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STUDIES ON THE OPTIMUM LIGHT REQUIREMENTS ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF LOCAL CHICKEN STRAINS

2. EFFECT OF DIFFERENT LIGHTING REGIMENS ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE AND SUBSEQUENT POST-HATCH PROGENY GROWTH OF LOCAL CHICKEN STRAINS

Hanaa M.Khalil; R.E.Rizk; E.H.A.Shahein;

Mona A.Mahmoud; and Amany A.El-Sahn

Animal Prod.Res.Inst;Agric.Res.Center,Ministry of Agric;Egypt

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Abstract: *The effect of four different lighting regimens on the production and reproduction performance for Mandarah (M) and Bandarah (B) chicken strains , and subsequent progeny growth were studies. Total of 600 chicks at 6wk-old from each of M and B strains were randomly distributed into four different lighting regimens in environmentally controlled house. The chicks were received the following regimens from 6 -22 wks of age., ahemeral lighting regimen ,step-down, step-up and intermittent photoperiods.*

Results obtained are summarized as follows:-

Age at first egg for both strains subjected to step-down lighting regimen was significantly (P≤ 0.001) postponed (159.9d) compared to those subjected to other lighting regimens .Egg weight produced from birds subjected to ahemeral lighting regimen (52.05 g) was significantly (P≤0.001) greater than that subjected to other lighting regimes, regardless of chicken strains. Egg weight for B strain was significantly (P≤ 0.001) heavier than that from M chicken strain. Irrespective to chicken strain, egg mass and egg production percentage for step-up lighting regimen were significantly (P≤0.001) increased than those from other lighting regimens. There were no apparent significant differences between lighting regimens on feed intake.Step-up lighting regimen represented the best significant improvement result of feed conversion compared to other lighting regimens. Regardless of chicken strain, the best result of overall mean fertility was recorded for eggs of step-up regimen followed by intermittent light regimen. The body weights of subsequent post-hatch growing chicks from parent *birds subjected to ahemeral light regimen on 2^{nd} and 8^{th} weeks of age were significantly ($P \leq 0.001$) heaviest than those of other light regimens. Irrespective to chicken strain, chick body weight gain from parent birds subjected to ahemeral light regimen was increased and surpassed significantly ($P \leq 0.001$) the weight gain of birds for other regimens during the periods from (0 -2 wks) and (6 – 8wks)of age. Bandarah strain recorded significantly ($P \leq 0.001$) heavier body weight gain compared to M strain during the experimented periods (0 -2 , 2 - 4 and 6 – 8wks) of age. The best results of feed conversion were significantly ($P \leq 0.001$) recorded for post-hatch growing chicks for ahemeral regimen compared to the other regimens through the experimented periods (0 -2 , 2 -4 and 4 – 6 wks) of age.*

INTRODUCTION

Lighting is a powerful exogenous factor of many physiological and behavioral processes which affects poultry performance. Moreover, light stimulates secretory patterns of several hormones that control growth, maturation and reproduction (Olanrewaju *et al.*, 2006).

Eitan and Soller (1991) showed that lighting regimens may be designed to either retarded or advanced maturity, and these resulted in significant changes in egg weight. Etches (1996) showed that it is of practical importance to know how many hours of light must be given to the birds before and after age at first egg in order to maximize egg production.

Egg weight at greater importance in egg production industry from both economical and settable eggs point of view. Gous *et al.*, (2000) observed that the delay in maturity caused by light regimen resulting generally in larger eggs at sexual maturity.

Egg mass is the most appropriate criteria for measuring egg production. Leeson and Summers (1980) studied the effect of photostimulation of age resulted in the best egg mass. There was evidence indicated that the use of regular increase in photoperiod throughout the laying cycle results a greater total egg yield than the use of a constant long photoperiod (Marr *et al.*, 1962).

Keshavarz (1998) observed that feed conversion was significantly inferior for hens on the step-down regimen than other experimented ones, while feed intake was not influenced by different lighting regimens. Also, Gous and Cherry (2004) showed that lighting regimen did not affect feed intake. El-Prollosy (2006) observed that there was significant different in feed conversion for Gimmizah and Silver Montazah chicken strains.

Brake *et al.,* (1989) noted that fertility was consistently high in broiler breeders reared on artificial light. On the other hand, Shanawany (1993) noted that fertility and hatchability were improved by long ahemeral lighting in domestic fowl. However, Lewis and Perry (1996) observed that poor hatchability and small chick weight were frequently associated with small egg size produced by an early maturing flock.

Numerous studies have shown the relationship between egg size and chick size in the chicken. Wilson (1991) reported that there was a positive correlation between egg weight and initial post-hatch growth. The objective of this study to investigate the effect of four different lighting regimens during the growing period on the production and reproduction performance and subsequently on post-hatch progeny growth.

MATERIALS AND METHODS

The present study was carried out at El-Sabahia Poultry Research Station, Animal Production Research Institute, Agricultural Research Center. Mandarah and Bandarah local chicks used in this experiment were hatched on December, 2006. Chicks were reared at one day old until 5 weeks of age in batteries under the same hygienic and managerial conditions. Feed and water were available *ad-libitum* throughout the study. Chicks were fed a starter diet (19% cp and 2800 Kcal) up to 8 weeks of age, grower diet (15% cp and 2700 Kcal) up to 20 weeks and layer diet (16.5% cp and 2750 Kcal).

Experimented birds and design:

A total of 1200 chicks at 6wks of age from M and B strains were transferred to an environmentally controlled light proof house in order to investigate the impact of four lighting regimens during the period from 6 to 22wks of age on the productive and reproductive performance. Chicks from each strain were randomly distributed into four insulated sections and assigned into 5 replicates to receive one of the four following light regimens(Fig.1).

