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PRODUCTIVE PERFORMANCE OF DANDARAWI CHICKENS DURING REARING AND LAYING PERIODS AS AFFECTED BY DIFFERENT PHOTOPERIODS DURING THE REARING PERIOD

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SUMMARY

The lighting program can have a major influence on the productive performance of Dandarawi chickens during rearing and laying periods. Two hundred 8 weeks old Dandarawi pullets were equally distributed into 5 groups (G1 to G5). The pullets in G1 to G5 were exposed during the rearing period (8 to 18 weeks of age) to 8L:16D, 10L:14D, 12L:12D, 14L:10D, and 16L:8D hrs daily, respectively.

The results showed that, at 26 and 62 weeks of age, no significant differences were observed in body weight among the 5 groups. Body weight gain during the rearing period for G5 significantly (P≤0.05) exceeded that of all the other groups. The total mortality rate (8-62 weeks of age) of the G3 group was lower than those of the other groups. The age at sexual maturity decreased gradually with increasing the photoperiod. No significant differences were observed in feed consumption (FC) and feed conversion, as g feed per g gain during rearing period among the 5 groups.

However, during laying period, the hens of the 12L:12D group had significantly (P≤0.05) better feed conversion as g feed per g egg mass; decreased FC; greater egg production, eggs number, egg mass; and better shell percentage and economical efficiency than the other groups. No significant differences were observed in egg weight, egg shape index, egg yolk and albumen percentages among the 5 groups. The egg yolk index of 14L:10D group was significantly better (P≤0.05) those of the other groups. Haugh units of the G2, G3 and G4 were significantly (P≤0.05) higher than those of the G1 and G5.

It was recommended to expose Dandarawi pullet's, during the period from 8 to 18 wks of age, to 12L:12D hrs daily to obtain higher productive performance during the laying period .

Keywords: Dandarawi, photoperiods, rearing, laying, egg quality, performance.

INTRODUTION

The light durations (photoperiods) during the rearing period of chickens are one of the most crucial environmental factors for controlling sexual maturity, body weight, activity, feed consumption, egg production and egg weight. The main objective of controlled lighting in the growing period is to retard or delay sexual maturity so as to increase early egg size and minimize mortality at the onset of lay. The adoption of a correct lighting program to achieve the desired egg output can have an enormous effect on income from eggs and profitability of the flock. (Morris, 1985; Hamilton and Kennie, 1997; and Mendes, *et al.*, 2005).

Research has shown that there is an optimum age for pullets to reach sexual maturity (50% lay) for each genetic stock and each set of economic conditions. The pattern of changing day length experienced by birds influences them in two ways: The first way, increasing natural day length, as occurs in spring, accelerates sexual maturity of growing pullets for the strain (produced by photo-stimulation at an early age) results in more total eggs but large numbers of small and peewee eggs. The second way, decreasing day length, as in autumn, slow growth, retards sexual maturity of growing pullets and restrains egg production. The heavier the pullet is at maturity, the larger her egg size will be, not only initially, but for her entire productive life (Leeson and Summers, 1985; Morris, 1994, and Lewis *et al.*, 1996a).

The standard lighting program we refer to in our management guides is to start chicks the first week with 20-22 hours of light per day. Then reduce day length each week to reach 8-12 hours by eight weeks of age, or, in open housing, the longest natural day length the flock will experience between 8 and 18 weeks. That day length should be kept constant until maturity. Longer day lengths during the growing period usually result in more feed intake and heavier body weights. Assuming body weight is at or above target, light stimulation can begin at 17-18 weeks with weekly increases in day length of 30 minutes initially, and 15 minutes later, until about 16 hours of total day length is reached. That type of "normal" program should achieve the egg size and egg number standards we publish in the management guides, mostly based on those reviewed by Morris (1968), and evaluated later by Shanawany and Morris (1980).

Intensive poultry production in Egypt depends not only on commercial hybrids but also on local strains of chickens. Recently in Egypt, a considerable attention has been paid to improve the productive performance of these local strains, especially Dandarawi. Although many researches have been carried out to determine the optimal requirements of different local strains under different locations in Egypt, the available data regarding their requirement of photoperiods during rearing are still insufficient. Therefore, this study aimed at evaluating productive performance of Dandarawi chicken during rearing and laying as affected by different photoperiods in the rearing period.

MATERIALS AND METHODS

This experiment was carried out at the Poultry Researches Farm of the Animal and Poultry Production Department, Faculty of Agriculture, Assiut University, Assiut, Egypt. The experiment started on March for sixty two weeks, using six hundred, unsexed one-day-old local chicks (Dandarawi). All chicks were wing-banded, individually weighed and housed on deep litter. During the first 8 weeks, all chicks were fed a starter diet (Table 1). By 8 weeks of age, 200 pullets with similar live body weights were selected and used in this study. All pullets were shank banded, weighed individually, randomly distributed into 5 equal groups of 40 birds, and housed in 5 closed floor pens in 5 rooms. Each group was kept in an area of 6 square meters provided with wheat straw litter (5 cm depth). The first, second, third, fourth, and fifth groups (G1 to G5) were exposed during rearing period (8 to 18 weeks of age) to 8L:16D, 10L: 12D, 12L: 12D, 14L:10D, and 16L: 8D hrs daily, respectively (Table 2). Light intensity was 10 and 20 Lux/m^2 in rearing and laying periods, respectively by using additional incandescent light. The humidity and temperature ranged from 60 to 70% and 22 to 26°C in rearing and laying periods, respectively. Feed and water were available *ad libitum*. All hens were kept under similar adequate managerial and hygienic conditions until the end of the experiment. Diets were formulated according to the NRC (1994) to cover the nutrients requirements recommendation (Table 1). The females received starter, grower and layer experimental diets from one-day old to 8, 9 to 22 and 23 to 62 weeks of age, respectively.

Individual body weights (BW) were recorded at 8 weeks of age, biweekly until 22 weeks of age, at 26 and 62 weeks of age. Egg weight (EW), egg number (EN) and egg mass (EM). Egg production was recorded daily and calculated as hen-day and hen-housed egg production (HDP&HHP). Feed consumption (FC), feed conversion ratio expressed as g feed/g gain (FCRg) and feed conversion ratio expressed as g feed/g egg mass (FCRe) were recorded weekly. Body weight gain (BWG), FC and FCRg during growth period (from 8 to 22 weeks of age) were calculated biweekly. Egg weight, EN, EM, HDP, HHP, FC, and FCRe during laying period (from 22 to 62 weeks of age) were calculated every four weeks. Dead females were recorded daily throughout the experimental period and expressed as percentages. The age at sexual maturity was obtained per group when the egg production reached to 50%.

