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EFFECT OF SOME MANAGEMENT FACTORS ON PRODUCTIVE AND REPRODUCTIVEPERFORMANCE OF MAMOURAH LAYER HENS

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ABSTRACT

The aim of this study was to evaluate the effect of housing system (cage or floor) , source of light (fluorescent or incandescent) and feeding regime (80 , 90 and 100 % diet levels of the *ad-libitum*) on some productive and reproductive traits of Mamourah layers hens.A total number of 360 hens at 28 week of age were randomly divided into two housing system groups and were similarly weights . The first group was housed in individual cages, while the second group was housed in floor pens (180 hens). Each housing system group was subdivided randomly into two light sources , which received fluorescent and incandescent light (90 hens in each). Each source of light was divided randomly into three feeding regimes. The first treatment (30 layers) fed 100 % diet level, while the second and the third treatments fed 90 and 80 % diet levels, respectively. The experiment continued until 52 weeks of age. Body weight, weight gain, egg number, hen - day egg production , egg mass , feed conversion , fertility , hatchability and some exterior and interior parameters of egg quality were determined . The obtained results can be summarized as follows:

1-Regardless of source of light and feeding regime effects, the hens were housed in cages significantly improved egg number per hen feed conversion and yolk index; while,those were housed on floor significantly surpassed in egg shell weight percentage and shell thickness .

2-The hens were housed on floor increased (not significantly) final live body weight, weight gain, egg weight and yolk weight percentage; while, the opposite (decrease) was in fertility, hatchability from total egg set, egg shape index, albumen weight percentage and Haugh units.

3-In respect of light source effect, the hens received fluorescent light were significantly better in final live body weight, egg number, hen - day egg production, feed conversion and egg mass than those received incandescent light; while, the later hens surpassed in weight gain, eggshell weight percentage and shell thickness.

4-There were significant interactions between the effects of source of light and feeding regime levels on most of the estimated parameters in this study.

It can be concluded that breeding laying hens in individual cages with using fluorescent bulbs as a source of light and feeding on 90 % from the *ad-libitum* level at the beginning of laying period will give an improvement in performance of egg production and reduction in costs of electricity consumption throughout the breeding period with a decrease in the diet price.

INTRODUCTION

Careful management of environmental factors such as feeding and lighting are very important for laying hens throughout the production period. There are many researches conducted on the restricted feeding of laying hens using several types of lighting sources.

Food restriction has been found to reduce weight gain and egg production, though the light hybrid layer hens seem fairly tolerant of food restriction of at least up to 10 % during the laying period (Snetsinger and Zimmerman, 1974). The benefits of food restriction during the breeding period have not been universally agreed upon. Pym and Dillon (1974) and Robbins *et al.* (1986 & 1988) provided evidence that *ad-libitum* feeding during part or all of the laying period improved egg production. However, McDaniel *et al.* (1981) and Robbins *et al.* (1991) reported that *ad-libitum* feeding system during breeding period resulted in lower egg production, egg fertility and hatchability percent of broiler breeders. Yu *et al.* (1992) observed that feed restricted hens during rearing and breeding periods reflected significantly high egg production, fertility and hatchability

On the other hand, light is widely used to stimulate non-seasonal egg production in chickens, and it is an essential tool in the management of chicken breeder flocks. In comparative study, lamp characteristics and relative energy efficiencies of light sources (incandescent lamp and fluorescent bulb),it is shown that the traditional incandescent lamp is inferior to the fluorescent bulb, in terms of lamp life and for more-energy efficient. Light sources may markedly reduce electrical costs (Felts *et al.*,1990).

Concerning light color, Jones *et al.* (1982) found that the birds responded to red or white light equally and had an adverse effect in terms of egg production. By contrast, Siopes (1981) found no significant differences in egg production, fertility or poult weight between incandescent and full-spectrum fluorescent light treatments, while hatchability was significantly lower for the birds under fluorescent lights. Siopes (1984 a) compared full-spectrum fluorescent lamps with incandescent lamps and found that hens stimulated by fluorescent lights had reproductive performance similar to that of hens kept under incandescent lighting. However, Siopes (1984 b) found that egg production of hens maintained under cool-white fluorescent lights was significantly less when compared with that of hens under incandescent light through 20 wk of egg production. Felts *et al.* (1990) reported significantly higher hen-day egg production only during the first 10 wk of the production period for females exposed to daylight fluorescent light than for those under incandescent lights. Hulet *et al.* (1992) found no significant differences in egg production when females were exposed to daylight fluorescent or incandescent lights.

