EDUCATION AND PRODUCTION

Effects on Commercial Broiler Chicks of Constant Exposure to Ultraviolet Light from Insect Traps

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ABSTRACT Constant exposure of newly hatched Avian × Avian broilers to ultraviolet light from insect traps for 42 d resulted in no significant differences in mortality, weight gain, feed consumption, or feed conversion. Birds were exposed to greater intensities of ultraviolet light for longer periods than could be expected under commercial conditions. Although house flies are rarely a problem in broiler houses, our results indicate that insect traps with ultraviolet light as an attractant would not be detrimental to production of broilers. The need for additional testing of light traps for nuisance fly control in commercial broiler houses is discussed.

(Key words: broiler, fly traps, mortality, weight gain, feed conversion)

INTRODUCTION

Insect traps that use ultraviolet light as an attractant have been shown to have no adverse affects on egg production in mature caged layers (Hogsette et al., 1997); however, the effects of the light from these traps on the productive performance of broilers have not been determined. A positive relationship between light and body weight of broilers has been demonstrated in many studies (Clegg and Sanford, 1951; Moore, 1957; Deaton and Reese, 1970), and changes in light intensity, photoperiod, and temperature were found to affect this relationship (Skoglund and Palmer, 1962; Beane et al., 1965; Deaton et al., 1970, 1989). However when using artificial light, certain wavelengths must be present to produce the desired effects. For example, Foss et al. (1972) found that broiler cockerels maintained under green light (545 nm) weighed significantly more after 11 wk than those maintained in total darkness, or under blue (450 nm), far red (750 nm), or white light (325 to 750 nm). Wabeck and Skoglund (1974) found that after 9 wk, broilers reared under either blue (470 nm) or green (530 nm) fluorescent light weighed more than those reared under red (650 nm) fluorescent light. In other broiler studies, red light reduced cannibalism and made feed more attractive, but birds were unable to see when exposed to blue light (Bowlby, 1957).

Ultraviolet light appears to have little if any effect on egg production (Hart et al., 1925; Titus and Nestler, 1935; Carson and Beall, 1955), although Barott et al. (1951) increased egg production significantly by exposing birds to ultraviolet light in the bacteriocidal region (200 to 280 nm). Recent studies demonstrated that broilers will respond to wavelengths as short as 360 nm (Prescott and Wathes 1998) and Holden (1983) indicated that the lens of the avian eye can transmit wavelengths as short as 350 nm.

Tests in open-sided (Driggers, 1971; Foil and Hogsette, 1994) and closed (Rutz et al., 1988; Pickens et al., 1994) caged layer houses have demonstrated the potential of traps that attract flies with ultraviolet light. In closed housing, ultraviolet light traps in constant operation may decrease the need for chemically based fly control. We are aware of only limited testing of ultraviolet light traps in commercial caged layer houses (Rutz et al., 1988), and until now there have been no reports of testing in broiler houses.

The purpose of this study was to determine the effects of constant-exposure ultraviolet light from insect traps on growing broiler chicks. Positive results should help to alleviate producers’ concerns that light from the traps may be detrimental to chickens or interfere with designated lighting schedules.
TABLE 1. Mean (± SEM) number of birds, body weight, feed consumption, and feed conversion of broilers maintained with and without constant exposure to ultraviolet (UV) light from fly traps.1,2

<table>
<thead>
<tr>
<th>Age (wk)</th>
<th>Number of birds</th>
<th>Weight (g)</th>
<th>Feed consumption (g)</th>
<th>Feed conversion (g/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>UV Light trap</td>
<td>Control</td>
<td>UV Light trap</td>
</tr>
<tr>
<td>0 (chicks housed)</td>
<td>101.5 ± 0.29</td>
<td>101.0 ± 0.00</td>
<td>39.7 ± 0.1</td>
<td>39.8 ± 0.3</td>
</tr>
<tr>
<td>3</td>
<td>99.3 ± 0.63</td>
<td>99.3 ± 0.85</td>
<td>661.0 ± 15.8</td>
<td>635.5 ± 14.3</td>
</tr>
<tr>
<td>6</td>
<td>98.5 ± 1.04</td>
<td>98.5 ± 1.04</td>
<td>1,946.3 ± 75.0</td>
<td>1,898.0 ± 78.3</td>
</tr>
</tbody>
</table>

1Feed consumption and feed conversion values for Week 6 are calculated from Day 0 to Day 42.
23-wk exposures.

MATERIALS AND METHODS

Avian × Avian4 newly hatched broiler chicks were housed on litter floors in approximate groups of 100 in each of four environmentally controlled houses (3.2 × 3.7 m) at the University of Florida Poultry Unit, Gainesville, FL. Birds were placed under brooders at 35 C for 1 wk, after which time air temperature was maintained at approximately 32.2 C. Relative humidity was ambient.

The lighting schedule was 24 h light:0 h dark for Days 1 to 3, and 16 h light:8 h dark for the remainder of the study. Light in each house was provided by two fluorescent loop bulbs (13-W Osram Dulux S, No. F13TT/27K). This lighting schedule was maintained throughout the tests and was completely independent of additional light provided when ultraviolet light traps were in operation. Standard broiler diets and water were consumed ad libitum.