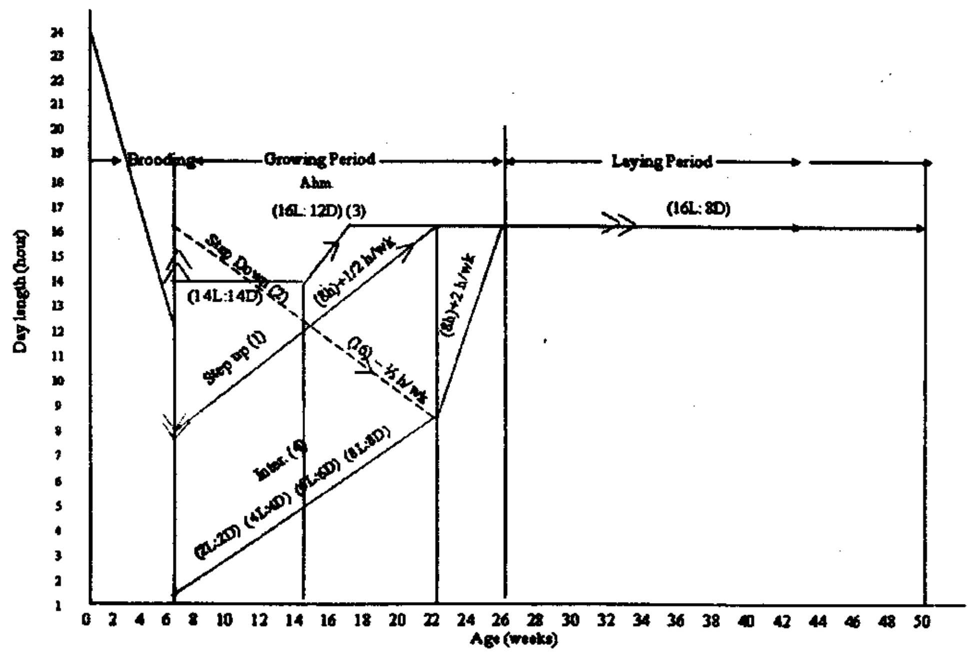

Fig. (1): Experimental Design

Regimen (1): Ahemeral lighting regimen: Light: Dark cycle had been 14L:14D till 14th week of age and then a modification was done to be reach the light to 16L:12D with a total of 28hrs till the end of the experiment.

Regimen (2): Step-down photoperiod: The photoperiod had been decreased gradually from 16-h/d by half an hours/week to reach 8-h/d photoperiod at 22wks of age, then a modification was done by increasing half an hour / week to achieve 16L:8D/day photoperiod till the end of the experiment.

Regimen (3): Step-up photoperiod: The photoperiod had been increased gradually from 8 hours/ day by half an hours each week to reach 16 hour/ day at 22 wks of age.

Regimen (4):Step-up intermittent photoperiod: Light: dark cycle had been increased 2L:2D to 4L:4D to 6L:6D and 8L:8D from 6th week till 18th week of age, respectively. On the beginning of 22nd week lighting period will be increased 2 hrs each week to reach 16 hr light until the end of the experiment.

All these light regimens had been done with fixed temperature and humidity and light intensity to be 10 lux during the growing period (6-22 wks) of age and 20 lux during the laying period.

Egg production traits:-

Age at first egg in days, average egg weight by grams, egg mass , egg production percentage, feed consumption (gm/bird/day, feed conversion (gm feed/ gm egg), fertility percentage as a percentage of macroscopic fertile eggs out of the number of total eggs set and hatchability of total eggs as a total number hatched chicks out of the total number of eggs set.

Post-hatch growth:

Two hundred and forty progeny chicks from M and B strains which produced from parents subjected to the four lighting regimens were randomly taken and distributed into batteries. Thirty chicks which replicated three times for each treatment. Chicks were raised in local –made batteries up to eight weeks of age.

Feed and water were offered *ad- libitum*. Chicks were individually weighed biweekly to the nearest gram up to eight weeks of age. Also, body weight gain (gm), feed consumption (gm/bird period) and feed conversion ratio (gm feed /gm gain) were recorded biweekly. Mortality throughout the experiment was low and therefore neglected.

Statistical analysis:

Data were analyzed using SAS general linear model procedure (SAS Institute, 1990). Mean values were compared using Duncan Multiple Rang Test (Duncan, 1955) when significant differences existed. Data were analyzed using the following model:-

$$Yijk = \mu + S_i + L_j + (SL)_{ij} + e_{ijk}$$

Where:-

Yijk= is the observation on the ij^{th} individual ; μ= is the overall mean common to all observations ; S_i = is the effect of i^{th} strains (i= 1,2) ; L_j= is the effect of j^{th} lighting regimens (j= 1,2,3and 4), and e_{ijk}= random error

RESULTS AND DISCUSSION

Results in Table 1 show the main effect of different lighting regimens on different egg parameters during the first 90 days of egg production for M and B chicken strains. Age at first egg for birds subjected to step-down lighting regimen was significantly ($P\leq 0.001$) postponed compared to those subjected to other lighting regimens. Besides, age at first egg for B strain subjected to step-down lighting regimen was significantly (P≤ 0.001) delayed compared to those from other B and M strains subjected to other lighting regimens. The lowest records of age at first egg were recorded for both B and M strains subjected to step-up and intermittent lighting regimens compared to those subjected to other regimens. Regardless of chicken strain, overall means of age at first egg were delayed for birds exposed to step-down lighting regimen by about 15, 28 and 24 days for ahemeral, step-up and intermittent regimens, respectively. Also, there was a significant (P≤ 0.001) interactions between lighting regimens and chicken strain with respect to age at first egg. The represented results regarding age at first egg for birds subjected to different lighting regimens are in accordance with those reported by Lee et al., (1971) who noted that short day lengths during rearing period will delay the onset of maturity of pullets. Supporting to our results, Keshavarz (1998) reported that the pullets on the step-down light regimen postponed the age at sexual maturity. Moreover, Lewis *et al.,* (2001) demonstrated that the influence of photoperiod on poultry age at 1^{st} egg appeared to involve a sequence of changes in the negative feedback control of the steroid hormones on gonadotrophin release.

