Influence of light emitting diodes (LED) bulbs on broilers grown to heavy weights

Light management influences growth, reproduction and behavior. Lighting programs slow the early growth rate of broilers allowing them to achieve physiological maturity prior to maximal rate of muscle mass accretion. Selected blood variables including blood gases are routinely used to determine the influences of not only lighting programs but also environmental, nutritional and pathological factors on the health status of poultry. Such things as changes in acid-base balance which are signified by changes in blood ph and particular blood ions may signal early symptoms of diseases while the corticosterone levels increase in response to stress. Indeed, corticosterone levels have been found to be consistently and significantly higher in birds housed under UV deficient lighting. Incandescent (ICD) lighting has been widely used to light broiler houses, but their disadvantages of short life, high energy consumption, and costly maintenance have become prominent factors in poultry production.

Most governments including the USA have legislation to phase out incandescent light bulbs in favor of more energy-efficient lighting alternatives. Many new lighting technologies including cold cathode fluorescent lamps (CCFL), compact fluorescent lamps (CFL), and light emitting diodes (LED) are currently being developed as replacements for ICD light sources. However, choosing the correct LED lighting source can be difficult since some do not dim well as is necessary for different production stages. The major benefits of these bulbs are high efficiency, long operating life, moisture resistance, and availability in differing peak wavelengths. There are a number of studies on the effect of different light sources especially ICD light on physiology of broilers grown to 4.5 pounds, but fewer such studies are available on growth performance and blood physiological parameters of broilers grown to heavy weights (greater than 7 pounds).

We evaluated the influence of 3 new LED light bulbs as well as ICD on various physiological variables including hematocrit, blood glucose, and corticosterone levels among others of broilers grown to heavy weights. The 3 LED light bulbs consisted of Warm-LED, Cool-LED-1, Cool-LED-2, and ICD (standard) light bulbs from 1 to 56 days of age. The Cool-LED-1 is a specific filtered LED made specifically for poultry.

Influence of light emitting diodes (LED) bulbs on body weight and physiological variables of broilers grown to heavy weights (greater than 7 pounds)[1]

	TREATMENTS[2]			
Variables[3]	1	2	3	4
Body Weight (lb)	9.08[b]	9.13[ab]	9.34[a]	9.19[ab]
pH	7.401[a]	7.393[ab]	7.381[b]	7.397[ab]
Bicarbonate (mmol/L)	27.62	27.34	27.65	27.46
Hematocrit (%)	23.7	24.03	23.99	24.37
Hemoglobin (g/dL)	7.6	7.71	7.7	7.82
Glucose (mg/dL)	225.4	224.6	219	219.8
Corticosterone (pg/mL)	1364.5	1510.1	1421.2	1439.4

[abc]Means within a row that lack common superscripts differ significantly ($P \leq 0.05$)

[2]Light Sources: 1= Incandescent light (ICD, Control), 2= Warm-LED with 2700K
3 = Cool-LED-1 with 5000K, which is Poultry Specific Filtered, 4 = Cool-LED-2 with 5000K

[3]Pooled SEM for interaction effect (n = 8)

The results as shown in the table indicated no statistically significant difference among the 3 LED light bulbs evaluated for either physiological variables or body weight. In addition, blood glucose and plasma corticosterone concentrations that are indicators of stress in addition to several welfare indices were not affected by treatments, suggesting that the light sources evaluated did not compromise the welfare of today's heavy broiler chickens. It was concluded that the 3 LED light bulbs evaluated could be suitable for replacement of ICD light sources for commercial poultry facilities that are currently using ICD bulbs to reduce energy cost and optimize production efficiency without causing stress on broilers grown to heavy weights. The 3 LED light bulbs ultimately also provide more economical poultry meat for human consumption, while ensuring that the birds are raised in a welfare-friendly environment.

H. A. Olanrewaju *and* ***S. L. Branton***

USDA-ARS Poultry Research Unit, Mississippi State, MS

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