The objective of the present study was to investigate the effects of the housing system (on floor or cages), the source of lighting (fluorescent bulb or incandescent lamp) and feeding restriction regime during the laying period on productive and reproductive traits in Mamourah layer hens.

MATERIALS AND METHODS

The experimental work of the present study was carried out at El-Gimmizah Poultry Station, Animal Production Research Institute, Ministry of Agriculture.

A total number of 360 laying hens and 36 cocks from Mamourah improved local strain at 28 weeks of age were used in the present study and

were randomly divided into two housing systems, and were similarly in weights (180hens+18 cocks in each). The first group was housed in individual wire cages, while the second group was housed in floor pens. Each housing system group was exposed to two light sources (90 hens and 9 cocks in each light source). The first light group was exposed to fluorescent bulb light (40watt) , while, the second light group was exposed to incandescent lamp light (40watt) .The artificial light was used beside the normal daylight to provide 16 h /day photoperiod. The birds of each group from both of light sources (90 hens + 9 cocks) were divided into three feeding regime treatments. Each feeding treatment were 30 hens + 3 cocks in three replicates. The hens of first feeding treatment were fed basal diet at 100 % level, and the hens of second treatment were fed at 90 % level, while the third treatment fed at 80 % level. The 100 % level was determinated by calculating the average of daily feed intake per hen at *ad- libitum* for two sequencelly weeks. It was 125 gm diet and considered 100 % level, thereafter, the 90 % level diet was 112.5 gm and the 80 % level diet was 100 gm. All birds of the experiment were kept under the same environmental, hygienic and management local conditions in the Research Station, fed on a formulated layer diet (Table 1), and the fresh water was supplied all time.

Table 1: Composition of the basal diet.

Ingredient	%
Yellow corn	64.00
Soya bean meal (44% CP)	22.60
Wheat bran	4.00
Dicalcium phosphate	1.50
Limestone	7.10
Common salt	0.30
Vit & Min. mix *	0.30
DL- Methionine	0.20
Total	100
Calculated analysis **	
Crude protein, %	16.13
ME (Kcal)	2727
Calcium, %	3.17
Available Phosphorus, %	0.39
Lysine, %	0.80
Methionine, %	0.46
Determined values ***	
Dry matter, %	88.63
Crude protein, %	15.87
Crude fiber, %	3.14
Ether Extract %	2.43
Ash, %	11.37

*Vit.& Min. mix:. each 3kg contains: 10,000,000 IU Vit. A; 2,000,000 IU Vit D_3 10,000 mg Vit. E;1,000mg Vit. K; 1,000mg Vit. B1; 5,000mg Vit. B2; 1,500mg Vit B6; 10mg Vit. B12; 50mg; Niacl, 20 gm ; Panatothenic acide, 1gm, Biotin;l,000mg Folic acid;250,000mg choline; 80g manganèse; 40g iron; 40g zinc; 2g copper; 2g iodine; 1gm Sélénium and 2g cobalt.

**Calculated according to NRC (1994).

***Determined according to the methods of A.O.A.C (1980)

Pullets were weighed at the beginning and at the end of the experiment. Egg number, egg weight and egg mass were recorded daily during the whole experimental period (24 weeks). Feed consumption was recorded weekly and then feed conversion per egg was calculated. Egg quality traits were measured at 48 week of age. Five eggs from each replicate were collected, weighed, broken and separated into shells, yolks and albumen. The weights of yolk, albumen and shell (with membranes) were recorded and calculated as percentages of egg weight. Fertility and hatchability were calculated three times throughout the experimental period (from 42 to 48 weeks of age). A total of 3240 eggs were hatched (90 eggs for each treatment for each hatch). The hens in cages were artificially inseminated with 0.5ml of diluted chicken semen twice a week. The eggs were collected daily and stored in a reserving room until they were set. Eggs were candled on the 18th day before transferring to the hatchery and culling the clear eggs. Fertility % was calculated as (number of fertile eggs) / (number of eggs set). Hatchability was defined as the ratio of number of chicks hatched to either number of fertile eggs or number of settable eggs.

The data obtained were subjected to analysis of factorial design (2housing system x 2light sources x 3feeding regimes) according to SPSS 8, (1997). Significant differences among individual means were analyzed by Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Body weight and Gain:

Data presented in Table 2 showed that the housing system had no significant effect on live body weight (LBW) and weight gain (WG) at the end of the experimental period (24 weeks) of the experiment.

