J. Agric. Sci. Mansoura Univ., 27 (7): 4463 - 4481, 2002

THE RESPONSE OF LAYING HENS TO INDUCED MOLT AS AFFECTED BY STRAIN, FEEDING AND LIGHTING PROGRAMS

Breikaa, Mervat A.; Nazla Y. Abou-El-Ella; Yousria K. Afify and M.M. Balat

Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Giza, Egypt

ABSTRACT

This experiment was conducted to study the performance of Gimmizah (G) and Golden Montazah (GM) hens which were induced to molt by fast where feed was withdrawn until a target body weight loss of 33.04% was reached (14 days) or fed on ration that contained high level of zinc oxide (ZO) (20,000 ppm) for 7 days. The hens were subjected to two light length treatments, the first receiving 14 hr of light per day (L/D) throughout the 24-week experiment and the second restricted to 8 hr L/D during the dietary treatments. This group of hens received a 24-hr photoperiod for 1 wk to provide maximum stimulation prior to initiation of dietary treatments and 8 hr L/D during the dietary treatments. Lightning interval was maintained through day 42, after which, lightning period was increased by one-half hr per day until it reached 14 hr L/D. Control group was maintained. All groups received a 16.84% protein layer ration throughout the experiment and given feed and water ad libitum. Body weight loss of G hens was significantly ($P<0.01$) higher than that of GM ones at 63 weeks of age. The fast hens and the hens treated with ZO achieved about 33% and 20% BW loss, respectively, till Day 14 from the beginning of treatment. The BW of the two treated groups was significantly less than the control one during postmolting period. The lightining period had no effect on BW at all ages studied. In addition, G hens produced significantly more eggs than GM ones during 72-76 weeks of age only. Both the ZO and control groups produced approximately similar EN and they surpassed the fast one during molting while the two treated groups produced significantly ($P<0.001$) more eggs than the control one during both the 64-68, 68-72 weeks of age. Moreover, Hens on the 8 hr L/D produced significantly less EN during 68-72 weeks of age than hens which received 14 hr L/D. On the other hand, the G hens had better ($P<0.05$) value of FE during 68-72 weeks of age than GM ones. Moreover, the fast group had the poorest value of FE during molting period and the feeding treatment had highly significant effect on FE during 68-72 weeks of age only. The L/D had no effect on FE. Moreover, G hens produced significantly ($P<0.001$) heavier eggs than GM ones, and eggs produced by control hens were heavier than those of the treated hens. The lighting period had no significant effect on EW. Moreover, light per day significantly affected both Hu and SHT where 8 hr L/D decreased Hu value but increased SHT. Age of hens showed highly significant effect on both EW and SHT. In addition, neither strain nor feed treatment had significant effects on F or H. While L/D showed no effect on H, the F of eggs produced from hens received 14 hr L/D was higher than the restricted L/D group. However, induced molting using the feeding and lighting programs in G and GM hens realizes positive REE except that in G ones which the REE of hens bred on 8 hr L/D and fed ZO was less compared with the control group. However, it could be concluded that most of the traits studied were improved due to feeding and lighting programs used in this experiment.

Keywords: Force molting, body weight. egg number, egg quality, hatch traits, economic analysis.

INTRODUCTION

There have been various methods proposed to induce molting of laying hens. The most common method used was fasting to reduce body weight (Berry and Brake, 1985, Mohammed, 1992; Abd-El-Baky, 1998, Alodan and Mashaly, 1999; Ali *et al.*, 1998, 1999). Long fasting period was used - 12 and up to 16 days - (Brake and Carey, 1983) while Berry and Brake (1987) used fasting to a body weight loss of 34%. Other molting techniques were used, such as feeding high levels of zinc (Berry and Brake, 1987, Alodan and Mashaly, 1999; Ali *et al.*, 1998, 1999). Photoperiod modification has been reported to increase the degree of involution of the reproductive tract when used with molts induced by fasting, and high ZO methods (Berry and Brake, 1985 and 1987; Hurwitz *et al.* 1995; Alodan and Mashaly, 1999). Each method can be used per se or in combination with each other. Moreover, Andrews *et al.* (1987) reported that light stimulation of more than 12 h is needed before Day 42 of the molt for optimum production to occur. Generally, most of these researchers concluded that induced molting improves the post molting performance of the laying hens compared to the control group. This improvement included egg weight (Zeelen, 1975), Haugh units (Zimmermann *et al.*, 1987). Recently, the results of Alodan and Mashaly (1999) demonstrated that induced molting using zinc oxide (20,000 ppm) and Califirnia methods, significantly increased egg production and Haugh units, while body weight of the molted hens was decreased significantly during molting. On the other hand, Doyon *et al.* (1986), and Afify *et al.* (2002) reported that performance of laying hens affected by strain and age of hen. However, developed local strains significantly differed in hatch traits and/or body weight, egg production traits (Awadin, 1998; Ali et al, 1998; Afify *et al.* 2002). In addition, Hurwitz *et al.* (1998) studied the responses to induced molt in four strains at ages ranging from 7 to 19 month. The present work aimed to compare the performance of Gimmizah and Golden Montazah strains during and after molting induced by feeding (fasting and high zinc) and lighting programs (8 hr and 14 hr L/D).

MATERIALS AND METHODS

This study was carried out at El Sabhiah Poultry Research Station, Animal Production Research Institute during the period of July to December, 1999. One hundred sixty eight laying hens aged (60 wk) from both, Gimmizah and Golden Montazah (84 hens each) were randomly assigned to 24 breeding pens (3 m2 each) in a poultry house. Experiment had a 2x3x2 factorial arrangement of treatments. The hens in each strain were randomly divided to three treatment groups (two experimental and one control). The hens in the first treatment group were fed a layer ration containing 20,000 ppm of zinc oxide (ZO) for 7 days. In the second one, feed was withdrawn until a target body weight loss of 33.04% was reached (14 days) as reported by Berry and Brake (1987). The third group was served as control and all groups received a 16.84% protein layer ration (Table 1) throughout the experiment and given feed and water ad libitum. The hens were subjected to two lightning programs, the first was receiving 14 hr of light per day (14 hr

L/D), (the hens were maintained under natural light, then light period was increased to 14 hr/d using artificial illumination) throughout the 24-week experiment while the second received 8 hr L/D. This group of hens received a 24-hr photoperiod for 1 wk to provide maximum stimulation prior to initiation of dietary treatments and 8 hr L/D during the dietary treatments, lightning period was maintained through day 42, after which, lightning period was increased by one-half hr per day until it reached 14 hr L/D. Bulb lamps were used (25 Watt each), 2 m above the ground. After 8 wks of the beginning of treatments, hens were transferred to laying cages.

