Effect of Differing Intermittent Lighting Regimes on Broiler Feed Conversion

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ABSTRACT Results in previous work have shown that feed can be saved by controlling light intensity in growing broilers. Windowless broiler houses have the disadvantage that a large amount of electricity for ventilation is required during the summer months. A paneled sidewall method of producing broilers might have the advantage of a house that could be windowless 9 months and have open sidewalls for 3 months. A panel would offer potential for light infiltration should cracks exist around that panel.

Results of this study indicate that total light intensity control is required within the broiler house for the entire 24-hr period to obtain maximum feed savings when broilers are reared under an intermittent lighting program.

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INTRODUCTION

Beane *et al.* (1962), Hooppaw and Goodman (1972), Gasperdone (1973), Quarles and Kling (1974), Deaton and Reece (1976), Weaver (1977), and Deaton *et al.* (1978) found that feed conversion was significantly better by broilers reared under intermittent light than by broilers reared under a continuous light. Control of the light environment in a broiler house requires that the house be windowless and that it have light traps over the air intake ducts and ventilation fans.

One disadvantage of windowless houses in areas such as the southern United States is that ventilation fans must run almost continuously during the summer months to prevent heat prostration. To take advantage of light control in such areas, one possible solution is to have a house with insulated or collapsible panel sidewalls. The house can then be windowless for 9 months of the year and opened where natural ventilation could be used for the other 3 months. Considerable savings in electricity use could be realized during the summer months if natural rather than fan ventilation were used (Deaton, 1978).

Should the industry move to a panel sidewall method of producing broilers during the cool part of the year, cracks around the panels could give more areas for light infiltration into the house during the daylight period and thus create a brownout rather than a dark house. Therefore, the objective of this study was to determine what feed conversion efficiencies could be obtained for broilers reared under simulated brownout light conditions.

EXPERIMENTAL PROCEDURE

The first of three experimental treatments consisted of broilers receiving 15 min of light at 5 lx intensity, followed by 105 min of darkness repeated continuously from 1 day of age. The second treatment consisted of broilers receiving 12 hr of continuous light at 5 lx followed by 12 hr at 15 min of light at 5 lx and 105 min of darkness from 1 day of age. The third treatment consisted of broilers receiving 15 min of light at 50 lx and 105 min of light at 5 lx for a 12-hr period, then 12 hr with 15 min of light at 5 lx and 105 min of darkness from 1 day of age.

The work was conducted in climatic chambers as described by Reece and Deaton (1969). For each trial, 40 males and 40 females were placed in each of 6 chambers at 1 day of age making a total of 2 replicates of 80 birds for each of the 3 treatments. Two trials were conducted.

Light was supplied by incandescent bulbs. Light intensity was measured at feeder level.

TABLE 1. *Light regime effect on broiler growth and feed conversion*

Treatment[1]	Age (days)	Trial	Average body weight (g) Male	Female	Mean	Feed conversion
1	0–35	1	1147	985	1066	1.72
	0–35	2	1195	1013	1104	1.76
	0–35	$\bar{X}$	1171[a]	999[a]	1085	1.74[a]
2	0–35	1	1157	971	1064	1.79
	0–35	2	1210	1009	1110	1.84
	0–35	$\bar{X}$	1184[a]	990[a]	1087	1.82[b]
3	0–35	1	1181	1025	1103	1.80
	0–35	2	1195	1031	1113	1.81
	0–35	$\bar{X}$	1188[a]	1028[a]	1108	1.81[b]

[1]Treatments consisted of: 1) broilers receiving 15 min of light at 5 lx intensity followed by 105 min of darkness repeated continuously from 1 day of age; 2) broilers receiving 12 hr of continuous light at 5 lx followed by 12 hr at 15 min of light at 5 lx and 105 min of darkness from 1 day of age; 3) broilers receiving 15 min of light at 50 lx and 105 min of light at 5 lx for the 12 hr, then 12 hr with 15 min of light at 5 lx and 105 min of darkness from 1 day of age.