On the other hand, the results obtained in this study indicated that there were significant differences between the two sources of light (fluorescent and incandescent) in either of the two housing systems (in cages or on floor) on live body weight and weight gain at the end of the experimental period (Table 2). The hens housed on floor and received fluorescent as a source of light had the heaviest live body weight and weight gain (1684 and 391 g), while, opposite results were obtained for the hens housed in cages, where fluorescent led to the lightest live body weight and weight gain (1638 and 371 g). These result may be due to the difference in spectral composition between fluorescent and incandescent light, that was responsible for unequal rates of maturation (Siopes and Wilson, 1980). However, the results presented disagreed with those obtained by Pyrzak *et al.* (1986) and Siopes (1984a) who reported that there were no statistically significant differences in body weights due to light source (fluorescent vs. incandescent).

In relation to the effect of the levels of feeding regimes, the data presented in Table 2 indicated that there were significant differences between the three levels of feeding regime in both of housing systems and under any source of light for live body weight and weight gain at the end of the

experimental period (Table 2). The hens fed on the whole level diet (100 %) were significantly the heaviest in live body weight and weight gain in both of two housing system and under either source of light followed by those fed 90 % diet and then 80 % diet .It would be noticed that the hens housed on floor were heavier in body weight than those housed in cages, also, the hens under the fluorescent source light were heavier in body weight than those under the incandescent source of light in either housing systems (Table2).These may be due to the reduction in the feed intake of laying hens from 100 % , 90 to 80 % of a set allowance which reduced live body weight significantly. The two restricted groups of hens fed 90 or 80 % diet showed a very similar depression of live body weight less than the hens fed 100 % diet. These results are in agreement with those obtained by Watson (1975), Blair *et al.* (1976) and Katanbaf *et al* (1989) who observed a significantly differences with in restricted feeding regimes.

Performance of egg production and feed conversion:

Results in Table 3 indicated that, irrespective of the effects of light source and feeding regime, the layers housed in cages had a significantly higher egg number per hen and hen–day egg production rate than the layers housed on floor throughout the experimental period of the study.

Also, regardless of the effects of housing and feeding regimes, the results presented in Table 3 showed that the layers received the fluorescent source of light had a significantly higher egg number and hen – day egg production rate than those received the incandescent source of light in both the two housing systems .It would be noticed that the highest egg number and hen – day egg production were of the layers housed in cages under the fluorescent light (92.8 and 55.2) while, the lowest values were of the layers housed on floor under the incandescent light(82.6 and 49.2) . This may be due to the different light sources. Benoit(1964) and Hartwig and Van Veen (1979) reported that wavelength and age of bird influence the degree of light penetration through the cranium to the hypothalamus but the significance of this for perception is not understood . Different light sources can have different effects on egg production of hens, presumably due to the difference in spectral output (Siopes, 1984a&b). For instance, photostimulation for egg production in turkeys occurs effectively with white or red but not with blue light (Scott and Payne, 1973 and Jones *et al.* , 1982) . Harrison (1974) reported that intervals between ovipositions in chickens were influenced by the wavelength of light due to the difference in spectral output. The results in Table 3 contrarily to those obtained by Siopes (1984a & b) who reported that the number of eggs per hen over the 20 – week production cycle was significantly lower in the fluorescent light treatment than in the incandescent light treatment. However, Ingram *etal.* (1987), Felts *et al.* (1990) and Hulet *et al.* (1992) found no differences in total egg production or hen – day egg production between fluorescent and incandescent source of light. Similar results were obtained by Felts *et al.* (1992) found that day light-fluorescent caused significantly higher hen – day egg production than that of incandescent light throughout 20 – week egg production cycle.

Table (2):Live body weight and weight gain as affected by housing system , light source and feeding regime in Mamourah laying hens .

Housing	In Cages									On Floor									S.E Of mean	Sig.
Lighting	Fluorescent				Incandescent				mean	Fluorescent				Incandescent				mean		
Feeding regime %	100	90	80	Aver	100	90	80	Aver		100	90	80	Aver	100	90	80	Aver			
Initial Body Weight,g	1265	1254	1282	1267	1247	1254	1280	1260	1264	1282	1295	1301	1293	1293	1257	1290	1280	1286	9.27	NS
Final Body Weight,g	ab 1935	d 1525	ef 1455	C 1638	ab 1890	ed 1580	e 1485	B 1652	1645	a 1977	c 1630	f 1445	A 1684	b 1885	cd 1620	ef 1450	B 1652	1668	58.17	***
Weight Gain,g	ab 670	d 271	ef 173	B 371	ab 643	cd 326	e 205	A 391	381	a 695	cd 335	f 144	A 391	b 592	c 363	ef 160	B 372	384	14.18	***

[a-f] means in the same horizontal row bearing different superscripts differ significantly.
[A-C] for each criterion ,means within light treatmentin the same horizontal row bearing different superscripts differ significantly.
NS = Not significant. *** = ($p \geq 0.001$).

