

Effect of Intermittent Light on Broilers Reared under Moderate Temperature Conditions

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ABSTRACT Commercial broilers reared under an intermittent-lighting regime produced a significantly better feed conversion than broilers reared under a continuous-lighting regime. Body weight gain was not significantly affected by light treatment. However, the number of breast trims, as recorded under commercial processing plant inspection procedures, was significantly higher for broilers reared under an intermittent-lighting regime than for those reared under a continuous-lighting regime in which the light intensity was changed during each 24-hr period.

INTRODUCTION

Because of sharply increased feed and fuel costs, and faced with a diminishing fuel supply, the broiler industry is modifying existing houses and is building new houses in which the environment can be better controlled. 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 fans. Some commercial broilers are now being reared under this housing system (Weaver, 1977). A list of advantages and disadvantages of windowless houses for broiler production was compiled by Deaton and Reece (1975) and further explained by Deaton and Reece (1976).

The effect of intermittent lighting programs on market chickens was reviewed by Buckland (1975). The general consensus is that broilers cannot undergo long periods of darkness and sustain maximum growth (Moore, 1957; Schutze *et al.*, 1960; Krueger *et al.*, 1962; Beane *et al.*, 1965; Deaton *et al.*, 1976). Beane *et al.* (1962), Hooppaw and Goodman (1972 and 1976), Gasperdone (1973), Quarles and Kling (1974), Buckland *et al.* (1974), Deaton and Reece (1976), and Weaver (1977) found that feed conversion was significantly better by broilers reared under intermittent light than by broilers reared under a continuous light. Buckland *et al.* (1971), Cain (1973), Buckland *et al.* (1973), and Quarles and Kling (1974) reported that the rearing of broilers under intermittent light had no effect on their carcass quality. Because an intermittent-light regime changes the activity pattern of the birds as indicated by Hooppaw and Goodman (1976), birds reared under that type of regime probably spend more

time resting on the keel than birds reared under a continuous-light regime. Therefore, the following studies were conducted to determine the effect of intermittent and continuous light on broiler body weight, feed conversion, breast trims, and body ether extract.

MATERIALS AND METHODS

In the first experiment, which served as a preliminary study, the work was conducted in climatic chambers as described by Reece and Deaton (1969). Four chambers were used and 40 males and 40 females were placed in each chamber at 1 day of age. Two treatments, each replicated in two chambers, were conducted. Treatment 1 consisted of continuous light at 12.9 lux for 8 weeks, and treatment 2 consisted of 15 min of light at 12.9 lux followed by 105 min of darkness for the 8-week period. The litter was new pine shavings. Experiment 1 consisted of two trials.

The second experiment was conducted in an environmentally controlled poultry house that contained 32 pens 1.52 × 3.66-m on each side of a 3.66-m center aisle as described by Reece and Harwood (1973). A solid partition divided the house into two equal partitions. Treatments consisted of (1) continuous repetitions of 12 hr of light at 237 lux and 12 hr at 7.5 lux during the 54-day trial period and (2) continuous light at 75 lux for the first 9 days, then continuous repetitions of 15 min of light at 7.5 lux followed by 105 min of darkness, until the birds were marketed at 54 days of age.

We used only male broilers in the second experiment to better evaluate the effect of lighting regimes on breast blisters. We placed 79

one-day-old broilers in each of the 32 pens. For the first trial new pine shavings were used as litter. For the second trial the caked litter was removed from the pens from the first trial and chicks for the second trial were started on the used litter.

Light was supplied by incandescent bulbs. Light intensity was measured at feeder level. Two 38.1-cm-diameter tube feeders and one 2.44-m waterer were used in each chamber or pen. The waterer was located along one wall or partition, allowing drinking on only one side. A starter diet containing about 23% protein and a metabolizable energy value of 3306 kcal/kg of diet. Feed and water were supplied *ad lib*.

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 market. At 54 days of age for experiment 2, a random sample of 32 birds/treatment in each trial was fasted for 12 hr before slaughter for carcass analyses. The carcasses were analyzed for ether extract in duplicates in accordance with the Association of Official Agricultural Chemists (1965). We obtained litter moisture by drying samples at 100 C for a 24-hr period.