Egg weight for ahmeral lighting regimen (52.05gm) was significantly (P≤ 0.001) greater than those for step-down (49.77gm), step-up (49.02 gm) and step-up intermittent (50.70 gm), regardless of chicken strain. Moreover, irrespective of lighting regimen, egg weight for B strain was significantly (P≤ 0.001), greater than those from M chicken strain. Also, there was a highly significant (P≤ 0.001) interaction between lighting regimens and chicken strains with respect to egg weight. The present results are in agreement with findings of Shanawany (1982) and Siopes and Neely (1997and 1999) who found that ahemeral lighting regimen increased egg size. Moreover, the significant decrease in egg weight of hens produced in step-up regimen is in line to its early maturation and in agreement with the results reported by Lesson and Summers (1980) who reported that early light stimulation decreased egg weight due to its positive correlation with sexual maturing. On contrary to our results regarding egg weight, Keshavarz (1998) stated that egg weight was significantly greater for hens on the step-down light regimen compared to other experimental light regimens. Significant differences between egg weights of M and B strains are supported by Younis and Abd El-Ghany (2003) who found a significant differences in egg weight between local strains.

Egg mass and egg production for step-up lighting regimen were significantly (P≤ 0.001) increased than those from other lighting regimens, regardless of chicken strain. Also, egg mass and egg production were significantly ($P \leq 0.001$) increased for birds exposed to step-up lighting regimen compared to others exposed to other lighting regimens. Moreover, M strain subjected to step-up regimen represented significantly ($P \leq 0.001$) high egg mass and egg-production percentage compared to M and B strains subjected to other lighting regimens. Also, there was a highly significant ($P \leq 0.001$) interaction between lighting regimen and chicken strain with respect to egg mass and egg production. The results of the present study are in accordance with those obtained by Keshavarz (1998) who found that egg mass was significantly lower for hens on the step-down regimen and the rate of egg production remained consistently lower for hens on the step-down regimen. It could be noted that reduced egg mass and egg production in current experiment may be due to delaying sexual maturity under the condition of lighting step-down. Supporting to the present results regarding the significant different in egg production between local strains El-nagar *et al.*, (2002), found that egg production was significantly different between local chicken strains. On contrary to our results, Nawar and Bahie El-Deen (2000) found no significant differences for local chicken strains in egg production. Also, El-Sudany (2005) found that no significant differences in egg mass for local chicken strains.

In conclusion, the step-up light regimen used in this experiment had the potential to increase egg mass and egg production compared to other lighting regimens.

Results presented in Table 2 show the main effect of different light regimens on feed intake and feed conversion of M and B chicken strains. Feed intake (g/hen/d) was not influenced significantly by experimented chicken strain. There were no apparent significant effect of lighting regimen on feed intake. Also, there was no significant interactions between lighting regimens and chicken strains with respect to feed intake. The results of feed consumption in this table partially agree with the results of Keshavarz (1998) who reported that the feed consumption was not influenced by different lighting regimens. Also, Gous and Cherry (2004) showed that lighting regimen did not affect feed intake of Ross broiler breeders. No significant differences were found herein between B and M strains in feed intake. This finding agrees with those obtained by Nawar and Bahie El-Deen (2000) and El-Sudany (2005) who observed similar results of feed intake for local chicken strains.

Step-up lighting regimen represented the best significant improvement result (3.75 g/g) of feed conversion compared to that subjected to ahemeral (3.93 g/g), step-up intermittent (4.10 g/g) and step-down

(4.29g/g) lighting regimens. Also, the best significant (P≤ 0.001). results of feed conversion was recorded for M strain subjected to step-up lighting regimen compared to those for M and B strains subjected to other lighting regimens. Besides, feed conversion for M birds (3.78 g/g) was significantly (P≤ 0.001) improved compared to that for B strain (4.26 g/g). Moreover, there were significant (P≤ 0.001) interaction between lighting regimen and chicken strain with respect to feed conversion.Step-down lighting regimen represented the inferior significant result of feed conversion (4.29 g/g). This result agrees with that reported by Keshavarz (1998) who reported that feed conversion was significantly inferior for hens on the step-down regimen than other experimented ones. Feed conversion improvement for M strain compared to that for B strain was parallel to the results reported by El-Sayed *et al.,* (1995); Younis and Abd El-Gahny (2003) and El-Prollosy (2006) who observed that there was a significant difference in feed conversion for local chicken strains. On contrary to our results, El-Sudany (2005) found that there were no significant differences in feed conversion among local chicken strains.

Effects of lighting regimens on fertility and hatchability of total eggs percentage are shown in Table 3. Egg fertility percentage was increased for M and B strains subjected to step-up lighting regimen compared to other lighting regimens. Also, regardless of chicken strain the best result of overall mean fertility was recorded for eggs of step-up regimen (92.77%) followed by step-up intermittent (91.14%), ahemeral (88.31%) and the lowest one was recorded for step-down (85.67%) lighting regimens. Moreover, no significant difference was observed between fertility of M and B chicken strains. Besides, no significant differences were found between lighting regimens with respect to hatchability of total eggs. This outcome agrees with the data reported by Siopes and Neely (1997and 1999) who noted that hatchability of total eggs was decreased by 3-4% for ahemeral light regimen compared to other regimens and escaped statistical significant. The numerical improvements of hatchability of total eggs were observed for eggs of both M (80.93%) and B (83.07%) strains subjected to step-up photoperiod compared to the other lighting regimens. Also, there was no significant interaction between lighting regimen and chicken strain with respect to fertility and hatchability of total eggs.

The increase of fertility percentage for birds exposed to step-up light regimen compared to other light regimen is consistent with the results of Lewis and Perry (1996) who correlated this increase of fertility with the early maturation of birds. Egg fertility percentage was decreased for birds subjected to ahemeral light regimen compared to step-up and step-up intermittent lighting regimens. Also, hatchability of total eggs percentages was decreased for ahemeral lighting regimen compared to other lighting regimens. These results are contradicted with the results of Shanawany (1993) who noted that fertility and hatchability were improved by long ahemeral lighting in domestic fowl.