Thirty fresh-laid eggs were taken every eight weeks from each group during the laying period to evaluate the egg quality traits. Egg weight was recorded to the nearest 0.1 gram on the same day of collection using special automatic scale. The length and width of each egg were determined by a sliding caliper and the egg shape index was calculated according to Reddy *et al.* (1979). The eggs were broken gently on a glass surface. The heights of the thick albumen and yolk were measured using a micrometer as described by Brant and Shrader (1952). The diameter of each yolk was measured using a sliding caliber. The yolk was separated from the albumen then it was weighted. Shell with membranes were dried then weighed to the nearest 0.01gm. Individual Haugh unit (Haugh, 1937) score was calculated using the egg weight and thick albumen height (Doyon *et al.*, 1986), using the following formula:

Haugh unit = 100 Log (H – 1.7X $W^{0.37}$ +7.6).

Where: H = the observed height of the thick albumen in millimeters and W = Weight of egg (grams).

Also, the egg yolk index (EYI) was calculated by dividing the yolk's height X 100/yolk's diameter. The albumen was calculated by subtracting the egg weight minus the shell plus yolk weights. The three egg components were expressed as percentages of the total egg weight.

Total feed costs per bird were calculated by multiplying mean FC per bird by the cost of 1 kg of diet of each female. The price of egg mass per bird was calculated by multiplying mean egg mass by price of one Kg egg mass. Total revenue was calculated by summing prices of egg mass and body weight change. Net revenue was calculated by subtracting total feed costs from total income of egg mass and body weight change price. Economical efficiency (EE) was estimated by dividing net revenue by total feed costs. Relative economical efficiency was calculated by dividing the EE of groups G2, G3, G4 or G5 by the EE of the control group (G1). Data collected were subjected to ANOVA by applying the General Linear Model Procedure of SAS software (SAS Institute, Version 6.12, 1996). Duncan (1955) was used to detect differences among means of different groups if significance existed. The percentages of HDP and HHP were transformed to Arcsine values.

RESULTS AND DISCUSION

Body weight and body weight gain:

The body weight (BW) of G4 (14L:10D) and G5 (16L:8D) were significantly ($P \leq 0.05$) higher than those of the other groups at 10, 12, 14 and 16 weeks of age (Table 3). The BW of 16L:8D group was significantly higher than that of other groups at 18 weeks of age. It was also significantly ($P \leq 0.05$) higher than that of the G1, G2 and G3 at 20 weeks of age and than that of the G2 and G3 at 22 weeks of age. No significant differences were found between G4 and G5 at 20 weeks of age. Also, there were no significant differences in BW among G1, G4 and G5 at 22 weeks of age. At 26 and 62 weeks of age, no significant differences were observed in BW among the 5 groups.

The overall mean of BWG of the G5 group was significantly ($P \leq 0.05$) higher than those of all the other groups studied (Table 4). However, the overall means of BWG for G1, G3 and G4 were significantly ($P \leq 0.05$) higher than that of G2. Keshavarz (1998) showed that body weight of the pullets on the step-down light regimen (which were exposed to 23 h/d light at day-old and was gradually reduced to 8 h/d at 15 wk of age) were heavier ($P \leq 0.05$) than the pullets of the short-day light regimen (which were exposed to 8 h/d light during the growing period) during most parts of the growing and laying periods. Lewis *et al.* (1997) showed that body weight for Shaver white-egg and ISA brown-egg pullets at first egg increased by the delay in age at first egg. However, body weight at 504 d of age was unaffected by age at first egg.

Mortality rate and age at sexual maturity:

During the rearing period (8-22 weeks of age), no mortalities occurred for pullets in G2, G3 and G5, however the mortality rate (MR) was 2.5 and 5.0% for G1 and G4, respectively (Table 3). During laying period, the MR was 17.5, 20.0, 7.5, 15.7 and 10.0% for G1, G2, G3, G4 and G5, respectively. The total MR (8-62 weeks of age) of G3 was lower than those of G1, G2, G4 and G5 by 16.7, 16.7, 17.6 and 3.3%, respectively. These mortality data are consistent with the findings of Lewis *et al.* (1992, 1996b, 1997). They studied that the longer periods of daily illumination are associated with a higher incidence of morality during the laying year.

Results in Table 3 show that, the age at sexual maturity decreased gradually with increasing the photoperiod. The age at sexual maturity was 158, 157, 155, 154 and 153 day for G1, G2, G3, G4 and G5, respectively. According to Shanawany (1983), the best age for the hen to reach sexual maturity is between 150-160 days, and this is the condition for producing the largest number of eggs with the best alimentary conversion index. Also, Lewis *et al.* (1997) showed that the mean age at first egg of Shaver white-egg pullets transferred from 8 h daily photoperiods to 8, 10, 13 or 16 h daily photoperiods at 9 weeks of age were 147.2, 137.3, 125.8 and 129.7d, respectively. In contrast, Lewis *et al.* (1996a) reported that birds reared on 10 h constant photoperiods matured earlier than birds kept on 8, 13 or 18 h constant photoperiods.

Feed consumption:

Results in Table 4 showed that, no significant differences were observed in feed consumption (FC) during rearing period among the 5 groups at all experimental periods studied as well as in the overall mean. The overall mean of FC during rearing period of pullets in the G3 was slightly lower than those of G1, G2, G4 and G5 groups.

The obtained results, during egg production, presented in Table 5 showed that, the FC of G2 and G3 were significantly ($P \leq 0.05$) lower than those of G1, G4 and G5 during the periods 22-26 and 26-30 weeks of age. The hens of G3 consumed significantly ($P \leq 0.05$) less feed than those of hens of the all other groups at all age periods studied as well as in the overall mean. It was observed that, the overall mean of FC for G3 during laying period was significantly ($P \leq 0.05$) less than those of all other groups studied. Lewis *et al.* (1997) showed that the mean daily feed intake between 98 and 504 d of age of Shaver white-egg and ISA brown-egg pullets transferred from 8 h daily photoperiods to 8, 10, 13 or 16 h daily photoperiods at 9 weeks of age were 104.0, 107.0, 107.7 and 123.4g, respectively.

Shanawany (1983) reported that sexual maturity has a minimal effect upon feed intake during the laying year. Nevertheless, the data do support a report by Lewis *et al.* (1994b) that significant effect of photoperiod upon daily feed intake, however, does have important implications for the lighting of commercial egg production stocks. However, Leeson *et al.* (2005) reported that indirect influences through the changes in age of first egg, evoked by the lighting regiments, were evident with a regression of mean daily feed intake on age of first egg indicating that it was reduced by 1g for each 4-d delay in sexual maturity. They also added that the step-down lighting regimens did not have direct influences on feed consumption during the laying period. Also, Keshavarz (1998) reported that feed consumption during the laying cycle was not influenced by light regimen during the growing period.

Feed conversion ratio:

The pullets of G3, G4 and G5 had significantly ($P \leq 0.05$) better feed conversion ratio as g feed per g gain (FCRg) than those of G1 and G2 during 8-10 weeks of age (Table 4). It was also observed that, there were no significant differences in FCRg among the 5 groups during the periods 10-12, 12-14 and 14-16 weeks of age. The FCRg of G1 was significantly ($P \leq 0.05$) better than those of all other groups studied during the period 16-18 weeks of age. During the period from 18-20 weeks of age, the FCRg of G1 and G5 were significantly ($P \leq 0.05$) better than those of G2 and G4, while the G3 had intermediate value. During the period from 20-22 weeks of age, the FCRg of G3 was significantly ($P \leq 0.05$) better than those of all other groups studied. No significant differences were observed in the overall means of FCRg among all groups studied.