In Experiment 2, the breast trim data were collected at a federally inspected, commercial broiler-processing plant. The processing line was broken between the experimental groups so the data could be recorded by treatment after the birds passed the inspector's and trimmer's stations. We used analysis of variance with Duncan's (1955) multiple range test to separate significant treatment means. Breast trim data were analyzed by chi-square (Snedecor and Cochran, 1959).

RESULTS AND DISCUSSION

Experiment 1. The feed conversion of the mixed-sex broilers reared under an intermittent-lighting regime from 1 to 56 days of age (Treatment 2) was significantly better than that of the broilers that were reared under a continuous-lighting regime (Treatment 1) at 35 and 56 days of age (Table 1). These findings were similar to those reported by Quarles and Kling (1974). Body weight at 35 or 56 days of age for the two light treatment groups did not differ significantly (Table 1). Even though breast trim data were not collected in this preliminary study, it was noted that 2 males in the intermittent-lighting group in 1 trial had severe breast blisters. No birds had severe breast blisters in the continuous-lighting group. Mortality was 3% in Experiment 1 and was scattered throughout the 4 chambers in the 2 trials.

Experiment 2. Body wt at 28 days and 54 days was not significantly affected by light treatment (Table 2). Feed conversion of the birds reared under intermittent-lighting regime (Treatment 2) was significantly better than that of birds reared under a bright-dim light regime (Table 2).

Significantly more breast trims were made for birds reared under the intermittent-lighting regime than for those reared under the continuous-lighting regime, even though body wt was similar (Table 2). In the first trial, when the chicks were started on new pine shavings, the percentages of breast trims were 8.01 and 11.74 with average body wt of 2088 and 2139 g for the continuous- and intermittent-lighting groups, respectively. In the second trial, when the chicks were started on used litter, the

TABLE 1.—*The effect of intermittent versus continuous light on body weight and feed conversion*

Treatment ^a	Age (days)	Average body weight (g) ^b			Feed ^b conversion
		Male	Female	Mean	
1	35	977 ^c	876 ^c	927	1.86 ^c
2	35	1008 ^c	874 ^c	941	1.75 ^d
1	56	2102 ^c	1754 ^c	1928	2.16 ^c
2	56	2134 ^c	1727 ^c	1931	2.09 ^d

^aThe treatments from 0–8 weeks of age were: 1) continuous light at an intensity of 12.9 lux, and 2) 15 min of light at 12.9 lux, followed by 105 min of darkness.

^bWithin each age and sex group, differing letters denote significance at the .05 level of probability.

TABLE 2.—*The effect of intermittent versus continuous light on body weight, feed conversion, breast trims and body ether extract (males only)*

Treatment ^a	Age (days)	Body weight (g) ^b	Feed conversion ^b	Breast trims ^b		% ether extract
				No.	%	
1	28	760 ^c	1.68 ^c
2	28	775 ^c	1.57 ^d
1	54	2120 ^c	2.14 ^c	231/2323 ^c	9.94	15.7
2	54	2135 ^c	2.09 ^d	374/2311 ^d	16.18	15.8

^aThe treatments from 0–8 weeks of age were: 1) 12 h of light at 237 lux and 12 h of light at 7.5 lux; and 2) continuous light at an intensity of 75 lux for the first 9 days, then 15 min of light at 7.5 lux, followed by 105 min of darkness.

^bWithin each age group, differing letters denote significance at the .05 level of probability.

percentages of breast trims were 11.96 and 20.99 with average body wt of 2152 and 2131 g. for the continuous- and intermittent-lighting groups, respectively. The litter moisture was maintained at about 30% for each of the light-treatment groups.

When the breast trim data were statistically compared between treatments for each of the two trials, birds reared under the intermittent-lighting regime had significantly more breast trims within each trial than the birds reared under the continuous-lighting regime. The general recommendation for litter moisture is 25% and up to 30%. It was obvious in these trials that litter moisture was too high because caking of litter did occur in a portion of each pen for each treatment group.

Percent body ether extract was unaffected by light treatment (Table 2). Mortality was 2.30% for the intermittent-lighting group and 2.80% for the continuous-lighting group in Experiment 2.

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