Table (1): Composition and calculated analysis of the experimental diet

Ingredients	Kg/ton
Yellow corn	620.00
Soybean meal (44%)	260.00
Vegetable oil	14.00
Sodium chloride	3.50
Limestone	82.65
Dicalcium phosphate	14.60
Vit. Mineral mix*	3.00
DL. Methionine	0.75
Sand	1.50
Total	1000.00
Calculated composition:	
Crude protein (%)	16.84
Metabolizable energy (k cal/kg diet)	2800.00
C/P ratio	166.00
Calcium %	3.20
Available phosphorus %	0.40
Total phosphorus %	0.67
Methionine %	0.36
Methionine + Cystine %	0.64
Lysine %	0.88

***Vitamin-mineral premix supplied per 1Kg. of diet: Vit.A, 12000 IU; Vit. D3, 2200 ICU; Vit. E,10 mg;Vit. K3, 2mg; Vit. B1,1 mg; Vit. B2,4mg; Vit. B6, 1.5 mg; Vit. B12, 10 Ug; Nicotinic acid, 20 mg; Folic acid, 1mg; Pantothenic acid,10 mg; Biotin 50 Ug; Choline chloride, 500 mg; Copper, 10 mg; Iron 30 mg; Manganese, 55mg; Zink, 50 mg; Iodine, 1mg; Selenium, 0.1 mg.**

Body weight (BW) was recorded at the beginning of experiment and weekly for 4 weeks (molting period) then, once every 4 weeks till 84 weeks of age. Feed intake was recorded and feed efficiency (FE) (kg feed/kg egg) was estimated. Eggs were collected daily and continued throughout the whole experimental period. Egg number per hen (EN) was estimated at different ages. At 68, 76 and 84 weeks of age, a three days of egg collection was done and the following traits were studied at the same day of production: Egg weight (EW), Haugh units (Hu) according to Stadelman and Catterill (1986), and shell thickness (SHT), ((m) using the micrometer. During 76-80 weeks of age, hens were inseminated with 0.05 ml of pooled semen. During 80-84 weeks of age, total eggs for each replicate were incubated at 7 days intervals for 4 hatches. Fertility percentage (F), and hatchability on the bases of fertile eggs (HFE) were determined. Data presented on a percent basis (V%, F%, and H%) were subjected to Arcsine transformation prior to statistical analysis.

The market cost of feed consumed through the experiment phase 0-24 week), according to the price was (0.810 LE./kg), and price of one kg egg mass (5.0 LE). The total expences and the total returns were estimated, economic efficiency (EE) and the relative economic efficiency (REE) of the three factors (S, T , L/D) were calculated according to input–output analysis.

Data of (BW), (FC), egg production traits, and V% were analyzed using three-way analyses of variance while egg quality traits were analyzed by four- way analyses of variance using (SAS, 1989). Significant differences among means were using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Effect of the strain on BW was not significant at all ages studied except that at 63 weeks of age. Although G hens were significantly (P<0.01) heavier than GM ones, body weight loss of G hens was higher than that of GM ones (Tables 2 and 3). The results of Attalah *et al.* (1992) pointed to significant difference in the reduction of BW between the strains. With respect to the effect of feed treatment, it was clear that BW of the control group surpassed (P<0.001) the other two groups at most of ages studied. Both the fasted hens and those fed on ZO achieved about 33% and 20% BW loss on Day 14 from the beginning of treatment. At the end of experiment BW of the treated hens reached values less than control group. Similar results were reported by Berry and Brake (1985), Mohammed (1992) and Alodan and Mashaly (1999). On the other hand, L/D showed no significant effect on BW at all ages studied. Opposite results were given by Berry and Brake (1985) indicating reduction of BW when the 8-hr photoperiod were used.

Egg production results presented in Tables 4 and 5 and Fig. 1 showed that strain did not affected the number of eggs produced during or post molting except that during 72-76 weeks of age where G hens produced significantly (P<0.05) more eggs than GM ones. Similar results were reported by Hurwitz *et al.* (1998). As for the dietary treatments, all birds did not completely stop egg production and both the ZO and control groups produced approximately similar EN and they surpassed the fast one during molting while the two treated groups produced significantly (P<0.001) more eggs than the control one during 64-68 and 68-72 weeks of age. However, ZO group produced significantly more eggs (about 21%) than control one during the whole experimental period and eggs produced by the three groups were decline with age after the week 76 of age. Similar results were found by Hurwitz *et al.* (1998) and Alodan and Mashaly (1999) who found that induced molt resulted in an increase in post molt egg production rate and the second group of authors found diminution of the rate of decline of production with age. Hens on the 8 hr L/D produced significantly less number of eggs than hens which received 14 hr L/D during 68-72 weeks of age only.

In contrast, Berry and Brake (1987) demonstrated that no significant effects on cumulative egg production were found due to photoperiod treatments.

Table (2): Means ± standard deviations of body weight of Gimmizah and Golden Montazah strains according to the force molting programs

Strain	Gimmizah						Golden Montazah					
Feed treatment	Control		Zinc Oxide		Fasting		Control		Zinc Oxide		Fasting	
L/D / Age, wk	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d
Initial weig	2.25±0.28	2.03±0.19	1.99±0.21	2.02±0.33	2.00±0.31	2.11±0.21	1.99±0.23	2.10±0.29	2.03±0.25	2.16±0.28	2.01±0.27	2.11±0.27
-61	2.28±0.29	2.03±0.20	1.79±0.22	1.83±0.29	1.67±0.27	1.82±0.17	2.03±0.23	2.14±0.28	1.82±0.26	1.89±0.21	1.68±0.21	1.73±0.22
-62	2.31±0.28	2.05±0.20	1.55±0.29	1.72±0.28	1.32±0.17	1.49±0.14	2.05±0.23	2.09±0.29	1.63±0.29	1.69±0.26	1.33±0.18	1.37±0.15
-63	2.34±0.3	2.06±0.20	1.79±0.25	1.78±0.30	1.88±0.32	1.91±0.19	2.06 ±0.25	214±0.27	1.71±0.24	1.76±0.23	1.74±0.14	1.78±0.17
-64	2.35±0.28	2.10±0.20	1.85±0.26	1.84±0.29	1.93±0.33	1.99±0.21	2.09±0.25	2.15±0.28	1.78±0.25	1.91±0.26	1.85±0.23	1.91±0.14
-68	2.39±0.29	2.09±0.30	1.93±0.27	1.91±0.25	1.86±0.31	2.02±0.21	2.11±0.25	2.08±0.30	1.87±0.26	1.80±0.38	1.92±0.25	2.01±0.23
-72	2.50±0.25	2.23±0.13	2.03±0.23	2.07±0.35	2.00±0.39	2.09±0.22	2.14±0.25	2.17±0.33	2.02±0.29	2.14±0.30	2.04±0.27	2.09±0.23
-76	2.54±0.28	2.34±0.14	2.15±0.19	2.22±0.42	2.09±0.39	2.21±0.26	2.20±0.24	2.27±0.32	2.11±0.29	2.16±0.41	2.15±0.29	2.21±0.24
-80	2.57±0.35	2.45±0.19	2.21±0.23	2.41±0.49	2.16±0.45	2.39±0.31	2.28±0.27	2.53±0.16	2.22±0.28	2.35±0.40	2 15±0.29	2.25±0.22
-84	2.64±0.33	2.55±0.20	2.32±0.24	2.47±0.48	2.26±0.46	2.42±0.35	2.33±0.28	2.57±0.22	2.31±0.31	2.38±0.36	2.30±0.34	2.34±0.22