Results presented in Table (5) showed that, no significant differences were found in feed conversion ratio as g feed per g egg mass (FCRe) among the 5 groups during 22-26, 26-30, 30-34 and 42-46 weeks of age. The hens of G3 and G4 had significantly ($P \leq 0.05$) better FCRe than those of G1, G2 and G5 during 34-38 and 38-42 weeks of age. During the periods 46-50 and 50-54 weeks of age, the FCRe of G1, G2, G3 and G5 wwere significantly ($P \leq 0.05$) better than those of G4. It was observed that, the FCRe of G3 was significantly ($P \leq 0.05$) better than those of all the other experimental groups studied during 54-58 and 58-62 weeks of age. The hens of G3 had significantly ($P \leq 0.05$) better overall mean FCRe than those of G1, G2, G4 and G5. The FCRe of G1, G2 and G5 were significantly ($P \leq 0.05$) better than those of G4. Keshavarz (1998) showed that the step-down light regimen (exposed to 23 h/d light at day-old and was gradually reduced to 8 h/d at 15 wks of age) resulted in impaired feed conversion for the entire experiment as compared to the short-day light regimen (exposed to 8 h/d light during the growing period).

Egg production, eggs number, egg mass and egg weight:

No significant differences were observed in egg weight (EW) among the five groups at all age periods studied (Table 5).

The hens of G3 had higher hen housed egg production (HHP), egg number (EN) and egg mass (EM) than most of the other groups at all age periods studied after the 30th weeks of age (Tables 6 and 7).

The G3 group had significantly ($P \leq 0.05$) higher overall mean of HDP, HHP, cumulative of EN and cumulative of EM than those of the other groups (Tables 6&7). These results are in agreement with those of Leeson and Summers (1987). They showed that the lightest hens (mean 15 wk body weight of 997 g) produced significantly ($P \leq 0.05$) more eggs than the heaviest hens (1226 g) but less than the middle group (1110 g). Lewis *et al.* (1997) showed that the mean egg production, to 504 d of age, for ISA and Shaver pullets transferred from 8 h daily photoperiods, to 8, 10, 13 or 16 h daily photoperiods at 9 weeks of age, were 291.2 and 316.4; 286.7 and 319.4; 319.6 and 314.3; and 318.9 and 319.2 for ISA and Shaver, respectively. Keshavarz (1998) showed that the step-down light regimen (exposed to 23 h/d light at day-old and was gradually reduced to 8 h/d at 15 wks of age) resulted in increased egg size and higher percentage of extra-large plus large-sized eggs for the entire experiment as compared to the short-day light regimen (exposed to 8 h/d light during the growing period). It also resulted in reduced hen-day egg production and egg mass for the entire experiment (18 to 66 wk of age).

Sexual maturity can be delayed by the use of a step-down light regimen during the growing period of pullets. Shutze *et al.* (1961) reported that when pullets were exposed to naturally declining daylight hours during the growing period, sexual maturity was delayed, but egg production rate remained significantly ($P \leq 0.05$) greater and larger eggs were produced than those raised under a constant 8 h light regimen. McClary (1960) reported delayed sexual maturity but increased egg production and egg weight when pullets were subjected to a step-down light regimen during the growing period. After peak production was reached, the rate of lay of the delayed groups remained 8 to 10% higher than the natural-lighted birds. Summers and Leeson (1983) and Keshavarz (1995) reported a positive correlation between the BW of pullets at the age of housing and egg weight during the egg production cycle. However, Leeson *et al.* (2005) using Shaver white layers; they reported no significant improvement in egg weight, egg numbers and egg mass between step down lighting and constant 8-h of light during the growing period.

Egg quality:

Results in Table (8) showed that, no significant differences were observed in egg weight (EW) and egg shape index (ESI) among the 5 groups at all ages studied as well as in the overall means. However, Lewis *et al.* (1997) showed that the mean egg weights (g) to 504 d of age for ISA and Shaver pullets transferred from 8 h daily photoperiods to 8, 10, 13 or 16 h daily photoperiods at 9 weeks of age were 62.7 and 54.7; 60.1 and 56.9; 57.5 and 55.8; and 60.6 and 60.0 for ISA and Shaver, respectively.

No significant differences were observed in egg yolk index (EYI) among the five groups at all ages studied except at 38 and 46 weeks of age where the differences were significant. The EYI of G4 was significantly ($P \leq 0.05$) higher than that of all the other groups at 38 and 46 weeks of age, except at 38 weeks of age where the differences were no significant between G4 and G2. Also, the overall mean of EYI of G 4 was significantly ($P \leq 0.05$) higher than of all the other groups (Table 8). No significant differences were observed in Haugh units (HU) among the 5 groups at all ages studied, except at 46 weeks of age where the differences were significant. The HU of G2, G3 and G4 were significantly ($P \leq 0.05$) higher than those of G1 and G5 at 46 weeks of age. Leeson *et al.* (2005) in Shaver white layers; reported no significant improvement in shell deformation and albumen height between step down lighting and constant 8-h of light during rearing.

Egg components:

There were no significant differences in egg yolk (YP) and albumen (AP) percentages among the 5 groups at all ages studied as well as their overall means (Table 9). The egg shell percentage (SP) of G3 was significantly ($P \leq 0.05$) higher than that in all other groups studied, at 54 and 62 weeks of age, while there were no significant differences in SP at 30, 38 and 46 weeks of age among the five groups. The overall mean of SP of G3 was significantly ($P \leq 0.05$) higher than that of G1, G2, G4 and G5. Leeson and Summers (1985), Leeson *et al.* (1991) and Lewis *et al.* (1997) observed that shell quality was unaffected by increasing photoperiod or age at first egg.

Economical evaluation:

The hens of G3 consumed less feed (Tables 4&5), thus it had the lowest feed cost (Table 10). Also, the hens of the same group had highest egg number and mass (Table 7), total revenue and net revenue per hen (Table 10) than those of any of the other groups. Also, economical efficiency (EE) and relative EE of G 3 exceeded that of the other groups.

CONCLUSION

From the obtained results, it can be concluded that hens of the G3 group (12L:12D hrs during rearing period) had greater egg production, EN, EM and better FC during the layering period and improved FCRe and SP and had the best EE as compared to those of all other groups.

