heart), total edible parts (carcass and giblets) and abdominal fat were weighted as carcass traits. Weight and length of intestinal were also recorded. At slaughtering, blood samples (5ml) were collected and centrifuged at 3000 rpm for 20 minutes. Plasma produced was frozen at -20C till the time of chemical analysis. Plasma total protein, albumin, calcium, inorganic phosphorus, glucose, total lipids, cholesterol, activity of alkaline phophatase, Glutamic Oxaloacetic Transaminase (GOT) and Glutamic Pyruvic Transaminase (GPT), were determined according to Armstro and Carr (1964), Drupt (1970), Krawczynski and Osinski (1962), Goldenberg and Fernandez (1966), Trinder (1969), Girard *et al*. (1970), Richmond (1973), Tomaszewski (1970) and Reitman and Frankel (1975).

Data were statistically analyzed by using (SAS, 1985). All percentage data were converted to the corresponding arcsine prior statistical analysis. The following formulae were used:

$Y_{ijk} = \mu + L_i + P_j + (LxP)_{ij} + e_{ijk}$.

Where :

Y_{ijk}	= Observation.	μ	= General mean.
L_i	= Light regime effect	P_j	= Protein level effect.
$(LxP)_{ij}$	= Interaction between light regime and protein level effect.		
e_{ijk}	= Random error.		

RESULTS AND DISCUSSION

1-Live body weight and weight gain:-

Live body weight for chicks exposed to continuous lighting showed significant (P<0.01) increase by (7.86 %) compared to that exposed to intermittent lighting at 6 weeks of age (Table 2). These results indicate that birds exposed to intermittent photoperiods were able to compensate the early growth decline so that at 6 wks of age, they attained an average body weight near to birds reared under constant lighting. These findings agree with the results of Kalamah (2002) and Soliman *et al*. (2006).

In other words these results may be due to that plasma growth hormone level in birds reared under intermittent light was higher than in those of constant light, intermittent light broilers manifesting compensatory growth have higher mean plasma growth hormone levels than their age-matched counterparts. Similar results observed by (Kuhn *et al*., 1996). While, Renden *et al*. (1996) and Laster *et al*. (1999) observed that there was no difference in body weight between birds reared under (16 L: 8 D and 23 L: 1 D).

Body weight gain for chicks exposed to continuous lighting showed significant (P<0.01) increase by (17.99 and 8.14 %), respectively compared to that exposed to intermittent lighting during periods (3-6 and 1-6 weeks of age) as shown in (Table 2). This may be due to intermittent light broilers manifesting compensatory growth have higher mean plasma growth hormone levels than their age-matched counterparts (Kuhn *et al*., 1996). The same findings were observed by Kalamah (2002). While, Smith (1994) found that photo-schedule (23 L: 1 D and 16 L: 8 D) had no effect on body weight gain.

Live body weight for chicks received optimum protein diet significantly ($P<0.05$ or $P<0.01$) increased by (7.30 and 3.84 %), respectively compared to that fed on low protein diet at 3 and 6 weeks of age (Table 2). These results were confirmed by Abd-Elsamee (2001) as well as (Abd El-Rahman, 2001). On the other hand, Hassanein (2006) showed that body weight of chicks fed on low protein diet was significantly lighter specially at 5, 6 and 7 weeks of age than those fed on control diet. He added that these results indicated that the dietary protein and energy levels have a pronounced effect on body weight of broilers at different ages especially during grower period.

The averages of body weight gain in chicks fed on optimum protein diet had significantly ($P<0.01$) body weight gain higher than that fed on low protein diet during periods 1-3 and 1-6 weeks of age. Body weight gain for chicks received optimum protein diet had body weight gain higher than that fed on low protein diet during periods 1-3 and 1-6 weeks of age by (6.61 and 3.39 %), respectively.

El-Sherbiny *et al.* (1997) and Abd El-Rahman (2001) found no significant differences in body weight gain of broiler chicks fed low protein diets compared to that fed optimum protein diet. However, Hassanein (2006) showed that chicks fed on low protein diet had significantly lower daily gain in comparison with those fed on control diet especially during grower period.