-L/D: Light per day.

Table (3): Means ± standard deviation of body weight (kg) and the change percentages of body weight at different ages as affected by strain and the force molting programs

Main Factors	Strain		Sig.	Feed treatment			Sig.	Light treatment		Sig.
Age, wk	G	GM		Control	Zinc oxide	Fast		14 hr/d	8 hr/d	
Molting period:										
60	2.06±0.27	2.06±0.26	NS	2.04±0.26	2.05±0.30	2.06±0.26	-	2.04±0.27	2.09±0.26	-
61	1.90±0.31	1.88±0.28	NS	2.12±0.26^{a}	1.83±0.24^{b}	1.72±0.22^{c}	***	1.88±0.32	1.91±0.26	NS
%	-7.75	-8.87		1.39	-10.40	-16.16		-8.08	-8.58	
62	1.74±0.41	1.69±0.38	NS	2.12±0.27^{a}	1.65±0.28^{b}	1.38±0.10^{c}	***	1.70±0.44	1.74±0.34	NS
%	-15.50	-18.07		1.58	-19.45	-33.04		-16.94	-16.68	
63	1.96±0.32^{A}	1.86±0.28^{B}	**	2.15±0.27^{a}	1.84±0.26^{b}	1.92±0.24^{b}	***	1.92±0.33	1.90±0.28	NS
%	-4.99	-9.98		2.84	-14.08	-11.14		-6.22	-8.77	
64	2.01±0.32	1.94±0.27	NS	2.18±0.27^{a}	1.88±0.28^{b}	1.95±0.25^{b}	***	1.97±0.32	1.98±0.26	NS
%	-2.57	-5.81		4.11	-9.87	-6.52		-3.38	-5.03	
postmolting period:										
68	2.04±0.32	1.97±0.29	NS	2.18±0.91^{a}	1.80±0.28^{b}	1.95±0.25^{b}	***	2.07±0.33	1.99±0.29	NS
%	-1.21	-4.75		4.11	-8.07	-8.07		1.32	-4.65	
72	2.16±0.32	2.10±0.28	NS	2.26±0.29^{a}	2.06±0.29^{b}	2.06±0.27^{b}	***	2.13±0.33	2.13±0.27	NS
%	4.60	1.55		8.27	5.38	5.38		4.01	2.01	
76	2.27±0.32	2.18±0.29	NS	2.340.28±^{a}	2.16±0.32^{b}	2.17±0.28^{b}	**	2.21±0.32	2.24±0.30	NS
%	10.03	5.77		11.96	5.33	5.74		8.32	7.24	
80	2.36±0.36	2.28±0.29	NS	2.46±0.28^{a}	2.37±0.31^{b}	2.37±0.31^{b}	**	2.27±0.34	2.37±0.31	NS
%	14.15	19.43		17.41	11.68	8.03		11.11	13.42	
84	2.45±0.36	2.36±0.30	NS	2.52±0.28^{a}	2.45±0.31^{b}	2.45±0.31^{b}	*	2.36±0.34	2.45±0.31	NS
%	18.80	14.39		20.97	15.40	13.82		15.66	17.35	

*Significant at $P<0.05$, ** Significant at $P<0.01$, *** Significant at $P<0.001$, NS: non-significant.
- Means with the same letter for each row (of each main factor) are not significantly different.

Table (4): Means ± standard deviations of egg number/ hen of Gimmizah and Golden Montazah strains during different intervals of age as affected by strain and the force molting programs

Strain	Gimmizah						Golden Montazah					
Feed treatment	Control		Zinc Oxide		Fasting		Control		Zinc Oxide		Fasting	
L/D / Age, wk	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d
60-64	4.8±0.3	5.1±0.3	5.1± 0.8	5.1±0.3	3.8±0.5	3.7±0.2	5.1±1.1	5.0±0.2	4.4±0.2	5.3±0.4	3.6±0.5	3.8±0.3
-68	9.5±1.7	9.4±0.7	13.9±10.4	12.8±0.3	11.6±0.6	14.3±0.4	9.6±1.9	8.6±0.1	12.1±0.3	14.1±1.0	11.8±2.9	14.2±3.9
-72	11.1±0.6	10.9±2.3	14.5± 1.0	14.5±0.5	13.6±0.4	15.2±0.3	12.4±0.6	10.3±0.4	14.2±0.4	12.5±0.7	15.0±0.2	12.3±0.4
-76	15.3±0.8	14.6±7.7	16.6± 2.8	13.9±0.4	14.4±0.1	14.3±0.2	11.5±1.2	11.4±1.1	14.4±0.6	10.8±0.2	13.0±0.2	12.5±0.7
-80	9.3±1.3	9.4±5.2	15.3±3.2	7.4±0.4	9.7±0.7	7.4±0.5	7.3±1.1	7.4±105	9.2±0.1	10.3±3.2	7.5±0.7	12.6±0.5
-84	7.0±1.4	8.6±4.4	10.4±0.5	5.8±0.1	6.6±0.1	6.1±0.3	5.4±0.6	5.4±0.6	6.6±0.3	8.5±4.5	6.8±0.1	10.0±0.7
60-84	56.9±7.1	57.8±20.	75.7±9.7	59.4±1.0	59.6±1.2	60.4±1.0	51.3±0.4	48.1±3.6	60.9±0.7	61.6±11.5	57.7±2.6	65.4±5.5

- L/D: Light per day.