The lack of significant differences between the two strains in fertility and hatchability of total eggs almost could be attributed to their similarity in genetic make up. These results are in harmony with those reported by Younis and Abd El-Ghany (2003) and El-Sudany (2005) who indicated that fertility and hatchability were not affected significantly among local chicken strains. Whereas, Balat (1990) and El-Sayed *et al.*, (1995) concluded that strain had a highly significant effect on hatchability.

Data obtained concerning the main effect of different lighting regimens for parent birds on subsequent post-hatch progeny weights (g) during the first eight weeks of growing for M and B strains are shown in Table 4. Irrespective to chicken strain, chick body weights at hatch for ahemeral light regimen (37.86 gm) were significantly ($P \leq 0.05$) heavier than those for step-up light regimen (35.92 gm). The body weight chicks produced from parent birds subjected to ahemeral light regimen on 2nd and 8th weeks of age were significantly ($P \leq 0.001$) heavier than body weights of birds subjected to other experimented light regimens. Moreover, body weight on the 4th week of age from parent birds subjected to ahemeral light regimen (250.51gm) was significantly ($P \leq 0.05$) heavier than those subjected to step-down (230.16 gm) and step-up (224.81 gm) light regimens, while it is not differ significantly than those for step-up intermittent regimen (240.16gm).On the 6th week of age, ahemeral light regimen had the best body weight compared to other light regimens as in other experimented periods with some exception in significant differences. Moreover, there were no significant interactions between lighting regimens and chicken strains in chicks body weight through the all experimented periods.

Table 5 represents the main effect of different lighting regimens for parent birds on subsequent post-hatch progeny body weight gain for M and B chicks. Irrespective of chicken strain, chick body weight gain of progeny birds from parent birds subjected to ahemeral light regimen was increased and surpassed significantly ($P \leq 0.001$) the weight gain from other regimens during the period of (0-2 wks) and (6-8 wks) of age. Whereas there were no significant differences between lighting regimens during the experimented periods (2-4 wks) and (4-6 wks) of age. Bandarah strain recorded significantly ($P \leq 0.001$) larger body weight gain compared to M strain during the experimented periods (0-2 wks), (2-4 wks) and (6-8 wks) of age. No significant interactions were detected between lighting regimens and chicken strains through the all experimented period.

Effect of different lighting regimens for parent birds on feed consumption subsequent of post-hatch growing chicks for M and B strains are shown in Table 6. Irrespective of chicken strain, post-hatch growing chicks from parent birds subjected to step-down light regimen consumed significantly ($P \leq 0.001$) less amount of feed (g/bird/period) compared to those from parent birds subjected to other experimented light regimens during the first two weeks of age. Whereas during the periods of (2-4 wks) and (4-6 wks) of age, chicks from parent birds subjected to ahemeral light regimen consumed significantly ($P \leq 0.001$) less amounts of feed compared to those from parent birds subjected to other regimens. Moreover, chicks from parent birds subjected to step-up light regimen realized significantly ($P \leq 0.001$) the larger amount of feed consumption compared to other experimented light regimens through the growing periods (0-2 wks), (2-4 wks) and (4-6 wks) of age, while during 6-8 wks of age, the chicks for the different regimens had different response of feed consumption compared to that in other first growing period as the chicks for ahemeral light regimen consumed the largest amount of feed compared to that for other regimens. Chicks from parent birds of M strain consumed significantly ($P \leq 0.001$) less amount of feed compared to those subjected to B chicks strain through all experimental periods. Also, there are significant ($P \leq 0.001$) interaction between lighting regimens and chicken strains during all experimented periods except the period of (6-8 wks) of age.

Effect of different lighting regimens for parent birds on feed conversion (gm feed/gm gain) of subsequent post-hatch growing chicks of M and B strains is shown in Table 7. Regardless of chicken strains, the best results of feed conversion were significantly ($P \leq 0.001$) recorded for post-hatch growing chicks from parent birds subjected to ahemeral light compared to the other regimens throughout the experimented periods (0-2, 2-4 and 4-6 wks) of age. Whereas during the growing period of (6-8 wks) of age the best significant ($P \leq 0.05$) improvements of feed conversion was recorded for chicks of ahemeral (3.50g/g) followed by step-up intermittent (3.74 g/g) and step-down (4.02 g/g) compared to those of step-up (5.04 g/g) light regimen. Moreover, chicks from parent birds of M strain realized significantly ($P \leq 0.001$) the better improvement of feed conversion compared to those for B strain through the (0-2 , 2- 4 and 4-6 wks of age), while no significant difference of feed conversion was recorded between the both strains during 6-8 wks of growing age. Also, there are significant

($P \leq 0.001$) interactions between light regimens and chicken strains during all experimented periods except the period of (6-8 wks) of age.

This part of experiment regarding the effect of lighting regimens on age at first egg and egg weight then consequently affects post-hatch growing chicks implies on the fact that increased chick weight occurs only with increased egg size. Results of this study are consistent with other reports by Shanawany, (1987) who mentioned that egg size is positively correlated with poult weight. Also, Wilson, (1991) reported a positive correlation between egg weight and initial post-hatch growth. In addition, Shanawany (1993) showed that heavier chick weight occurred from eggs laid under ahemeral light than the natural light.

It is concluded from these results that step-up light regimen realized the best records of egg mass, egg production percentage and fertility compared to other light regimens. Also, it is concluded that ahemeral light regimen realized the best results of egg weight and consequently the post-hatch growing chicks weights, chick weight gain and feed conversion through the periods of growing until 8th weeks of age compared to the other experimented light regimen.

