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DEVELOPMENTS WITH AHEMERAL LIGHTING

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In the early 1900s, poultry producers learned that supplemental lighting was necessary if they were to get eggs from their laying flocks during the winter months.

Since that time many experiments have been conducted to better define the lighting period, light intensity, and even wavelengths of light for egg production. It was also discovered that a lighting stimulus to the bird has a short duration effect so that lighting programs of an intermittent nature could be used. As a result, commercial production units today have satisfactory production under a variety of lighting programs. Research continues in lighting and its influence on the bird and egg production so that the hen of the future may experience a lighting environment different from those used today.

It takes a hen from 25 to 26 hours to complete the process of egg formation. This results in a pattern of egg production in which the hen lays each egg at a later hour in the day and then skips a day of production.

During the past few years, a number of researchers have tried altering the light-dark cycle of the hen so that it is exposed to day lengths that are either shorter or longer than the normal 24-hour day. The programs in which the light-dark cycles do not add up to 24 hours are called ahemeral lighting programs and a number of reports have appeared in the scientific literature on the effect on egg production. British workers, nearly 10 years ago, found that a 27-hour day (14 light : 13 dark) could accommodate the egg production cycle from egg to egg laid by the hen. The egg spent about 1½ hours longer in the formation process during this cycle and had a greater shell weight than eggs produced under a 24-hour cycle.

Two papers presented at the Poultry Science Association meetings in August, reporting both research and field studies in western Washington with ahemeral lighting, interested me. The effect of these light-dark cycles on shell quality and laying hen performance near the end of the laying year was studied in research trials. Hens were subjected to either a 26-hour cycle (16 light : 10 dark) or a 27-hour cycle (16 light : 11 dark) at 56 weeks of age, with control hens remaining on a 24-hour cycle (16 light : 8 dark). At 60 weeks, groups of birds on 24-hour days and 26-hour days also had day length increased. A summary of egg production and egg quality observations from this study follows.

Table 1. Shell weight (grams)

Cycle length (hour)	Age of hens (weeks)			
	53	57	60	64-76
24	5.80	5.81	5.88	5.72
26		5.89	6.06	5.90
27		6.16	6.19	6.02

The pretreatment egg shell weight at 53 weeks of age was 5.8 grams. Hens on the 24-hour cycle maintained this shell weight through 60 weeks; all birds on the longer cycles produced statistically significantly heavier shell weights from the shorter cycles. The 57th week is shown because shell weight responded quickly and shell weights were taken at the end of the week following the switch in light cycles. The 26- and 27-hour cycles include eggs laid by all pens of birds in those time cycles. Measurements were made on two days' eggs every four weeks. Data in the 64-76 week column are averages of four determinations.

Shell weight per unit of surface area was also calculated. As with shell weight at 57 weeks, this measure also showed significantly heavier scores in each longer light treatment. Similar findings were demonstrated in field trials. Measurements of shell weight per unit surface area after 60 weeks of age were significantly greater for the 26- and 27-hour treatments than the 24-hour treatment, but were not significantly different from one another.

Egg weight increases as the hens aged were quite normal for birds on the 24-hour cycle. Egg weights of the 24- and 26-hour cycle hens were not statistically different, while those from hens on the 27-hour cycle were significantly heavier than those on the 24- and 26-hour cycles.

Albumen quality, as measured by Haugh units, showed the expected internal quality decline experienced as hens age. Extending the day length did not restore or delay decline.

Table 2. Rate of lay [1]

Cycle length (hour)	Age of hens (weeks)		
	54-56	57-60	61-76
24	68.7	65.5	57.2
26		65.5	57.9
27		67.3	60.5

[1]Percent hen-day on a 24-hour basis.

Table 2 shows rate of lay adjusted to a 24-hour basis. Differences are not statistically significant in this study. Placing the birds on fewer days did not reduce the total number of eggs gathered. One of the researcher's thoughts is that the improved shell quality in the long-day cycles may have salvaged eggs which may have previously been lost to the producer as membrane or soft-shelled eggs. Death losses were about 1 percent per month in these studies and there were no significant differences among treatments.

Table 3. Feed efficiency (g feed/g egg)

Cycle length (hour)	Age of hens (weeks)		
	54-56	57-60	61-76
24	2.65	2.82	3.14
26		2.85	3.12
27		2.71	2.89

Feed efficiency was measured in grams of feed per gram of egg produced (table 3). In this treatment, increased day length did not increase feed consumption. As expected, the hens became less efficient as they grew older. Increased output in both number of eggs and in egg weight on the 27-hour cycle led them to achieve a statistically better feed to egg ratio than 24- and 26-hour hens during the 61-76 week period. There was no influence of light treatment on body weight of the hens.

In addition to the research studies just reported, three field trials were conducted on farms having shell quality problems. These field trials used a 28-hour light-dark cycle (20 light : 8 dark), on hens near the end of a laying cycle to measure improvement in eggshell quality on commercial poultry farms with light-tight housing. The 28-hour cycle meant each week could be divided into six 28-hour days using a 7-day clock. The system also simplified scheduling of employees for work and eggs were gathered only six days during what would normally be a seven day time period. Results of the field trials suggest that shell quality, as measured by the incidence of cracked eggs or by specific gravity, was improved in hens exposed to a 28-hour light-dark cycle. Rate of lay when adjusted to a 24-hour basis was not adversely affected by the 28-hour light-dark program. One of the researchers cautions that this might not hold true if birds are above 70 percent production at the time of exposure to the long day cycles. In the field studies egg weight was increased and there was a tendency for increased feed consumption.

The Future of Ahemeral Lighting

The research studies and field trials reported in these papers show promise for ahemeral lighting as a potential management tool in improving shell quality in a flock towards the end of a production cycle. Additional studies and field trials will undoubtedly lead to refinements in techniques which further define the effects of ahemeral lighting on egg production and egg quality. This type of management program can only be carried out in a house that is absolutely light-tight to enable the light-dark periods to be effective. Work in the house would have to be adjusted to conform to the lighted periods. But as with many other production practices, potential economic benefits may outweigh some of the other disadvantages in certain flock situations. It will be interesting to watch reports of additional research and gains in commercial experience.

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