Table 3 : Effect of housing system , sources of light and feeding regime on performance of egg production traits and feed conversion in Mamourah laying hens .

Housing	In Cages									On Floor									S.E [Of mean	Sig.
Lighting	Fluorescent				Inca[ndescent				mean	Fluorescent				Incandescent				mean		
Feeding regime %	100	90	80	Aver	100	90	80	Aver		100	90	80	Aver	100	90	80	Aver			
Egg Number/hen	a 98.4	ab 93.6	cd 86.4	A 92.8	bc 91.8	cd 86.1	de 81.0	C 86.3	*a* 89.6	ab 95.4	bc 90.0	de 81.3	B 88.9	bc 90.9	d 81.6	e 75.3	D 82.6	*b* 85.8	1.26	**
Hen-day egg production, %	a 58.6	ab 55.7	cd 51.4	A 55.2	bc 54.6	cd 51.3	de 48.2	C 51.4	a 53.3	ab 56.8	cd 53.6	de 48.4	B 52.9	cd 54.1	de 48.6	e 44.8	D 49.2	*b* 51.1	0.74	**
Egg Weight,g	53.5	53.9	53.5	53.6	53.3	53.8	52.9	53.5	53.5	53.1	53.6	53.2	53.3	53.0	53.4	53.3	53.3	53.3	0.17	N.S
Daily Feed intake, g/h/d	a 116.3	c 107.9	e 100.0	108.1	b 114.4	d 106.5	e 100.0	107.0	107.6	ab 115.6	cd 106.6	e 100.0	107.4	ab 115.7	cd 107.2	e 100.0	107.6	107.5	1.10	**
Egg Mass, g/h/d	a 31.3	b 30.0	de 27.5	A 29.6	c 29.1	d 27.6	ef 25.5	C 27.4	*a* 28.5	ab 30.2	cd 28.7	ef 25.7	B 28.2	cd 28.7	e 25.9	f 23.9	D 26.2	*b* 27.2	0.42	**
Feed conversion	d 3.72	f 3.60	ef 3.64	D 3.65	bc 3.93	cd 3.86	bc 3.92	B 3.91	*b* 3.76	cd 3.83	de 3.71	c 3.89	C 3.81	b 4.03	ab 4.14	a 4.18	A 4.11	*a* 3.95	0.07	**

[a-f] means in the same horizontal row bearing different superscripts differ significantly.
[A-D] means within light treatment in the same horizontal row bearing different superscripts differ significantly.
[a-b] means between housing systems in the same horizontal row bearing different superscripts differ significantly.
NS = Not significant. ** = ($p \leq 0.01$).

In respect of, the effect of feeding regimes on egg number per hen and hen – day production, data in Table 3 indicated that the hens fed 100 % diet level had the highest significant egg number and hen – day egg production for the two sources of light (fluorescent and incandescent) in both of two housing systems. The hens fed 80 % diet level had the significantly lowest egg number and hen – day egg production in all treatments. It would be noticed that there were no significantly differences between the hens fed 100 % diet level and those fed 90 % diet level in egg number and hen – day egg production for layers in cages (Table 3). These results agree with those obtained by Watson (1975) and Blair *et al.* (1976) who reported that restricting the intake of feed by 20 % during the laying period resulted in a significantly sever drop in egg number and number of settable eggs per hen housed. Sherwood *et al.* (1964) reported that egg production was reduced by 3.7 % units with 15 % food restriction. However, Manning and McGinnis (1974) reported that egg production was not affected by reducing the food allowance by 8 % during the laying period .

Data in Table 3 showed that there were no significant differences in mean egg weight neither between the two housing systems (in cages and on floor) nor between the two light sources (fluorescent and incandescent). Similar effect was indicated within the feeding regime levels for the mean egg weight (Table 3). These results were in agreement with those reported by Siopes (1984a), Felts *et al.* (1992) and Hulet *et al.*(1992) who found no significantly differences in egg weight due to the sources of light . Similarly, Robbins *et al.* (1988) and Yu *et al.* (1992) reported that there were no significant differences among feeding regime levels.

In respect of daily feed intake, data presented in Table 3 showed that there was no significant difference between the two housing systems where they had almost an equal amount of daily feed intake (107.6 vs. 107.5 g / hen / day). The same result was found in comparison of the effect of light sources, where, it would be noticed from Table 3 that there was no significant difference between the fluorescent and the incandescent lights for the daily feed intake which ranged from 107.0 to 108.1 g / hen / day. Similar results were obtained by Siopes (1984a) who reported that no significant differences occurred in feed intake measured over a 2- week period ending after 20 weeks egg production.