Table (5): Means ± standard deviations of egg number/ hen during different intervals of age as affected by strain and the force molting programs

Main Factors	Strain		Sig.	Feed treatment			Sig.	Light treatment		Sig.
Age, wk	G	GM		Control	Zinc oxide	Fast		14 hr/d	8 hr/d	
60-64	4.60±0.72	4.53±0.78	NS	4.99±0.47[A]	4.97±0. 51[A]	3.73±0.32[B]	***	4.46±0.77	4.66±0.71	NS
-68	11.98±2.16	11.75±2.71	NS	9.28±1.08[B]	13.21±1.04[A]	12.96±1.30[A]	***	11.40±2.00	12.23±2.67	NS
-72	13.30±1.95	12.76±1.62	NS	11.16±1.24[B]	13.92±1.04[A]	14.01±1.30[A]	***	13.46±1.46[a]	12.60±2.01[b]	*
-76	14.82±2.68[a]	12.29±1.37[b]	*	13.20±3.60	13.91±2.44	13.55±0.93	NS	14.19±1.48	12.91±2.78	NS
-80	9.73±3.34	9.05±2.64	NS	8.32±2.39	10.96±3.86	9.29±2.33	NS	9.71±2.99	9.08±3.05	NS
-84	7.40±2.19	7.11±2.22	NS	6.59±2.26	7.82±2.55	7.35±1.68	NS	7.12±1.68	7.39±2.63	NS
60-84	61.73±9.79	57.48±7.50	NS	53.53±9.36[B]	64.40±9.04[A]	60.90±3.84[AB]	*	60.34±8.66	58.67±9.25	NS

*Significant at P<0.05, *** Significant at P<0.001, NS: non-significant.
- Means with the same letter for each row (of each main factor) are not significantly different.

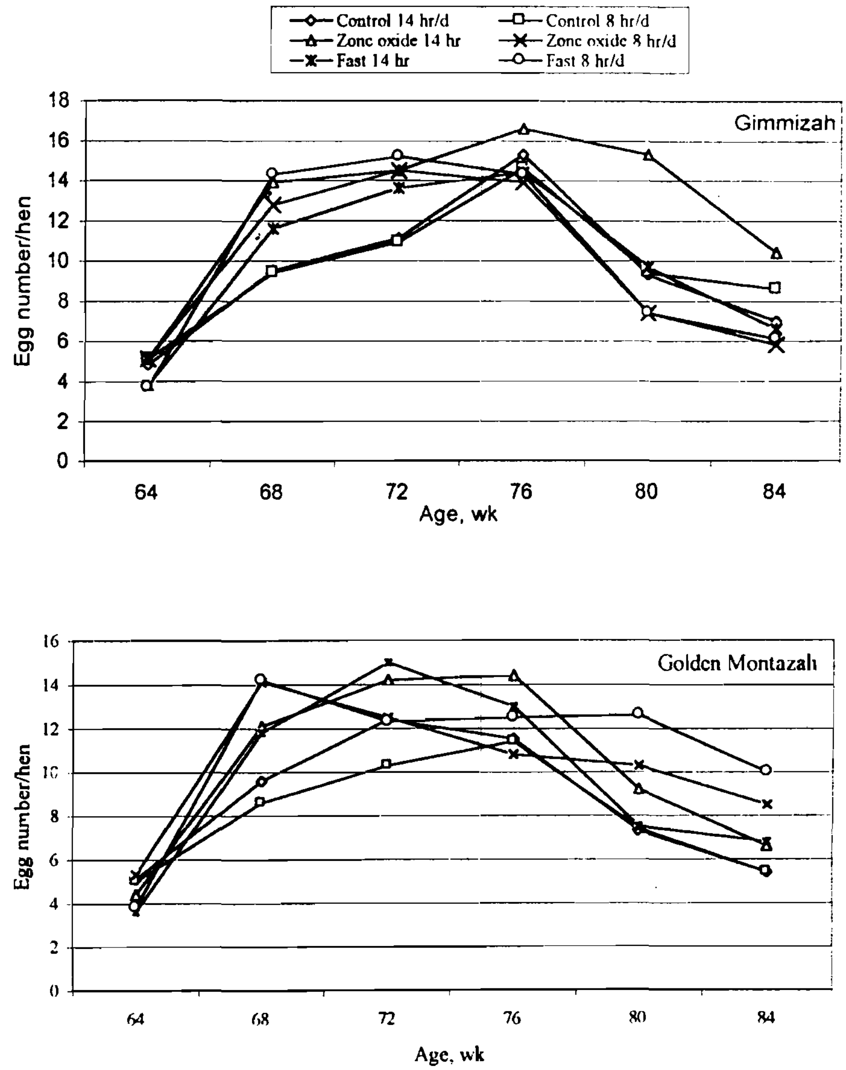

Figure (1): Egg number/hen of Gimmizah and Golden Montazah hens in which molt was induced using feed and light programs.

Tables 6 and 7 indicate FE during the force molting and postmolt periods. No significant difference between both G and GM strains with respect to FE in all periods studied except that during 68-72 weeks of age, the FE of G hens was significantly better than GM. The same results were reported by Hurwitz *et al.* (1998). Hens of control and ZO groups showed significantly decreasing of FE during molting period than the fasted ones. Both fast and ZO groups significantly (P<0.01) improved FE than those of control during 68-72 weeks of age, the ZO group had the best value of FE. Similar results were found by Berry and Brake (1987) and Abd El-Kader (1997) while opposite results were reported by Cerniglia *et al.* (1984) which limited feeding did not improve feed efficiency in any trial. On the other hand, no significant differences in FE were found as a response of L/D effect in the different periods studied. Andrews observed on FE during the whole period of the experiment *et al.* (1987) found opposite results, FE was improved by restricted lighting program. In general, no significant effects of the main factors studied were.

Results of egg quality traits, fertility and hatchability are presented in Tables 8 and 9. It was obvious that both S and T significantly (P<0.001 and P<0.01), respectively, affected EW. The G eggs were heavier than eggs produced by GM ones. Similar results were reached by Ghatas (1994), Afify *et al.* (2002) who found significant effects of strain on EW. Moreover, hens on both the fast and ZO treatments produced eggs significantly lighter than those of the control. Opposite results were reported by Berry and Brake (1987) and Hurwitz *et al.* (1998). In addition, Andrews *et al.* (1987) found that neither T nor L/D affected EW. On the other hand, restricted L/D to 8h decreased Hu value. Opposite to this result, Zimmermann *et al.* (1987) and Alodan and Mashaly (1999) found that induced molting using feed treatments significantly increased Hu. Age of hens significantly affected both. EW and shell thickness while it had no significant effect on Hu. The results reported herein were in agreement with those found by Doyon *et al.* (1986) and Afify *et al.* (2002), who reported that Hu decreased significantly as age of hen developed. On the other hand, both S and T were not affected SHT while 8 hr L/D significantly (P<0.001) improved the same trait. In contrast, Ali *et al.* (1998) reported that induced molting using feed treatments significantly improved SHT.