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Table 1. Composition and calculated analysis of the experimental diets

Ingredients (%)	Starter (0-8 weeks)	Grower (9-22 weeks)	Layer (23-62 weeks)
Yellow corn	62.1	71.40	67.97
Wheat bran	1.25	1.05	--
Soybean meal (44% CP)	28.90	19.70	17.85
Layer concentrate* (44%)	--	--	8.00
Salt	0.25	0.25	0.15
Limestone	1.50	1.70	6.0
Dicalcium Phosphate	1.70	1.60	--
Vit & Min. Premix**	0.30	0.30	--
Manganese	--	--	0.03
Sand	4.00	4.00	--
Total	**100**	**100**	**100**
Calculated analysis *:**			
ME, Kcal/Kg	2812	2916	2971.6
Crude protein, %	18.4	15.1	17.51
Crude fiber, %	3.60	3.1	2.95
Ether extract, %	2.64	2.9	3.30
Lysine, %	1.00	0.75	0.93
Methionine, %	0.31	0.27	0.38
Total calcium,%	1.03	1.06	2.93
Available phosphorus,%	0.45	0.42	0.38
Cost/kg diet L.E. (Local price	2.814	2.721	2.973

* The layer concentrate contained: Crude protein, 44%; Crude fiber, 1.02%; Crude fat, 6.23%; Methionine, 1.58%; Methionine + Cystine, 2.13%; Lysine, 3.05%; Calcium, 7.24%; Available phosphorus, 3.25%; Sodium, 1.30%; and Metabolizable energy, 2457 Kcal / Kg diet. *Layer concentrate supplied the following per kilogram of the diet: Vit. A, 10000 IU; vit. D_3, 1000 IU; vit. E, 10 mg; Vit. K, 1 mg; Vit. B_1,1 mg; Vit. B_2, 4 mg; Pantothenic acid, 10 mg; Folic acid,1 mg; Niacin,20 mg; Vit. B_6, 1.5 mg; vit. B_{12}, 0.01 mg; Biotin, 0.05 mg; Chlorine chloride, 500 mg; Iron, 30 mg; Iodine, 0.3 mg; Zinc, 45 mg; Manganese, 40 mg; Copper, 3 mg; and Selenium, 0.1 mg.

**Vitamins and minerals premix provided per kilogram of the diet: Vit A (as all-transretinyl acetate), 12000 IU; Vit D_3, 2200 IU; Vit E (all rac-α-tocopheryl acetate), 10 mg; Vit K_3, 3 mg; Vit B_2, 10 mg; Pantothenic acid, 10 mg; Niacin, 20mg; Vit B_{12}, 10µg; Vit B_6, 1.5 mg; Thiamine (as thiamine mononitrate), 2.2 mg; Folic acid, 1 mg; D-Biotin, 50 µg; Chorine chloride, 500 mg; Copper, 10mg; Iron, 30 mg; Manganese, 55 mg; Zinc, 50 mg, Selenium, and 0.1 mg, Ethoxyquin, 3mg.

L.E. = Egyptian pound

*** Calculated according to NRC (1994).

Table 2. Lighting regimens

Age	G1	G2	G3	G4	G5
Days 1-3	24	24	24	24	24
Days 3-4	22	22	22	22	22
Week 2	20	20	20	20	20
Week 3	18	18	18	18	18
Week 4	16	16	16	16	16
Week 5	14	14	14	14	16
Week 6	12	12	12	14	16
Week 7	10	10	12	14	16
Weeks 8-18	**8**	**10**	**12**	**14**	**16**
Week 19	12	12	12	14	16
Week 20	13	13	13	14	16
Week 21	14	14	14	14	16
Week 22	15	15	15	15	16
Week 23	16	16	16	16	16
Weeks 24-62	16	16	16	16	16

G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D,12L:12D, 14L:10D, and 16L:8D hrs/day, respectively

Table 3. Means ± SE of body weight (g), age at sexual maturity (day) and mortality rate (%) for Dandarawi chickens as affected by different photoperiods during the rearing period

Items	8L:16D		10L:14D		12L:12D		14L:10D		16L:8D	
Body weight:										
	n		**n**		**n**		**n**		**n**	
8th weeks	40	365 ± 7	40	367 ±10	40	365 ± 6	40	365 ± 6	40	365 ± 5
10th weeks	39	429^{bc} ± 7	40	425^{c} ±10	40	428^{bc} ± 8	40	464^{a} ± 9	40	474^{a} ± 8
12th weeks	39	536^{b} ± 8	40	532^{b} ±10	40	530^{b} ± 8	39	570^{a} ±11	40	589^{a} ± 9
14th weeks	39	655^{b} ±10	40	643^{b} ±12	40	640^{b} ±11	39	692^{a} ±11	40	707^{a} ±10
16th weeks	39	761^{b} ±10	40	766^{b} ±15	40	763^{b} ±13	39	813^{a} ±10	40	832^{a} ±12
18th weeks	39	897^{b} ±14	40	877^{b} ±17	40	876^{b} ±14	39	913^{b} ±13	40	955^{a} ±15
20th weeks	39	1017^{bc} ±17	40	972^{b} ±20	40	988^{b} ±16	38	1022^{ab} ±14	40	1070^{a} ±19
22nd weeks	39	1110^{ab} ±20	40	1053^{b} ±21	40	1094^{b} ±19	38	1107^{ab} ±16	40	1155^{a} ±22
26th weeks	39	1240 ±27	40	1247 ±23	40	1259 ±24	38	1220 ±17	39	1288 ±27
62nd weeks	33	1546 ±42	32	1590 ±35	37	1589 ±32	34	1596 ±29	36	1591 ±35
ASM	**158**		**157**		**155**		**154**		**153**	
MR^{1}	2.5		0.0		0.0		5.0		0.0	
MR^{2}	17.5		20.0		7.5		15.0		10.0	
MR^{1+2}	**20.0**		**20.0**		**7.5**		**20.0**		**10.0**	

$^{a—c}$ means with different superscripts in the same row are significantly different ($P \leq 0.05$).
n= number of hens
ASM = Age at sexual maturity (50% egg production).
MR^{1} = Mortality rate during rearing period (8-22 weeks of age.
MR^{2} = Mortality rate during laying period (22-62 weeks of age).
MR^{1+2} = Total mortality rate (from 8 to 62 weeks of age).
G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D,12L:12D, 14L:10D, and 16L:8D hrs/day, respectively.

Table 4. Means ± SE of body weight gain (g/hen/day), feed consumption (g/hen/day) and feed conversion (g feed/ g gain) during the rearing period for Dandarawi chickens as affected by different photoperiods during the rearing period.