2. Feed consumption and feed conversion ratio:-

Table (3) show that feed consumption of continuous lighting was greater than that of intermittent lighting treatment at all periods studied. The feed conversion ratio was higher for continuous than intermittent lighting treatment at 1-3 wk period, but the reverse result was obtained during 3-6 and 1-6 wk periods. Similar results were reported by Buys *et al.* (1998), Al–Homidan and Patchey (2001) and Soliman *et al.*(2006). However, El-Neney(2003) showed that daily feed consumption of continuous and intermittent chickens had higher means than that of constant chickens at different periods studied, each bird under intermittent light consumed less feed than that reared under continuous light regime. These results suggested that birds reared under intermittent light regime were more efficient than those reared under continuous light.

Feed consumption for chicks received low protein diet was high compared to that fed on optimum protein diet at all periods studied. Chicks fed on low protein diet had higher feed conversion ratio than that fed on optimum protein diet at all periods studied (Table 3). These results were confirmed by Abd El-Rahman, (2001) who showed that chicks fed lowest protein level consumed more feed and had feed conversion ratio than chicks fed optimum protein level during all experimental periods. On the other hand, Abd-Elsamee (2001), Hammouda *et al*. (2001) as well as (Abd El-Rahman, 2001), Salwa and Abd El-Ghany (2003) and Hassanin (2006) reported that chicks fed on low level of protein consumed significantly more feed compared with groups fed on control protein diet.

3-Blood plasma constituents:-

a-Plasma proteins:

The plasma total protein and albumin for chicks exposed to continuous lighting showed significant ($P<0.05$) increase by (2.23 and 21.18 %), respectively compared to that exposed to intermittent lighting program (Table 4).

Soliman *et al*. (2006) observed that chicks exposed to intermittent lighting program had insignificantly plasma total protein and albumin higher than that exposed to either continuous or constant lighting programs. An opposite trend was true for plasma globulin. These results agree with El-Neney (2003) who showed that there were no significant differences due to light regimes intermittent and continuous lighting on plasma total protein and significant ($P<0.05$) on plasma albumin.

Plasma proteins (total protein, albumin and globulin) for chicks fed on optimum protein showed insignificant increment by (4.71, 1.18 and 7.73 %), respectively compared to that fed on low protein diet (Table 4). These results reveal that total serum proteins correlated positively with protein intake. Similar findings were reported by Attia (1986) and El-Naggar *et al*. (1997) who found that there was progressive increase in total serum proteins with increasing CP level.

b-Plasma minerals:

Plasma calcium (Ca) for chicks exposed to intermittent lighting program showed significant ($P<0.05$) increase by (13.44 %), compared to that exposed to continuous lighting program (Table 4). However, plasma inorganic phosphor (IPh) and IPh/Ca ratio was similar in the two groups.

In contrast, El-Neney (2003) found that broiler chicks reared under intermittent had insignificantly plasma calcium higher than that reared under continuous lighting system. While, the plasma phosphorus was significantly ($P<0.05$) higher in continuous than that exposed to intermittent lighting system.

Birds fed low protein diet had insignificantly plasma inorganic phosphor than that fed optimum protein diet. Moreover, plasma calcium and IPh/Ca ratio were nearly similar in the two groups (Table 4).

c-Plasma glucose, cholesterol and total lipids:

Plasma glucose and cholesterol for chicks exposed to continuous lighting program had insignificantly lower than that exposed to intermittent lighting program by (7.24 and 3.25 %), respectively. In this respect, El-Neney (2003) showed that broiler chicks reared under intermittent lighting system had plasma cholesterol significantly ($P<0.01$) higher than that reared under continuous lighting system.

Plasma total lipids significantly ($P<0.05$) decreased in chicks exposed to intermittent compared to that exposed to continuous lighting program. Similar results are obtained by Soliman *et al*. (2006) who found that plasma total lipids were insignificantly lower of intermittent lighting program than that continuous lighting program, while plasma cholesterol was nearly similar in both lighting programs. Plasma glucose, cholesterol and total lipids showed insignificantly decreased for chicks fed on low protein diet that that fed on optimum protein diet (Table 4).

El-Naggar *et al*. (1997) showed that total serum cholesterols was significantly ($P<0.05$) decreased linearly with increasing protein intake. He added that there was a significant negative correlation between protein intake and total serum cholasterols. In contrast, Sherif (1989) showed that plasma cholesterol significantly decreased for chicks fed optimum protein diet compared to that fed on low protein diet.

d-Plasma enzymes:

Plasma alkaline phosphatase activity, GOT and GPT were insignificantly decreased in birds exposed to continuous lighting program compared to that those in exposed to intermittent lighting program by (3.59, 4.28 and 1.5 %), respectively (Table 4). Similar results observed by Soliman *et al*. (2006) who found that both plasma alkaline phosphatase activity and GOT were insignificantly higher in chicks exposed to intermittent than that exposed to either continuous or constant lighting programs. While, plasma GPT was insignificantly higher in chicks exposed to continuous than exposed to either constant or intermittent lighting programs.