Table (1): Effect of different lighting regimens on age at first egg and different eggs parameters during the first 90 days of egg production for Mandarah (M) and Bandarah (B) chicken strains

Traits	Age at first egg (day)			Egg weight (g)			Egg mass (g/hen/day)			Egg production (%)		
Lighting regimens	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean
Abermeral (AH)	145.0 ± 1.78^{c}	145.0 ± 2.09^{c}	145.0 ± 1.29^{B}	51.32 ± 0.48^{b}	52.78 ± 0.47^{a}	52.05 ± 0.47^{A}	29.33 ± 0.37^{b}	27.44 ± 0.32^{cd}	28.39 ± 0.34^{B}	27.20 ± 0.002^{b}	52.0 ± 0.002^{e}	54.60 ± 0.002^{B}
Step-down (SD)	154.0 ± 2.21^{b}	165.0 ± 2.30^{a}	159.9 ± 2.36^{A}	49.08 ± 0.47^{cd}	50.47 ± 0.48^{bc}	49.77 ± 0.46^{BC}	28.24 ± 0.36^{c}	23.84 ± 0.32^{e}	26.04 ± 0..36^{D}	57.66 ± 0.001^{b}	47.20 ± 0.002^{f}	52.40 ± 0.012^{D}
Step-up (SU)	132.40 ± 2.11^{d}	132.0 ± 1.58^{d}	132.20 ± 1.24^{C}	49.56 ± 0.40^{cd}	48.48 ± 0.47^{d}	49.02 ± 0.43^{C}	32.84 ± 0.30^{a}	26.94 ± 0.35^{d}	29.89 ± 0.35^{A}	66.20 ± 0.001^{a}	55.60 ± 0.001^{d}	60.90 ± 0.012^{A}
Intermittent (SU-I)	138.20 ± 1.85^{d}	134.0 ± 2.38^{d}	136.10 ± 1.58^{C}	49.80 ± 0.49^{cd}	51.61 ± 0.48^{ab}	50.70 ± 0.48^{B}	28.07 ± 0.37^{c}	26.63 ± 0.34^{d}	27.35 ± 0.29^{C}	56.40 ± 0.001^{c}	51.60 ± 0.001^{e}	54.00 ± 0.001^{C}
Overall mean	142.40 ± 2.06^{Y}	144.75 ± 2.18^{X}		49.94 ± 0.46^{Y}	50.83 ± 0.48^{X}		29.62 ± 0.35^{X}	26.21 ± 0.27^{Y}		59.35 ± 0.001^{X}	51.60 ± 0.004^{Y}	
	Significant											
Between lighting photoperiods	***			***			***			***		
Between strains	***			**			***			***		
Interaction	***			**			***			***		

A,B and C, means within lighting regimens effect with no common superscripts differ significantly (P≤ 0.001).
X and Y, means within strain effect with no common superscript differ significantly (P≤ 0.001).
a,b,c and d means within lighting regimens by strain interaction effect with no common superscripts differ significantly (P≤ 0.001).

Table (2): Effect of different lighting regimens on feed intake and feed conversion of Mandarah (M) and Bandarah (B) chicken strains

Traits / Lighting regimens	Feed intake (g/hen/d)			Feed conversion (g feed/g egg)		
	M	B	Overall mean	M	B	Overall mean
Ahermeral (AH)	112.20± 0.47	111.00± 0.47	111.60± 0.47	3.82± 0.032^{b}	4.04± 0.033^{cd}	3.93± 0.033^{B}
Step-down (SD)	111.20± 0.47	110.70± 0.47	110.95± 0.47	3·94± 0.033^{c}	4.64± 0.042^{f}	4.29± 0.085^{D}
Step-up (SU)	111.12± 0.48	111.14± 0.47	111.13± 0.46	3.38± 0.031^{a}	4.12± 0.036^{cd}	3.75± 0.038^{A}
Intermittent (SU-I)	111.74± 0.47	112.36± 0.47	112.05± 0.47	3.98± 0.035^{c}	4.22± 0.036^{e}	4.10± 0.036^{C}
Overall mean	111.56± 0.47	111.30± 0.47		3.78± 0.031^{X}	4.26± 0.040^{Y}	
	Significant					
Between lighting photoperiods	NS			***		
Between strains	NS			***		
Interaction	NS			***		

A,B and C, means within lighting regimens effect with no common superscripts differ significantly (P≤ 0.001).
X and Y, means within strain effect with no common superscripts differ significantly (P≤ 0.001).
a,b,c,d,e and f means within lighting regimens by strain interaction effect within no common superscript differ significantly (P≤ 0.001).
NS, not significant

Table (3): Effect of different lighting regimens on hatchability traits of laying hens for Mandarah (M) and Bandarah (B) chicken strains

Traits	Fertility (%)			Hatchability of total eggs (%)		
Lighting regimens	M	B	Overall mean	M	B	Overall mean
Ahermeral (AH)	87.18± 2.31	89.44± 0.20	88.31± 1.15^{BC}	76.56± 1.54	80.85± 1.74	78.70± 1.41
Step-down (SD)	84.34± 2.64	86.99± 1.88	85.67± 1.56^{C}	79.65± 3.80	82.87± 4.15	81.26± 3.62
Step-up (SU)	93.28± 1.80	92.26± 0.42	92.77± 0.86^{A}	80.93± 2.75	83.07± 2.72	82.00± 2.79
Intermittent (SU-I)	91.18± 0.76	91.10± 0.31	91.14± 0.56^{AB}	80.03± 2.48	82.14± 1.09	81.09± 1.30
Overall mean	88.99± 1.35	89.95± 0.72		79.29± 2.28	82.23± 2.17	
	Significant					
Between lighting photoperiods	***			NS		
Between strains	NS			NS		
Interaction	NS			NS		

A,B and C, means within lighting regimens effect with no common superscripts differ significantly ($P \leq 0.001$).
NS ,not significant

Table (4): Effect of different lighting regimens for parent birds on subsequent post-hatch progeny weight for Mandarah (M) and Bandarah (B) chicken