Results of fertility and hatchability presented in Table (9) Showed no significant effects of either strain or feed treatments on F or H while L/D significantly (P<0.01) affected F. Eggs produced by hens reseiving 14 hr L/D had higher average of F than those produced by hens reseived 8 hr L/D, (87.28% vs 77.66%). Similar results were reported by Ali *et al.* (1998) who found that F and H were approximately the same in the two strains while the feed treatments significantly increased both traits. On the other hand Awadin (1998) found highly significant effect of S and T, feed treatment improved the

two traits. The opposite was true as reported by and Soliman (2000) who found that both Gimmizah and Golen Montazah strains differed in their fertility and hatchability values.

Input-out put analysis, economical efficiency and relative economic efficiency are presented in Table (10) and Figures (1 and 2).

Table (6): Means ± standard deviations of feed efficiency (kg diet/kg egg mass) of Gimmizah and Golden Montazah strains according to the force molting programs

Strain	Gimmizah						Golden Montazah					
Feed treatment	Control		Zinc Oxide		Fasting		Control		Zinc Oxide		Fasting	
L/D / Age, wk	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d
60-64	10.0±0.5	7.7±0.5	8.3±1.5	10.0± 1.5	13.1±2.4	10.3±0.5	9.6±0.4	7.3±1.0	11.7±0.2	9.5±0.4	12.5±1.7	13.9±3.5
-68	4.5±0.4	4.0±0.0	12.8±0.3	3.4±0.2	3.5±0.5	2.5±0.3	4.6±0.2	3.8±0.0	4.4±0.1	2.9±0.3	3.7±0.7	4.2±1.3
-72	5.2±0.1	4.3±1.0	14.5±0.5	3.5± 0.2	3.9±0.2	3.1±0.0	3.8±0.0	4.6±0.0	3.7±0.1	3.9±0.2	4.2±0.4	5.2±0.2
-76	3.7±0.3	3.6±1.9	13.9±0.4	3.6± 0.2	3.7±0.0	3.4±0.1	4.0±0.4	4.1±0.5	3.5±0.3	4.4±0.0	3.5±0.4	3.9±0.4
-80	5.5±0.5	6.2±4.2	7.4±0.4	5.6±0.2	5.2±0.8	5.9±0.3	7.5±1.2	5.8±0.9	4.8±0.2	5.0±2.2	5.5±1.3	3.3±0.2
-84	7.9±1.0	6.9±4.1	5.8±0.1	8.5±0.3	3.1±0.6	7.9±0.0	9.4±0.5	8.5±0.6	7.4±0.7	6.2±3.3	6.7±1.4	4.7±0.4
60-84	5.4±0.3	4.8±1.9	59.4±1.0	4.8±0.4	4.9±0.2	4.2±0.1	5.5±0.4	5.2±0.4	4.8±0.2	4.6±0.4	4.5±0.3	4.1±0.6

-L/D: Light per day.

Table (7): Means ± standard deviations of feed efficiency (kg diet/kg egg mass) as affected by strain and the force molting programs

Main Factors	Strain		Sig.	Feed treatment			Sig.	Light treatment		Sig.
Age, wk	G	GM		Control	Zinc oxide	Fast		14 hr/d	8 hr/d	
60-64	9.82±2.08	10.73±2.84	NS	8.65±1.97^{B}	9.73±1.55^{B}	12.45±2.25^{A}	***	10.85±2.39	9.71±2.53	NS
-68	3.52±0.66	3.59±0.99	NS	4.16±0.94	3.56±0.62	3.49±0.90	***	3.91±1.01^{a}	3.52±0.59	NS
-72	3.29±0.78	4.12±0.56	*	4.46±0.66^{A}	3.68±0.25^{C}	3.06±0.82^{B}	***	4.04±0.59	4.10±0.79	NS
-76	3.53±0.65	3.89±0.43	NS	3.85±0.79	3.67±0.57	3.61±0.28	NS	3.58±0.38	3.83±0.70	NS
-80	5.24±1.66	5.31±1.59	NS	6.33±1.89	4.64±1.30	4.96±1.19	NS	5.28±1.46	5.27±1.76	NS
-84	7.37±1.77	7.14±1.96	NS	8.16±1.90	6.76±1.90	6.85±1.55	NS	7.40±1.54	7.11±2.15	NS
60-84	4.82±0.73	4.92±0.52	NS	5.23±0.81	4.74±0.46	4.65±0.41	NS	5.05±0.42	4.69±0.75	NS
Viability %	83.14	76.24	NS	77.08	79.99	81.99	NS	79.41	79.96	NS

*Significant at $P<0.05$, *** Significant at $P<0.001$, NS: non-significant.

- Means with the same letter for each row (of each main factor) are not significantly different.

Table (8): Means ± standard deviations of some egg quality traits, fertility and hatchability of Gimmizah and Golden Montazah strains according to the force molting programs

Strain	Gimmizah						Golden Montazah					
Feed treatment	Control		Zinc Oxide		Fasting		Control		Zinc Oxide		Fasting	
L/D / Age, wk	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d	14hr/d	8hr/d
Egg weight,	58.0±3.8	57.8±4.0	54.6±5.6	55.7±5.3	55.9±4.1	57.5±5.7	53.4±4.3	53.4±5.1	51.0±4.0	50.3±4.5	53.7±3.4	52.7±5.5
Haugh units	67.7±11.	64.2±8.1	68.2±8.4	63.5±11.9	66.2±8.9	67.8±8.1	62.6±12.0	63.0±15..2	69.6±10.0	60.4±13.4	66.2±14.2	67.3±12.1
Shell thickness,m	31.2±2.7	32.2±3.1	27.9±2.5	31.2±2.7	30.5±2.7	31.7±1.9	31.9±3.6	30.6±3.3	27.4±2.4	29.5±2.6	30.4±2.7	32.0±3.6
Fertility												
%	87.90	86.00	95.5	87.90	99.05	91.6	99.83	76.5	83.6	88.7	96.6	89.2
Adj.*	69.6±22.	68.0±15.	77.8±22.8	69.6±22.1	84.4±13.9	73.2±18.8	87.6±6.9	61.0±20.1	66.1±21.5	70.4±16.5	79.3±15.2	70.8±23.0
atchability												
%	79.90	79.40	75.10	79.90	75.00	55.60	76.30	56.20	53.10	71.10	82.70	70.40
Adj.	63.4±23.	63.0±14.	60.1±19.5	63.4±23.5	60.0±24.4	48.2±29.7	60.9±2104	48.6±35.3	46.8±25.8	57.5±22.6	65.4±22.0	57.0±18.1

[1] Arcsine values.