[a,b]For each column, differing superscript letters for each treatment mean ($\bar{X}$) denote significance at ($P<.05$).

Two tube feeders each 38.1 cm in diameter and one 2.44-m waterer were used in each chamber. The waterer was located along one wall, allowing drinking on only one side. A starter diet containing about 23% protein and a metabolizable energy value of 3306 kcal/kg of diet was fed for the first 4 weeks. From 4 weeks, the broilers were fed a diet containing about 21% protein and a metabolizable energy value of 3372 kcal/kg of diet. Feed and water were supplied *ad libitum*.

The temperature regime used was 29.4 C for the first week, 26.7 C for the second week, 23.9 C for the third week, and 21.1 C from 4 weeks to the end of the study.

Analysis of variance with Duncan's (1955) multiple range test were used to separate significant treatment means.

RESULTS AND DISCUSSION

None of the light regimes used in this study

TABLE 2. *Light regime effect on broiler growth and feed conversion*

Treatment[1]	Age (days)	Trial	Average body weight (g) Male	Female	Mean	Feed conversion
1	0–54	1	2233	1834	2034	2.02
	0–54	2	2252	1756	2004	2.02
	0–54	$\bar{X}$	2243[a]	1795[a]	2019	2.02[a]
2	0–54	1	2261	1802	2032	2.07
	0–54	2	2226	1765	1996	2.08
	0–54	$\bar{X}$	2244[a]	1784[a]	2014	2.08[b]
3	0–54	1	2269	1852	2061	2.10
	0–54	2	2233	1791	2012	2.07
	0–54	$\bar{X}$	2251[a]	1822[a]	2037	2.09[b]

[1]Treatments consisted of: 1) broilers receiving 15 min of light at 5 lx intensity followed by 105 min of darkness repeated continuously from 1 day of age; 2) broilers receiving 12 hr of continuous light at 5 lx followed by 12 hr at 15 min of light at 5 lx and 105 min of darkness from 1 day of age; 3) broilers receiving 15 min of light at 50 lx and 105 min of light at 5 lx for the 12 hr, then 12 hr with 15 min of light at 5 lx and 105 min of darkness from 1 day of age.

[a,b]For each column, differing superscript letters for each treatment mean ($\bar{X}$) denote significance at ($P<.05$).

significantly influenced average body weight at 35 or 54 days of age (Tables 1 and 2). Allowing a constant brownout light condition (5 lx) for 12 hr of a 24-hr period and then reverting to 15 min of light at 5 lx intensity and 105 min of darkness for 12 hr (treatment 2) did not produce as good a feed conversion as rearing broilers that received 15 min of light at 5 lx intensity and 105 min of darkness repeated continuously (treatment 1; Tables 1 and 2). These results indicate that feed conversion efficiencies associated with light intensity cannot be maximum unless light intensity is under total control for the entire 24-hr period; that is, a brownout light situation in a broiler house during daylight hours will not produce the maximum benefit in feed conversion savings that would be produced with total light intensity control during daylight hours. To obtain maximum response to feed efficiency with an intermittent light regime for broilers reared in a paneled sidewall house, leakage of light into the house to cause a brownout rather than a total light control house should be prevented. Broilers reared under brownout or low-light intensities should have a better feed conversion, however, than broilers reared under bright light conditions (205 lx) during a part of the 24-hr period (Deaton *et al.*, 1976).

Providing a contrast in light intensities during the daylight period (15 min of light at 50 lx and 105 min of light at 5 lx for 12 hr) then providing 12 hr with 15 min of light at 5 lx and 105 min of darkness (treatment 3), as could be done during the night period, did not improve feed conversion efficiencies when compared to treatments 1 and 2 (Tables 1 and 2).

Mortality was not affected by light regime. Of the 960 broilers started during the course of the experiment, 20 broilers dispersed among the three treatments died.

The results of this experiment indicate that to obtain the feed conversion efficiency response for broilers from an intermittent light regime, total control of light intensity is required.

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