Traits / Lighting regimens	Body weight (gm)														
	Chick weight at hatch			2 week			4 week			6 week			8 week		
	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean
Ahermeral (AH)	37.60 ± 0.60^{a}	38.14 ± 0.71^{a}	37.86 ± 0.45^{A}	112.73 ± 3.78^{b}	121.85 ± 0.95^{a}	117.13 ± 2.15^{A}	249.64 ± 11.42^{a}	251.33 ± 10.52^{a}	250.51 ± 10.61^{A}	430.33 ± 8.63^{ab}	441.78 ± 16.30^{a}	435.86 ± 11.94^{A}	728.57 ± 31.49^{a}	696.0 ± 29.70^{ab}	711.72 ± 29.45^{A}
Step-down (SD)	36.13 ± 0.70^{ab}	37.66 ± 0.52^{a}	36.90 ± 0.45^{AB}	100.86^{d} ± 3.28	109.93 ± 2.45^{bc}	105.40 ± 2.18^{B}	218.33 ± 2.18^{bc}	242.0 ± 4.92^{ab}	230.16 ± 4.65^{B}	418.93 ± 13.90^{ab}	402.0 ± 10.45^{ab}	410.46 ± 12.68^{AB}	638.33 ± 21.22^{bc}	584.0 ± 26.66^{c}	611.16 ± 23.48^{BC}
Step-up (SU)	35.14 ± 0.78^{b}	36.76 ± 0.90^{ab}	35.92 ± 0.60^{B}	98.71^{d} ± 3.55	107.0 ± 1.24^{bcd}	102.70 ± 2.06^{B}	209.33 ± 6.74^{c}	239.28 ± 11.65^{ab}	224.81 ± 9.35^{B}	401.78 ± 13.47^{ab}	390.0 ± 8.30^{b}	396.11 ± 10.98^{B}	582.69 ± 21.27^{c}	570.35 ± 15.04^{c}	576.29 ± 18.67^{C}
Intermittent (SU-I)	37.26 ± 0.96^{ab}	37.93 ± 0.60^{a}	37.61 ± 0.55^{A}	102.40 ± 3.69^{cd}	113.93 ± 2.17^{ab}	108.35 ± 2.32^{B}	239.68^{ab} ± 9.19	240.66 ± 10.65^{ab}	240.16 ± 9.88^{AB}	424.33 ± 19.96^{ab}	426.25 ± 18.17^{ab}	425.32 ± 19.96^{AB}	676.25 ± 27.05^{ab}	625.0 ± 9.86^{bc}	651.45 ± 18.25^{B}
Overall mean	36.55 ± 0.69^{Y}	37.65 ± 0.64^{X}		103.76 ± 3.88^{Y}	113.25 ± 1.16^{X}		229.74 ± 7.77^{Y}	243.38 ± 9.78^{X}		419.13 ± 13.24	415.60 ± 13.45		658.10 ± 25.30^{X}	619.66 ± 20.52^{Y}	
	Significant														
Between lighting photoperiods	*			***			*			*			***		
Between strains	*			***			*			NS			*		
Interaction	NS			NS			NS			NS			NS		

A,B and C, means within lighting regimens effect with no common superscript differ significantly ($P \leq 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($P \leq 0.001$).
a,b,c and d means within lighting regimens by strain interaction effect with no common superscript differ significantly ($P \leq 0.001$). NS,no significant

Table (5): Effect of different lighting regimens for parent birds on subsequent post-hatch progeny body weight gain for Mandarah (M) and Bandarah (B) chicken strains

Traits / Lighting regimens	Body weight gain (gm)											
	(0-2) wk			(2-4 wk)			(4-6 wk)			(6-8wk)		
	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean
Abermeral (AH)	75.13 ± 3.66^{c}	83.71 ± 1.25^{a}	79.27 ± 2.11^{A}	127.79 ± 10.97^{abc}	138.60 ± 12.25^{ab}	133.37 ± 11.17	179.0 ± 12.07	192.14 ± 8.81	185.34 ± 7.52	265.66 ± 28.23^{ab}	286.78 ± 26.34^{a}	275.86 ± 26.12^{A}
Step-down (SD)	64.73 ± 3.46^{c}	72.26 ± 2.70^{bc}	68.50 ± 2.26^{B}	108.40 ± 7.62^{bc}	141.13 ± 6.19^{a}	124.76 ± 5.70	176.93 ± 14.92	183.66 ± 6.33	180.30 ± 10.98	165.06 ± 13.88^{e}	236.33 ± 24.88^{abcd}	200.70 ± 18.48^{B}
Step-up (SU)	63.57 ± 3.74^{c}	70.23 ± 1.78^{bc}	66.77 ± 2.18^{B}	102.23 ± 5.90^{c}	140.57 ± 11.70^{a}	122.11 ± 8.57	162.50 ± 17.58	180.76 ± 7.35	171.30 ± 11.76	168.57 ± 20.49^{de}	192.69 ± 21.48^{cde}	180.18 ± 19.73^{B}
Intermittent (SU-I)	65.13 ± 3.78^{ab}	76.0 ± 2.29^{ab}	70.74 ± 2.36^{B}	125.75 ± 8.47^{abc}	138.27 ± 12.02^{ab}	131.80 ± 10.24	183.66 ± 11.42	186.56 ± 11.36	185.16 ± 10.22	200.66 ± 24.14^{bcde}	250.0 ± 15.06^{abc}	226.13 ± 19.50^{B}
Overall mean	67.20 ± 3.88^{Y}	75.60 ± 1.98^{X}		116.48 ± 8.38^{Y}	139.62 ± 5.26^{X}		175.74 ± 13.93	185.86 ± 8.36		200.52 ± 21.13^{Y}	242.50 ± 21.58^{X}	
	Significant											
Between lighting photoperiods	***			NS			NS			***		
Between strains	***			***			NS			***		
Interaction	NS			NS			NS			NS		

A,B and C, means within lighting regimens effect with no common superscript differ significantly ($P \leq 0.001$).