Age (in wks)	Body weight gain					Feed consumption					Feed conversion				
	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5
8-10	4.62^{b} ±0.27	4.20^{b} ±0.34	4.51^{b} ±0.34	7.09^{a} ±0.46	7.74^{a} ±0.35	36.1 ±0.7	34.8 ±0.8	32.4 ±0.9	34.7 ±0.8	35.6 ±0.7	7.81^{a} ±0.14	8.29^{a} ±0.16	7.23^{b} ±0.18	4.90^{c} ±1.50	4.60^{d} ±1.65
10-12	7.62^{ab} ±0.23	7.62^{ab} ±0.20	7.25^{b} ±0.26	7.56^{b} ±0.18	8.19^{a} ±0.15	43.3 ±1.0	43.6 ±0.1	43.3 ±0.0	44.1 ±0.0	43.1 ±0.1	5.68 ±0.42	5.72 ±0.33	5.97 ±0.30	5.84 ±0.32	5.26 ±0.33
12-14	8.51^{ab} ±0.26	7.91^{b} ±0.25	7.88^{b} ±0.28	8.74^{a} ±0.17	8.45^{ab} ±0.13	45.8 ±0.9	45.0 ±0.7	45.4 ±0.9	47.1 ±0.3	45.9 ±0.1	5.38 ±0.10	5.69 ±0.10	5.76 ±0.13	5.39 ±0.13	5.43 ±0.09
14-16	7.59 ±0.54	8.80 ±0.34	8.79 ±0.36	8.65 ±0.27	8.93 ±0.29	54.9 ±0.5	52.3 ±0.7	53.0 ±0.8	54.7 ±0.7	53.2 ±0.9	7.24 ±0.22	5.94 ±0.07	6.03 ±0.70	6.32 ±0.08	5.96 ±0.19
16-18	9.67 ±0.50	7.91 ±0.28	8.11 ±0.42	7.16 ±0.40	8.79 ±0.64	56.4 ±0.8	55.9 ±0.5	54. ±0.3	56.4 ±0.3	54.8 ±0.9	5.83^{b} ±0.09	7.06^{a} ±0.06	6.66^{a} ±0.12	7.88^{a} ±0.12	6.24^{a} ±0.12
18-20	8.59^{a} ±0.32	6.79^{b} ±0.32	8.00^{a} ±0.28	7.79^{a} ±0.39	8.21^{a} ±0.38	57.7 ±0.5	55.9 ±0.9	55.9 ±0.9	57.5 ±10	55.9 ±0.9	6.72^{c} ±0.02	8.24^{a} ±0.06	6.99^{bc} ±0.17	7.39^{b} ±0.18	6.81^{c} ±0.16
20-22	6.65^{a} ±0.41	5.80^{b} ±0.28	7.55^{a} ±0.45	6.02^{b} ±0.36	6.11^{b} ±0.44	57.8 ±0.7	56.0 ±0.8	56.1 ±0.9	57.7 ±0.8	55.9 ±0.7	8.69^{b} ±0.02	9.66^{a} ±0.38	7.43^{c} ±0.05	9.58^{a} ±0.08	9.15^{ab} ±0.18
Overall mean	**7.61^{b} ±0.16**	**7.01^{c} ±0.14**	**7.44^{b} ±0.14**	**7.57^{b} ±0.13**	**8.06^{a} ±0.13**	**50.3 ±2.21**	**49.1 ±2.0**	**48.6 ±2.2**	**50.3 ±2.2**	**49.2 ±2.0**	**6.76 ±0.30**	**7.23 ±0.39**	**6.57 ±0.19**	**6.76 ±0.39**	**6.21 ±0.38**

$^{a,\ b,\ c\ and\ d}$ Means within each row for each trait (body weight gain, feed consumption and feed conversion) with different superscripts are significantly different ($P \leq 0.05$).
G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D,12L:12D, 14L:10D, and 16L:8D hrs/day, respectively.

Table 5. Means ± SE of feed consumption (g/hen/day), feed conversion (g feed/g egg mass) and egg weight (g) for Dandarawi chickens during egg production as affected by different photoperiods during the rearing period

Age (in wks)	Feed consumption					Feed conversion					Egg weight				
	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5
22-26	74.8^{b} ±0.3	71.3^{d} ±0.1	70.6^{d} ±0.5	79.2^{a} ±0.1	73.0^{c} ±0.2	7.05 ±1.67	6.55 ±1.86	6.35 ±2.47	6.26 ±3.56	5.71 ±3.24	30.3 ±0.5	31.1 ±0.5	30.8 ±0.6	30.8 ±0.5	31.4 ±0.5
26-30	83.7^{a} ±0.5	75.8^{c} ±0.5	75.7^{c} ±0.4	84.1^{a} ±0.2	78.2^{b} ±0.6	3.37 ±0.11	3.88 ±0.31	3.71 ±0.35	3.39 ±0.19	3.46 ±0.11	38.2 ±0.5	38.5 ±0.5	38.3 ±0.5	39.0 ±0.4	37.7 ±0.5
30-34	101.0^{a} ±0.1	97.1^{b} ±1.7	93.1^{c} ±1.1	102.8^{a} ±0.7	97.3^{b} ±0.7	4.07 ±0.13	4.31 ±0.18	4.06 ±0.35	3.92 ±0.16	4.08 ±0.15	40.6 ±0.6	40.2 ±0.6	40.6 ±0.4	41.2 ±0.3	40.7 ±0.6
34-38	110.5^{a} ±1.1	107.7^{b} ±0.4	103.0^{d} ±0.2	106.6^{bc} ±0.2	105.0^{c} ±0.4	3.98^{a} ±0.06	3.87^{a} ±0.05	3.49^{b} ±0.08	3.62^{b} ±0.10	3.88^{a} ±0.11	41.4 ±0.7	41.0 ±0.8	41.9 ±0.7	42.1 ±0.6	41.6 ±0.5
38-42	110.2^{a} ±0.7	106.9^{b} ±0.5	102.8^{c} ±0.9	107.3^{b} ±0.1	106.0^{b} ±0.1	4.00^{a} ±0.08	4.19^{a} ±0.11	3.56^{b} ±0.06	3.72^{b} ±0.07	3.99^{a} ±0.17	42.4 ±0.8	42.8 ±0.7	42.6 ±0.7	43.9 ±0.6	43.3 ±0.5
42-46	113.7^{a} ±0.3	108.7^{b} ±0.9	102.5^{d} ±0.1	109.6^{b} ±0.1	105.9^{c} ±0.1	4.24 ±0.17	3.86 ±0.05	3.49 ±0.09	4.34 ±0.48	3.88 ±0.48	43.2 ±0.6	43.3 ±0.5	44.4 ±0.8	45.0 ±0.7	45.0 ±0.6
46-50	107.6^{bc} ±1.0	108.9^{ab} ±0.3	102.1^{d} ±0.2	109.2^{a} ±0.2	106.3^{c} ±0.2	4.03^{b} ±0.20	3.92^{b} ±0.18	3.60^{b} ±0.17	5.24^{a} ±0.69	3.86^{b} ±0.17	44.2 ±0.8	44.2 ±0.7	45.7 ±0.6	44.9 ±0.8	45.1 ±0.7
50-54	106.5^{b} ±0.2	108.4^{a} ±0.1	101.7^{c} ±0.2	108.4^{a} ±0.1	106.9^{b} ±0.3	3.91^{b} ±0.12	3.62^{b} ±0.07	3.56^{b} ±0.03	5.85^{a} ±0.40	3.75^{a} ±0.42	50.2 ±0.6	51.1 ±0.6	51.0 ±0.7	51.9 ±0.6	51.5 ±0.6
54-58	106.5^{b} ±0.1	108.4^{a} ±0.2	104.1^{b} ±0.7	110.0^{a} ±0.4	108.5^{a} ±0.3	5.67^{b} ±0.50	5.42^{b} ±0.37	4.05^{c} ±0.11	8.48^{a} ±0.95	7.10^{a} ±0.95	51.6 ±0.6	52.8 ±0.9	52.9 ±0.7	54.2 ±0.7	53.5 ±0.8
58-62	109.3^{a} ±0.4	109.6^{a} ±0.1	101.0^{c} ±0.2	109.1^{a} ±0.6	108.1^{a} ±0.7	7.13^{a} ±0.88	6.70 ^{a}±0.22	4.48^{b} ±0.44	10.54^{a} ±1.21	7.54^{a} ±1.22	53.0 ±1.0	54.5 ±0.8	53.1 ±0.9	54.7 ±0.9	54.7 ±0.7
Overall mean	**102.4^{a} ±0.9**	**100.3^{a} ±1.0**	**95.6^{b} ±0.4**	**102.6^{a} ±1.0**	**99.5^{a} ±1.1**	**4.74^{b} ±0.21**	**4.63^{b} ±0.30**	**4.04^{c} ±0.31**	**5.54^{a} ±0.23**	**4.72^{b} ±0.21**	**43.5 ±0.6**	**44.0 ±0.6**	**44.1 ±0.6**	**44.8 ±0.6**	**44.5 ±0.6**