Plasma alkaline phosphatase activity GOT and GPT had insignificantly decreased in chicks fed on low protein diet compared to that fed on optimum protein diet (Table 4).

4-Carcass traits:-

Intestinal and carcass weights showed significant (P<0.05) increase for chicks exposed to continuous lighting program than that those exposed to intermittent lighting program. However, intestinal length and abdominal fat were nearly similar in both groups (Table 5). These results agree with the results obtained by Stanley *et al*. (1997), Al-Homidan and Petchey (2001), El-Neney (2003) and Soliman *et al*. (2006). However, Kalamah (2002) reported that the absolute weight of heart was significantly lower in the (23 L: 1 D) or (1 L: 3 D), the weights of liver and spleen for birds grown under (8 L: 16 D) was significantly greater compared to the other light treatments, the photoperiods significantly affected the relative weight of liver and spleen, it did not significantly affect the relative weight of heart.

Gizzard weight showed significant (P<0.05) increase for chicks fed on low protein diet compared to that fed on normal protein diet (Table 5). While, there were no significant differences between groups (optimum and low protein diet) on the other carcass traits studied. These findings disagree with that of Abou El-Wafa *et al*. (2001) who found that total edible parts percentages were not affected by different dietary protein treatments. They added that, chicks fed 20/17% CP diets had significantly (P<0.05) higher percentage of abdominal fat and gizzard than those fed 23/20% CP diets. Also, Abd-Elsamee (2001) showed that the average values of giblets percentages were similar and there were no significant differences between treatments optimum level of crude protein (23 and 20 % at growing and finishing periods) and low level of crude protein (21 and 18 % at growing and finishing periods). On the other hand, Hassnein (2006) found that the effect of diet was significant on slaughter weight and abdominal fat percentage.

However, level of protein diet had no significant effects on the carcass characteristics (El-Deeb and Makled, 1993; El-Naggar *et al*., 1997 Abd El-Rahman, 2001). Moreover, Cabel and Waldroup (1991) found that abdominal fat was increased with decreasing CP level in the broiler finisher diets.

From the present results, it can be concluded that using the optimum protein level in the diet with either intermittent lighting (during 1-3 weeks) or continuous lighting (during 3-6 weeks) enhance growth performance, also decrease the feed consumption in broiler chicks.

Table 1. Composition and calculated analysis of the experimental diet.

Item	Growing diet (0-3) wks		Finisher diet (3-6) wks	
	23%	20%	20%	18%
Yellow corn	48.50	63.30	55.40	65.0
Soybean meal; 44%	40.00	32.00	30.60	28.00
Corn gluten; 62%	2.00	1.00	3.90	-
Vegetable oil	5.90	-	6.60	3.30
Di-ca-phosphate	1.70	1.80	1.80	1.80
Limestone	1.18	0.98	0.98	0.98
Nacl	0.30	0.30	0.30	0.30
Vit.Min .premix*	0.30	0.30	0.30	0.30
Dl-methionine	0.12	0.12	0.12	0.12
Total	100.00	100.00	100.00	100.00
Calculated analysis**				
CP%	22.96	20.01	20.06	18.02
ME kcal/kg	3102	2880	3230	3050
Lysine%	1.30	1.10	1.70	0.98
Methionine%	0.45	0.45	0.45	0.43
Methionine +Cystine, %	0.86	0.78	0.81	0.71
Ca	0.96	0.90	0.88	0.90
Available-p%	0.45	0.45	0.45	0.44

* **Vit. And Min. Premix**: Vitamin and Mineral mixture supplied each kg diet:-

Vit A 1200 IU. Vit D3 2000 IU, Vit E 10mg, Vit K3 2mg, Vit B1 1mg, Vit B2 5mg, Vit B6 1.5mg, Vit B12 10mcg, Niacin 20 mg, Pantothenic acid 10mg, Folic acid 1mg, Choline chloride 250mg, Biotin 50mcg, Manganese 60mg, Zinc 50mg, Copper 5mg, Iodine 0.3mg, Iron 30mg, Cobalt 0.1mg and Selenium 0.1mg.

**** According to NRC, (1994).**

Table (2): Live body weight and body weight gain as affected by light regimes and protein levels (X ± S.E).