X and Y, means within strain effect with no common superscript differ significantly ($P \leq 0.001$).

a,b,c and d means within lighting regimens by strain interaction effect with no common superscripts differ significantly ($P \leq 0.001$). NS,no significant

Table (6): Effect of different lighting regimens for parent birds on feed consumption (gm/bird period) of subsequent post-hatch chicks for Mandarah (M) and Bandarah (B) strains

Traits	Feed consumption (gm/bird)											
	(0-2) wk			(2-4 wk)			(4-6 wk)			(6-8wk)		
Lighting regimens	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean	M	B	Overall mean
Ahermeral (AH)	190.50 ± 6.09^{h}	198.0 ± 7.45^{d}	194.25 ± 6.7^{C}	357.10 ± 10.93^{g}	383.50 ± 17.81^{e}	370.45 ± 14.35^{D}	571.40 ± 14.61^{g}	561.20 ± 18.83^{h}	566.30 ± 16.70^{D}	857.10 ± 14.33^{abc}	918.40 ± 14.42^{a}	887.75 ± 14.39^{A}
Step-down (SD)	191.40 ± 9.15^{f}	193.30 ± 6.19^{e}	192.35 ± 7.69^{D}	335.20 ± 7.01^{h}	429.00 ± 16.13^{b}	382.10 ± 11.59^{B}	574.30 ± 14.68^{e}	575.20 ± 14.70^{d}	574.75 ± 14.70^{C}	619.05 ± 8.47^{d}	809.50 ± 11.08^{abc}	714.27 ± 9.77^{B}
Step-up (SU)	204.10 ± 9.36^{c}	223.60 ± 10.24^{a}	213.85 ± 9.81^{A}	387.40 ± 13.10^{c}	459.20 ± 15.41^{a}	423.30 ± 14.22^{A}	612.20 ± 20.55^{b}	715.90 ± 29.44^{a}	664.05 ± 24.91^{A}	682.40 ± 10.75^{cd}	883.50 ± 13.93^{ab}	782.95 ± 12.38^{AB}
Intermittent (SU-I)	191.00 ± 9.66^{g}	214.30 ± 12.88^{b}	202.65 ± 11.29^{B}	361.90 ± 16.79^{f}	384.80 ± 13.01^{d}	373.35 ± 14.92^{C}	573.80 ± 14.67^{f}	582.10 ± 19.54^{c}	577.95 ± 17.15^{B}	714.30 ± 18.26^{bcd}	805.80^{abc} ± 12.70	760.05 ± 15.50^{B}
Overall mean	194.25 ± 8.57^{Y}	207.30 ± 9.19^{X}		360.40 ± 11.96^{Y}	414.20 ± 15.60^{X}		582.92 ± 16.13^{Y}	608.60 ± 20.49^{X}		718.21^{Y} ± 12.96	854.30 ± 13.05^{X}	
	Significant											
Between lighting photoperiods	***			***			***			*		
Between strains	***			***			***			***		
Interaction	***			***			***			NS		

A,B and C, means within lighting regimens effect with no common superscripts differ significantly ($P \leq 0.001$).

X and Y, means within strain effect with no common superscripts differ significantly ($P \leq 0.001$).

a,b,c,d,e and f means within lighting regimens by strain interaction effect with no common superscript differ significantly ($P \leq 0.001$). NS, no significant

Table (7): Effect of different lighting regimens for parent birds on feed conversion (gm feed/gm gain) of subsequentpost-hatch growing **chicks** of Mandarah (M) and Bandarah (B) strains

Traits / Lighting regimens	Feed conversion (gm feed / gm gain) (0-2) wk M	(0-2) wk B	(0-2) wk Overall mean	(2-4 wk) M	(2-4 wk) B	(2-4 wk) Overall mean	(4-6 wk) M	(4-6 wk) B	(4-6 wk) Overall mean	(6-8wk) M	(6-8wk) B	(6-8wk) Overall mean
Abermeral (AH)	2.54 ± 0.053^{b}	2.30 ± 0.027^{a}	2.42 ± 0.041^{A}	2.91 ± 0.099^{c}	2.87 ± 0.825^{a}	2.89 ± 0.451^{A}	3.46 ± 0.149^{c}	3.08 ± 0.123^{a}	3.27 ± 0.138^{A}	3.51 ± 1.162^{a}	3.49 ± 0.125^{a}	3.50 ± 0.643^{A}
Step-down (SD)	3.13 ± 0.230^{f}	2.74 ± 0.788^{c}	2.94 ± 0.529^{B}	3.32 ±0.119^{f}	3.25 ± 0.116^{c}	3.29 ± 0.118^{C}	3.54 ± 0.153^{f}	3.38 ± 0.121^{d}	3.46 ± 0.140^{C}	4.25 ± 1.407^{ab}	3.79 ± 1.255^{a}	4.02 ± 1.331^{A}
Step-up (SU)	3.49 ± 0.257^{h}	3.43 ± 0.179^{g}	3.46 ± 0.215^{D}	4.30 ± 1.424^{h}	3.57 ± 0.154^{g}	3.93 ± 0.499^{D}	4.27 ± 1.414^{g}	4.54 ± 1.503^{h}	4.40 ± 1.460^{D}	4.66 ± 1.543^{ab}	5.41 ± 0.232^{b}	5.04 ± 0.887^{B}
Intermittent (SU-I)	3.10 ± 0.123^{e}	2.93 ± 0.189^{d}	3.01^{C} ± 0.156	3.02 ± 0.120^{d}	2.89 ± 0.186^{b}	2.96 ± 0.155^{B}	3.37 ± 0.135^{c}	3.36 ± 0.134^{b}	3.37 ± 0.140^{B}	3.98 ± 1.317^{ab}	3.51 ± 0.150^{a}	3.74 ± 0.733^{A}
Overall mean	3.07 ± 0.166^{Y}	2.85 ± 0.296^{X}		3.39 ± 0.440^{Y}	3.15 ± 0.322^{X}		3.66 ± 0.464^{Y}	3.59 ± 0.477^{X}		4.10 ± 1.359	4.05 ± 0.443	
	Significant											
Between lighting photoperiods	***			***			***			*		
Between strains	***			***			***			NS		
Interaction	***			***			***			NS		