$^{a, b, c \text{ and } d}$ Means within each row for each trait (feed consumption, feed conversion and egg weight) with different superscripts are significantly different ($P \leq 0.05$).

G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D,12L:12D, 14L:10D, and 16L:8D hrs/day, respectively.

Table 6. Means±SE of hen day and hen housed egg production percentages of Dandarawi chickens as affected by different photoperiods during the rearing period

Age (in wks)	Hen day egg production (%)					Hen housed egg production (%)				
	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5
22-26	35.0±2.9	34.9±2.6	35.9±2.9	40.9±3.7	40.6±2.8	35.0±2.7	34.9±2.6	35.4±2.8	40.9±3.7	39.8±2.7
26-30	64.9^{a}±1.4	50.6^{b}±1.8	53.3^{b}±2.0	63.4^{a}±1.7	60.0^{a}±1.8	60.8^{a}±1.4	50.6^{b}±1.8	52.0^{b}±2.0	63.4^{a}±1.7	58.4^{a}±1.7
30-34	61.2^{ab}±1.0	55.9^{c}±1.3	56.6^{c}±2.1	63.7^{a}±1.2	58.5^{bc}±1.4	56.5^{b}±0.9	53.8^{b}±1.2	55.2^{b}±2.0	63.7^{a}±1.2	55.5^{b}±1.3
34-38	67.1^{ab}±0.1	67.8^{ab}±1.0	70.5^{a}±1.1	70.1^{a}±1.4	65.1^{b}±1.1	60.4^{c}±0.9	64.4^{b}±1.0	68.8^{a}±1.0	70.1^{a}±1.4	61.9^{bc}±1.1
38-42	64.9^{a}±1.2	59.7^{b}±1.0	68.0^{a}±1.1	65.7^{a}±2.3	61.4^{b}±1.3	58.2^{b}±1.1	55.6^{b}±1.1	65.1^{a}±1.1	64.7^{a}±1.6	58.1^{b}±1.2
42-46	62.3^{a}±2.0	65.0^{a}±1.6	66.2^{a}±1.5	55.9^{b}±2.3	60.8^{ab}±1.4	55.9^{b}±1.8	56.5^{b}±1.5	63.0^{a}±1.4	52.8^{b}±2.2	56.3^{b}±1.3
46-50	60.3^{a}±1.6	63.0^{a}±1.8	62.1^{a}±1.1	46.3^{b}±2.0	61.0^{a}±1.4	54.1^{bc}±1.5	50.7^{c}±1.4	59.1^{a}±1.0	43.8^{d}±1.9	56.4^{ab}±1.3
50-54	54.4^{a}±1.5	58.5^{a}±1.7	56.2^{a}±1.2	35.8^{b}±1.6	55.3^{a}±1.2	48.6^{bc}±1.3	46.8^{c}±1.3	53.5^{a}±1.1	33.8^{d}±1.5	51.2^{ab}±1.1
54-58	36.5^{a}±3.2	37.9^{a}±3.4	48.5^{a}±1.4	24.1^{c}±1.4	28.4^{b}±1.8	31.7^{b}±2.8	30.3^{b}±2.7	44.4^{a}±1.3	20.2^{c}±1.1	25.8^{b}±1.7
58-62	29.1^{bc}±1.5	30.0^{b}±0.1	42.5^{a}±2.2	19.1^{d}±1.1	26.2^{cd}±1.1	22.8^{bc}±1.1	24.0^{b}±0.6	40.3^{a}±2.1	17.2^{c}±1.2	23.6^{b}±1.0
Overall mean	**53.6^{b}±1.0**	**52.3^{b}±1.0**	**56.0^{a}±0.8**	**48.5^{c}±1.2**	**51.7^{b}±1.0**	**48.4^{b}±0.9**	**46.8^{b}±0.9**	**53.7^{a}±0.8**	**47.1^{b}±1.2**	**48.7^{b}±0.9**

$^{a, b, c \text{ and } d}$ Means within each row for each trait (hen day and hen housed egg production) with different superscripts are significantly different ($P \leq 0.05$).

G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D, 12L:12D, 14L:10D, and 16L:8D hrs/day, respectively.

Table 7. Means±SE of egg number (egg/ hen/ 28 days) and egg mass (g/hen/28 days) for Dandarawi chickens as affected by different photoperiods during the rearing period