- L/D: Light per day.

Table (9): Means ± standard deviations of some egg quality traits at different ages, and fertility and hatchability as affected by strain and the force molting programs used

Main Factors	Strain		Sig.	Feed treatment			Sig.	Light treatment		Sig.	Age of hen, wk			Sig
Trait	G	GM		Control	Zinc oxide	Fast		14 hr/d	8 hr/d		68	76	84	
Egg weight,g	56.6±4.8[A]	52.5±4.6[B]	***	55.2±5.2[A]	54.3±5.0[B]	53.3±5.1[C]	**	54.2±4 7	54.4±5.6	NS	55.9±4.8[A]	52 7±5 3[C]	54.3±4.9[B]	***
Haugh units	66 2±9 6	65 4±13 0	NS	66.0±12.0	64.4±13.7	53.3±5.1	NS	67.0±11.4[A]	64.3±11.8[B]	*	64.4±11.8	66.0±11 2	66.7±11 8	NS
Shell thickness, (μm)	30 3±3 2	30.2±3.4	NS	30.5±3.4	30.3±3.4	29 9±3.2	NS	29.7±3.2[B]	30 8±3.4[A]	***	31.5±3 2[A]	28 1±2 7[B]	31 1±3 0[A]	***
Fertility														
%	83 1	83.1		82.2	78.4	87.4		87 3	78 0					
Adj.[1]	72 2±19.8	72.5±19.2	NS	71.6±19.2	68.6±20.2	76.9±18.4	NS	77.5±18.9[A]	67.2±18.7[B]	**	-	-	-	-
Hatchability														
%	81 5	76.7		82.4	80.0	74 8		76.9	81.2					
Adj.	72.3±26 2	68.2±27 4	NS	73.3±26.6	70.9±24.5	66.4±29.4	NS	68.0±26.7	72.5±27.0	NS	-	-	-	-

[1] Arcsine values, *Significant at P<0.05, ** Significant at P<0.01, *** Significant at P<0.001, NS: non-significant.
- Means with the same letter for each column (of each main factor) are not significantly different.

Table (10): Input-out put analysis and economical efficiency of egg production of Gimmizah and Golden Montazah strains through postmolt phases according to the force molting programs

Strain	Gimmizah						Golden Montaza					
Light treatment	8 hr L/D			14 hr L/D			8 hr L/D			14 hr L/D		
Item / Feed treatment	Control	ZO	Fast	Control	ZO	Fast	Control	ZO	Fast	Control	ZO	Fast
Feed consumption (0-24 wk). kg (a)	16.110	16.327	15.801	16.705	19.723	16.628	15.307	16.119	18.621	16.149	16.596	16.460
Price of kg feed, LE (b)	0.810	0.810	0.810	0.810	0.810	0.810	0.810	0.810	0.810	0.810	0.810	0.810
Total cost of feed, LE (axb= c)	13.049	13.225	12.799	13.831	15.975	13.493	12.399	13.056	15.083	13.081	13.442	13.333
Egg mass, g (d)	7238.98	6861.9	7504.8	6179.09	8305.21	6762.67	5907.98	7234.59	8091.17	5889.20	6871.25	6844.85
Price of kg egg . LE (e)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total revenue, LE (d x e)	36.195	34.310	37.527	30.895	41.526	33.813	29.540	36.173	40.456	29.446	34.356	34.224
Net revenue, LE (f-c= g)	23.146	21.085	24.725	17.864	25.55	20.32	17.141	23.117	25.373	16.365	20.914	20.391
E.E. (g/c)	1.774	1.594	1.932	1.283	1.599	1.506	1.382	1.771	1.682	1.251	1.556	1.668
REE	100	89.85	108.91	100	124.65	117.38	100	128.15	121.72	100	124.38	133.33

E.E.:Economic efficiency, REE: Relative economic efficiency.
ZO: Zinc oxide.

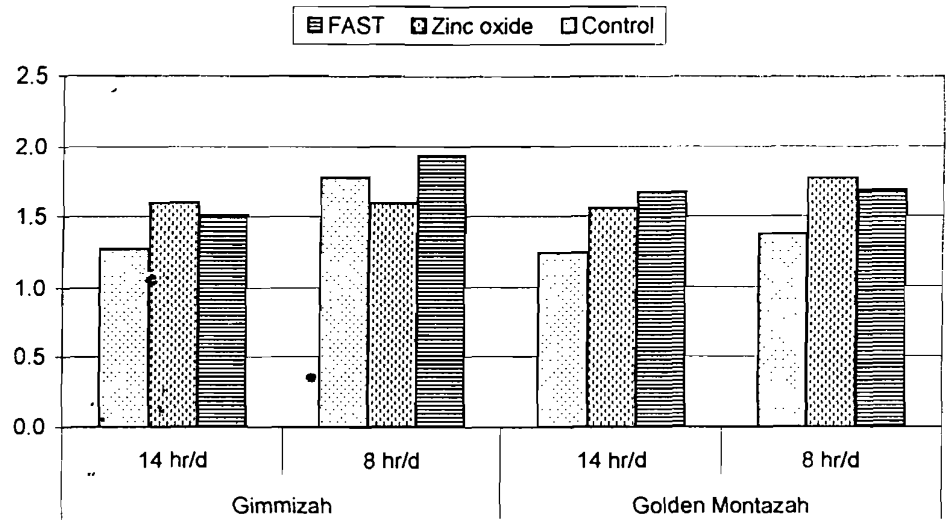

Fig. (2) : Economic efficiency of Gimmizah and Golden Montazah hens in which molt was induced using feed and light programs

