EFFECT OF LIGHTING AND MOVING AGE ON PERFORMANCE OF LEGHORN PULLETS[1]

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Primary Audience: Egg Producers, Layer Flock Supervisors, Production Managers, Management Consultants, Poultry Extension Specialists

SUMMARY

The age at which sexual maturity occurs in layers can affect flock performance, egg size, and flock income. In this study, Hy-Line W-36 pullets were moved to the lay house and light stimulated at 126, 136 or 146 days of age. Egg production, egg size and egg shell quality were measured for twelve 28-day periods starting at 126 days of age. The age at 50% production was delayed significantly by the two latter lighting ages, but no statistically significant differences could be shown in eggs per hen housed, average egg weight, egg mass per hen, or egg value per hen housed. Eggs per hen housed, percent hen-day egg production and egg mass per hen were negatively correlated with age at 50% egg production. These results suggest that light stimulation at 126 days of age was the most profitable alternative of those studied with this strain.

Keywords: Lighting age, sexual maturity, performance
1992 J. Appl. Poultry Res. 1:291-295

DESCRIPTION OF PROBLEM

Different genetic stocks mature at different ages under the same photoschedule [1, 2, 3]. Poultry breeders have been selecting for earlier sexual maturity [4], and it appears that the optimum age to light stimulate pullets has been advanced by several days during the last ten years. Previous research [5] indicates that the age at sexual maturity can influence egg size and the number of eggs produced in the subsequent laying period. Because these two factors have an important impact on flock profitability, it is important to manage flocks so that the optimum age at sexual maturity is achieved. This study was undertaken to inves-

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tigate the effect of lighting on commercial pullets at different ages.

Materials and Methods

Hy-Line W-36 pullets hatched on July 2, 1986 were reared in an open-type house on the University of Florida Poultry Research Farm. Chicks were brooded under infra-red heat lamps in a litter floor pen. They were given naturally decreasing light until 126 days (18 weeks) of age. All pullets were weighed individually and 160 birds were selected randomly and transferred to an open-type cage laying house at the same location. The pullets were assigned randomly to 8 replicate groups with 2 birds per 12" x 18" cage (10 cages/replicate). The cages used were in a full stair-step configuration with half of the birds in each replicate on each level. When the remaining pullets reached 136 or 146 days of age, all were again weighed, and at each age 160 were transferred and housed as described previously.

Cages were equipped with a flowing water trough at the front of the cage and a feed trough with a wire insert to reduce wastage. Lighting was provided for 15 hours per day in the laying house, from 0430 hours until 1930 hours. All pullets were given a pre-lay ration containing two percent calcium at 126 days of age. Birds in each treatment were transferred to a laying diet when they reached 5% egg production. The feeding program during the laying phase was based on feed consumption and followed University of Florida recommendations [6]. Egg value was calculated based on the following egg values: small $.35/doz., medium $.53/doz., large $.60/doz., and extra large $.63/doz.

The experiment was continued for twelve 28-day periods from 18 to 66 weeks of age. Egg production and mortality were recorded daily and summarized by periods. Age at 50% production was used as a measure of sexual maturity. The eggs collected on one day each week were used to determine egg weight and egg size grade, except during periods 11 and 12 when these measurements were taken monthly. Once each month egg specific gravity was measured on the same egg samples.

Results and Discussion

Delaying the housing and lighting of pullets by 10 or 20 days delayed sexual maturity significantly, although lighting 20 days later delayed maturity only by an average of 5.3 days (Table 1). As expected, pullets that were exposed to lighting at 126 days of age peaked in production first (Figure 1) and began to decline slightly before those exposed to lighting at 136 or 146 days of age. When pullets reached 66 weeks of age, there were no significant differences in eggs per hen housed or percent hen-day egg production. Correlation of eggs per hen housed with age at light stimulation revealed a correlation coefficient of $r = -.394$ which approached statistical significance ($P = .056$); a parallel analysis of percent hen-day egg production showed a similar result ($r = -0.375$, $P = .071$). When these traits were compared with age at 50% production, a higher correlation coefficient was obtained (eggs per hen housed: $r = -.535$, $P = .007$; percent hen-day egg production: $r = -.525$, $P = .008$). The significant negative linear relationship between the age at which birds were light stimulated and the number of eggs produced suggests that as the days to 50% egg production increased, the number of eggs per hen housed decreased.