In respect of feeding regime effects, the data in Table 3 indicated that, there were highly significant differences in daily feed intake per hen and the hens fed 100 % diet level had the highest amounts of daily feed intake, while, those fed 80 % diet level had the lowest amount of daily feed intake. This is due to the different amounts of diet offered to the groups of treated hens.

It would be noticed from Table 3, that egg mass of hens housed in cages was higher than that of hens housed on floor, with no significant difference. Data showed hat the hens received the fluorescent light had highly significant egg mass in both of the two housing systems in comparison with those received the incandescent light in both of the two housing systems The differences in egg mass (gram eggs / hen / day) may be due to the different effects on egg production of hens due to the different sources of

light, where, they can have different effects on egg production of hens due to the different in spectral output (Siopes (1984a& b) .The results in this study were in contrast to those reported by Siopes(1984 b) who found that egg production of hens maintained under fluorescent lights was significantly less when compared with that of hens under incandescent lights through 20 wk of egg production .However, Siopes (1984a) and Felts *et al.* (1990) reported that there were no significant differences in total egg production of hens kept under fluorescent or incandescent light sources .

Data presented in Table 3 showed that there were highly significant differences within feeding diet levels in respect of egg mass of hens received either fluorescent or incandescent light sources in both of two housing systems. The highest egg mass (31.3 g eggs / hen / day) was of hens fed 100 % diet level received fluorescent light source in cages; while, the lowest egg mass (23.9 g eggs / hen / day) was of hens fed 80 % diet level received incandescent light on floor housing. These results of egg mass are related to those of egg number and hen - day egg production (Table 3). The results obtained agreed with those reported by Blair *et al.* (1976) who found that restricted feeding by 20 % during the laying period resulted in a depression in egg number and sequence egg mass by 17 % compared to hens full – fed (100 % diet level).

From Table 3, data indicated that the hens housed in cages had the best feed conversion compared with the hens housed on floor (3.76 vs. 3.95). The difference was significant. It would be noticed that the hens received fluorescent light had significant best feed conversion in both of cages and floor housing.

The best-feed conversion was of hens received fluorescent light in cages (3.65 g feed / g eggs) while, the worse feed conversion was of hens received incandescent light on floor (4.11 g feed / g eggs).

In respect of effect of feeding regime on feed conversion, it would be noticed from Table 3 that there were significantly differences within the levels of diets. The best feed conversion was of the hens fed 90 % diet level received fluorescent light in cages (3.60 g feed / g eggs) while, the worse feed conversion was of hens fed on 80% diet and received incandescent light on floor (4.18 g feed / g eggs). It seems clear from the results of this study in Table 3 that the improvement in feed conversion was dependent on the increasing in egg number and hen – day egg production in different treatments.

Fertility and Hatchability:

Results presented in Table 4 indicated that fertility and hatchability percentages were not significant different as affected by either housing system or source of light .The hens received fluorescent light have fertility and hatchability percentages higher than those received incandescent light in both of the two housing systems. The low different response may relate to the slight differences in spectral distribution among the various light sources used (Levenick and Leighton, 1988). These results support those of Siopes (1984 a& b), Felts *et al.* (1990 & 1992) and Hulet *et al.* (1992); who noted no differences in fertility and hatchability for hens housed under full spectrum fluorescent and incandescent light.

Regardless to the effects of housing and lighting, data presented in Table 4, showed that there were significant differences of fertility and hatchability percentages among the levels of diets offered to hens. It would be noticed that there were no significant differences among the levels of 100 % and 90 % diets in all treatments of fertility and hatchability percentages, while, the significant different was found between the 80 % level diet and the other two levels in all treatments of fertility and hatchability percentages .The highest values of fertility and hatchability percentages were of the hens fed on the 100 % level diet and received fluorescent light in cages housing, followed by those of the same feed and light on floor . However, the lowest values of fertility and hatchability percentages were of the hens fed 80 % diet level and received incandescent light on floor. These differences in fertility and hatchability percentages may be due to the variance of diet levels offered to hens in this study. Blair *et al.* (1976) found that the hens fed 80 % were lower significantly in comparison to those fed 100 % concerning fertility and hatchability of eggs set and hatchability of fertile eggs percentages. On the other hand, many researches reported no significant differences between levels of restricted feeding regimes. Potter *et al.*,(1978) offered limited feed at 80 % and found no significant differences in that respect.