Age (in wks)	Egg number					Egg mass				
	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5
22-26	9.8±0.8	9.8±0.7	10.1±0.8	11.5±1.0	11.4±0.8	296.9±28.3	304.8±26.8	311.1±29.4	354.2±36.3	358.0±28.8
26-30	18.2^{a}±0.3	14.2^{b}±0.5	14.9^{b}±0.6	17.8^{a}±0.5	16.8^{a}±0.5	695.2^{a}±14.8	546.7^{c}±17.4	570.7^{c}±19.0	694.2^{a}±18.0	633.4^{b}±19.1
30-34	17.1^{ab}±0.3	15.7^{c}±0.4	15.8^{c}±0.6	17.8^{a}±0.3	16.4^{bc}±0.4	694.3^{ab}±11.1	631.1^{c}±14.2	641.5^{c}±23.3	733.4^{a}±14.1	667.5^{bc}±15.7
34-38	18.8^{bc}±0.3	19.0^{ab}±0.3	19.7^{a}±0.3	19.6^{ab}±0.4	18.2^{c}±0.3	778.3 ^{b}±11.6	779.0^{b}±12.0	825.4^{a}±12.1	825.2^{a}±15.8	757.1^{b}±14.1
38-42	18.2^{a}±0.3	16.7±0.3	19.0^{a}±0.3	18.4^{a}±0.5	17.2^{b}±0.4	771.7^{ab}±15.4	714.8^{c}±15.0	809.4 ^{a}±13.1	807.8^{a}±20.9	744.8^{bc}±16.3
42-46	17.4^{a}±0.6	18.2^{a}±0.5	18.5^{a}±0.4	15.7^{b}±0.7	17.0^{ab}±0.4	751.7^{bc}±22.8	788.1^{ab}±19.3	821.4^{a}±18.0	706.5^{c}±30.0	765.0^{abc}±19.5
46-50	16.9^{a}±0.5	17.6^{a}±0.5	17.4^{a}±0.3	13.0^{b}±0.6	17.1^{a}±0.4	747.0^{a}±20.8	777.9^{a}±22.8	795.2^{a}±13.4	583.7^{b}±26.6	771.2^{a}±17.2
50-54	15.2^{a}±0.4	16.4^{a}±0.5	15.7^{a}±0.3	10.0^{b}±0.5	15.5^{a}±0.3	763.0^{b}±20.0	838.0^{a}±20.6	800.7^{ab}±16.1	519.0^{c}±23.9	798.3^{ab}±18.9
54-58	10.2^{a}±0.9	10.6^{a}±1.0	13.6^{a}±0.4	6.7^{c}±0.4	8.0^{b}±0.5	526.3^{a}±45.0	559.7^{a}±49.2	719.4^{a}±20.1	363.1^{c}±20.2	428.0^{b}±25.6
58-62	8.1±0.4	8.4^{b}±0.2	11.9^{a}±0.6	5.3^{d}±0.3	7.3^{cd}±0.3	429.3^{bc}±22.9	457.8^{a}±11.4	631.9^{a}±29.7	289.9^{d}±16.6	401.3^{cd}±15.2
Overall mean	**149.9^{b}±2.7**	**146.6^{b}±2.7**	**156.6^{a}±2.4**	**135.8^{c}±3.4**	**144.9^{b}±2.7**	**6453.8^{b}±113.0**	**6397.9^{b}±120.5**	**6926.7^{a}±111.3**	**5876.9^{c}±132.2**	**6324.4^{b}±114.8**

$^{a, b, c \text{ and } d}$ Means within each row for each trait (egg number and egg mass) with different superscripts are significantly different (P≤0.05).
G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D,12L:12D, 14L:10D, and 16L:8D hrs/day, respectively.

Table 8. Means ± SE of egg quality for Dandarawi chickens as affected different photoperiods during the rearing period

Age (in wks)	Egg weight (g)					Egg shape index (%)					Egg yolk index (%)					Haugh units				
	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5
30	40.4 ±0.6	39.8 ±0.7	41.6 ±0.8	41.4 ±0.9	40.1 ±0.8	78.9 ±0.7	78.4 ±0.5	78.8 ±0.5	78.3 ±0.5	79. ±0.4	54.3 ±0.6	56.2 ±0.8	56.0 ±0.9	55.6 ±0.6	53.9 ±0.8	79.1 ±1.6	82.8 ±1.8	81.9 ±1.8	79.9 ±1.4	81.3 ±1.7
38	41.7 ±0.7	42.5 ±0.7	42.1 ±0.5	42.0 ±0.7	42.6 ±0.7	79.6 ±0.7	80.5 ±0.5	79.7 ±0.4	80.7 ±0.6	79.7 ±0.9	54.7^{c} ±0.7	57.5^{ab} ±1.0	56.7^{bc} ±0.7	59.5^{a} ±0.7	56.1^{bc} ±0.7	79.5 ±1.4	80.2 ±1.7	80.1 ±1.5	81.5 ±0.7	81.2 ±1.1
46	44.2 ±0.7	45.0 ±0.6	45.6 ±0.7	45.1 ±1.0	46.8 ±0.6	78.5 ±0.5	78.2 ±0.8	78.0 ±0.5	78.8 ±0.5	79.5 ±0.6	54.6^{b} ±0.6	55.3^{b} ±0.5	54.8^{b} ±0.6	57.2^{a} ±0.8	55.4^{b} ±0.5	80.5^{b} ±1.5	85.0^{a} ±1.6	85.7^{a} ±1.1	85.7^{a} ±1.4	80.0^{b} ±1.5
54	50.1 ±0.6	50.1 ±0.8	49.7 ±0.7	50.0 ±0.6	50.5 ±0.8	77.2 ±0.6	77.5 ±0.8	78.1 ±0.7	76.5 ±1.2	77.9 ±0.9	54.2 ±0.7	53.8 ±0.7	53.6 ±0.7	55.5 ±0.8	53.4 ±0.8	76.5 ±1.7	78.0 ±1.7	79.9 ±1.3	79.8 ±2.1	75.8 ±1.7
62	52.3 ±0.6	53.7 ±0.7	53.1 ±0.8	54.5 ±0.6	54.1 ±0.7	77.0 ±0.5	77.2 ±0.7	77.7 ±0.8	76.4 ±0.9	77.5 ±0.8	53.7 ±0.6	53.4 ±0.5	53.1 ±0.7	54.5 ±0.9	53.0 ±0.7	75.5 ±2.3	77.0 ±1.9	78.8 ±1.8	78.5 ±2.1	75.0 ±2.1
Overall mean	**45.7 ±0.6**	**46.2 ±0.7**	**46.4 ±0.6**	**46.6 ±0.7**	**46.8 ±0.6**	**78.2 ±0.3**	**78.4 ±0.4**	**78.5 ±0.3**	**78.1 ±0.3**	**78.7 ±0.3**	**54.3^{c} ±0.3**	**55.2^{b} ±0.4**	**54.8^{bc} ±0.3**	**56.5^{a} ±0.4**	**54.4^{bc} ±0.3**	**78.2^{b} ±0.8**	**80.6^{a} ±0.9**	**81.3^{a} ±0.7**	**81.1^{a} ±0.8**	**78.7^{b} ±0.7**

$^{a, b \text{ and } c}$ Means within each row for each trait (Egg weight, egg shape index, egg yolk index and Haugh units)) with different superscripts are significantly different (P≤0.05).
G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D,12L:12D, 14L:10D, and 16L:8D hrs/day, respectively.