Ultraviolet light traps5 oriented horizontally were placed individually in two of the houses, centered on a 3.7-m wall approximately 60 cm above the floor, and angled approximately 30° from the perpendicular to provide maximum direct exposure to the floor area. Traps were fitted with two blacklight (40-W Sylvania, No. F40BL) fluorescent tubes. Tubes had been illuminated for 200 h prior to use to allow phosphors in the tubes to stabilize and thus ensure that maximum emission of wavelengths in the desired range (310 to 390 nm) was maintained. Light traps were in constant operation during test periods.

The four test houses were located spatially at the corners of a rectangle, the houses at opposite diagonals being selected to receive like treatments. Houses not receiving ultraviolet light traps were control treatments. The first group of birds (hatched on April 1, Experiment 1) was housed on April 2 and ultraviolet light traps were operated in two houses for the 6-wk test period. The second group of birds (hatched June 17, Experiment 2) was housed on June 18 and ultraviolet light traps were moved to the other two houses and operated for the second 6-wk test period.

Parameters measured were bird mortality, weight gain, feed consumption, and feed conversion. Birds were weighed in a group by house on Days 0, 21, and 42. Feed consumption and feed conversion (adjusted for mortality when necessary) were calculated for Weeks 1 to 3 and for Weeks 1 to 6, and mortality was recorded daily. Because constant exposure for 6 mo to ultraviolet light emitted from insect traps had no adverse effects on the eyes of laying hens in our previous study (Hogsette et al., 1997), we assumed that the eyes of broilers in this study would not be adversely affected by only a 6-wk exposure period.

Data were analyzed with General Linear Models procedures (SAS Institute, 1985) to evaluate time and positional effects; a two-tailed t test (SAS Institute, 1985) was used to determine differences between treatments.

RESULTS AND DISCUSSION

All effects with respect to time and position were nonsignificant with the exception of weight. Birds in Experiment 1 were significantly heavier than birds in Experiment 2 regardless of treatment (F = 354.2; df = 7, 23; P = 0.0001); however, differences were considered to be related to feed intake, and data were pooled for the t test analyses.

There were no significant differences in bird numbers at the beginning of the test (t = 1.7321; df = 6; P = 0.134) and there were no significant differences in bird mortality after the two 3-wk exposure periods (t = 0.0000; df = 6; P = 1.0000; t = 0.0000; df = 6; P = 1.0000) (Table 1). Mortality was quite uniform during the course of the experiments, with overall mortality, regardless of treatment, averaging 2.8%. There were no significant differences in initial weights (t = -0.3136; df = 6; P = 0.764) and no significant differences in weight gains by exposure period (t = 1.2019; df = 6; P = 0.275; t = 0.4451; df = 6; P = 0.672) (Table 1), although birds in control groups were numerically heavier than those exposed to ultraviolet light.

There were no significant differences in feed consumption by exposure period (t = 0.3366; df = 6; P = 0.748; t = 0.0030; df = 6; P = 0.998) (Table 1), but birds in Experiment 1 consumed significantly more feed than those in Experiment 2 (F = 75.74; df = 6, 15; P > 0.0001). There were no significant differences in feed conversion

1Avian Farms Inc., Portland, ME 04112.
by exposure period ($t = -0.4634; df = 6; P = 0.659; t = -0.7224; df = 6; P = 0.497$) (Table 1), but feed conversion for the birds in Experiment 1 was significantly higher than that of birds in Experiment 2 ($F = 46.43; df = 6, 15; P > 0.0001$). As stated above, birds in Experiment 1 were heavier than birds in Experiment 2, so concomitant differences in feed consumption and feed conversion could be anticipated.

Results were as expected, with constant exposure to ultraviolet light from insect traps having no effect on broiler performance. In our experiments, birds were subjected to worst-case scenarios by being maintained close to ultraviolet light for long exposure periods. In commercial practice, this would be similar to birds remaining close to ultraviolet light traps affixed to broiler house walls without moving to another location during their 6-wk growing period. Of course, this is unrealistic.

In a previous study (Hogsette et al., 1997), constant exposure to ultraviolet light from insect traps caused no significant differences in egg production or fertility of laying hens. These hens were exposed for a much longer period than the broilers in the current study, but there were no detrimental effects in either case. The fact that no significant differences occurred in feed consumption and feed efficiency between treatment groups suggests strongly that these factors are not affected by increased levels of ultraviolet light between 310 and 390 nm.

Broilers under constant lighting regimens (fluorescent plus ultraviolet) did not use the 8-h periods of exposure to ultraviolet light to consume additional feed. Traps that rely on ultraviolet light to attract insects may be more widely used in the industry if producers realized that the light from these traps will not interfere with their scheduled lighting programs. Ultraviolet light traps may be most efficacious when they are the only traps on White Leghorn hens. Poultry Sci. 76:1134–1137.


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REFERENCES