Egg quality traits:

Data presented in Table 5 showed that there were no significant differences in egg weight and egg shape index in both of housing systems (in cages or on floor) and sources of light (fluorescent and incandescent). It would be noticed that the hens received fluorescent light had less values of egg weight and egg shape index in comparison with those of incandescent light in both of two housing systems (in cages and on floor).

In respect of the effect of feeding levels on egg weight and egg shape index, the results found in Table 5 indicated that there were differences among the three levels of diet offered to hens without significance. It would be noticed that the hens fed 80 % diet level had the largest values of egg weight and egg shape index under either of fluorescent or incandescent light, while the lowest values were of the hens fed 100 % diet level.

In respect of shell weight percentage, results in Table 5 showed that there was significant difference between the two housing systems (in cages and on floor) , although there were no significant differences between both lighting sources within both housing systems. The hens received the incandescent light output eggs with heavier shell than those laid by hens received fluorescent light in both housing systems.

On the other hand, it would be noticed from Table 5 that the effects of feeding regime were significant on egg shell weight percentages in all treatments in this study. The results showed that the hens fed 80 % diet level output eggs with the highest significantly values of egg shell weight percentages in all lighting and housing treatments. While, the significantly lowest values were of those fed 100 % diet level. These results of egg shell weight percentages may be due to the different egg number and rates of hen - day egg production for the three levels of feeding regime in either light treatments.

Table 4 : Fertility and hatchability as affected by housing system , light source and feeding regime in Mamourah laying hens.

Housing	In Cages									On Floor									S.E of mean	Sig.
Lighting	Fluorescent				Incandescent				Mean	Fluorescent				Incandescent				mean		
Feeding regime %	100	90	80	Aver	100	90	80	Aver		100	90	80	Aver	100	90	80	Aver			
Fertility %	a 89.7	ab 87.1	cd 83.0	86.6	b 86.3	bc 85.6	de 81.5	84.5	85.6	ab 87.8	ab 86.4	cd 82.5	85.6	bc 85.6	c 84.2	e 80.7	83.5	84.6	2.54	*
Hatch. of total. %	a 72.6	ab 70.2	cd 65.1	69.3	b 69.2	bc 66.8	d 63.6	66.5	67.9	ab 71.1	ab 69.4	de 62.9	67.8	bc 67.1	bc 65.7	e 61.8	64.9	66.4	2.47	*
Hatch of fertility%	a 85.3	ab 83.0	c 80.7	83.0	ab 83.3	bc 82.0	d 79.0	81.4	82.2	ab 84.4	b 82.7	cd 79.6	82.2	ab 84.1	b 82.7	cd 80.2	82.3	82.3	1.73	*

a-e means in the same horizontal row bearing different superscripts differ signlficantly. * = ($p \leq 0.05$).

Table 5 : Effect of housing system , source of light and feeding regime on external and enternal egg quality traits of Mamourah laying hens .

Housing	In Cages									On Floor									S.E of mean	Sig.
Lighting	Fluorescent				Incandescent				mean	Fluorescent				Incandescent				mean		
Feeding regime %	100	90	80	Aver	100	90	80	Aver		100	90	80	Aver	100	90	80	Aver			
Egg Weight,g	53.0	53.8	54.3	54.3	54.0	54.3	55.3	54.5	54.4	52.4	54.1	54.6	53.7	53.7	54.2	55.6	54.5	54.1	0.83	N.S
Egg shape Index, %	75.9	76.1	76.6	76.3	75.8	76.8	78.2	77.0	76.7	75.6	76.0	77.7	76.2	76.1	76.9	78.9	76.8	76.5	0.95	N.S
Shell Weight, %	f 11.7	d 12.6	ab 13.5	12.6	e 12.2	cd 12.7	ab 13.5	12.8	*b* 12.7	ef 11.9	cd 12.8	a 13.9	12.9	de 12.5	c 12.9	a 13.8	13.1	*a* 13.0	0.09	*
Shell Thickness mm	f 31	e 33	c 35	C 33	d 32	c 34	b 36	B 34	*b* 34	ef 32	d 34	b 36	B 34	e 33	c 35	a 37	A 35	*a* 35	0.28	**
Yolk Weight %	e 29.6	cd 31.7	bc 32.3	31.2	d 30.9	bc 32.1	bc 32.4	31.8	31.5	de 30.8	cd 31.9	c 32.0	31.6	de 30.8	cd 31.9	b 32.6	31.8	31.7	0.39	*
Yolk Index %	d 41.9	bc 43.5	a 44.6	44.3	d 41.9	c 43.0	ab 44.3	43.1	*a* 44.2	de 41.6	b 43.7	a 44.6	43.3	e 41.2	cd 42.8	bc 43.4	42.5	*b* 42.9	0.41	**
Albumen Weight %	a 58.7	bc 55.8	d 54.2	56.2	b 56.9	cd 55.2	de 54.1	55.4	55.6	ab 57.3	c 55.3	de 54.1	55.5	bc 56.7	cd 55.2	e 53.6	55.2	55.3	0.73	*
Haugh Unit	a 86.3	bc 84.7	d 82.5	84.5	ab 85.7	c 84.6	de 82.3	84.2	84.4	ab 86.0	c 84.6	de 82.4	84.3	b 85.5	cd 84.3	e 82.2	84.0	84.2	0.52	*