TABLE 1. Effect of age lighted on performance of Hy-Line W-36 pullets from 18 to 66 weeks of age

AGE LIGHTED (Days)	AGE AT 50% LAY (Days)	EGGS PER HEN HOUSED (No.)	HEN DAY PRODUCTION (%)	MEAN EGG WEIGHT (g)	EGG MASS PER HEN (kg)	EGG VALUE PER HEN HOUSED ($)
126	161.3[b]	229.8	71.9	59.4	14.34	11.25
136	164.4[a]	227.2	71.1	59.6	14.26	11.06
146	166.6[a]	222.7	69.8	59.6	13.98	10.65
F Ratio	10.21	2.01	1.68	0.29	1.14	2.25
Probability	0.001	0.16	0.21	-	0.34	0.13

[a,b]Means with different superscripts are significantly different at $P < .05$ using Duncan's multiple range test.

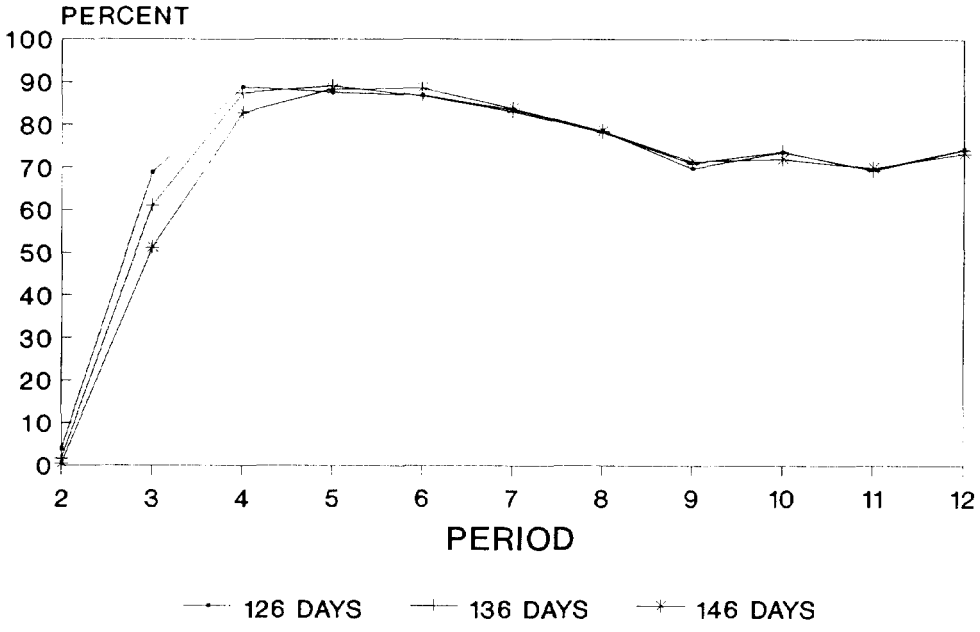

FIGURE 1. Effect of age lighted on hen-day egg production of Hy-Line W-36 pullets from 18 to 66 weeks of age