Items	Light / Protein	Continuous (23L : 1D) X ± S.E	Intermittent (4L: 8D) X± S.E	Average X ± S.E	Sig	Interaction
Body weight week (g) 1st week	Optimum	97.9±2.9	98.7±2.85	98.3±2.2	N.S	N.S
	Low	92.7±3.1	84.7±2.18	88.7±2.6		
	Average	95.3±2.1	91.7±1.86	93.5±2.2		
	Significant	N.S				
3rd week	Optimum	484.6±13.5	603.0±17.1	544.2±11.9	**	**
	Low	515.8±15.7	495.5±15.5	505.9±11.0		
	Average	500.4±10.4	549.9±12.3	525.0± 8.2		
	Significant	**				
6th week	Optimum	1482.4±44.9	1402.1±41.7	1442.2±33.1	*	N.S
	Low	1458.9±37.2	1316.9±46.4	1387.9±27.8		
	Average	1470.7±29.0	1359.5±31.3	1415.1±21.5		
	Significant	**				
Body weight gain (g) 1-3 wk	Optimum	386.7±14.4	504.3±15.9	445.5±12.5	*	*
	Low	423.1±15.7	410.8±13.7	417.0±12.7		
	Average	404.9±14.0	457.6±12.3	431.2±10.9		
	Significant	**				
3-6 wk	Optimum	997.8±21.8	799.1±17.4	898.5±18.6	N.S	**
	Low	943.1±18.8	821.4±18.3	882.3±16.9		
	Average	970.5±17.7	810.3±16.5	890.4±14.7		
	Significant	**				
1-6 wk	Optimum	1384.5±29.0	1303.4±35.1	1344.0±31.2	*	*
	Low	1366.2±33.3	1232.2±37.2	1299.2±29.9		
	Average	1375.4±31.7	1267.8±35.7	1321.6±28.7		
	Significant	**				

Sig (Significant) * Significant at ≤0.05 ** highly significant at ≤0.01 N.S. Not significant

Table (3): Effect of light regimes and protein levels on feed consumption (g / bird) and feed conversion ratio (feed/gain, FCR)

Periods	Light / Protein	Continuous (23L : 1D)	Intermittent (4L : 8D)	Average
Feed consumption 1-3 WK	Optimum	1127	1168	1148
	Low	1254	1203	1229
	Average	1191	1186	1188
3-6 WK	Optimum	1720	1670	1695
	Low	1842	1747	1795
	Average	1781	1709	1745
1-6 WK	Optimum	2847	2838	2843
	Low	3096	2950	3023
	Average	2972	2894	2933
Feed conversion ratio 1-3 WK	Optimum	2.91	2.32	2.62
	Low	2.96	2.93	2.95
	Average	2.94	2.63	2.79
3-6 WK	Optimum	1.72	2.09	1.91
	Low	1.95	2.13	2.04
	Average	1.84	2.11	1.98
1-6 WK	Optimum	2.06	2.18	2.12
	Low	2.27	2.39	2.33
	Average	2.17	2.29	2.23

Table (4): Blood plasma constituents as affected by light regimes and protein levels (X ± S.E).

Blood plasma	Light / Protein	Continuous (23L : 1D) X ± S.E	Intermittent (4L : 8D) X± S.E	Average X ± S.E	Significant	Interaction
Total protein g / l	Optimum	4.09±0.623	4.15±0.808	4.12±0.703	N.S	N.S
	Low	4.05±0.504	3.81±0.547	3.93±0.526		
	Average	4.07±0.552	3.98±0.693	4.03±0.620		
	Significant	N.S				
Albumin g / l	Optimum	2.02±0.692	1.39±0.413	1.71±0.609	N.S	N.S
	Low	1.74±0.674	1.64±0.517	1.69±0.587		
	Average	1.88±0.650	1.52±0.473	1.70±0.591		
	Significant	*				
Globulin G / l	Optimum	2.08±1.133	2.75±0.799	2.42±1.016	N.S	N.S
	Low	2.31±0.955	2.17±0.606	2.24±0.782		
	Average	2.20± 1.027	2.46± 0.753	2.33±0.899		
	Significant	N.S				
Calcium mg/l	Optimum	92.31±11.467	102.31±26.41	97.31±20.47	N.S	N.S
	Low	89.23± 9.730	105.39±14.53	97.31±14.61		
	Average	90.77±10.470	103.85±20.81	97.31± 17.55		
	Significant	*				
Inorganic phosphors mg/l	Optimum	44.22±23.535	31.18±12.86	37.70±19.63	N.S	*
	Low	33.95±13.785	45.13±11.44	39.54±13.60		
	Average	39.08±19.498	38.16±13.84	38.62± 16.70		
	Significant	N.S				
IPh /Ca ratio	Optimum	0.495±0.303	0.312±0.126	0.403±0.245	N.S	*
	Low	0.381±0.149	0.439±0.141	0.410±0.144		
	Average	0.438±0.240	0.376±0.146	0.407±0.199		
	Significant	N.S				
Glucose g / l	Optimum	1.085±0.356	1.245±0.282	1.165±0.323	N.S	N.S
	Low	1.045±0.290	1.045±0.383	1.045±0.331		
	Average	1.065±0.317	1.145±0.343	1.105±0.329		
	Significant	N.S				

