EFFECT OF LIGHT DURATION ON BEHAVIOURAL AND GROWTH PERFORMANCE OF BROILER CHICKENS

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Abstract
Light duration is a crucial environmental factor influencing welfare, behaviour, and productivity in broiler production. This study investigated the effects of varying light durations (12, 16, 20, and 24 h) on growth performance and behavioural responses of Arbor acres broiler chickens over eight weeks. The experiment was designed in response to welfare concerns in intensive poultry systems where artificial lighting is commonly used to manipulate activity and growth. A total of 96 day-old chicks were randomly allotted to four treatments in a Completely Randomized Design (CRD), with two replicates of 12 birds each, reared on deep litter. Feed and water were supplied *ad libitum*, with chicks fed a starter diet from weeks 1–5 and a finisher diet thereafter. Behavioural parameters including preening, walking, foraging, resting, and standing were monitored using video recordings to evaluate welfare outcomes. Results showed that broilers exposed to 12 h of light had significantly higher resting frequencies ($p < 0.05$), while those under 24 h had the lowest feeding frequency. Birds exposed to 16 and 20 h exhibited improved numerical weight gain, but no significant differences ($p > 0.05$) were observed in growth parameters such as weight gain and feed conversion ratio. Conclusively, excessive lighting (24 h) compromises welfare, while moderate durations (16–20 h) optimize behavioural balance, welfare, and productivity, offering sustainable management recommendations.

Keywords: Behaviour, broiler, feed conversion ratio, growth performance, light duration.

Description of Problem

Broiler chickens require optimal environmental conditions to maximize productivity and welfare. Among these factors, light plays a crucial role not only in regulating physiological processes such as growth and feed efficiency but also in influencing behavioural patterns that directly reflect animal welfare [1, 2]. Continuous light exposure has been reported to reduce rest periods and affect feeding behaviour, which may negatively impact performance and elevate stress levels [3]. Conversely, strategic light schedules can help balance productivity with welfare, allowing birds to express natural behaviours such as resting, foraging, and preening.

Despite the recognition of light management in poultry production, most existing studies tend to focus predominantly on growth performance or production efficiency alone, with limited attention given to behavioural outcomes. Moreover, research that combines both behavioural and growth performance under varying light durations remains scarce, particularly within tropical climates where environmental stressors such as heat and humidity may interact with lighting to influence bird welfare and productivity [4].

This study evaluates the effects of four different photoperiods (12, 16, 20, and 24 hours) on behavioural expression and growth outcomes in broilers. By addressing this gap, it aims to provide insights that support both welfare-conscious and productivity-driven broiler management strategies in tropical environments.

Materials and Methods

A total of 96-day-old Arbor acres broiler chicks were randomly assigned into four treatment groups, each subjected to different durations of light exposure per day: 12 hours, 16 hours, 20 hours, and 24 hours. Each treatment was

replicated twice, and birds were raised under standard management practices including feed and water provided *ad libitum*. A branded commercial feed was used throughout the experimental period. The nutrient composition of the branded commercial feed for starter and finisher feed is provided in table 1. The experiment was conducted at the Teaching and Research Farm, Poultry unit, College of Agriculture, Engineering and Science, Bowen University, Iwo, Osun State. Behavioural data such as resting, feeding, walking, preening, and standing were observed daily using the instantaneous sampling method at 6:00 AM and 6:00 PM for five-minute periods. Observations were recorded through camera footage, and the daily data were subsequently combined and averaged to obtain weekly behavioural summaries for each treatment replicate.

Statistical Analysis: Data collected was subjected to, and analyzed using Anova (Analysis of Variance) using the general linear model. Differences between means were separated using Duncan's Multiple Range Test (DMRT) at 5% probability ($p<0.05$) level of significance using Statistical Package for the Social Sciences (SPSS) software.

Result and Discussion

As shown in Table 2, light duration had a significant influence on certain behavioural activities of broiler chickens. Resting frequency was highest ($p < 0.05$) in the 12-hour light group, indicating a higher resting tendency under shorter photoperiods. Conversely, feeding frequency significantly decreased ($p < 0.05$) in birds exposed to continuous 24-hour light, suggesting potential disruption of natural feeding patterns. Standing frequency was significantly higher ($p < 0.05$) in the 16- and 20-hour groups compared to the 12-hour group. However, walking and preening behaviours did not differ significantly ($p > 0.05$) across all treatments. These findings are in agreement with earlier reports that lighting duration strongly influences feeding and resting rhythms in broilers [6,7]. Similarly, studies have shown that providing an appropriate length of darkness (scotophase) improves ocular development, circadian rhythm, and overall welfare [8,9,10]. The present result supports these observations, as shorter light durations encouraged more resting and balanced activity patterns, while continuous light exposure (24 h) appeared to disturb normal behavioural rhythms. This suggests that intermediate light durations may promote more stable behavioural responses in broilers.

