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"THROUGH RESEARCH"

VARYING THE AGE OF MOVING AND LIGHTING SINGLE COMB WHITE LEGHORN LAYING HENS

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In 1981, an experiment conducted at the Moreno layer research facility in Riverside County compared the adult performance resulting from initiating light increases and layer feed at three different ages in two strains of White Leghorn pullets. The pullets used in this experiment were hatched in August and raised on naturally decreasing day lengths from eight weeks on. A light increase of approximately seven hours per day was provided at 18, 20 or 22 weeks of age.

The experiment demonstrated significant differences in performance between the treatments and different responses to identical treatments between strains. (Progress in Poultry No. 23, May 1982)

The following experiment was designed to evaluate the advantages of various starting ages with a February hatched flock using three strains of White Leghorn pullets.

EXPERIMENTAL PROCEDURE

Location: University of California, Moreno Ranch, Riverside County.

Housing: California open-type with curtains and hot weather foggers. Three hens per 16" wide by 12" deep cage. Cages placed stair-step and back to back.

Feeding: Ad libitum hand feeding, front feeder.

Watering: One Swish cup for two cages, in partition.

Duration of Experiment: February 3, 1982 to June 7, 1983.

Stock: Three commercial White Leghorn strains (A,B,C) hatched February 3, 1982.

Experimental Design: Completely randomized, 5 replicates of 12 hens each, 4 treatments (2X2 factorial).

Treatments: Light stimulation was initiated at 18, 20, and 22 weeks of age. One treatment was moved at 18 weeks and light stimulated at 20 weeks (18/20).

All pullets were reared in an open-type cage rearing house during a period of increasing day lengths. The artificial lighting program during the growing period was a "step-down" program with approximately 14 1/2 hours at the time of sexual stimulation.

At 18 weeks of age, one-half of the pullets were moved approximately ten miles and placed in the laying house. Half of them were placed in laying cages and immediately given a 17 hours day length and a 17% protein layer diet (Treatment 18). The other half of the birds moved at 18 weeks were set aside and held on a pullet developer ration without artificial light until they were 20 weeks old and then placed in their laying cages (Treatment 18/20).

The second half were moved from the grow house to the laying house at 20 weeks of age. Half of these were placed in their laying cages and given 17 hours of light and a 17% protein laying ration (Treatment 20). The other half were held for two additional weeks on a pullet developer ration without artificial light. At 22 weeks of age, they were placed in their laying cages and given 17 hours of light and a 17% protein laying ration (Treatment 22).

The light increase at sexual stimulation was approximately 2 1/2 hours per day.

TABLES OF RESULTS

TABLE 1. Egg production (percent hen-day)[1/]

4-Week	Treatment				Strain		
Period	18[2]	18/20	20	22	A	B	C
1	27.8a	22.8b	27.0ab	22.7b	21.4z	23.2z	30.6y
2	82.2	78.8	81.8	80.0	80.5	80.1	81.5
3	86.7	84.8	88.2	87.0	87.2	87.4	85.3
4	84.6	84.0	85.0	84.0	82.1z	85.9y	85.2y
5	85.9	86.1	85.6	86.4	84.5	87.7	85.9
6	84.1	84.1	81.8	82.3	82.2	85.0	82.0
7	82.0	83.2	82.3	82.7	82.0z	85.9y	79.8z
8	79.7	82.1	78.8	80.6	79.5z	83.7y	77.7z
9	70.7	74.9	71.5	72.7	70.4z	75.5y	71.5yz
10	74.9	77.8	74.6	75.3	73.4z	80.2y	73.3z
11	73.0	77.1	74.5	76.6	74.8yz	78.8y	72.3z
12	70.9	75.6	73.9	75.7	74.4yz	76.6y	71.0z

1/ Means in any row (within treatments or strains) with different letters are significantly different ($P<0.05$)

2/ Age at lighting

TABLE 2. Egg weight (grams/egg)[1/]

4-Week	Treatment				Strain		
Period	18[2]	18/20	20	22	A	B	C
1	49.0	49.1	48.7	49.1	48.7	49.3	48.9
2	51.1	51.5	51.1	51.7	51.3	51.7	51.1
3	54.6	55.3	54.5	54.9	55.0yz	55.2y	54.2z
4	56.8	57.5	56.4	56.7	57.1y	57.5y	55.9z
5	59.0	59.5	58.8	59.2	59.3y	59.8y	58.3z
6	61.3	61.9	60.9	61.5	61.6y	61.9y	60.7z
7	63.1	63.3	62.2	63.2	62.9yz	63.4y	62.4z
8	64.0	64.1	63.2	64.0	63.7	64.2	63.6
9	64.8a	64.9a	63.7b	64.1ab	64.5	64.5	64.1
10	65.2a	65.3a	63.9b	64.9ab	65.0	65.0	64.4
11	65.1ab	65.7a	64.5b	65.7a	65.4	65.4	65.0
12	65.4	65.9	64.9	66.0	65.8	65.4	65.5

