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Effect of Light Regimens on Turkey Performance in the Subtropics. 1. Egg Production

G.A.R. Kamar, F.K.R. Stino, M.A. Kicka and S.Y.T. Al-Sardary

Faculty of Agriculture, Cairo University, Egypt.

LIGHT-TREATED medium-weight turkey hens laid significantl ($P \leq .01$) more eggs than an untreated group. There were no significant differences in the egg weight of the light treated and non-treated groups. The number of set eggs and set egg percentages for the light stimulated groups were higher than the control group. Hens exposed to a gradually increasing day length produced significantly ($P \leq .01$) more monthly eggs per hen, more egg mass, and more settable eggs than those exposed to an abrupt increase in day length. High monthly eggs per hen, more egg mass, and more set eggs bers, egg weights, egg masses and numbers of set eggs than the low light intensity of 11 lux.

Egg production of turkey hens is controlled by daylight length. Usually turkey hens are restricted to a dry length of 6 to 8 hr for 6 to 8 weeks before sexual maturity. Following that, they are exposed to stimulatory light of 14 or 16 hr per day at about 30 weeks of age (Nestor and Brown, 1972). Gerland *et al.* (1961), working with medium-white turkey hens, used light intensities of 0.5, 1.2 and 12 ft-c, and concluded that each increment of light intensity up to 2 ft-c caused an increase in egg production. Woodard *et al.* (1974) stated that Broad Breasted White (BBW) turkey hens exposed to stimulatory light at 30 weeks of age produced more and larger eggs than those exposed to stimulatory light at 24 or 26 weeks of age.

McCartney *et al.* (1961) found that the number of set eggs was relatively low for Beltsville White (BSW) turkey hens exposed to natural day length from hatch to 42 weeks of age (8.5 eggs). Higher numbers of set eggs (14.5 and 20.9 eggs) were obtained

when they were exposed to 15 and 21 hr daily light during a 10-week production period. They additionally stated that hens which were restricted to 9 hr of light daily at either 23 or 25 weeks of age, and then exposed to a gradually increased day length of 22 hr from 26 to 42 weeks of age, produced even more (34.3) set eggs.

The purpose of this study was to evaluate different light durations and intensities on the egg production weight, and the number of set eggs of medium-weight turkey hens under the subtropical conditions of Egypt.

Material and Methods

Medium-weight BBW Studler turkey poults hatched March 1, 1978, were raised under similar conditions at the Poultry Research Centre, Faculty of Agriculture, Cairo University, Giza, Egypt. They were placed in brick houses with open-fenced yards. The windows of these houses were painted black to allow for complete light control inside the house. The birds were fed a ration containing 22% protein and 2900 Kcal/kg ME for the first 15 weeks. Then they were fed a diet containing 16.5% protein and 3100 Kcal/kg ME. Greens were supplied daily during the experimental period. The birds received *ad libitum* feed and water during all the experimental period.

Ninety 30-week-old hens were chosen at random and restricted to 6 hr of natural light for 4 weeks. Thereafter the hens were divided at random into 5 equal groups (18 hens per group) of similar body weights. They were fed a turkey breeder ration containing 16% protein and 2850 Kcal/kg ME. The hens were then exposed to the following light regimens :

Group 1 was exposed abruptly to 17 hr of light daily : 8 hr of natural light plus 9 hr of artificial light of 11 lux. The exposure to natural daylight was restricted to the scheduled hours irrespective of natural day length.

Group 2 was exposed to the same light regimen as Group 1 but with a light intensity of 22 lux.

Group 3 was exposed to 8 hr of natural light, plus 2 hr of artificial light daily. The 10-hr day length of this group was increased 1 hr weekly for 7 weeks until the birds were exposed to 17 hr of light. This level remained constant for the remaining part of the experiment, with a light intensity of 11 lux.

Group 4 was exposed to the same light regimen as Group 3, but with a light intensity of 22 lux.

Group 5, the controls, was exposed to natural day length only. Day length ranged from 10 hr and 39 min in November to 13 hr and 39 min in May.