a-f means in the same horizontal row bearing different superscripts differ significantly.
A-C means within light treatment in the same horizontal row bearing different superscripts differ significantly.
a-b = means among housing systems in the same horizontal row bearing different superscripts differ significantly.
NS = Not significant. * = ($p \leq 0.05$). ** = ($p \leq 0.01$).

Results presented in Table 5 showed also that shell thickness of eggs laid by hens housed in cages was thinner than those of hens housed on floor (34 vs. 35 *µm*) with significance. However, shell thickness had significantly affected by source of light, where the hens received incandescent light output eggs with thickly shell than those of hens received fluorescent light. It would be noticed from Table 5 that the thinnest eggshell was (33 *µm*) in eggs laid by hens received fluorescent light in cages housing Also, the results showed that there were highly significant differences within the levels of feeding. The layers fed 80 % diet level output eggs with thickly shell in comparison with the other levels, i.e. 90 and 100 % (Table 5).

These results of eggshell thickness may be due to decreasing of hen – day egg production in hens fed 80 % diet level; hence, their eggs staid long time in oviduct and as a sequence there is increase in shell formation. These results agreed with those reported by Davis *et al.* (1993) who reported that there were no significant differences between light treatments in mean egg and shell weights at any time during the study, while, shell thickness was significant different between the two treatments. However, Pyrzak and Siopes (1986) reported that percent of shell and shell quality were different significantly among light treatments.

Similarly, results in Table 5 showed no significant differences between the two housing systems and the two sources of light in respect of yolk weight percentage and yolk index. The results showed that the hens received incandescent light laid eggs with yolk weight percentage slightly heavier that of eggs laid by hens received fluorescent light in both housing systems. Contrary results of yolk index were obtained in Table 5, where the hens received fluorescent light output eggs with yolk index larger than those received incandescent light in both housing systems.

In respect of the effects of feeding regime, results in Table 5 indicated that there were significant differences within the levels of feeding regime. It would be noticed that the hens fed 80 % level of feeding regime output eggs with significantly higher yolk weight percentage and yolk index than those of 90 and 100 % levels. These results of yolk weight percentage were not agreed with those reported by Pyrzak and Siopes (1986) who reported that both yolk parameters (weight and percent) were significantly different among all light treatments .

Results presented in Table 5 showed that albumen weight percentages and Haugh units of egg laid by the hens housed in cages were slightly more than of those housed on floor. Also, it would be noticed that the eggs laid by the hens received fluorescent light had more albumen weight percentages and Haugh units in comparison with those laid by the hens received incandescent light. The differences were not significant between the two housing systems and the two sources of light.

In respect of the effects of feeding regime levels on albumen weight percentages and Haugh units, results in Table 5 showed that there were significant differences among the three levels of feeding regimes. It would be noticed that the hens fed 100 % diet level had the highest significant values of albumen weight percentages and Haugh units. This was expectance with the significant depression of corresponding values of shell and yolk weight

percentages. The highest values of albumen weight percentage and Haugh unit (58.7 % and 86.3 U) were output by the hens fed 100 % diet level and received fluorescent light in cages, while the lowest values of the same traits (53.6 % and 82.2 U) were found in eggs laid by hens fed 80 % diet level and received incandescent light on floor. Pyrzak and Siopes (1986) reported that light treatments (colors) caused significant changes in egg quality traits during the laying period of hens. The authors added that percent albumen in the red light treatment was significantly higher than all other treatments and remained unchanged during the entire laying period. However, Davis *et al.* (1993) reported that there were no consistent significant trends in egg quality measurements among the treatment groups.