1/ Means in any row (within treatments or strains) with different letters are significantly different (P<0.05)

2/ Age at lighting

TABLE 3. Feed Consumption (pounds per hen per day)[1/]

4-Week	Treatment				Strain		
Period	18[2]	18/20	20	22	A	B	C
1	.197a	.195a	.196a	.170b	.187	.189	.193
2	.217a	.211b	.210b	.212b	.213	.213	.212
3	.232	.232	.233	.232	.231	.235	.230
4	.235	.233	.234	.236	.232	.242	.230
5	.256	.260	.252	.254	.252	.260	.255
6	.273	.274	.268	.269	.269	.275	.269
7	.276	.279	.276	.269	.270z	.281y	.273yz
8	.273	.273	.271	.272	.270	.277	.269
9	.260	.262	.262	.262	.254z	.266y	.264y
10	.273	.268	.268	.265	.263z	.280y	.264z
11	.272	.268	.266	.267	.265z	.275y	.266z
12	.258	.262	.256	.258	.257	.263	.256

1/ Means in any row (within treatments or strains) with different letters are significantly different (P<0.05)

2/ Age at lighting

TABLE 4. Feed conversion (pounds per dozen eggs)[1/]

4-Week	Treatment				Strain		
Period	18[2]	18/20	20	22	A	B	C
1	9.05	11.80	9.60	10.00	11.74y	10.52y	8.09z
2	3.18	3.23	3.09	3.18	3.19	3.20	3.13
3	3.22	3.29	3.18	3.21	3.19	3.24	3.25
4	3.35	3.33	3.31	3.37	3.40	3.38	3.24
5	3.59	3.65	3.54	3.54	3.61	3.56	3.57
6	3.90	3.92	3.94	3.94	3.94	3.90	3.94
7	4.05	4.03	4.03	3.91	3.97z	3.93z	4.12y
8	4.12	4.00	4.13	4.06	4.09yz	3.98z	4.17y
9	4.43	4.21	4.42	4.34	4.35	4.26	4.44
10	4.40	4.16	4.34	4.35	4.36	4.21	4.37
11	4.52a	4.19b	4.33ab	4.19b	4.28	4.21	4.44
12	4.41a	4.18ab	4.19ab	4.10b	4.16	4.15	4.35

1/ Means in any row (within treatments or strains) with different letters are significantly different (P<0.05)

2/ Age at lighting

TABLE 5. Mortality (%)[1/]

4-Week	Treatment				Strain		
Period	18[2]	18/20	20	22	A	B	C
1	1.11	1.11	-0-	-0-	-0-	.83	.83
2	-0-	1.11	2.22	1.11	-0-z	2.50y	.83 yz
3	-0-	2.78	.56	1.11	1.67	.83	.83
4	2.22	1.11	.56	1.11	.83	2.08	.83
5	-0-	-0-	-0-	.56	-0-	.42	-0-
6	.56	.56	.56	.56	.42	.83	.42
7	.56	-0-	1.11	.56	-0-	.83	.83
8	-0-	-0-	-0-	-0-	-0-	-0-	-0-
9	2.22	-0-	.56	.56	.83	1.25	.42
10	-0-	-0-	1.11	-0-	.42	.42	-0-
11	-0-	-0-	-0-	-0-	-0-	-0-	-0-
12	.56ab	2.22a	.56ab	-0-b	1.25	.83	.42

1/ Means in any row (within treatments or strains) with different letters are significantly different (P<0.05)

2/ Age at lighting

TABLE 6. Daily egg mass (grams per hen per day)[1/]

4-Week	Treatment				Strain		
Period	18[2]	18/20	20	22	A	B	C
1	13.6	11.2	13.2	11.2	10.5	11.4	14.9
2	42.0	40.6	41.8	41.4	41.3	41.4	41.6
3	47.3	46.9	48.0	47.8	48.0yz	48.3y	46.2z
4	48.0	48.3	48.0	47.6	46.9z	49.3y	47.7yz
5	50.6	51.2	50.4	51.2	50.1z	52.4y	50.1z
6	51.5	52.1	49.8	50.7	50.6yz	52.6y	49.8z
7	51.7	52.6	51.2	52.3	51.6z	54.5y	49.8z
8	51.0	52.6	49.7	51.6	50.6z	53.7y	49.4z
9	45.8	48.6	45.5	46.7	45.5z	48.7y	45.8z
10	48.8	50.8	47.7	49.0	47.8z	52.1y	47.2z
11	47.4	50.6	48.1	50.4	48.9yz	51.5y	47.0z
12	46.4	49.8	48.0	50.0	49.0yz	50.1y	46.5z