For all the light-treated groups, incandescent bulbs were supplied with reflectors and were distributed evenly about 6 feet from the ground to give similar light intensity to the whole area of the house. The bulbs and reflectors were cleaned twice weekly. Time clocks were used to switch the lights on and off.

The hens were trapnested and the eggs were pedigreed. The egg weight was recorded daily to the nearest gram. Monthly (30-day) egg production after sexual maturity for each hen was calculated for a period of 5 months.

Statistical analysis was carried out according to Steel and Torrie (1960). The separation of means was applied according to Duncan (1955).

Results and Discussion

Egg number

Light treatments in general resulted in significant ($P \leqslant .01$) increases in monthly egg numbers (successive months after sexual maturity) over the controls (Table 1). Robinson and Temperton (1953) reported better egg production in turkey hens when exposed to any increase in light duration. Groups exposed to a gradual increase (1 hr weekly increments) in day length produced

more average monthly eggs per hen (10.8 eggs) than those exposed to an abrupt light increase (9.8 eggs). This difference was statistically significant ($P \leq .01$). Similar results were reported by Jull (1946), Smith (1950), Marsden and Martin (1960), Hamilton (1959) and McCartney *et al.* (1961).

TABLE 1. Effect of different light treatments on the monthly egg number in medium-weight turkey hens.

Months after Sexual maturity	Treatments				
	17 hr abrupt light 11 lux	22 lux	17 hr gradual light 11 lux	22 lux	Control
1	11.39	12.50	12.00	11.22	8.89
2	9.94	13.05	11.94	14.11	7.89
3	7.94	10.89	9.56	13.50	6.72
4	7.89	9.28	7.33	12.22	6.89
5	6.22	8.67	6.61	9.83	7.17
TOTAL	43.38^{d*}	54.39^{b}	47.44^{c}	60.88^{a}	37.56^{e}

*Treatment totals followed by different letters differ significantly ($P \leq .01$) from each other (Duncan, 1955).

The average monthly egg number per hen in the groups exposed to high light intensity (22 lux) was greater (11.5 eggs) than those exposed to 11 lux (9.0 eggs). The difference between the two groups was statistically significant ($P \leq 0.1$). Comparable results were reported earlier by Asmundson *et al.* (1946) Gerland *et al.* (1961), Thomason *et al.* (1972) and Nestor and Brown (1972).

It is also apparent from the results (Table 1) that there was a monthly decline in the number of eggs produced from the onset of laying to the 5*th* month of production. However, the two groups receiving 22 lux of light intensity increased their monthly egg numbers for 1 month after the onset of egg production. Following that month their monthly egg number declined like the other groups. However, the rate of decline was less than that of those receiving only 11 lux light intensity.

After 3 months of egg production, the control group (natural day length) started to increase its egg production, contrary

to all other groups. This is probably due to the increase in the natural photo period from January to April, which coincided with this increase in egg production. It is also worth mentioning that during the *5th* month of egg production, the control group produced more eggs than the groups exposed to light intensity of 11 lux (Table 1). This may suggest that 11 lux is not sufficient to induce medium-sized turkey hens to produce eggs at their maximum potential.

These results also indicate that the group of turkey hens exposed to a gradual increase in day length (1 hr weekly increments) with a light intensity of 22 lux produced the highest monthly egg number per hen (12.2 eggs) for 5 months. The difference between this group and all the other treatment groups was highly significant (Table 1).

Egg weight

The average egg weight of Studler turkey hens was about 80 g (Table 2). Statistical analysis for egg weight of the different groups showed mostly no significant differences (Table 2). However, the egg weight of the groups exposed to a light intensity

TABLE 2. Effect of different light treatments on the monthly egg weight (g) in medium-weight turkey hens.