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تأثير بعض عوامل الرعاية على الأداء الإنتاجي و التناسلي لدجاج المعمورة البياض

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استهدفت هذه الدراسة تقييم تأثير كل من نظام الإسكان للطيور (بطاريات – أرضي) ، مصدر الإضاءة (فلورسنت – متوهج) و كذلك مستويات غذائية (٨٠ ، ٩٠ ، ١٠٠ % من الكمية التي تحتاجها الطيور من بداية التجربة) على بعض الصفات الإنتاجية و التناسلية لدجاج المعمورة البياض .

تم استخدام ٣٦٠ دجاجة معمورة عمر ٢٨ أسبوعا ومتساوية في الوزن تقريبا حيث قسمت إلى مجموعتين متساويتين كل مجموعة ١٨٠ دجاجة . المجموعة الأولي تم تسكينها في بطاريات فرديا بينما المجموعة الثانية تم تسكينها في بيوت التربية الأرضية . تم تقسيم كل مجموعة تسكينية إلي معاملتين ضونيتين متساويتين في العدد (٩٠ في كل معاملة). المعاملة الأولي استقبلت الإضاءة من خلال لمبات فلورسنت الأنبوبية أما المعاملة الأخرى فتلقت إضاءة باستخدام لمبات كمثرية متوهجة ،وتحت نظام الإضاءة قسمت كل معاملة إضاءة الي ثلاث معاملات نظم تغذية والمعاملة الأولي تغذت على مستوى ١٠٠ % عليقه ، أما الثانية و الثالثة فتغذت على ٩٠ ، ٨٠ % من الكمية التي تحتاجها الطيور على الترتيب .

استمرت التجربة لمدة ٢٤ أسبوعا (من ٢٨ – حتى ٥٢ أسبوع من العمر) .تم تقدير كل من وزن الجسم – الزيادة في وزن الجسم – عدد البيض لكل دجاجة – معدل الإنتاج اليومي – كتلة البيض – معدل التحويل الغذائي – بعض صفات جودة البيض الخارجية و الداخلية – النسبة المئوية للخصوبة و الفقس.

النتائج التي تم الحصول عليها أمكن تلخيصها كالتالي : –

١. بصرف النظر عن تأثير كل من مصدر الضوء أو المستوى الغذائي ، فإن الدجاجات التي تم تسكينها في البطاريات قد حسنت معنويا في عدد البيض لكل دجاجة – معدل الإنتاج اليومي للبيض – كتلة البيض – معدل التحويل الغذائي و معامل الصفار ، بينما التي تم تسكينها في البيوت الأرضية فقد تفوقت معنويا في النسبة المئوية لوزن القشرة و سمك القشرة .
٢. الدجاجات التي تم تسكينها في البيوت الأرضية ازدادت بدون معنوية في وزن الجسم النهائي – الزيادة في الوزن – وزن البيضة – النسبة المئوية لوزن الصفار ، بينما كانت النتائج عكس ذلك في نسبة الخصوبة – نسبة الفقس من البيض الكلي – معامل شكل البيضة – النسبة المئوية للبياض ووحدات Haugh .
٣. فيما يتعلق بتأثير مصدر الضوء ،فإن الدجاجات التي استقبلت إضاءة فلورسنت كانت أحسن معنويا من تلك التي تلقت إضاءة متوهجة في كل من وزن الجسم النهائي – عدد البيض لكل دجاجة – معدل إنتاج البيض – معدل التحويل الغذائي و كتلة البيض ، بينما الدجاجات التي سكنت على الأرض كانت متفوقة معنويا في الزيادة في وزن الجسم – النسبة المئوية لوزن القشرة و سمك القشرة .
٤. لم يكن هناك فروق معنوية بين مستوى ١٠٠ % ومستوى ٩٠ % للتحديد الغذائي في كل من صفات عدد البيض لكل دجاجة – وزن وشكل البيضة – معدل إنتاج البيض – نسبة الخصوبة – نسبة الفقص سواء كان من البيض الكلي أو من البيض المخصب .
٥. كان هناك تداخل معنوي بين كل من تأثيرات مصدر الضوء و مستويات التحديد الغذائي على معظم الصفات المقدرة في هذه الدراسة .

مما سبق : يمكن أن نستنتج أن تربية السلالات المحلية المستنبطة في البطاريات الفردية مع استخدام لمبات الفلورسنت الأنبوبية كمصدر للإضاءة و التغذية على مستوى ٩٠ % من مستوى التغذية الكاملة المقررة لها أعطى تحسن في كفاءة الأداء لصفات إنتاج البيض مع تقليل الكهرباء المستخدمة طوال فترة التربية و تقليل نسبة من ثمن العلائق المستخدمة.