IPh Inorganic phosphors * significant at ≤0.05 ** highly significant at ≤0.01
N.S. Not significant

Table (4): Continuous

Blood plasma	Light / Protein	Continuous (23L : 1D) X ± S.E	Intermittent (4L: 8D) X± S.E	Average X ± S.E	Significant	Interaction
Cholesterol mg/l	Optimum	146.66±45.98	143.33±34.46	145.00±39.58	N.S	N.S
	Low	136.00±22.27	148.67±44.67	142.33±34.96		
	Average	141.33±35.58	146.00±38.93	143.67±36.89		
	Significant	N.S				
Total lipids mg/100 ml	Optimum	382.95±13.63	363.18±15.13	373.07±14.08	N.S	N.S
	Low	382.27±17.76	350.68±19.45	366.48±18.22		
	Average	382.61±14.96	356.93±17. 77	369.77±15.32		
	Significant	0.05				
Alkaline phosphatase U/L	Optimum	184.96±1.22	172.69±6.54	178.83±4.17	N.S	N.S
	Low	175.35±8.27	174.92±6.03	175.14±7.77		
	Average	180.16±6.53	173.81±6.11	176.98±5.92		
	Significant	N.S				
GOT U/L	Optimum	41.50±0.625	40.20±1.561	40.93±0.911	N.S	N.S
	Low	42.35±0.476	40.28±1.424	41.32±0.895		
	Average	42.00±0.513	40.24±1.341	41.12±0.698		
	Significant	N.S				
GPT U/L	Optimum	14.84±0.454	14.60±0.382	14.72±0.417	N.S	N.S
	Low	14.67±0.451	14.48±0.409	14.58±0.440		
	Average	14.76±0.453	14.54±0.401	14.65±0.429		
	Significant	N.S				

* significant at ≤0.05 ** highly significant at ≤0.01 N.S. Not significant

Table (5): Carcass traits as affected by light regimes and protein levels (X ± S.E).

Carcass traits	Light / Protein	Continuous (23L : 1D) X ± S.E	Intermittent (4L : 8D) X± S.E	Average X ± S.E	Significant	Interaction
Live weight Kg	Optimum	1.470±0.132	1.395±0.169	1.433±0.153	N.S	N.S
	Low	1.533±0.187	1.329±0.238	1.431±0.234		
	Average	1.502±0.162	1.362±0.204	1.432±0.194		
	Significant	*				
Liver weight g	Optimum	46.40±4.881	47.80±9.126	47.10±7.159	N.S	N.S
	Low	50.60±12.003	45.50±12.448	48.05±12.614		
	Average	48.50± 9.736	46.65±10.688	47.58±10.135		
	Significant	N.S				
Heart weight g	Optimum	9.20±1.932	9.20±1.317	9.20±1.609	N.S	N.S
	Low	9.88±2.767	9.50±2.799	9.69±2.716		
	Average	9.54± 2.349	9.35± 2.134	9.45±2.217		
	Significant	N.S				
Gizzard weight g	Optimum	48.00±12.046	40.10±9.122	44.05±11.161	**	**
	Low	47.06± 7.372	60.10±10.344	53.58±11.008		
	Average	47.53± 9.732	50.10±13.977	48.82± 11.959		
	Significant	N.S				
Intestinal weight g	Optimum	112.20±17.517	99.20±15.047	105.70±17.24	N.S	N.S
	Low	108.94±15.683	91.70±18.050	100.32±18.68		
	Average	110.57±16.268	95.45±16.624	103.01± 17.95		
	Significant	**				
Intestinal length cm	Optimum	192.40±19.01	193.40±11.42	192.90±15.27	N.S	N.S
	Low	198.45±19.12	191.20±14.19	194.83±16.81		
	Average	195.43±18.82	192.30±12.59	193.87±15.88		
	Significant	N.S				
Abdominal fat g	Optimum	41.10±17.227	40.80±13.062	40.95±14.880	N.S	N.S
	Low	37.90±16.059	40.80±18.480	39.35±16.916		
	Average	39.50±16.292	40.80±15.575	40.15±15.746		
	Significant	N.S				
Carcass weight Kg	Optimum	1.136±0.128	1.074±0.152	1.105±0.140	N.S	N.S
	Low	1.213±0.195	1.024±0.216	1.119±0.222		
	Average	1.175±0.166	1.049±0.183	1.112.±0.184		
	Significant	*				