Table 1: Nutrient composition of experimental diet

Nutrient Parameter	**Starter Feed**	**Finisher Feed**
Crude Protein (%)	20.50	19.00
Crude Fat (%)	5.00	5.50
Crude Fibre (%)	5.00	5.00
Calcium (%)	0.90	0.80
Available Phosphorus (%)	0.40	0.38
Metabolizable Energy (Kcal)	3100	3150
Lysine (%)	1.15	1.05
Methionine (%)	0.52	0.46

Table 2: Effect of Light Durations on Behavioural Activities of Broiler Chickens

Parameters	12hrs	16hrs	20hrs	24hrs
Preening	0.56 ± 0.76^{a}	0.63 ± 0.75^{a}	0.63 ± 0.66^{a}	0.61 ± 0.76^{a}
Walking	0.91 ± 0.89^{a}	1.03 ± 0.90^{a}	1.03 ± 0.97^{a}	1.06 ± 0.98^{a}

Eating	2.25±1.08[c]	1.59±1.10[b]	1.31±1.18[ab]	0.81±0.82[a]
Resting	21.41±1.16[a]	1.28±0.89[b]	1.66±1.04[b]	2.16±1.25[b]
Standing	0.53±0.62[a]	1.06±0.80[b]	1.00±0.80[b]	0.94±1.01[ab]

[abc] values along the same row are significantly different ($p < 0.05$) from each other.

Table 3 shows the effect of light duration on the feed and growth performance of broiler chickens. No significant differences ($p > 0.05$) were observed in all measured parameters including initial weight (IW), total feed intake (TFI), feed conversion ratio (FCR), and body weight (BW). However, numerically better performance was recorded in the 16 and 20-hour light groups, which showed higher values for weight gain (1344.58±1285.38g and 1329.32±1256.49g, respectively) and lower FCR (0.97±0.31 and 0.95±0.33), suggesting more efficient feed utilization. In contrast, birds under 24 hours of light had the lowest body weight and highest FCR, indicating potential negative effects of continuous light exposure on growth [3, 6].

Table 3. Effect of Light Durations on the Feed and Growth Performance of Broiler Chickens

Parameters	12hrs	16hrs	20hrs	24hrs
IW (g)	883.81±8.39[a]	863.18±9.25[a]	859.18±9.78[a]	803.40±3.21[a]
FI (g/week)	161.63±2.92[a]	152.49±4.13[a]	144.24±4.33[a]	107.82±5.80[a]
TFI (g)	1131.41±0.41[a]	1067.56±0.86[a]	1009.80±0.26[a]	754.82±0.56[a]
AFI (g/bird/day)	214.66±6.86[a]	197.42±6.28[a]	191.12±0.49[a]	140.64±3.81[a]
FCR	1.01±0.32[a]	0.97±0.31[a]	0.95±0.33[a]	1.12±0.35[a]
BW (g)	1380.87±3.38[a]	1344.58±5.38[a]	1329.32±6.49[a]	729.14±5.54[a]
ABW (g)	1380.87±3.38[a]	1344.58±5.38[a]	1329.27±6.51[a]	729.09±5.52[a]

[abc] values along same row are not significantly different ($p > 0.05$) from each other. Where IW – initial weight, FI – weekly feed intake, TFI – total feed intake, AFI – average feed intake, FCR – feed conversion ratio, BW – final body weight, ABW – average body weight.

In addition, birds exposed to 16 and 20 hours of light numerically outperformed other treatments in body weight and feed efficiency. Although the differences were not statistically significant ($p > 0.05$), these groups showed lower feed conversion ratios and higher final weights. Conversely, birds exposed to 24 hours of light recorded the lowest weight and highest FCR, indicating that prolonged photoperiods may adversely affect feed utilization and growth [10, 11]. These observations support the use of moderate lighting durations for improved broiler performance.

Conclusion and Application

Light duration significantly influenced the behaviour and growth performance of broiler chickens. Birds under 12 hours of light showed the highest resting (2.41 ± 1.16) and feeding activity (2.25 ± 1.08), while those under 24 hours had the lowest feeding frequency (0.81 ± 0.82) and body weight (729.14 ± 5.54 g) with a higher FCR (1.12 ± 0.35). Although differences were not statistically significant ($p > 0.05$), broilers exposed to 16 and 20 hours of light had numerically higher weights (1344.58 ± 5.38 g, 1329.32 ± 6.49 g) and better FCRs (0.97 ± 0.31, 0.95 ± 0.33). These results indicate that moderate photoperiods (16–20 hours) enhance productivity and maintain better welfare balance in broilers.

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