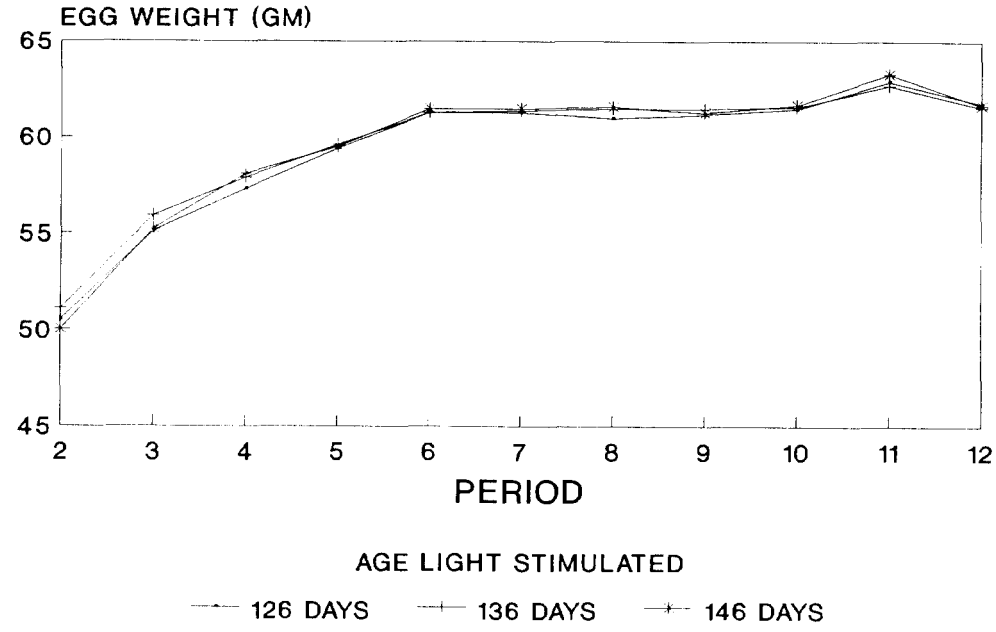

FIGURE 2. Effect of age lighted on mean egg weight of Hy-Line W-36 pullets from 18 to 66 weeks of age

TABLE 2. Effect of age lighted on egg size grade of Hy-Line W-36 pullets from 18 to 66 weeks of age

AGE LIGHTED (Days)	SMALL (%)	MEDIUM (%)	LARGE (%)	EXTRA LARGE(%)
126	3.9[a]	30.2	46.9	19.0
136	2.3[b]	28.9	48.9	19.9
146	2.6[b]	28.6	45.7	23.1
F Ratio	5.29	0.5	1.5	1.5
Probability	.01	-	0.25	0.25

[a,b]Means with different superscripts are significantly different at P < .05 using Duncan's multiple range test.

The mean egg weight and the egg mass (egg weight x egg number) were not influenced significantly by the date at which birds were housed (Table 1 and Figure 2). Mean egg weight was not correlated significantly with either age of light stimulation or age at 50% egg production. A significant correlation was found between egg mass and age at 50% egg production (r = -.468, P = .021). The latter result was clearly due to differences in the number of eggs produced rather than egg weight, because egg weight was not different between treatments.

Lighting pullets at 136 or 146 days of age resulted in a significant reduction in the percent of small eggs (Table 2) but no significant improvement in egg value per hen housed (Table 1). The economic interpretation of these results differs with different egg prices or different price spread between egg sizes.

Our results vary from those of Bell and Kuney [7], who found that one commercial strain produced greater egg value per hen housed when lighted at 22 weeks of age, while a second strain produced maximum egg value when light stimulation occurred at 18 weeks of age. In both of these studies, moving age was confounded with age of light stimulation due to the limitation of facilities. We expected the pullets lighted at 136 and 146 days of age to peak at a later age, but to maintain egg production at a slightly higher rate than the group exposed to light earlier, but this did not occur (Figure 1).

Body weight was not affected by age at which light stimulation occurred (Table 3). The hens were 245 g (.54 lb.) lighter at 66 weeks of age than the weight recommended in the Hy-Line management guide. This was probably a result of hot weather experienced by these hens during the final five months of the experiment. Specific gravity of eggs was significantly lower for pullets lighted at 136 days of age (Table 3), but this was a very small difference and is not judged meaningful from a practical standpoint.

Liveability did not differ significantly between treatments and was not correlated with either age at which light stimulation occurred, or age at 50% lay.

Interpretation of feed consumption records suggested errors were made in recording or calculating the values and, as a result, these data were not included in this report.

TABLE 3. Effects of age lighted on body weight and egg specific gravity of Hy-Line W-36 pullets from 18 to 66 weeks of age

AGE LIGHTED (Days)	BODY WEIGHT AT 30 WEEKS (g)	BODY WEIGHT AT 66 WEEKS (g)	MEAN SPECIFIC GRAVITY x 1000	LIVEABILITY HOUSING TO 66 WEEKS (%)
126	1539.9	1631.5	82.24[a]	93.1
136	1558.5	1623.8	81.11[b]	90.6
146	1567.4	1625.3	81.97[a]	88.8
F Ratio	1.80	0.08	4.86	1.10
Probability	0.17	-	0.02	0.35

[a,b]Means with different superscripts are significantly different at P < .05 using Duncan's multiple range test.

CONCLUSIONS AND APPLICATIONS

1. No advantage was found for delay of light stimulation beyond 18 weeks of age with the Hy-Line W-36 strain of commercial Leghorns.
2. Earlier lighting and moving resulted in the production of more small eggs, but the value of eggs produced to 66 weeks of age did not differ with lighting treatment.
3. Egg production and egg value were correlated negatively with age at which light stimulation occurred, and with age at 50% egg production, suggesting that earlier light stimulation was more profitable with regard to these variables with the conditions used in this study.

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