Months After Sexual Maturity	Treatments				
	17 hr abrupt light		17 hr gradual light		
	11 lux	22 lux	11 lux	22 lux	Control
1	74.06	78.15	76.41	74.87	75.26
2	76.50	78.09	78.87	78.46	79.16
3	76.75	80.41	79.88	81.03	81.99
4	78.28	82.35	79.41	80.80	80.40
5	79.89	81.67	80.41	81.23	80.13
Means	77.09^{b*}	80.13^{a}	78.99^{ab}	79.27^{a}	79.38^{a}

*Treatment averages followed by different letters differ significantly ($P \leq .01$) from each other (Duncan, 1955).

of 11 lux was lighter than of those exposed to 22 lux or natural light. This was more apparent in the group exposed to an abrupt

increase in day length with 11 lux light intensity. This could also indicate that to obtain the maximum egg weight for turkey hens, 11 lux is not enough. Comparable results were also reported by McCartney *et al.* (1961), Thomason *et al.* (1972) and Bacon and Nestor (1977).

Egg mass

As a function of egg number and egg weight, light treatments generally resulted in an increase in egg mass during the successive months of egg production following sexual maturity in Studler turkey hens (Table 3). The differences between all treatment groups were highly significant (Table 3). The gradual increase in day length with the high light intensity of 22 lux group produced more egg mass than the other groups.

TABLE 3. Effect of different light treatment on the monthly egg weight (g) in medium-weight turkey hens.

Months after Sexual Maturity	Treatments				
	17 hr abrupt light		17 hr gradual light		
	11 lux	22 lux	11 lux	22 lux	Control
1	853	980	928	860	674
2	761	1027	976	1064	622
3	612	877	763	1090	544
4	617	754	581	985	555
5	492	708	532	804	583
TOTAL	3335^{d*}	4346^{b}	3780^{c}	4803^{a}	2988^{e}

*Treatment totals followed by different letters differ significantly ($P \leq .01$) from each other (Duncan, 1955).

Number of set eggs

The number of set eggs and set egg percentages for the light-stimulated groups was higher than that of the control group (Table 4). These results agree with those obtained by McCartney *et al.* (1961). The group that received the gradual increase in day length with a light intensity of 11 lux had a higher set egg percentage than the other treated groups. Similar results were obtained by Thomason *et al.* (1972).

TABLE 4. Average numbers of settable eggs and settable egg percentages for the different light-treated groups of medium-weight turkey hens.

	Treatments				
TRAITS	17 hr abrupt light 11 lux	22 lux	17 hr gradual light 11 lux	22 lux	Control
Number of settable eggs	33.28^{b*}	40.27^{b}	40.00^{b}	48.44^{a}	27.77^{c}
Percent settable eggs	76.7^{ab*}	74.0^{b}	84.3^{a}	79.5^{ab}	65.9^{c}

*Treatment averages within traits followed by different letters differ significantly ($P \leq .05$) from each other (Duncan, 1955).

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تأثير الاضاءة على انتاجية الرومى فى المناطق شبه الحارة

١ ـ انتاج البيض

جمال الدين عبد الرحمن قمر ، فريد كمال رمزى استينو ، مختار عبد الفتاح قيقة ، سردار ياسين طه السرداري .

قسم الانتاج الحيوانى ـ كلية الزراعة ـ جامعة القاهرة .

معاملة الدجاج الرومى المتوسط الوزن ضوئيا ادى الى زيادة معنوية ($P. \leqslant 0.01$) فى عدد البيض الناتج عن المجموعة غير المعاملة .

كما انه لم توجد اختلافات معنوية بالنسبة لوزن البيض بين المجموعة المعاملة ضوئيا او المجموعة غير المعاملة .

اعطت المجموعة المعاملة ضوئيا عددا اكبر من البيض الصالح للتفريخ عن المجموعة الغير معاملة وادت الزيادة التدريجية فى طول الاضاءة اليومية الى زيادة معنوية ($P. \leqslant 0.01$) بالنسبة لكل من الانتاج الشهرى لكل دجاجة ـ كتلة البيض والبيض الصالح للتفريخ عن المجموعة التى تعرضت للزيادة الاضائية المفاجئة .

كما ادت الكثافة الضوئية العالية (٢٢ وحدة ضوئية) الى تحسين الانتاج الشهرى من البيض ووزن البيض والبيض الصالح للتفريخ عن الكثافة الضوئية المنخفضة (١١ وحدة ضوئية) .