* significant at ≤0.05 ** highly significant at ≤0.01 N.S. Not significant

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Broilers, light regimes, protein levels, carcass, blood.

الملخص العربي

تأثير نظم الاضاءة المختلفة على الأداء الانتاجى لكتاكيت اللحم المرباة على علائق تحتوى على مستويات منخفضة ومثلى من البروتين

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أجريت هذه التجربة لدراسة تأثير كل من نظم الاضاءة ونسبة البروتين فى العليقة على الأداء الأنتاجى والصفات الفسيولوجية لبدارى التسمين ، حيث قسمت الطيور عند عمر يوم الى مجموعتان متساويتا العدد طبقا الى نظم الاضاءة، وهى اضاءة مستمرة (23 ساعة اضاءة : 1 ساعة اظلام)، واضاءة متقطعة (4 ساعة اضاءة : 8 ساعة اظلام : 4 ساعة اضاءة : 8 ساعة اظلام)، وكل نظام من نظم الاضاءة تم تقسيمه الى مجموعتين تبعا لمستوى البروتين فى العليقة وهى (23أو20% فى البادىء و 20 أو18% فى الناهى). وتلخصت النتائج فى الآتى : كانت الطيور المرباة تحت نظام اضاءة مستمرة أثقل معنويا فى وزن الجسم عند عمر 6 أسابيع ، وكذلك الزيادة الاسبوعية فى وزن الجسم خلال الفترتين من 3-6 و 1-6 أسابيع من العمر مقارنة بالاضاءة المتقطعة. أوضحت النتائج أن الطيور المغذاه على المستوى الأمثل من البروتين زادت زيادة معنوية فى وزن الجسم عند 3 و 6 أسابيع من العمر، وكذلك الزيادة الاسبوعية فى وزن الجسم خلال الفترتين من1-3 و 1-6 أسابيع من العمر وذلك بالمقارنة بالطيور المغذاه على عليقة منخفضة البروتين. الطيور المعرضة للاضاءة المستمرة استهلكت غذاء أكبر بالمقارنه بالاضاءة المتقطعة خلال جميع فترات العمر المختلفة، بينما كان معدل التحويل الغذائى أقل للمعرضة للاضاءة المتقطعة خلال الفترتين من 3-6 و 1-6 أسابيع من العمر. الطيور المغذاه على عليقة منخفضة البروتين استهلكت غذاء أكبرومعدل تحويل غذائى أعلى بالمقارنه بالطيور المغذاه على المستوى الأمثل من البروتين خلال جميع فترات العمر المختلفة . أرتفع محتوى بلازما الدم من البروتينات الكلية ،الألبيومين ، الفسفور الغير عضوى، ونسبة الفسفور الغير عضوى الى الكالسيوم فى دم الطيور المرباه تحت نظام اضاءة مستمرة بالمقارنه بالاضاءة المتقطعة . بينما وجد العكس فى محتوى بلازما دم الطيور من الجلوبيولين ، الكالسيوم والكوليستيرول والجولكوز. وجد أن محتوى بلازما الدم من البروتينات الكلية، الجولكوز، الكوليستيرول والليبيدات الكلية فى الطيور المغذاه على المستوى الأمثل من البروتين مرتفع عن تلك المغذاه على عليقة منخفضة البروتين. أوزان الذبيحة والأمعاء الدقيقة زادت زيادة معنوية فى الطيور المرباه تحت نظام اضاءة مستمرة بالمقارنه بالاضاءة المتقطعة. أوزان الكبد، والقلب، والقونصة والذبيحة كانت أعلى فى الطيور المغذاه على العلائق المنخفضة فى البروتين عن العلائق المرتفعة فى البروتين.

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