A,B and C, means within lighting regimens effect with no common superscripts differ sig ificantly (P≤ 0.001).
X and Y, means within strain effect with no common superscripts differ significantly (P< 0.001).
a,b,c,d,e,f,g and h means within lighting regimens by strain interaction effect with no cc mmon superscript differ significantly (P≤ 0.001).
NS. no significant

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الملخص العربى

١. دراسة الاحتياجات المثلى من الاضاءة لسلالات الدجاج المحلية و تأثيرها على الصفات الانتاجية و التناسلية

٢. تأثير إختلاف برامج الاضاءة المختلفة على الصفات الانتاجية والتناسلية وبالتالى على نمو الكتاكيت بعد الفقس لسلالات الدجاج المحلية

هناء محمد خليل ، رءوف إدوارد رزق ،السيد حامد شاهين ، منى محمود أحمد ،أمانى عادل الصحن

معهد بحوث الانتاج الحيوانى -مركز البحوث الزراعية -وزارة الزراعة-الدقى

أجريت هذة التجربة بمحطة بحوث تربية الدواجن بالصبحية بالاسكندرية التابعة لمركز البحوث الزراعية فى الفترة مابين ديسمبر ٢٠٠٦ إلى فبراير ٢٠٠٨ الهدف من هذة الدراسة هو تأثير أربعة برامج إضاءة على الأداء الانتاجى والتناسلى لسلالتى المندرة والبندرة وبالتالى على نمو الكتاكيت بعد الفقس .عدد الكتاكيت المستخدمة ٦٠٠ كتكوت عند عمر ٦ أسابيع وذلك من سلالتى المندرة والبندرة تم توزيعهم عشوائيا وتم تعريضهم لأربعة برامج إضاءة مختلفة خلال مرحلة النمو من ٦-٢٢ أسبوع من العمر.وكانت كالأتى -:

١. البرنامج الأول - :برنامج إضاءة أكثر من ٢٤ ساعة إضاءة

٢. البرناج الثانى - :برنامج إضاءة متناقص

٣. لا البرنامج الثالث - :برنامج إضاءة متزايد

٤. البرنامج الرابع - :برنامج إضاءة متزايد متقطع

وتتلخص أهم النتائج المتحصل عليها فى الأتى - :

١. تعرض سلالتى المندرة والبندرة لبرنامج الاضاءة المتناقص أدى إلى تأخير العمر معنويا عند أول بيضة مقارنة ببرامج الاضاءة الأخرى.

٢. وزن البيض الناتج من برنامج الاضاءة الأكثر من ٢٤ ساعة إضاءة كان ٥٢.٠٥ جرام وكان أعلى معنويا من وزن البيض الناتج من برنامج الاضاءة المتناقص ٤٩.٧٧ جرام وبرنامج الاضاءة المتزايد ٤٩.٠٢ جرام وبرنامج الاضاءة المتزايد المتقطع ٥٠.٧٠ جرام وذلك بغض النظر عن السلالة.

٣. حقق وزن بيض سلالة البندرة زيادة معنوية ($P \leq 0.001$) مقارنة بوزن بيض سلالة المندرة.

٤. أدى التعرض لبرنامج الاضاءة المتزايد إلى زيادة معنوية ($P \leq 0.001$) فى نسبة إنتاج البيض وكتلة البيض مقارنة بالبرامج الأخرى وذلك بغض النظر عن السلالة.

٥. لم يكن هناك تأثير معنوى واضح لبرامج الاضاءة المستخدمة على معدل إستهلاك العلف اليومى للغذاء ماعدا بين برنامج الاضاءة المتناقص وبرنامج الاضاءة المتزايد المتقطع.

٦. أظهر برنامج الاضاءة المتزايد أحسن نسبة تحويل غذائى لكتلة البيض مقارنة بالبرامج الأخرى.

٧. أظهر برنامج الاضاءة المتزايد تفوقا فى نسبة خصوبة البيض مقارنة بالبرامج الأخرى وذلك بغض النظر عن السلالة.

٨. وزن جسم الكتاكيت الناتجة بعد الفقس لأباء تعرضوا لبرنامج إضاءة أكثر من ٢٤ ساعة إضاءة كان أثقل وأعلى معنويا وذلك عند عمر ٢و٨ أسبوع مقارنة بالبرامج الأخرى.

٩. وزن جسم الكتاكيت المكتسب لأباء تعرضوا لبرنامج إضاءة أكثر من ٢٤ ساعة إضاءة كان أعلى معنويا ($P \leq 0.001$) ومتفوق عن وزن جسم الكتاكيت المكتسب للأبناء الناتجين من برامج الاضاءة الأخرى وذلك فى الفترة من(صفر – ٢) أسبوع و(٦-٨) أسبوع من العمر.

١٠. سجل وزن الجسم المكتسب لكتاكيت سلالة البندرةالأبناء بعد الفقس أعلى أرقام بزيادة معنوية مقارنة بوزن الجسم المكتسب لسلالة المندرة بعد الفقس وذلك أثناء فترات (صفر-٢ أسبوع و٢-٤) أسبوع و (٦-٨) أسبوع (من العمر.

١١. أفضل نسبة تحويل غذائى للكتاكيت بعد الفقس كانت لأباء تعرضوا لبرنامج إضاءة أكثر من ٢٤ ساعة إضاءة مقارنة ببرامج الآضاءة الأخرى وذلك فى الفترات من (صفر-٢) أسبوع و (٢-٤)أسبوع و(٦-٨) أسبوع من العمر .