Table 9. Means ± SE of egg components for Dandarawi chickens as affected by different photoperiods during the rearing period

Age (in wks)	Yolk (%)					Albumen (%)					Shell (%)				
	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5
30	30.5 ±0.3	30.5 ±0.2	30.8 ±0.3	30.7 ±0.4	30.7 ±0.3	58.5 ±0.2	58.4 ±0.3	58.2 ±0.3	58.3 ±0.4	58.3 ±0.4	11.0 ±0.1	11.1 ±0.1	11.0 ±0.1	11.0 ±0.1	11.0 ±0.1
38	33.6 ±0.3	33.5 ±0.3	33.3 ±0.2	33.2 ±0.2	33.6 ±0.2	56.0 ±0.3	56.0 ±0.3	56.0 ±0.2	56.4 ±0.2	56.0 ±0.2	10.4 ±0.1	10.5 ±0.1	10.7 ±0.2	10.4 ±0.1	10.4 ±0.1
46	33.7 ±0.2	33.2 ±0.3	33.6 ±0.3	34.3 ±0.5	33.5 ±0.3	56.4 ±0.3	56.5 ±0.4	56.3 ±0.4	55.9 ±0.5	56.7 ±0.4	9.9 ±0.1	10.3 ±0.2	10.1 ±0.1	9.8 ±0.1	9.8 ±0.2
54	34.8 ±0.6	35.0 ±0.6	34.6 ±0.5	34.1 ±0.6	35.6 ±0.5	56.1 ±1.5	56.1 ±0.4	55.8 ±0.3	56.8 ±0.6	55.6 ±0.3	9.1^{bc} ±0.1	8.9^{bc} ±0.1	9.6^{a} ±0.1	9.1^{bc} ±0.1	8.8^{c} ±0.1
62	35.3 ±0.6	36.0 ±0.4	35.1 ±0.4	34.8 ±0.6	36.6 ±0.6	55.7 ±0.5	55.3 ±0.6	55.5 ±0.8	56.2 ±0.7	54.7 ±0.6	9.0^{b} ±0.1	8.7^{c} ±0.1	9.4^{a} ±0.1	9.0^{b} ±0.1	8.7^{c} ±0.1
Overall mean	**33.6 ±0.2**	**33.6 ±0.2**	**33.5 ±0.2**	**33.4 ±0.4**	**34.0 ±0.2**	**56.5 ±0.4**	**56.5 ±0.2**	**56.7 ±0.2**	**56.3 ±0.2**	**56.2 ±0.2**	**9.9^{b} ±0.1**	**9.9^{b} ±0.1**	**10.2^{a} ±0.1**	**9.9^{b} ±0.1**	**9.7^{b} ±0.1**

$^{a, b, and c}$ Means within each row for each trait (yolk, albumen and shell percentages) with different superscripts are significantly different (P≤0.05).
G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D,12L:12D, 14L:10D, and 16L:8D hrs/day, respectively.

Table 10. Economical evaluation for Dandarawi chickens as affected by different photoperiods during the rearing period

Items	G1	G2	G3	G4	G5
Feed costs during growth period (LE.)	13.87	13.54	13.40	13.87	13.57
Feed costs during laying period (LE.)	85.24	83.49	77.44	85.41	82.83
Total feed costs (LE.)	**99.11**	**97.03**	**90.84**	**99.28**	**96.40**
Live body weight change from 8 to 62 weeks of age (kg)	1.181	1.224	1.224	1.232	1.226
Body weight change price (LE.)	23.62	24.48	24.48	24.64	24.52
Egg mass (kg/hen)	6.4538	6.3979	6.9267	5.8769	6.3224
Egg mass price (L.E.)	**103.26**	**102.37**	**110.83**	**94.03**	**101.16**
Total revenue (L.E.)	**126.88**	**126.85**	**135.31**	**118.67**	**125.68**
Net revenue per hen (not including constant costs)	27.77	29.81	44.46	19.39	29.28
Economical efficiency per hen	0.28	0.31	0.49	0.20	0.30
Relative economic efficiency (%)	**100**	**110**	**175**	**70**	**108**

Price of 1kg eggs were 16.0 L.E. at the time of experimental period. Price of 1Kg grower diet was 2.721 L.E.
Price of 1Kg grower diet was 2.973 L.E. Price of 1 Kg live body weight was 20.0 L.E.
LE = Egyptian pound. Net revenue per hen = total revenue minus total feed costs
Economical efficiency/hen =Net revenue per hen / total feed costs. Relative economical efficiency of the control group
*Constant costs include: Price of body chick, housing, labour, heating, cooling, lighting and treatment regimens.
G1 to G5 = The pullets were exposed during 8 to 18 weeks of age to 8L:16D, 10L:14D ,12L:12D, 14L:10D, and 16L:8D hrs/day, respectively

تأثير فترات الاضاءة المختلفة أثناء فترة الرعاية علي الاداء الانتاجي للدجاج الدندراوي أثناء فترتي الرعاية وانتاج البيض

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أجريت هذه الدراسة على مائتان من اناث طيور الدندراوي عند عمر ٨ أسابيع ، وقسمت الأناث بالتساوي إلي خمسة مجموعات (المجموعة الاولي الي المجموعة الخامسة), والبداري من المجموعة الأولي الي الخامسة تعرضت أثناء فترة الرعاية من عمر ٨ الي ١٨ اسبوع لفترات ٨ ، ١٠ ، ١٢ ، ١٤ ، ١٦ ساعة اضاءة يوميا علي التوالي.

أمكن تلخيص النتائج المتحصل عليها كالتالي:

لم توجد اختلافات معنوية ما بين طيور المجاميع الخمسة في وزن الجسم عند عمر ٢٦ ، ٦٢ اسبوع. حققت طيور المجموعة الخامسة معدل زيادة في وزن الجسم اثناء فترة الرعاية اعلا معنويا ($P\leq0.05$) عن طيور المجاميع الاخري. نقص معدل النفوق في طيور المجموعة الثالثة من عمر ٨ – ٦٢ اسبوع عن المجاميع الاخري. نقص العمر عند النضج الجنس تدريجيا مع الزيادة في فترة الاضاءة. لم تلاحظ اختلافات معنوية ما بين طيور المجاميع الخمسة اثناء فترة الرعاية في الغذاء المستهلك ، وكفاءة التحويل الغذائي.

أثناء فترة انتاج البيض: أظهرت طيور المجموعة الثالثة تحسنا معنويا ($P\leq0.05$) في كفاءة التحويل الغذائي، ونقص الغذاء المستهلك ، وارتفع إنتاج البيض وعدد البيض وكتلة البيض ، وزادت نسبة القشرة والكفاءة الانتاجية عن المجاميع الاخري. لم توجد إختلافات معنوية ما بين طيور المجاميع الخمسة في وزن البيضة ، ونسبتي البياض والصفار في البيضة. سجل دليل شكل صفار البيضة للطيور المجموعة الرابعة ارتفاعا معنويا عن المجاميع الاخري. تحسنت وحدات جودة البياض (HU) معنويا ($P\leq0.05$) لطيور المجاميع الثانية ، والثالثة ، والرابعة عن طيور المجموعة الأولي والخامسة.

بصفة عامه يقترح للحصول علي أفضل معدل اداء إنتاجي لدجاج الدندراوي البياض أثناء فترة انتاج البيض أن يتم تربيتها تحت فترة ١٢ ساعة اضاءة ، ١٢ ساعة اظلام يوميا اثناء فترة الرعاية من عمر ٨ - ١٨ اسبوع.