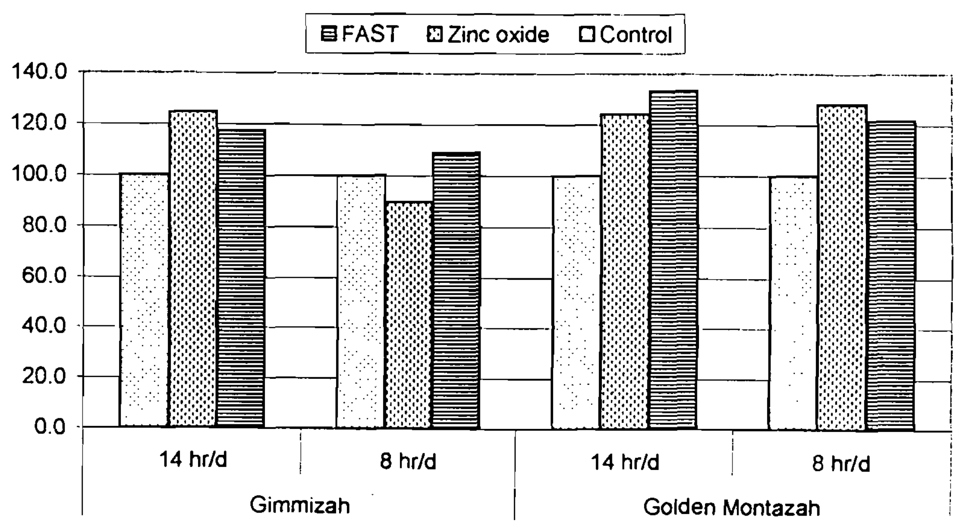

Fig. (3) : Relative economic efficiency of Gimmizah and Golden Montazah hens in which molt was induced using feed and light programs

It was indicated that induced molting realized REE in all factors studied compared with control group except that in G hens. The REE of G hens which received 8hr L/D and fed on ZO was less than control ones while REE of fast group was higher (108.91%) than that of control one. The G hens which fed on ZO or fasted and received 14 hr L/D had higher REE (124.65% and 117.38 %, respectively), than control group. With respect to REE of GM hens which fed on ZO or fasted and received 8 hr L/D had higher REE (128.15%, 121.72%) than that of control one. As for GM hens on 14 hr L/D and fed ZO or fast were also higher (124.38% and 133.33%, respectively), than control.

However, it could be concluded that most of the traits studied were improved due to feeding and lighting programs used in this experiment.

REFERENCES

Abd-El-Baky M. (1998). Studies on some economical traits in chickens. Ph.D. thesis, Mansoura Univ., Faculty of Agric.. Mansoura, Egypt.

Abd El-Kader, A.H. (1997). Effect of force molting on laying performance, egg quality and hatching results of some local strains. Ph.D.Thesis, Zagazig Univ., Egypt.

Afify, Yousria K.; Nazla Y. Abou-El-Ella; Mervat A. Breikaa and Magda M. Balat (2002). The effect of using a feeding program during the rearing period on some economic traits in two of developed strains of chicken. J. Agric. Sci. Mansoura Univ., 27(4): (In press).

Ali, Mervat A.; El-Samra H.Abo-Egla; A.M. El-Wardany; M.A. Ibrahim and M.M. Khalifah (1998). Effect of force molting method and strain on some molting traits. 1. Egg production, egg quality, internal organs, fertility and hatchability. J. Agric. Sci. Mansoura Univ., 23(12): 5923-5938.

Ali, Mervat A.; A.M. El-Wardany; El-Samra H.Abo-Egla; M.A. Ibrahim and M.M. Khalifah (1999). Effect of force molting method and strain on some molting traits. 2. Body weight change, hen-day egg production, egg mass, feed conversion and blood constituents. J. Agric. Sci. Mansoura Univ., 24(3): 1069-1083.

Alodan, M.A. and M.M. Mashaly (1999). Effect of induced molting in laying hens on production and immune parameters. Poult Sci., 78(2):171-177.

Andrews, D.K.; W.D. Berry and J. Brake (1987). Effect of lighting program and nutrition on reproductive performance of molted Single Comb White Leghorn hens. Poult Sci., 66:1298-1305.

Attalah, A.A.; M.A. Kicks; S.A. Riad and F.R. Mohamed (1992). The production performance of laying hens subjected to different methods of force molting. J.Agic. Sci., 17(6):2080-2089.

Awadin, N.B. (1998). Some physical studies in poultry "Effect of force molting on the laying performance of three local layer breeds". M.Sc. Thesis. Mansoura Univ. Egypt.

Berry, W.D. and J. Brake (1985). Comparison of parameters associated with molt induced by fasting, zinc, and low dietary sodium in caged layers.

Poult. Sci., 64:2027-2036.

Berry, W.D. and J. Brake (1987). Postmolt performance of laying hens molted by high dietary zinc, low dietary sodium, fasting: egg production and eggshell quality. Poult. Sci., 66:218-226.

Brake, J.T. and J.B. Carey (1983). Induced molting of commercial layers. North Carolina Agricultural Extension Service Poultry Science and Technical Guide No. 10. North Carolina Agricultural Extension Service, Raleigh, NC. (Cited by Ruszler, 1998).

Cerniglia GJ; A.C. Goodling; JA. Hebert (1984). Production performance of white Leghorn layers limited fed.Poult. Sci., 63 (6):1105-1109.

Doyon, G.; M. Bernier-Cardou; R.M.G. Hamilton; F. Castaigne and C.J. Randall (1986). Egg quality. 2- Albumen quality of eggs from five commercial strains of White Leghorn during one year of lay. Poult. Sci., 65:63-66.

Duncan, D.B. (1955). Multiple range and multiple F tests. Biometrics, 11: 1-42.

Ghatas, M.S. (1994). Studies on second year performance of force molted hens in some local chicken breeds. M.Sc. Thesis, Minia Univ.

Hassan, A.H. (1996). Effect of fiorce molting on laying performance, egg quality and hatching results of some local strains. Ph.D. thesis, Zagazig Univ., Faculty of Agric., Zagazig, Egypt.

Hurwitz, S.; E.Wax; Y. Nisenbaum and I. Plavnik (1995). Responses of laying hens to forced molt procedures of variable length with or without light restriction. Poult. Sci., 74:1745-1753.

Hurwitz, S.; E.Wax; Y. Nisenbaum; M.Ben-Moshe and I. Plavnik (1998). The response of laying hens to induced molt as affected by strain and age. Poult. Sci., 77:22-31.

Mohammed, Kh. A. (1992). Force molting induced by fasting or high zinc supplemented diet and its effect on the subsequent performance of RIR hens. Minia J. Agric. Res.& Dev. Nol. 14(3). (September, 1992).