1/ Means in any row (within treatments or strains) with different letters are significantly different (P<0.05)

2/ Age at lighting

TABLE 7. Overall results - periods 1-12[1/]

	Treatment				Strain		
	18[2]	18/20	20	22	A	B	C
Hen-day production (%)	75.1	75.5	75.3	75.3	74.3z	77.1y	74.5z
Eggs per hen-housed	241.4	239.6	242.9	243.5	242.5	241.6	241.5
Average egg weight (g)	60.2ab	60.9a	59.7b	60.5ab	60.5yz	60.7y	59.8z
Total egg weight/hen-housed (kg.)	14.5	14.6	14.5	14.8	14.57	14.67	14.43
Large eggs & above (%)	74.9	78.4	74.6	77.1	76.6yz	78.4y	73.7z
Average daily egg mass (g)	45.2	45.9	44.9	45.6	44.9z	46.8y	44.5z
Feed per hen-day (lbs.)	.251	.250	.249	.247	.247z	.253y	.248z
Feed conversion (lbs./dozen)	4.02	3.98	3.97	3.94	3.99	3.95	4.00
Feed to egg ratio	2.53	2.48	2.52	2.46	2.50yz	2.46z	2.53y
Mortality (%)	7.2	8.9	7.2	5.6	5.4z	10.8y	5.4z
Feed-cost per dozen (¢)[3/]	34.9	34.5	34.4	34.1	34.6	34.2	34.7
Average egg value (¢/dozen)[3/]	57.0	57.3	56.8	57.3	57.2y	57.5y	56.7z
Egg income minus feed cost per hen-housed ($)[3/]	4.46	4.55	4.55	4.71	4.58	4.68	4.44

1/ Means in any row (within treatments or strains) with different letters are significantly different (P<0.05)
2/ Age at lighting
3/ Prices used: Feed - $8.67/100 pounds. Eggs - Large, 60¢/dozen; Medium, 53¢/dozen; Small, 35¢/dozen

RESULTS AND DISCUSSION

Statistical analysis of the treatment test results showed only one significant overall effect--egg size. The 20-week treatment showed a significant reduction in egg size during periods 9, 10 and 11 and for the entire experiment. Overall egg mass, though, was not significantly different from the other treatments. Strain C demonstrated a significant reduction in egg weight when stimulated with light at 20 weeks of age compared to the other three programs. This difference was observed in every period.

The 20-week light stimulation program appeared to be associated with a higher early mortality rate, especially in Strain B. The two 20-week programs in Strain B averaged 6.67% mortality through eight weeks, while the other two treatments experienced none. This difference was statistically significant ($P>0.05$). As a result, these two treatments produced 10 to 13 fewer eggs on a hen-housed basis over the entire test in this strain. A similar reduction in hen-housed egg production was noted in the 20-week treatment in the earlier experiment.

The 18/20- and 22-week treatments represent a two-week delay between moving and light stimulation. In each instance, income appeared to be improved (Table 7). Even though the economic results showed a trend toward higher income from the later treatments, these differences did not prove to be statistically significant.

The step-down lighting program used to retard sexual maturity was less effective in this February-hatched flock when compared with the previous experimental flock hatched in August. This resulted in earlier egg production in the pullets lighted at 20 and 22 weeks of age in the present experiment. In the previous experiment, one strain of pullets lighted at 18 weeks started to lay earlier (40% hen-day during period 1) than any of the strains in the present experiment. This may have been due to the greater increase in day length (7 hours in the first experiment vs. 2.5 hours in the present experiment) which occurred when the pullets were lighted. These seasonal differences may be responsible for the different responses observed.

Step-down lighting programs depend upon a combination of natural and artificial lighting to simulate a decreasing day length pattern. In Winter- or Spring-hatched flocks, the naturally increasing pattern of day length is offset with additions of low intensity artificial lights. The results of this experiment would make one question the efficacy of this type of program as a means to delay sexual maturity at this time of the year. The high intensity increasing pattern may not be effectively masked by additions of low intensity artificial lighting.

In summary, the two experiments demonstrate several important interactions between treatment and strain. Poultrymen must recognize that all strains should not be treated the same relative to this question. In addition, egg price patterns and large/medium egg price spreads must also be considered when developing a lighting program.

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