Ruszler, Paul L. (1998). Health and husbandry considerations of induced molting. Poult. Sci., 77:1789-1793.

SAS Institute, (1989). SAS User's Guide, Statistics. Version 5. SAS Institute Inc., Cary, NC.

Soliman, F.N. (2000). Effect of short pre-incubation storage periods on egg weight loss, embryonic development, chicks weight, fertility and hatchability in two local chicken strains. Egypt. Poult. Sci., 20 (1):157-170.

Stadelman, W.J. and Owen J. Catterill (1986). EGG SCIENCE AND TECHNOLOGY, Third Edition. PSS,58. AVI Publishing Company. INC. Westport, Connecticut.

Zeelen, H.H.M., Jr. (1975). Technical and economic results from force molting of laying hens. World's Poult. Sci., J. 31:57-67.

Zimmermann, N.G.; D.K. Andrews and J. McGinnis (1987). Comparisons of several induced molting methods on subsequent performance of Single Comb White Leghorn hens. Poult. Sci., 66:408-417.

J. Agric. Sci. Mansoura Univ., 27 (7), July, 2002

إستجابة الدجاج البياض للقلش الإجبارى الناتج عن تأثير السلالة وبرنامجى تغذية وإضاءة

مرفت على بريقع – نظلة يوسف أبو العلا – يسرية كمال عفيفى – ماجدة مصطفى بلاط
معهد بحوث الإنتاج الحيوانى والدواجن –مركز البحوث الزراعية –وزارة الزراعة

الهدف من هذه التجربة دراسة الأداء الإنتاجى لدجاج الجميزة والمنتزه الذهبى الذى استخدم معه القلش الإجبارى باستخدام التصويم لتحقيق خفض وزن الجسم بنسبة حوالى ٣٣,٠٤% (خلال ١٤ يوم) أو إضافة مستوى عالى من أكسيد الزنك (٢٠٠٠٠ وحدة دولية) لمدة ٧ أيام. وقد تم تقسيم مجموعات التغذية إلى برنامجى إضاءة حيث تعرضت مجموعة البرنامج الأول إلى ١٤ ساعة إضاءة/يوم بينما تعرضت طيور المجموعة الثانية إلى ٨ ساعات إضاءة خلال فترة المعاملات الغذائية حيث تم توفير إضاءة مستمرة لمدة أسبوع لتحقيق أقصى تنشيط قبل بدء المعاملات وقد استمرت معاملة الإضاءة حتى ٤٢ يوم ثم تم زيادة نصف ساعة يوميا حتى بلغت الإضاءة ١٤ ساعة يوميا وتم الإحتفاظ بمجموعة للمقارنة. وقد تم تقديم عليقة بياض تحتوى ١٦,٨٤ % بروتين وتم تقديم العليقة والمياه باستمرار لجميع المعاملات. وقد أوضحت النتائج ما يلى:

١- كانت نسبة الفقد فى دجاجات الجميزة أكثر بدرجة عالية المعنوية عن دجاجات المنتزه الذهبى عند عمر ٦٣ أسبوع. وقد بلغ الفقد فى وزن الجسم فى مجموعة التصويم حوالى ٣٣% وفى المجموعة المغذاه على مستوى عالى من الزنك ٢٠ % من وزن الجسم عند بداية التجربة خلال أسبوعين من بدء التجربة، وقد انخفضت أوزان مجموعتى المعاملات الغذائية معنويا عن مجموعة المقارنة خلال مرحلة ما بعد القلش ، بينما لم يؤثر برنامج الإضاءة معنويا على هذه الصفة عند جميع الأعمار.

٢- تفوقت سلالة الجميزة معنويا فى عدد البيض الناتج عند سلالة المنتزه الذهبى خلال ٧٢-٧٦ أسبوع من العمر. وكان إنتاج البيض لمجموعة الصيام أقل بدرجة معنوية عن كل من مجموعتى المقارنة وتلك المغذاة على الزنك خلال مرحلة القلش بينما تفوقت كل من مجموعتى الصيام والزنك معنويا عن مجموعة المقارنة خلال المرحلتين ٦٤-٦٨ ، ٦٨-٧٢ أسبوع من العمر. وقد زاد عدد البيض فى مجموعة الطيور المعرضة لعدد ١٤ ساعة إضاءة معنويا عن المجموعة الأخرى فقط عند ٦٨-٧٢ أسبوع من العمر.

٣- تفوقت كفاءة العلف لطيور المنتزه الذهبى بدرجة معنوية خلال ٦٨-٧٢ أسبوع من عمر الطيور، كما تفوقت كفاءة العلف لطيور مجموعة المقارنة والمجموعة المغذاة على الزنك معنويا عن مجموعة الصيام خلال مرحلة القلش بينما وجدت اختلافات معنوية بين الثلاث مجاميع خلال ٦٨-٧٢ أسبوع فقط. و لم يؤثر برنامج الإضاءة معنويا على هذه الصفة.

٤- كان متوسط وزن البيض الناتج عن دجاجات الجميزة أكبر معنويا عن بيض المنتزه الذهبى كما أن البيض الناتج عن دجاجات الكنترول كان أثقل معنويا عنه فى البيض الناتج عن دجاج المجموعتين التجريبيتين.

٥ – أدى خفض فترة إضاءة اليومية إلى ٨ ساعات إلى خفض قيمة وحدات هيو بينما أدى ذلك إلى تحسين فى سمك القشرة. كما أن عمر الدجاجات كان له تأثيرا عالى المعنوية على كل من وزن البيضة وسمك القشرة.

٦- لم تؤثر كل من السلالة والمعاملات الغذائية معنويا على كل من نسبتى الخصوبة و الفقس. وبينما لم يؤثر برنامج الإضاءة على نسبة الفقس فقد أدى استخدام خفض فترة الإضاءة إلى خفض فى خصوبة البيض.

٧- أدى استخدام برنامج القلش الإجبارى إلى زيادة الكفاءة الاقتصادية النسبية فى كلا السلالتين ما عدا دجاجات الجميزة التى تم تربيتها فى فترة إضاءة ٨ ساعات/يوم وغذيت على عليقه الزنك حيث انخفض العائد الاقتصادى النسبى لها عن مجموعة الكنترول.

ويمكن القول بأن برنامجى التغذية والإضاءة المستخدمة فى هذه الدراسة لدفع القلش إجباريا فى سلالتى الجميزة والمنتزه الذهبى قد أدى إلى تحسين معظم الصفات التى تم دراستها خلال فترة ما بعد القلش.